PLANNING COMMISSION MEETING AGENDA
Tuesday, May 17, 2016, 7:00 PM
City Municipal Center, 616 NE 4th Avenue

I. CALL TO ORDER

II. ROLL CALL

III. MINUTES

A. Approval of the Minutes from the April 19, 2016 Planning Commission Meeting

April 19, 2016 Planning Commission Meeting Minutes

IV. MEETING ITEMS

A. Public Hearing for Proposed Camas 2035 Comprehensive Plan (File No. CPA16-01)
Details: Camas 2035 is a citywide process to update the city's comprehensive plan. The comprehensive plan is a long-range plan that guides Camas' future growth and development. Interested citizens may find information on the Camas 2035 project history, outreach details, current draft document (dynamic version), and draft maps online at the following website: www.Camas2035.com. A staff report will be available and added to the agenda.
Presenter: Sarah Fox, Senior Planner
Recommended Action: Staff recommends that Planning Commission conduct a public hearing, deliberate and recommend approval of the Camas 2035 Comprehensive Plan to City Council.

Draft Comprehensive Plan (109MB)

Appendices to Draft Comprehensive Plan (15MB)

V. MISCELLANEOUS UPDATES

A. Miscellaneous Updates

VI. NEXT MEETING DATE

The next scheduled Planning Commission Meeting will be held on Tuesday, June 21, 2016, in the City Council Chambers at 7:00 p.m.

VII. ADJOURNMENT

NOTE: The City of Camas welcomes and encourages the participation of all of its citizens in the public meeting process. A special effort will be made to ensure that persons with special needs have opportunities to participate. For more information, please call 360.834.6864.

PLANNING COMMISSION MEETING MINUTES - DRAFT
Tuesday, April 19, 2016, 7:00 PM
City Municipal Center, 616 NE 4th Avenue

I. CALL TO ORDER

Chair Beel called the meeting to order at 7:00 p.m.

II. ROLL CALL

Present: Bryan Beel, Frank Hood, Jim Short and Lloyd Goodlett

Excused: Troy Hull and Timothy Hein

Absent: Jaima Johnson

Staff Present: Jan Coppola, Sarah Fox, Robert Maul, David Schultz and John Frias (intern)

Council Liaison: Bonnie Carter

III. MINUTES

A. Approval of the Minutes from the March 15, 2016 Planning Commission Meeting

March 15, 2016 Planning Commission Minutes

It was moved by Commissioner Hood, seconded by Commissioner Short to approve the minutes from the March 15, 2016 Planning Commission Meeting. The motion carried unanimously by roll call vote.

IV. MEETING ITEMS

A. Continued Public Hearing to Consider Airport Overlay Zoning
Details: Proposed Camas Municipal Code, Chapter 18.34 Airport Overlay Zoning included draft development regulations that would be applicable to properties within one mile of Grove Field. The regulations would restrict certain land uses, limit building height, and provide notice of aircraft noise, in order to minimize and resolve potential land use conflicts with the airport. The public hearing was continued from March 15, 2016.
Presenter: Sarah Fox, Senior Planner

Staff Report for Airport Overlay Zoning (MC16-03)

Draft Chapter 18-34 Airport Zoning - Version 2

Attachment A Letter from WSDOT

Attachment B Flight Patterns

Attachment C Letter from Building Dept

Attachment D Noise Levels

Attachment E Response from WSDOT to Port

Attachment F Appendix E WSDOT Airports and Compatible Land Use

Attachment G Staff Report from March 8, 2016

Draft Camas Zoning Map Revised from Previous Public Hearing

Sarah Fox briefly summarized the April 14, 2016 Staff Report and highlighted the concerns expressed at the March public hearing. She further clarified and elaborated on how the concerns were resolved.

Chair Beel opened the public testimony portion of the hearing at 7:13 p.m.

The following members of the public spoke:
David Ripp, Camas-Washougal Port Director, 558 NW Viewridge Lane, Camas
Scott Price, Immelman Hangers at Grove Field LLC, 3439 NW Sierra Drive, Camas

The public testimony portion of the hearing was closed at 7:16 p.m.

It was moved by Commissioner Goodlett, seconded by Commissioner Short to forward a recommendation to City Council to approve the proposed amendments to Camas Municipal Code, Chapter 18.34 Airport Overlay Zoning (File No. MC16-03). The motion carried unanimously by roll call vote.

B. Continued Public Hearing to Consider Amendments to the Camas Zoning Map and Camas Comprehensive Plan Map (File No. CPA16-01)
Details: A public hearing was continued from March 15, 2016, to consider amending the Camas Zoning Map and the Camas Comprehensive Plan Map. The proposed map amendments are part of the Camas 2035 Comprehensive Plan Update project, which must be adopted this June.
Presenter: Sarah Fox, Senior Planner

Staff Report to Planning Commission - Edition 2.0

Draft Camas Zoning Map

Draft Comprehensive Plan Map

Staff Report to Planning Commission - Edition 1.0

Attachment: Table of Proposed Map Amendments

Ms. Fox briefly summarized the April 14, 2016 Staff Report and addressed the concerns expressed at the March public hearing. She further elaborated on the progress of the public outreach process thus far for the Camas 2035 Comprehensive Plan Update.

Chair Beel opened and closed the public testimony portion of the hearing at 7:27 p.m., as there were not any members of the public who wished to speak.

Staff responded to the Commissioner's inquiries.

After discussion, it was moved by Commissioner Hood, seconded by Commissioner Goodlett to forward a recommendation to City Council to approve the proposed amendments to the Camas Comprehensive Plan and Zoning Maps (File No. CPA16-01).

V. MISCELLANEOUS UPDATES

A. Miscellaneous Updates

Ms. Fox noted that the draft 2035 Comprehensive Plan will be on the May 17, 2016 Planning Commission Agenda.

Robert Maul briefly updated the Commissioners on the progress of several development applications.

VI. NEXT MEETING DATE

The next regularly scheduled Planning Commission Meeting will be held on Tuesday, May 17, 2016, in the City Council Chambers at 7:00 p.m.

VII. ADJOURNMENT

NOTE: The City of Camas welcomes and encourages the participation of all of its citizens in the public meeting process. A special effort will be made to ensure that persons with special needs have opportunities to participate. For more information, please call 360.834.6864.

A Comprehensive Plan to guide future growth and development for the City of Camas

Camas 2035

The Camas Vision
Introduction

Developing Camas 2035
Introduction

Land Use Goals and Policies
Pg. 1-4

Gateways and Entries
Pg. 6-6

Natural Beauty

Future City policies will preserve trees and natural areas.

Acknowledgements

Thank you to the members of the Camas community for sharing your time and insight in the development of Camas 2035.

Mayor
Scott Higgins

Camas City Council
Greg Anderson
Bonnie Carter
Don Chaney
Tim Hazen
Steve Hogan
Melissa Smith
Shannon Turk

Camas Planning Commission
Bryan Beel, Chair
Lloyd Goodlett
Tim Hein, Vice Chair
Frank Hood
Troy Hull
Jamia Johnson
Jim Short

Camas 2035 Steering Committee
Barb Baldus
Jon Busby
Barry Carson
Bonnie Carter
Troy Hull
Alicia King
Lynn Johnston
Mike Nerland
Buzz Truitt
Shannon Turk
Lisa Willis

Camas 2035 Technical Advisory Committee
Jarred Jackman
Eric Lanciault
Eric Levison
Matthew McBride
Shannon Turk
Sean Vergillo

City of Camas Staff
Phil Bourquin, Community Development Director
Sarah Fox, Senior Planner
Steve Wall, Public Works Director
James Carothers, Engineering Manager

Consultant Team
BergerABAM
Cogan Owens Greene

Acronyms, Abbreviations, and Initialisms

ACS	American Community Survey
ADA	Americans with Disabilities Act
ADU	accessory dwelling unit
BP	Business Park (zone)
CC	Community Commercial (zone)
CIP	capital improvement plan
City	City of Camas
CMC	Camas Municipal Code
County	Clark County
CRC	Columbia Resource Company
CSWMP	Clark County Solid Waste Management Plan
CTR	commute trip reduction
CWFD	Camas-Washougal Fire Department
DC	Downtown Commercial (zone)
Ecology	Washington State Department of Ecology
EMS	emergency medical services
EPA	U.S. Environmental Protection Agency
FVRL	Fort Vancouver Regional Library
GIS	geographic information system
GMA	Growth Management Act
Gpm	gallons per minute
HCM	*Highway Capacity Manual*
HI	Heavy Industrial (zone)
HUD	U.S. Department of Housing and Urban Development
I/I	infiltration/inflow
LED	light-emitting diode
LI/BP	Light Industrial/Business Park (zone)
LID	low impact development
LOS	level of service
MF	Multi-Family (zone)
mgpd	million gallons per day
MHI	median household income
MIX	Metropolitan Interlibrary eXchange
MX	Mixed-Use (zone)
N/A	not applicable; not available
NC	Neighborhood Commercial (zone)
NP	Neighborhood Park (zone)
NPDES	National Pollutant Discharge Elimination System
Ord.	City ordinance
OS	Open Space (zone)
Qi	instantaneous quantity basis
PRD	Planned Residential Development
PROS	*Parks, Recreation and Open Space Comprehensive Plan Update*
RC	Regional Commercial (zone)
RCW	Revised Code of Washington
Res.	City resolution
RTC	Regional Transportation Council
SR	State Route
STEP	septic tank effluent pumping
SU	Special Use Park (zone)
TAC	technical advisory committee
TIF	traffic impact fee
UGA	urban growth area
WUTC	Washington Utilities and Transportation Commission
WWTP	Wastewater treatment plant

Table of Contents

Introduction 1

1 Land Use 1-1

1.1 Vision 1-1
1.2 Organization of Land Use Element 1-1
1.3 Land Use Overview 1-1
1.4 Goals and Policies 1-4

2 Housing 2-1

2.1 Vision 2-1
2.2 Organization of Housing Element 2-1
2.3 Housing Overview 2-1
2.4 Goals and Policies 2-3

3 Natural Environment 3-1

3.1 Vision 3-1
3.2 Organization of Natural Environment Element 3-1
3.3 Natural Environment Overview 3-1
3.4 Goals and Policies 3-1

4 Transportation 4-1

4.1 Vision 4-1
4.2 Organization of Transportation Element 4-1
4.3 Transportation Overview 4-1
4.4 Goals and Policies 4-2

5 Public Facilities and Services 5-1

5.1 Vision 5-1
5.2 Organization of Public Facilities and Services Element 5-1
5.3 Public Facilities and Services Overview 5-1
5.4 Fire Protection and Emergency Medical Services 5-1
5.5 Police Protection 5-2
5.6 Camas Public Library 5-2
5.7 Parks and Recreation Facilities 5-3
5.8 City Cemetery 5-4
5.9 Animal Control Services 5-4
5.10 Other City Facilities 5-5
5.11 City Utilities 5-5
5.12 Capital Improvement Plan 5-10
5.13 Franchise Utilities 5-11
5.14 School Districts 5-12

6 Economic Development 6-1

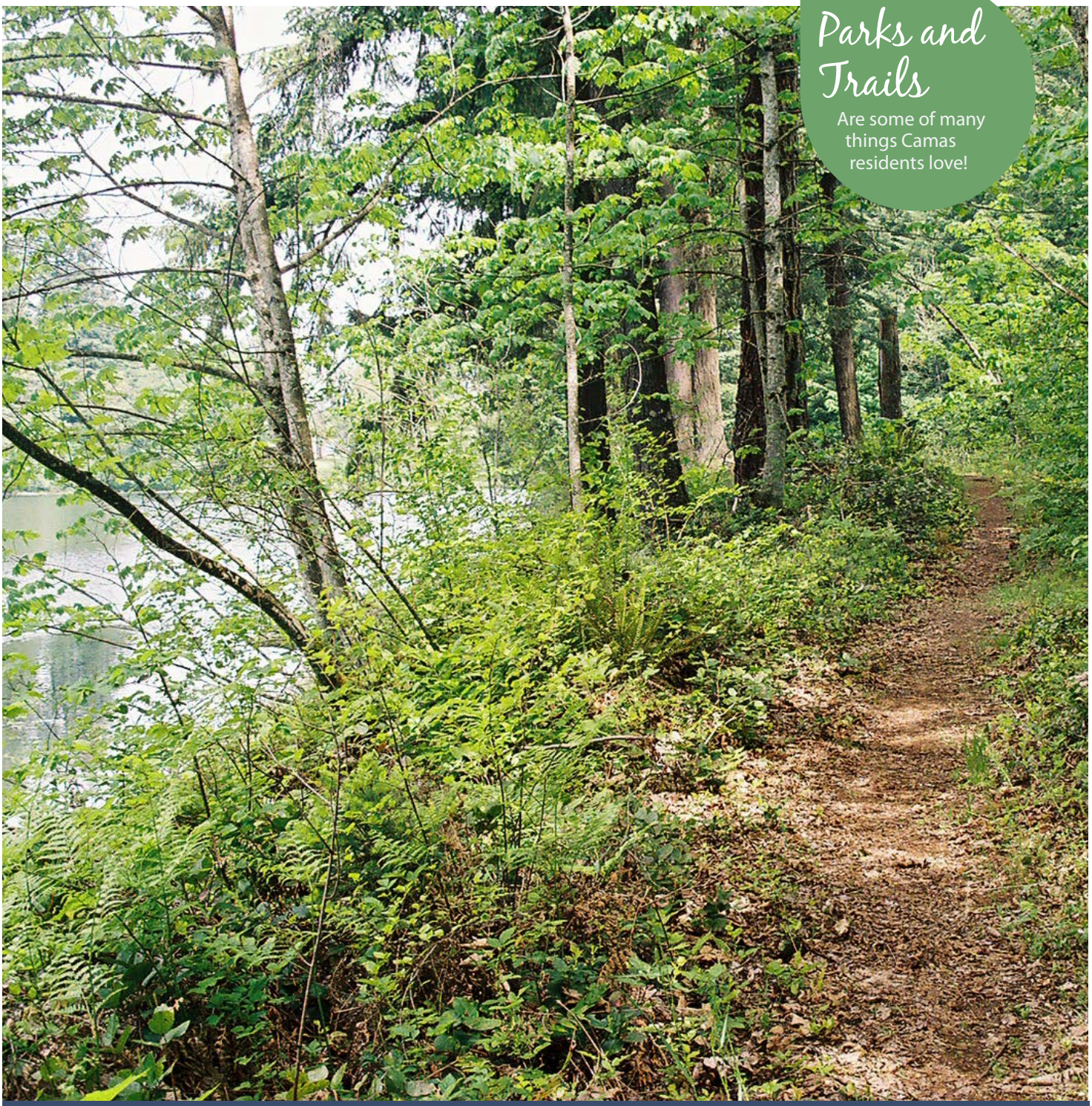
6.1 Vision 6-1
6.2 Organization of Economic Development Element 6-1
6.3 Economic Development Overview 6-1
6.4 Goals and Policies 6-3

Maps

Map 1-1: Camas Comprehensive Plan
Map 1-2: Camas Zoning
Map 3-1: Wetlands
Map 4-1: Camas Transportation Plan
Map 5-1: Water System (Included in Appendix G)
Map 5-2: Sewer System (Included in Appendix H)
Map 5-3: Storm Drainage System (Included in Appendix I)

Appendices

Appendix A: Camas 2035 Public Involvement Summary
Appendix B: Clark County Buildable Lands Report
Appendix C: 6-Year Street Plan
Appendix D: Capital Improvement Project List
Appendix E: Camas Public Library Strategic Plan
Appendix F: Park, Recreation and Open Space Comprehensive Plan Update
Appendix G: Water System Plan
Appendix H: General Sewer Plan
Appendix I: Comprehensive Stormwater Drainage Plan
Appendix J: School Districts Capital Facilities Plans and Impact Fee Calculations



Parks and Trails

Are some of many things Camas residents love!

The purpose of the Camas comprehensive plan update is to ensure that in 2035, the City remains vibrant and diverse and meets the needs of its residents.

Lacamas Lake is a treasured resource residents enjoy

Camas 2035

In the year 2035, residents of Camas continue to appreciate their safe, diverse and welcoming community. Camas maintains its small town character while accommodating future residents. The City is well known for its excellent schools, thriving businesses, and ready access to metropolitan amenities and natural features. A vibrant downtown brings neighbors together and is enjoyed by all.

Camas has a long and rich history. More than 10,000 years ago, Native Americans occupied the Columbia River Valley. Europeans settled in the area in 1792. The Lewis and Clark Corps of Discovery camped by the river in 1806. In the late 1800s, the La Camas Colony Company of Portland purchased 2,600 acres and began planning the construction of a paper mill to supply newsprint for The Oregonian. With the construction of the mill came the platting of the town and the beginning of today's city, a vibrant and diverse community that occupies approximately 16 square miles and is home to nearly 23,000 people.

Camas 2035 is the update of the City of Camas comprehensive plan. The purpose of the Camas update is to ensure that, in 2035, the City, which was incorporated in 1906, remains a vibrant and diverse city that meets the needs of its residents.

The history of Camas comprehensive planning dates back to 1963 when the first plan was prepared. In 1990, the state adopted the Growth Management Act (GMA) with the goal of managing the growth of cities that had heretofore grown in an uncoordinated fashion. GMA requires municipalities to consider the provision of the utilities and services necessary to serve new residential subdivisions, commercial centers, and industrial sites before approving their development. The last major update to the City's comprehensive plan was in 2004 when Camas was a community of approximately 15,360 people; since then, the City's population has grown to 22,843 people in 2015 and annexation has added 2,400 acres, primarily north of Lacamas Lake to its area.

"With the construction of the mill came the platting of the town – and the beginning of today's city"

Camas Vision Statement

In order to create a vision for the future, it was important to understand the today. Camas 2035 has been guided by the community vision established over a 6-month process that involved hundreds of community members. In this process, we examined where we've been, how we've grown, what we do, and who we are today – to better understand how we will grow.

The vision is written in the present tense, as if describing the city as it exists in 2035. Some aspects of the vision can be found in Camas today, while others represent aspirations. It was adopted by City Council Resolution #15-002 on February 17, 2015, the vision provides a framework for the goals and policies of every element of Camas 2035.

Introduction to Vision

In the year 2035, residents of Camas continue to appreciate their safe, diverse and welcoming community. Those that were raised in Camas will return for family wage jobs, and to ultimately retire here. Camas maintains its small town character while accommodating future residents. Camas is well known for its excellent schools, thriving businesses and ready access to metropolitan amenities and natural features. A vibrant downtown and community events bring neighbors together and are enjoyed by all.

Vital, Stable and Livable Neighborhoods

Camas is a well-planned and connected city where residents enjoy pedestrian and bicycle paths between neighborhoods and to downtown. Historic structures are maintained and rehabilitated to accommodate new homes and businesses. There is a wide variety and range of housing for all ages and income levels. Quality public facilities, services and utilities contribute to a high quality of life.

Diversified Economy

The economy has grown to attract a variety of businesses that offer stable employment opportunities and family wage jobs in the medical and high-tech fields. Camas is a gateway to nature and recreational opportunities, leading to a robust tourism industry. Professional office, medical and industrial uses will typify western Camas, with retail businesses supporting the large campus firms. The north shore area will fulfill the employment and retail needs of the growing population on the northeast side, and reduce trips outside of the city.

Downtown Camas retains its historic atmosphere as a walkable, attractive place to shop, dine and gather. Housing within the city's core contributes to a town center that supports local businesses.

How we've grown...

Camas has added nearly 7,500 residents since 2004!

But we've added more than 1,300 acres of land to our city over the past 10 years.

Residential density is among the least dense urban areas in Clark County.

Public Services

Camas continues to have an excellent school system, an asset that draws families to the community. Students and their families enjoy the city's parks, trails, community centers and other recreational opportunities. The library continues its vital role as a place of learning. Residents value well-funded police, fire and emergency response services. Proficient government agencies maintain existing city assets and coordinate future development.

Natural Environment

Camas appreciates and remains good stewards of its natural environment. A vegetated corridor provides habitat and safe passage for wildlife from Green Mountain to the Columbia River. Lacamas Lake is treasured as a unique and pristine resource. City policies preserve trees and natural areas.

What is a Comprehensive Plan?

Camas 2035 guides land use development and public facility investment decisions between now and 2035. **Camas 2035 has eight elements that work together to achieve the community's vision and ensure long-term economic vitality:**

- **Land Use**
- **Housing**
- **Natural Environment**
- **Transportation and Street Plans**
- **Parks, Recreation, Open Space, and Trails/Bikeways**
- **Public Facilities, Utilities, and Services**
- **Capital Facilities**
- **Economic Development**

Each element sets goals that will implement the vision and expresses policies that will guide land use and infrastructure decisions for the 20-year planning horizon. The elements are supported by the comprehensive plan map, which identifies land use designations throughout the City and within its urban growth area.

Why Plan?

Planning is choosing what to do and how and when to do it. Planning is part of our everyday lives. We plan our vacations, our family budgets, and even our trips to the grocery store. The detailed planning of our daily lives derives from a set of goals that we want to accomplish – in a day, in the next six months, or the next two years.

In the same way and for the same purpose, the City's plan is the basis of coordinated action – it enables public and private interests to undertake projects with a clear understanding of community goals and policies.

Camas 2035 helps the City identify deficiencies and take steps to remedy them. Planning can find desirable and reasonable solutions before the problem is beyond the community's economic capabilities. The plan is crucial to avoiding uncoordinated activities as the City adapts to changing conditions and experiences the population growth that is anticipated.

The plan is not intended as a rigid system of goals and development policies; rather, it is:

- **Long range** – looks ahead as far as is practical to anticipate growth and resulting community needs.
- **Comprehensive** – relates and integrates all types of uses and necessary public facilities.
- **General** – establishes general locations and areas for the elements and indicates their relationships to each other and the population they serve.
- **Responsive** – through regular updates, adjusts to changing conditions, unforeseen circumstances, and local and regional trends.

We have pride in and honor our natural areas.

How we play...

543 acres
Of county-owned open space and greenways in or near Camas, including Lacamas Lake Regional Park

450 acres
City-owned open space

120 acres
In 14 parks

6 trails
Totaling 22 miles

4 facilities
For recreational use

How is a Comprehensive Plan Related to Other Plans?

Camas 2035 is part of a family of state, regional, and local plans. Some, like statewide GMA, and Clark County's Community Framework Plan, set the overall planning framework and guide the content of the Camas comprehensive plan.

Others, like plans that are specific to particular subareas, supply more detailed information about individual topics or smaller parts of the City.

Growth Management Act (GMA)

The GMA establishes state goals, sets deadlines for compliance, and offers direction on how to prepare comprehensive plans and development regulations.

GMA also establishes requirements for early and continuous public participation. GMA requires state and local governments to manage growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, and preparing comprehensive plans and implementing them through capital investments and development regulations.

The GMA legislation, which is Chapter 36.70A of the Revised Code of Washington (RCW), contains 14 goals.

For a community's plan to be valid, it must meet the requirements of the GMA through consistency with state statutory goals, countywide policies, and the plans of adjacent jurisdictions.

The fourteen statutory goals identified in the GMA (RCW 36.70A) are:

1. **Urban growth.** Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
2. **Reduce sprawl.** Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
3. **Transportation.** Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.
4. **Housing.** Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.
5. **Economic development.** Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities.
6. **Property rights.** Private property shall not be taken for public use without just compensation having been made. The property rights of landowners shall be protected from arbitrary and discriminatory actions.
7. **Permits.** Applications for both state and local government permits should be processed in a timely and fair manner to ensure predictability.
8. **Natural resource industries.** Maintain and enhance natural resource-based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses.
9. **Open space and recreation.** Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.
10. **Environment.** Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.
11. **Citizen participation and coordination.** Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.
12. **Public facilities and services.** Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.
13. **Historic preservation.** Identify and encourage the preservation of lands, sites, and structures, that have historical or archaeological significance.
14. **Provide consistency.** Between shoreline management and growth management by considering the goals and policies of a shoreline master program for a county or city, approved under Chapter 90.58 RCW, as an element of the county or city's comprehensive plan.

Urban Growth Areas

An urban growth area is a defined area of land adjacent to city limits within which urban growth is encouraged and beyond which growth can occur only if it is not urban in nature.

Each county that adopts a comprehensive plan under the GMA must designate urban growth areas. The City of Camas has 1,962 acres of land within the urban growth areas that adjoin the City limits. This land, combined with the vacant land available within the City limits, must accommodate the City's population and employment projections as established by the state's Office of Financial Management. The population and employment projections for the City for the year 2035 are 34,098 people and 11,182 additional jobs. The City currently has adequate land to accommodate these projections. Expansion of the urban growth areas is not necessary with Camas 2035. (see the Land Use Element for additional details)

County Planning Goals

The Community Framework Plan, adopted by Clark County and its cities and last updated in 2007, guides local jurisdictions as they work to decide questions of regional land use and services.

Clark County is in the final stages of fully updating this plan for 2015 through 2035. As County and city plans were developed, representatives of the City of Camas met with officials of the County and its cities to coordinate efforts. This level of communication helps ensure that the plans and capital projects of these jurisdictions are consistent when adopted. Camas 2035 is consistent with the concepts put forward in the County's Community Framework Plan and the initial drafts of its pending comprehensive plan.

Local Plans

The goals and policies included in Camas 2035 are implemented through development regulations established in the Camas Zoning Code (Title 18 of the Camas Municipal Codes as well as the standards set forth in existing plans and policy documents.

Camas 2035 has been developed to ensure consistency with all other relevant local plans, listed below:

- Camas Water System Plan (June 2010, Res. 1188)
- Camas General Sewer Plan Amendment (April 2010, Res. 1190)
- Camas General Sewer/Wastewater Facility Plan (November 2009, Res. 1189)
- City of Camas Parks, Recreation, and Open Space Comprehensive Plan (January 5, 2015, Ord. 15-002)
- Camas Design Standards Manual–Engineering (October 20, 2014, Res. 1308)
- Camas Design Review Manual (December 2002)
- Amending Gateway/Corridor Standards (in process)
- Camas Shoreline Master Program (July 27, 2015, Ord. 15-007)
- Downtown Design Manual (July 21, 2014, Res. 1301)
- Camas Stormwater Design Standards Manual (July 2010, Res. 1193)
- Six-Year Street Plan 2016–2021 (Res. 15-003)
- 2013–2030 Capital Facilities Plan Project List (December 2012, Ord. 2668)
- Transportation Impact Fee Update (May 2012, Res. 1240)
- Camas Corridor Study (in process)

Amending a Comprehensive Plan

The City is required to review its comprehensive plan at least every seven years. However, the City's comprehensive plan and development regulations are reviewed and evaluated regularly.

Camas 2035 is based on the best available information. As years go by, new information or changing circumstances – for instance, a revised sewer or water plan – may prompt changes to this plan. By state law, amending a comprehensive plan can occur only once a year and must follow the procedures that are set forth in RCW 36.70A.130.

Amendments to a comprehensive plan require legislative action, which entails the adoption of a resolution or ordinance following notice and public hearing indicating, at a minimum, a finding that a review and evaluation has occurred and identifying the revisions made, or that a revision was not needed and the reasons.

The review and evaluation must include the consideration of critical area ordinances, population projections, and other plans and policies in effect.

Under certain circumstances, amendments can occur more frequently:

- The initial adoption of a subarea plan that does not modify the comprehensive plan policies and designations applicable to the subarea;
- The adoption or amendment of a shoreline master program under the procedures set forth in Chapter 90.58 RCW;
- The amendment of the capital facilities element of a comprehensive plan that occurs concurrently with the adoption or amendment of a county or city budget.
- The revision is to address an emergency, or to resolve an appeal of a comprehensive plan filed with a growth management hearings board or with the court.
- The adoption of comprehensive plan amendments necessary to enact a planned action under RCW 43.21C.440, provided that amendments are considered in accordance with the public participation program established by the county or city.

Developing Camas 2035

Camas 2035 began with a citywide process to envision our desired future for the 20-year planning horizon. Public outreach involved over 600 community members, three questionnaires, several interviews with stakeholder groups, the development of a Steering Committee, and two public vision summits.

The result was the vision for Camas 2035 that is stated at the beginning of this document. This vision guided the update of every element that is part of Camas 2035. Appendix A discusses the public outreach involved in the visioning process.

The second phase of public outreach consisted of a Technical Advisory Committee (TAC), the continuation of the Steering Committee, a community survey, and a public forum. This second phase focused on implementation – making sure the goals and policies established in Camas 2035 were consistent with the community vision. The purposes and functions of the Steering Committee and the TAC are described further below.

In addition to the outreach efforts described above, the City maintained a website and Facebook page throughout the visioning process and the development of Camas 2035.

Steering Committee

The Steering Committee was formed at the outset of the visioning process and consisted of identified leaders of the community. This committee spearheaded the outreach efforts, and was integral to shaping the vision of Camas 2035. Throughout the development of the plan, the Steering Committee continued to ensure that the vision was upheld and consistency was maintained throughout each element of the Plan. The Steering Committee met three times during the visioning process and three times during the development of Camas 2035.

Technical Advisory Committee

The TAC was formed to help ensure that Camas 2035 would adhere to the community vision and meet the public service and infrastructure needs of a growing city. Members of the TAC were selected for their technical expertise and knowledge of key plan elements such as transportation, parks and trails, neighborhood livability, and employment.

The TAC met five times from March to October 2015 and provided invaluable input on each element of Camas 2035. The first two TAC meetings focused on establishing community gateways and corridors. During the visioning process, many residents voiced their desire that the entrances to our City be welcoming and identifiable. The TAC and staff worked together to identify gateways and gateway elements such as signage, lighting, sidewalks, and crosswalks that will distinguish Camas from neighboring cities. These gateways are included as overlays on the City zoning map and the Economic Development Element identifies specific goals and policies for them.

What we learned..

Some of the feedback from residents...

"Rivers, Lakes, Trails, and Parks! Mill City Pub and Camas Theater!"

"5 minutes to work-no traffic-what could be better!"

"We love everything: great schools, parks, floating in the river"

Camas Days!
We attended in 2014 and 2015 to gather feedback.

Community Surveys

During the two years it took to complete the visioning and comprehensive plan update process, community members were asked to complete three surveys. The first and second occurred during the visioning process in 2014 and early 2015. The purpose of the first survey was to identify Camas' strengths and understand what residents' value about Camas today. More than 400 community members completed the first survey. The second survey was intended to validate the draft vision statement and was completed by 177 community members. The third survey, conducted in December 2015 and January 2016, asked respondents to indicate their preferences for development styles and features and to validate draft comprehensive plan policies, which was completed by 182 community members. Summaries of each community survey are included in Appendix A.

Vision Summits and Public Forum

During the comprehensive plan update, the City hosted two vision summits and one public forum. The first vision summit was held on November 5, 2014 to discuss the future vision for the City. Approximately 50 community members gathered at Fire Station 42 and were asked to complete the sentence, "In 2035, Camas is/has/enjoys…" This input together with online surveys helped frame the Vision Statement. The second vision summit was held on January 8, 2015 to solicit feedback on implementing the vision, and was attended by approximately 120 community members. On January 14, 2016, a public forum was held in order to review the first draft of the updated comprehensive plan, including proposed zoning and comprehensive plan maps. Approximately 43 community members attended and provided feedback.

The City of Camas values residents' opinions and is committed to being responsive. The final comprehensive plan incorporates the contributions and comments from everyone that has been involved to date.

"During the visioning process, many residents voiced their desire that the entrances to our city be welcoming and identifiable."

Land Use

The Land Use Element is designed to support development that adheres to the City's vision to ensure Camas' future is as bright as its past.

1 LAND USE

1.1 Vision

In 2035, Camas is a well-planned and connected city where residents enjoy pedestrian and bicycle paths between neighborhoods and to downtown. The economy has grown to attract a variety of businesses that offer stable employment opportunities and family-wage jobs in the medical and high-tech fields. Professional office, medical, and industrial uses typify western Camas, with retail businesses supporting the large campus firms. The north shore area fulfills the employment and retail needs of a growing population on the east side, and reduces trips outside of the city. Downtown Camas retains its historic atmosphere as a walkable, attractive place to shop, dine, and gather. Housing within the city's core contributes to a town center that supports local businesses. Camas appreciates and remains good stewards of the environment by preserving trees and natural areas.

1.2 Organization of Land Use Element

- Land Use Overview
- Population and Employment Projections
- Land Use Designations
- Goals and Policies by Land Use Category
  - Citywide
  - Employment Lands (including commercial, industrial, and business park)
  - Neighborhoods (including single-family, multi-family and mixed-use housing)
  - Natural Environment (including parks, trails, and open space)
  - Residential Mixed-use Areas

1.3 Land Use Overview

The City of Camas is home to great schools, family-wage jobs, high-quality neighborhoods, and an abundance of open space and recreational amenities. Camas has grown into a dynamic, vibrant city with diversified employment opportunities and services that cater to its residents' various needs. In 2015, Camas maintains its small town charm and character, and downtown remains the heart of the City with a mix of restaurants, shops, professional offices, and residential development. The Grass Valley area is home to several national and international technology and manufacturing firms. A significant amount of residential development is underway in the Green Mountain area, and planned transportation improvements north of Lacamas Lake will improve connectivity and provide better transportation options throughout the City.

The Land Use Element is designed to support development that adheres to the City's vision to ensure Camas' future is as bright as its past. The Growth Management Act (GMA) identifies the Land Use Element as the foundation of the Comprehensive Plan. GMA outlines the framework by which the Plan will be implemented and establishes land use designations to accommodate the City's population and employment projections. The development of land in accordance with the goals and policies included in the Land Use Element will ensure the achievement of an appropriate balance of public facilities, housing, employment, services, and recreational uses throughout the City.

"Camas has grown into a dynamic, vibrant city with diversified employment opportunities and services that cater to its residents' various needs."

1.3.1 2035 Population Projections

GMA requires that each jurisdiction accommodate its share of the region's growth. In 2035, the City of Camas is expected to have a population of 34,098, an 11,255-person increase from the 2015 population of 22,843. During the same period, Camas is expected to add 11,182 jobs. The table below outlines the population and employment projected for Camas and its ability to meet these projections within its current urban growth boundary.

Table 1-1. Residential and Employment Capacity

	2035 Projection	Residential Unit Increase	Assumed Units or Jobs/Acre	Acres Needed	Capacity[1] Acres
Population	34,098	3,868[2]	6 units/acre	645	876
Employment	11,182 (increase)	N/A	IND: 9 jobs/acre COM: 20 jobs/acre	IND: 493 COM: 337	IND: 660 COM: 464

Source: Clark County Buildable Lands Report, unless otherwise noted. See Appendix B.
[1]Capacity calculated as net developable acreage using the County Vacant Buildable Lands Model and further refined based on GIS analysis conducted by the City.
[2]Based on 2013 American Community Survey data, consistent with Clark County Buildable Lands Report.

1.3.2 Land Use Designations

In order to ensure the City's vision and land use goals are achieved, land use designations are used to assign a variety of development uses and building densities to land throughout the City. The plan identifies areas for residential, commercial, and industrial development as well as community gateways and areas appropriate for a mix of uses. The plan also identifies areas for parks and open space to support recreation and enhance natural areas, including habitat and wildlife corridors.

Land use designations are identified below on Table 1-2 and on Map 1-1.

Table 1-2. Acreage by Comprehensive Plan Designation

Comprehensive Plan Designation	Corresponding Zones	Total (Acres)[1]
Single-Family-High	• Residential 6,000 (R-6)	436
Single-Family-Medium	• Residential 12,000 (R-12) • Residential 10,000 (R-10) • Residential 7,500 (R-7.5)	4225
Single-Family-Low	• Residential 15,000 (R-15)	846
Multi-Family	• Multi-Family 18 (MF-18) • Multi-Family 10 (MF-10)	541
Commercial	• Neighborhood Commercial (NC) • Community Commercial (CC) • Regional Commercial (RC) • Mixed-use (MX) • Downtown Commercial (DC)	800
Industrial	• Light Industrial/Business Park (LI/BP) • Light Industrial (LI) • Heavy Industrial (HI) • Business Park (BP)	2544
Park[2]	• Neighborhood Park (NP) • Special Use Park (SU)	337
Open Space / Green Space	• Open Space (OS)	471
Gross Total		**10200**
Rights-of-Way and Stormwater Facilities		-27.7 percent[3]
Net Total		**7375**

[1]Total area within each comprehensive plan designation within the urban growth boundary.
[2]Applies only to land held in public trust.
[3]Based on typical County infrastructure deduction used in Clark County Buildable Lands Report.

Overlays

In addition to the land use designations listed in Table 1-2, land use overlays further define appropriate uses and development standards for particular areas within the City. Overlays included in this update are identified as follows:

- Airport Overlay
- Gateways and Corridors
- Multi-Family Cottage

The 2004 Comprehensive Plan included additional overlays (Planned Industrial Development, North Dwyer Creek Employment Mixed-Use, and North Dwyer Creek Residential Mixed-Use). These areas have developed since 2004, the overlay designations are no longer needed, and they were removed from the map.

Several overlays require zone change approval, while others are established on the zoning map. Two overlays – Airport and Gateways and Corridors – are established on the adopted zoning map. An overlay that requires zone change approval is the Multi-Family Cottage overlay. Development within all overlay areas must comply with the goals and policies of the underlying land use designation.

Grove Field, an airport owned and operated by the Port of Camas-Washougal and located northeast of Lacamas Lake, adjoins the City's boundary. The Airport Overlay is designated to ensure land uses adjacent to the airport are compatible with air traffic and do not interfere with safe air navigation. For example, the comprehensive plan designation of lands adjacent to the airport is generally industrial, rather than residential, and the Airport Overlay area restricts uses tending to high concentrations of people, such as schools or hospitals.

This update designates gateways and corridors because Camas residents say they want the entrances to the City to be welcoming and identifiable. Community gateways create a sense of arrival and let visitors and residents know they are in Camas.

A primary gateway is a main entry into Camas and includes a corridor, whereas a secondary gateway is limited to an intersection or a few city blocks. A corridor extends approximately 0.25 mile from a gateway and includes enhanced features such as bike lanes, widened or detached sidewalks, and signage. Table 1-3 identifies community gateways and corridors and the features that should be included in each gateway and/or corridor.

Table 1-3. Gateways and Corridors

Gateway/ Corridor	Designation	Typical Gateway and Corridor Features
6th Avenue	Primary	Gateway • Iconic street lighting • Layered landscaping • Signage – City/downtown depending on gateway location – monument-style signage Corridor • Pedestrian and bicycle amenities (bike lanes, crosswalks, and sidewalks) • Signage (wayfinding, historic, and/or interpretive) • Iconic street lighting • Street trees
3rd Avenue	Primary	
Everett	Secondary	
38th Avenue	Primary	
Lake Road	Primary	
Green Mountain – Goodwin	Primary	
Brady Road	Primary	
Union Street	Secondary	
Note: In addition to compliance with the standards established above, development within corridors and gateways must adhere to all applicable transportation and public works standards, including road cross-sections.		

Development/redevelopment within a designated gateway or corridor must adhere to the goals and policies included in the Economic Development Element as well as the applicable development regulations and design guidelines of the *Camas Design Review Manual*.

An analysis of building permits issued since 2004 shows that 70 percent of new homes were over 3,000 square feet, with only 7 percent of homes less than 2,000 square feet. To address this disparity in housing, the Multi-Family Cottage Overlay provides an incentive to build smaller, single-level dwellings. The intent is to encourage the development of cottages, especially those with architectural elements typical of this type of dwelling such as a front porch, a steep-pitched gable roof, and a recessed garage. This overlay is also intended to accommodate

those with mobility impairments. The dwellings must be less than 1,000 square feet, and are subject to design review approval.

1.4 Goals and Policies

Land use goals and policies are established to ensure that future development is consistent with the community vision. Goals and policies are presented for five land use categories:

- Citywide – establishes a citywide land use goal and broad policies to be considered throughout the City
- Gateways/Corridors – focuses on areas designated as community gateways and corridors
- Employment Land – includes land zoned for commercial, mixed-use, industrial, and business park development
- Neighborhoods – includes single- and multi-family zoning designations
- Natural Areas – includes parks, open space, and critical areas
- Residential Mixed-use Areas – applies to current and future areas designated as mixed-use

For additional goals and policies related to economic development, housing, and the environment, see Element 2 – Housing, Element 3 – Environment, and Element 6 – Economic Development.

1.4.1 Citywide Land Use

In 2035, residents of Camas continue to appreciate their safe, diverse, and welcoming community. Those who were raised in Camas will return for family-wage jobs and to ultimately retire here. Camas maintains its small town character while accommodating future residents. Camas is well known for its excellent schools, thriving businesses, and ready access to metropolitan amenities and natural features. A vibrant downtown and community events bring neighbors together and are enjoyed by all.

Citywide Land Use Goal

LU-1: Maintain a land use pattern that respects the natural environment and existing uses while accommodating a mix of housing and employment opportunities to meet the City's growth projections.

Citywide Land Use Policies

LU-1.1: Ensure the appropriate mix of commercial-, residential-, and industrial-zoned land to accommodate the City's share of the regional population and employment projections for the 20-year planning horizon.

LU-1.2: Coordinate with Clark County, the state, and special districts to identify future needs for essential public facilities such as airports, state education facilities, state and regional transportation facilities, state and local correctional facilities, solid waste handling facilities, and regional parks.

LU-1.3: Maintain compatible use and design with the surrounding built and natural environments when considering new development or redevelopment.

LU-1.4: Ensure that park and recreation opportunities are distributed equitably throughout the City and work to achieve park and continuous trail corridors from Green Mountain to the Columbia River.

LU-1.5: Where compatible with surrounding uses, encourage redevelopment or infill development to support the efficient use of urban land.

LU-1.6: Ensure adequate public facilities (including roads, emergency services, utilities, and schools) exist to serve new development, and mitigate potential impacts to current residents.

LU-1.7: Ensure consistency with County-wide planning policies.

LU-1.8: Support and encourage the implementation of sustainable projects that capture, treat, and reuse rainwater for all new development and redevelopment.

LU-1.9: Continue to support the arts throughout the City by promoting opportunities for the arts and artists to contribute to new development.

1.4.2 Employment Land (Commercial, Industrial, and Business Park)

The economy in Camas has grown to attract a variety of businesses that offer stable employment opportunities and family-wage jobs in the medical and high-tech fields. Camas is a gateway to nature and recreational opportunities, leading to a robust tourism industry. Professional office, medical, and industrial uses typify western Camas, with retail businesses supporting large campus firms. The north shore area fulfills the employment and retail needs of a growing population on the northeast side and reduces trips outside the city. Downtown Camas retains its historic atmosphere as a walkable, attractive place to shop, dine, and gather.

Employment Land Goal

LU-2: Create a diversified economy and serve Camas residents and tourists by providing sufficient land throughout the City to support a variety of business types and employment opportunities.

Employment Land Policies

LU-2.1: Attract and encourage a balance of new commercial, light industrial, and knowledge-based business, medical, and high-tech uses, and the expansion of existing businesses to provide regional and local employment.

LU-2.2: Support village-style employment and retail development in the north shore area to serve the growing population. Discourage strip developments.

LU-2.3: Encourage shopping local and support for Camas businesses.

LU-2.4: Encourage mixed-use developments (residential and commercial) in order to support adjacent uses and reduce car trips, but not at the expense of job creation.

LU-2.5: Ensure industrial development and other employment lands are compatible with adjacent neighborhoods through development and landscaping regulations and design review.

LU-2.6: Encourage the development of businesses that offer family-wage jobs and support the City's vision for attracting medical and high-tech industries.

LU-2.7: Protect employment land from conversion to residential uses in order to ensure an adequate supply of commercial and industrial land to meet 20-year employment projections.

LU-2.8: Ensure appropriately zoned land for the development of food retailers (grocery stores and farmers' markets) within a half-mile of residential areas.

1.4.3 Neighborhoods

Camas is a well-planned and connected City where residents enjoy pedestrian and bicycle paths between neighborhoods and to downtown. Historic structures are maintained and rehabilitated to accommodate new homes and businesses. There is a wide variety and range of housing for all ages and income levels.

Neighborhood Goal

LU-3: Create vibrant, stable, and livable neighborhoods with a variety of housing choices that meet all stages in the life cycle and the range of affordability.

Neighborhood Policies

LU-3.1: Encourage a variety of housing typologies to support the overall density goal of six dwelling units per acre.

LU-3.2: Develop areas appropriate for senior housing, considering proximity to services and transportation options.

LU-3.3: Encourage connectivity between neighborhoods (vehicular and pedestrian) to support citywide connectivity and pedestrian access.

LU-3.4: Camas residents are protective of the small-town ambiance and family-friendliness of the community. Discourage exclusive neighborhoods, privacy walls, and gated communities.

LU-3.5: Where neighborhoods adjoin natural areas or trails, ensure connections through neighborhoods to enhance access to recreation amenities.

LU-3.6: Improve food access in residential areas that are farther than a half-mile from healthy food stores (grocery store or farmers' markets).

1.4.4 Natural Environment

Camas appreciates and remains good stewards of its natural environment. A vegetated corridor provides habitat and safe passage for wildlife from Green Mountain to the Columbia River. Lacamas Lake is treasured as a unique and pristine resource.

Natural Environment Goal

LU-4: Develop an interconnected network of parks, trails, and open space to support wildlife corridors and natural resources and enhance the quality of life for Camas residents and visitors.

Natural Environment Policies

LU-4.1: Maintain development regulations that encourage the preservation of trees and natural areas, including the use of density bonuses to protect sensitive areas and encourage tree replacement.

LU-4.2: Support the purchase by the City, or the dedication and preservation by private owners, of open space and encourage careful consideration and integration of the natural environment in any planning activity to perpetuate the park-like setting of Camas.

LU-4.3: Encourage regional trail connectivity and increased access throughout the City to support multi-modal transportation and physical activity.

LU-4.4: Development on the edges of the City adjacent to unincorporated land in agricultural use or in a forested or natural state should consider those adjacent uses and, where appropriate, provide buffers.

1.4.5 Residential Mixed-Use Areas

In 2015, mixed-use (MX) zoning in the City includes approximately 10 acres south of NE Third Avenue in the Louis Block Park Neighborhood. This area is dominated by small lots with an aging, single-family housing stock and future redevelopment is anticipated. The strengths of the area include its proximity to the historic downtown, regional trail connections, a large anchor grocery store, and the natural areas to the south and east.

Future conversion of commercial or industrial areas to MX should consider the benefits to the community, such as providing a gathering place (e.g., pocket park), housing options for a variety of income levels, and job opportunities.

Residential Mixed-Use Goal

LU-5: To foster economically and socially diverse mixed neighborhoods as the foundation for a healthy city, which includes meeting the multi-modal transportation, housing, employment, education, recreation, and health needs of the citizens.

Residential Mixed-Use Policies

LU-5.1: Mixed-use developments should be unique to the area in which they are located and encourage small business development, a mix of housing types to ensure affordability, and pedestrian and transit connections, and designed to be sensitive to the natural environment.

LU-5.2: Ensure that the development of mixed-use areas is oriented to the public street and is scaled and designed to be compatible with surrounding land uses.

LU-5.3: Densities in new mixed-use areas should not exceed the maximum densities allowed in multi-family zones.

Legend

- Camas City Limits
- UGA

Designations

- Single-Family_Low
- Single-Family_Medium
- Single-Family_High
- Multi-Family_Low
- Multi-Family_High
- Commercial
- Industrial
- Open Space/Green space
- Park

Text

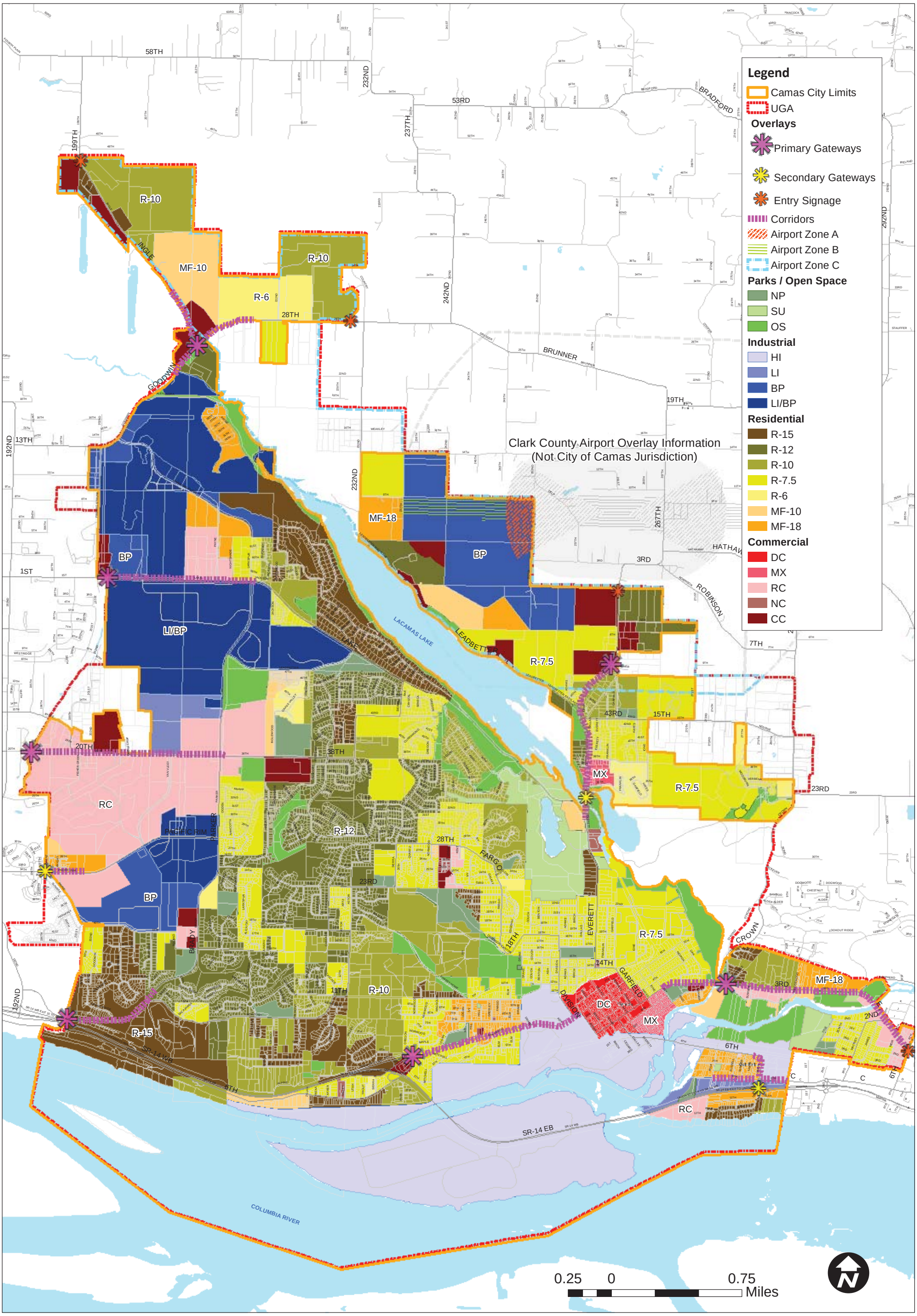
0.25 0 0.75 Miles

CAMAS COMPREHENSIVE PLAN MAP DRAFT - NOT ADOPTED

CAMAS, WA I DRAFT I March 2015

2035 Camas

Your voice, Your vision, Your future



CAMAS ZONING MAP

CAMAS, WA I DRAFT I March 2015

DRAFT - NOT ADOPTED

2035 Camas
Your voice, Your vision, Your future

Housing

The Housing Element further identifies goals and policies to address the types and scales of the housing needed for the projected population.

2 HOUSING

2.1 Vision

In the year 2035, residents of Camas continue to appreciate their safe, diverse, and welcoming community. Those raised in Camas will return for family-wage jobs and to ultimately retire here. Camas is a well-planned and connected city where residents enjoy pedestrian and bicycle paths between neighborhoods and to downtown. There is a wide variety and range of housing for all ages and income levels.

2.2 Organization of Housing Element

- Housing Overview
  - Housing Needs
  - Housing Diversity and Supply
- Goals and Policies by Housing Category
  - Citywide Housing
  - Affordable Housing
  - Senior and Special Needs Housing

2.3 Housing Overview

Camas provides a full range of housing opportunities to meet the needs of the people who call the City home. Neighborhoods are strong, and residents participate in community events and care about the livability and quality of life of their community. Housing in Camas ranges from residential estates on acreage to higher density apartments and a variety of single and multi-family housing types. While new development in Green Mountain and north of Lacamas Lake will add nearly 2,500 lots to the City and include a mix of housing types, additional housing is needed to support the growing population of seniors and those whose household incomes fall below the median.

"Neighborhoods are strong, and residents participate in community events and care about the livability and quality of life of their community."

According to the GMA, the housing goal is to "[e]ncourage the availability of affordable housing to all economic segments of the population of the state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock." To accomplish this goal at the local level, Camas should pursue opportunities to increase the supply and diversity of housing by converting existing houses, increasing the number of accessory dwelling units (ADU) (a.k.a., in-law apartments), and providing incentives for the development of a wider range of housing sizes and types (e.g., single- story, multi-story, and cottage).

Regional cooperation is essential to assure adequate housing opportunities. Camas participates with the Vancouver Housing Authority, a local intergovernmental non-profit housing agency, to promote low- and moderate-income housing throughout the City.

2.3.1 Housing Needs

As stated in the Land Use Element, GMA requires jurisdictions to accommodate their shares of the region's projected growth. In 2035, the City is expected to have a population of 34,098 people, an 11,255-person increase from the 2015 population of 22,843. In order to accommodate this projected increase, the City will need approximately 3,868 new housing units. Furthermore, in order to maintain the overall City density of six dwelling units per acre, approximately 645 acres are needed to support a variety of housing typologies and styles. The goals and policies in section 2.4 as well as the goals and policies included in the Land Use Element, are established to ensure the City can accommodate the population increase and provide housing for all economic segments of the community.

2.3.2 Housing Diversity and Supply

As Camas continues to grow as a regional economic and employment center, the demand for housing in and around the City will grow. While the Land Use Element establishes land use designations that support a variety of housing densities to accommodate the City's projected population increase, the Housing Element further identifies goals and policies to address the types and scales of the housing needed for the projected population.

The City addresses housing diversity and supply by promoting the innovative use of residentially and commercially designated land through development regulations such as the ordinances governing planned residential development (PRD) and mixed-use, as well as by encouraging in-fill development where appropriate.

The PRD and mixed-use ordinances provide developers with greater flexibility than traditional subdivision ordinances and allow variations in site design and density. While these optional development types are intended to foster more creative communities that exceed minimum standards, they must provide a clear benefit to the City. Encouraging in-fill developments within existing neighborhoods, such as ADUs, can expand housing diversity and affordability.

Housing Affordability

A major challenge facing all cities is to provide housing for all economic segments of the population. GMA's housing goal affirms the City's responsibilities to encourage the availability of affordable housing to all economic segments of the population, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.

The federal Department of Housing and Urban Development (HUD), which provides grant and technical assistance for community projects, uses a standard formula for housing affordability. The formula for affordability assumes that no more than 30 percent of monthly household income is spent on rent or a mortgage. Therefore, a major factor that determines affordability is income. In 2013, the median household income in Clark County was $57,341, while in Camas, it was $81,897.[1] This number represents the midpoint of all household incomes, where half is above the midpoint and the other half is below.

Table 2-1 below represents the affordable monthly housing costs for households with incomes ranging from 30 percent to 100 percent of the median household incomes for Clark County and Camas. If, for example, in Camas the household income is half (50 percent) of the median, the affordable monthly housing cost (30 percent of monthly income) would be $1,024.

Table 2-1. Monthly Affordable Housing Costs

Annual Household Income		Monthly Affordable Housing Costs[1]	
Clark County	Camas	Clark County	Camas
$17,202 (30% of MHI)	$24,569 (30% of MHI)	$430	$614
$28,671 (50% of MHI)	$40,949 (50% of MHI)	$717	$1,024
$45,873 (80% of MHI)	$65,518 (80% of MHI)	$1,147	$1,638
$57,341 (100% of MHI)	$81,897 (100% of MHI)	$1,434	$2,047
Washington Minimum Wage (2015)			
$19,697		$492	

Note: Median Household Income (MHI) for Clark County = $57,341; for Camas = $81,897.
[1]30% of monthly income, inclusive of utilities and taxes and insurance for ownership housing.

[1] U.S. Census Bureau, American Community Survey (ACS) 3-year estimate (2011–2013).

In Washington, the fair market rent for a two-bedroom apartment is $1,128.[2] In order to afford this level of rent and utilities – without paying more than 30 percent (affordable cost) of income – a household must earn $3,760 monthly or $45,119 annually. Assuming a 40-hour work week, 52 weeks per year, this translates to an hourly wage of $21.69 per hour. In 2015, the minimum wage in Washington is $9.47 an hour, less than half the wage required to afford the fair market rent for a two-bedroom apartment.

As illustrated in Table 2-1, there is a discrepancy between annual income and the cost of housing which exceeds the affordable thresholds. During the course of the public forums for this comprehensive plan update, citizens expressed concern that residents at both ends of the life spectrum – young professionals returning from college and retiring seniors – do not have affordable housing options. The Housing Element responds to these concerns with goals and policies for the development of housing that meets the needs of the full spectrum of income levels in the City.

There are a number of factors that contribute to the cost of housing: the availability and cost of the land, the cost of the necessary infrastructure, the topography of the site, and the cost of building (including fees and permits). Additional factors that command a higher price of housing include the reputation of the Camas School District as one of the best districts in the region. For example, the Camas High School graduation rate in 2014 was 93 percent compared to 76 percent statewide, and the school was ranked 23 of 458 high schools in the state by US News & World Report (2015).

Because of the difficulty of creating affordable housing, it is important to maintain affordability for as long as possible in existing affordable housing and new housing built with public funding. Through various options such as flexible lot sizes, development agreements, and covenants, assurances can be made that housing will remain affordable and will target affordability for the life of the development or the zoning of the property. Additionally, all new housing developments of significant size should create a balance of housing types and densities in order to increase affordable housing throughout the community.

Senior and Special Needs Housing

According to the U.S. Census Bureau, "[b]y 2030, one in every five people living in the US will be over the age of 65. This aging of America is fueled by 72 million baby boomers aging through the life cycle in combination with a profound increase in longevity. Average life expectancy doubled from the mid-thirties in the 19th century to age 78 today [2015]."

In general, special needs populations include people who might require some assistance in their day-to-day living, such as people who are physically or mentally disabled, victims of domestic violence, and at-risk youth. The City encourages efforts to provide for those needs and to require a percentage of new housing developments to include universal design accommodations. Special needs housing should be integrated into Camas neighborhoods and have easy access to public transportation, shopping, medical facilities, and other essentials.

2.4 Goals and Policies

Housing goals and policies are established to ensure adequate housing is developed throughout the City to support residents of all ages and income levels. Goals and policies are presented for three housing categories:

- Citywide – establishes a broad housing goal and sets policies to be considered throughout the City
- Affordable Housing – focuses on the development of affordable housing
- Special Needs and Senior Housing – establishes goals and policies to address the particular needs of residents with special needs and seniors

2.4.1 Citywide Housing

Citywide Housing Goal

H-1: Maintain the strength, vitality, and stability of all neighborhoods and promote the development of a variety of housing choices that meet the needs of all members of the community.

[2] National Low Income Housing Coalition, "Out of Reach 2015"

Citywide Housing Policies

H-1.1: Provide a range of housing options to support all ages and income levels.

H-1.2: Support residential development that minimizes both impervious areas and minimizes site grading to retain the natural contours of the land. Low impact development (LID) strategies include conserving native vegetation in tracts and considering narrower streets, stormwater gardens, and other landscape practices that store and filter runoff.

H-1.3: Encourage use of the optional development codes (e.g., PRD, MXPD) in order to create a variety of housing types within new developments.

H-1.4: Require a percentage of newly created lots to include one or more of the following unit types (to be designated on the face of the plat):

- Single-story dwellings
- Barrier-free dwellings (consistent with Americans with Disabilities Act [ADA] guidelines)
- ADUs, to be constructed concurrent with primary dwellings

H-1.5: Ensure that housing in mixed-use buildings (or developments) will complement the commercial and retail portion of the development and increase local family-wage jobs.

H-1.6: Encourage in-fill development on vacant or underutilized sites, subject to design review guidelines, that have adequate urban services, and ensure that the development is compatible with the surrounding neighborhood.

H-1.7: Require all new housing developments to provide a range of housing types and sizes that are evaluated through the land use approval process and stipulated on the final plat.

2.4.2 Affordable Housing

Affordable Housing Goal

H-2: Create a diversified housing stock that meets the needs of all economic segments of the community through new developments, preservation, and collaborative partnerships.

Affordable Housing Policies

H-2.1: Support and encourage a wide variety of housing types throughout the City to provide choice, diversity, and affordability and promote homeownership.

H-2.2: Provide incentives and bonuses to encourage the development of affordable housing.

H-2.3: Any comprehensive plan designation change that increases residential capacity should require a quarter (25 percent) of the new units to be affordable to households earning 50 to 80 percent of Camas' MHI at the time of development.

H-2.4: All affordable housing created in the City should remain affordable for the longest possible term, whether created with public funds, through development agreements, or by regulation.

H-2.5: Participate in collaborative partnerships with various local and regional public and non-profit housing groups to ensure that affordable housing is provided throughout the City.

H-2.6: Provide financial assistance through collaborative partnerships to qualifying low-income residents to maintain or repair the health and safety features of their homes.

H-2.7: Conduct an affordable housing study in order to determine the number of existing affordable units and assess the need for additional units. Develop policies to implement recommendations of the affordable housing study.

2.4.3 Senior and Special Needs Housing

Senior and Special Needs Housing Goal

H-3: Encourage and support a variety of housing opportunities for those with special needs, particularly those with challenges relating to age, health, or disability.

Senior and Special Needs Housing Policies

H-3.1: Encourage special needs and senior housing to be dispersed throughout the community and close to public transportation, shopping, medical clinics, and other essential services.

H-3.2: Encourage and support social and health service organizations that offer programs and facilities to help persons with special needs remain in the community.

H-3.3: Treat residential structures occupied by persons with disabilities the same as residential structures occupied by a family or by non-disabled unrelated individuals.

H-3.4: Support and encourage the development of smaller (less than 1,000-square foot), single-story houses through the Multi-Family Cottage Overlay or other tools.

Natural Environment

The Natural Environment Element provides a policy framework for the protection and improvement of Camas' natural environment, an important element for the development of a sustainable city.

3 NATURAL ENVIRONMENT

3.1 Vision

In 2035, Camas appreciates and remains good stewards of its natural environment. A vegetated corridor provides habitat and safe passage for wildlife from Green Mountain to the Columbia River. Lacamas Lake is treasured as a unique and pristine resource. City policies preserve trees and natural areas.

3.2 Organization of Natural Environment Element

- Natural Environment Overview
- Goals and Policies
  - Environmental Stewardship
  - Critical Areas
  - Shorelines
  - Landscape Enhancement and Tree Preservation

3.3 Natural Environment Overview

The quality of life in the Pacific Northwest is often equated with the quality of the environment. Preserving the quality of the environment depends on individual, corporate, and government decisions, and on actions that are coordinated to minimize adverse environmental impacts.

The Natural Environment Element provides a policy framework for the protection and improvement of Camas' natural environment, an important element in the development of a sustainable city.

The City of Camas is committed to the concept of a sustainable urban environment and weighs the merits and costs of its environmental actions with other important demands such as public safety and recreation, public infrastructure, housing, and economic development.

The City has adopted a number of plans and development regulations to balance environmental regulations and public safety with economic development. These plans and regulations include:

- Camas Shoreline Master Program (July 27, 2015, Ord. 15-007)
- 2014 Parks, Recreation, and Open Space Comprehensive Plan (January 5, 2015, Ord. 15-002)
- Landscape Ordinance (Camas Zoning Code, Chapter 18.13) (Ord. 2515)
- Sensitive Areas and Open Space Ordinance (Camas Zoning Code, Chapter 18.31) (2008, Ord. 2515; amended in 2011, Ord. 2612)
- Title 16, Environment, Camas Municipal Code (2015, Ord. 15-007)
- LID policies in *Camas Stormwater Design Standards Manual* (Res. 1193, update in progress)

3.4 Goals and Policies

These goals and policies are established to ensure the preservation of the natural environment, consistent with the Camas 2035 Vision. Goals and policies are presented for environmental stewardship, critical areas (wetlands, critical aquifer recharge areas, frequently flooded areas, geologically hazardous areas, fish and wildlife habitat conservation areas, and historic and cultural resources), shorelines, and landscape enhancement and tree preservation.

3.4.1 Environmental Stewardship

One of the most demanding roles the City of Camas must fulfill is that of chief steward of the city's environment. The City has the authority to regulate land use and the responsibility to implement federal and state statutes. Therefore, the City must endeavor at all times to ensure that its environment is managed wisely. The City

encourages the preservation, restoration, and improvement of the natural environment in all development.

Environmental Stewardship Goal

NE-1: To preserve Camas' natural environment by developing a sustainable urban environment and protecting habitat and vegetation corridors.

Environmental Stewardship Policies

NE-1.1: Consider the immediate and long-term environmental impacts of policy and regulatory decisions.

NE-1.2: Supply quality services to the community while ensuring resource conservation and ensure an environmentally safe workplace for City employees.

NE-1.3: Prepare, plan, and provide ongoing training for those responding to adverse environmental events.

NE-1.4: Establish citywide multi-modal connectivity to encourage non-motorized transportation in order to protect the City's air quality.

NE-1.5: Protect, conserve, and manage existing natural resources and valuable historic and cultural areas in order to ensure their long-term preservation.

NE-1.6: Encourage the preservation of the night sky through dark sky standards in development regulations and design guidelines.

NE-1.7: Limit clearing, grading, and soil disturbance outside building footprints in order to maintain the natural hydrologic functions of a site.

NE-1.8: Encourage the development of grading regulations that preserve the natural contours of undeveloped properties, natural vistas, and mature vegetated corridors.

3.4.2 Critical Areas

The critical areas goal and policies are intended to protect critical areas as identified by GMA. Camas' natural environment is composed of a variety of landforms, soils, watercourses, and vegetation. Protection and, where appropriate, restoration of these critical areas will ensure the preservation of Camas' natural environment and contribute to Camas' quality of life. Development on property that contains critical areas must comply with the goal and policies listed below, as well as the development regulations contained in Title 16 of the Camas Municipal Code.

Critical Area Goal

NE-2: To preserve, maintain, and restore the City's critical areas to protect their function and values.

Critical Area Policies

NE-2.1: Use best management practices and best available science to preserve, protect, and, to the extent practicable, restore the biological health and diversity of Camas' critical areas.

NE-2.2: Preserve, and when appropriate, restore, aquatic and riparian habitats consistent with applicable regulations.

NE-2.3: Conserve and protect groundwater resources.

NE-2.4: Regulate land use and development so as to protect natural topographic, geologic, vegetative, and hydrologic features.

NE-2.5: Promote soil stability through the use of the natural drainage systems and protection of existing native vegetation.

NE-2.6: Minimize and control soil erosion during and after construction by using best management practices, best available science, and ecologically sustainable site design.

NE-2.7: Preserve and avoid areas with endangered, threatened, and sensitive species and species of local importance as required by local, state, and federal laws.

NE-2.8: Ensure that development throughout the City meets or exceeds standards and practices for long-term wetland protection and mitigation.

3.4.3 Shorelines

The 2003 Washington State Legislature enacted a law (Substitute Senate Bill 6012) requiring Washington cities and counties to amend their shoreline management programs by December 2011. In 2009, Camas, Battle Ground, Vancouver, Washougal, Ridgefield, La Center, Yacolt, and Clark County established the Clark County Coalition to update the shoreline inventory and encourage public participation in the updates of their shoreline management programs. The update of the Camas program involved monthly public outreach, regional open houses, and Planning Commission and City Council work sessions. The City also created an ad hoc committee to examine the proposed amendments and ensure that the locally significant policies remained intact.

The Camas Shoreline Master Program was amended in 2012 with Ordinance 2643 and Resolution 1250. A limited amendment to the wetland regulations was adopted in July 2015 with Ordinance 15-007.

Shoreline Goals (as provided in the Camas Shoreline Master Program)

SMP-3.1: To guide the future development of shorelines in the City in a positive, effective, and equitable manner consistent with the Shoreline Management Act.

SMP-3.2: To promote the public health, safety, and general welfare of the community by providing long-range, comprehensive policies and effective, reasonable regulations for development and use of the City's shorelines.

SMP-3.3: To ensure, at minimum, no net loss of shoreline ecological functions and processes and to plan for restoring shorelines that have been impaired or degraded.

3.4.4 Landscape Enhancement and Tree Preservation

The natural landscape and existing tree cover are important aspects of Camas' natural environment. Native, mature landscaping and trees contribute to the City's ecological health, supply valuable animal habitat, and enhance the community's natural beauty.

Landscape Enhancement and Tree Preservation Goal

NE 4: To protect Camas' native landscape and mature tree cover.

Landscape Enhancement and Tree Preservation Policies

NE-4.1: Encourage the use of native plants in residential, commercial, and industrial landscapes in order to increase the implementation of low-impact site design.

NE-4.2: Prioritize management to eradicate aggressive non-native vegetation species.

NE-4.3: Analyze the tree canopy citywide and create a plan to encourage retention of significant tree cover.

NE-4.4: Develop a program to compensate for the loss of tree canopy coverage, when retention of mature trees within development sites is impractical.

NE-4.5: Develop a program of community education regarding healthy tree management and support the management of urban forest areas.

Legend

- UGA
- CAMAStaxlots
- Subdivisions with Wetland Delineation Reports (See note 4)
- ROW Developments with Wetland Delineation Reports

National Wetland Inventory Data

- Wetlands
- Open Water

Clark County Wetland Inventory Data

- Wetland Present

Notes:

1. Information on this map was collected from many sources, namely from wetland surveys on file with the city.
2. Dates adjacent to developments/subdivisions indicate when a delineation report was filed with the City.
3. Wetland ratings 1-4 represented with roman numerals.
4. Shaded areas indicate subdivisions with wetland delineation reports. Shading DOES NOT represent wetland boundaries, buffers, or areas. Property boundaries have been approximated. Users of this information should verify all details for accuracy.
5. The wetland areas indicated on the map are based on an inventory of wetland areas using existing published data and wetland delineations and may not represent accurate boundaries or the presence of wetland areas on a specific site. Only a site specific analysis can determine the presence, extent and category of wetland areas.

0.35 0 1.05 Miles

CAMAS WETLANDS MAP

Camas, WA. I Ordinance #: _____ | Adopted: _____

2035 Camas
Your voice, Your vision, Your future

Transportation

The quality of life for many people is significantly affected by how well streets function for pedestrians, bicyclists, transit riders and motorists. The Transportation Element must balance the needs of all users.

4 TRANSPORTATION

4.1 Vision

In 2035, residents of Camas continue to appreciate their safe, diverse, and welcoming community as a livable place for people of all ages. Quality public facilities, services, and utilities contribute to their high quality of life.

4.2 Organization of Transportation Element

- Transportation Overview
- Transportation Goals and Policies
  - Streets
  - Walking, Bicycling, and ADA Mobility
  - Local and Regional Transit
  - Design and Low-Impact Development
  - Safety and Traffic Calming
- Transportation Demand Management
- Concurrency and Level of Service
- Transportation Revenue
  - Multi-Year Financing Plan

4.3 Transportation Overview

The quality of life for many people is significantly affected by how well streets function for pedestrians, bicyclists, transit riders, and motorists. The Transportation Element must balance the needs of all users.

The basic roadway system providing circulation to and from Camas is the federal and state highway system – Interstate 5, Interstate 205, State Route 14 (SR), and SR 500. The interstates link Camas and surrounding areas to Portland to the south as well as Olympia and Seattle to the north. SR 14 is the major east-west connection from Camas to I-205 and I-5. SR 500 provides access to the northern parts of the county. The City coordinates with C-TRAN, the area's public transit provider, for transit stops and access.

The City recognizes the importance of coordinated and strong inter-jurisdictional action because transportation impacts do not stop at local boundaries. Amidst increasing congestion and limits on public resources, inter-jurisdictional coordination is necessary if the region is to achieve the land use and transportation vision contained in the Clark County *Countywide Planning Policies*. The City is a member of the Regional Transportation Council (RTC) and uses a regional model to project future trips based on proposed land use designations and projected population. This practice resulted in establishing the transportation elements needed to meet the level of service (LOS) standards throughout the City.

Transportation planning and operation priorities are found within the following documents, which are intended to support the goals and policies in this comprehensive plan update.

- *Design Standards Manual* (annual updates): This manual contains engineering design standards for the construction of roads, erosion control, grading, storm, sewer, water, and landscaping in the right-of-way.
- City of Camas 2014– 2019 Six Year Street Priorities (June 2014): This list of street projects is organized in priority order.
- Traffic Impact Fee (TIF) Update (May 2012): The update identifies the areas impacted by projected growth and determines the transportation facility improvements needed to accommodate it.

4.4 Goals and Policies

4.4.1 Streets

Street Goal

T-1: Streets will function for all users including bicyclists, pedestrians, transit users, and motorists.

Street Policies

T-1.1: Maintain the livability of Camas through proper location and design of transportation facilities, consistent with the Camas Transportation Plan map (Map 4-1) and 6-year street plan (Appendix C).

T-1.2: Support the need for regular street maintenance, safety and efficiency improvements, and access management measures.

T-1.3: Construct streets that are interconnected and avoid long cul-de-sacs or dead ends. Block lengths should be less than 1,000 feet.

T-1.4: Maintain the transportation system at a level that preserves user safety, facility aesthetics, and the overall integrity of the system.

T-1.5: Provide attractive streetscapes through design standards that encourage appropriate traffic volumes, speeds, and multi-modal safety.

T-1.6: Minimize access to new development and redevelopment along the City's arterials, and consolidate access points when spacing is insufficient.

T-1.7: Include enhanced roadway features such as roundabouts, decorative lighting, and landscaping for gateways.

4.4.2 Walking, Bicycling, and ADA Mobility

Walking, Bicycling, and ADA Mobility Goal

T-2: The needs of bicyclists, pedestrians, transit users, and accessibility (ADA-compliant) will be considered in all street improvements and will be integrated in all collector and arterial roadway projects, including regular safe street crossings.

Walking, Bicycling, and ADA Mobility Policies

T.2.1: Enhance travel choices and provide pedestrian and bicycle routes designed especially for them, not simply along routes designed for cars. Route planning should seek shortcuts and other opportunities that give walking or biking advantages over the automobile.

T.2.2: Support opportunities to increase participation of school-age children in walking or biking to school to improve their health and reduce traffic congestion.

T-2.3: Include pedestrian and bicycle linkages in the construction of cul-de-sacs and other forms of dead-end streets. Existing dead-end streets should be retrofitted to provide bicycle and pedestrian linkages as practicable.

T-2.4: Recognize and support Complete Street[3] implementation in all new and retrofit development to better the health of the community.

T-2.5: Coordinate with schools and the community to designate safe pedestrian and bicycle routes between residential areas, schools, and public facilities.

T-2.6: Increase wayfinding signage for outdoor destinations throughout the City.

T-2.7: Support enhanced pedestrian improvements in the downtown and other economic development areas.

[3] Complete Streets are designed to provide safe access for all users (pedestrians, bicyclists, motorists, and transit riders of all ages and abilities).

4.4.3 Local and Regional Transit

Local and Regional Transit Goal

T-3: Regional transit will provide safe, efficient, and dependable service to our community.

Local and Regional Transit Policies

T-3.1: Coordinate with local municipalities, the Washington State Department of Transportation, adjacent counties, and C-TRAN to ensure that minimum roadway and multi-modal design standards are consistent.

T-3.2: Continue to advocate for quality regional transit services and an increase to service availability.

4.4.4 Design and Low-Impact Development

Design and Low-Impact Development Goal

T-4: The transportation system will be designed to support community character and environmental policies.

Design and Low-Impact Development Policies

T-4.1: Provide attractive streetscapes through design standards that encourage appropriate traffic volumes, speeds, robust landscaping, and safety for pedestrians and bicyclists.

T-4.2: Minimize cut and fill in roadway design and minimize restructuring the natural contours of the land.

T-4.3: Encourage the inclusion of LID design features (e.g., rain gardens, grass pavers, pervious pavement) in the design of private driveways, parking lots, and other road surfaces.

T-4.4: Continue implementing new strategies such as LED lights as a standard for new development and replacing existing inventory.

4.4.5 Safety and Traffic Calming

Safety and Traffic Calming Goal

T-5: Design and construct safe transportation facilities that meet applicable requirements.

Safety and Traffic Calming Policies

T-5.1: Encourage traffic safety through education, enforcement, and engineering.

T-5.2: Ensure that adequate access for emergency services vehicles is provided throughout the City.

T-5.3: Provide design standards that encourage appropriate traffic volumes, speeds, and pedestrian safety.

T-5.4: Incorporate safe pedestrian and bicycle routes between residential areas, schools, and public facilities in development.

T-5.5: Require new developments to implement design standards using the Neighborhood Traffic Management Plan.

T-5.6: Identify high accident areas, and implement specific measures to reduce their occurrence.

4.4.6 Transportation Demand Management

The City studies corridor and traffic impact fees to plan transportation management that keeps pace with growth projections. Growth assumptions are based on the RTC travel demand model. The demand management projects are included in the annual update of the City's list of capital improvement projects.

Transportation Demand Management Goal

T-6: Transportation planning will achieve the efficient use of transportation infrastructure, increase its person-carrying capacity, and accommodate and facilitate future growth consistent with land use objectives.

Transportation Demand Management Policies

T-6.1: Require large employers to implement a commute trip reduction program for employees, as mandated by the state's Commute Trip Reduction law.

T-6.2: Develop Complete Street design that is supportive of the use of alternative modes of travel and adopt engineering design standards consistent with these goals.

T-6.3: Support intergovernmental development review.

T-6.4: Support RTC with funding and staff participation to the extent possible.

4.4.7 Concurrency and Level of Service

Concurrency and Level of Service Goal

T-7: The City will maintain the adopted LOS standards for all arterials, transit routes, and highways.

Concurrency and Level of Service Policies

T-7.1: Encourage growth in areas with existing or planned infrastructure capacity.

T-7.2: Require new development to demonstrate that adequate person trips are available, or that multi-modal improvements to the transportation system are made to accommodate the impacts concurrent with the development.

T-7.3: Utilize traffic impact fee studies, development traffic impact analyses, and corridor studies to identify deficiencies and plan improvements to maintain or improve level-of-service standards.

T-7.4: The City strives to maintain a LOS standard during peak hours as follows. The following table is based on the most current *Highway Capacity Manual* (HCM) of the Washington State Department of Transportation.

Table 4-1. Transportation Level of Service

Level of Service	A/B	C	D	E
Intersections	N/A	Local Access	Collectors and Arterials	State Highways of Non-Significance
Roundabouts	N/A	Local Access	Collectors and Arterials	State Highways of Non-Significance

Table 4-2. Volume to Capacity Ratio

Volume to Capacity Ratio	0.85	0.9
Roundabouts	Local Access and Collectors	Arterials and State Highways of Non-Significance
Roadways Based on Average Speed	Collectors and Arterials	State Highways of Non-Significance

T-7.5: Take the following actions (not in priority order) if probable funding falls short of meeting identified needs:

- Delay development until programs, facilities, or services can be funded;
- Obtain needed revenue or revise the transportation plan to reflect known financial resources.
- As a last choice, change the transportation LOS standard.

4.4.8 Transportation Revenue

The City's transportation budget provides for capital improvements and the operation, maintenance, and preservation of the street system. The City also must plan for that portion of the improvements that are not funded by state or federal grants or loans and developer contributions. The budgeting decisions must include an analysis of the benefits and costs for priority areas.

Transportation Revenue Goal

TR-8: Maximize the use of state and federal funds for transportation capital, operating, service, and demand improvements.

Transportation Revenue Policies

T-8.1: Maintain a capital improvement plan that identifies construction and improvement priorities and funding.

T-8.2: Ensure that the transportation impact fee program responds to land use changes, so that connectivity occurs and new development pays its proportionate share of needed capacity.

T-8.3: Support the Pavement Management System to ensure cost-effective maintenance of transportation facilities and efficient use of public funds.

T-8.4: Develop equitable transportation impact fees by which land developers are assessed fair-share contributions for any transportation improvements.

T-8.5: Direct transportation funding primarily toward multi-modal improvements that will enhance safety and circulation within and between infill areas, schools, and employment centers within City limits.

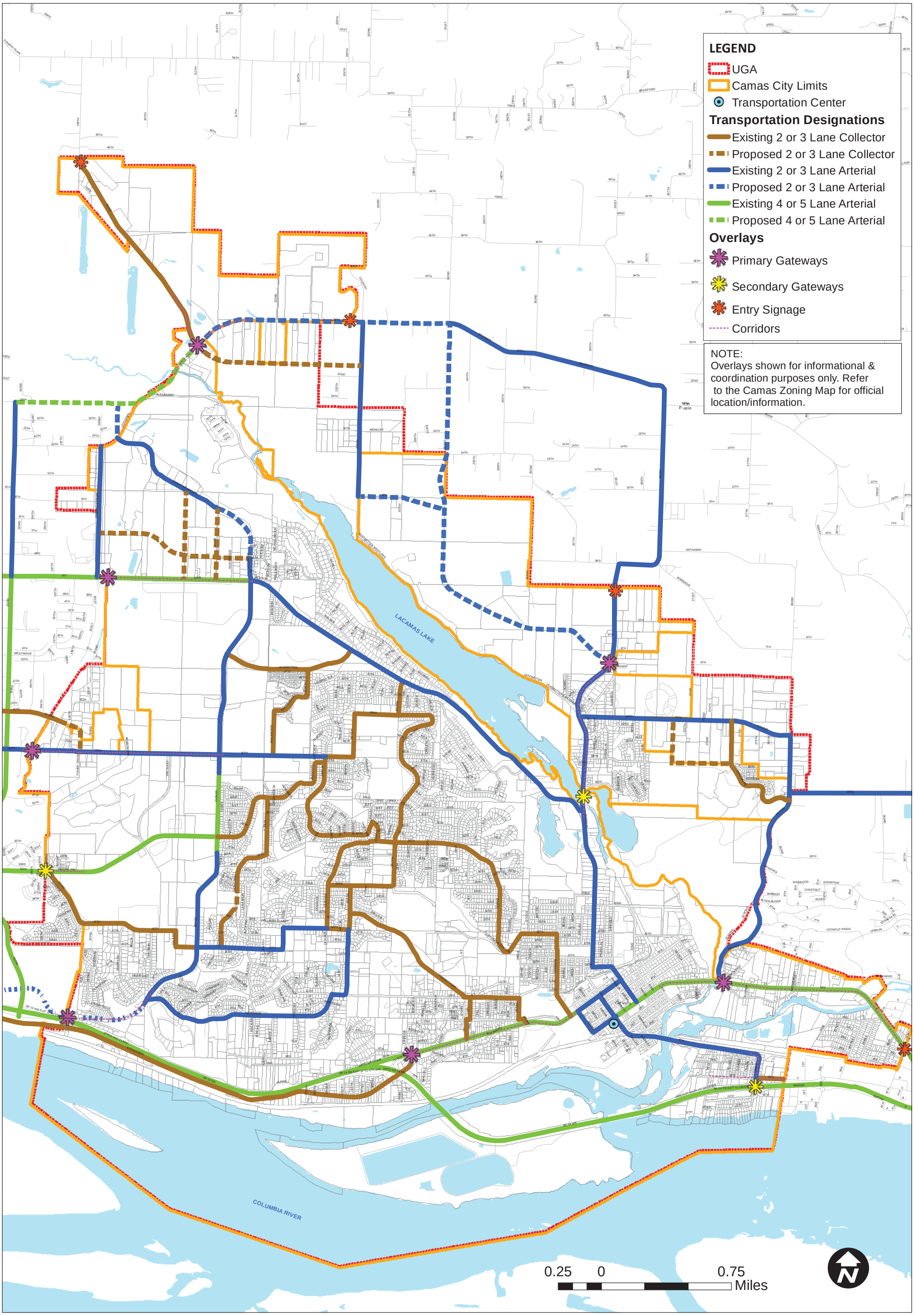
T-8.6: Focus transportation projects in economic development areas to act as catalysts for job growth.

Multi-Year Financing Plan

In previous years, the City relied heavily on Public Works Trust Fund loans, which are not currently available. The financing of capital transportation projects is prioritized along with the list of projects in the Capital Improvement Plan, which is projected as a long-range plan for funding. The current capital improvement plan comprises Appendix D.

Revenues for roadway-related activities come from the following sources:

- General County revenue (e.g., property tax),
- Impact fees, and
- Distribution from state and federal sources (e.g., state gas tax allocations).



CAMAS TRANSPORTATION COMPREHENSIVE PLAN MAP

CAMAS, WA I DRAFT I March 2016

DRAFT - NOT ADOPTED

2035 Camas
Your voice, Your vision, Your future

Public Facilities & Services

The City provides police, fire, and ambulance services as well as library services, water and sewer services, animal control services, and parks and recreation programs and facilities. The City also manages the City cemetery.

5 PUBLIC FACILITIES AND SERVICES

5.1 Vision

In 2035, Camas continues to have an excellent school system, an asset that draws families to the community. Students and their families enjoy the city's parks, trails, community centers, and other recreational opportunities. The library continues its vital role as a place of learning. Residents value well-funded police, fire, and emergency response services. Proficient government agencies maintain existing City assets and coordinate future development.

5.2 Organization of Public Facilities and Services Element

- Public Facilities and Services Overview
- Fire Protection and Emergency Medical Services
  - Policies and Recommended Actions
- Police Protection
  - Strategic Plan
  - Policies and Recommended Actions
- Camas Public Library
  - Strategic Plan
  - Policies and Recommended Actions
- Parks and Recreation Facilities
  - Comprehensive Plan
  - Goal and Policies
  - Impact Fees
- City Cemetery
  - Operations and Maintenance
  - Policies
- Animal Control
  - Policies
- Other City Facilities
  - Policies and Recommended Actions
- City Utilities
  - General Utilities
  - Water Services
  - Surface Water
  - Groundwater Wells
  - Sewer System and Service
  - Stormwater Drainage
  - Solid Waste
- Capital Improvement Plan
  - Policies and Recommended Actions
  - Project List (2016–2035)
- Franchise Utilities
  - Existing Conditions and Future Needs
  - Franchise Utility Summary
- School Districts
  - Capital Facilities Plans and Impact Fees

5.3 Public Facilities and Services Overview

The City provides manifold services to its residents. They include police, fire, and ambulance along with library and water and sewer services. The City also constructs and maintains parks and recreation facilities. In addition, the City issues building and development permits and manages the City cemetery. While the City also constructs and maintains streets and other public improvements, transportation is a standalone element and is not included in the Public Facilities and Services Element.

This element includes the goals and policies for public facilities and services to be provided concurrent with anticipated growth. The element also identifies strategic plans and actions to maintain or improve services. The identified goals and policies were given consideration based on a framework of budgetary and operational guidelines as described throughout this element.

5.4 Fire Protection and Emergency Medical Services

The Camas-Washougal Fire Department (CWFD) covers 20 square miles and 33,000 residents for fire protection and approximately 80 square miles and 65,000 residents for paramedic services. On July 13, 2011, the Camas and Washougal fire departments were consolidated into one agency through a contract for service. Under this agreement, the departments operate under one chief and combine all operational staffing in an effort to improve efficiency and lower expenditures. CWFD averages approximately 5,000 fire and medical calls annually.

The CWFD is the only fire department in Clark County that provides ambulance transport services. This added responsibility requires our firefighters to be highly skilled in emergency medical services along with fire suppression techniques. CWFD services include fire suppression, public education, inspection, prevention, and code enforcement activities.

5.4.1 Fire Protection and Emergency Medical Services Policies and Recommended Actions

FE-1: Plan for fire and emergency medical services to include adequate land, building, and equipment to effectively serve the geographic area of the city north of Lacamas Lake.

FE-2: Continue to provide advanced life support emergency medical services at present levels and at increased levels as necessary.

FE-3: Continue to ensure the installation of residential and commercial fire sprinklers where required by code and to strongly encourage their use when installation is optional.

FE-4: Seek the appropriate funding levels to maintain fire facilities to include all fire apparatus at levels to best serve the community. Fire apparatus means (and includes) fire suppression equipment such as engine, water tenders, brush trucks and command officer vehicles.

5.5 Police Protection

The Camas Police Department operates a full-service police department from one location at 2100 NE 3rd Avenue, just east of the downtown core. This facility was built in 1998 and is 15,000 square feet in size. Included in the facility is a 1,500-square foot community/training room. The facility is served by a backup generator.

5.5.1 Police Protection Policy

PP-1: Plan police annex facilities at strategic locations; these are preferred over a separate, new full service police facility.

5.6 Camas Public Library

Since 1929, the City of Camas has maintained an independent municipal library. Camas chose to keep its library when the Fort Vancouver Regional Library (FVRL) was established in the 1960s. FVRL is a junior taxing district that serves Clark, Skamania, and Klickitat counties and the City of Woodland in Cowlitz County.

The Camas Library building, constructed in 1940, was fully remodeled in 2002, with 27,000 square feet of space to provide access to books, CDs, DVDs, and other materials. The expanded library space includes meeting rooms, study spaces, and an art gallery. The library also has more than 20 computers and free Wi-Fi for public use.

The library has additional support from the Friends & Foundation of the Camas Public Library. This non-profit group is a source of volunteers and raises funds for items not covered by the City budget in order to sustain the library's high level of service.

The library's physical collection contains more than 100,000 items including books, DVDs, CDs, and portable MP3 players. The library's online collection includes thousands of eAudio and eBooks, digital magazines, and over 30 research databases that are available any time from any device. The library expands its collections through a cooperative partnership with the FVRL. The library is a member of the Metropolitan Interlibrary eXchange (MIX), so residents of Camas can go to a library in Multnomah, Hood River, Washington, or Clackamas counties in Oregon and use those libraries for free. Additionally, through World Cat, the library provides access to the holdings of Washington libraries and libraries around the globe.

5.6.1 Camas Public Library Strategic Plan

The library's future is outlined in its strategic plan, which is generally updated every 3 to 5 years. The current plan was adopted on February 2, 2012 (see Appendix E).

5.6.2 Policies and Recommended Actions

CPL-1: Plan and construct a library to serve the west side of the City, in the area of Green Mountain.

CPL-2: Explore opportunities for furthering regional cooperation, not limited to consolidation with FVRL.

5.7 Parks and Recreation Facilities

Camas' parks and recreation facilities include the Lacamas Lake Lodge and Conference Center, Camas Community Center, Camas Municipal Pool, Scout Hall, 14 parks, 22 miles of trails, and over 600 acres of open space.

Camas has a highly developed park system that supports a broad range of recreation interests. As confirmed through the public involvement process, the community places a high value on its park system and is interested in adding recreational facilities to supplement the existing offerings.

5.7.1 Parks and Recreation Facilities Comprehensive Plan

In December 2014, the City adopted a comprehensive plan for parks and recreation facilities (see Appendix F). The *Parks, Recreation and Open Space Comprehensive Plan Update* (PROS) includes goals and objectives related to physical park planning, management and operations, recreation programs, and public involvement.

The focus of the 2014 PROS plan was to maximize the use of existing sites and facilities, while targeting locations where new parks are needed to serve areas of planned growth.

5.7.2 Parks and Recreation Goal and Policies

Parks and Recreation Goal

Preserve and enhance the quality of life in Camas through the provision of parks, recreation programs, recreational facilities, trails, and open spaces.

Park Policies and Recommended Actions

The PROS document includes a detailed list of future park and recreation projects and services. Section 6 of the PROS plan describes park operations and standards for maintenance. Section 7 includes a list of project priorities, potential funding sources, and a 6-year park capital improvement plan. The development of new indoor recreation space and aquatic facilities (e.g., community center) is one of the top priorities listed in this section of the plan (refer to the PROS plan, page 7-3 Project Priorities, and page 3-11).

5.7.3 Park Impact Fees

With economic recovery in progress, the speed of new development, particularly within the expanded City limits north of Lacamas Lake, will increase. Camas receives impact fees paid by new development for park, trail, and open space improvements that increase the capacity of the system. The expenditure of the collected fees will be applied to the total costs of implementing projects that are identified in the PROS Plan project list, and as further refined by the City's Capital Improvements Plan.

Policies for Approval of Park Impact Fee Credits

The City encourages private development of parks and trails when they serve all residents and to support a healthy lifestyle. In these situations, the City allows the crediting of park impact fees when private development projects propose to build a park, trail, or open space connector that is identified in the adopted PROS plan. In general, the credit is based upon the actual cost estimate of park development and construction. For consideration of park impact fee credits, the park must be consistent with the comprehensive plan and the following policies:

PIF-1: Acquire land for park development with the intent of developing open spaces as active use areas, or as a special use park.

PIF-2: Ensure every neighborhood has a park within walking distance (about a half mile). In places where little vacant land exists for a park site, the City should partner with the school district to develop recreational facilities on school playgrounds.

PIF-3: Ensure creditable parks are no smaller than 3 acres, with the optimum being 5 to 7 acres.

PIF-4: Ensure at least 75 percent of the park site is usable for active recreation, and provide space for both active and passive uses. A minimum of 3 acres should be developed and maintained as detailed in the PROS plan.

PIF-5: Encourage the development of a community park (7 to 10 acres in size) that contains the normal neighborhood park facilities, plus specialized recreation areas such as sport fields or indoor recreation facilities.

PIF-6: Develop trails that are universally accessible as the standard for public and private projects. Work to establish a parks and recreation design standards manual.

5.8 City Cemetery

The Camas Cemetery is an important historic and aesthetic resource for the City of Camas. Located adjacent to Lacamas Park, it is a peaceful resting place for our loved ones, a quiet place for reflection, and an addition to our open space network. The *City of Camas 2009 Cemetery Master Plan* was developed to support this important resource and guide the City's efforts to manage the cemetery.

In 1883, the Camas Colony Company, formed by Henry Pittock, the publisher of *The Oregonian*, and a group of investors, sought land near La Camas Lake (Lacamas Lake) on which to establish a newsprint-producing paper mill. The company platted the cemetery in 1885, shortly after establishing the mill, but their temporary layout markers and plats were lost. Although there is uncertainty over the early years, many believe the land the cemetery now occupies was originally owned by Donald Stearns, a close associate of Pittock.

The Women's Civic Club maintained the affairs of the cemetery from 1910 through 1914. In 1914, a deed was recorded giving ownership of the cemetery land to the recently incorporated City of Camas, granted by the Pittock and Leadbetter families. The City operated the cemetery for 6 years until the Camas Cemetery Association was formed; the association operated the cemetery for more than 80 years, doing most of the work in creating what we know today as the Camas Cemetery, Ownership and operation came full circle and were transferred back to the City of Camas in 2007.

Throughout its history, several local cemeteries have incorporated their graves into the Camas Cemetery. The Camas Catholic Cemetery relocated a number of its graves and erected a memorial listing the names of all those moved. Many other graves were also relocated to the Camas cemetery over the years, including one of the oldest-dated headstones, belonging to the Karnath family.

5.8.1 Cemetery Operations and Maintenance

The City's Parks maintenance crew maintains the grounds, marks the gravesites, inspects the sites after service, and marks out and inspects marker installation. The crew also inters remains in a grave plot or niche wall without a service, and, along with the Finance Department, administers lot sales. Burials that involve a service, headstones, and markers are the responsibility of the funeral home. The City provides a license (revocable grave digging permit) for contractors to dig graves and place markers under the supervision and authority of the funeral home.

The data below list general information as of August 2015:

- 5,731 burials to date.
- 470 cremated remains placed in lots or niche walls. Based on observed data base errors, this number is presumed to be low.
- 827 veterans interred in the cemetery, according to the Veterans of Foreign Wars, which maintains data about the burials of veterans.

Over 1,500 lots are currently available for purchase at the Camas Cemetery.

5.8.2 City Cemetery Policies

CEM-1: Develop a robust and trustworthy database of burial information.

CEM-2: Meet residents' service expectations.

CEM-3: Make the cemetery financially stable and reduce dependency on the general fund.

CEM-4: Maximize the developed and undeveloped property for cemetery use to meet future burial needs and trends and provide economic stability to the cemetery fund.

CEM-5: Develop a strong volunteer and donation program.

5.9 Animal Control Services

The City has contracts with the City of Washougal for animal control services in Camas. Dog owners in Camas are required to pay a one-time lifetime license fee (CMC 6.08.030), which means that the license does not need to be renewed annually as is typical in other jurisdictions.

5.9.1 Animal Control Policies

AC-1: Continue partnership with the City of Washougal in regard to animal control.

AC-2: Explore opportunities to support the expansion of the Humane Society facility and staffing to accommodate future growth.

AC-3: Explore the development of dog parks within special use park areas to balance the needs of pet owners and other park users.

5.10 Other City Facilities

Other City-operated buildings include the Camas Municipal Center and the Operations Center.

Located downtown at 616 NE 4th Avenue, the Camas Municipal Center, constructed in 1967, houses a number of general governmental services in approximately 25,000 square feet of space. These services include administration, building, engineering, finance, planning, and public works. The east end of this building serves as a fire and EMS station. Space for meetings, whether small staff meetings or larger public events, is at a premium. Expansion plans should include flexible space that could be used for both purposes.

5.10.1 Policies and Recommended Actions

OCF-1: Develop an expansion plan (e.g., new municipal facility) as a top priority because, as growth in general governmental services occurs, the current facility will not accommodate additional personnel.

OCF-2: Consider additional meeting spaces for staff and the public when designing an expansion or building a new facility.

OCF-3: Ensure that the municipal building and primary services remain downtown, in the heart of the City.

5.11 City Utilities

City utility services include water, sewer, stormwater, and solid waste disposal.

5.11.1 General Utilities

General Utility Goal

Provide utility services to all businesses, residents, and properties in the City limits. In urban areas, eliminate private water and sewer/septic systems, including wells used only for irrigation.

General Utility Policies

U-1: Where service is available, require connection to public water for domestic and irrigation needs and connection to sewer systems. The intent is to not wait for the malfunction of a well or septic system if service is available.

U-2: Prohibit construction of new private wells and subsurface sewage disposal systems in new developments.

U-3: Eliminate the introduction of groundwater and surface water into the sewer system.

U-4: Within UGAs, the City should be the sole provider of urban services.

U-5: Do not extend utilities without annexation or commitments for annexation. Exceptions may be made in cases where human health is threatened. In areas where utilities presently extend beyond City limits, but are within UGAs, the City should plan development jointly with the County. A joint development must be consistent with City standards.

U-6: Coordinate plans for providing public utility services in UGAs and rural areas with plans for transitioning undeveloped land to urban uses.

U-7: Plan public utility services so that service provision maximizes efficiency and cost effectiveness and ensures concurrency.

U-8: Coordinate City activities with other entities, to the greatest extent possible, to provide services within the urban area.

5.11.2 Water Services

The City's current *Water System Plan* (see Appendix G, adopted June 2010) provides the overall framework for managing and expanding the water system. The City is drafting an update to the plan, which should be adopted in 2016. The updated report will describe the existing water supply and distribution system, as well as proposed improvements necessary for serving the land in the north and west portions of the study area that either have been, or are proposed for, annexation to the City.

The City owns and operates a Class A water system which, in 2014, served 7,928 customers. The system obtains water from two surface water sources (Jones Creek and Boulder Creek, which are located on the south side of Larch Mountain, northeast of the City) and from ten wells. All water is treated with chlorine for disinfection, fluoride for dental health, and sodium hydroxide to reduce the corrosion of copper piping to meet state and U.S. Environmental Protection Agency (EPA) standards. Water pressure and fire flows are maintained throughout the service area with seven distribution reservoirs totaling 8.45 million gallons of storage capacity, nine booster pump stations, and over 140 miles of pipe. Because of the City's varied topography, there are five main pressure zones and 11 secondary pressure zones located throughout the City.

The City currently has municipal water rights issued by the Washington State Department of Ecology (Ecology) for two surface water sources and nine groundwater sources. The combined water right on instantaneous quantity basis (Qi) from all of the City's sources is 14,045 gallons per minute (gpm). The annual withdrawal allocated to the City is 11,090 acre feet.[4]

Map 5-1 depicts the City's water system.

5.11.3 Surface Water

The surface water from Jones Creek and Boulder Creek is used to supply water to the City from November 1 through May 14. These water sources are used during that time to minimize the pumping required from groundwater sources. The low silica characteristics of the surface water also make it very desirable for use by high-tech manufacturing facilities. A new slow sand filter water treatment plant began construction in 2015 and was completed in 2016. The new plant will replace the existing surface water disinfection system and the water filtration plant located near Lacamas Lake that was taken out of service in 2010. The new plant and transmission facilities ultimately will be capable of providing approximately 2.2 million gallons of water per day.

The Jones Creek and Boulder Creek watershed consists of approximately 1,700 acres of mature forest land that is used by the City to collect water through water intake facilities. The City acquired this property in five individual transactions between 1923 and 1950. The property is generally split into two principal drainage basins, with Boulder Creek draining the westerly half and Jones Creek draining the easterly half. Both creeks are large streams that have public water intakes and are fed by numerous tributaries. A forest management plan has been established for the property and prescribed logging in the watershed began in 2014. Other transmission improvements and maintenance activities necessary to operate the water intake facilities have been constructed or are under design.

5.11.4 Groundwater Wells

The City operates 10 groundwater wells. Wells 7, 8, 10, 11, and 12 are located on SE Sixth Avenue, in the eastern downtown area, and are referred to as the Washougal Wellfield. Well 6 and Well 14 (completed in 2010) are located farther east along SE Sixth Avenue near the Camas/Washougal border. Well 5 is located south of Well 6 on SE Eighth Street. Well 9 was completed in August 2000 at a capacity of 650 gpm and is located on NW 38th Avenue near Parker Street. Well 13 was completed in June 2008 and is located just south of downtown on First Avenue. Wells 1, 2, 3, and 4 are abandoned.

Level of Service Criteria for Water Services

The 2011 *Clark County Coordinated Water System Plan Update*, along with the City's *Design Standards Manual*, are used to guide the design and construction of the water system. The City is updating its water system plan with an adoption date in 2016. The current plan (adopted June 2010) provides the overall framework for managing and expanding the water system.

[4] An acre-foot is the volume of 1 acre of surface area to a depth of 1 foot. According to the Water Education Foundation (http://www.watereducation.org/general-information/whats-acre-foot), covering 1 acre to a depth of 1 foot would require about 326,000 gallons of water.

Current Deficiencies/Excess Capacity of Water Services

The Camas water system meets or exceeds the LOS criteria identified above with limited exception. Because of the City's varied topography, limited pockets periodically have water pressure in excess of 100 pounds per square inch (psi). Adequate storage and treatment is available to meet the on-going needs of the City. System improvements are scheduled to maintain this LOS. The City undertakes an update of the water system plan every 6 years per Department of Health regulations, and an update is anticipated to be completed in late summer 2016.

Water Services Policy

WS-1: Extend adequate public water service throughout the City's urban areas. An adequate public water system is one that meets Washington requirements and provides minimum fire flow as required by the Fire Marshal.

WS-2: Provide safe, clean, high quality drinking water to residents.

WS-3: Ensure water infrastructure is designed to City standards and is in place prior to land development.

WS-4: Maintain sole responsibility for providing water within the UGA, and require that all new construction connect to the City's system.

WS-5: Coordinate with Clark County or other purveyors to eliminate private systems in accordance with the *Clark County Coordinated Water System Plan* (2011).

WS-6: Coordinate with the County and the cities of Vancouver and Washougal to protect groundwater from contamination.

5.11.5 Sewer System and Service

The City owns and operates a secondary sewage wastewater treatment plant (WWTP), over 100 miles of sanitary sewer piping, 23 pump stations, and over 3,200 individual septic tank effluent pumping/gravity systems. The sewer system served 7,368 customers in 2014. All domestic, commercial, and industrial waste flows are treated at the WWTP. The plant is a conventional activated sludge treatment plant built in 1972 and upgraded in 2000 and again in a phased expansion in 2010 through 2014. The WWTP has a maximum monthly average flow of 6.1 million gallons per day (mgpd), and a peak hour flow rating of 13.44 mgpd. Map 5-2 displays the City's public sewer system. The WWTP consists of primary screens, primary clarifiers, aeration basins, secondary clarifiers, ultra-violet disinfection, effluent filters, and anaerobic digesters. The effluent from the WWTP is discharged into the Columbia River.

The sewage collection system generally comprises two types of systems. The first is a standard gravity collection system where residential, commercial, and industrial sewage is collected through a series of ever-larger gravity lines and directed to the WWTP. The second is a septic tank effluent pumping (STEP) system where each residential, commercial, or industrial customer has its own septic tank and pump. Solids are collected in the septic tanks, which are owned and maintained by the City. Solids are pumped out of the septic tanks approximately once every 8 years. The sewer effluent (liquid) is pumped from each individual tank into a larger system of force mains and pumps and directed to the WWTP.

Sewer Level of Service Criteria

The sewage disposal system and treatment plant serving the City are designed and regulated in accordance with the *Criteria for Sewage Works Design Manual* issued by the Department of Ecology. The manual guides the design of sewage collection and treatment systems. The 2007 *General Sewer/Wastewater Facility Plan* and the associated 2015 *General Sewer Plan Amendment* provide the overall framework for managing and expanding the sewer collection system and the WWTP. Additionally, the plan and amendment include information about the system, the capital improvement plan, and the finance plan.

Current Deficiencies/Excess Capacity

Collection System – The capacities of the City collection system pipelines and pump stations are adequate to serve existing flow rates. Capacity expansions will be necessary as the area's tributaries to each sewer basin continue to develop. Pump station and pipeline expansions are guided by the *General Sewer Plan* (Appendix H), and by actual loads and flows entering their respective sewer basins.

Wastewater Treatment Plant

The WWTP underwent an extensive phased upgrade which was completed in 2014, expanding the capacity to meet the 2025 population projections based on the 2007 Comprehensive Plan. Future upgrades are identified in the *General Sewer/Wastewater Facility Plan and* in the 2015 *Amendment* to provide service to the full build-out of the UGA.

Sewer Infiltration/Inflow Analysis

An infiltration/inflow (I/I) analysis was conducted with the 1997 *City of Camas Wastewater Facilities Plan* to identify and prioritize the inflow of groundwater into the sewer system. An updated analysis was completed in 2015 and 2016. This is an important element to control and reduce as increased flow due to rainfall or high groundwater uses needed capacity at the WWTP and makes the influent more difficult to treat. Since 1998, the City has invested in removing the major sources of I/I identified in the study and has a plan to continue the I/I reduction program.

Policy for Sewer Services

SS-1: Extend public sanitary sewer service, which is required within urban areas, throughout urban areas. Service may be provided outside urban areas to serve areas where imminent health hazards exist.

SS-2: To reduce maintenance and power costs, use traditional gravity sewer systems (in lieu of STEP systems) to serve future customers to the greatest extent possible.

SS-3: Coordinate with Clark County to eliminate septic systems.

5.11.6 Stormwater Drainage

The City owns and maintains a stormwater conveyance system that drains approximately 7,500 acres. This storm system includes approximately 75 miles of stormwater conveyance pipe, 1,800 stormwater inlets and catch basins, and approximately 25 City-owned treatment and detention facilities, including underground treatment vaults, detention ponds, biofiltration swales, and wet ponds. The system also includes numerous culverts and drainage channels. All stormwater pipelines are separate from the City's sanitary sewer system. The City has a longstanding policy of requiring commercial and residential stormwater facilities to be privately owned and maintained. As part of its March 2010 stormwater code update, the City retained this policy and codified it under CMC 14.02.200 Ownership and Maintenance. As such, there are approximately 110 private stormwater facilities within its boundaries.

The City's stormwater management area includes three major watersheds: the Columbia River, the Washougal River, and the Lacamas Lake watersheds. All surface water and piped stormwater conveyance systems drain to one of these water bodies through a network of interconnected drainage channels, creeks, and storm pipes. Each of these main drainages has distinct and important sub-basins that have critical collection points.

The City became a Phase II National Pollutant Discharge Elimination System (NPDES) permittee in 2007. The City must meet all management and maintenance requirements outlined in its NPDES permit and the permit requirements continue to get more stringent and consume more of the City's resources. The City created a stormwater utility in 1989 and continues to refine the utility goals and rate structures to meet the permit requirements and serve the community. Stormwater management strategies are designed to meet the City's goals and objectives as described in the City's 2013 *Comprehensive Stormwater Drainage Plan* (Appendix I). The key strategy relating to stormwater is to support economic development while protecting the environment. More recent requirements through the City's NPDES permit require all development to consider, and use where possible, LID strategies. The City is drafting LID regulations for adoption in 2016.

Map 5-3 shows the City storm drainage system.

Stormwater Policies

SW-1: Provide a stable funding source to meet NPDES Phase 2 requirements.

SW-2: Inspect homeowner association and other private facilities, and provide directions and standards for repair.

SW-3: Meet water quality standards by providing best management practices for development activities.

SW-4: Establish baseline flows on each drainage basin or sub-basin for the analysis of deficiencies.

SW-5: Develop standards that would reduce the amount of impervious surface on new construction, including the creation and adoption of LID standards.

SW-6: Require new development or redevelopment to comply with the Camas *Stormwater Design Standards Manual* and design criteria.

SW-7: Protect natural stream courses for water quality.

SW-8: Manage stormwater to safely pass surface water and maintain water quality of lakes, streams, and rivers.

5.11.7 Solid Waste

The City owns and operates its own solid waste utility which provides for the collection and transfer of solid waste refuse to the Clark County owned Washougal Transfer Station. The City is responsible for managing garbage collection within the Camas boundaries. The City has established universal compulsory solid waste collection, requiring all residents and business to maintain solid waste service. The City contracts with Waste Connections of Washington to provide recycling and yard debris management, collection, and disposal. The City also contracts with Waste Connections to provide large container service (larger than 2 cubic yards) to account holders with greater solid waste handling needs.

All cities and towns in Clark County have delegated responsibility for solid waste transfer and disposal planning to the County through 2021, including Camas. The adopted Clark County Solid Waste Management Plan (CSWMP) of 2015 is updated regularly and reviewed by the County Solid Waste Advisory Commission. Agreements between Clark County and its cities commit each to the plan and to the plan's waste disposal system. Counties and cities in Washington are required by RCW 70.95 to:

- Prepare and maintain coordinated comprehensive solid waste management plans
- Determine the nature and extent of various solid waste streams (for example, from households, industries, offices, etc.)
- Establish management strategies for the handling, utilization, and disposal of solid waste
- Identify waste reduction, source-separated recycling, and waste separation programs as priority management tools

Waste Connections of Washington is responsible for managing collection services within the Camas boundaries for recyclable materials. There are no permanent solid waste facilities within the City of Camas; facilities are located throughout the County. Clark County entered into a 10-year contract with Columbia Resource Company (CRC), owned by Waste Connections of Washington, in 2010 to recycle solid-waste materials collected and delivered to transfer and recycling stations, with the remaining non-recycled wastes transported for final disposal to CRC's Finley Buttes Landfill. Waste is compacted into intermodal containers and transported upriver by private barge, then trucked to the landfill. Over half of the waste generated in the County is recycled or recovered, with the remainder disposed of in landfills. In 2012, the total waste stream for the County was 665,766 tons, of which 359,169 tons were recycled, or 53.9 percent. Since 2003, pounds per person per day landfilled has declined from 3.40 to 2.94 pounds, similar to the national rate of 2.90 pounds per capita landfill disposal. However, even as the percentage of waste that is recycled has increased, the total waste per capita—recyclable and nonrecyclable—has also increased, requiring additional resources to collect, sort, transfer, and convert to a recycled product or landfill.

Total waste generation is expected to continue to increase in Camas and across the county as the population grows. The County has projected a 1.3 percent increase in total waste per year, including a 1.6 percent increase in landfill tonnage and a 2 percent increase in residential recycling tonnage. At these rates, the County projects an increase from 665,766 tons total waste countywide in 2012 to 789,819 tons in 2034. Camas's total waste generation can be expected to increase at a higher rate due to the higher population growth rate forecasted for the City relative to the County. The County has evaluated the capacity of its transfer stations and landfills and concluded that they can accommodate the projected waste increase through 2034.

The CSWMP establishes several overall goals for waste management over the 2015-2020 timeframe including:

- Increase recycling rate to 55 percent and the total diversion rate to 70 percent.
- Reduce per person per day landfilled volumes by 5 percent.
- Reduce total amount of waste generated per person per day by 5percent.

Camas will work with the County towards these goals by implementing the specific objectives of the CSWMP.

Solid Waste Policies

SOW-1: Provide for solid waste service throughout the City through continuance of self-collection of solid waste and contracting with private waste management companies to provide recycling and yard debris collection options.

SOW-2: Continue a system of universal compulsory solid waste collection.

SOW-3: Implement the CSWMP. Reduce the total production of waste, increase the recycling rate of waste that is produced, and properly manage and dispose of waste that is not recycled. Provide education and outreach to businesses and the public on benefits and opportunities for waste reduction and recycling. Focus on residential recycling rates to improve participation rates similar to the rest of the County.

5.12 Capital Improvement Plan

Capital improvements include major projects that exhibit certain characteristics – large in size, fixed in nature, having a long life – and require the expenditure of significant funds over and above annual operating expenses. Capital improvements are defined as items planned, purchased, constructed, or otherwise acquired for the betterment of the community which add physical value to the City.

The projects identified for inclusion in the capital improvement plan will be categorized into one of the following areas:

- Street
- Stormwater
- Water
- Sewer
- General Government (i.e., City departments)
- Police
- Fire and Emergency Service
- Library
- Parks and open space
- Solid waste
- Cemetery

5.12.1 Capital Improvement Policies and Recommended Actions

CIP-1: Update the Capital Improvement Plan biannually and include a statement of projected costs and sources of revenue.

CIP-2: Ensure that capital improvements are for the betterment of the community and add physical value to the City.

CIP-3: Put any earnings from bond proceeds toward the debt service fund reserved for the future repayment of debt directly for enhancement of the project.

CIP-4: Dedicate all or a portion of the first year of property taxes generated from newly incorporated areas to the Capital Fund.

CIP-5: Dedicated funds and bonds may be used to fund essential capital improvement projects such as police, fire, and general municipal structures.

CIP-6: Use voted, general obligation debt for discretionary projects such as recreation and library facilities.

CIP-7: Give priority to those projects that support the core services provided by the City.

CIP-8: Assure consistency of capital improvement plans with the adopted Comprehensive Plan map and evaluate if funding is adequate to provide necessary public facilities and services to implement the plan.

5.12.2 Capital Improvement Plan – Project List (2016–2035)

The list of capital improvement plan projects is a complete catalogue of all projects that have been identified in various planning documents. The implementation dates and associated costs listed for the projects are tentative and should be viewed as such, but the dates are invaluable as a long-term planning tool. Appendix D contains the project list, which will continue to be updated bi-annually.

Financing of Listed Projects

Financing a capital improvement plan is a complex issue. Anticipating the future availability of financial resources to fund projects cannot be accomplished with any degree of certainty. Nonetheless, an analysis of what resources appear to be available for such long-term purposes is needed since most of the projects listed would be considered long-term and would have a significant impact on future resources. This section will provide the "best guess" as to how the long-range capital needs of the City of Camas might be financed.

Capital Improvement Plan Goal

The City will produce a viable, yet realistic, capital improvement plan which, when administered, will provide the necessary facilities and services to the citizens of the community.

5.13 Franchise Utilities

One of the evaluation criteria used in defining the UGA was that urban services would be available concurrent with all development. These services include all utilities that are privately and publicly provided. This section addresses the privately provided facilities.

GMA requires all comprehensive plans to include an element describing existing and proposed utilities, including power, gas, and telecommunication facilities. For the City of Camas, power is provided by Clark Public Utilities, gas is provided by Northwest Natural, and telecommunication facilities are provided by companies such as Verizon, Frontier, and others. All utilities are regulated by the Washington Utilities and Transportation Commission (WUTC).

Typically, utility providers, with the primary responsibility of serving their customers, have worked with the City. Although each utility must plan the distribution of its services, siting facilities within existing corridors has become increasingly important. Also, given heightened environmental protections and community design standards, more coordination is necessary. Likewise, the City supports programs that encourage energy and resource conservation.

5.13.1 Existing Conditions and Future Needs

This section summarizes general information pertaining to the existing utilities in the City. It does not inventory the capacity of the existing system since that information is unavailable.

Electrical

Clark Public Utilities indicates there is ample capacity to meet existing demand for areas within both the incorporated City limits and the UGA.

Natural Gas

Delivery of natural gas to Camas and its UGA is provided by Northwest Natural. The delivery of natural gas is governed by the Federal Energy Regulatory Commission, the National Office of Pipeline Safety, and the WUTC. The City's regulations include safety and emergency provisions, LOS standards, and rate limitations.

Northwest Natural provides natural gas service to all of Clark County. The alignment of the main pipeline crosses the Columbia River at the area of the Port of Camas-Washougal. Additionally, Northwest Natural is improving its backbone through the City with the installation of a large-diameter high-pressure gas main connecting Lake Road and Pacific Rim Boulevard.

Telecommunications

Verizon provides local telephone service to the City and its UGA. Many of the telecommunication facilities, including aerial and underground, are co-located with those of the electrical power provider. Frontier Communications also provides telecommunications to a large number of customers in the Camas area.

5.13.2 Franchise Utilities Goals and Policies

The future specific locations and capacities of utilities is not addressed in this section because the location, capacity, and timing of utility improvements depend greatly on opportunities for expansion, the particular location, and the rate of growth of Clark County and the City. In general, the siting and expansion of service will be coordinated with the development phases of the City, and the City will work with each utility in the permit approval process to assure timely development.

Franchise Utilities Goal

F-1: To ensure that energy and communication facilities and their services are available to support development when they are needed.

Franchise Utilities Policies

F-1: Minimize the effects on adjacent properties, the environment, and the visual quality of the community of siting, developing, operating, and maintaining these facilities.

F-2: Coordinate to provide reliable service through partnering and agreements with utility companies.

F-3: Promote the conservation of energy resources through the adoption of appropriate energy codes and efficient land use patterns and transportation systems.

5.14 School Districts

5.14.1 School District Capital Facilities Plans and Impact Fees

There are three school districts within city limits. In general, the Camas School District serves the central and southern areas of the City, and extends to serve a portion of the north side of Lacamas Lake. The north and northwest areas of the City are in the Evergreen School District. The southeast portion of the City is generally within the boundary of the Washougal School District.

The districts submit their capital facilities plans every other year, accompanied by impact fee calculations. The plans describe the existing and planned school facilities and services. The districts' plans and impact fee calculations are attached as Appendix J.

Economic Development

The Economic Development Element aims to promote a wide range of employment opportunities for the citizens of the community and to provide a setting and quality of life that attract businesses and residents.

6 ECONOMIC DEVELOPMENT

6.1 Vision

In 2035, the economy has grown to attract a variety of businesses that offer stable employment opportunities and family-wage jobs in the medical and high tech fields. Camas is a gateway to nature and recreational opportunities, leading to a robust tourism industry. Professional office, medical, and industrial uses typify western Camas, with retail businesses supporting the large campus firms. The north shore area will fulfill the employment and retail needs of the growing population on the northeast side, and reduce trips outside the city. Downtown Camas retains its historic atmosphere as a walkable, attractive place to shop, dine, and gather. Housing within the city's core contributes to a town center that supports local businesses.

6.2 Organization of Economic Development Element

- Economic Development Overview
- Goals and Policies by Area
  - Citywide
  - Downtown
  - Grass Valley
  - North of Lacamas Lake
  - Eastside Commercial District
  - Gateways and Corridors

6.3 Economic Development Overview

Economic development for the City of Camas is the creation and sustenance of a diverse array of employment opportunities, ensuring the tax base currently enjoyed by the City endures and is strengthened. The economic health and well-being of the City are tied to commitments to promote a wide range of employment opportunities for the citizens of the community and to provide a setting and quality of life that attract businesses and residents. While GMA does not specifically require such an element, the City of Camas believes it is important to include an Economic Development Element in its comprehensive plan.

Planning a diverse and vibrant economy must start by understanding current economic conditions in the City and Clark County. While the City's past economic health had been closely tied to the paper mill, in more recent years, the City's economy has diversified and now supports many technology and manufacturing firms, as well as a growing school system and professional offices. The tables below compare the median household incomes and percentage of civilian workers employed in all industry sectors, as defined by the North American Industry Classification System, within the City and Clark County from 2010 to 2013.

According to the second community survey completed during the vision process, over 90% of survey respondents support or strongly support the vision statement for a diversified economy.

Table 6-1. Median Household Income

Camas		Clark County	
2010	2013	2010	2013
$77,334	$81,897	$58,262	$57,341

As illustrated in Table 6.1, when compared with Clark County, wages in Camas are higher and have grown. Higher wages can have positive impacts on other aspects of the economy, and community members have expressed their desire to support family-wage jobs, particularly in healthcare and high technology.

Table 6-2. Percentage of Jobs by Industry Sector

Industry	Camas		Clark County	
	2010	2013	2010	2013
Agriculture, Forestry, Fishing, Hunting, and Mining	0%	1%	1%	1%
Construction	7%	3%	8%	7%
Manufacturing	16%	15%	13%	13%
Wholesale Trade	6%	4%	4%	3%
Retail Trade	14%	12%	12%	12%
Transportation, Warehousing, and Utilities	7%	6%	8%	8%
Information	2%	3%	2%	2%
Finance, Insurance, Real Estate, and Rental and Leasing	8%	8%	7%	6%
Professional, Scientific, and Management, and Administrative and Waste Management Services	13%	10%	10%	11%
Educational Services, Healthcare, and Social Assistance	16%	22%	20%	21%
Arts, Entertainment, Recreation, and Accommodation and Food Service	4%	7%	7%	8%
Other Services, except Public	4%	4%	5%	6%
Public Administration	4%	6%	5%	4%

Source: U.S. Census Bureau, 2013 American Community Survey (ACS) 3-year estimate (2011–2013) and 2010 ACS 5-year estimate (2006–2010).
Notes:
[1]Percentages have been rounded to the nearest whole number.
[2]The total number of civilian workers in 2013 in Camas was 9,093 and 215,992 in Clark County. In 2010, the total number of civilian workers in Camas was 8,733 and 211,215 in Clark County.
[3]Additional information on industry categories can be found on the Bureau of Labor Statistics website: http://www.bls.gov/iag/home.htm.

As illustrated in Table 6.2, between 2010 and 2013, Camas saw declines in construction and professional, scientific, and management jobs, a small decline in manufacturing jobs, and an increase in educational services, healthcare, and social assistance jobs. These same trends are generally reflected in the County as a whole; however, Camas did experience a greater decline in construction jobs and a greater increase in educational services, healthcare, and social assistance jobs. As the nation recovers from the recent economic recession, these trends in employment by industry sector are reflected in the economies of the nation and the state.[5]

In order to support the continued growth of the Camas economy and the planned increase of 11,182 jobs by the year 2035,[6] the Economic Development Element establishes goals and policies that seek to maintain the diversification of employment opportunities.

The City is targeting businesses that provide a greater proportion of family-wage jobs. Increasing retail services in support of residential, industrial, and professional business growth is highly desirable.

[5] *2014 Labor Market and Economic Report*, Washington State Employment Security Department, published March 2015.
[6] As noted in the Land Use Element of Camas 2035, GMA requires that each jurisdiction accommodate its share of the region's growth. Based on analysis conducted by Clark County and each municipality within the County, Camas' share of the region's growth is expected to be 11,182 jobs.

6.4 Goals and Policies

Economic development goals and policies are established to ensure economic development in the City of Camas is consistent with the Camas 2035 Vision and provides a diverse range of employment opportunities throughout the City. Goals and policies are presented for citywide economic development and for six areas of the City that contribute particular attributes to the City's overall economy.

6.4.1 Citywide Economic Development

Citywide Economic Development Goal

ED-1: Maintain a diverse range of employment opportunities to support all residents and provide a setting and quality of life that attract and retain businesses.

Citywide Economic Development Policies

ED-1.1: Ensure that tools are in place to attract healthcare and high-tech, sustainable, and innovative industries to expand and to provide stable employment.

ED-1.2: Encourage apprenticeships, internships, and on-the-job training in all industry sectors.

ED-1.3: Encourage appropriate reuse and redevelopment of older and deteriorating commercial areas and industrial brownfield sites.

ED-1.4: Foster and expand year-round recreational services, lodging, dining, and retail options that will capture tourism and benefit residents and employers.

ED-1.5: Ensure adequate infrastructure is planned or in place to nurture and incubate new businesses.

ED-1.6: Remain active in regional recruitment organizations to ensure the availability of an adequate supply of commercial and industrial employment land to support the City's economic development goals.

ED-1.7: Support retention, expansion, and recruitment of local businesses with a commitment to the community.

ED-1.8: Ensure that development standards are balanced in order to promote high-quality building and site design and encourage businesses to operate in an environmentally responsible manner.

ED-1.9: Encourage businesses to reduce travel times and trips through implementation of a trip reduction program, which includes incentives for carpooling, transit ridership, and other options beyond single-occupancy vehicles.

ED-1.10: Encourage complementary businesses throughout the City to support industry clusters and leverage resources.

6.4.2 Downtown

Downtown Camas is the historic center of the City, which has seen steady redevelopment in recent years with a brew pub, conversion of uses (e.g., Ford dealership to offices), and a new building on NE Everett. Land uses in downtown include a mix of retail services, restaurants, professional offices, government services, and single- and multi-family residential development. Downtown Camas is also home to several community events throughout the year, including Camas Days. These events attract thousands of people to downtown and support the local economy and community.

Downtown Economic Development Goal

ED-2: Maintain Downtown Camas as the heart of the City and encourage development/redevelopment from 3rd Avenue to 6th Avenue, and Adams to Garfield, which respect the area's historic character and support walkability and a range of diverse services.

Downtown Economic Development Policies

ED-2.1: Safeguard the design of downtown through requiring compliance with the *Downtown Design Review Manual* and consistency with the comprehensive plan, which includes an abundance of street trees and historic design features.

ED-2.2: Collaborate with public agencies, private parties, and non-profits in marketing and outreach efforts that sustain existing local businesses and attract new development/redevelopment while maintaining the historic character of downtown.

ED-2.3: Ensure the Land Use Element supports higher residential densities adjacent to the downtown district and atop downtown businesses to increase activity in downtown in support of local businesses.

ED-2.4: Fulfill the vision for a central gathering place in the heart of downtown, which will support regular community events, and be the catalyst for new ones. The gathering place could include design features such as: seating areas; public art; fountains; children engagement art; expanded farmer's market space; and other amenities that create ambiance and bring people of all ages to Downtown.

ED-2.5: Ensure adequate parking in Downtown for continued business growth. Seek out opportunities for additional parking on the edges of the downtown district, which could also serve as a park and ride transit facility.

6.4.3 Grass Valley

Grass Valley is home to several national and international technology and manufacturing firms. Land uses in Grass Valley include large technology and manufacturing campuses, surrounded by retail and commercial services and residential development. The City has invested in significant infrastructure improvements in Grass Valley in support of high-tech industrial development, which is still the focus for this area.

Grass Valley Economic Development Goal

ED 3: Promote a cooperative industrial business park in which businesses and the City share resources efficiently to achieve sustainable development, with the intention of increasing economic gains and improving environmental quality.

Grass Valley Economic Development Policies

ED-3.1: Promote the development of a subarea plan that will capitalize on the creation and retention of industries that provide family-wage jobs.

ED-3.2: Subarea planning should capitalize on existing facilities and infrastructure and include a mix of uses that are trail- and transit-oriented and designed with high-quality streetscape appeal.

ED-3.3: Protect employment land from conversion to residential uses by requiring an analysis of adequate buildable lands in Grass Valley to meet 20-year employment projections prior to land conversion approval.

6.4.4 North of Lacamas Lake

The area north of Lacamas Lake is anticipated to experience substantial growth and redevelopment within the 20-year planning horizon. Planned transportation infrastructure will improve transportation connectivity throughout the City and support the employment and retail uses desired north of Lacamas Lake. A large portion of the land in this area is zoned Business Park and Multi-Family, with some Commercial and lower density residential zoning. The Port of Camas -Washougal manages an airport that is outside City limits, but most of the developable land north of Lacamas Lake is within the airport influence area.

North of Lacamas Lake Economic Development Goal

ED 4: To encourage master planning that allows a more intense level of development, well-served by transportation options and includes facilities for pedestrian and bicycle travel, a range of housing choices, and a mix of shops, services, and public spaces.

North of Lacamas Lake Economic Development Policies

ED-4.1: Promote the growth of businesses such as grocery stores, medical offices, and restaurants that will meet the retail and service needs of the population.

ED-4.2: Protect the viability of the airport as a significant economic resource to the community by encouraging compatible land uses[7] and densities, and reducing hazards that may endanger the lives and property of the public and aviation users consistent with state laws RCW 36.70A.510 and RCW 36.70.547.

ED-4.3: Encourage new developments to include provisions for neighborhood parks that are within walking and biking distance of a person's home or work to encourage greater physical activity, including shared-use paths (or trails) that link homes, work and commercial centers, public transit, and community facilities.

ED-4.4: Promote economic development opportunities adjacent to the Port of Camas-Washougal's Grove Field that will benefit from additional transportation options.

ED-4.5: Preserve large tracts of land for large industry and master-planned commercial development.

ED-4.6: Support public-private partnerships for infrastructure development.

ED-4.7: Advocate better transit routes and service.

6.4.5 Eastside Commercial District

The Eastside Commercial District has tremendous economic growth potential and would benefit from targeted streetscape improvements. The development of a streetscape that is attractive and safe for all modes of transportation (e.g., bicycles, wheelchairs, pedestrians) could attract new economic opportunities and investment to the area.

This commercial area generally straddles NE Third Avenue at the City's eastern edge to the bridge over the Washougal River. The commercial structures are single-story, with stretches along the street that are in disrepair and vacant. Scattered businesses have been recently renovated. This vehicle-dominated corridor has several drive-through chain restaurants and large parking lots adjoin the street. There are no pedestrian or bicycle amenities and landscaping is scarce or non-existent.

Eastside Commercial District Economic Development Goal

ED 5: To create a redeveloped and revitalized Eastside Commercial District that supports existing and new unique-to-Camas businesses and recreation within a safe and pedestrian-friendly streetscape.

Eastside Commercial District Economic Development Policies

ED-5.1: Develop commercial and mixed-use areas that are safe, comfortable, and attractive to pedestrians.

ED-5.2: Reinforce streets as public places that encourage pedestrian and bicycle travel and provide transitions between Third Avenue and neighborhoods.

ED-5.3: Encourage efficient land use by facilitating compact, high-density development and minimizing the amount of land that is needed for surface parking.

ED-5.4: Improve wayfinding to recreational amenities.

[7] Refer to "Airport and Compatible Land-Use Program Guidebook," Washington State Department of Transportation; available online at http://www.wsdot.wa.gov/aviation/Planning/ACLUguide.htm.

6.4.6 Gateways and Corridors

Community gateways create a sense of arrival and let visitors and residents know they are in Camas. Primary and secondary gateways are designated to distinguish between gateways that offer a primary entrance into Camas and those that are secondary and serve as an entrance to a particular part of the City. A corridor extends approximately 0.25 mile from the gateway and includes enhanced features such as bike lanes, widened or detached sidewalks, and signage. As outlined in the Land Use Element, gateways are established as an overlay zone and identified on the Camas Zoning Map (see Map 1-2).

Gateways and Corridors Economic Development Goal

ED-6: Create attractive and welcoming entrances to the City and distinguish Camas from adjacent jurisdictions through the development of community gateways.

Gateways and Corridors Economic Development Policies

ED-6.1: Ensure development in community gateways meets and, where possible, exceeds, the design principles and guidelines for primary and secondary gateways as described in the *Camas Design Review Manual*.

ED-6.2: Ensure zoning regulations and design standards promote development/redevelopment in gateways that include the gateway and corridor overlay features identified in the Land Use Element and the *Camas Design Review Manual*.

ED-6.3: Coordinate gateway and corridor development/redevelopment with Public Works planning to leverage resources and ensure adequate right-of-way is available for gateway/corridor improvements.

ED-6.5: Encourage redevelopment along the Everett corridor that respects the historic character of the area, improves pedestrian mobility/safety, and supports small-scale retail and commercial services.

ED-6.6: Encourage development of commercial uses and multi-family residential within the 6th Avenue and 3rd Avenue gateways and corridors to further support downtown businesses. Consider rezoning low-density residential land to support the downtown area.

ED-6.7: Building entrances should face the street and provide pedestrian connections from the building entrance to the sidewalk. Encourage landscaping, rather than parking, between the building and the street in order to create a welcoming streetscape.

City of Camas
Camas 2035
Camas, Washington

Appendix A
Camas 2035 Public Involvement Summary

Summary of Public Outreach January 6, 2015

As a community, we are preparing an update of the Camas Comprehensive Plan that directs our city's long-term growth and development. The 2004 Plan helped lead the way for the neighborhoods, schools, parks and downtown that we enjoy today. Camas 2035 is a citywide process to envision our desired future 20 years from now and identify the policies and actions needed to get us there. The Camas 2035 outreach process is designed to meet the following objectives:

- Create a vision that preserves what Camas residents value most about Camas today, while planning for future generations.
- Ensure early and continuous public engagement through a variety of outreach methods.
- Build community support for the 2035 Vision and the subsequent comprehensive plan update.

Over the past six months, under the guidance of the Vision Steering Committee, hundreds of community members have participated in two rounds of Camas 2035 outreach activities. The purpose of the first round was to identify Camas' strengths and understand what residents value about Camas today. Outreach activities included:

- Online questionnaire completed by 417 community members.
- Conversations with key stakeholder groups, including the Camas Youth Advisory Committee (CYAC), Port of Camas/Washougal, Camas Parent Teacher Organization Leaders, Hellen Baller Parent Teacher Association and Camas/Washougal Economic Development Association.
- Vision kick-off at Camas Days where community members recorded what they love most about Camas.

The purpose of the second round was to validate the draft vision statement and identify actions needed to achieve the vision. Outreach efforts were targeted to segments of the population that did not show strong participation in the first round, including the southeast quadrant of the city, seniors and youth. A second questionnaire distributed online and in paper form was completed by 177 people.

The following is a summary report of community outreach results. A detailed compilation of comments received throughout the process is available upon request.

ROUND ONE (July – November 2014)

Questionnaire

Who Responded?

While responses are fairly well distributed over various demographics, it is clear that different tools or targeted outreach are needed to reach the under 18 and 55 and older cohorts. Approximately 71% of questionnaire respondents fall between the ages of 35 and 54, significantly higher than the percentage of the population they represent. While it is unlikely that pre-high school youth would respond to this questionnaire, an overall response rate of 1.0% for those 18 and younger leaves room for improvement. Likewise, while rates of internet use are lower for people 65 and older, targeted efforts to reach seniors should be employed.

Age Group	Response %	2010 Census
18 or younger	1.0%	33.3%*
19 to 34	8.4%	13.9%**
35 to 44	39.8%	17.3%
45 to 54	31.6%	15.9%
55 to 64	15.3%	10.9%
65 and older	3.9%	8.7%

*Census cohort 19 and younger. **Census cohort 20 to 34

While the majority of respondents are longer-term residents of Camas, more than 41% moved here within the last 10 years. Approximately 8% of respondents work, but do not live in Camas.

Years Lived in Camas	Response
1 or less	6.8%
2 to 5	18.0%
6 to 10	16.7%
More than 10	48.5%
I work in Camas	8.3%
I am a visitor to Camas	1.7%

Responses have come in from all areas of the city. The highest percentage of responses came from NW Brady Road and NW 18th Ave., NW 38th and NW Parker St., and NW Lake Road and Sierra St. The southeast portion of the City is likely underrepresented so targeted outreach efforts should be employed.

Closest Intersection to Residence	Response
NW Brady Road and NW 18th Ave.	17.7%
NW Lake Road and Sierra St.	14.8%
NW 38th and NW Parker St.	14.0%
NW Fargo St and NW Logan	8.6%
NE 3rd Ave. and NE Adams	8.1%
NW 18th and Division St	6.7%
NE Everett and 43rd Ave.	6.7%
Leadbetter Road and 232nd Ave.	4.4%
NW Lake Road and NW Friberg-Strunk St.	2.0%
SE 2nd and SE Whitney	2.0%
Not sure/Not applicable	15.0%

What did they say?

What do you love/value most about Camas?

The excellent schools and "small town feel" are most often cited as what people value about Camas. Another important feature is the ready access to nature, such as open spaces, parks, trails, the Columbia River and Lacamas Lake. Residents value their neighbors and the broader community and see Camas as a safe, livable place to raise a family. Camasonians also appreciate the Camas downtown, as well as its proximity to Portland.

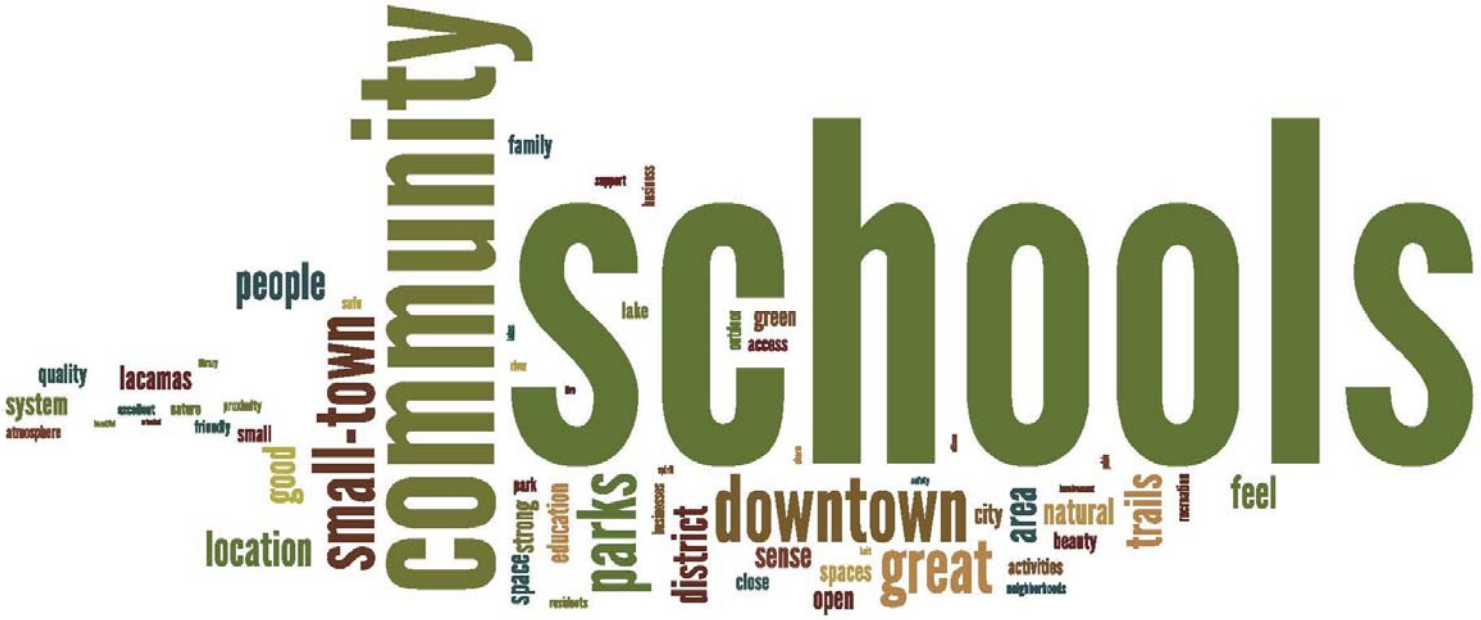
What are the City's two greatest strengths/assets?

Responses regarding Camas greatest strengths or assets are similar to the responses above. Camas schools are the overwhelming choice as the City's greatest strength, followed by trails, parks, open spaces and nature. The Camas community, downtown, people, and businesses all contribute to an outstanding quality of life.

The following "word clouds" help illustrate responses regarding what people value about Camas and the City's greatest assets.

What we value

Greatest strengths/assets



Rate the importance of goals and aspirations identified in the 2004 Comprehensive Plan.

Camas residents strongly support comprehensive plan goals that promote the City's "small town" atmosphere and vital, stable and livable neighborhoods. The Camas downtown, recreational opportunities and preserving the City's natural assets also receive strong support. Camasonians support quality public facilities, a vibrant and diverse economy and robust public participation in land use decisions. Receiving less support are providing a variety of housing types to meet the needs of the community and providing "a safe, balanced and efficient transportation system that supports industrial, commercial and residential uses."

Goal	Average
Camas' "small town" atmosphere.	3.68
Vital, stable and livable neighborhoods	3.64
Downtown as a unique and special place to visit, shop and live	3.64
Optimal active and passive recreational opportunities for present and future residents	3.61
Preservation, restoration and improvement of the natural environment	3.60
Public facilities, services and utilities to ensure the quality of life for current and future community members	3.42
A strong, vibrant and diverse economy	3.38
Early and continuous public participation for all community members in the development of land use plans and regulations	3.35
A variety of housing opportunities to meet the needs of all members of the community	2.86
A safe, balanced and efficient transportation system that supports industrial, commercial and residential uses	2.77

Highest possible score is 4.0.

What should the City do to make Camas an even better place to live or visit in the future?

Camasonians would like to see new recreational amenities, such as an indoor pool and community center, as well as more parks and trails. New businesses and employment opportunities, and investment in city infrastructure also are important. Camas residents would like to develop or renovate underutilized properties, while preserving those structures with historic value. Less important to residents are pursuing additional entertainment options, cultural activities, gathering places or retail services.

Priority	Responses		
	#1 Action	#2 Action	#3 Action
Add new recreational amenities (indoor pool, community center, tennis courts)	72	51	36
Recruit new businesses for more employment opportunities	66	51	42
Invest in infrastructure (roads and bridges, municipal buildings, water and sewer)	57	46	43
Add more parks and trails	59	46	30
Renovate/develop underutilized properties	19	34	54
Preserve historic structures and features	22	31	32
Promote cultural and social activities (theater, public art, music in the park)	20	26	47
Create a public gathering space (plaza or square)	21	31	19
Pursue additional retail services	14	27	19
Pursue additional entertainment options	5	9	19

In what ways are you most likely to participate in the Camas 2035 Vision process?

Going forward, Camas residents are prefer to participate in the 2035 process by completing online questionnaires and staying informed via email or local newspapers. Residents are less likely to participate through groups of which they are a member, social media or public meetings. Most Camasonians prefer not to give public testimony.

Activity	Response
Complete online questionnaires	77.1%
Stay informed by email	60.3%
Read articles in the Camas Washougal Post Record or The Columbian	51.7%
Participate through groups of which I am a member (e.g., school, church, civic organization)	38.0%
Follow the vision Facebook page	32.0%
Attend public meetings	30.3%
Comment on the vision website	28.0%
Give testimony at public hearings	8.6%

Community Conversations

The following is a summary of key comments made during community conversations.

Port of Camas Washougal
Camas' strengths include its location relative to SR 14 and easy access to I-5 and I-205, the School District and sports programs, proximity to rural areas and downtown Portland, and access to recreational and shopping opportunities. The City should continue to be good stewards of the environment while seeking opportunities to ease the development process. More shopping opportunities are needed within Camas to reduce travel.

Camas Parent Teacher Organization Leaders
Camas greatest assets are its schools, sense of community, proximity to Portland and natural areas/views and recreational opportunities. The City should protect trees and open spaces, close the income disparity, update and maintain park facilities and encourage more professional services and specialists.

Camas/Washougal Economic Development Association
Camas' schools, quality of life, parks/trails and housing are its greatest assets. Camas and Washougal are seeking more development-ready sites, such as the Steigerwald Commerce Center, Camas Meadows and North Dwyer Creek Business Park as environmental constraints are present across much of the city in the form of floodplains and steep slopes. The City should seek opportunities to add a variety of housing options to meet the needs of all of its residents.

Hellen Baller Parent Teacher Association
Camas' greatest strengths are its schools, green space and small businesses. The City does an excellent job of providing planning, police and infrastructure services. The mill is another important element of the community. In the future, more transportation and housing options are desired along with recreational opportunities and a community center. Specific goods and services also are needed, such as a bakery, book store and café for parents with young kids.

Camas Youth Advisory Committee (CYAC)
CYAC members believe one of Camas' primary assets is Camas High School, which brings the community together. Downtown is a central gathering place with sufficient retail to serve the community and other amenities, such as the farmers market, library and theater. Students value the city's parks, trails and recreational opportunities as well as easy access to natural features like mountains and beaches. CYAC members also appreciate the nice people and residential neighborhoods that are Camas. Students are concerned about population growth and want to see Camas High School, downtown and a new community center as central gathering places. They are interested in preserving the sense of community and safety Camas enjoys today. CYAC members believe transportation and environmental measures are needed to address traffic congestion and pollution. They anticipate a more diverse population and want to ensure that community members are not divided by socio-economic differences.

ROUND TWO (December 2014 – January 2015)

Questionnaire

Who Responded?

As in the first round, we saw very few survey responses from residents age 34 and younger and none from those under 18. Low turnout may be due in part to the survey being conducted at a time when school was not in session. Targeted efforts to reach seniors were successful as responses from those 65 and older make up 16.6% of the responses, four times the share of round one.

Age Group	Response %	Round One Response %
18 or younger	0.0%	1.0%
19 to 34	8.0%	8.4%
35 to 44	30.7%	39.8%
45 to 54	30.7%	31.6%
55 to 64	14.1%	15.3%
65 and older	16.6%	3.9%

*Census cohort 19 and younger. **Census cohort 20 to 34

As in the first survey, more than 56% of respondents have lived in Camas for more than 10 years, while approximately 41% have lived here fewer than 10 years.

Years Lived in Camas	Response
1 or less	4.0%
2 to 5	18.0%
6 to 10	20.0%
More than 10	55.3%
I work in Camas	2.0%
I am a visitor to Camas	0.7%

Vision Validation

Introduction

In the year 2035, residents of Camas continue to appreciate their community as a safe, welcoming and livable place for people of all ages. Camas maintains its small town character while accommodating current and future residents. Excellent schools, a vibrant downtown and ready access to metropolitan amenities, parks, trails, open space, the Columbia River and Lacamas Lake are enjoyed by all. The Camas Farmer's Market, First Fridays, Camas Days and other community events bring neighbors together.

97.1% of respondents support or strongly support the introduction to the vision statement.

	Responses	Response %
Do not support	2	1.2%
Somewhat support	3	1.8%
Support	36	21.1%
Strongly support	130	76.0%
Total	171	100.0%

Vital, Stable and Livable Neighborhoods

Camas is a well planned and connected city where residents enjoy pedestrian and bicycle paths between neighborhoods and to downtown. Historic structures are maintained and rehabilitated to accommodate new homes and businesses. There is a wide variety and range of affordable housing for all ages and income levels. Quality public facilities, services and utilities contribute to a high quality of life. Residents enjoy a variety of social and cultural activities to celebrate the city, its history and its people.

91.7% of respondents support or strongly support the statement on vital, stable and livable neighborhoods.

	Responses	Response %
Do not support	5	2.9%
Somewhat support	9	5.3%
Support	58	34.1%
Strongly support	98	57.6%
Total	170	100.0%

Diversified Economy

Downtown Camas retains its main street atmosphere as a walkable, attractive place to shop, with local businesses and low vacancy rates. The economy has grown to attract manufacturing and high tech companies offering stable employment opportunities and family wage jobs. Camas is a gateway to nature and recreational opportunities, leading to a robust tourism industry.

93.0% of respondents support or strongly support the statement on a diversified economy.

	Responses	Response %
Do not support	5	2.9%
Somewhat support	7	4.1%
Support	53	31.2%
Strongly support	105	61.8%
Total	170	100.0%

Public Services

Camas continues to have an excellent school system, an asset that draws young families to the community. Students and their families enjoy the city's parks, trails and recreational opportunities, which are well maintained by city employees and volunteers. The library continues its vital role as a community gathering place. Residents of all ages gather at the community center to socialize and enjoy its many amenities. Citizens value the services of well funded police, fire, planning and parks departments.

95.9% of respondents support or strongly support the statement on public services.

	Responses	Response %
Do not support	2	1.2%
Somewhat support	5	2.9%
Support	29	17.1%
Strongly support	134	78.8%
Total	170	100.0%

Natural Environment

A wildlife corridor enhances the trail system throughout the city and connects to the Columbia River. Lacamas Lake is treasured as a unique resource for recreation. The parks and trails are well maintained and handicap accessible. City policies protect trees and open spaces.

97.4% of respondents support or strongly support the statement on the natural environment.

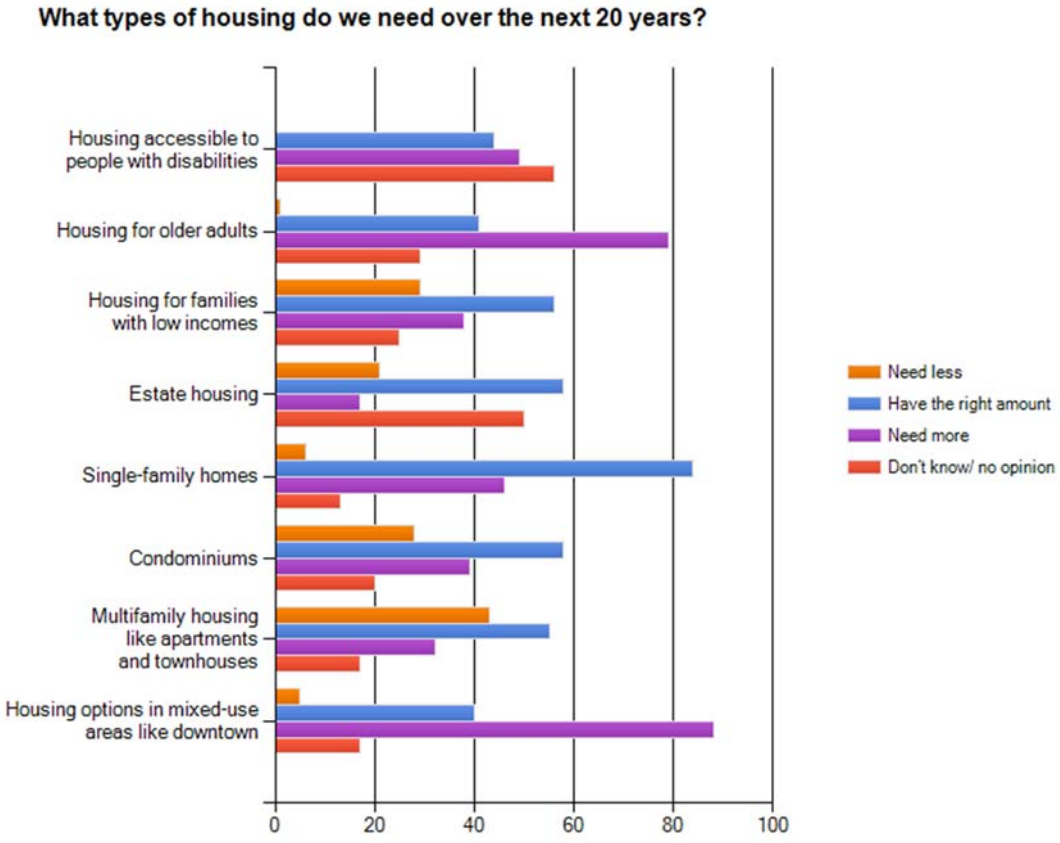
	Responses	Response %
Do not support	2	1.3%
Somewhat support	2	1.3%
Support	19	12.0%
Strongly support	135	85.4%
Total	158	100.0%

Vision Actions

Housing

What types of housing do we need over the next 20 years?

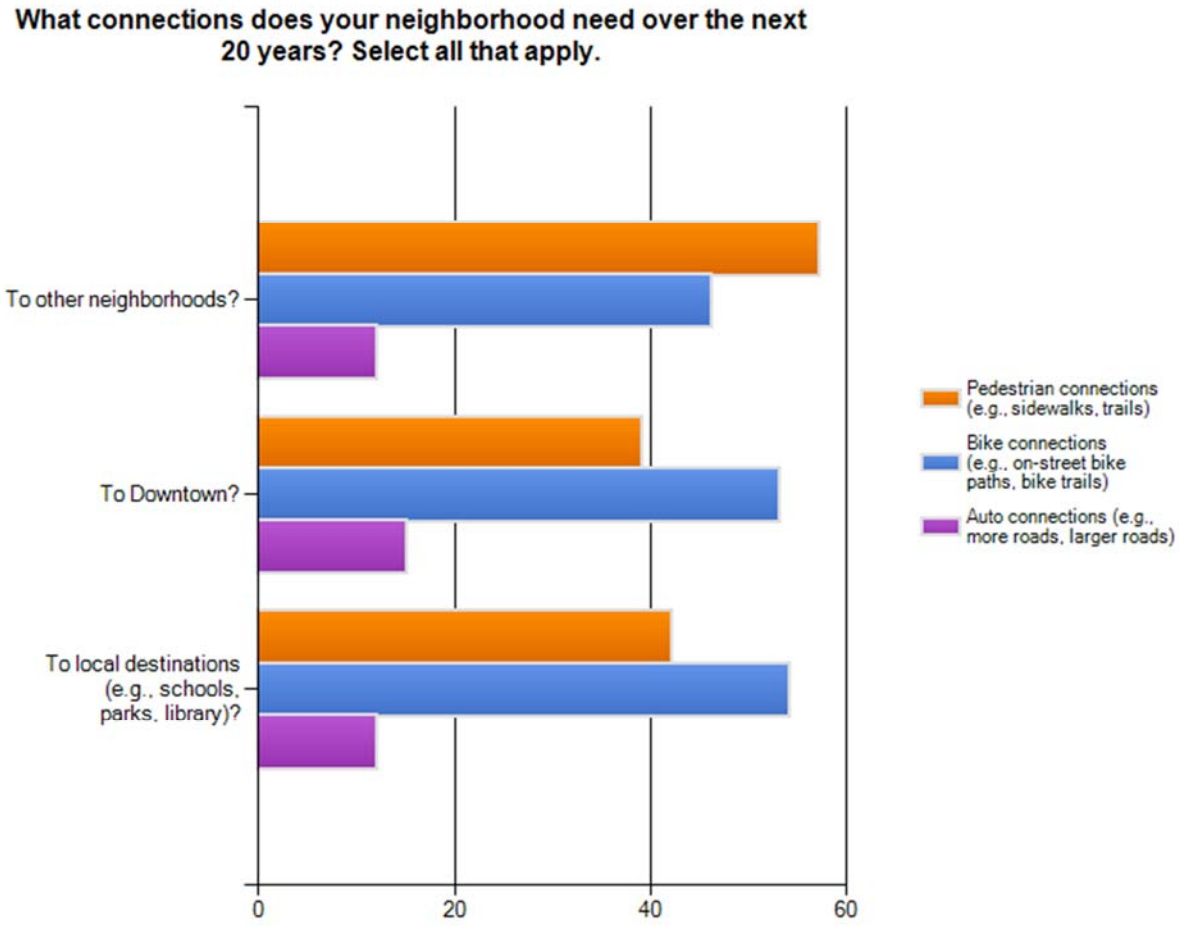
Respondents indicate that housing options in mixed-use areas like downtown are most needed, followed by housing for older adults and people with disabilities. A majority of respondents feel that the city has the right amount of single-family homes, estate housing, condominiums, housing for families with low incomes and multi-family housing.



Connections/Transportation

What connections does your neighborhood need over the next 20 years?

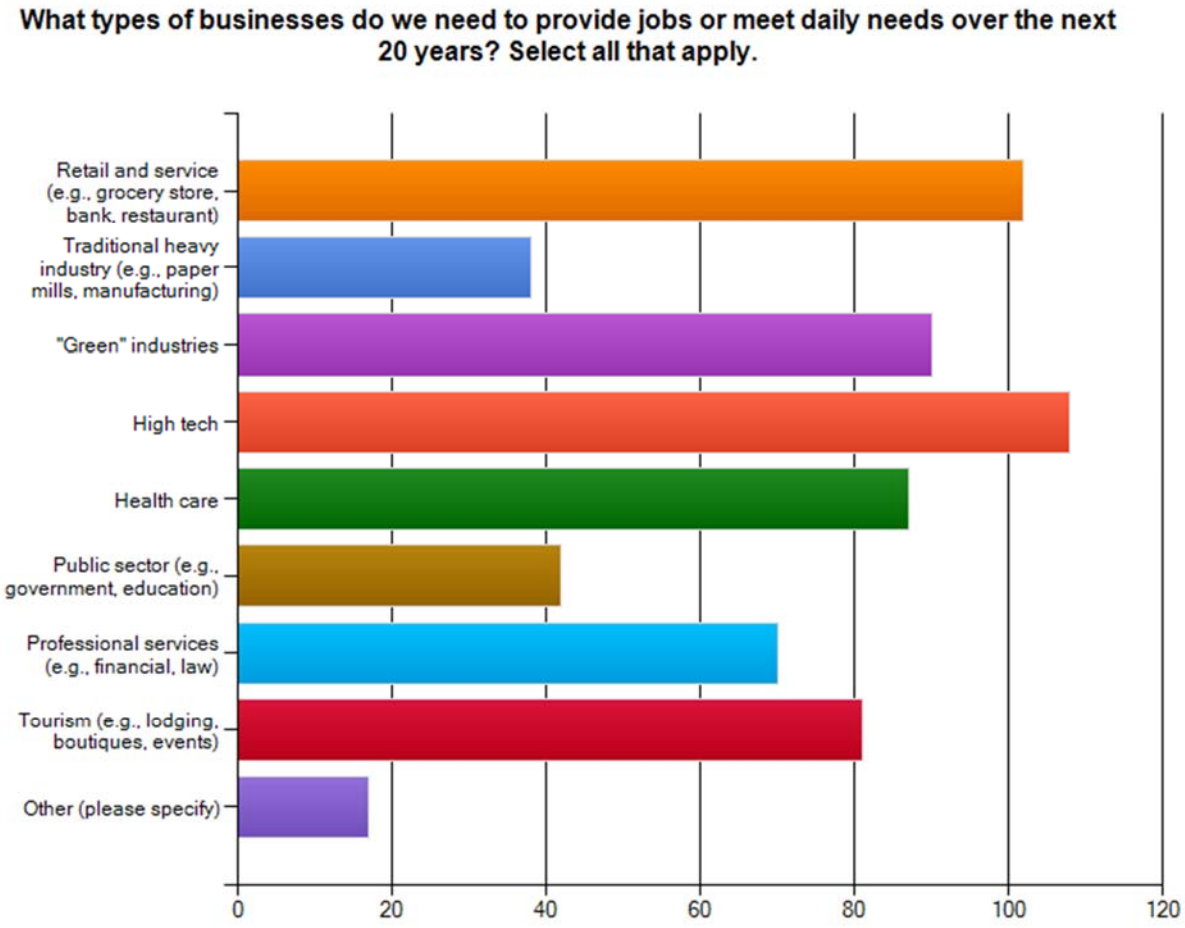
Respondents indicate that better pedestrian and bike connections are needed throughout the city, with a focus on pedestrian connections between neighborhoods and bike connections to downtown and local destinations.



Economy/Jobs

What types of businesses do we need to provide jobs or meet daily needs over the next 20 years?

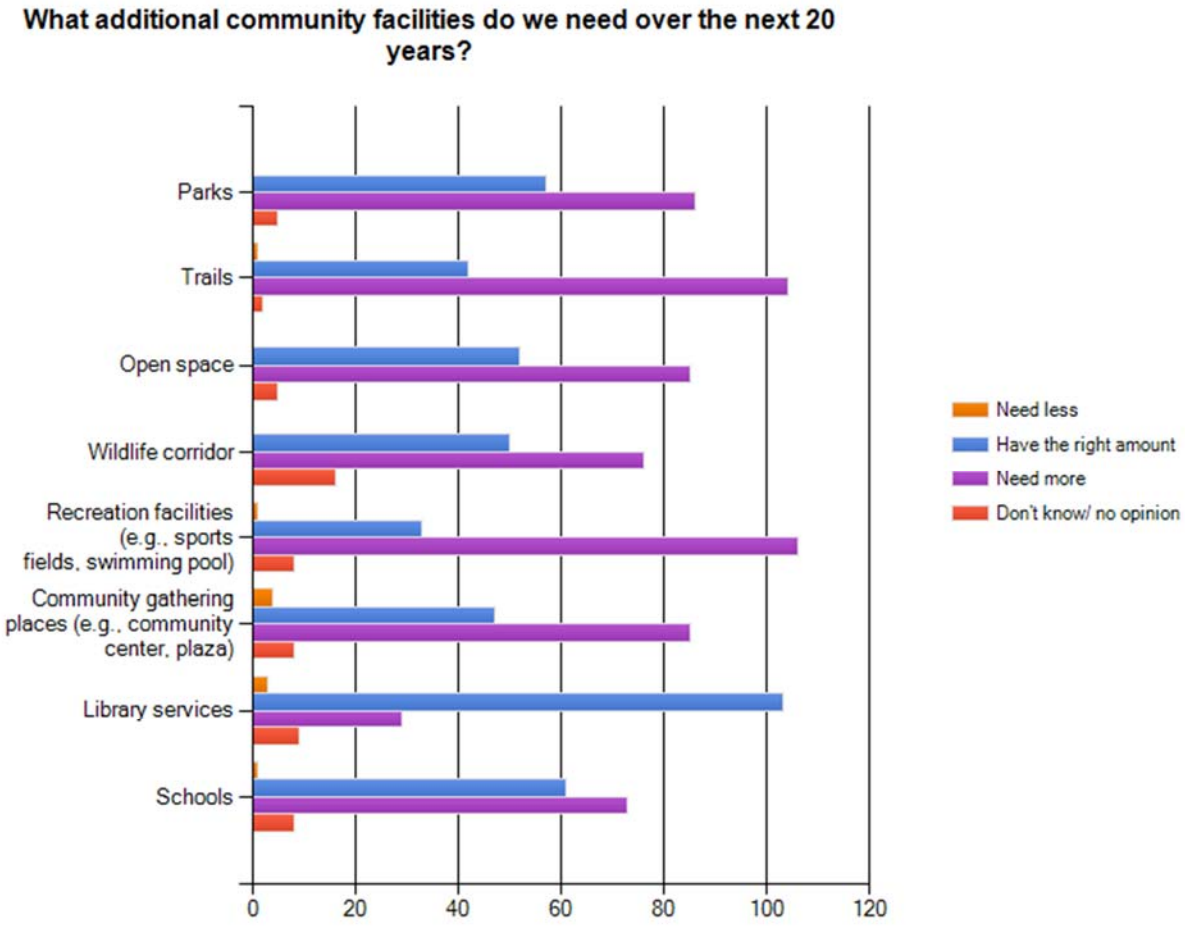
Respondents desire high tech businesses most, followed by retail and service, “green” industries, health care and tourism. Public sector and traditional heavy industry are least desirable.



Community Facilities

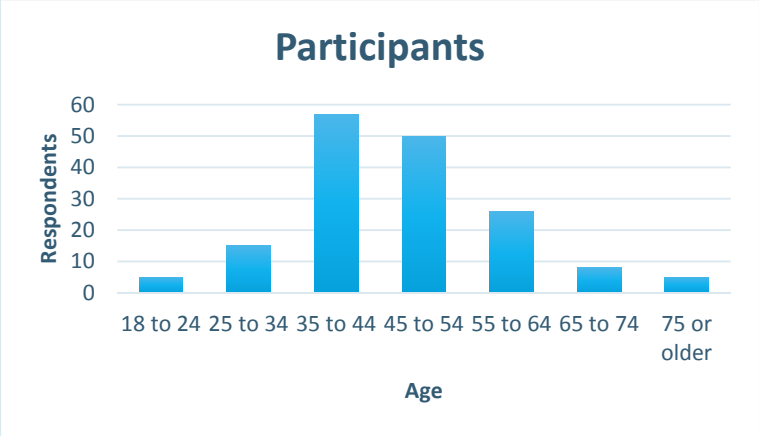
What additional community facilities do we need over the next 20 years?

A majority of respondents feel that more is needed of all the services listed with the exception of library services.

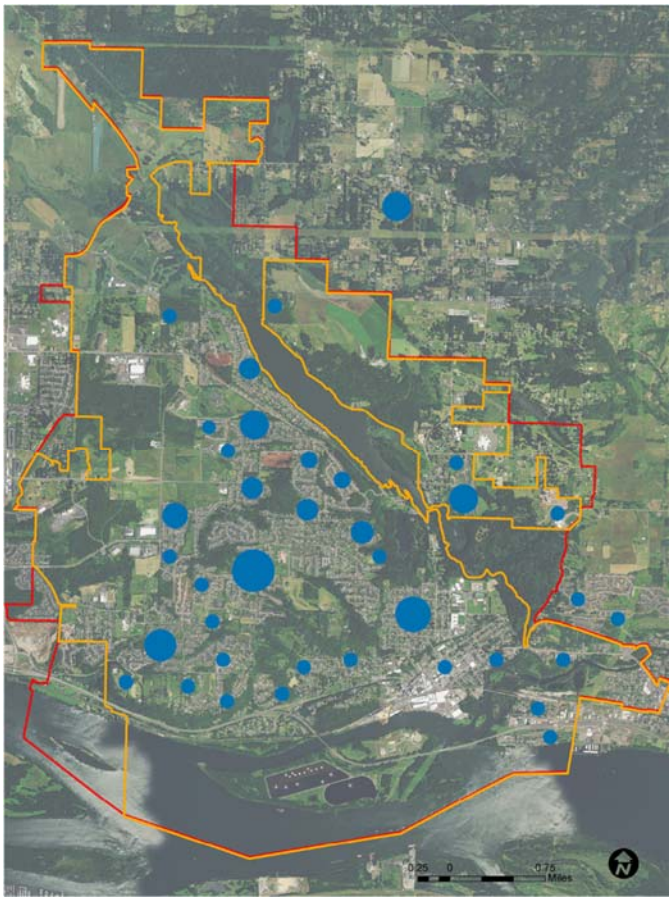


Survey Summary – February 12, 2016

The third Camas 2035 survey was published on December 11, 2015 and closed on January 22, 2016. 182 people participated in the survey and similar to the first two surveys, the majority of respondents were between the ages of 35 and 54 (approximately 65 percent). However, half of respondents to this survey indicated that they did not participate in the Camas 2035 Vision process.



Additionally, respondents were asked to identify what neighborhood they live in. The dots on the map below correspond to the responses received. The larger the dot, the more responses received from that area. The smallest dots represent 1 or 2 responses and the largest dot represents 14 responses.



Development Styles and Features

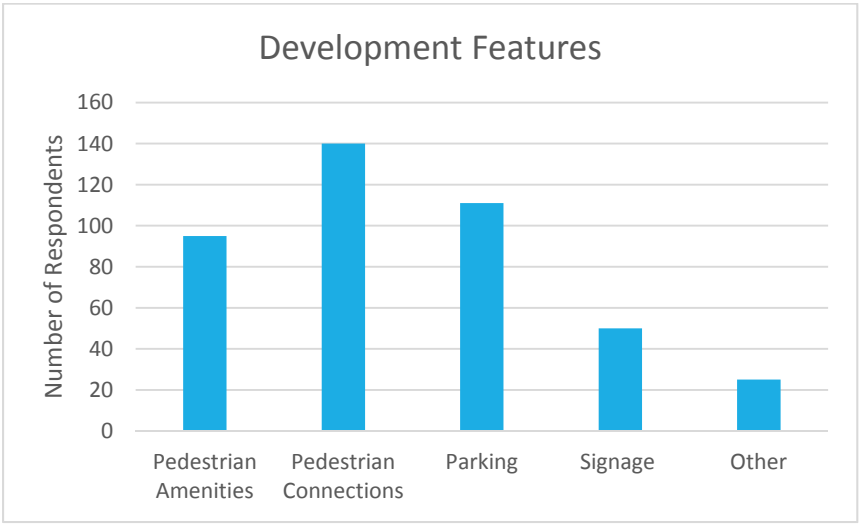
The survey asked participants to identify styles of development appropriate for gateways and corridors and throughout the City, as well as development features important in new developments. Respondents were able to select more than one development style and feature. Over 60 percent of respondents indicated that they prefer a development style similar to downtown Camas for gateways and corridors. Nearly 80% of respondents indicated pedestrian connections are an important feature of new developments.

The sets of images below identify the percentage of respondents that preferred each development style for gateways and corridors, followed by preferences for development styles throughout the City.

Gateways and Corridor Preferences

Citywide Preferences (Commercial or Mixed Use areas outside of a gateway or corridor)

Development Features



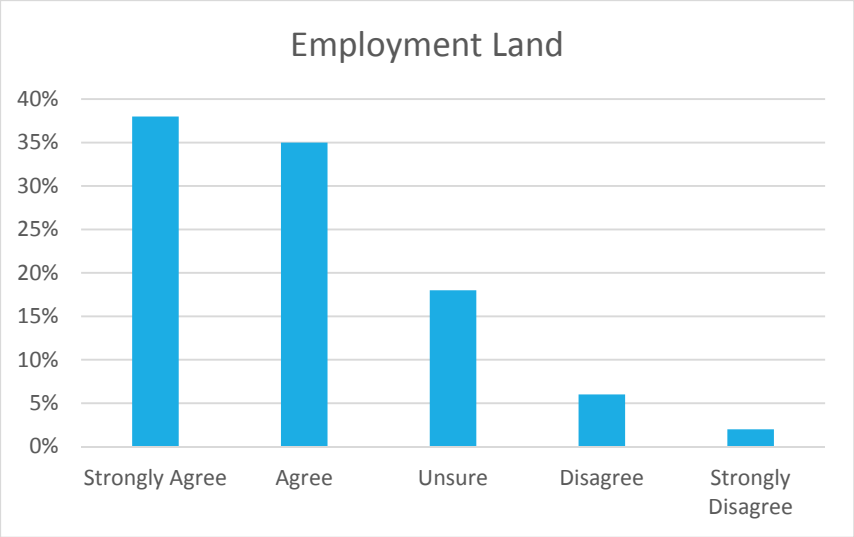
The 'other' category included write-in comments for bike lanes and parking, public transportation access along corridors, landscaping, public art, and gathering spaces.

Camas 2035 Policies

In order to solicit feedback on draft comprehensive plan policies, respondents were asked to indicate if they agree with a sample set of policies. Reponses are summarized below.

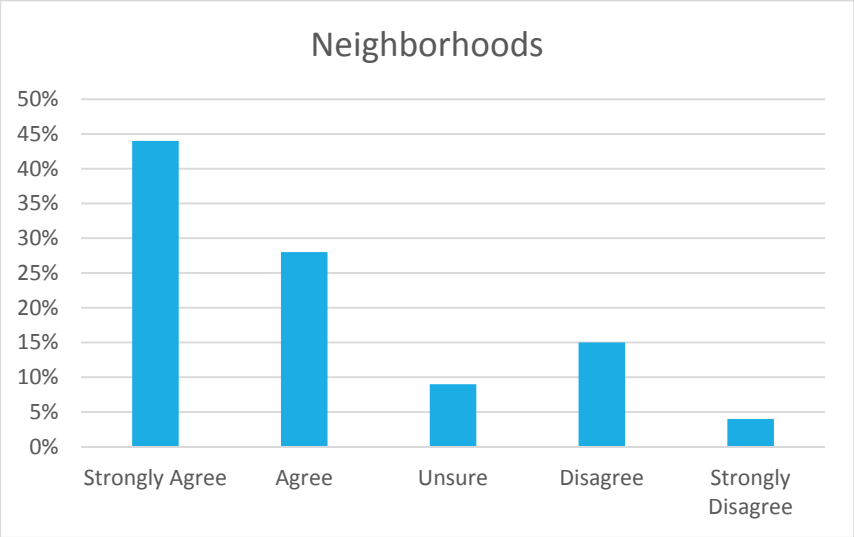
Employment Land Policy

Discourage strip-style developments while promoting employment and retail opportunities.



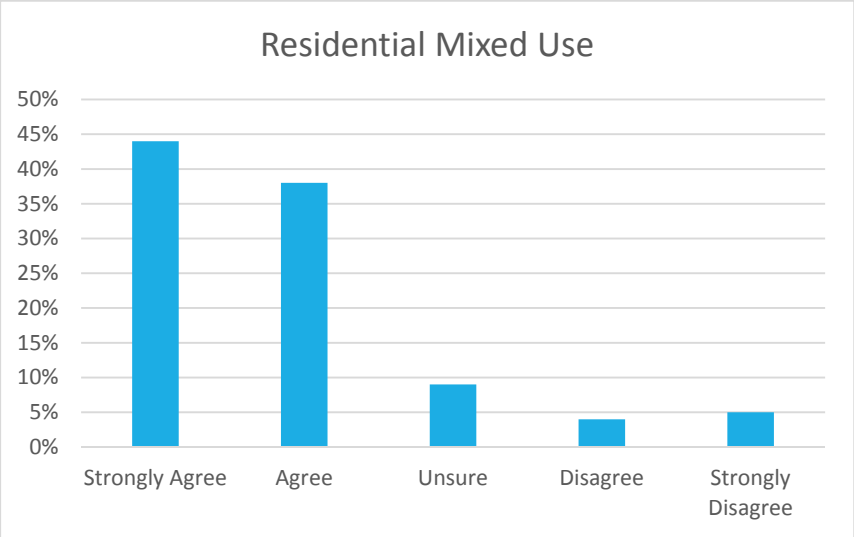
Neighborhood Policy

Discourage exclusive neighborhoods, privacy walls, and gated communities in order to maintain Camas' small-town ambiance and family-friendliness of the community.



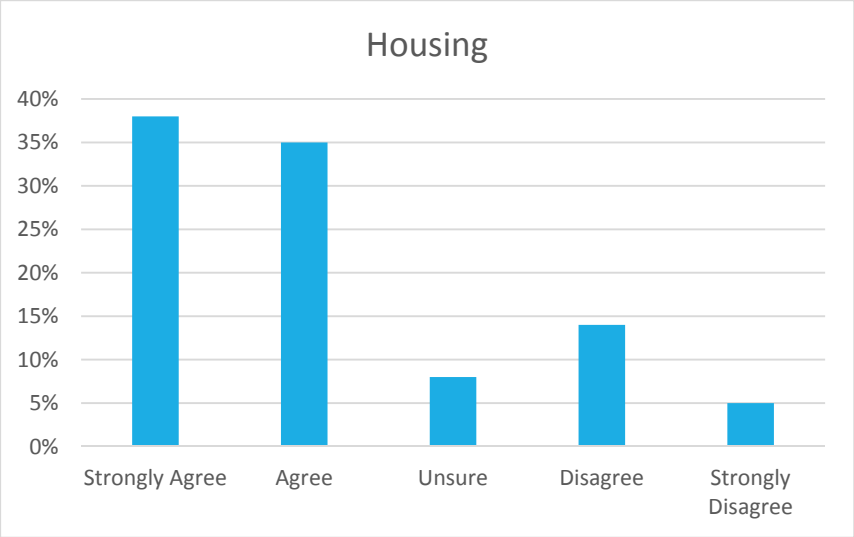
Residential Mixed Use Policy

Mixed use developments should be unique to the area in which they are located and encourage small business development, a mix of housing types to ensure affordability, pedestrian and transit connections, and designed to be sensitive to the natural environment.

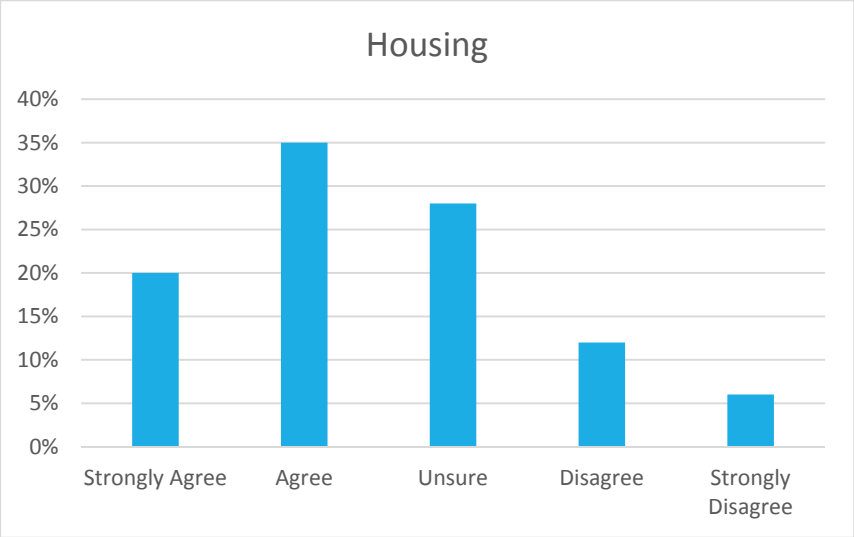


Citywide Housing Policies

Provide a range of housing options to support all ages and income levels.

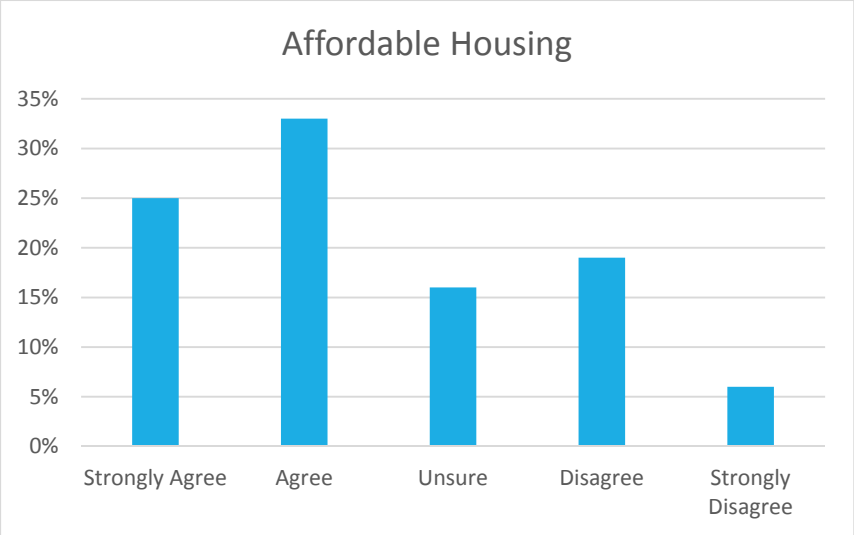


Require a percentage of newly created lots to include single-story dwellings, barrier-free dwellings (consistent with Americans with Disabilities Act guidelines), and/or Accessory Dwelling Units (ADUs) to be constructed concurrent with primary dwellings.



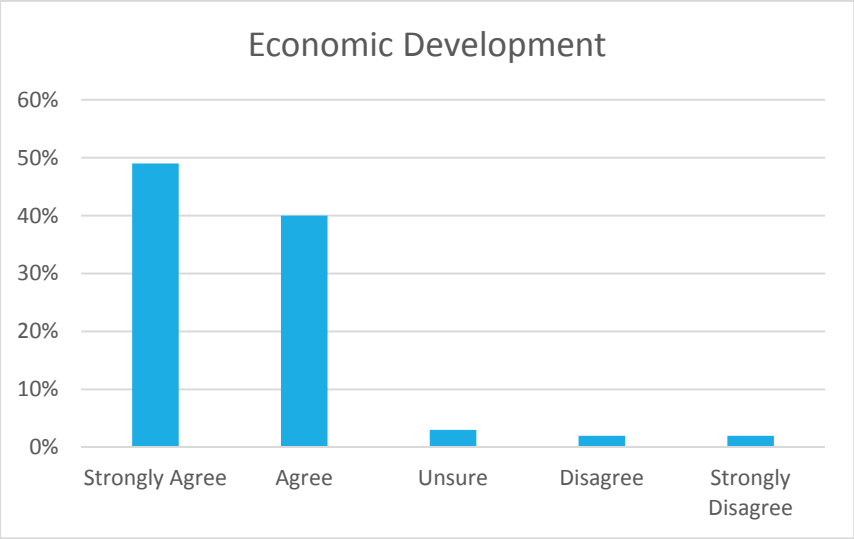
Affordable Housing Policy

Conduct an affordable housing study in order to determine the number of existing affordable units and assess the need for additional units. Develop policies to implement recommendations of the affordable housing study.



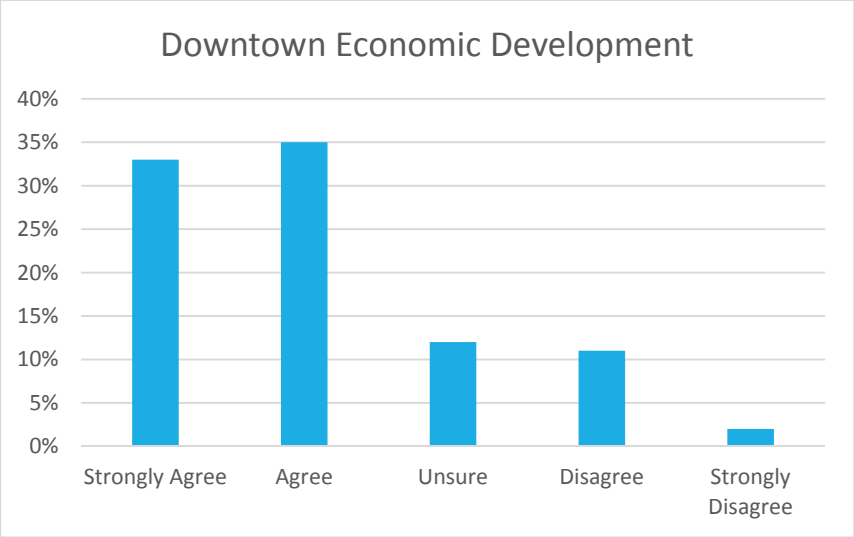
Citywide Economic Development Policy

Support retention, expansion, and recruitment activities for local businesses with a commitment to the community.



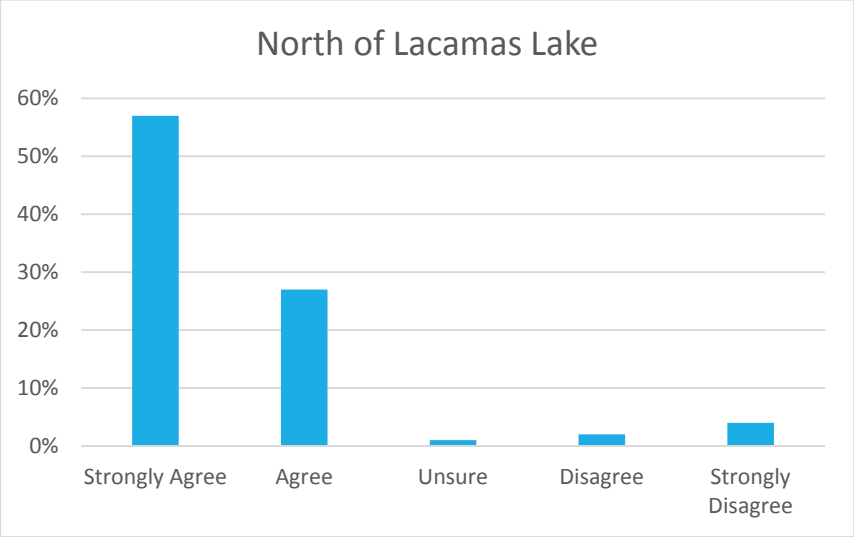
Downtown Economic Development Policy

Ensure the Land Use Element supports higher residential densities adjacent to the downtown district and atop downtown businesses to increase activity in downtown in support of local businesses.



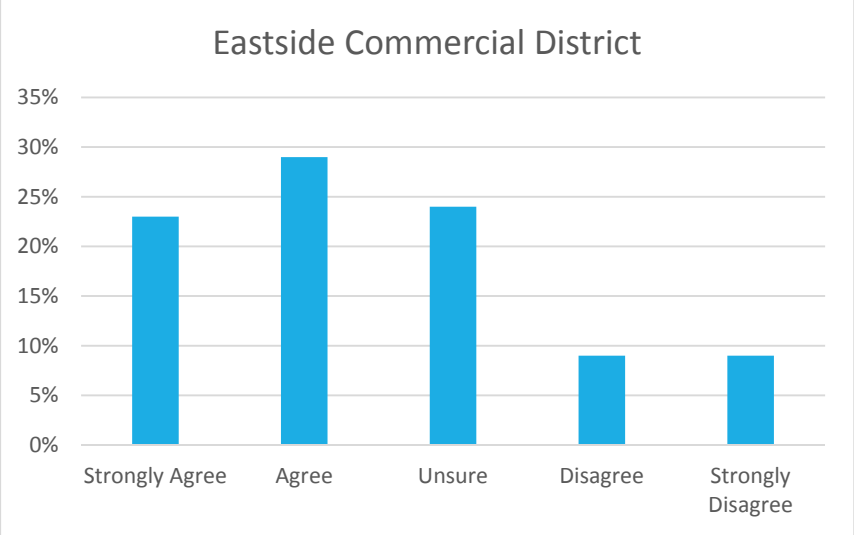
North of Lacamas Lake Economic Development Policy

Encourage new developments to include provisions for neighborhood parks that are within walking and biking distance of a person's home or work to encourage greater physical activity, including shared use paths (or trails) that link homes, work, commercial centers, public transit, and community facilities.



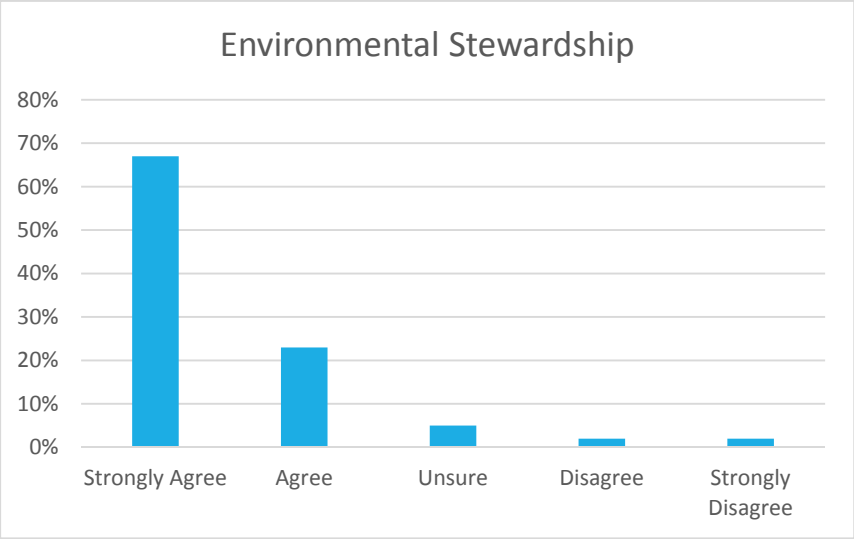
Eastside Commercial District Economic Development Policy

Encourage efficient land use by facilitating compact, high-density development and minimizing the amount of land that is needed for surface parking.



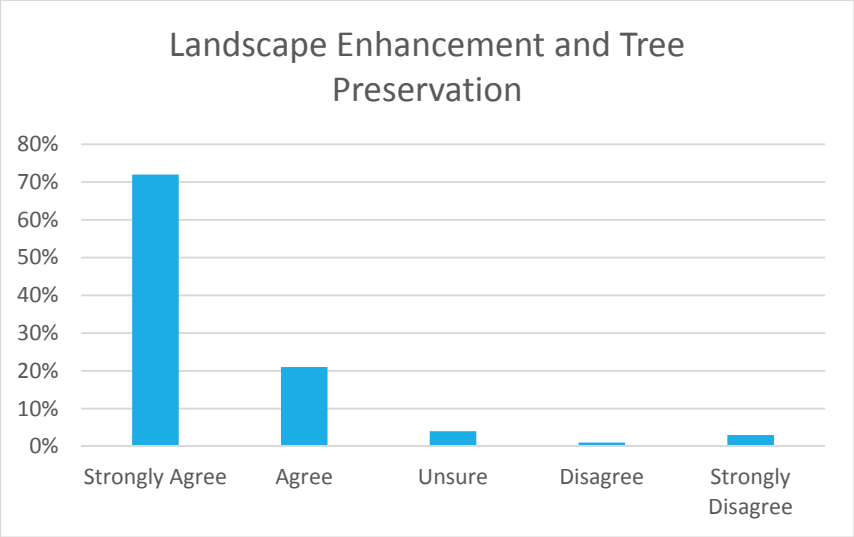
Environmental Stewardship Policy

Encourage the development of grading regulations that will preserve the natural contours of undeveloped properties, natural vistas, and mature vegetated corridors.



Landscape Enhancement and Tree Preservation Policy

Conduct an analysis of the tree canopy citywide and create a plan to encourage retention of significant tree cover.



Conclusion

The feedback summarized above, including input on desired development styles and development features, will be incorporated into the final comprehensive plan, scheduled for adoption in June 2016. While the majority of respondents strongly agree or agree with the draft comprehensive plan policies presented, some refinements will be necessary to address policies with a greater mix of responses.

Appendix B
Clark County Buildable Lands Report

RESOLUTION NO. 2015-04-05

A RESOLUTION amending Resolution 2014-06-17, relating to the adoption of the Clark County population and employment allocations that will be used for the county's comprehensive land use plan 2016 periodic update pursuant to Chapter 36.70A RCW.

WHEREAS, the Board adopted Resolution 2014-06-17 Clark County 2016 Population and Employment Allocation, the Comprehensive Plan 2016 periodic update Planning Assumptions and the 2016 Board Principles and Values at a duly advertised public hearing on June 24, 2014 that will be used for the county's Comprehensive Plan 2016 periodic update pursuant to RCW 36.70A.140 ; and

WHEREAS, the Board reviewed Issue Paper 4.2 and considered amending the population allocation at a worksession on September 24, 2014; and

WHEREAS, the Board considered Issue Paper – 4.2: Clark County 2016 Population and Employment Allocation, the Comprehensive Plan 2016 periodic update Planning Assumptions and the 2016 Board Principles and Values (Exhibit 1) at a duly advertised public hearing on April 14, 2015; and

WHEREAS, the Board took public testimony from interested parties, considered all the written and oral arguments and testimony, and considered all the comments presented to the Board; and

WHEREAS, the Board finds that adoption will further the public health, safety and welfare; now therefore,

BE IT RESOLVED BY THE BOARD OF COUNTY COUNCILORS OF CLARK COUNTY, STATE OF WASHINGTON, hereby amends the Comprehensive Plan 2016 periodic update Planning Assumptions as shown in Table 1, the population growth and employment allocation for the preliminary allocations for initial review of urban growth areas 20-year period ending in 2035 as shown in Table 2 and the 2016 Board Principles and Values as shown in Table 3. This information will be used for the county's 20-year Comprehensive Growth Management Plan 2016 periodic update pursuant to RCW 36.70A.140.

Table 1: Planning Assumptions

Assumption	2016
20-Year Population Projection	578,391
Planned Population Growth (new)	129,546
Urban/Rural Population Growth Split	90/10
Assumed Annual Population Growth Rate	1.12%
Housing Type Ratio	75% single-family, 25% multifamily
Persons per Household	2.66
New Jobs	101,153
Jobs to Household	1:1
Infrastructure Deduction (Residential)	27.7%
Infrastructure Deduction (Commercial and Industrial)	25%
VBLM (definition of vacant)	$13,000 residential, $67,500 commercial and, industrial
Market Factor	15% residential, 15% commercial, business park, industrial

Table 2: Population and Employment Allocation

UGA	January 1, 2015 Population Estimates	2015 to 2035 VBLM Population Allocation	Additional Allocation	2035 Estimates	2035 Estimates Including Redevelopment
Battle Ground	20,871	15,972	1,600	37,705	39,305
Camas	22,843	11,255		34,410	34,410
County	62,205	11,432		73,628	73,628
LaCenter	3,209	3,233	1,200	6,714	7,914
Ridgefield	6,575	13,087	5,832	20,523	26,356
Vancouver	315,460	52,786	6,200	365,743	371,943
Washougal	15,932	6,023	392	22,118	22,510
Woodland	89	229		339	339
Yacolt	1,661	303		1,986	1,986
Total	448,845	114,322	15,224	**563,167**	**578,391**

Source: Clark County, Geographic information System and Community Planning
Note: ^ 10% based on 90/10 urban/rural planning assumption. March 3, 2015 expansion request includes additional acreage for Washougal's UGA - 392 persons and Ridgefield's UGA - 832 persons; totaling an additional 1,224 persons.

Table 3: Board Principles and Values

Employment Lands

- Equalize land allocation and jobs/population ratio so that cities have equitable share of jobs – diverse job base
- Mapping: Put job lands close to transportation so that capacity is provided to job opportunities
- Ground-truth where residential and jobs "make sense" – no more "wetland industrial"
- Focus Public Investment Areas – "hubs" of job growth that can be serviced effectively (adjust Transportation Improvement Plan if necessary)
- Maximize the potential for the county's railroad as a job-creating asset
- Prioritize lands that are most likely to provide "family-wage jobs" as defined in the comprehensive plan policies

Housing

- Vancouver UGB: minimize residential growth (there will be some residential growth but not dense residential growth, especially where there already exists large-lot, high-value development). Minimize doesn't mean "don't" but lower density of residential growth.
- Maintain a mix of housing options (a variety of housing densities – large, medium, and small lots)
- Identify school sites or areas where school buildings will be necessary inside the new hubs of residential areas (need sites close to where children will be). Avoid penalizing property owners in the process.

Community Design

- New growth needs to blend well with existing neighborhoods (e.g., transition zones, buffering, gradual transitions in development style, type)

Rural Lands

- Minimize the conversion of productive farmland – those lands which have long-term commercial agricultural viability. Is it being used today for commercial agriculture?

Other Land Use

- Ensure good geographic distribution of commercial lands
- Breaks/Green spaces between communities – natural borders
- Use an integrated view in examining the proposed boundaries and plan map
- Respect cities' investment in capital facilities by not shrinking the 2007 urban growth boundaries.

Tax Base

- Maintain county tax base (generate revenue necessary to provide services
- Balance between the cities

- Resulting tax base (e.g. jobs, residential that doesn't result in great demand for schools) needs to be equitable for school districts. Tax base equitably distributed between residential and job producing lands.

Mapping Implications

- La Center needs greater economic diversification opportunities and multi-family land use designations
- Ground-truthing is extremely important for employment
- Lands with few if any constraints ("easy") should be allocated first for employment
- Employment-reserve overlay for lands served by county railroad corridor

Allocation

- Guided by the values identified (in the previous topics)
- Ground-truthing will clarify/define the allocation (versus "assigned")

1

Section 1. Instructions to Clerk.

The Clerk to the Board shall:

1. Transmit a copy of the adopted resolution to Community Planning Department Director.

2. Transmit a copy of the adopted resolution to the Cities of Battle Ground, Camas, La Center, Ridgefield, Washougal, Woodland, Vancouver and Town of Yacolt.

3. Transmit a copy of the adopted resolution to the Ports of Camas/Washougal, Ridgefield, Vancouver and Woodland.

4. Transmit a copy of the adopted resolution to the Columbia River Economic Development Council President.

ADOPTED this 14th day of April 2015.

Attest:

BOARD OF COUNTY COUNCILORS
FOR CLARK COUNTY, WASHINGTON

Clerk to the Board

By: _____
David Madore, Chair

Approved as to Form Only:
Anthony F. Golik
Prosecuting Attorney

By: _____
Jeanne E. Stewart, Councilor

By: _____
Christine Cook
Deputy Prosecuting Attorney

By: _____
Tom Mielke, Councilor

Exhibit 1

Clark County Comprehensive Plan 2016 Update

Planning for growth 2015 – 2035

2016 Population and Employment Allocation – Issue Paper 4.2

Purpose

This memorandum provides a basic framework and starting point from which the county and its cities may consider population and employment allocation.

Background

In July 2013, Clark County began the process of updating its Comprehensive Growth Management Plan to meet the 2016 periodic update requirement of Chapter 36.70A.140 RCW. Several issue papers have already been prepared to allow the Board to make decisions about the update:

- Issue Paper 1 - Comprehensive Plan Overview: A summary of the county's Planning Assumptions, 2013 vacant and buildable lands model (VBLM) inventory and population and employment projections.
- Issue Paper 2 – Population and Job Projections: Background information for a discussion with the cities and the town of Yacolt on population and job planning assumptions for 2015-2035. On Jan. 21, 2014, the Board adopted the state Office of Financial Management's (OFM) medium population projection of 562,207 for the 20-year period ending 2035 (Res. 2014-01-09).
- Issue Paper 3 – Employment forecast based on input from Washington Employment Security Department (ESD). It was revised as Issue Paper 3.1 to include the 2014 VBLM information. On April 29, 2014, the Board adopted the high employment forecast of 91,200 net new jobs for the 20-year period ending 2035 (Res. 2014-04-01).
- Issue Paper 4 – Population and Job Allocation: On June 24, 2014, the Board identified the methodology for allocating growth by UGA and adopted preliminary allocations for initial review (Res. 2014-06-17). The allocations were revised as Issue Paper 4.1 to reflect the additional capacity for population and jobs not captured by the vacant land model and presented at a BOCC Worksession on September 24, 2014.
- Issue Paper 5 – SEPA Scoping: On July 16, 2014, the Board discussed the environmental impact review process under the State Environmental Policy Act (SEPA) and directed staff to proceed to scoping on development of alternatives. Issue Paper 5.1 provides a partial list of what has transpired from July 17, 2014 through March 11, 2015.

This issue paper (Issue Paper 4.2) will discuss the additional capacity for population and jobs not captured by the vacant land model reflecting an increase of 15,224 persons and 24, 175 jobs from redevelopment and public sector jobs that will occur within the planning horizon.

It updates Issue Paper 4.0, to reflect recent information. Countywide forecasts adopted by the Board in Resolution 2014 -06-17 are modestly adjusted to reflect the increase in existing population and jobs that occurred during 2014, to include City assumptions for project future growth through redevelopment as directed by the Board, and to be consistent with cities proposals for their respective UGAs. These

forecasts and allocations are intended to keep cities whole by not reducing or significantly expanding city UGAs.

Methodology

Allocation of population growth and jobs is a key step in the planning process. There are three options for allocating that can be used by the Board:

1) placing growth where it has historically occurred within the urban growth areas (UGA) as documented by U.S. Census;
2) allocating growth by UGA based on the vacant and buildable lands model plus the potential capacity for jobs and population by considering factors such as FPIAs, redevelopment, filling vacancies, etc.; or
3) allocating growth by UGA according to the proportion of the total county identified vacant and buildable lands (used since 1994).

The following are essential to the outcome regardless of which method is used:

- Maintain coordination and consistency with local comprehensive plans;
- Use official state population forecasts from OFM (already adopted);
- Use the employment projections from ESD (already adopted);
- Use estimates of the existing VBLM capacity for growth of the UGAs to inform decisions on allocation of growth targets;
- Continue using the inventory of available VBLM inventory information; a practice since 1994;
- Allow for flexibility where necessary;
- Consider impacts of the recent stormwater regulations on infrastructure needs. Identified vacant and buildable residential lands reflect a 27.7% infrastructure deduction;
- Carrying capacity is assumed on vacant or underutilized residential land are on net developable acres at units per UGA; Vancouver- 8; Battle Ground, Camas, Ridgefield, Washougal, at Woodland – 6; La Center and Yacolt – 4 units per net acre; and
- The urban/rural growth percentage split remains at 90/10. (Rural population growth is assumed to be 10% of the population forecast even though the GMA does not require a cap or formal allocation.)

Countywide Population Allocation

The following table shows the current population estimate, 2015 vacant lands model capacity, and the allocation of 2035 population forecast if the Board use method 3 as listed above. The cities have concerns that the allocation shows a reduction in capacity from the 2007 Comprehensive Plan. Additional allocation was added in order to reflect the existing comprehensive plans of the cities.

The 2035 population allocation to UGA's is based on determining the potential population that can be accommodated by the 2015 Vacant Lands Model (VLM) and figuring the share of the total potential VLM population by UGA. The 2035 estimate is calculated by applying the UGA share of the VLM to the total population for the urban area (114,322 = 102,890 + 11,432). The 11,432 represents 10% of population assumed for the rural area and 102,890 represents 90% urban allocation. 2015 VLM can accommodate the urban population and additional allocation.

The Board directed that the county acknowledge the 2007 Comprehensive Growth Management Plan adopted urban growth areas as a baseline for the 2016 update. Staff allocated 1,600 persons to the Battle Ground UGA, 5,832 persons to Ridgefield's UGA, 1,200 persons to La Center's UGA, and 6,200 persons to the Vancouver UGA. See table 1 below. Total population growth expected between 2015 and 2035 is 114, 322 persons plus 15,224 persons totaling 129,546. The January 1, 2015 base year estimate of 448,845 plus 129,546 produces a 2035 estimate of 578,391.

Table 1: 2035 Population Forecast by UGA.

UGA	January 1, 2015 Population Estimates	2015 to 2035 VBLM Population Allocation	Additional Allocation	2035 Estimates	2035 Estimates Including Redevelopment
Battle Ground	20,871	15,972	1,600	37,705	39,305
Camas	22,843	11,255		34,410	34,410
County	62,205	11,432		73,628	73,628
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Washougal	15,932	6,023	392	22,118	22,510
Woodland	89	229		339	339
Yacolt	1,661	303		1,986	1,986
Total	448,845	114,322	15,224	**563,167**	**578,391**

Source: Clark County, Geographic information System and Community Planning
Note: ^ 10% based on 90/10 urban/rural planning assumption. March 3, 2015 expansion request includes additional acreage for Washougal's UGA - 392 persons and Ridgefield's UGA - 832 persons; totaling an additional 1,224 persons.

Countywide Employment Allocation

The GMA does not dictate a data source that must be considered in planning for future employment. For the 1994, 2004, and 2007 planning efforts, the number of anticipated new jobs in Clark County was developed by the Washington State Employment Security Department. The forecasts were based on anticipated population growth, workforce participation, unemployment, and percentage of Clark County employees who commute to Oregon for work.

Table 2 below shows the number of net new jobs based on allocation method number 3 as listed above. The Board chose to plan for a total of 91,200 net new jobs. According to the 2015 vacant land model and additional land requested by the cities of Battle Ground, La Center and Ridgefield, the county has capacity for 101, 153 net new jobs. Public sector employment is not accounted for in the model. ESD estimates up to 7,400 new public sector jobs over the next twenty years. We anticipate that most of those public sector jobs will occur on existing facilities, and therefore will not require new lands.

Table 2: 2015-2035 Employment Forecast by UGA.

UGA	2015 VBLM
Battle Ground	9,933
Camas	11,182
La Center	1,324
Ridgefield	8,708
Vancouver	41,188
Washougal	4,175
Yacolt	468
Woodland	0
Total	***101,153**

Source: Clark County, Geographic information System and Community Planning

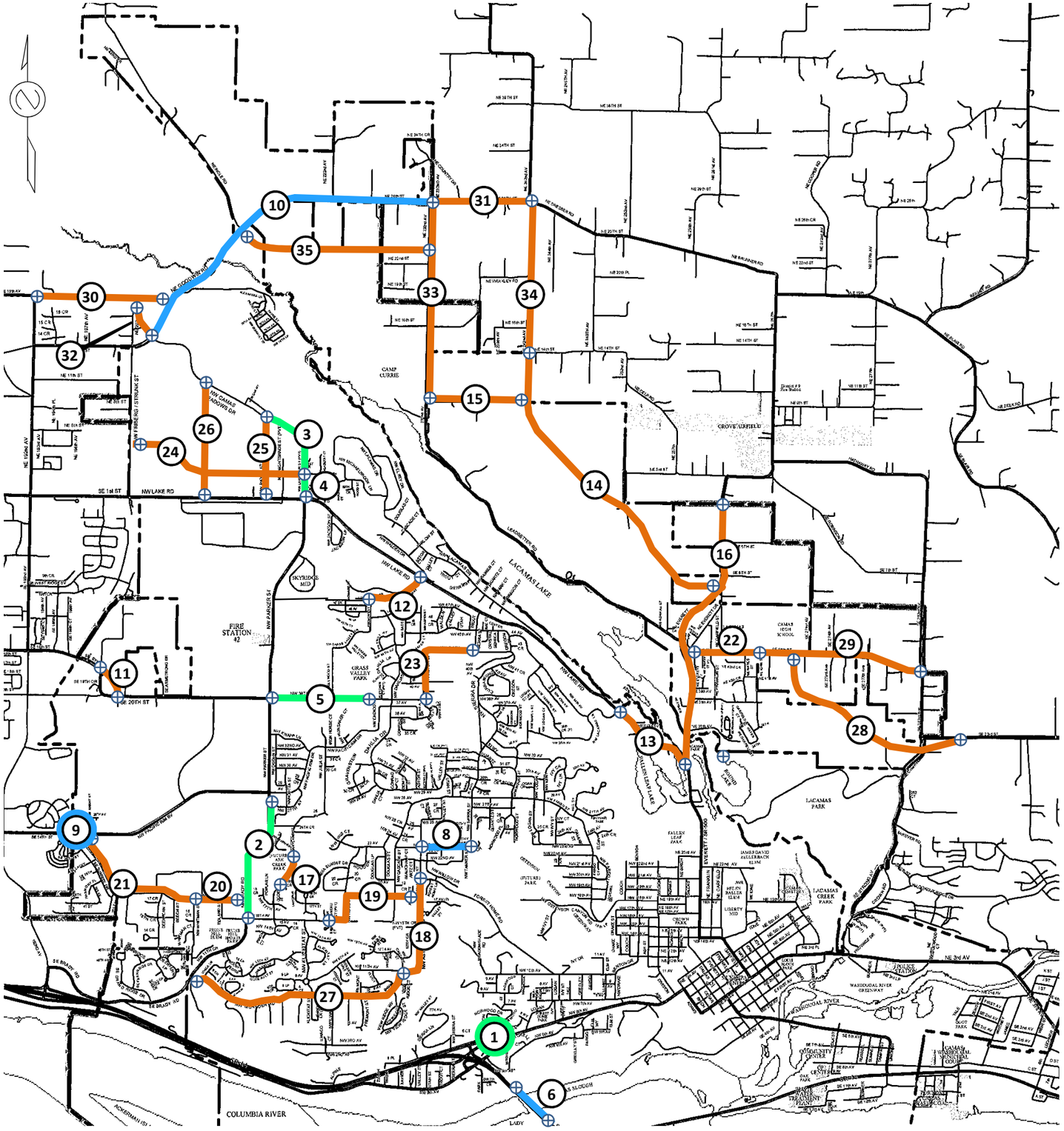
*Note: Existing assumptions of total potential jobs not captured by the vacant lands model increase the capacity by 16,775 jobs for redevelopment and 7,400 public sector jobs, thus increasing the total potential job capacity from 76,978 to 101,153.

Conclusion and Recommendation

Much has changed since Clark County first adopted its Comprehensive Plan in 1994. The county's demographic characteristics have continued to change. Community Planning recommends that this revised population and employment allocation be approved as they reflect new information.

Appendix C
6-Year Street Plan

City of Camas
2016 – 2021
Six Year Street Priorities



	1	NW 6th Ave & Norwood Roundabout
	2	NW Brady Rd
	3	NW Camas Meadows Dr (East)
	4	NW Larkspur St
	5	NW 38th Ave (Ph 3)
	6	SR 14 - West Camas Slough Bridge
	7	ADA Compliance Citywide (7)
	8	NW 23rd Ave
	9	Pacific Rim Blvd & Payne Rd Signal
	10	NE Goodwin Rd/28th St
	11	Bybee Rd
	12	NW Leadbetter Dr Phase 2
	13	NW Lake Rd.
	14	New East/West Arterial
	15	NE 9th St
	16	SR 500 (Everett St/Rd)
	17	NW Maryland St
	18	NW Astor St.
	19	NW 16th Ave/Hood/18th Ave
	20	NW 18th Ave
	21	NW 18th Ave/Payne Rd
	22	NE 43rd Ave
	23	NW Astor St. /43rd Ave
	24	Street "B" (North Dwyer Creek Area)
	25	NW Payne St.
	26	Street "A" (North Dwyer Creek Area)
	27	NW McIntosh Rd
	28	NW Woodburn Dr.
	29	SE 15th St./Norse Rd
	30	NE 18th St
	31	NE 28th St
	32	NW Camas Meadows Dr (West)
	33	NE 232nd Ave
	34	NE 242nd Ave
	35	NW Ingle Rd Extension

City of Camas WASHINGTON

150429-343 Six Year Street Plan Map 2016-2021 FINAL

Washington State Department of Transportation

Six Year Transportation Improvement Program

Agency: City of Camas
Co. No.: 06 Co. Name: Clark Co.
City No.: 0145 MPO/RTPO: RTC

FROM: 2016 **TO:** 2021
Hearing Date: 6/1/2014 Adoption Date: 6/15/2014
Amend Date: Resolution No: 15-003

Functional Class	Priority Number	Project Identification A. Pin/Project No. B. STIP ID C. Project Title D. Road Name or Number E. Begin & End Termini F. Project Description G. Structure ID	Improvement Type(s)	Status	Total Length	Utility Codes	Project Costs in Thousands of Dollars Project Phase	Phase Start (yyyy)	Fund Source Information Federal Fund Code	Federal Funds	State Fund Code	State Funds	Local Funds	Total Funds	Expenditure Schedule (Local Agency) 1st	2nd	3rd	4th thru 6th	Federally Funded Projects Only Envir. Type	R/W Required
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
14	1	***NW 6th Avenue*** NW Norwood St. to NE Adams from: to: Includes Norwood Intersection Roundabout	24	S	0.00		CN	3/1/2016					1850	1850	1850					NO
							Totals		0	0		0	1850	1850	1850	0	0	0		
16	2	***NW Brady Road*** NW 16th to NW 25th from: to: Widening, bike lanes	03	P	0.63	P C G T	RW	1/1/2016					800	800	800				CE	YES
							CN	3/1/2021			OTHER	6000		6000				6000		
							Totals		0	0		6000	800	6800	800	0	0	6000		
00	3	***NW Camas Meadows Drive*** NW Payne St. to NW 60th Ave. from: to: New construction	15	P	0.41		PE	7/1/2017			OTHER	400	100	500		400	100		CE	YES
							RW	7/1/2018					160	160			160			
							CN	6/1/2019			OTHER	2200	600	2800				2800		
							Totals		0	0		2600	860	3460	0	400	260	2800		
00	4	***NW Larkspur Street*** NW Lake Rd. to NW 60th from: to: Widening, sidewalk	03	P	0.13	W S P T C G	PE	7/1/2017			OTHER	120	40	160		120	40		CE	YES
							RW	7/1/2018					100	100			100			
							CN	6/1/2019			OTHER	170	640	810				810		
							Totals		0	0		290	780	1070	0	120	140	810		
16	5	***NW 38th Avenue*** NW Parker to Grass Valley Park from: to: Widening, bike lanes	03	P	0.45	P C G T	ALL	1/1/2019	STP(U)	1800			1710	3510				3510	CE	YES
							Totals		0	1800		0	1710	3510	0	0	0	3510		
12	6	***SR-14 West Camas Slough Bridge*** from: to: Widen to 4 lanes NOTE: PE phase began 1/2006	03	P	2.25		ALL	1/1/2018			WSDOT	25000		25000				25000		NO
							Totals		0	0		25000	0	25000	0	0	0	25000		

Agency: City of Camas
Co. No.: 06 Co. Name: Clark Co.
City No.: 0145 MPO/RTPO: RTC

FROM: 2016 **TO:** 2021
Hearing Date: 6/1/2014 Adoption Date: 6/15/2014
Amend Date: Resolution No: 15-003

Functional Class	Priority Number	Project Identification A. Pin/Project No. B. STIP ID C. Project Title D. Road Name or Number E. Begin & End Termini F. Project Description G. Structure ID	Improvement Type(s)	Status	Total Length	Utility Codes	Project Costs in Thousands of Dollars Project Phase	Phase Start (yyyy)	Fund Source Information Federal Fund Code	Federal Funds	State Fund Code	State Funds	Local Funds	Total Funds	Expenditure Schedule (Local Agency) 1st	2nd	3rd	4th thru 6th	Federally Funded Projects Only Envir. Type	R/W Required
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
14	7	***ADA Compliance*** from: Citywide to: (Ongoing)	28	P	00		ALL	1/1/2016					180	180	30	30	30	90		NO
							Totals		0	0		0	180	180	30	30	30	90		
00	8	***NW 23rd Avenue*** Nw Astor to NW Sierra from: to: Widening, sidewalk	04	P	0.23		ALL	1/1/2017					520	520		520				YES
							Totals		0	0		0	520	520	0	520	0	0		
16	9	***NW Pacific Rim Boulevard*** @ SE Payne Rd. from: to: Traffic signal	24	P	00		ALL	1/1/2019					300	300				300		NO
							Totals		0	0		0	300	300	0	0	0	300		
17	10	***NE Goodwin Road/28th Street*** NW Camas Meadows Dr. to NE 232nd Ave. from: to: Widen to 5 lanes with bike lanes west of Ingle Widen to 3 lanes with bike lanes east of Ingle	15	P	1.72		ALL	1/1/2020	STP(U)	6880	OTHER	7200	6000	20080				20080	CE	YES
							Totals		0	6880		7200	6000	20080	0	0	0	20080		
17	11	***Bybee Road Realignment*** SE 15th St. to SE 20th St. from: to: New construction	01	P	0.05	C S W G P T	ALL	1/1/2017					1450	1450				1450		YES
							Totals		0	0		0	1450	1450	0	0	0	1450		
17	12	***NW Leadbetter Drive*** NW Lake Rd. to NW Fremont St. from: to: Sidewalk Notes:	28	P	0.15	P C T G W S	CN	1/1/2017					60	60				60		NO
							Totals		0	0		0	60	60	0	0	0	60		

Agency: City of Camas
Co. No.: 06 Co. Name: Clark Co.
City No.: 0145 MPO/RTPO: RTC

FROM: 2016 **TO:** 2021
Hearing Date: 6/1/2014 Adoption Date: 6/15/2014
Amend Date: Resolution No: 15-003

Functional Class	Priority Number	Project Identification A. Pin/Project No. B. STIP ID C. Project Title D. Road Name or Number E. Begin & End Termini F. Project Description G. Structure ID	Improvement Type(s)	Status	Total Length	Utility Codes	Project Costs in Thousands of Dollars Project Phase	Phase Start (yyyy)	Fund Source Information Federal Fund Code	Federal Funds	State Fund Code	State Funds	Local Funds	Total Funds	Expenditure Schedule (Local Agency) 1st	2nd	3rd	4th thru 6th	Federally Funded Projects Only Envir. Type	R/W Required
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
16	13	***Lake Road*** NW Lacamas Lane to NE Everett from: to: Widening, sidewalk	03	P	0.45		ALL	6/1/2020					3220	3220				3220		YES
							Totals		0	0		0	3220	3220	0	0	0	3220		
00	14	**New NUGA E/W Arterial** NE 14th St. to Everett Rd. from: to: New construction Includes Critical Areas and Alignment Investigation	15	P	2.00		PE	6/1/2020					415	415				415		
							Totals		0	0		0	415	415	0	0	0	415		
00	15	***NE 9th Street*** NE 232nd Ave. to NE 242nd Ave. from: to: New construction Includes Critical Areas and Alignment Investigation	15	P	0.50		PE	6/1/2020					210	210				210		
							Totals		0	0		0	210	210	0	0	0	210		
16	16	***SR-500 (Everett St./Rd.)*** NW Lake Rd. to SE 4th St. from: to: Widen to 3 lanes with bike lane	15	P	1.08		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
19	17	***NW Maryland Street*** NW 19th to NW 24th from: to: New construction	01	P	0.25	C S W G P T	ALL	6/1/2021					270	270				270		NO
							Totals		0	0		0	270	270	0	0	0	270		
17	18	***NW Astor Street/NW 11th Avenue*** NW 16th Ave. to McIntosh Rd. from: to: Widening, bike lanes Includes path on Forest Home Road from Forest Home Lane to Astor Street	03	P	0.62	P C G T	PE RW CN	1/1/2018 1/1/2019 6/1/2020					115 115 1820	115 115 1820			115	115 1820		YES
							Totals		0	0		0	2050	2050	0	0	115	1935		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
16	19	***NW 18th Avenue, et al*** NW Astor to NW 16th, include NW Hood from: to: Widen curb, sidewalk	03	P	0.51	S W P T C	RW CN	1/1/2021 6/1/2021					230 2015	230 2015				230 2015		YES
							Totals		0	0		0	2245	2245	0	0	0	2245		
16	20	***NW 18th Avenue*** NW Whitman St. to NW Brady Rd. from: to: New construction with bike lanes	01	P	0.26	P G T C W S	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
16	21	**NW 18th Avenue** NW Whitman St. to West City Limits from: to: Widening, bike lanes	03	P	0.40	W S P T C G	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
17	22	***NE 43rd Avenue*** from: SR-500 to: East City Limits Widen to 3 lanes with bike lanes	03	P	0.36	C S G P T	ALL	1/1/2021					2110	2110				2110		YES
							Totals		0	0		0	2110	2110	0	0	0	2110		
00	23	***NW 43rd/NW Astor - NW Sierra to NW 38th*** from: to: Widening, bike lanes	03	P	.50	S P C G T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	24	***North Dwyer Creek Master Plan Street "B"*** NW Friberg St./Strunk to NW Larkspur St. from: to: New construction	15	P	0.90	C S W G P T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		

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Functional Class	Priority Number	Project Identification A. Pin/Project No. B. STIP ID C. Project Title D. Road Name or Number E. Begin & End Termini F. Project Description G. Structure ID	Improvement Type(s)	Status	Total Length	Utility Codes	Project Costs in Thousands of Dollars Project Phase	Phase Start (yyyy)	Fund Source Information Federal Fund Code	Federal Funds	State Fund Code	State Funds	Local Funds	Total Funds	Expenditure Schedule (Local Agency) 1st	2nd	3rd	4th thru 6th	Federally Funded Projects Only Envir. Type	R/W Required
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
00	25	***NW Payne Street*** NW Lake Rd. to NW Camas Meadows Dr. from: to: Widening	03	P	0.40	C G P T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	26	***North Dwyer Creek Master Plan Street "A"*** NW Lake Rd. to NW Camas Meadows Dr. from: to: New construction	15	P	0.64	C S W G P T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	27	***NW McIntosh Road*** NW Brady Rd. to NW 11th Ave. from: to: Widening, bike lanes	15	P	1.2	P G C T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	28	***NE Woodburn Drive*** SE 283rd Ave. to SE 15th St. from: to: New construction Includes 23rd St. realignment	01	P	.70	C S W G P T	ALL	1/1/2021					5870	5870				5870		YES
							Totals		0	0		0	5870	5870	0	0	0	5870		
07	29	***SE 15th Street/Nourse Road*** from: Camas High School to: NE 283rd Ave. Widen to 3 lanes with bike lanes	15	P	0.59	C S W G P T	PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	30	***NE 18th Street*** NE 192nd Ave. to NE Goodwin Rd. from: to: New construction (potential alternate alignment)	15	P	0.67		PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
17	31	***NE 28th Street*** NE 232nd Ave. to NE 242nd Ave. from: to: Widen to 3 lanes with bike lanes	15	P	0.50		PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	32	***NW Camas Meadows Drive*** NE 13th St. to NE 18th St. from: to: New construction (potential alternate alignment)	15	P	0.20		PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
17	33	***NE 232nd Avenue*** NE 28th to NE 9th St. from: to: Widen to 3 lanes with bike lanes	15	P	0.97		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	34	***NE 242nd Avenue*** NE 28th St. to NE 14th St. from: to: Widen to 3 lanes with bike lane	15	P	0.70		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	35	***NE Ingle Road Extension*** Goodwin to 232nd Ave from: to: New construction	15	P	1.00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
14	36	***NW Brady Road*** @ NW 16th Ave. from: to: Traffic signal	24	P	00		ALL	1/1/2021					300	300				300		NO
							Totals		0	0		0	300	300	0	0	0	300		
16	37	***NW Lake Road*** @ NW Sierra St. from: to: Traffic signal	24	P	00		ALL	1/1/2021					300	300				300		NO
							Totals		0	0		0	300	300	0	0	0	300		
00	38	***NE Goodwin Road @ NW Camas Meadows Drive*** from: to: Traffic signal	24	P	00		ALL	1/1/2021					300	300				300		NO
							Totals		0	0		0	300	300	0	0	0	300		
16	39	***NW Pacific Rim @ Parker Street*** from: to: Traffic signal	15	P	00		PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
16	40	***SR-500 @ Leadbetter Road*** from: to: Access Control	15	P	00		PE	1/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
16	41	***SR-500 @ New E/W Arterial*** from: to: Traffic signal	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
16	42	***NE 28th Street @ 242nd Avenue*** from: to: Traffic signal	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
17	43	***NE Goodwin Road*** @ NE Ingle Rd. from: to: Traffic signal	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
16	44	***SR-500*** @ NE Lake Rd. from: to: Roundabout	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
16	45	***SR-500*** @ NE 14th Ave. from: to: Controlled Access	24	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	46	***NE 232nd Avenue @ 9th Street*** from: to: Roundabout	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		
00	47	***NE 232nd Avenue @ Ingle Extension*** from: to: Roundabout	15	P	00		PE	6/1/2021					5	5				5		
							Totals		0	0		0	5	5	0	0	0	5		

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
00	48	***Pavement Treatments (maintenance & preservation)*** from: to: Overlays, surface treatments	47	P	00	P	CN	6/1/2016					4200	4200	700	700	700	2100		NO
							Totals		0	0		0	4200	4200	700	700	700	2100		
00	49	***Reconstructs*** from: Citywide to:	04	P	00	G W	ALL	1/1/2016	CDBG	250		0	1250	1500	250	250	250	750		NO
							Totals		0	250		0	1250	1500	250	250	250	750		
00	50	***Sidewalk Projects*** from: to: Sidewalk installations Citywide	28	P	00		CN	1/1/2017	CDBG	450		0	50	500		100	100	300		NO
							Totals		0	450		0	50	500	0	100	100	300		
00	51	***Curb Ramp Projects*** from: to: Future curb ramp installations	28	P	00		CN	1/1/2016				0	90	90	15	15	15	45		NO
							Totals		0	0		0	90	90	15	15	15	45		
00	52	***Shared Path Improvements*** Citywide from: to:	28	P	00		ALL	1/1/2018				0	200	200			50	150		NO
							Totals		0	0		0	200	200	0	0	50	150		

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							Project Phase	Phase Start (yyyy)	Fund Source Information: Federal Fund Code	Federal Funds	State Fund Code	State Funds	Local Funds	Total Funds	1st	2nd	3rd	4th thru 6th	Envir. Type	R/W Required
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
00	53	***Safety Projects*** from: to: Future safety projects Includes traffic revisions, NW Fargo Curve Safety Analysis	21	P	00		ALL	1/1/2017					250	250		50	50	150		NO
							Totals			0		0	250	250	0	50	50	150		
00	54	***Storm Grate Replacements (Bike Improvements)*** from: to: Storm grate replacements for bike lane improvements	38	P	00		CN	1/1/2016					20	20	20					NO
							Totals			0		0	20	20	20	0	0	0		
00	55	***Future Bike Route Improvements*** Citywide from: to: Future bike route improvements	28	P	00		CN	1/1/2016					30	30	5	5	5	15		NO
							Totals			0		0	30	30	5	5	5	15		
00	56	***Street Lighting*** Citywide from: to: Street Lighting	21	P	00		CN	1/1/2016					120	120	20	20	20	20		NO
							Totals			0		0	120	120	20	20	20	20		
02	57	***NE 3rd Avenue Washougal River Bridge*** from: to: Seismic rating, scour critical, and footing rehabilitation	14	P	00		ALL	1/1/2021	BR	800			200	1000				1000		NO
							Totals			0		800	0	200	1000	0	0	0	1000		

Appendix D
Capital Improvement Project List

Draft

2016-2035

City of Camas

Capital Improvement Plan

Project List

May 2016

Capital Improvement Plan
DRAFT

YEAR: 2016

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
ANNEX BUILDING/FIRE MARSHALL BUILDING	$ 450,000					$ 300,000						$ 150,000				$ 450,000
GENERAL GOVERNMENT TOTAL	**$ 450,000**															**$ 450,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
AMBULANCE	$ 250,000					$ 250,000										$ 250,000
FIRE TRUCK	$ 500,000					$ 500,000										$ 500,000
FIRE TOTAL	**$ 750,000**															**$ 750,000**
PARKS																
GOODWIN TRAILHEAD PARKING ADDITION	$ 480,000											$ 480,000				$ 480,000
PARKS LANDS PURCHASE	$ 200,000											$ 100,000	$ 100,000			$ 200,000
FALLEN LEAF LAKE MASTERPLAN	$ 40,000											$ 40,000				$ 40,000
COOPER'S VIEW PARK AT DREWF'S FARM	$ 575,000											$ 575,000				$ 575,000
CROWN PARK MASTERPLAN	$ 150,000												$ 150,000			$ 150,000
																$ -
PARKS TOTAL	**$ 1,445,000**															**$ 1,445,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
6TH AVE / NORWOOD ROUNDABOUT	$ 2,150,000					$ 1,900,000				$ 55,000	$ 10,000	$ 185,000				$ 2,150,000
BRADY ROAD - DESIGN & ROW (16TH TO 500' N. OF 25TH)	$ 1,287,000					$ 300,000	$ 339,000	$ 648,000								$ 1,287,000
LED STREETLIGHT REPLACEMENT AND PAC RIM BLVD LIGHTING	$ 2,850,000					$ 2,350,000	$ 500,000									$ 2,850,000
FRANKLIN STREET (14TH TO 19TH)	$ 665,000					$ 120,000	$ 225,000			$ 45,000	$ 275,000					$ 665,000
FRANKLIN STREET (19TH TO 22ND)	$ 600,000		$ 60,000				$ 250,000			$ 40,000	$ 250,000					$ 600,000
PAVEMENT MANAGEMENT PROGRAM	$ 700,000		$ 700,000													$ 700,000
TIF STUDY UPDATE	$ 100,000	$ 100,000														$ 100,000
STREETS TOTAL	**$ 8,352,000**															**$ 8,352,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
NORTH SHORE STORM BASIN ANALYSIS	$ 150,000								$ 150,000							$ 150,000
COLUMBIA STORM BASIN ANALYSIS	$ 50,000								$ 50,000							$ 50,000
LACAMAS LANE SLIDE RECONSTRUCTION	$ 1,500,000						$ 1,125,000		$ 375,000							$ 1,500,000
FOREST HOME ROAD SLIDE RECONSTRUCTION	$ 1,500,000						$ 1,297,500		$ 202,500							$ 1,500,000
STORM SYSTEM REHAB																
STORM TOTAL	**$ 3,200,000**															**$ 3,200,000**
WATER																
544' ZONE SURFACE WATER UPGRADES (WTP, TRANS. MAIN, INTAKE LINES)	$ 6,000,000					$ 6,000,000										$ 6,000,000
2.O MG 544' ZONE RESERVOIR	$ 310,000									$ 310,000						$ 310,000
WELL 6 EASEMENT	$ 50,000									$ 50,000						$ 50,000
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
WELL 17 DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
WATER SYSTEM PLAN UPDATE	$ 275,000									$ 275,000						$ 275,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
WATER TOTAL	**$ 7,845,000**															**$ 7,845,000**
SEWER																
NORTH SHORE SEWER TRANSMISSION SYSTEM	$ 1,500,000					$ 1,500,000										$ 1,500,000
LACAMAS CREEK PUMP STATION	$ 40,000										$ 40,000					$ 40,000
STEP BY-PASS TRANSMISSION MAIN	$ 900,000					$ 900,000										$ 900,000
WWTP SEPTAGE RECEIVING STATION	$ 215,000										$ 215,000					$ 215,000
WWTP ENERGY UPGRADES	$ 50,000										$ 50,000					$ 50,000
STEP ODOR CONTROL ADDITIONS	$ 150,000										$ 150,000					$ 150,000
SEWER MAIN PUMP STATION REHAB	$ 250,000										$ 250,000					$ 250,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
SEWER TOTAL	**$ 4,305,000**															**$ 4,305,000**
GRAND TOTAL	**$ 26,347,000**	**$ 100,000**	**$ 760,000**	**$ -**	**$ -**	**$ 14,120,000**	**$ 3,736,500**	**$ 648,000**	**$ 777,500**	**$ 1,985,000**	**$ 2,440,000**	**$ 1,530,000**	**$ 250,000**	**$ -**	**$ -**	**$ 26,347,000**

Capital Improvement Plan
DRAFT

YEAR: 2017

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
CITY HALL/POLICE/LIBRARY ROOFING	$ 400,000											$ 400,000				$ 400,000
																$ -
																$ -
																$ -
GENERAL GOVERNMENT TOTAL	**$ 400,000**															**$ 400,000**
POLICE																
																$ -
																$ -
																$ -
POLICE TOTAL	**$ -**															**$ -**
FIRE																
																$ -
																$ -
FIRE TOTAL	**$ -**															**$ -**
PARKS																
PROPERTY DEMOLITION	$ 25,000	$ 25,000														$ 25,000
DOG PARK ACQUISITION	$ 250,000											$ 100,000	$ 150,000			$ 250,000
WILDLIFE LEAGUE ACQUISITION/CLEAN-UP	$ 250,000											$ 250,000				$ 250,000
T-3 NORTH SHORE DEVELOPMENT	$ 115,000												$ 115,000			$ 115,000
T-1 NORTH/SOUTH CONNECTOR	$ 100,000												$ 100,000			$ 100,000
POOL SAFETY/FACILITY REPAIR DESIGN	$ 75,000											$ 75,000				$ 75,000
COMMUNITY CENTER RENOVATION	$ 500,000											$ 500,000				$ 500,000
OPEN SPACE PARK ACQUISITION	$ 200,000											$ 200,000				$ 200,000
TRAIL AND TRAILHEAD DEVELOPMENT	$ 50,000											$ 50,000				$ 50,000
MAJOR CAPITAL IMPROVEMENTS	$ 75,000											$ 75,000				$ 75,000
																$ -
PARKS TOTAL	**$ 1,640,000**	**$ 25,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,250,000**	**$ 365,000**	**$ -**	**$ -**	**$ 1,640,000**
LIBRARY																
PARKING PROPERTY AQCISITION (Sanks)	$ 150,000											$ 150,000				$ 150,000
LIBRARY TOTAL	**$ 150,000**															**$ 150,000**
STREETS																
ADA ACCESS UPGRADES	$ 50,000	$ 50,000														$ 50,000
TRAFFIC SIGNAL PAYNE ROAD/PACIFIC RIM BOULEVARD	$ 300,000						$ 120,000								$ 180,000	$ 300,000
NW LARKSPUR (LAKE TO 6200 BLOCK)	$ 2,500,000						$ 1,222,000	$ 435,000							$ 843,000	$ 2,500,000
NW CAMAS MEADOWS DRIVE (PAYNE TO 6200 BLOCK)	$ 2,760,000						$ 653,000	$ 843,000							$ 1,264,000	$ 2,760,000
TRANSPORTATION CAPITAL FACILITIES PLAN DEVELOPMENT	$ 100,000	$ 100,000														$ 100,000
WOODBURN DRIVE (277TH TO 15TH ST)	$ 3,600,000						$ 1,030,000	$ 1,020,000							$ 1,550,000	$ 3,600,000
PAVEMENT MANAGEMENT PROGRAM	$ 718,000		$ 718,000													$ 718,000
STREETS TOTAL	**$ 10,028,000**															**$ 10,028,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
CITY-WIDE HYDRAULIC MODELING	$ 75,000								$ 75,000							$ 75,000
10TH / DRAKE FACILITY REHABILITATION	$ 250,000								$ 250,000							$ 250,000
STORM SYSTEM REHAB	$ 250,000								$ 250,000							$ 250,000
STORM TOTAL	**$ 575,000**															**$ 575,000**
WATER																
																$ -
2.O MG 544' ZONE RESERVOIR	$ 5,000,000									$ 5,000,000						$ 5,000,000
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
WELL 17 DEVELOPMENT	$ 150,000									$ 150,000						$ 150,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
DECOMMISSION BUTLER RESERVOIR	$ 100,000									$ 100,000						$ 100,000
FOREST HOME BOOSTER STATION SITE ACQUISITIOIN	$ 50,000									$ 50,000						$ 50,000
BUTLER 8" PRV INSTALLATION	$ 90,000									$ 90,000						$ 90,000
FOREST HOME TRANSMISSION	$ 350,000									$ 350,000						$ 350,000
WATER TOTAL	**$ 6,900,000**															**$ 6,900,000**
SEWER																
NORTH SHORE SEWER TRANSMISSION SYSTEM	$ 13,000,000					$ 13,000,000										$ 13,000,000
LACAMAS CREEK PUMP STATION	$ 450,000										$ 450,000					$ 450,000
SEWER MAIN PUMP STATION REHAB	$ 150,000										$ 150,000					$ 150,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 250,000										$ 250,000					$ 250,000
SEWER TOTAL	**$ 15,050,000**															**$ 15,050,000**
GRAND TOTAL	**$ 34,743,000**	**$ 200,000**	**$ 718,000**	**$ -**	**$ -**	**$ 13,000,000**	**$ 3,025,000**	**$ 2,298,000**	**$ 575,000**	**$ 6,900,000**	**$ 2,050,000**	**$ 3,050,000**	**$ 730,000**	**$ -**	**$ 3,837,000**	**$ 34,743,000**

Capital Improvement Plan
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YEAR: 2018

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
MAJOR BLD. MAINTENANCE	$ 100,000											$ 100,000				$ 100,000
ASSET MANAGEMENT SYSTEM-PWORKS	$ 250,000	$ 20,000	$ 35,000	$ 35,000	$ 10,000				$ 50,000	$ 50,000	$ 50,000					$ 250,000
GENERAL GOVERNMENT TOTAL	**$ 350,000**															**$ 350,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
FIRE TOTAL	**$ -**															**$ -**
PARKS																
DOWNTOWN TRAIL	$ 225,000.00											$ 225,000.00				$ 225,000.00
WILDLIFE LEAGUE ACQ/CLEAN-UP/DEV	$ 500,000.00						$ 250,000.00					$ 250,000.00				$ 500,000.00
NP 1 -PROPERTY ACQUISITION	$ 1,500,000.00					$ 500,000.00	$ 500,000.00	$ 500,000.00								$ 1,500,000.00
POOL SAFETY AND FACILITY REPAIR	$ 275,000.00											$ 275,000.00				$ 275,000.00
PROPERTY DONATION, CLEAN-UP	$ 300,000.00						$ 300,000.00									$ 300,000.00
FALLEN LEAF PARK	$ 1,500,000.00					$ 750,000.00	$ 500,000.00						$ 250,000.00			$ 1,500,000.00
3RD AVE. TRAILHEAD DESIGN/PERMIT	$ 40,000.00												$ 40,000.00			$ 40,000.00
OPEN SPACE AND PARK ACQUISITION	$ 200,000.00											$ 200,000.00				$ 200,000.00
TRAIL HEAD AND TRAIL DEVELOPMENT	$ 50,000.00											$ 50,000.00				$ 50,000.00
MAJOR CAPITAL IMPROVEMENTS	75,000											75,000				$ 75,000
																$ -
																$ -
																$ -
PARKS TOTAL	**$ 4,665,000**					$ 1,250,000	$ 1,550,000	$ 500,000	$ -	$ -	$ -	$ 1,075,000	$ 290,000			**$ 4,665,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
ADA ACCESS UPGRADES	$ 50,000	$ 50,000														$ 50,000
BYBEE ROAD REALIGNMENT EAST	$ 1,450,000						$ 484,400	$ 239,000							$ 726,600	$ 1,450,000
SHARED BIKE PATH/PED IMPROVEMENT	$ 150,000	$ 150,000														$ 150,000
LAKE ROAD/EVERETT STREET ROUNDABOUT	$ 2,422,000						$ 968,800								$ 1,453,200	$ 2,422,000
NW 23RD AVENUE WIDENING AND SIDEWALK ASTOR TO SIERRA	$ 300,000	$ 300,000														$ 300,000
PAVEMENT MANAGEMENT PROGRAM	$ 735,000		$ 735,000													$ 735,000
STREETS TOTAL	**$ 5,107,000**															**$ 5,107,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
10TH / IVY FACILITY REHABILITATION	$ 250,000								$ 250,000							$ 250,000
STORM SYSTEM REHAB	$ 250,000								$ 250,000							$ 250,000
STORM TOTAL	**$ 500,000**															**$ 500,000**
WATER																
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
WELL 17 DEVELOPMENT	$ 150,000									$ 150,000						$ 150,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
FOREST HOME BOOSTER STATION UPGRADE	$ 450,000									$ 450,000						$ 450,000
WELL 17 DEV-CAMAS MEADOWS	$ 2,000,000									$ 2,000,000						$ 2,000,000
WATER TOTAL	**$ 3,760,000**															**$ 3,760,000**
SEWER																
NORTH SHORE SEWER TRANSMISSION SYSTEM	$ 2,000,000					$ 2,000,000										$ 2,000,000
LACAMAS CREEK PUMP STATION	$ 1,275,000										$ 1,275,000					$ 1,275,000
SEWER MAIN PUMP STATION REHAB	$ 150,000										$ 150,000					$ 150,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 250,000										$ 250,000					$ 250,000
SEWER TOTAL	**$ 4,875,000**															**$ 4,875,000**
GRAND TOTAL	**$ 19,257,000**	**$ 520,000**	**$ 770,000**	**$ 35,000**	**$ 10,000**	**$ 4,500,000**	**$ 4,553,200**	**$ 1,239,000**	**$ 550,000**	**$ 3,810,000**	**$ 2,925,000**	**$ 2,250,000**	**$ 580,000**	**$ -**	**$ 2,179,800**	**$ 19,257,000**

Capital Improvement Plan
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YEAR: 2019

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
MAJOR BLD. MAINTENANCE	$ 100,000											$ 100,000				$ 100,000
GENERAL GOVERNMENT TOTAL	**$ 100,000**															**$ 100,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
Ambulance	$ 300,000					$ 300,000										$ 300,000
FIRE TOTAL	**$ 300,000**															**$ 300,000**
PARKS																
DOWNTOWN TRAIL	$ 1,000,000						$ 1,000,000									$ 1,000,000
INP 17 NORTH SHORE	$ 500,000											$ 250,000	$ 250,000			$ 500,000
PROPERTY DONATION, CLEAN UP	$ 300,000											$ 300,000				$ 300,000
CROWN PARK	$ 500,000							$ 500,000								$ 500,000
OPEN SPACE AND PARK ACQUISITION	$ 200,000.00											200,000				$ 200,000
TRAILHEAD AND TRAIL DEVELOPMENT	$ 50,000.00											50,000				$ 50,000
MAJOR CAPITAL IMPROVEMENTS	$ 75,000.00											75,000				$ 75,000
																$ -
PARKS TOTAL	**$ 2,625,000**											$ 875,000	$ 250,000			**$ 2,625,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
ADA ACCESS UPGRADES	$ 50,000	$ 50,000														$ 50,000
NW BRADY ROAD - CONSTRUCTION (16TH TO 500' N. OF 25TH)	$ 6,000,000						$ 6,000,000									$ 6,000,000
6TH AVENUE CORRIDOR IMPROVEMENTS	$ 1,000,000						$ 1,000,000									$ 1,000,000
SR-500 EVERETT ST CORRIDOR IMPROVEMENTS	$ 250,000	$ 250,000														$ 250,000
SHARED BIKE PATH/PED IMPROVEMENT	$ 150,000	$ 150,000														$ 150,000
NW LEADBETTER DRIVE SIDEWALK FREMONT TO LAKE ROAD	$ 100,000	$ 100,000														$ 100,000
PAVEMENT MANAGEMENT PROGRAM	$ 754,000		$ 754,000													$ 754,000
STREETS TOTAL	**$ 8,304,000**															**$ 8,304,000**
CEMETERY																
MEMORIAL GARDEN	$ 75,000	$ 75,000														$ 75,000
CEMETERY TOTAL	**$ 75,000**															**$ 75,000**
STORM																
PAC RIM BLVD @ FISHER CREEK IMPROVEMENTS STUDY	$ 30,000								$ 30,000							$ 30,000
MARYLAND STREET @ CARSON ESTATES IMPROVEMENTS	$ 250,000								$ 250,000							$ 250,000
STORM SYSTEM REHAB	$ 250,000								$ 250,000							$ 250,000
STORM TOTAL	**$ 530,000**															**$ 530,000**
WATER																
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
WELL 17 DEVELOPMENT	$ 1,350,000									$ 1,350,000						$ 1,350,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
COUCH STREET BOOSTER STATION	$ 120,000									$ 120,000						$ 120,000
LACAMAS BOOSTER STATION UPGRADE	$ 200,000									$ 200,000						$ 200,000
20" SUCTION LINE TO LACAMAS BOOSTER STATION	$ 300,000									$ 300,000						$ 300,000
WATER TOTAL	**$ 3,130,000**															**$ 3,130,000**
SEWER																
LACAMAS CREEK PUMP STATION	$ 1,275,000										$ 1,275,000					$ 1,275,000
SEWER MAIN PUMP STATION REHAB	$ 150,000										$ 150,000					$ 150,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 250,000										$ 250,000					$ 250,000
SEWER TOTAL	**$ 2,875,000**															**$ 2,875,000**
GRAND TOTAL	**$ 17,939,000**	**$ 625,000**	**$ 754,000**	**$ -**	**$ -**	**$ 300,000**	**$ 8,000,000**	**$ 500,000**	**$ 530,000**	**$ 3,130,000**	**$ 2,875,000**	**$ 1,850,000**	**$ 500,000**	**$ -**	**$ -**	**$ 17,864,000**

Capital Improvement Plan
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YEAR: 2020

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
NEW FINANCIAL SYSTEM	$ 1,000,000	$ 300,000			$ 100,000				$ 150,000	$ 150,000	$ 150,000	$ 150,000				$ 1,000,000
MAJOR BLD. MAINTENANCE	$ 100,000											$ 100,000				$ 100,000
GENERAL GOVERNMENT TOTAL	**$ 1,100,000**															**$ 1,100,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
FIRE TOTAL	**$ -**															**$ -**
PARKS																
WILDLIFE LEAGUE ACQ./CLEAN-UP/DEV.	$ 2,000,000						$ 1,500,000					$ 250,000	$ 250,000			$ 2,000,000
PROPERTY DONATION CLEAN-UP	$ 300,000											$ 300,000				$ 300,000
FALLEN LEAF PARK	$ 1,000,000					$ 500,000	$ 500,000									$ 1,000,000
OPEN SPACE AND PARK ACQUISITION	$ 1,000,000					$ 1,000,000										$ 1,000,000
TRAIL AND TRAIL HEAD DEVELOPMENT	$ 200,000											$ 200,000				$ 200,000
MAJOR CAPITAL IMPROVEMENTS	$ 75,000											$ 75,000				$ 75,000
																$ -
																$ -
PARKS TOTAL	**$ 4,575,000**					$ 1,500,000	$ 2,000,000					$ 825,000	$ 250,000			**$ 4,575,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
ADA ACCESS UPGRADES	$ 50,000	$ 50,000														$ 50,000
TRAFFIC SIGNAL NW LAKE RD/SIERRA	$ 300,000							$ 120,000							$ 180,000	$ 300,000
NE 28TH ST INGLE TO 232ND	$ 7,750,000						$ 2,180,000	$ 2,300,000							$ 3,270,000	$ 7,750,000
SHARED BIKE PATH/PED IMPROVEMENT	$ 150,000	$ 150,000														$ 150,000
NORTH SHORE EAST-WEST ARTERIAL	$ 3,000,000							$ 3,000,000								$ 3,000,000
PAVEMENT MANAGEMENT PROGRAM	$ 773,000		$ 773,000													$ 773,000
STREETS TOTAL	**$ 12,023,000**															**$ 12,023,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
STORM SYSTEM REHAB	$ 250,000								$ 250,000							$ 250,000
STORM TOTAL	**$ 250,000**															**$ 250,000**
WATER																
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
UPPER PRUNE HILL PRV AND NW ASTOR LOOPING	$ 300,000									$ 300,000						$ 300,000
20" SUCTION LINE TO LACAMAS BOOSTER STATION	$ 1,500,000									$ 1,500,000						$ 1,500,000
WATER TOTAL	**$ 2,960,000**															**$ 2,960,000**
SEWER																
SEWER MAIN PUMP STATION REHAB	$ 150,000										$ 150,000					$ 150,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 250,000										$ 250,000					$ 250,000
SEWER TOTAL	**$ 1,600,000**															**$ 1,600,000**
GRAND TOTAL	**$ 22,508,000**	**$ 500,000**	**$ 773,000**	**$ -**	**$ 100,000**	**$ 3,000,000**	**$ 6,180,000**	**$ 5,420,000**	**$ 400,000**	**$ 3,110,000**	**$ 1,750,000**	**$ 1,900,000**	**$ 500,000**	**$ -**	**$ 3,450,000**	**$ 22,508,000**

Capital Improvement Plan
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YEAR: 2021

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
MAJOR BLD. MAINTENANCE	$ 100,000											$ 100,000				$ 100,000
GENERAL GOVERNMENT TOTAL	**$ 100,000**															**$ 100,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
FIRE TOTAL	**$ -**															**$ -**
PARKS																
OPEN SPACE RESOURCE ASSESSMENT	$ 100,000	$ 100,000														$ 100,000
PROERTY DONATION, CLEAN-UP	$ 100,000											$ 100,000				$ 100,000
SPORTS COMPLEX	$ 8,000,000					$ 7,000,000	$ 1,000,000									$ 8,000,000
AQUATICS FACILITY	$ 15,000,000.00					$ 15,000,000										$ 15,000,000
OPEN SPACE AND PARKS ACQUISITION	$ 1,000,000.00											800,000	$ 200,000			$ 1,000,000
TRAIL AND TRAILHEAD DEVELOPMENT	$ 200,000.00											200,000				$ 200,000
MAJOR CAPITAL IMPROVEMENTS	$ 75,000.00											75,000				$ 75,000
PARKS TOTAL	**$ 24,475,000**	$ 100,000	$ -	$ -	$ -	$ 22,000,000	$ 1,000,000	$ -	$ -	$ -	$ -	$ 1,175,000	$ 200,000	$ -	$ -	**$ 24,475,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
ADA ACCESS UPGRADES	$ 50,000	$ 50,000														$ 50,000
GOODWIN ROAD FRIBERG TO LACAMAS CREEK 5 LANES	$ 7,145,000						$ 2,325,100	$ 1,332,200							$ 3,487,700	$ 7,145,000
GOODWIN ROAD LACAMAS CREEK TO INGLE 5 LANES	$ 5,978,000						$ 2,179,800	$ 528,500							$ 3,269,700	$ 5,978,000
SHARED BIKE PATH/PED IMPROVEMENT	$ 150,000	$ 150,000														$ 150,000
PAVEMENT MANAGEMENT PROGRAM	$ 792,000		$ 792,000													$ 792,000
TRANSPORTATION CAPITAL FACILITIES PLAN -UPDATE	$ 150,000	$ 150,000														$ 150,000
STREETS TOTAL	**$ 14,265,000**															**$ 14,265,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
STORM SYSTEM REHAB	$ 250,000								$ 250,000							$ 250,000
STORM TOTAL	**$ 250,000**															**$ 250,000**
WATER																
NORTH SHORE WATERLINE	$ 900,000									$ 900,000						$ 900,000
STEIGERWALD WELLFIELD PROPERTY	$ 60,000									$ 60,000						$ 60,000
STEIGERWALD WELLFIELD DEVELOPMENT	$ 50,000									$ 50,000						$ 50,000
PRIORITY PIPELINE REPLACEMENT	$ 150,000									$ 150,000						$ 150,000
WATER TOTAL	**$ 1,160,000**															**$ 1,160,000**
SEWER																
SEWER MAIN PUMP STATION REHAB	$ 150,000										$ 150,000					$ 150,000
IN-CITY SEWER MAIN REHAB	$ 1,200,000										$ 1,200,000					$ 1,200,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 250,000										$ 250,000					$ 250,000
SEWER TOTAL	**$ 1,600,000**															**$ 1,600,000**
GRAND TOTAL	**$ 41,850,000**	**$ 550,000**	**$ 792,000**	**$ -**	**$ -**	**$ 44,000,000**	**$ 6,504,900**	**$ 1,860,700**	**$ 250,000**	**$ 1,160,000**	**$ 1,600,000**	**$ 2,450,000**	**$ 400,000**	**$ -**	**$ 6,757,400**	**$ 41,850,000**

Capital Improvement Plan
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YEAR: 2022-2035

CAPITAL FACILITY CATEGORY	Total Project Cost ($)	Funding Sources														Total Project Cost ($)
		General Fund	Street Fund	Equipment Rental	C/W Fire & EMS	Debt (Bonds/Loans)	Grants	Development	Stormwater Rates	Water Rates / Water SDC	Sewer Rates / Sewer SDC	REET	Park Impact Fees	Fire Impact Fees	Traffic Impact Fees	
GENERAL GOVERNMENT																
MAJOR BUILDING MAINTENANCE	$ 1,300,000											$ 1,300,000				$ 1,300,000
GENERAL GOVERNMENT TOTAL	**$ 1,300,000**															**$ 1,300,000**
POLICE																
POLICE TOTAL	**$ -**															**$ -**
FIRE																
NORTH SHORE FIRE STATION	$ 9,000,000					$ 5,000,000								$ 4,000,000		$ 9,000,000
REPLACE FIRE STATION 41	$ 9,000,000					$ 7,500,000								$ 1,500,000		$ 9,000,000
FIRE TOTAL	**$ 18,000,000**															**$ 18,000,000**
PARKS																
NEIGHBORHOOD PARK #16 NORTH SHORE DEV.	$ 1,500,000					$ 1,000,000							$ 500,000			$ 1,500,000
PROPERTY DONATION, CLEAN UP/IMPROVEMENTS	$ 5,000,000						$ 4,000,000					$ 1,000,000				$ 5,000,000
NEIGHBORHOOD PARK #1 DEVELOPMENT	$ 1,750,000					$ 750,000						$ 500,000	$ 500,000			$ 1,750,000
ASH CREEK PARK DEVELOPMENT	$ 1,000,000					$ 250,000	$ 500,000						$ 250,000			$ 1,000,000
OSTENSEN CANYON PARK DEVELOPMENT	$ 2,500,000					$ 1,500,000	$ 1,000,000									$ 2,500,000
HERITAGE PARK ENTRANCE UPGRADES	$ 1,500,000					$ 1,000,000	$ 500,000									$ 1,500,000
OPEN SPACE/PARKS LAND ACQUISITION	13,000,000					$ 1,000,000						10,000,000	$ 2,000,000			$ 13,000,000
TRAIL AND TRAILHEAD DEVELOPMENT	2,600,000											1,600,000	$ 1,000,000			$ 2,600,000
MAJOR CAPITAL IMPROVEMENTS	975,000											475,000	$ 500,000			$ 975,000
PARKS TOTAL	**$ 29,825,000**					$ 5,500,000	$ 6,000,000					$ 13,575,000	$ 4,750,000			**$ 29,825,000**
LIBRARY																
LIBRARY TOTAL	**$ -**															**$ -**
STREETS																
ADA ACCESS UPGRADES	$ 700,000	$ 700,000														$ 700,000
DALLAS/3RD TURN LANES	$ 500,000	$ 200,000					$ 300,000									$ 500,000
TRAFFIC SIGNAL NW BRADY/16TH	$ 300,000							$ 120,000							$ 180,000	$ 300,000
TRAFFIC SIGNAL NE 242ND/28TH & SB LEFT TURN LANE	$ 610,000						$ 68,000	$ 440,000							$ 102,000	$ 610,000
INTERSECTION IMPROVEMENTS NE INGLE/GOODWIN	$ 300,000							$ 120,000							$ 180,000	$ 300,000
NE 232ND/28TH INTERSECTION IMPROVEMENTS	$ 610,000							$ 610,000								$ 610,000
NE 232ND/9TH INTERSECTION IMPROVEMENTS	$ 610,000						$ 244,000								$ 366,000	$ 610,000
TRAFFIC SIGNAL NEW NORTH SHORE E/W ART./EVERETT	$ 300,000							$ 120,000							$ 180,000	$ 300,000
ACCESS CONTROL LEADBETTER/EVERETT	$ 61,000							$ 24,400							$ 36,600	$ 61,000
NW 18TH WHITMAN TO BRADY PATHWAY	$ 125,000	$ 75,000						$ 50,000								$ 125,000
SE CROWN RD SE 23RD ST TO NE 3RD AVE	$ 10,040,000							$ 10,040,000								$ 10,040,000
IMPROVEMENTS 14TH/EVERETT	$ 61,000							$ 24,400							$ 36,600	$ 61,000
NW 43RD/ASTOR SIERRA TO 38TH	$ 2,600,000	$ 600,000						$ 2,000,000								$ 2,600,000
NW 38TH PARKER TO GRASS VALLEY PRK	$ 3,512,000						$ 1,066,000	$ 847,000							$ 1,599,000	$ 3,512,000
NE 43RD AV-SR500 TO EAST CITY LIMITS	$ 5,000,000	$ 500,000						$ 4,500,000								$ 5,000,000
SE 15TH ST/NOURSE RD-CHS TO 283RD	$ 5,700,000							$ 5,700,000								$ 5,700,000
NE INGLE RD - GOODWIN TO CITY LIMITS	$ 6,500,000							$ 6,500,000								$ 6,500,000
AREA WIDE SIGNAL STUDY	$ 125,000	$ 125,000														$ 125,000
N DWYER CREEK MP- STREET A	$ 4,100,000							$ 4,100,000								$ 4,100,000
N DWYER CREEK MP- STREET B	$ 7,300,000	$ 1,000,000						$ 6,300,000								$ 7,300,000
NW PAYNE ST LAKE TO CAMAS MEADOWS DR	$ 2,000,000							$ 2,000,000								$ 2,000,000
TRAFFIC SIGNAL GOODWIN/CAMAS MEADOWS DR	$ 300,000							$ 120,000							$ 180,000	$ 300,000
ACCESS CONTROL NE 14TH/EVERETT	$ 61,000							$ 24,400							$ 36,600	$ 61,000
NW MCINTOSH 11TH TO BRADY	$ 5,000,000	$ 1,000,000						$ 4,000,000								$ 5,000,000
SE 23RD ST REALIGNMENT CROWN/283rd	$ 750,000						$ 244,000	$ 140,000							$ 366,000	$ 750,000
NE 13TH/18TH GOODWIN TO 192ND	$ 8,235,000						$ 1,066,000	$ 5,570,000							$ 1,599,000	$ 8,235,000
EVERETT ST NE 35TH AV TO N. CITY LIMITS	$ 5,700,000						$ 1,744,000	$ 1,340,000							$ 2,616,000	$ 5,700,000
NEW E/W ARTERIAL 242ND&9TH TO EVERETT	$ 13,925,000						$ 4,360,000	$ 3,025,000							$ 6,540,000	$ 13,925,000
NE 242 AVE 28TH TO 9TH	$ 11,505,000						$ 2,180,000	$ 6,055,000							$ 3,270,000	$ 11,505,000
NE 9TH ST 232ND TO 242ND	$ 4,480,000						$ 1,405,000	$ 968,000							$ 2,107,000	$ 4,480,000
NE 232 AVE 28TH TO 9TH	$ 9,450,000						$ 2,277,000	$ 3,758,000							$ 3,415,000	$ 9,450,000
INGLE RD EXTENSION GOODWIN TO 232ND	$ 8,965,000						$ 2,470,000	$ 2,789,000							$ 3,706,000	$ 8,965,000
NE 28TH ST 232ND TO 242ND	$ 3,875,000						$ 388,000	$ 2,905,000							$ 582,000	$ 3,875,000
NW 18TH/PAYNE TIDLAND TO PACIFIC RIM	$ 3,525,000	$ 525,000						$ 3,000,000								$ 3,525,000
16TH/HOOD/18TH IMPROVEMENT	$ 3,600,000							$ 3,600,000								$ 3,600,000
TRANSPORTATION CAPITAL FACILITIES PLAN UPGRADES	$ 300,000	$ 300,000														$ 300,000
SHARED BIKE PATH/PED IMPROVEMENT	$ 450,000	$ 450,000														$ 450,000
NW ASTOR/11TH FOREST HOME RD TO MCINTOSH	$ 2,214,000							$ 2,214,000								$ 2,214,000
PAVEMENT MANAGEMENT PROGRAM	$ 13,500,000		$ 13,500,000													$ 13,500,000
STREETS TOTAL	**$ 146,889,000**															**$ 146,889,000**
CEMETERY																
CEMETERY TOTAL	**$ -**															**$ -**
STORM																
STORM SYSTEM REHAB	$ 3,500,000								$ 3,500,000							$ 3,500,000
STORM TOTAL	**$ 3,500,000**															**$ 3,500,000**
WATER																
PIPELINE REPLACEMENT	$ 2,100,000									$ 2,100,000						$ 2,100,000
TRANSMAIN CEMETERY RESERV TO 290 ZONE	$ 642,500									$ 642,500						$ 642,500
CEMETERY BOOSTER STATION	$ 980,313									$ 980,313						$ 980,313
TRANSMAIN CEMETERY BS TO 455 ZONE	$ 1,593,750									$ 1,593,750						$ 1,593,750
CONVERT 12" CL TO SUPPLY 455 ZONE	$ 62,500									$ 62,500						$ 62,500
2.0 MG CEMETERY RESERVOIR	$ 2,735,000									$ 2,735,000						$ 2,735,000
UPPER PRUNE HILL LOOPING ALONG NW 16TH AV	$ 403,750									$ 403,750						$ 403,750
15,600 LF OF 12" NORTH SHORE TRANSMAIN	$ 4,292,500							$ 4,292,500								$ 4,292,500
LOWER PRUNE HILL BS UPGRADE	$ 603,750									$ 603,750						$ 603,750
542 ZONE LOOPING	$ 617,500									$ 617,500						$ 617,500
5,300 LF OF 12" NORTH SHORE TRANSMAIN	$ 1,617,500							$ 1,617,500								$ 1,617,500
DECOMMISSION 10TH AV/FRANCIS ST BS	$ 588,750									$ 588,750						$ 588,750
1,900 LF OF 12" NORTH SHORE TRANSMAIN	$ 737,500							$ 737,500								$ 737,500
LOWER PRUNE HILL RESERVOIR REPLACEMENT	$ 1,923,750									$ 1,923,750						$ 1,923,750
UPPER PRUNE HILL STANDPIPE OUTLET PIPING UPGRADE 24"	$ 188,750									$ 188,750						$ 188,750
11,200 LF OF 12" NORTH SHORE TRANSMAIN	$ 3,148,750							$ 3,148,750								$ 3,148,750
2,600 LF OF 12" NORTH SHORE TRANSMAIN	$ 918,750							$ 918,750								$ 918,750
WELL 15 DEV PARKERS LANDING	$ 2,000,000									$ 2,000,000						$ 2,000,000
NORTH SHORE SOURCE DEVELOPMENT	$ 625,000									$ 625,000						$ 625,000
7,900 LF OF 12" NORTH SHORE TRANSMAIN	$ 2,293,750							$ 2,293,750								$ 2,293,750
14" TRANSMISSION MAIN FROM BUTLER TO 455 ZN	$ 1,953,750									$ 1,953,750						$ 1,953,750
5,700 LF OF 12" NORTH SHORE TRANSMAIN	$ 1,723,750							$ 1,723,750								$ 1,723,750
WELL 16 DEV NEAR WWTF	$ 2,000,000									$ 2,000,000						$ 2,000,000
UPPER GRN MTN BS	$ 523,750									$ 523,750						$ 523,750
2.0 MG GRN MTN RESERVOIR	$ 2,297,500									$ 2,297,500						$ 2,297,500
CROWN RD BOOSTER STATION UPGRADE	$ 891,250									$ 891,250						$ 891,250
12" TRANSMAIN WELL 16 POLK ST	$ 642,500									$ 642,500						$ 642,500
WELL 18 DEV-FIRE STATION	$ 1,250,000									$ 1,250,000						$ 1,250,000
STEIGERWALD SOURCE DEVELOPMENT	$ 1,000,000									$ 1,000,000						$ 1,000,000
STEIGERWALD PROPERTY ACQUISITION	$ 840,000									$ 840,000						$ 840,000
WATER SYSTEM PLAN UPDATE	$ 500,000									$ 500,000						$ 500,000
WATER TOTAL	**$ 41,696,563**															**$ 41,696,563**
SEWER																
SEWER PUMP STATION REHAB	$ 2,100,000										$ 2,100,000					$ 2,100,000
SEWER MAIN LINE REHAB	$ 16,800,000										$ 16,800,000					$ 16,800,000
NORTH SHORE SEWER COLLECTION SYSTEM	$ 3,500,000										$ 3,500,000					$ 3,500,000
WASTEWATER FACILITY PLAN UPDATE	$ 500,000										$ 500,000					$ 500,000
TREATMENT PLANT EXPANSION	$ 14,000,000					$ 14,000,000										$ 14,000,000
SEWER TOTAL	**$ 36,900,000**															**$ 36,900,000**
GRAND TOTAL	**$ 278,110,563**	**$ 5,475,000**	**$ 13,500,000**	**$ -**	**$ -**	**$ 37,500,000**	**$ 29,812,000**	**$ 97,736,700**	**$ 3,500,000**	**$ 26,964,063**	**$ 22,900,000**	**$ 28,450,000**	**$ 9,500,000**	**$ 5,500,000**	**$ 27,097,800**	**$ 278,110,563**

Appendix E
Camas Public Library Strategic Plan

LIBRARY
OBJECTIVE
STAFF
TECHNOLOGY
PUBLIC
LIBRARY'S
NEEDS
SERVICES
FUTURE
INITIATIVES
FUNDING
USE
NEW
CAMAS
AREAS
PLAN
CONTINUE
CHANGE
WELL
JUNE
EXPERIMENTATION
EBOOKS
QUESTIONS
MULTIPLE
CHANGES
SOCIAL
EFFORTS
LOCAL
PROVIDING
BOARD
KNOW
YEARS
AVAILABLE
ADMINISTRATION
DATABASES
INCLUDE
EXPAND
FOUNDATION
WANT
REQUIRE
VARIETY
HELP
GO
STAFF
DESCRIPTIONS
CONTENT
HELD
PLACE
SPECIFIC
PLANNING
INVESTIGATE
OPPORTUNITIES
COMMUNITY
CPL
WAY
CATALOG
CLEAR
COLLABORATION
IDEAS
DIRECTION
SURVEYS
TIMES
CITY
ACCESS
SECOND
NEED
STRATEGIC
MAKE
PATRONS
ALLOW
EXPERIMENT
ALWAYS
BOOKS
PROVIDE
TRAINING
CONTINUE
MEMBERS
MEET
GET
SERVICES
USERS
PROCESS
MANY
NUMBER
POSSIBLE
CHILDHOOD
MUST
COLLECTIONS
GAME
MAY
PAST
IDENTIFY
EXPAND
PLAN
ROLE
BROADBAND
GROUPS
FUTURE
WORLD
BECOME
FRIENDS
PROGRAMMING
OFFERINGS
MATERIALS
INFORMATION
COLLECTION
LIBRARIES
KNOWLEDGE
EARLY
EVENTS
PHYSICAL
SYSTEM
PUBLIC
TIME
INTEREST
BEGIN
FIND
ONLINE
TECHNOLOGY
GRANTS
ONE
ADDITIONAL
SET
JANUARY
PEOPLE
YEAR
BETTER
NETWORK
TRUSTEES
OFTEN
EBOOK
TAKE
ISD
BUDGET
EQUIPMENT
MEDIA
STAFFING
JULY
DIVISION
PROGRAM
SERVICE
REORGANIZATION
STORY
INCREASE
LEARNING
WAYS
PROGRAMS
JOB
FFCL
COMMON

Contents

Preface…….. page 2

I. Wandering in the Fog…….. page 3

II. A plan…….. page 4

III. Library Staff…….. page 5

IV. Community Engagement…….. page6

V. Technology…….. page 9

VI. Funding…….. page 11

Appendix Public Library Service Responses 2007…… page 13

Notes…….. page 14

"A Strategy for Uncertain Times" by Ron Gompertz, Library Trustee

Preface

The public library is at a crucial and game-changing point in its evolution.

Library staff and the Board of Trustees have spent a year reading, talking, listening, investigating -- all to find some clear direction, a travel guide to the future where the library is a vital, vibrant contributor to the life of the community and not a cobwebbed relic of "the Olden times."

Alas, what we have found is that there is no guide. There is no clear vision. There are no clear cut "do this, not that" answers to the questions. The Camas Public Library is like every other aspiring public library, feeling our way, vulnerable, tentative, and yet hopeful and excited.

What we know is that there are clear negative implications for library service as demand continues to increase and funding is static or irregular. The library has seen a decrease in the number of employees from the high of 17 FTE authorized in 2007. There has been a sizeable decline in the materials budget.

We know that we are not in the library business, but the Camas business. We are the community.

We know the future will happen with the library or without it. No one will ask the library for its permission for the world to change.

Clearly, sitting still is not an option. The library must change if it is to survive. It is not wise to believe "books will never go away" or if we continue to smile the customers will continue to come. The library must be agile, must make foundational changes, must be as ready as it can to re-position itself and deliver as the place the community comes to seek free unbiased answers to its questions, to help fulfill the need for personal growth, to remain in touch with other human beings. To be the community's heart.

For sure we will make some false starts, stumble or hit a few walls along the way to the future, but we will learn, adapt, and thrive.

This plan is the next step in the evolution of the Camas Public Library.

Ron Gompertz, Library Trustee, attended some of the workshops and webinars and read many publications about public libraries. After reading a draft of this document he drafted his response and thoughts. "A Strategy for Uncertain Times" is appended to this plan.

The Camas Public Library Board of Trustees adopted this plan on February 2, 2012.

Board of Trustees

Leesa Bequette
Michael Buzan
Brian Christopher
Laura Felter
Cathy Nickerson

I. Wandering in the Fog

The plight of the Camas Public Library and some possible direction can be illustrated by some thoughts by others:

"But libraries have never been solely about free books. They are about something deeper, about information, about access to knowledge, about providing a public space where citizens can interact with each other, all within the context of an exchange of knowledge. Libraries are at the core of our understanding of civilization, and if we are to keep them healthy, we'll have to make sure that they continue to answer deep needs in our society, rather than provide particular services because they've always done so." -- *Hugh McGuire*[1]

"But guessing correctly, while important, is not really the key. What matters is responding to customer wants and needs in a timely and efficient manner, even at the expense of letting go of past practices and tools no matter how cherished or successful." – Steven Escar Smith, Carmelita Pickett [2]

"Librarians are either at the table or on the menu." -- George Needham & Joan Frye Williams[3]

"True experimentation is the only way to manage uncertainty…." -- Stefan Thomke[4]

"Libraries must move from defining their professional role in terms of providers of information literacy on to a role as multimodal knowledge centres encompassing information as well as entertainment, retrieval as well as production. Second, librarians need to redefine their role in the physical library as facilitators of multimodal literacy and do so in close cooperation with other partners advancing civic society." -- Kirsten Drotner[5]

"We're in a Dungeons & Dragons, multi-level role-playing game with mysterious, morphing rules, unknown shape shifting players, and who knows what around the next corner." --David Zavortink .

To determine what was to go into this strategic plan, Library Director David Zavortink and Assistant Directory Sandy Glover devised a process that would engage the public, the staff, the Board of Trustees and get them to share their opinions, ideas and concerns about the future of the Camas Public Library. The intent was to enter into a discussion of what is possible and what people want from a "library."

CPL sought direction from its users. A series of public sessions was held to gather input on a variety of questions. Various interest groups such as the Friends & Foundation of the Camas Library (FFCL), the Second Story Gallery, the Craft-o-Rama group, and the No 2 Readers book discussion group were invited to participate. A blog was created to spur people's interest in the library of the future; it included many provocative ideas and statements (http://camas.typepad.com/future_camas_library/). Three surveys were conducted: an online survey to validate what we heard in the public sessions, and an IMPACT survey to find out about the use and desire for public computers.

There were informal surveys to find out what people used, what they wanted, what was on their minds. These various surveys had limited success.

Staff transmitted comments made by library users.

A forum on "the Future of Public Libraries" with three local library leaders was held to get their thoughts and a sense of the direction they are taking.

The CPL staff thought and talked about what the future holds and where the library can make changes to better position itself.

Staff and trustees have read and listened to podcasts and webinars about THE future library.

The Public Library Association's strategic roles (see Appendix) were reviewed . It was striking to the staff how quickly these roles have been outdated or rendered mute.

The Board of Trustees, with the future in mind, reviewed the library's mission. It was felt the mission remains valid. *The Camas Public Library exists to enrich lives, encourage self-education and promote an enlightened citizenry by providing free access to diverse and expansive collections.*

Out of all of these efforts, there was little in the way of specific targets to be found. The public is at a loss – they want books, they want all things digital, they want 16mm films and a card catalog. They want the past and the future. Their desires seem to be "all over the map." Other libraries are trying to find their way. No one knows a specific path or what specific dangers await us.

Camas Library staff is in a similar quandary. Feelings range from "there will always be books" to "we need to do this now!"

The Board of Trustees recognizes the need for change and well knows the obstacles. They look to the library administration to set the course.

The library will, as others will, grope through the dark, experiment, and search for the best ways to serve the future community.

II. A Plan.

From our various efforts, however, some decisions have been made and a form for the "strategic plan" has been chosen.

The strategic plan cannot be the typical multi-year strategic plan the library has had in the past. Instead, it will be more of a loose set of directions in certain identified areas, with one year of specific initiatives or experiments and one year of subsequent possible directions. The plan's ideas will be revisited annually and a new two-year plan established. The planning process will become central to the library's operation. It won't be limited to a small set of service responses.

To coincide with the budgeting process, the annual review should take place in June or July. With the American Library's Association conference in late June or early July it will be an ideal time to incorporate

some new services and technology unveiled at the conference. In several ways, the library has already begun to implement this plan, so working from a July to June calendar is not unreasonable.

If experimentation leads to some specific goals or projects, those can be added to the plan during the annual review.

The PLA's specific 2007 Public Library Service Responses* have been abandoned as the basis for the plan. Absolutely there are elements of many of them in the strategic initiatives that follow. Lifelong Learning is one example. But this plan will not specifically reference the PLA responses.

The library will continue to provide core services, such as access to books and computers, and niche services, such as foreign language materials, foreign language story times, and sleepovers, that are highly-valued by patrons. The initiatives will further identify directions for these core services.

This plan will include lots of experimentation and initiatives. Objectives may have fewer measureable outcomes than found in a previous strategic plan. It will mean going down dead-ends. In the spirit of experimentation, if it isn't working, it will be abandoned; unfruitful or less fruitful efforts may cease abruptly. The reset button may be pressed at any time. Flexibility is key.

The following sections will deal with five areas where the library will concentrate its initial energy and experimentation. The five areas are Library Staff, Community Engagement, Collections, Technology, and Funding. They are in many ways intertwined, as technology impacts the staff and the staff interacts with the community, which in turn influences the library's collections and policies. And, of course, all involve funding.

This plan contains many ideas, initiatives, tasks and objectives. In only one or two years it would be a Herculean undertaking to achieve all the tasks, solve all the puzzles or expect to find all the answers the library needs to survive to the next decade.

Perhaps this Plan will result in some glimpses of what the future public library looks like. To reach that library will require a mindset shift from slow and deliberately implemented plan to one of more rapid experimentation, constant change, and innovation. It will require an allegiance to letting go of the past. It will be fun and exhilarating; the unexpected will surprise everyone. It will require the staff, the Board of Trustees, and the city administration to remain flexible, positive, and hopeful.

III. Library Staff

Not only does the staff keep the collection relevant, plan and run events, and maintain the myriad of day-to-day physical and technological operations, the library staff defines the library to the public. The one-on-one interaction between the staff and public is a powerful and crucial nexus. It is imperative that the library build on and strengthen this connection in multiple ways.

In 2011 the library had its first retirement in many years. In 2012 and beyond there are likely to be additional staff vacancies. Thus, now is the time to begin looking at staffing and reorganization for the future and making changes and adjustments as necessary.

Time and time again the words "flexibility," "change," and "collaboration" are seen in discussions of library staffing. These need to be woven into all training.

There is a definite need to devote more time to training as well as thinking, planning, and producing. The entire staff will be involved. There will be a focus on developing the skills of the library staff to make them ready for the future. And for staff to be the guides to the technologies our customers crave.

The initiatives for 2012 are:

1. Establish a staff tool (Wiki? Intranet?) to facilitate training and education and to improve internal communication. OBJECTIVE: In place by July 1.
2. Determine staffing needs and consider revising library hours to achieve efficient use of staff and resources. OBJECTIVE: Preliminary report by January 20, 2012 in preparation for City Council Planning Conference. OBJECTIVE: Analyze library use patterns by February 15.
3. Investigate revised, changed job descriptions to meet future needs and reorganize staff. Answer the question "what qualifications do we need on staff?" With Human Resources Department, begin the process of writing the descriptions and doing comparables. OBJECTIVE: Complete one investigation by May 1. OBJECTIVE: Begin to phase in new job descriptions and reorganization as opportunities arise.
4. Begin a systematic staff training program to emphasize customer service, technology, and collaboration with library members. The program may include multiple "Staff Training days" throughout the year where the library is closed to the public. OBJECTIVE: Begin in January 2012. Develop the technology skills of staff so they can provide better assistance to patrons. OBJECTIVE: The list of staff competencies will be revised by April 1.
5. Identify areas of greatest need for training. OBJECTIVE: By January 15.
6. Pursue new funding for staff training.
7. Explore low-cost means of providing staff with meaningful training and professional development opportunities
8. Create more opportunities for staff training.
9. Expand jobs/tasks for volunteers. How can volunteers be used to meet the mission.

For 2013 the initiatives are:

1. Build on the staff training; revise as necessary.
2. Continue evaluating and implementing job descriptions and assignments.
3. Complete staff reorganization
4. Get staff training dollars back into the city budget.
5. Continue to reorganize for effective use of staff time.
6. Utilize additional volunteer help.

IV. Community Engagement

If there was anything learned from the public fora that the library held on the topic of the library's future, it was that we need to hear more from the public we serve. More and more often. The library needs to have an ongoing dialog with the community. We need to push to hear more.

Likewise, the library needs to tell its story more often and in different ways. Marketing the library to the greater community is in the best interests of the library.

The library needs to make a commitment to strengthen the bond the Library has with the Greater Camas community in order to provide staff with invaluable experience and insight.

The library has been on a small forefront with social networking, having Facebook, Twitter, and Flickr accounts. The library needs to engage its users in these new areas even more than it has. The library needs to be where its users are. Additionally, the library needs to provide a place for community dialogs to take place.

A new e-mail calendar and newsletter was launched in November 2011. The library distributed a new brochure in 2011; while beautiful, it needs to be more widely disseminated. The word about the library needs to reach more people and more often. This should include traditional media as well as the new.

As a city department, the library's web page—and the library's technology-- is controlled by the Information Services Division. This results in a less than rapid response to the fast changing nature of the library world.

The library received a "Transforming Life After 50" grant to provide at least two programs during the first half of 2012. This will provide the library with an opportunity to add some new types of programs and make new connections. The library will build on what it learns from this experiment.

Statistics show that the percentage of Camas residents with library cards has declined as the population has risen. The library needs to discover or create ways to connect with new residents and encourage library use.

The library needs to sell itself to the community in more ways. There are a number of areas of endeavor included in this broad topic: marketing, outreach, programs. There is much for the library to do in each of these areas.

The 2012 initiatives are:

1. More civic engagement. Staff will be assigned to various civic groups with which to interact and market the library. This will include attending meetings and working with the organizations to find areas of commonality.
2. Continue to use social media to reach our members. Turn up the volume on online efforts—enliven, embolden them. OBJECTIVE: Specifically, add six YouTube videos and six podcasts in 2012. OBJECTIVE: increase frequency of postings by 20 percent and respond to all comments. OBJECTIVE: Monitor other sites and comment to market the library.
3. Expand adult programming offerings. OBJECTIVE: beginning in January at minimum, one monthly program will be added to the schedule. These will be in a variety of areas: informational; brain stimulation; community conversations (topics of local interest); technology; health; twenty-something interests. OBJECTIVE: Work with Friends and Foundation and Second Story Gallery Society to increase the number of programs.
4. Join the Early Learning Public Library Partnership. OBJECTIVE: First quarter 2012.
5. Enhance and expand Early Childhood offerings. This is to include programs (such as evening or Saturday story times), materials, furnishings (manipulatives), etc. to reach young families.
6. Add additional after hours programming.
7. Create and utilize a volunteer registry for programming. OBJECTIVE: As part of TLA50, by June 30.
8. Try a monthly "new resident" mixer at the library or find other ways to reach people new to the community.
9. The library will conduct quarterly surveys during the year to define areas for collaboration with our users and discover what we need to know to serve them better. This will affect staff training.

10. Begin the process of finding new measurements for the library's success in the community. Go beyond circulation.
11. Make the adult summer reading program more active.
12. More "virtual library" offerings online.
13. Begin coordinated, planned word-of-mouth advertising. OBJECTIVE: Consider building a network of folks that would push general library use as well as specific programs. OBJECTIVE: Include Trustees, FFCL, Second Story Gallery.
14. The Board of Trustees will continue and expand its advocacy opportunities.
15. Evaluate and monitor the use of library services and programs; enhance those that are well-received; eliminate those that are under-utilized . OBJECTIVE: Staff create list for review by Board of Trustees by April 15.
16. Market the library's meeting spaces to increase utilization and library awareness, and also contribute to providing a wider variety of events for public consumption.
17. Begin planning for 2013 library 90th birthday celebration in April and 10th anniversary of "new" library. OBJECTIVE: Form planning committee no later than June 2012.

For 2013 the initiatives are:

1. Continue to expand Early Childhood Learning offerings.
2. Continue to refine the adult programs offered, building on the successful.
3. More collaboration and partnerships with outside groups.
4. Add two social media channels based on what members or potential members are using.
5. Seek needed funding for additional programming.

V. Collections

The ground is shifting. In 2011, library staff felt a strong earthquake of interest in electronic books. The use of the library's e-books rapidly eclipsed the use of downloadable audio books. More and more inquiries about how to download free e-book content grew throughout the year. The structure the library has in place is not adequate to meet the demand. More questions from trustees and staff arose about the potential impact to the library. If there was ever a clear sign of the change to come, this was it. Then, in December 2011 the number of e-readers and tablets owned *doubled*.

Likewise, on the vendor side there were major changes occurring. There is more digital content available from a greater array of sources and vendors. Digital offers the promise of "no waiting" and "always on" and available. It promises convenience and infinite choice. It will be a challenge to make this a reality in the library.

Of course, the library's materials budget remains at 60% of what it was in 2003. It does not allow the library to pour large amounts into buying new formats or new online services unless there are cuts elsewhere, or large spending by the Friends and Foundation (FFCL) or through grants. The physical collection needs to grow at the same time we expand our virtual collection.

For 2012, the initiatives are:

1. Seek vendors that will provide a new model for e-books to allow simultaneous downloads
2. Continue to evaluate e-book vendors. **OBJECTIVE:** Triple the number of e-books available by year's end. **OBJECTIVE:** Make e-books available through the library's catalog.

3. Continue to evaluate the materials expenditures, reducing or expanding the budget allocations where necessary.
4. Make e-books easier to find and use. **OBJECTIVE:** Get bibliographic records for all library-purchased e-books available into the library's online catalog. **OBJECTIVE:** By March 15, update all e-book user guides and get them online.
5. Conduct a survey to discover what e-book devices our patrons are using and to measure the demand for e-book content.
6. Continue to expand Early Childhood Learning materials to the collections. OBJECTIVE: Identify and add 100Early Childhood Learning materials to the collections, including discovery kits.
7. Monitor statistics of use for databases and magazines. **OBJECTIVE:** By August 1, make decisions on renewals.
8. Continue to lobby for and seek more funding for materials. This includes applying for grants through the FFCL and Washington State Library. **OBJECTIVE:** Increase materials expenditures by 15% in 2013.
9. Market the library's databases more aggressively through a variety of methods. These will include promoting them at appropriate programs (e.g. Novelist marketed to the book discussion groups; highlight specific products in newsletters; mention specific databases and uses in public outreach opportunities).
10. Begin to look for a new model for a collection development policy/plan that includes e content.
11. Continue to evaluate the library's existing print collections. OBJECTIVE: Decrease the library's inventory of books by 10% through a regular systematic weeding of the collections.
12. Investigate new evolving technologies to exploit for access to library collections.

VI. Technology

The pace of technological change doesn't allow the library the luxury of sitting back and contemplating if it should do this or do that or to wait. It has to happen and it has to happen now. With a tech-savvy clientele, the library cannot dally; it needs to be responsive to the demands of its members.

Library users are not unlike other people: they want self service and the library needs to provide more ways for such people to fully use the library and its resources without relying on staff intervention.

Technology is creating the future. Video teleconferencing for program events and training will be common place. Providing technology for library users to collaborate and produce content will be common place. Using technology to connect people to information will become not only easier, but truly ubiquitous. The world will become more connected and the library will be an important and vital hub in that network.

If the library doesn't offer the latest and greatest, if the library falls behind what other local agencies or libraries or services provide, the Camas Public Library will be lost. The library staff realizes that we are in a competition with all the other demands on peoples' lives and if the library isn't there, the library loses.

The Camas Public Library has some big challenges in utilizing technology. The first is that the library "contracts" with Fort Vancouver Regional Library for use of their integrated library system; thus, CPL is at the mercy of what FVRL does or does not do with the system. Because FVRL does not have mobile access to the catalog, Camas Public does not have this mobile service. It seems everyone has a smart phone and yet the library has little in the way of mobile services.

The second is that the library's technology is controlled by the Information Services Division (ISD). ISD does not have the staff to cover all technology needs of the city, let alone the library. With everything from providing public WiFi, to connecting to the ILS, to managing public PCs and printers, to the public accessing databases, to the need to constantly update web content, the library has no equal in the city when it comes to the wide variety of technology needs. The library tries to do as much as it can with technology and it is increasingly difficult to do so when there is not enough technical support due to the demands on the ISD.

The third challenge is the budget. The library will need to explore multiple options to find funding for future technology.

The CPL is fairly contemporary in its use of social media; it has multiple blogs, a Facebook page, and Twitter. These services are some that are not expensive or do not require the intervention of the City of Camas' IS Division.

In 2012 the library's technology-related initiatives are:

1. See the completion of the Broadband connection by July 1.
2. Begin to identify what can be done with broadband. OBJECTIVE: By July 15 identify items for the 2013 budget.
3. File for Erate to cover the costs of putting the public network on the NoaNet broadband network. OBJECTIVE: Completed by January 20.
4. Continue to work with the city administration and ISD to get ISD staff devoted to the library's technology.
5. Upgrade public PCs with Deep Freeze which will allow the use of Windows 7.
6. Replace the staff and public computers that are on the replacement schedule.
7. Continue to investigate Web 2.0 services that can be used by the library.
8. Come up with three ways to use a tablet device in the provision of public library service.
9. Devote one-third of all staff training hours to technology related areas. This is to provide better service to the public as well as to be better able to utilize the tools at their disposal when serving the public.
10. In early 2012, cross-train staff in those technology-related crucial areas behind the scenes.
11. Develop a "Technology Petting Zoo" program series to provide opportunities for the public to try new technologies and devices in a supportive environment
12. Expand the library's offerings for training of the public on equipment to use the services the library provides. OBJECTIVE: Plan courses and costs for 2013 budget process.
13. Establish public photo scanning program, train staff, establish venue to post content (such as a blog or Flickr page)
14. Investigate technology for library users to collaborate and produce content. Tie in with broadband. OBJECTIVE: Survey community about what they want to have available. OBJECTIVE: Place some equipment in 2013 budget or find alternate funding sources.
15. Expand the library's WiFi network so it is operational in more areas of the library. OBJECTIVE: Provide WiFi access through the library's PC management software to get better control over bandwidth issues, etc. OBJECTIVE: Provide Wi-Fi printing capabilities.
16. Identify and experiment with ways to use technology to make it easier for patrons of all ages to use the Library.
17. Implement new Comprise Smart Access Management software on public PC's. OBJECTIVE: By September 1.
18. Put a figure for a new ILS in the 2013 budget.

The following year, the library will have these initiatives:

1. With Fort Vancouver Regional Library, begin the process of procuring a new integrated library system to replace the rapidly aging Sirsi Dynix Symphony system.
2. Seek additional funding for equipment to better utilize the library's broadband connection.
3. More and continued staff training in technology. Cross-train staff.

VII. FUNDING

Through out the staff discussions on these areas, time and again the topic of funding came to the forefront. The city budget has been static for four years and for the majority of the last decade. The current economy is in doldrums. The common wisdom is that it will be several years for a turn around to occur. This will make the library's sea change more difficult.

The library administration, trustees, and city council have had inquiries or sales pitches from the Fort Vancouver Regional Library about joining the district. As lean times continue and local dollars become scarcer, this is an avenue that can be explored during the life of this and subsequent strategic plans. As the larger district is more agile with technology and staffing, and has a funding source which is not subject to competition from other departments as the city library is, it may become harder and harder to compete for the allegiance of library members. Pressure to join FVRL will potentially come from the patron side. Political pressure is also likely.

While the library has had a few grants, federal money, given through the Library Services and Technology Act via the Washington State Library will likely be reduced or eliminated. With cuts to state government, the WSL's maintenance of effort is in danger.

Other grants are possible. Given the library's limited staffing, grants are sometimes more work than they are ultimately worth. Thus, few grants are applied for. Grants which have a streamlined application process, give money for materials, and have few reporting requirements are the library's number one choice and will continue to be pursued.

The Friends and Foundation of the Camas Library (FFCL) remain the library's strongest supporter. Their continued success and support will continue to be sought by the library. The library staff will continue to work with FFCL on donations, events, and marketing.

The initiatives for 2012 for funding are:

1. With FFCL, apply for corporate grants for materials. OBJECTIVE: Raise $15,000 for materials in 2012.
2. Trustees and FFCL board continue to advocate for library funding with city officials.
3. Analyze the pros and cons of joining the regional library district.
4. Apply for Erate funding for broadband access.
5. Investigate additional ways of raising revenue.
6. Collaborate with other agencies to cooperate on common endeavors.

In 2013, funding initiatives are:

OBJECTIVES

1. Increase the materials budget by 15 percent.
2. Increase the amount given by FFCL to the library.
3. Include major upgrades in the facility and equipment in the Capital Facilities Plan.

APPENDIX

PUBLIC LIBRARY SERVICE RESPONSES

From *PUBLIC LIBRARY SERVICE RESPONSES 2007* By June Garcia and Sandra Nelson (Chicago: Public Library Association, 2007)

- Be an informed Citizen: local, national and world affairs
- Build Successful Enterprises: Business & non-profit support
- Celebrate Diversity: cultural awareness
- Connect to the Online World: public Internet access
- Create Young Readers: Early literacy
- Discover your roots: genealogy and local history
- Express Creativity: create and share content
- Get Facts Fast: Ready reference
- Know Your Community: community resources & services
- Learn to Read and Write: adult, teen & family literacy
- Make Career Choices: Job and career development
- Make Informed Decisions: Health, wealth & other life choices
- Satisfy Curiosity: Lifelong learning
- Stimulate Imagination: reading, viewing & listening for pleasure
- Succeed in School: homework help
- Understand How to Find, Evaluate & Use Information: Info fluency
- Visit a Comfortable Place: Physical & virtual spaces
- Welcome to the United States: New immigrants will have citizenship info

NOTES

[1]"What Are Libraries For?" *In the Library with the Lead Pipe* . 20 April 2011 http://www.inthelibrarywiththeleadpipe.org/2011/what-are-libraries-for/print/

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[3] *Libraries in a Post-Print Worl.* Webinar. *Infopeople.* 13 Sept. 2011

[4] "How Business Experimentation Fuels Innovation." *Chief Executive. Net. 6* June 2011. http://chiefexecutive.net/how-business-experimentation-fuels-innovation

[5] "Library innovation for the knowledge society" *Scandinavian Public Library Quarterly* Volume 38 NO. 2 2005: http://www.splq.info/issues/vol38_2/07.htm

A Strategy for Uncertain Times
Draft 2 - Version 11/4/11
Ron Gompertz

Introduction

A true library is more than a house of books. It's a community.

We are not in the library business, we are in the Camas business.

We are not in the book business. We are in the information business.

Neither are we in the reference business. We are in the collaboration business.

The Camas Library has been called the town's living room and the heart of the community. Along with the schools and the quality of life in our town, the library is one reason that families are attracted to Camas.

Library's help communities. Our library will soon turn 90. Part of our job is to help Camas "tell and maintain its story" across the years.

Libraries have always adapted to shifting funding levels and changing approaches to consuming information. We have never been married to one format or another.

Today, a patron can read a physical book, read an electronic book, watch a dramatization on DVD, listen to an audio version, and find the story on YouTube, Hulu or other online sources.

All of these and future formats are part of the ever evolving notion of a collection. Many of these formats did not exist 10 years ago. Some will not survive into the next decade.

Benjamin Franklin, the founder of the American library system, would be proud to know that people still hold tremendous goodwill toward libraries. Libraries may be loved today, but we must continue to earn that love in the future.

The Future Arrived a Minute Ago

When we surveyed and met with patrons we got many good suggestions.

Not surprisingly, when we asked, "what do you want to see in the future," many people only imagine an extension of what they see today. It's said that if Henry Ford had asked customer what they wanted, he would have created a horse that ate less.

People don't always know what they want. This a common problem for companies who develop products. When Apple first introduced the iPad, it was mocked as a "giant iPhone." Now, tens of millions of iPads later, it's seen as a transformative device.

A good library, like a good company must lead, not follow.

We must offer services and products that, once understood, people can't imagine living without.

Who are our core customers? What can we do to anticipate their needs and delight them?

A casual glance at our stats and usage suggest these core constituencies whose needs do not always overlap.:

- Kids 1-12 years old and the parents they bring in
- Participants in our crafting activities
- People who use our computers and Wi-Fi.
- Middle School Teens
- Seniors

As we invest in and develop new programs, we should always have one of these top constituencies in mind. We need to serve all citizens, but we don't need to be all things to all people.

The Digital Wave is Here

The biggest change we see coming is that books will be as mobile as music. In fact, what happened in the music industry is likely to repeat in publishing.

Digital books are a good thing. People will read more, not less, in the future. They will read snippets of books whenever they have a spare moment, and they will still curl up on the couch for extended reading.

Digital offers the promise of "no waiting" and "always on." It promises convenience and infinite choice.

Demand for digital content will grow and we cannot predict the plethora of devices that will be used to consume content. Nor should we. Our job is not to predict winning devices, it is to provide content in formats that our patrons demand.

We must recognize that the arrival of new digital formats comes with an implicit promise of ease and convenience.

We will need to deliver on that promise.

Books aren't dead

We know that that many of our constituents will continue to want books in traditional forms. We believe this especially true for the very young, the technical "have nots," and many patrons who are "just not into" gadgets and technology.

Thus, books continue to be relevant and core to our services. We need to grow our physical collection at the same time as we expand our virtual collection.

Changing Definitions, Metrics, and Services

We will need to change some of our notions and metrics. What is "a visit" when someone can check out books without ever stepping foot in the library?

How should we help remote patrons who are trying to master their first download? Without providing tech support for everyone's gadgets, shouldn't we know how they work well enough to help people access our services?

Does it make sense for each library district to master new forms of customer service on their own, or should we lobby the state to set up a unified approach with 24/7 phone and online chat customer service?

We measure computer usage, but how do we measure customer Wi-Fi activity? How do we measure collection size in an age of digital access to everything?

Shouldn't we also measure impact? A DVD has 90 minutes of impact. A novel has many hours of impact. Do our metrics give them the same value?

We will need to develop new ways to deliver our services and measure our effectiveness.

Libraries are catalysts for learning

The extended community of learners we serve includes ourselves.

Our job descriptions may change. Our routines will be disrupted.

Our staff will need to adapt and evolve. New training will need to be procured. All this change is not additive. Some things will have to cease. We'll need to liberate time from old activities to make way for the new.

The Journey has Begun, but our Mission is the Same

We don't know how the future will play out and accelerating trends make it harder than ever to predict, but our core values remain the same.

We will continue to focus on learning, investigation, creativity, and collaboration with our community.

A strategy of successive approximations

Cleary, sitting still isn't an option. Given the current economic times, we should not expect significant funding increases.

Rather than place big bets, we will launch some experiments and learn from them. We'll collaborate and communicate with other libraries, including our friends in the local school district. We may team up with private companies.

We will make some false starts, and hit a few walls, but we will learn, adapt, and thrive.

This, in a nutshell, is the strategy for the next year. Rather than a grand five-year plan that risks plotting the wrong course, we'll explore the terrain and adapt as we go. As the terrain becomes clear, we'll put deeper stakes in the ground.

We'll continue to pursue what's working and forgive ourselves if we try things that don't. We will learn from others. The entire library world is going through this together.

Our community is a key partner in this effort. They, too, are exploring new technologies, information services, and means of communication. The library is their living room and we need to be sure they feel welcome and excited to be part of our adventure.

This is an exciting time to be a library. Uncertain, yes, but that's how most voyages of discovery start.

Appendix A. Random Thoughts

Implications for Staff:

- Nothing replaces or changes the need for world class customer service
- Library staff are life-long learners. We have always embraced technology.
    - That said, we need to step up our investment in training and skill development.
- Not all current practices may not be relevant in a post-book or reduced book world
- Changing paradigms are stressful for customers, too. We'll need to be patient guides.

Implications for Services

- New lending and subscription models may replace our current approach.
- Patrons consider electronic resources to be limitless. Loan periods, holds, restrictions may not be valid concepts in the digital world.

Implications for Materials:

- No one laments the loss of LP records. We'll continue let go of less popular formats and clear the decks for new uses.
- Just as Google has changed the reference desk, digital will change the stacks.
    - Stacks may "thin" as more content goes digital. This space may be put to different use.

City of Camas
Camas 2035
Camas, Washington

Appendix F
Park, Recreation and Open Space Comprehensive Plan Update

Adopted December 2014

City of Camas

2014

parks, recreation and open space comprehensive plan update

ACKNOWLEDGEMENTS

The City of Camas greatly appreciates the efforts of the numerous Camas officials and residents who have contributed to the community's parks, recreation and open space system over the years. The efforts of caring citizens and dedicated officials and staff have enabled the success of our community's park system.

Mayor Scott Higgins

City Council

Ward 1:	Tim Hazen
	Melissa Smith
Ward 2:	Linda Dietzman
	Steve Hogan
Ward 3:	Greg Anderson
	Shannon Turk
At Large:	Don Chaney

Planning Commission

Bryan Beel, Chair
Lloyd Goodlett
Tim Hein
Frank Hood
Troy Hull
Jamia Johnson
Jim Short

Past Planning Commission Members

Carol Page Collier
Shelly Damore
David Shepherd

Park and Recreation Commission

Brent Erickson, Chair
Eunice Abrahamsen
Juli Bradley
Randy Curtis
David Gast
Steve Lorenz
Cassi Marshall

Planning Advisory Committee

Jerry Acheson
Krista Bashaw
Marilyn Boerke
Mike Brasch
Randy Curtis
Katy Daane
Tim Hazen
Nan Henriksen
Troy Hull
Cassi Marshall
Casey O'Dell

City Staff

Peter Capell, City Administrator
Jerry Acheson, Parks & Recreation Manager
Krista Bashaw, Special Events Coordinator
Phil Bourquin, Community Development Director
Sarah Fox, Senior Planner
Cathy Huber Nickerson, Finance Director
Eric Levison, Public Works Director
Denis Ryan, Operations Manager

Dedication

To the late Nina Regor, City of Camas Administrator, who served our community from January to October, 2013.

Consultant

MIG, Inc.
815 SW 2nd Avenue, Suite 200
Portland, OR 97204

www.migcom.com

TABLE OF CONTENTS

		Page
Section 1 INTRODUCTION		
1.1	Purpose of the Plan	1-1
1.2	Planning Process	1-1
1.3	Public Participation	1-2
1.4	Updating the Plan	1-4
1.5	Organization of the Plan	1-5
Section 2 GOALS AND OBJECTIVES		
2.1	Overview	2-1
2.2	Primary Goal	2-2
2.3	Physical Planning	2-3
2.4	Management & Operations	2-6
2.5	Programs & Services	2-7
2.6	Public Involvement	2-8
Section 3 PARKS AND FACILITIES		
3.1	Planning Concept	3-1
3.2	Neighborhood Park Recommendations	3-5
3.3	Recommendations for Special Use Areas	3-9
3.5	Recreation Facility Recommendations	3-12
Section 4 TRAILS		
4.1	Trails Plan Concept	4-1
4.2	Existing Inventory	4-2
4.3	Recommended Trails Plan	4-5
Section 5 NATURAL OPEN SPACE		
5.1	Overview	5-1
5.2	Existing Natural Open Space	5-1
5.3	Open Space Components	5-5
5.4	Permanent Open Space Network	5-6
5.5	Open Space and Lacamas Lake	5-12

Section 6 MAINTENANCE AND OPERATIONS

6.1	Maintaining the Park System	6-1
6.2	Tiered Levels of Service	6-1
6.3	Additional Maintenance and Operations Recommendations	6-7

Section 7 IMPLEMENTATION PLAN

7.1	Plan Implementation	7-1
7.2	Project Priorities	7-3
7.3	Funding Sources	7-4
7.4	Proposed Short Term Financing Strategy	7-9
7.5	Proposed Six-Year Capital Improvement Plan	7-10
7.6	Call to Action	7-16

LIST OF MAPS

Map 1: Park System Concept Map
Map 2: Existing Trails Map
Map 3: Trails System Concept Map
Map 4: Existing Parks and Open Space
Map 5: Open Space Concept Map

APPENDICES

Appendix A: Community Recreation Questionnaire Results Summary

Appendix B: Design & Development Guidelines

SECTION 1. INTRODUCTION

1.1 Purpose of the Plan

This Parks, Recreation and Open Space Comprehensive (PROS) Plan provides an update to the Park, Recreation and Open Space Comprehensive Plan adopted by Camas in 2007. [1] Since this time, Camas has evolved in several ways and has successfully leveraged its adopted plan to expand and improve its system of parks, recreation facilities and open spaces. Today, residents and park users have reconfirmed that this system is highly valued and central to the city's high quality of life.

This PROS Plan update continues the city's long history of planning and providing a high quality park and recreation system. This Plan responds to the many changes that have occurred over the past several years, reaffirms the system-wide vision, goals and objectives and outlines new strategies for the future. Specifically, this Plan:

- Provides an update of the city's existing parks, open spaces, recreational facilities and trails;
- Describes changes in public perceptions, needs and interests related to the park and recreation system;
- Addresses changes and needs in new growth areas and developing areas of the city;
- Recommends new projects and implementation strategies to guide development of the system; and
- Addresses state-wide requirements and renews the City's eligibility for grant funding.

[1] As an update, goals, policies and recommendations of the 2014 PROS Plan supersede those provided in the 2007 PROS Plan.

1.2 Planning Process

The planning process for preparing the PROS Plan update comprised three phases, depicted below.

Figure 1.1: Planning Process

- **Analysis and Review:** The initial phase consisted of a review of changes since the 2007 PROS Plan, including changes in land use, system inventory, park improvements, funding opportunities and partnerships. During this phase, the planning team conducted public outreach using a range of sources, and met with City staff and community stakeholders to create a strong foundation to base the Plan.
- **Plan Development:** During the second phase, the planning team collected input from the community and discussed the preferred future system with City staff and the Planning Advisory Committee. The planning team also revisited the vision, goals and objectives with outcomes of the first phase and developed updated recommendations and directions for the PROS Plan update.
- **Plan Adoption:** The Plan Adoption phase consisted of Draft Plan development with a detailed implementation strategy, public hearings to review the plan, and adoption by City Council.

1.3 Public Participation

Involvement from the public was a major contributor towards the PROS Plan update. The planning team solicited feedback from community members, stakeholders and City leaders in a variety of ways to ensure that the updated Plan reflects the priorities and needs of the community.

This Plan relied on the following primary public outreach opportunities.

- **Planning Advisory Committee:** The Planning Advisory Committee (PAC) represented a variety of recreation interests and community perspectives. The PAC met at each of the three phases in the planning process and provided overall direction for the Plan. The PAC also convened for a special meeting to focus on the future direction of aquatics in Camas.

- **Community Intercept Events:** These activities allowed the public to learn about the PROS Plan at popular community events. There were three events which consisted of a series of display boards that allowed participants to express their needs and provide comments related to the future system. Members of the planning team were available to respond to questions and provide more detailed information about the project. The planning team also used the initial events to announce the questionnaire.

- **Community Recreation Questionnaire:** The questionnaire was a key tool for broadening participation and validating the input received via the community intercept events. The design of the questionnaire also allowed for comparison of findings with those of the Community Recreation Survey from the 2007 PROS Plan. In total, there were 230 completed questionnaires provided both online and on paper. Appendix A provides a more detailed summary of questionnaire results.

- **City Website:** The City's website provided information about the Plan and community involvement opportunities to the public throughout the planning process.

- **City Staff Strategy Session:** The planning team met with City department heads from parks, planning and public works to identify opportunities, challenges and needs facing the system. This meeting also served to refine key recommendations in the updated PROS Plan.

- **City Council Retreat:** The planning team presented an overview of the planning process and key recommendations of the PROS Plan to the City Council and received feedback to guide direction of the Plan.

- **Parks and Recreation Commission, Planning Commission and City Council:** The planning team presented the PROS Plan for review and discussion to City leaders and officials at public meetings and hearings, as well as final adoption by the City Council.

1.4 Updating the Plan

The planning process will not end with the adoption of this PROS Plan update. Many factors will make it necessary to re-evaluate the Plan and the decisions that led to its creation. In addition, physical changes in the community, such as population growth, acquisition of property, and changes to private facilities all will directly affect the plan and its recommendations. The City should follow a multi-tiered approach to track progress on the Plan and make adjustments.

- **Development Review:** The City should review development proposals for conformance with the PROS Plan update. This is especially critical in future growth areas north of Lacamas Lake, as well as near the location of proposed park sites, to ensure consistency with Plan goals.
- **Biennial Review:** The Park and Recreation Commission should review the PROS Plan update every two years to reflect changes in existing conditions, new facilities, or significant population changes in the community. This is also a good time to evaluate how well the community is meeting goals set out in this document. Are acquisition and development keeping up with population growth and land development? Are facilities being maintained at the proper level? The results of the review can be used to fine tune the Plan. The review process should occur every two years, with a report and work plan for the coming biennium as products.
- **Six Year Plan Update:** Every six years the City should undertake a more extensive update of the PROS Plan to make adjustments based on changes in the community as well as to maintain eligibility for state and federal recreation grants.

The City should also ensure that periodic updates to the Comprehensive Plan are developed to support the goals, objectives and recommendations of the PROS Plan.

1.5 Organization of the Plan

Following this section, the Parks, Recreation and Open Space Comprehensive Plan update includes the following sections and appendix.

- **Section 2: Goals and Objectives** presents the goals and objectives that provide the framework for the Plan.

- **Section 3: Parks and Facilities** describes the system of park land and recreation facilities present in Camas; provides recommendations for new parks and improvements to existing sites and facilities.

- **Section 4: Trails** describes the existing trail system and provides recommendations for expanding and improving it to meet community needs.

- **Section 5: Natural Open Space** reviews the existing inventory of open space, describes the classifications of open space, and depicts the proposed open space network.

- **Section 6: Maintenance and Operations** provides recommendations for upkeep of the valuable community investments in parks and facilities.

- **Section 7: Implementation Plan** describes capital improvement priorities and a review of funding options. This section also provides a detailed six-year capital improvement plan.

- **Appendices:**

  Appendix A: Community Recreation Questionnaire Results Summary presents the results of the questionnaire conducted as part of the planning process.

  Appendix B: Design & Development Guidelines provides considerations for the design and development of parks, open spaces and trails.

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SECTION 2. GOALS AND OBJECTIVES

2.1 Overview

Through the planning process, the community revealed a commitment to continue the vision for park and recreation services first identified during the 2007 PROS Plan:

> *Through provision of recreation and park services, we enhance the quality of life and nurture the health and well being of our people, our community, our environment and our economy.*

Goals and objectives are the means of achieving this vision, and statements describing how the City will achieve the vision. The goals and objectives set the direction for providing services and can be a means of measuring the performance of a leisure services program.

The Primary Goal is the overarching goal for all Camas leisure services, and reflects the vision and mission of the City as it relates to parks, recreation, trails, and open space. Additional goals supplement this Primary Goal, providing more specific direction related to physical park planning, management and operations, recreation programs, and public involvement.

These goals and objectives stem from previous planning efforts, including the 2000 and 2007 PROS plans. The planning team revisited and refined directions from these past plans with members of the community, the Planning Advisory Committee and City staff. The recommendations contained in subsequent chapters of this document are implementing actions to achieve the goals and objectives set forth below. All goals, objectives, recommendations, and actions flow from the Camas vision for leisure services.

2.2 Primary Goal

PROS GOAL 1: Preserve and enhance the quality of life in Camas through provision of parks, recreation programs, recreational facilities, trails, and open spaces.

Objectives:

1A: Ensure that new development in future growth areas is compatible with this plan.

1B: Preserve the sensitive natural areas and bodies of water within Camas and the surrounding areas to maintain the community's character.

1C: Identify and protect significant cultural resources as part of new park, recreational facilities, trails, and open spaces, to enhance community identity and quality of life and enrich the recreational experience of users.

1D: Provide a comprehensive network of trails that is environmentally responsive and compatible with adjoining property.

1E: Encourage preservation of natural vegetation and provision of public access and recreational opportunities within private developments.

1F: Actively seek funds for the acquisition and development of park land, recreation facilities, and trails to meet recreation needs.

1G: Cooperate with other government agencies in the provision of park and recreation services in the Camas vicinity.

1H: Encourage continuing citizen involvement in park, trail, and open space planning.

2.3 Physical Planning

PROS GOAL 2: Provide active and passive recreation opportunities to serve the community's needs.

Objectives:

2A: Locate neighborhood parks convenient to all residents of Camas. Residents should have a neighborhood park or connection to the trail system available within about ½ mile of their homes.

2B: Provide equitable park opportunities throughout the City. This means upgrading existing parks to new standards; providing geographically distributed parks, trails, and facilities; and providing opportunities for different age groups and abilities.

2C: Provide parks and facilities that are responsive to diverse age groups, recreation interests, and abilities.

2D: Coordinate with the School District to acquire, develop, and maintain parks and sports fields adjacent to school facilities to maximize community benefit of public facilities.

2E: Develop a safe, scenic and enjoyable trail and bikeway system for City of Camas residents and visitors.

2F: Supplement the neighborhood park system with special use facilities, open space, and indoor facilities to serve a range of recreational needs.

2G: Plan parks to aid in the preservation of natural, cultural, historical or unique physical features.

2H: Encourage, support, and, where possible, initiate activities, to preserve, conserve or improve the shorelines of the Columbia and Washougal Rivers, Lacamas Creek, and Lacamas, and Fallen Leaf Lakes.

PROS GOAL 3: Develop a city-wide continuous network of natural open space to protect environmentally sensitive land and scenic views, create a sense of openness, and provide trail corridors.

Objectives:

3A: Preserve and protect the Open Space Network depicted in this plan.

3B: Enhance native vegetation in the Open Space Network while removing invasive species and preventing them from spreading.

3C: Work cooperatively with property owners and developers to preserve natural open space, especially those that provide visual or physical linkages to the proposed Open Space Network identified in this plan.

3D: Preserve the visual integrity of the wooded hillsides that provide the backdrop for the city. This should include encouraging the preservation of natural vegetation, minimizing disruption of soils and slopes, maintaining drainage patterns, and encouraging wildlife habitat.

3E: Encourage preservation of natural drainage corridors to reduce flood risks and allow for natural absorption of water into the soil.

PROS GOAL 4: Provide a convenient, safe, and pleasant pedestrian and bicyclist trail network that links parks, schools, and community destinations throughout the City.

Objectives:

4A: Develop a trail network that provides recreation opportunities as well as transportation. Recreation trails should be off-street as much as possible, but still allow for commuter bicyclist or pedestrian use.

4B: Improve pedestrian and bicyclist route options to connect Lacamas and Fallen Leaf lakes with Downtown.

4C: Reduce conflicts among users through the planning, design, and development of recreation trails. Trail design and location should enhance enjoyment of natural open space and provide safety for users.

4D: Meet accessibility guidelines for trail development. Incorporate information about trail difficulty into the trail system's signage.

4E: Provide connections across and around water bodies and wetlands where needed to create linked systems.

4F: Maximize public benefit of public infrastructure and publicly owned lands by co-locating trails in these areas or with these facilities.

4G: Take advantage of available traffic safety, transportation, and trail development funding to develop the bike and trail network.

4H: Incorporate interpretation and signage into the trail system.

PROS GOAL 5: Provide high quality community recreation facilities that are responsive to recreation needs and trends.

Objectives:

5A: Explore partnerships that will further development of a full-service indoor recreation facility that serves Camas residents.

5B: Design new sports fields to meet the higher level of demand and use placed on them, during the master planning of individual parks and facilities.

5C: Maintain and regularly update policies on the number of practices and games each sport team should be permitted

per week to balance demand for fields with the community's ability to provide them.

5D: Update the policies and methodology for assessing recreation facility needs periodically to reflect trends in participation.

5E: Continue to provide aquatics opportunities to serve the community as recommended in this Plan.

5F: Distribute recreation facilities throughout the community to improve access to recreational opportunities, especially in underserved areas.

5G. Work in partnership with user groups and project proponents to identify and test new recreational facilities.

5H. Design parks and facilities to improve operational efficiency and energy conservation.

2.4 Management and Operations

PROS GOAL 6: Provide a quality park, recreation, natural open space, and trail system that is efficient to administer and cost-effective to maintain.

Objectives:

6A: Strive to provide staff training, acquire labor saving equipment, and develop effective, state of the art facility designs.

6B: Explore alternative staffing, such as community service workers, youth employment programs such as Americorps, and others for additional staffing.

6C: Designate a City volunteer coordinator position to promote and manage volunteerism in the parks, recreation and open space system.

6D: Invest in preventive maintenance and upgrades to parks and facilities to maximize long-term benefits.

PROS GOAL 7: Encourage and actively pursue cooperation between governmental agencies, nonprofit organizations, and private business in providing park and recreation services.

Objectives:

7A: Encourage a range of recreational opportunities within the community by facilitating cooperation and communication among service providers.

7B: Continue cooperative planning and use of recreation facilities with public and private groups in the community.

7C: Encourage and pursue mutual cooperation and a "good neighbor" policy with residents and businesses located adjacent to park facilities, trails, and natural open space areas.

2.5 Programs and Services

PROS GOAL 8: Provide a diverse range of recreation programs and services to serve multiple ages, populations, and interests.

Objectives:

8A: Continue to develop community-oriented programs that are responsive to expressed demands and that foster participant support of all ages and abilities.

8B: Continue to support participants with special needs.

8C: Continue to promote park and recreation programs, services, and facilities through an effective community information system.

8D: Operate recreation programming in a financially self-sustaining way to the extent possible. Fees and charges policies should be evaluated every other year to progress on meeting this objective.

8E: Offer programming that encourages use of the City's trail system and open space network. These programs or events can include fitness classes as well as interpretive programs to increase awareness of the City's assets.

2.6 Public Involvement

PROS GOAL 9: Encourage public input and involvement in as many aspects of park and recreation planning and operations as is feasible to give residents a sense of ownership.

Objectives:

9A: Cultivate avenues for input from those people or groups that are particularly interested in park and recreation issues, and encourage their continued interest and participation in the planning process.

9B: Maintain contact with citizens through a variety of means, such as press releases, public forums, mailings, a web site, and print advertisements.

9C: Use the Parks and Recreation Commission to maintain visibility and contact with citizens on park and recreation issues. These bodies should be used to integrate citizen input in the decision-making process and administrative structure.

9D: The City, assisted by the media when appropriate, should undertake the development of a public information program to promote parks, natural open space, trails, and recreation programs.

9E: Develop a volunteer program to recruit, organize and retain volunteers to serve the City on a variety of projects and programs related to the park system. The program should connect volunteers with opportunities that contribute to the system, while off-setting City resources and building ownership of the system.

SECTION 3. PARKS AND FACILITIES

This section describes recommendations for parks and facilities in Camas, presenting the preferred future park system concept. These recommendations provide more specific direction for the goals and objectives described in Section 2. Sections 4 and 5 detail recommendations for trails and natural open space areas.

3.1 Planning Concept

This Plan builds on the park system concept from previous iterations of the Camas Parks, Recreation and Open Space Plan: a system composed of various park types, each offering certain types of recreation opportunities. Separately, each park type may serve one basic function, but collectively the system serves the entire range of community recreation needs. This concept will provide an efficient and usable park and open space system that meets the needs of all residents.

The focus of the 2014 PROS Plan is to maximize the use of existing sites and facilities, while targeting locations where new parks are needed to serve planned growth areas. The *Park's Recreation, Open Space & Trails Element* of the City's current Comprehensive Plan (2004) relies on a different approach to expressing need, focusing on the number of needed acres per park type. Among other reasons, the expressed acreage need primarily supports park impact fees that the City can leverage to help fund new parks. Following adoption of the 2014 PROS Plan, the update to the Comprehensive Plan element should consider the park acreage needs, and revise these based on the proposed parks and recreation facilities identified in this chapter.

The Camas park system includes neighborhood parks located to serve individual neighborhoods in Camas, natural open space areas that preserve resources throughout the community, and special use areas to provide for specific recreation needs. Supplementing these sites are public and private sites and facilities, such as school sites, regional parks and privately owned parks, open space and recreation facilities. A comprehensive trail system links all of these sites to the regional trail network. At the center of Camas is Lacamas Lake, a

major community resource and defining feature of the City. The planning concept strengthens the role of the lake through new trail connections, protected open space areas and new parks along its shoreline.

The Park System Concept Map depicts the proposed park system. Each existing and proposed park has a unique label that coincides with descriptions in this section based on the 2007 PROS Plan, to ensure continuity with external references.

Primary elements of the concept depicted on the map include:

- **Proposed Parks:** The general locations of proposed neighborhood and special use parks. The map depicts proposed park sites with an asterisk, illustrating the general and preferred location of a park site; not intended to indicate specific parcels of land.

- **Proposed Trails:** The preferred alignment of future trails and their connections to existing alignments.

- **Existing Parks and Trails:** The locations of all existing parks, natural open space areas and trails.

City of Camas
WASHINGTON

Parks, Recreation and Open Space Comprehensive Plan Update

Park System Concept

- Proposed Neighborhood Park
- Proposed Special Use Park
- Proposed Trails
- Existing Trail
- City Park
- City Open Space
- City Undeveloped Park
- Private / HOA Open Space
- Other Park
- County Park
- School
- Water
- Camas UGA Boundary
- City of Camas
- Taxlots
- Other City
- Highway

0 0.5 1 Miles

MIG

9.9.2014 | Data source: Clark County GIS, USGS, ESRI, NOAA

3.2 Neighborhood Park Recommendations

Proposed Neighborhood Park (NP-1)

A new neighborhood park is needed in the northwestern corner of the city to provide park service to residential areas unserved by existing parks. Once identified, the site should be acquired, master planned, and then developed to serve the growing residential population in the area.

Lacamas Heights Park (NP-2)

Lacamas Heights Park is located at the corner of the Lacamas Heights Elementary School/Camas High School campus. There are no proposed recommendations for this site. However, because of its small size and physical constraints this site may hold potential for transferring to the school district in exchange for more suitable parkland in other areas of the city.

Goot Park (NP-3)

The City should consider expanding the site into adjacent opportunity areas. These undeveloped lands are publicly owned and include overhead utility lines, but may be suitable for future public recreational facilities such as sports fields or an off-leash dog area. As with all expansion projects, the City should first develop a master plan for this area to help guide cohesive site programming, design and public access.

Oak Park (NP-4)

No major needs exist for this site and there are no proposed recommendations other than ongoing maintenance and upkeep.

Louis Bloch Park (NP-5)

Louis Bloch Park should be upgraded to better meet the neighborhood park design guidelines. The playground equipment, and restroom within the fence line should be upgraded and a covered picnic shelter should be considered for the site. Field improvements should be considered to allow for soccer and baseball/softball use. The City should also examine options for dealing with the lack of parking surrounding the park, especially on game days during baseball season. A parking management plan may be needed to reduce parking impacts on surrounding neighbors.

Crown Park (NP-6)
Crown Park is a community gathering place for Camas and should be upgraded to support its role as a destination park for the community. Major recommendations for Crown Park include:

1. **Continue to operate the pool pending the development of replacement facility.** The existing outdoor pool is aging, and is reaching the end of its useful life. During the planning process, the planning team discussed existing conditions and the future of the pool with City staff, the Planning Advisory Committee and the public. The result of these discussions indicated a desire to continue to operate the pool, avoiding major capital improvement costs, until the City opens a replacement pool at another location. The following section provides additional discussion of the pool.

2. **Develop a parking management plan for special events.** Crown Park has on-street parking on all sides of the park, which is adequate most of the time. However, during special events, parking issues arise. The City should develop an innovative parking management plan for special events. This plan should include identifying alternative parking locations, such as sharing the parking lots of nearby churches or businesses; incorporating shuttle buses if needed; and providing traffic management to direct people to alternative parking locations before they get to the park.

3. **Complete a master plan.** The master plan should be generated through a community design process, and should incorporate special features that support Crown Park as a community gathering place. Walkable features, performance space such as a stage or amphitheater, interactive water play features, picnic areas, and a destination playground are all elements that should be considered for this park. The plan should identify the

preferred programming that will replace the pool area once pool operations have relocated elsewhere. The master plan should identify phases and prioritize improvements. Ageing Douglas Fir trees on the site should also be considered for replacement in this plan.

4. **Phase in Crown Park improvements based on the master plan.** As funding is available, implement Crown Park improvements as recommended in the master plan.

Benton Park (NP-7)

Benton Park is a small wooded park with a community trail that connects the Ostensen Canyon to Downtown and Lacamas Park. This site will need a health assessment of old Douglas fir trees. Otherwise, no major needs exist for this site other than ongoing maintenance and upkeep.

Forest Home Park (NP-8)

As an older Camas park, Forest Home Park should be upgraded to meet established design guidelines for neighborhood parks. This park needs an upgraded restroom facility, along with a sheltered picnic area and upgraded playground equipment. As with Louis Bloch Park, there are parking issues at this site on game days. A parking management strategy should be developed to reduce impacts on surrounding neighborhoods.

Klickitat Park (NP-9)

No major needs exist for this site and there are no proposed recommendations other than ongoing maintenance and upkeep.

Ash Creek Park (NP-10)

Ash Creek Park should be developed as a neighborhood park as the surrounding neighborhood develops. The park should be master planned and built according to the neighborhood design guidelines.

Proposed Neighborhood Park (NP-11)

A new neighborhood park is needed to serve the central-western portion of Camas where multiple growth areas will occur. The specific location of this site should be central to the ongoing planning and development discussions occurring among the City, development community and the public. After identifying the site, the City should acquire the property and develop a master plan, then develop the site as the population increases in the area.

Grass Valley Park (NP-12)

Grass Valley is one of Camas' premiere parks. It is one of the city's best designed and most heavily used parks. This park provides a broader range of facilities and amenities than more typical neighborhood parks. Based on recommendations from the 2007 PROS Plan, the City has completed several improvement projects to this site including a perimeter walking path and additional public parking. The City should continue to provide ongoing maintenance of this popular park based on recommendations outlined in Section 6.

Dorothy Fox Park (NP-13)

Dorothy Fox Park is a neighborhood park that adjoins a school. This park should be improved to provide additional facilities, including permanent restroom facilities as well as a picnic area with shelter. The hedge at this site requires a significant amount of maintenance, and should be eliminated. The fence may need to be visually improved. The City should also consider sports field upgrades at this site.

Ostensen Canyon (NP-14)

The City should develop this park in phases as recommended by the site master plan. Improvements include a playground, restroom, picnic shelter, two basketball courts, two soccer fields, a tennis court, and a bridge across the canyon. Perimeter walking trails should also be included.

East Hillside Park (NP-15)

Because of its proximity, this site has potential for improved connectivity to Fallen Leaf Lake Park. The City should continue development of this park based on the master plan.

Proposed Neighborhood Park (NP-16)

The City should identify a new neighborhood park to serve future growth within this area of Camas. This location presents an opportunity for a larger neighborhood park that includes a wider range of facilities. In particular, the City should make use of the unique topography of Green Mountain for views of Lacamas Lake and most of northern Camas. The City should develop this site to support trail activities and take maximum advantage of the views.

Proposed Neighborhood Park (NP-17)

The City should identify an appropriate neighborhood park site to serve this growth area, just east of Camp Currie, to provide nearby neighborhood park service. Once it is identified, the City should acquire the site as the opportunity arises, develop a master plan, and then develop the property.

Proposed Neighborhood Park (NP-18)

The City should identify an appropriate neighborhood park site in this future growth area, just north and west of Camas High School, to provide neighborhood park service coverage in that area. The City should acquire the preferred park site, develop a master plan, and develop the property to coincide with population increases in the area.

Proposed Neighborhood Park (NP-19)

An appropriate neighborhood park site should be identified in this future growth area, northeast of the existing city limit, east of Camas High School and north of Lacamas Park, to provide neighborhood park service coverage in that area. The City should acquire the preferred park site, develop a master plan, and develop the property to coincide with population increases in the area.

3.3 Recommendations for Special Use Areas

Heritage Park (SU-1)

Heritage Park has a range of popular recreation facilities including a boat ramp, two docks and a playground. The site also serves as a trailhead, offering a restroom and public parking. There are no major needs identified for this site and the City should continue providing routine maintenance as recommended in Section 6.

Lacamas Lake Lodge (SU-2)

Formerly the Moose Lodge, Lacamas Lake Lodge offers indoor programming and rental space, and its location near Heritage Park and Lacamas Lake makes it an ideal location for holding special events. The City should continue to prioritize the use of this facility for community events and rentals.

Fallen Leaf Softball Field (SU-3)

Fallen Leaf Softball Field features a softball stadium, restroom and parking and is currently fully developed for this specialized use. The City should continue to provide routine maintenance for this site as recommended in Section 6.

Fallen Leaf Lake Park (SU-4)

Fallen Leaf Lake Park has considerable natural and aesthetic values and access around the lake should be maintained. The City should add an internal trail system, paved parking, as well as water access towards the north end of the site. The City should also identify the location of an improved public entrance to the park. Additional facilities that should be added to this site include a large picnic area to accommodate groups of 100+, trailhead signage and supporting facilities.

Proposed Ione Street Sports Park (SU-5)

In partnership with the Camas School District and local sports organizations, the City should pursue improvements to existing sports fields south of Doc Harris Stadium to create a lighted sports field complex for baseball, softball, soccer and football. Improvements using City parks funding should allow for public use in addition to the school uses of the fields. The City should include neighborhood serving amenities such as walking trails, a playground, and site furnishings to be available to the public during school hours.

Camas-Washougal Skatepark (SU-6)

The joint Camas-Washougal skatepark is a heavily used facility that is uniquely positioned between the two cities. This facility and the successful partnership should continue. Both partners should be aware of the need for enhanced visibility, supporting amenities and updated skatepark features to keep this park appealing to local youth. Upgrades should include a permanent restroom facility.

Washougal Greenway Boat Launch (SU-7)

An informal small boat launch exists behind the Camas-Washougal Skatepark on the Greenway. The City should improve access to this facility and add a restroom (serving the boat launch and skatepark) to better serve fishing and small boating users. Improvements to this site will coordinate with the City of Washougal's plans for a water trail on the Washougal River.

Proposed Community Recreation Center Site (SU-8)

Camas is currently examining the opportunity to build and operate a full service community recreation center. The preferred site to locate a new facility (SU-8) is located near Heritage Park and the Lacamas Lake Lodge. The Camas Community Center Development Committee has conducted a detailed study for the future facility, addressing potential programming, costs and impacts to the City.[1] Because of the location along Lake Road, the design for this site should consider traffic impacts, circulation needs and overall compatibility with nearby recreation areas and adjoining uses.

Camas Community Center (SU-9)

The existing Camas Community Center is a small former elementary school converted to recreation use. Built in 1915, the Center was not designed for recreation programming, and does not have a full-size gym. However, its classrooms and multi-purpose room do provide space for some types of recreation programming. A full-service multi-purpose recreation center is a major community priority for Camas residents, a function that is not served by the existing community center. In the future, as the proposed community recreation center moves forward, the City should reexamine the use of the existing community center to avoid duplication of services. All options should be considered for the community center site, including surplusing the property.

Proposed Downtown Gathering Place (SU-10)

The community continues to express a need for a community gathering space in Downtown Camas. Camas has an active, pedestrian-oriented main street with a mix of retail, office, and civic uses. The library and City Hall anchor the east end of Main Street. Camas should identify and develop a downtown gathering place or plaza to support ongoing downtown revitalization efforts. One potential location is the street segment between City Hall and the library, which could be designated and improved as a festival street that could be closed to traffic and used as a plaza, as is done currently with the farmers' market. This downtown gathering function could be supplemented by an interactive fountain or water playground at an adjacent integrated site.

[1] *The Camas Community Recreation Center: Keeping the Vision Alive, an Updated Financial Analysis, Camas Community Center Development Committee (2012).*

Proposed Columbia Viewpoint (SU-11)

During development of the plan, feedback from the community indicated a need to improve access to and views of the Columbia River. There are currently little to no opportunities to view the Columbia River in Camas because of the presence of SR-14, which serves as a barrier. Site SU-11 offers an opportunity for a viewpoint of the Columbia from the City's trail system. This site is likely to be accessible only by foot or bicycle, but is desirable as a viewpoint with a character of solitude. Parking should be provided near access trails to this site.

Prune Hill Sports Park (SU-12)

The Prune Hill Sports Park is located adjacent to Prune Hill Elementary School, and includes a sports field complex and restrooms. Additional facilities, including a gymnasium, parking, and a playground, are located on the school grounds. Parking and field use is shared between the school and the park with 22 parking spaces reserved for park use and the school having use of the fields for physical education classes. The City should also consider field upgrades, limiting these upgrades if field lighting is not possible due to impacts to the neighborhood.

Proposed Camas Sports Field Complex (SU-13)

Planned growth areas north of the lake will require nearby sports facilities. To meet the need for additional ball fields, Camas should acquire a large parcel of land within this future growth area north of the lake for use as a sports field complex. This facility would concentrate on competitive level play and offset some of the demand for sports field use in other areas of the city. Ideally, this facility would be created in partnership with the Camas School District and located in such a way that maximum use, including field lighting and artificial turf, is possible.

3.5 Recreation Facility Recommendations

This section discusses recommendations for recreation facilities. This includes many of the elements that are included in neighborhood parks as well as the more specialized facilities that may need a special use site.

Sports Facilities

Organized sports have been and continue to be a popular activity in Camas. During the planning process, the community identified a need for more sports fields, while City staff and PAC members discussed the need for improved scheduling of these facilities to manage their use. The following provides three recommendations to improve sports facilities, in addition to maintenance recommendations provided in Section 6.

1. **Provide informal fields at new neighborhood parks.** Camas should provide at least one rectangular informal or practice field at each new neighborhood park site, and if possible, should provide more than one field. These fields should be scheduled for team practices and games at lower levels of competition, but should also have unscheduled time for casual play.

2. **Concentrate competitive play.** Camas should develop a sports complex, a park with multiple fields (four to five softball or baseball and/or three or more soccer) with support facilities suitable for league play and tournaments. As described previously, SU-5 and SU-13 present good opportunities to work with the school district to provide shared facilities. Either location would provide a good starting point, but ultimately the City may require build out of both sites to meet the demand for competitive play as the community grows. Alternatively, the City could locate a sports complex in other underdeveloped sites in Camas. The location should conform to the design and development guidelines for special use areas (Appendix B), in a setting that would minimize impacts to nearby residential uses.

3. **Evaluate upgrades to existing fields to increase hours of use.** The fields in Camas are generally in very good condition. However, most fields were not built for the heavy use they receive. Field quality impacts the amount of time available for public use.

To expand the capacity of existing fields, Camas should consider upgrades to existing facilities to increase hours of community use, improve quality, and reduce maintenance demand. Turf renovation, conversion to sand-based fields (instead of earth-based fields), subsurface drainage improvements, and conversion to artificial turf are all options to consider. There are costs and benefits of each of these solutions, and the City should evaluate each situation to determine the best solution. Lighting should be a priority for enhanced fields to allow for extended playing time. The City should consider use of artificial turf only in lighted facilities.

Aquatics Facilities

Currently, the Crown Park pool is the only public swimming pool in Camas and the only public outdoor pool in Clark County. There are also indoor pools provided by others, including Lacamas Swim and Sport in Camas and the Firstenburg Center in Vancouver, WA.

Feedback from the public reinforced the importance of aquatic facilities and water play in Camas, as previously identified in the 2000 and 2007 PROS planning efforts. As the 2006 survey and 2013 questionnaire results indicated, public demand for a swimming pool remains high, as it was in 1999. The City conducted a feasibility study for an indoor aquatic center for the Camas-Washougal area in 2001, and an independent committee conducted a more recent study in 2012. The biggest constraints on aquatics facilities in Camas (as in other communities) are the cost of pool development and the ongoing operations cost.

Crown Park Pool

As part of the 2014 PROS update process, the planning team met with members of the Planning Advisory Committee to discuss the aquatic facility options presented in the 2007 PROS Plan. Built in 1954, the pool at Crown Park is suffering from an aging structure and equipment that has outlasted its design life. As outlined in the previous PROS Plan, the pool will continue to fail until it eventually becomes inoperable. Along with results from the public intercepts and community questionnaire, as well as discussions with City staff, the results of this meeting indicated a preferred direction for the aging Crown Park Pool.

1. **Continue to provide routine maintenance.** The City should continue with routine maintenance of the pool until a new facility is available to the public.

2. **Build a new pool as part of an indoor recreation center.** The City should find a suitable location for a public pool at another location, such as the Community Recreation Center or another site that is centrally located to the majority of Camas residents.

3. **Replace the pool with a new recreational facility.** Replacement of the pool should be based on a future master plan for Crown Park. A water playground or sprayground is a popular type of facility that may function well as a replacement of the Crown Park pool. Spraygrounds are play areas where water is sprayed from structures or ground sprays and then drained away before it can accumulate. These playgrounds with water features are sometimes referred to as aquatic playgrounds, splash pads, or water play areas.

Indoor Aquatic Center at a Community Recreation Center

If Camas pursues a public indoor swimming pool, it should be part of a full-service community recreation center and not a stand-alone indoor pool. The aquatic element should be considered as part of the operating pro forma for the community recreation center. An outdoor pool element could be considered for the community recreation center. To serve the most users, Camas should consider incorporating both a leisure pool and a competition pool at the community recreation center.

- **Leisure pool.** A leisure pool is generally free-form in shape and often varies from 0 to 4 or 6 feet in depth. These pools usually contain a shallow area for small children, along with free play area and special effects facilities, such as water slides, bubble pool, current channel, swirl pool, or water playground. The leisure pool is a place for fun and water play rather than competitive swimming.

- **Competition swimming pools.** These pools are usually rectangular in shape and are generally in lengths for competitive swimming (25 m or 25 yd). These pools generally range in depth from 3.5 to 8 or 12 feet, and sometimes have a diving board. These two types of pools attract different interest groups and age profiles.

As a result, they have different operating requirements, user capacities, and revenue generation potential. Camas should avoid a 50-meter pool, because these generally have the highest operating cost and limited additional value to the majority of the community.

Indoor Recreation Facilities

Camas needs indoor recreation space that supports a broader range of activities than the aging Community Center. The community's need for indoor space dates back to before the 2000 Plan, and was reconfirmed in 2006/2007 and again during this 2014 PROS Plan update. Many communities in the Northwest are adding multi-use recreation centers because of the recreation opportunities they provide, particularly during rainy winter months. If designed correctly, a recreation center can offer a wide variety of activities while meeting financial goals for operation. The public also expressed interest in creating an indoor play area that could be located in a new recreation center or other indoor public facility such as the existing Community Center building.

Community Recreation Center

In Camas, the preferred model for an indoor center is a multi-purpose community recreation center that provides rooms for receptions, meetings, and large group gatherings, as well as gymnasiums, fitness rooms, and classrooms. The Camas Community Center Development Committee identified a potential site along Lake Road, known as the Buhman property and identified as SU-8 on the concept map, which could be a suitable location.[2]

The next step in pursuing the center is to conduct a detailed feasibility study to identify the building program that is the best fit for the financial goals. The City should also consider outcomes and recommendations of the financial analysis conducted by the Camas Community Center Development Committee. While the feasibility study will determine the best program of uses to meet the desired financial goals, the following facilities should be considered for an indoor recreation center:

- Gymnasium (at least one full-sized court)
- Multipurpose room for special events, receptions, and dance classes
- Catering kitchen

[2] *The Camas Community Recreation Center: Keeping the Vision Alive, an Updated Financial Analysis, Camas Community Center Development Committee (2012).*

- At least two classrooms/meeting rooms to accommodate various sized groups
- Exercise room (aerobics, dance, fitness classes)
- Fitness center
- Support facilities, including lobby, restrooms, office space for center staff, locker rooms, storage space, etc.
- Arts and crafts room
- Concessions/vendor space such as a coffee kiosk or snack bar
- Indoor leisure and conventional pools
- Potentially a youth center and/or a senior center.

Lacamas Lake Lodge

The Lacamas Lake Lodge is located near Heritage Park along Lacamas Lake and Lake Road. Located on the site formerly occupied by the Camas Moose Lodge, the new building provides community meeting and event space as well as improved access to Lacamas Lake and public parking. This facility is intentionally designed for multiple uses but is especially well suited to rent for events. The City should program this facility to support recreation but ensure that this use does not interfere with the rental use, which will maximize the revenue stream to support this facility and other City services.

Camas Community Center

The Camas Community Center is a historic school building located south of the Washougal River and downtown Camas. The City uses this structure as the offices for the Park Department, in addition to providing some recreation programming space and rentals. This facility has limited function as a recreation center due to its small size, limited amenities, location, and lack of expansion room. Additionally, the facility would require extensive and expensive upgrades to extend its useful life. If Camas proceeds with a community recreation center, the City should reconsider the role of the Camas Community Center since the recreation center will accommodate the recreation uses of the Community Center.

A range of options is possible for the Community Center.

1. **Surplusing the property.** Camas could surplus the property, either selling or donating it to another user. This would reduce the operating impacts to the City, and reduce the need for future capital projects at the center.

2. **Leasing the property.** Camas could lease the property to another user. Depending on the lease agreement, the operating impacts to the City could be reduced, while still keeping the property in public ownership.

3. **Continuing public ownership.** Public ownership could continue with the same or different uses. Under this option, Camas would retain ownership, but could change the use. For example, the Community Center could become a maintenance headquarters, or be improved to provide a range of recreational opportunities such as an indoor play area.

Other Recreation Facilities

Camas has a highly developed park system that supports a broad range of recreation interests. As confirmed through the public involvement process, the community highly values the park system, and has expressed interest in additional recreation facilities to supplement the existing offerings.

Off-Leash Dog Area

An off-leash dog area provides a location where residents can allow their dogs to play and exercise off-leash. An off-leash area should be at least one acre in size, be fenced with a double-gated entry, have nearby parking, and include amenities such as pooper scooper stations, water, benches, and trash cans. The site should also be safe, not isolated, and noise impacts on neighbors should be considered. This facility may be a prime opportunity to cooperate with neighboring Washougal or Clark County to create a facility with a regional draw.

Water Access

Water access to the Washougal River, Lacamas Lake, Fallen Leaf Lake, and the Columbia River continues to be a high priority for residents. Camas should maximize water access opportunities at all waterfront parks and should target acquisition of additional waterfront park

sites. Water access means trails, viewpoints, overlooks, and non-motorized boat access, and does not necessarily mean boat ramps and similar high intensity facilities. The City should base improvements in public water access and use on the goals, policies and regulations of the Shoreline Master Program (2012).

Pilot Projects

There are a range of facilities, including those that support new or emerging types of activities, which could be provided in the city's park system. In addition to those previously mentioned in this section, other types of facilities identified by the public included community gardens, bike skills parks and bike pump tracks, covered play areas, fitness courses and others. Though the park system has limited space to accommodate all of these facilities, the City can develop pilot projects in coordination with user groups at suitable locations. Pilot projects allow the City to test the performance of added features through a limited or conditional use agreement with project proposers. After a predefined trial period, the City should reevaluate successful projects as permanent park features.

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SECTION 4. TRAILS

4.1 Trails Plan Concept

Trails are an important recreation asset in Camas, and residents continue to place a high priority on a community-wide trails network. Results from public outreach activities from past plans, as well as the most recent PROS Plan update process reinforce the community's commitment to trail-related recreation and reflect the high popularity of recreation activities that take place in trail corridors, such as walking, bicycling for pleasure, nature walks, and jogging/running. The questionnaire results in Appendix A describe these findings in greater detail and include comparisons to the 2007 PROS Plan outcomes.

As with the 2007 PROS Plan, the Parks, Recreation and Open Space Comprehensive Plan Update responds to community needs and priorities by recommending a network of trails that provides linkages within the community as well as to the region beyond. Based on feedback from the community, there is strong support for trails and connections that provide:

- Direct and safe connections to school, work and home;
- Looped routes for fun, enjoyment and recreation;
- Trails and trailheads that provide scenic views of surrounding natural beauty, especially Lacamas Lake, Mt. Hood, the Columbia River and Columbia Gorge;
- Trails designed for multiple users to enjoy without conflict; and
- Facilities that are accessible, efficient and well maintained.

The trails plan provides connections between parks, open spaces, schools, and neighborhoods, and incorporates the Vancouver-Clark County regional trails, City of Washougal and Port of Camas-Washougal facilities, and the Camas Open Space Network into a cohesive trail system for the community. The trails plan also supports neighborhood connections to the community-wide system, and provides for trailhead support facilities to encourage trail use.

4.2 Existing Inventory

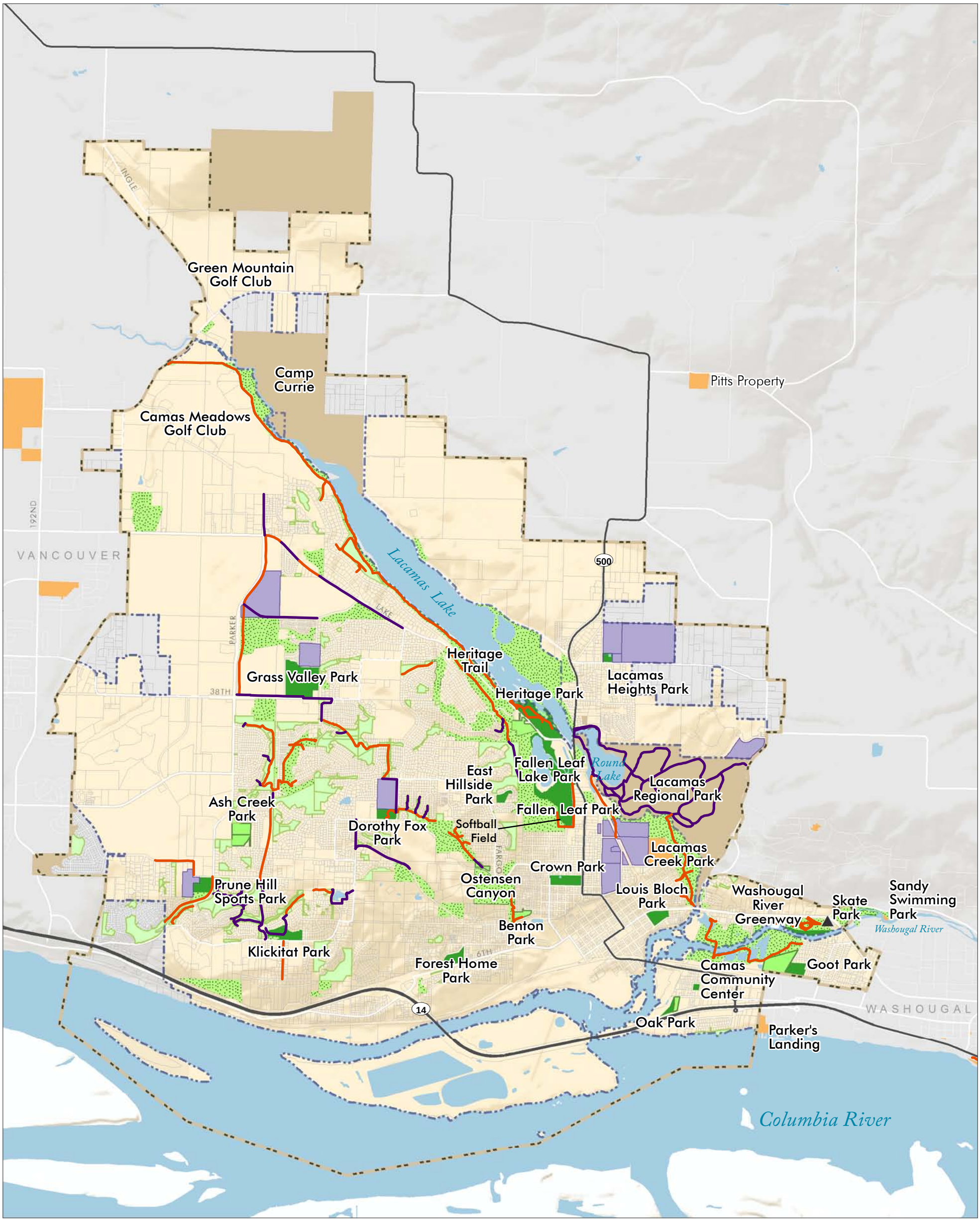
There are currently 25.3 miles of existing trails within the planning area. These include three major trail routes, and several other segments owned by the City and others. The City has connected many shorter segments into longer continuous segments. However, several missing segments will require completion to create an interconnected system. Table 4.1 details the existing trail inventory in Camas.

Table 4.1
2014 Trail Inventory

Trail Name	Length in Miles	Description
Heritage Trail	3.5	Unpaved; trailhead at Camas Heritage Park; runs along Lacamas Lake
Lacamas Park trails (county)	4.6	0.14 miles paved; 4.48 miles unpaved; other informal paths; natural open space
Washougal River Greenway trails	0.9	Partially paved with other informal paths
Other Trails	16.2	Various segments owned by the City and a number of Homeowners' Associations.
TOTAL	25.3	

Existing trails include the Heritage Trail along Lacamas Lake, a heavily used nature trail. The trails in County-owned Lacamas Park and City-owned Lacamas Creek Park provide outdoor experiences and are easily accessible by the public. The Washougal River Greenway provides contact with the Washougal River, and is used by Camas residents as well as regional users. Camas has made great progress towards an interconnected trail system, but there continues to be a lack of connections between individual trail segments.

According to 2006 survey results and results of the Community Recreation Questionnaire (Appendix A), one of the most significant reasons people don't use trails more frequently is lack of connections. The Existing Trails System Map on the following page shows the existing trails in Camas.



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Parks, Recreation and Open Space Comprehensive Plan Update

Existing Trails

City Trail
Other Trail
City Park
City Open Space
City Undeveloped Park
Private / HOA Open Space
Other Park
County Park
School
Water
Camas UGA Boundary
City of Camas
Taxlots
Other City
Highway

0 0.5 1 Miles

MIG

9.9.2014 | Data source:
Clark County GIS, USGS, ESRI, NOAA

4.3 Recommended Trails Plan

The recommended trails plan provides a linked system based on a hierarchy of trail types. Linkages are provided at the neighborhood scale, at the communitywide scale, and regionally. The trails plan also takes advantage of existing and planned public land and utility infrastructure, the open space network, and the existing trails provided by private developments (Trails System Concept Map). In addition, the recommended trails plan incorporates the Vancouver-Clark County trails plan and the City of Washougal's trails plan.

Carried forward from the 2007 PROS Plan, each trail segment is designated by a reference, such as T-1 (designating trail segment 1). The Trails System Concept Map provides an overview of the segments, described in detail below. Proposed segments of the trail system are generalized to make connections or follow the direction of natural corridors. Final alignments are subject to change due to environmental conditions, development or alternate routes. Table 4.2 summarizes trail recommendations.

There are two types of trails shown on the Trails System Concept Map: those owned and maintained by the City and those owned and maintained by other parties. By focusing on connecting individual segments, the Camas trail network will provide a wide variety of pathway experiences and tie together regional and community connections. Appendix B (Design & Development Guidelines) provides trail development policies and further guidance for development of the system.

Trail Segment Descriptions

Trail T-1

Trail T-1 runs along the west side of Camas, paralleling Parker Road. This trail segment provides a north-south connection and links two regional trails. About half of the alignment has been constructed. This segment passes from Prune Hill Park, to Ash Creek Park, past Sky Ridge Middle School and ending at its junction with T-3.

Trail T-2

Trail T-2 parallels the Columbia River. This regional trail is an extension of the Vancouver-Clark County trail system, and connects to neighboring Washougal's trail system. This trail provides visual access to the Columbia River, and makes an important regional connection.

Trail T-3
Trail T-3 is a regional trail running along the north shore of Lacamas Lake and connecting Lacamas Park, Camp Currie and the County's Green Mountain Trail heading north. Trails T-3 and T-4 make a loop around Lacamas Lake. This trail segment will include bridges or boardwalks across wetlands and water features in some locations. T-3 continues just north of Lacamas Park and then south, crossing T-4 at the Washougal River and continuing on to the Columbia River and trail T-2.

Trail T-4
Trail T-4 is the Heritage Trail, a regional trail running along the south side of Lacamas Lake and connecting Lacamas Park and Camp Currie. It passes through Heritage Park and will link to planned segment T-3, creating a loop around Lacamas Lake. T-4 links through Lacamas Park, continues into the Washougal River Greenway, and includes a bridge across the Washougal River to connect with T-17.

Trail T-5
Trail T-5 provides a loop around Prune Hill, with linkages to parks and neighborhoods. The northern half of the loop connects from Lake Road through the Open Space Network to the proposed Ash Creek Park. The southern half of the loop connects from Klickitat Park, continues through the Open Space Network, and connects Fallen Leaf Park. Camas has been completing pieces of trail T-5 as development has occurred along the alignment.

Trail T-6
Trail T-6 parallels Lake Road, connecting from T-1 to T-21. This segment has been partially constructed.

Trail T-7
Trail T-7 connects from T-5 through Grass Valley Park and parallels NW 38th Avenue toward the west boundary of Camas. The segment of the trail in the vicinity of Grass Valley Park has been constructed.

Trail T-8
Trail T-8 is a north/south connector that connects through the center of the T-5 loop. This trail connects through the Open Space Network and passes Dorothy Fox Elementary School and Dorothy Fox Park. The trail also includes several spur connections to T-9 and T-7 as well as a pedestrian bridge connection to T-9 across Ostensen Canyon.

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Parks, Recreation and Open Space Comprehensive Plan Update

Trail System Concept

M I G

9.9.2014 | Data source: Clark County GIS, USGS, ESRI, NOAA

- Primary Trailhead
- Secondary Trailhead

Existing Trail System

- City Trail
- Other Trail

Proposed Trail System

- Proposed Trails
- Other Trail

- City Park
- City Open Space
- City Undeveloped Park
- Private / HOA Open Space
- Other Park
- County Park
- School
- Water

- Camas UGA Boundary
- City of Camas
- Taxlots
- Other City
- Highway

0 0.5 1 Miles

Trail T-9
Trail T-9 connects from T-3/T-4 past Zellerbach Elementary School and Liberty Middle School (the renovated high school), through downtown, and then passes through the Benton Park and Ostensen Canyon sites. This trail then connects to trail T-8 at a bridge across Ostensen Canyon and at Dorothy Fox Park before turning south to reconnect to T-5.

Trail T-10
Trail T-10 includes a mini network of connections from neighborhoods to Klickitat Park and Prune Hill Sports Park. The trails also link to T-1, T-5 and T-11. This trail is owned and maintained by local Homeowners' Associations, is located largely within the Open Space Network, and is nearly complete.

Trail T-11
Trail T-11 is a loop that connects Klickitat Park to the overlook at SU-9.

Trail T-12
Trail T-12 connects from T-5 at Fallen Leaf Lake to a proposed neighborhood park.

Trail T-13
Trail T-13 is the trail network around Fallen Leaf Lake. This trail connects to Fallen Leaf Park as well as T-4 and T-5. The City has already completed several sections of this trail.

Trail T-14
Trail T-14 connects from T-3 and Lacamas Park to a planned neighborhood park, Lacamas Heights Elementary School, and Camas High School. T-14 also forms a loop with T-3 and T-27.

Trail T-15
Trail T-15 includes the Lacamas Park trail network. This system provides important community connections between T-3 and T-4.

Trail T-16
Trail T-16 provides a linkage from Louis Bloch Park to the Washougal River Greenway.

Trail T-17
Trail T-17 is the Washougal River Greenway trail system on the south river bank. This trail segment passes through the Washougal River Greenway, providing access to the river corridor for Camas, Washougal, and regional residents. This trail segment is joined to T-4 by a pedestrian bridge across the Washougal River to link the Greenway corridor and increase access. T-17 links to Oak Park, Goot Park, and T-2, the Columbia River trail.

Trail T-18
Trail T-18 follows a utility corridor from Washougal and meets up with Trail T-4 in the Washougal River Greenway. T-18 is also a proposed trail in the Washougal Comprehensive Park and Recreation Plan.

Trail T-19
Trail T-19 connects Lacamas Park trails to the north-south trail T-18 and to the Washougal trail system. This trail should be a jointly maintained connection between the two cities.

Trail T-20
Trail T-20 provides a secondary east-west connection between T-1 and T-21 in the northwestern corner of the City.

Trail T-21
Trail T-21 is a north-south connection on the western edge of Camas. It connects from T-4 south to T-1. East-west connections to T-21 are provided by trails T-6, T-7, T-20, T-22 and T-24.

Trail T-22
Trail T-22 includes the Leadbetter Corridor and connects T-6 east-west across T-1 to T-21.

Trail T-23
Trail T-23 connects through the open space network from the intersection of trails T-1 and T-22 to trail T-21.

Trail T-24
Trail T-24 connects trail T-23 with Prune Hill Sports Park and Trail T-1.

Trail T-25
Trail T-25 connects T-5 to Forest Home Park.

Trail T-26
Trail T-26 connects T-5 and T-8 to Grass Valley Park through a portion of the Open Space Network.

Trail T-27
Trail T-27 is the primary trail that will connect uses along the north shore of Lacamas Lake. This route will run parallel to the future realignment of Leadbetter Road and provide a continuous trail from the northern corner of the city towards Lacamas Park to the southeast.

Trail T-28
Similar to Trail T-32, Trail T-28 will link land uses on the north shore of Lacamas Lake. The City should design and construct this segment concurrent with future utility lines and pump stations planned to serve future uses.

Trail T-29
Trail T-29 will provide an alternative trail connection for residents of this future growth area.

Trail T-30
Trail T-30 will provide an alternative trail connection for residents of this future growth area.

Trail T-31
Trail T-31 will connect opposite sides of Camp Currie with a more direct route.

Trail T-32
Similar to Trail T-28, Trail T-32 will link land uses on the north shore of Lacamas Lake. The City should design and construct this segment concurrent with future utility lines and pump stations planned to serve future uses.

Trail Recommendations

Table 4.2 summarizes the recommendations for the Camas trail network. Trails T-27 though T-32 comprise trails in areas recently brought into the city limits. The 2007 PROS Plan identified several of these prior to their annexation into the city. While the specific alignment of these trails will be based on future development proposals, these segments will provide key connections north of Lacamas Lake.

Table 4.2
Summary of Trail Recommendations

Trail #	Name	Total Miles	Comments	City Maintained
T-1	West Camas Regional Trail	2.1	Completion/ Acquisition/ Development	✓
T-2	Columbia River Regional Trail	6.6	Acquisition/ Joint Development	✓*
T-3	East Camas Regional Trail*	7.9	Clark County Development	✓
T-4	Heritage Trail	1.8	Minor Additions/ Improvements/ Development of Washougal River crossing	✓
T-5	Camas Neighborhood Loop Trail	3.1	Additional Acquisition/ Development	✓
T-6	Lake Road Connector Trail	1.0	Completion/Upgrade to Standard	✓
T-7	West Camas Connector Trail	2.1	Completion/Upgrade to Standard	✓
T-8	Prune Hill Connector Trail	0.9	Completion/Upgrade to Standard	
T-9	Downtown Connector Trail	0.4	Completion/Upgrade to Standard	✓
T-10	Deer Creek Connector Trail	0.2	Completion/Upgrade to Standard	
T-11	View Ridge Connector Trail	0.3	Completion/Upgrade to Standard	✓
T-12	East Hilltop Connector Trail	0.2	Acquisition/ Development	✓
T-13	Fallen Leaf Lake Trails	1.8	Development/ Completion of Acquisition	✓
T-14	Lacamas Heights Connector Trail	1.1	Acquisition/ Development	
T-15	Lacamas Park Trails	3.7	No Changes	

Trail #	Name	Total Miles	Comments	City Maintained
T-16	Louis Bloch Connector Trail	0.3	Acquisition/ Development	
T-17	South Camas River Loop	3.3	Acquisition/ Development	✓
T-18	Washougal Connection	1.5	No Action	
T-19	Washougal Connection 2	0.6	No Action	✓*
T-20	Northwest Connector	0.8	Acquisition/ Development	
T-21	Westside Route	3.4	Acquisition/ Development	✓
T-22	Leadbetter Corridor	0.3	Acquisition/ Development	✓*
T-23	Natural Trail	2.6	Acquisition/ Development	
T-24	Prune Hill West Trail	0.9	Acquisition/ Development	
T-25	Forest Home Park Connection	0.8	Acquisition/ Development	
T-26	Grass Valley Link	0.9	No Changes	
T-27	North Camas 1	4.7	Acquisition/ Development	✓
T-28	North Camas 2	1.1	Acquisition/ Development	✓
T-29	Green Mountain 1	2.8	Acquisition/ Development	
T-30	Green Mountain 2	0.3	Acquisition/ Development	
T-31	Camp Currie Connection	0.3	Acquisition/ Development	✓
T-32	North Camas 3	0.8	Acquisition/ Development	✓
	TOTAL	58.6	Total City/Joint Maintained Trails	40.0 miles

*Jointly maintained

Trailhead Recommendations

Trailheads are another key component of the trail system. These facilities serve as access points, encourage use of the trail system and establish support facilities at stand alone sites or within existing and future parks and open spaces. The Trails System Concept Map depicts the recommended location of trailheads. There are two types of proposed trailheads. Primary trailheads include restrooms and designated parking, while secondary trailheads provide trail access but not restrooms. In some cases, trailheads are incorporated into existing or proposed parks. In other cases, trailheads will be developed for that single purpose.

Table 4.3 summarizes the recommended trailheads. For proposed trails north of Lacamas Lake, the City should consider providing additional trailheads upon further planning of this area. Appendix B provides additional design and development considerations for future trailheads in Camas.

Table 4.3

Summary of Recommended Trailheads

ID	Location	Type
a	Camas Meadow Greenway	Primary
b	Skyridge	Secondary
c	West Camas Park	Secondary
d	Grass Valley Park	Primary
e	Ash Creek Park	Secondary
f	Prune Hill Sports Complex	Primary
g	Klickitat Park	Secondary
h	Dorothy Fox Park	Primary
i	Fallen Leaf Lake Park	Secondary
j	Heritage Park	Primary
k	Lacamas Heights Park	Secondary
l	Fallen Leaf Lake	Secondary
m	Lacamas Park	Secondary
n	Hellen Baller/Liberty MS	Secondary
o	Lacamas Park South	Secondary
p	Washougal River Greenway	Primary
q	Oak Park	Secondary
r	Goot Park	Primary
s	Washougal River Greenway 2	Secondary
t	Washougal River Greenway 3	Primary
u	Lacamas Lake 1	Secondary
v	Lacamas Lake 2	Primary
v2	Lacamas Lake 3	Primary
w	Columbia Viewpoint	Secondary
x	Lacamas Park East	Primary
y	Sports Park	Primary
y2	Lacamas Heights School	Primary
z	Green Mountain Overlook	Primary
z2	Green Mountain Overlook 2	Secondary

SECTION 5. NATURAL OPEN SPACE

5.1 Overview

Camas residents are strongly tied to the area's natural open space, and value the range of benefits these lands provide. As with the City's previous PROS plans, activities that can take place in open spaces, such as nature walks, wildlife watching and hiking, are some of the most popular activities according to public feedback gathered during the planning process. At the same time, the public also prioritizes the natural system benefits these areas provide, such as water quality, wildlife habitat and land preservation. The city has an extensive network of public and private open space sites and has also placed development restrictions on critical areas. As verified by the community, the city's natural open spaces continue to serve a key role in the park and recreation system in Camas.

5.2 Existing Natural Open Space

Natural open space includes undeveloped land left primarily in its natural environment with recreation use as a secondary objective. It may be owned by a public agency or preserved under private ownership. This type of land often includes wetlands, steep hillsides, and large blocks of forested areas or similar spaces. Environmentally sensitive land (or critical areas) can include wildlife habitat areas, stream and creek corridors, or places with unique and/or endangered plant species.

Existing natural open space exists in a number of forms in Camas. This makes for a variety of experiences for hikers and walkers, as well as providing a variety of habitat opportunities. A small number of the open space sites are relatively large in size and contain trail segments. However, many of these sites are independently located and do not all connect together.

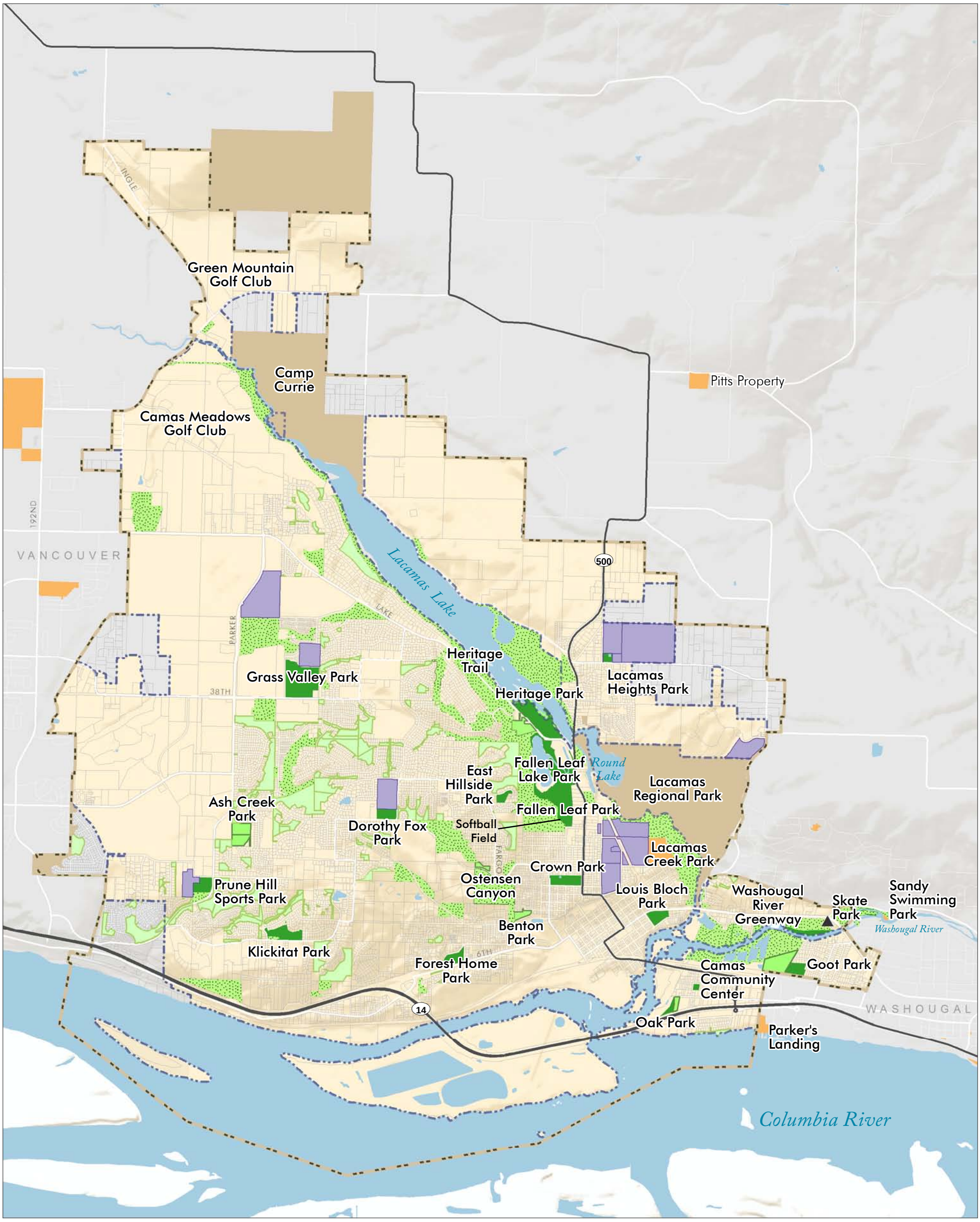
The existing natural open space also varies considerably in terms of character, terrain, vegetation cover and other features. Of concern is that each type of open space requires a different type of maintenance and management. The urban forest in Camas will also require specialized care to maintain the health of the trees and management of invasive vegetation.

The City of Camas owns many parcels of open space. Some of these parcels form large continuous areas while others are smaller and more isolated. The largest City-owned open space sites are called out on the open space inventory below in Table 5.1. The Existing Parks and Open Space Map on the following page depicts the existing natural open space in Camas.

Table 5.1
Summary of Existing Natural Open Space

Natural Open Space	Acres
City-Owned Natural Open Space	
Camas Meadows Greenway	22.4
Heritage Trail Greenway	38.1
Lacamas Creek Open Space	50.3
Ostenson Canyon Greenway	26.8
Washougal River Greenway	95.3
Other City-Owned Natural Open Space	207.4
Clark County-owned Natural Open Space and Regional Parks	543.4
Homeowners Association Owned Natural Open Space	268.7
TOTAL	1,252.4

Other significant natural open space areas include the Clark County owned sites and the many pieces of land owned by various Homeowners' Associations.



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Parks, Recreation and Open Space Comprehensive Plan Update

Existing Parks and Open Space

- City Park
- City Open Space
- City Undeveloped Park
- Private / HOA Open Space
- Other Park
- County Park
- School
- Water
- Camas UGA Boundary
- City of Camas
- Taxlots
- Other City
- Highway

0 0.5 1 Miles

MIG

9.9.2014 | Data source: Clark County GIS, USGS, ESRI, NOAA

5.3 Open Space Components

As defined in previous plans, the goal of this PROS Plan update is to define a permanent open space network from various categories of critical lands and other forms of natural open space. These three basic types of land are:

1) **Existing Natural Open Space:** This is land owned by the City, Clark County or that is owned as permanent open space by homeowner's associations. The Existing Parks and Open Space Map shows the existing natural open space system which currently represents about 1,252 acres of land.

2) **Wetland Areas:** These are areas that are inundated or saturated by surface water or ground water at a frequency and duration to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands typically include swamps, marshes, bogs, constructed mitigation sites, and similar areas, but do not include man-made areas such as ditches, swales, canals, detention and wastewater facilities, or other water features. A number of state and federal regulations are currently in place that either prohibit or limit the amount of development that can occur on or around areas designated as wetlands.

   Wetland areas also require buffers to protect the integrity, function, and value of the wetland. The width of these buffers is established in the Critical Areas Ordinance adopted by the City and is generally based on the intensity of adjacent development and the overall value of the wetland. Because of these development restrictions, wetlands areas provide opportunities for additions to open space systems without substantial acquisition cost.

   There are two major areas where wetlands exist. The largest amount is located in the western portions of the city, generally west of NW Parker Street. The other prolific area of wetlands exists in the Washougal River Greenway area to the southeast. Large portions of this land have been acquired as natural open space already.

3) **Steep/Unstable/Geologically Hazardous Areas:** The City of Camas adopted ordinances and maps providing protection of these areas. Development proposals within these areas are subject to geotechnical work and additional review by the City.

5.4 Permanent Open Space Network

The objective of the PROS Plan update is to combine individual open space parcels into an open space network to preserve vegetation, separate neighborhoods, create a sense of seclusion, protect critical areas, and provide land for trail systems. The 2007 PROS Plan defined the City's open space system as the Permanent Open Space Network or simply "The Network."[1] The Open Space Concept Map depicts the Permanent Open Space Network.

Criteria for Inclusion in the Open Space Network

1) *Continuous Wildlife Habitat:* Typically, urban development separates habitat areas and prohibits wildlife from migrating from one area to another. By providing continuous habitat corridors, these problems can be reduced.

2) *Connecting Existing Open Space:* The basic concept of the Network is to form large parcels of open space. Obtaining connecting open space parcels is the key to this concept.

3) *Drainage and Erosion Control:* The inclusion of steep or unstable slopes, as well as regulations on buffers for streams and creeks means that a number of steps are in place to protect the waterways and control erosion. The Network includes the majority of shorelines, including Lacamas Lake, within the planning area.

4) *Protection of Viewsheds:* A number of open space areas serve to protect views both within the City and from outside.

5) *Interpretation/Education:* A number of wetland sites, waterways, and areas of geologic diversity are included in

[1] *Some areas identified on the Open Space Concept Map are not included in the Network. These areas do not adhere to the criteria for inclusion in the Network.*

the network. These provide educational as well as interpretive functions.

6) *Wetlands:* Inclusion of wetlands and mitigation sites will protect environmentally critical areas and wildlife habitat.

7) *Trail Corridors:* While not a high priority, trail corridors developed concurrently with the Network will provide a safe and enjoyable route for trails. Some natural open space should have limited impact from trails, and thus routing should be outside or at the fringes of the Network corridors.

8) *Maintenance Impacts:* As open spaces are reviewed for inclusion in the City owned and maintained system, cost of maintenance is a factor to be considered in the review. Section 6 outlines the levels of maintenance for different types of natural open space.

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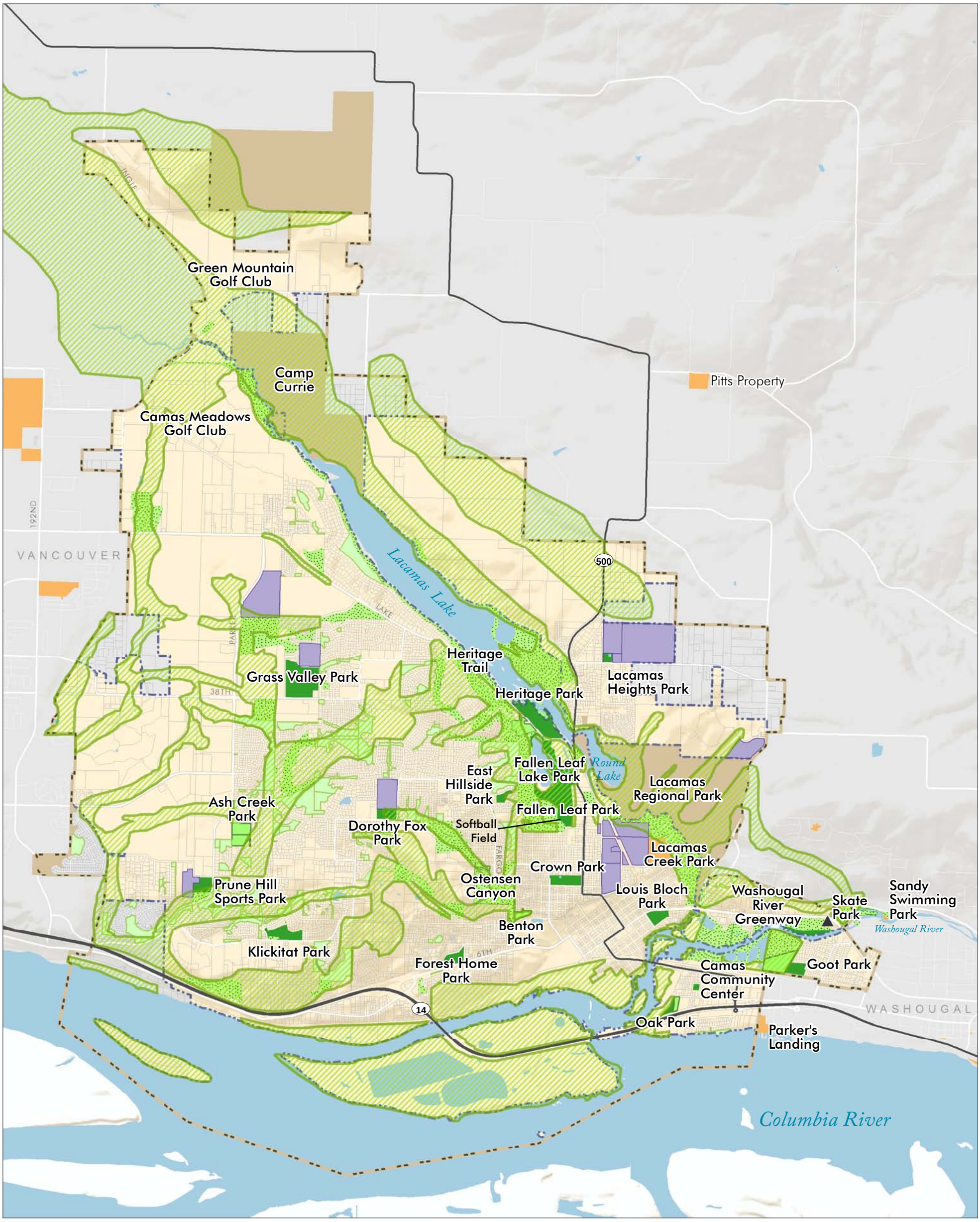

City of Camas WASHINGTON

Parks, Recreation and Open Space Comprehensive Plan Update

Open Space Concept

- Open Space Concept Map
- City Park
- City Open Space
- City Undeveloped Park
- Private / HOA Open Space
- Other Park
- County Park
- School
- Water
- Camas UGA Boundary
- City of Camas
- Taxlots
- Other City
- Highway

0 0.5 1 Miles

MIG

9.9.2014 | Data source: Clark County GIS, USGS, ESRI, NOAA

Network Connections

Network connections are areas needed to connect individual open space parcels together to form a much larger area. In most instances, this land will not fall under one of the other open space categories and so will consist of developable land. This will require purchase at fair market value, relying on park and open space impact fees as the primary funding source.

Network connections should have a high priority of acquisition because of their development potential and the importance of connecting other open space areas. The 2000 PROS Plan identified 170 acres of Network Connection land. Of this total, acreage consists of city-owned land or land dedicated as open space through development of residential uses. Remaining undeveloped land forming connections in the Permanent Open Space Network remains a high priority for acquisition by the City.

Network Policies

The intent of the Network is the creation of a regulatory overlay that will identify the general location of the desired open space areas along with policies related to managing and using these areas. Based on conversations with City staff and input gathered during the planning process, the land identified for inclusion in the Permanent Open Space Network should be accessible to the public, and the City may acquire or accept ownership of these lands. The City prioritizes ownership of land which has the highest values in terms of the "Criteria for Inclusion in the Network," as listed above. With ownership, the City will assume responsibility for managing the City-owned open space. Other network policies include:

1) Specific boundaries of the Network will be identified at the time of specific development and will be determined by the network criteria.

2) Policies described for the acquisition and management of the Network will be followed in the land development process. The City, guided by the criteria for inclusion in the Permanent Open Space Network, will determine the amount and general location of land set aside for the Network.

    - New development must reflect the intent of the Network in configuration and general area.

- Developers may receive density bonuses for land that is dedicated for the Network

3) Natural open space in a development outside of the Network may be reserved for open space but will not receive a density transfer, nor will the City be responsible for the maintenance and management of these areas.

5.5 Open Space and Lacamas Lake

Feedback from the public identified Lacamas Lake as a defining feature of Camas and should be enhanced with new and improved ways for public access, and heightened protections to preserve habitat, views and water quality. Shoreline and upland development and continued use of the lake should be balanced with a mix of policies and projects that restore this valued resource and sustain the long term health of the lake.

Since the 2007 PROS Plan, the City has expanded its boundary and has designated a mix of land uses north of Lacamas Lake. With this addition, the Network includes larger, more continuous open spaces along the north shore of Lacamas Lake and along the north side of the future realignment of Leadbetter Road. These large tracts are designed to recognize the importance of protecting and enhancing the bank and water quality of Lacamas Lake.

The Camp Currie site and the hillside land on the south and west slopes of Green Mountain have also been added. As specific information about the remaining land is acquired, the policies for inclusion in the network should be applied to designate additional land, if necessary.

SECTION 6: MAINTENANCE AND OPERATIONS

6.1 Maintaining the Park System

Camas has a well-planned, well-developed park system. The community values the parks and open space, as well as the high quality of the park system. Feedback from the public indicates that park users and residents are very satisfied with system maintenance, and also feel that the City should focus on upkeep of existing assets before adding new features to the park system. At the same time, there is a perception that older parks receive less attention than newer parks, creating a disparity between established neighborhoods and new growth areas in Camas.

The City should continue to consider maintenance and operation of existing and planned parks and facilities to ensure that the community's assets are maintained and preserved for the future. This section provides recommendations on maintaining and operating the park system.

6.2 Tiered Levels of Service

Camas continues to maximize the maintenance within the resources available, aiming for the high standard the community values. The cuts in service and staffing through the great recession have resulted in a standard level of maintenance across all parks. The current maintenance level focuses on keeping the parks clean and safe to use but does not allow for enhanced or preventative maintenance. These tasks, which protect the long-term investment the community has made in park lands and facilities, are especially important in the most popular and intensively used park sites.

To manage the park system efficiently and assist with resource allocation, Camas should return to a tiered system of maintenance services. This tiered system has a close connection to the maintenance management plan for the park system, which will specify performance standards, frequency goals, and time requirements. The 2007 PROS Plan identified four maintenance levels for traditional parks (detailed in Table 6.1), two for sports fields (Table 6.2) and three levels for natural open space (Table 6.3).

This structure remains valid and should be implemented as City resources allow maintenance to return to a more sustainable level. As a starting point, the City should ensure that all parks and facilities are receiving the basic level of maintenance needed to protect the investment Camas has made in the system. As additional resources are available the parks and facilities indicated for higher maintenance levels can be elevated a step at a time.

Traditional Parks

Traditional park maintenance includes routine care of most parks in Camas, excluding sports fields which are addressed separately. To help allocate staff time and resources, four levels of park maintenance are recommended:

- Level C, the basic level of care for a Camas park, includes all of the services that keep the city's parks looking great, both routine and preventive tasks.
- Level B and Level A are for parks with higher use or more amenities. Parks in this category receive additional maintenance tasks or frequencies to support the higher level of use and more varied facilities.
- The undeveloped level is for future park sites. Some of these sites are completely undeveloped, and are maintained to ensure public safety.

Restrooms can significantly increase the basic maintenance needs; the presence of a restroom should increase the allocated resources for any level of park. This increase should be scaled according to use so that there is an appropriate allocation for restrooms in each maintenance level.

Table 6.1 on the following page summarizes each of the maintenance tiers, and identifies which sites fall under each tier. The maintenance management plan will assign frequencies for each task.

Table 6.1

Traditional Park Maintenance Levels

Maint. Level	Description	Maintenance Overview		Camas Parks Proposed for Each Level
		May Include	**Does Not Include**	
A	Highest level of detailed maintenance, for signature high visibility and most heavily used parks	▪ Camas basic level of care PLUS ▪ Annual plantings ▪ Shrub and landscape beds, ▪ Maintenance of special facilities, e.g. water spraygrounds ▪ Additional urban forest management ▪ Additional turf maintenance to offset impacts of heavy use	N/A	▪ Crown Park ▪ Grass Valley Park ▪ Heritage Park ▪ Lacamas Lake Lodge
B	Enhanced level of care due to moderately high use.	▪ Camas basic level of care PLUS ▪ Shrub and landscape beds ▪ Additional turf maintenance to offset impacts of use	▪ Annual plantings	▪ Dorothy Fox Park ▪ Fallen Leaf Lake Park ▪ Forest Home Park ▪ Goot Park ▪ Klickitat Park ▪ Louis Bloch Park ▪ Prune Hill Sports Park
C	Camas basic level of care: regular maintenance to preserve assets, ensure safety, and contribute to community livability.	**Standard Tasks** ▪ Mowing and trimming ▪ Playground safety inspections ▪ Restroom cleaning* ▪ Trash removal ▪ Paved surface maintenance ▪ Parking lot maintenance ▪ Lighting maintenance ▪ Irrigation maintenance ▪ Edging **Preventive Tasks** ▪ Annual fertilization ▪ Pruning ▪ Structure evaluation *where present	▪ Landscape beds ▪ Annual plantings ▪ Water features	▪ Benton Park ▪ Camas-Washougal Skatepark ▪ Oak Park ▪ Washougal Greenway Boat Launch
Undeveloped	Sites reserved for future park use. May contain preexisting non-park uses.	▪ Hazard mowing and tree maintenance to sustain the site and provide for public safety. ▪ May require additional maintenance to support preexisting non-park use		▪ Ash Creek Park ▪ East Hillside Park ▪ Lacamas Heights Park ▪ Ostenson Canyon

Sports Fields

Camas has a well-used and highly developed inventory of baseball, softball and soccer fields that is supplemented by less formal turf areas suitable for practice and casual play. Some of Camas's fields receive extensive maintenance support from the partnering sports organizations such as the Little League. In some of the City's park sites, such as Louis Bloch Park, sports fields and the supporting facilities are the primary developments on the site. In other parks, such as Crown Park, the grass field is simply one of a wide variety of amenities. As with general park maintenance, the current maintenance budget has strained the ability of Camas to do more than mowing and litter collection at sports fields. The continued heavy use of fields without additional maintenance resources has reduced the playable field time and the quality of some fields, particularly where there is not additional support from community organizations.

To maintain access and equity of use across the sports fields in Camas, the City should take a more active role in scheduling field time. Recognizing the interrelated nature of City and School District sports fields, a coordinated field use meeting should be convened annually between the City, the School District and representatives of the community sports organizations to identify issues and coordinate the best utilization of the community's inventory of sports fields. This meeting should include conversation about the maintenance needs and resources available from all parties.

The cost of maintaining a particular field type can be estimated based on the type of use it will get, the design of the facility, and the underlying conditions of the site. Recognizing the large differences in upkeep of formal and informal fields, two levels of maintenance are recommended. These levels of maintenance can then have budgeted costs that will help to allocate the appropriate level of funding for these important facilities. Table 6.2 describes the two levels.

Table 6.2
Sports Fields Maintenance Levels

Field Type	Maintenance Overview	Existing Fields Proposed for this Maintenance Level
Formal	Formal sports fields are designed and built to a specification for one or a variety of specific uses. The maintenance of these fields should include all of the basic turf care practices as well as: ▪ Higher frequency mowing ▪ Over seeding ▪ Intensive fertilization ▪ Aeration ▪ Rigorous weed control ▪ Heavy irrigation ▪ Priority repair of irrigation ▪ Priority drainage fixes ▪ Spot sod replacement ▪ Chalking field lines ▪ Infield repair ▪ Priority maintenance of backstops, fencing, goals, etc.	▪ Grass Valley Park ▪ Dorothy Fox Park ▪ Fallen Leaf Lake Park ▪ Prune Hill Sports Park ▪ Forest Home Park ▪ Louis Bloch Park
Informal	Informal sports fields include a range of facilities, from open turf areas to casual baseball or soccer fields. These fields should be maintained to the turf standard described in the traditional park maintenance level they are assigned to.	▪ Klickitat Park ▪ Goot Park ▪ Crown Park ▪ Oak Park

Natural Open Space

Natural open space areas have very different maintenance requirements from active use parks. For budgeting and goal setting purposes, each natural open space area should be assigned into one of three levels of maintenance. For each of these levels of maintenance, specific maintenance tasks should be assigned that will keep the area up to the standard described below in the maintenance overview. Since very limited maintenance occurs in these areas at the current time, assigning sites to these levels will result in increased maintenance at most sites. Table 6.3 describes the three levels.

Table 6.3
Natural Open Space Maintenance Levels

Maintenance Level	Maintenance Overview	Example
Level 1	Sites designated Level 1 are the most heavily used natural open space areas or those with the highest natural resource values. Level 1 sites receive more frequent trail maintenance and more forest and vegetation management than levels 2 and 3. Natural resource value should be maintained and improved, if feasible. The goal for Level 1 sites is to eventually develop a specific management plan that provides site-specific direction on topics such as weed control, forestry, revegetation, public use, and litter control.	▪ Heritage Trail and Greenway ▪ Lacamas Creek Park ▪ Washougal River Greenway
Level 2	Level 2 is most appropriate for moderately used sites or sites with good resource value. Sites designated Level 2 should be managed, at minimum, to control invasive species. Trail maintenance and tasks that support public use are completed to the extent feasible within budget and volunteer limitations.	▪ Ostenson Canyon Greenway
Level 3	Sites designated Level 3 should be managed for hazard mitigation only, such as removal of a tree in danger of falling on a trail or onto neighboring property. This level of service is most appropriate for sites with lower use or with lower resource value.	▪ Lacamas Creek Open Space

6.3 Additional Maintenance and Operations Recommendations

1. **Base capital decisions on the long-term costs and benefits of project options.** During project planning and design, consider lifetime project costs – capital costs plus operating and maintenance costs – when making project decisions. Decisions made during the project design have significant impacts on the cost and level of effort required to maintain parks. Since capital project funding is more readily available than operations funding, project decisions should factor in the operating impacts as part of the decision-making. Camas has a highly skilled operations and maintenance staff who, if involved in the design process, could suggest operational savings opportunities. For example, spending additional money on soil preparation or synthetic turf up front can greatly reduce the lifetime maintenance and operations costs, and at the same time result in projects that support increased public use. Other design decisions, such as using path locations to separate turf from planting areas, adding concrete mow strips under fences, and using a consistent palette of materials and site furnishings, also have potential to reduce lifetime maintenance costs. Designing projects that use less energy or water also can reduce the long-term cost of a project.

2. **Target invasive plant species in Camas natural open spaces, parks and the interface between public and private property.** Camas should identify and target the highest impact interventions to the invasive plant species, which are largely unchecked in Camas natural open spaces. In addition, the City should develop and implement a preventive weed and pest management program for its parks and natural open space areas, with noxious weeds the highest priority. Although devoting staff hours to weed prevention will result in less time available for routine maintenance, preventing weeds before they grow and keeping them from spreading will pay off in the long run, by improved park appearance and reduced weed removal efforts. If invasive weeds originate from private property and encroach onto the City-owned natural open space network, it will be the homeowner's responsibility to remedy the problem or shoulder the burden of cost.

3. **Monitor and manage forest heath in Camas.** The City has a partial baseline tree inventory/forest health survey, initiated in 2006. Gaps in the understanding of city-wide forest health should be filled in with supplemental field work. Management of forest health should be considered a priority to maintain the natural look and feel of the community. The City's survey of forest health should be refreshed at least every six years, in parallel to the park and open space plan update, to ensure that the City-owned natural open space network retains its resource value and thrives.

4. **Develop a detailed list of the assets at each site and evaluate asset condition annually.** This task is important for the long-term management of the Camas park system. By developing detailed inventories and rating the condition of the assets on a scale of one to three or one to four, the Parks Maintenance division will be able to plan its workload more effectively and budget for repairs and upgrades. The asset inventory can also be used in the City's maintenance management plan, to assign maintenance frequency. The City's Facilities Specialist could be responsible for evaluating the condition of park structures, such as picnic shelters, restrooms, and buildings.

5. **Keep Camas Cemetery as a self-contained budgetary unit.** In 2007 the City of Camas took over the operations of the Camas Cemetery. The cemetery had been an independent operation. While it provides an important service, the cemetery does not provide general public benefits. The cemetery should not be subsidized at the expense of the City's parks, which do provide general public benefits. Revenues and expenditures for all maintenance time and materials should be accounted for separately from the maintenance of parks and other City facilities. While the same staff and equipment may maintain the cemetery and City parks and facilities, keeping accurate accounting is important to ensure that fees for the cemetery can be appropriately adjusted, and to ensure that the parks maintenance budget is not subsidizing the cemetery.

6. **Continue with the current division of maintenance responsibility for trails.** The City should continue with the policy that the City accepts maintenance responsibility for those trails that provide connections to key community resources and destinations. Other trails, primarily local trails that connect individual subdivisions to the larger network, or that are within parks owned by other agencies, should be maintained by other relevant groups. In Section 4 the existing and recommended trail system maps indicate this division.

7. **Staff Parks and Public Works departments to meet long-term maintenance needs of developed parks.** With the park system reaching maturity, several additional skill sets will be needed to preserve and maintain the many diverse assets in the system. One such position has recently been created: Facilities Specialist. This position could be responsible for evaluating the condition of park structures (picnic shelters, restrooms, and buildings). A specialized staff position could also help to coordinate interns to monitor the condition of the City-maintained trail system.

8. **Build the level of expertise needed to effectively care and manage natural resources.** The specialized skills required for resource management could be further developed in an existing employee, a contractor could be hired or if necessary, a new position could be created.

   In any case, natural resource management responsibilities might include, but would not be limited to, oversight of forest and natural area maintenance, volunteer management, wildlife management, trails development and management, and potentially managing mitigation banking. An urban forester or arborist would also be helpful in managing the extensive woodlands within the open space network, shade and decorative trees planted in parks, and street trees such as the downtown canopy on 4th Avenue.

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SECTION 7: IMPLEMENTATION PLAN

7.1 Plan Implementation

The implementation plan sets project priorities for parks, trails, and open space improvements. It also presents funding options to design, build and maintain additions to the system. Table 7.1 presents the complete list of park, recreation and open space projects based on the recommendations in the preceding chapters.

Table 7.1
Complete Project List

Facility	Site #	Action	New Park/ Facility
Neighborhood Park Projects			
Proposed Neighborhood Park	NP-1	Acquisition, master planning, design and development	✓
Lacamas Heights Park	NP-2	Continue ongoing maintenance	
Goot Park	NP-3	Continue ongoing maintenance	
Oak Park	NP-4	Continue ongoing maintenance	
Louis Bloch Park	NP-5	Upgrade outfield to artificial turf to maximize use of field.	
Crown Park	NP-6	Parking management plan, master planning, implementation of master plan; sustain functionality of the pool while proceeding with new community center	
Benton Park	NP-7	Conduct tree assessment and continue ongoing maintenance	
Forest Home Park	NP-8	Upgrade to design standards	
Klickitat Park	NP-9	Continue ongoing maintenance	
Ash Creek Park	NP-10	Master planning and development	
Proposed Neighborhood Park	NP-11	Acquisition, master planning, design and development	✓
Grass Valley Park	NP-12	Plan park expansion, perimeter walking path	
Dorothy Fox Park	NP-13	Minor improvements	
Ostensen Canyon	NP-14	Development according to master plan, pedestrian bridge	✓

Facility	Site #	Action	New Park/ Facility
East Hillside Park	NP-15	Ongoing park development	✓
Proposed Neighborhood Park	NP-16	Acquisition, master planning and development	✓
Proposed Neighborhood Park	NP-17	Acquisition, master planning and development	✓
Proposed Neighborhood Park	NP-18	Acquisition, master planning and development	✓
Proposed Neighborhood Park	NP-19	Acquisition, master planning and development	✓
Special Use Area Projects			
Heritage Park	SU-1	Continue ongoing maintenance	
Lacamas Lake Lodge	SU-2	Continue ongoing maintenance	
Fallen Leaf Lake Park	SU-4	New entrance road, trail and water access improvements. Picnic area trailhead facility	
Proposed Ione Street Sports Park	SU-5	Improve fields in cooperation with the School District, local sports organizations	
Camas-Washougal Skatepark	SU-6	Minor improvements	
Washougal Greenway Boat Launch	SU-7	Improve access and add a restroom	
Proposed Community Recreation Center Site	SU-8	Community recreation center planning and development	✓
Camas Community Center	SU-9	Investments to stabilize indoor recreation opportunities	
Downtown Gathering Place	SU-10	Site identification, master planning and development	✓
Columbia Viewpoint/Trailhead	SU-11	Acquisition, master planning and development	✓
Prune Hill Sports Park	SU-12	Field upgrades	
Camas Sports Field Complex	SU-13	Acquisition, master planning and development	✓
Trail Projects			
Leadbetter corridor	T-22	Trail development	
Trailheads	Misc	Trailhead construction	✓
Trail Improvements	Misc	Annual trail improvements (6 years)	✓
Open Space Projects			
Open Space	Misc	Annual open space acquisition (6 years)	✓

7.2 Project Priorities

The following criteria are recommended for prioritizing projects in the forthcoming Capital Improvement Plan. Projects that meet one or more of the following criteria are the highest priorities:

- **Land acquisition:** There are several areas of planned development in Camas, including north of Lacamas Lake, and towards the northern and western edges of the city. The acquisition of land is critical to providing for future park and recreation needs.
- **Preservation of natural open space, especially sites providing connections:** Camas residents place a high value on protecting the community's natural resources. Preserving open space through land acquisition, easements, and natural resource restoration is important to maintaining an Open Space Network with integrity.
- **Trail development and development of trail support facilities:** Trail-related activities are some of the most popular forms of recreation in Camas, and trails also provide a means for residents to experience the city's natural resources. Completing the trail network and developing trail support facilities will facilitate participation in these highly desired activities.
- **Development of new parks in underserved and developing areas:** Camas has a well-developed park system. However, some areas of the city are underserved by parks and recreation facilities, and some residents perceive an imbalance in the level of services between older parks in established neighborhoods with new parks in new growth areas. Maintaining equity in the park system is a community priority, so that all residents have similar access to parks and facilities.
- **Development of indoor recreation space/aquatic facilities:** Community members have expressed a need for indoor recreation space and aquatic facilities for many years, and needs assessment results have also indicated a need for these types of facilities.
- **Upgrading existing parks:** Bringing existing parks up to current standards and providing additional facilities at existing sites will increase equity in park system and make efficient use of land.

7.3 Funding Sources

The tables on the following pages present potential financing and funding sources for acquiring, developing, and maintaining parks, natural open space, trails, and other recreational areas. The sources are listed in no particular order.

Table 7.2
Potential Public and Government Financing Sources

Source	Description
General Fund	This is the City's primary source for operating revenue. Most of this revenue comes from taxes levied on property and the sale of merchandise within the City's boundary.
Real Estate Excise Tax (REET)	Real Estate Excise Tax (REET) is a tax levied on all real estate sales and is levied against the full value of the property. Camas is allowed under the statutes to levy 0.5% in addition to the State of Washington tax. These funds can only be used for projects identified in the Capital Facilities Plan Element of the City's Comprehensive Plan. Camas has extensively used REET funds to fund park projects.
Park Impact Fees	Park Impact Fees are fees imposed on new development to pay for capital projects required to accommodate the impacts of development on the City's infrastructure.
General Obligation Bond	These are voter-approved bonds paid off by an assessment placed on real property. The money may only be used for capital improvements. This property tax is levied for a specified period of time (usually 15-20 years). Passage requires approval by 60%. Major disadvantages of this funding option are the voter approval requirement and the interest costs.
Revenue Bonds	These bonds are sold and paid for from the revenue produced from the operation of a facility. The City does not have any recreational facilities funded in this manner. However, this funding source would be especially applicable for development of a new indoor recreation center or sports field complex.
Metropolitan Park District	A special tax district, authorized under RCW 35.61.210, with a board of park commissioners could take over part or all of park ownership and operations. This would be funded by a levy of up to $0.75/1000 of property value.

Source	Description
Donations	The donation of labor, land, or cash by service agencies, private groups or individuals is a popular way to raise small amounts of money for specific projects. One common example is a service club, such as Kiwanis, Lions or Rotary, funding playground improvements.
Exchange of Property	If the City has an excess parcel of land with some development value, it could be traded for private land more suitable for park use.
Joint Public/Private Partnership	This concept has become increasingly popular for park and recreation agencies. The basic approach is for a public agency to enter into a working agreement with a private corporation to help fund, build, and/or operate a public facility. Generally, the three primary incentives a public agency can offer are free land to place a facility (usually a park or other parcel of public land), certain tax advantages, and access to the facility. While the public agency may have to give up certain responsibilities or control, it is one way of obtaining public facilities at a lower cost.
Lifetime Estates	This is an agreement between the City and a land owner, where the City acquires the property but gives the owner the right to live on the site after the property transfer.
Certificates of Participation	This is a lease-purchase approach where the City sells Certificates of Participation (COPs) to a lending institution. The City then pays the loan off from revenue produced by the facility or from its general operating budget. The lending institution holds title to the property until the COPs are repaid. This procedure does not require a vote of the public.
Exactions	Costs of necessary public improvements are passed onto the adjacent landowners through the development agreement process.

The primary source of park and recreation grant funding in the State of Washington is the Washington State Recreation and Conservation Office (RCO). The RCO is responsible for administering a wide variety of public funds, and also provides technical assistance, policy development and prepares statewide plans on trails, boating facilities, habitat preservation, and off-road vehicles. There are some additional grants available through other programs.

Table 7.3
Public/Government Grant Programs

Source	Description
Boating Facilities Program	This grant program is funded by boaters' gasoline taxes and administered by the RCO. Projects eligible under this program include acquisition, development, planning, and renovation projects associated with launching ramps, transient moorage, and upland support facilities. Grants are distributed on an annual basis and require a minimum of 25 percent matching funds by a local agency.
National Recreational Trail Program	This program is funded from federal gasoline taxes attributed to recreation on non-gasoline tax-supported roads and administered by the RCO. Grants fund maintenance and rehabilitation of recreational trails that provide a "backcountry experience" and for safety and environmental protection programs. 20 percent of the funding for a project must come from the application sponsor in the form of cash, bond, or an approved contribution of labor and or materials.
Land and Water Conservation Fund	This is a federal grant program that receives its money from offshore oil leases. The money is distributed through the National Park Service and is administered locally by the RCO. In the past, this was one of the major sources of grant money for local agencies. In the current proposed federal budget (2014), a small amount of money has been allocated to this program. The funds can be used for acquisition and development of outdoor facilities and require a 50% match.
Nonhighway & Off-Road Vehicle Activities Program	RCO-administered grants in this program are funded by off-road vehicle (ORV) gasoline tax and a small portion of ORV permits. Funds can be used for acquisition, development maintenance, and management of opportunities for ORVs, hikers, equestrians, bicyclists, and other users of non-highway roads.
Washington Wildlife and Recreation Program	This program is administered by the RCO. There are two accounts under this program: 1) Habitat Conservation; and 2) Outdoor Recreation. Projects eligible under this program include acquisition and development of parks, water access sites, trails, critical wildlife habitat, natural areas, and urban wildlife habitat. Applicants must provide a minimum of a 50 percent non-RCO match. Local park projects have maximum requests of $300,000 for development and $500,000 for acquisition costs. There are no

Source	Description
	maximum request levels in the following categories: urban wildlife habitat, trails, and water access.
Youth Athletic Fund	The Youth Athletic Fund is a grant program designed to provide funding for new, improved, and better maintained outdoor athletic facilities serving youth and communities. This program was established by State Statute (RCW 79A.25.800-830) as part of the State Referendum 48, which provided funding for the Seattle Seahawks Stadium. The program is administered by the RCO and applicants must provide matching funds of at least 50 percent.
Conservation Futures Open Space Program	A land acquisition program intended to preserve and enhance environmentally sensitive properties. Projects can be submitted by the County, Cities, and Towns for review by a citizen-based advisory committee. The Board of Clark County Commissioners makes final funding decisions based on the prioritization of this committee. The program is funded by a 6-1/4 cent per thousand dollar of property tax assessment in Clark County. This program has funded a series of natural open space acquisitions in Camas.
Aquatic Land Enhancement Account	This program is administered by the RCO and supports the purchase, improvement, or protection of and access to aquatic lands for public purposes. Grant applications are reviewed once every two years for this program. Applicants must provide a minimum of a 50 percent match.
Community Development Block Grants (CDBG)	These grants from the Federal Department of Housing and Urban Development are available for a wide variety of projects. Most are used for projects in lower income areas of the community because of funding rules. Grants can cover up to 100% of project costs. Since 1985, Clark County has administered over one million dollars annually through a competitive proposal process.
U.S. Fish and Wildlife Service (USFW)	USFW may provide technical assistance and administer funding for projects related to water quality improvement through debris and habitat/vegetation management, watershed management and stream bank erosion, and sediment deposition projects.

Other potential sources for implementation are included in Table 7.4.

Table 7.4
Other Potential Sources

Source	Description
Partnerships	The City could consider developing partnerships with other jurisdictions, agencies, or non-profit service providers to implement projects identified in the plan. Some potential partners include the YMCA, Boys and Girls Club, private sport groups, neighborhood organizations, Clark County, and the City of Washougal.
Private Land Trusts	Private land trusts, such as the Trust for Public Land, Inc. and the Nature Conservancy will acquire and hold land for eventual acquisition by a public agency.
Private Grants and Foundations	Private grants and foundations provide money for a wide range of projects, targeted to the foundation's specific mission. A number of foundations do not provide grants to governments, and grants are difficult to find and equally difficult to secure because of the open competition.
Shared Facilities	In some situations other services provided in the City, or private utilities, may be able to share the cost of improvements that would benefit the park, recreation, and open space system. One example is utility corridors; in many cases, land used for water or power lines may make an excellent trail corridor. In this situation, the utility may pay to develop a service road that can also serve as a trail.

7.4 Proposed Short Term Financing Strategy

Capital improvements to the Camas Park, Recreation, and Open Space system have been funded by a combination of funding sources. The strategy has been to create a mix of sources that allows the City to add capacity to serve growing residential areas, as well as to add important facilities when specific funding is available. The categories of funding sources recommended for this plan are:

- **General Fund.** While the General Fund is not a major source for trail and open space capital improvements, the City does use some general funds for these projects.

- **Impact Fees**. With economic recovery in progress, the speed of new development, particularly in the expanded city limits north of Lacamas Lake, will increase. Camas receives impact fees paid by new development for park, trail, and open space improvements that increase capacity in the system.

- **REET.** The Real Estate Excise Tax (REET) is a major source of park, trail, and open space funding in Camas. The City has used REET funding strategically to match grants and complete larger projects.

- **Grants.** This includes grants, primarily through the State of Washington's Recreation and Conservation Office (RCO).

- **Capital Measure.** The City of Camas will need to refer a bond or park district measure to the voters to raise additional capital resources to fund the acquisition and development of the largest projects (particularly the future community center and pool) recommended in this plan.

- **Other.** This includes other sources of revenue, such as donations, costs paid by utility funds and partner organizations.

The projected amount for each category of funding, for the next six years, is outlined in Table 7.5.

Table 7.5
2014-2021 Proposed Financing Strategy

Funding Source	Annualized Amount	6-Year Total
General Fund	$25,000	$150,000
Impact Fees	$900,000	$5,400,000
REET	$400,000	$2,400,000
Grants	$1,000,000	$6,000,000
Capital Measure	$4,000,000	$24,000,000
Other	$108,300	$650,000
Total	**$6,430,000**	**$38,600,000**

The majority of this financial projection is fairly conservative, using funding types and amounts that are similar to the actual expenditures of the last several years (for impact fees, REET and Grants). Impact fee income may cover a larger portion of the cost of improvements depending on the outcomes of a reevaluation of the fee to account for the large undeveloped area north of Lacamas Lake. The General Fund is assumed to contribute to the planning and management studies that will be an important (but small) part of the CIP projects. The largest line in the financing strategy table is a potential capital measure to fund the new community center and key major investments in existing park sites.

7.5 Proposed Six-Year Capital Improvement Plan

Applying the project priorities and the available funding to the complete project list creates a short list of projects that can be completed and funded in the next six year period. The proposed Capital Improvement Plan (CIP) for parks, recreation and open space should be used to prioritize projects into the City-wide CIP process. This will ensure that parks and recreation-related projects can be evaluated against other department projects and available resources during the City's six-year budget process.

The six-year CIP for parks, recreation and open space is presented in Table 7.6 on page 7-12. In addition to an estimated planning level cost for each project, each applicable funding source has been indicated. Projects have not been assigned specific funding sources, recognizing the flexibility of funding that has served Camas well in the past.

Park Development

Three new neighborhood parks are included in the six-year CIP to serve residential areas in the west and central portions of Camas. The budget for development of Ash Creek and Ostensen Canyon Parks has been adjusted to reflect higher costs and a more complete build-out necessary before turning to developing new parks north of Lacamas Lake. The third park is a very small site, East Hillside Park (also know as Drewfs Farm), which is being developed with amenities specifically targeted for the adjacent residents. The development of a sports field complex (at the most practical site) will enhance the City's capacity to support competitive sports.

Park Upgrades

Enhancements at several specific sites, Fallen Leaf Lake, Crown Park and Louis Bloch, as well as the replacement of aging facilities such as playgrounds, will increase the capacity of existing parks to meet the needs of current and future Camas residents.

Park Land Acquisition

Looking to the future, an allowance for land acquisition will be focused on the expansion of the system to the north of Lacamas Lake.

Major Recreation Facilities

The priority for indoor recreation facilities is to move forward with the community recreation center to replace the aging pool and community center. This will be a major undertaking that should be initiated as soon as possible to meet the community desire for access to aquatics in Camas. The time required to fund and complete the new recreation center will result in the need for some additional investment in the existing Camas Community Center and Crown Park pool.

Trail System Development

The ongoing investment in trail linkages should continue over the next six year period with two focused efforts. The first is to convert the existing Leadbetter Road to complete a loop of Lacamas Lake. The second is to finish a continuous north to south connection across the city, possibly at trail T-1.

Open Space Acquisition

In addition to continuing to acquire (on an opportunity basis) land to fill in the Open Space Concept, the City should conduct an assessment of the natural resources within existing open space lands. This assessment will serve as a baseline for targeting maintenance to the highest value areas.

Additional funding for the largest of these projects, as well as the ongoing maintenance and operation of the system, will likely require voter approval. To prepare for this, the City should begin a public information campaign to ensure that the community is well educated about the benefits of the parks, recreation and open space system and the planned improvements.

Table 7.6
Proposed Six-Year Capital Improvement Plan

Project Name	Site #	Est. Cost (2014 $)	Details	Impact Fees	General Fund	Grants/ Misc.	REET	Capital Measure	Other
Park Development									
Ash Creek Park	NP-10	$1,750,000	Master Plan and development of new park.	■		■	■		■
Ostenson Canyon	NP-14	$2,500,000	Develop according to site master plan	■		■	■	■	■
East Hillside Park (Drewfs Farm)	NP-15	$400,000	Ongoing development of new park.	■		■	■		
Proposed Sports Complex	SU-5, SU-13, TBD	$2,500,000	First phase of field and site improvements for a sports complex to serve the community.	■		■	■	■	■
Park Development Subtotal		**$7,150,000**							
Park Upgrades									
Fallen Leaf Lake Park	SU-3, SU-4	$2,000,000	New entrance road, parking, primitive trail enhancement and hand boat launch.			■	■	■	■
Crown Park	NP-6	$150,000	Master plan for the site laying out a future after the end of the pool's life.		■	■	■	■	
Louis Bloch Park	NP-5	$500,000	Playing field enhancements			■	■	■	■
Major Capital Improvements	Various	$450,000	6-Year total, increased from past assumptions to allow for increased size of the system.				■		
Park Upgrade Subtotal		**$3,100,000**							
Park Land Acquisition									
Acquisition Allowance	Various	$4,500,000	6-Year total, assumes an acceleration of acquisition necessary to expand the system north of Lacamas Lake.	■		■	■	■	■

Table 7.6
Proposed Six-Year Capital Improvement Plan

Project Name	Site #	Est. Cost (2014 $)	Details	Impact Fees	General Fund	Grants/ Misc.	REET	Capital Measure	Other
Major Recreation Facilities									
Future Community Center	SU-8	$24,000,000	Develop indoor community recreation and aquatics center.	■	■	■	■	■	■
Camas Community Center	SU-9	$500,000	Invest in existing facility to stabilize indoor recreation opportunities.		■		■		■
Crown Park Pool	NP-6	$300,000	Sustain functionality while proceeding with new community center		■		■		■
Major Recreation Facilities Subtotal		**$24,800,000**							
Trail System Development									
Retrofit Leadbetter Road for Trail Use	T-3	$350,000	First phase of modifications to create a loop of Lacamas Lake using Leadbetter Road	■		■	■		■
Complete North-South Trail Corridor	T-1	$400,000	Allowance for filling gaps connecting north to south.			■	■		■
Trail and Trailhead Acquisition and Development	Various	$1,200,000	6-Year total, continuing the annual allowance for opportunity based acquisition.	■		■	■		■
Trail System Development Subtotal		**$1,950,000**							
Open Space Acquisition									
Open Space Acquisition	Various	$1,500,000	6-Year total, continuing the annual allowance for opportunity based acquisition.	■		■	■		■
Open Space Network Resource Assessment	Various	$100,000	Inventory and develop management strategies for the Permanent Open Space Network.		■		■		

Table 7.6
Proposed Six-Year Capital Improvement Plan

Project Name	Site #	Est. Cost (2014 $)	Details	Impact Fees	General Fund	Grants/ Misc.	REET	Capital Measure	Other
Open Space Subtotal		**$1,600,000**							
Capital Improvement Plan Total		**$38,600,000**							

7.6 Call to Action

The City of Camas has remained committed to its parks, recreation and open space system. Following guidance of the 2007 Parks, Recreation and Open Space Comprehensive Plan, the City has made several accomplishments such as completion of the Lacamas Lake Lodge, additions to the trail system and acquisition of new open spaces. With adoption of this Plan, the City reconfirms its support for a high quality system, through a variety of new and improved places and opportunities for residents and visitors.

The future system will require reinvestment into existing parks and recreation facilities in established neighborhoods. At the same time, the City should continue to plan for new recreation facilities such as the indoor recreation center and pool, and new and expanded sports fields. Planned growth north of Lacamas Lake will require a major expansion of the park system, through new and interconnected parks and trails. Building on the legacy of its existing system, new trails and trailheads will be needed that offer safe and efficient connections between parks and neighborhoods. The continued protection of natural areas and water resources should also be a focus, through the guidance of the open space concept and supporting goals and policies.

During development of this Plan the community has expressed strong support for the future parks, recreation and open space system. With adequate resources and the continued dedication of City leadership, staff and community partners, Camas can continue to build and sustain these valued resources.

City of Camas
Camas 2035
Camas, Washington

Appendix G
Water System Plan

CITY OF CAMAS
CLARK COUNTY, WASHINGTON

WATER SYSTEM PLAN

G&O No. 08495
June 2010

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF CAMAS

CLARK COUNTY, **WASHINGTON**

WATER SYSTEM PLAN

G&O #08495
JUNE 2010

Gray & Osborne, Inc.
CONSULTING ENGINEERS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

June 10, 2010

Mr. Andy Anderson, P.E.
Washington State Department of Health
Southwest Drinking Water Operations
243 Israel Road SE, 1st Floor
Tumwater, Washington 98501

SUBJECT: FINAL WATER SYSTEM PLAN
CITY OF CAMAS, CLARK COUNTY, WASHINGTON
G&O #08495

Dear Mr. Anderson:

Enclosed are three copies of the City of Camas's Final Water System Plan for your review. The Department of Health project submittal form and checklist can be found in Appendix B of the Plan.

Please contact the undersigned if you have any questions on this submittal.

Very truly yours,

GRAY & OSBORNE, INC.

Russell Porter, P.E.

RP/sn
Encl.

cc: Mr. Mike Stevens, City of Camas
Mr. Eric Levison, City of Camas
Mr. Jim Hodges, City of Camas
Mrs. Jacquie Andresen, Washington State Department of Commerce

701 Dexter Avenue N., Suite 200 Seattle, Washington 98109 (206) 284-0860 Fax (206) 283-3206

Printed on recycled paper

DOH COMMENT RESPONSE FORM

DOH Comment No.	DOH Comment	Water System Response	Page Number of Response	Other Water System Comments
1	*According to Table 4-20, it appears the City has insufficient storage capacity in the 343 and 542 pressure zones. By 2015, it appears all pressure zones except 455 and 852 will be deficient. Please re-evaluate the capacities and clarify how the City will address any deficiencies. Please indicate whether the City will restrict new connections in any area.*	Added: The deficits shown in Table 4-20 and 4-21 are for a single zone analysis. Excess storage is available in other zones to eliminate any single zone deficiencies. The City has adequate total system storage through the 6-year planning period. In 2015, excess storage in the UPH Reservoir will supplement the 544 Lacamas zone (not the 544 NUGA). There is currently a City policy in place that limits the growth in the 542 Gregg zone. The LPH Reservoir will supplement the 343 Butler zone. Growth will not occur within the 542 and 544 NUGA zones until reservoirs are constructed. Footers have been added to Table 4-20 and 4-21 to explain the storage capacities: Table 4-20 footers: (1) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 343 Butler Zone. (2) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 542 Gregg Zone. Table 4-21 footers: (1) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 343 Butler Zone. (2) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 542 Gregg Zone. (3) NUGA growth is dependent on the construction of additional storage by developers. (4) Excess storage in the 852 UPH Zone eliminates the deficit shown in the 544 Lacamas Zone.	4-23	

2	*According to Table 4-13, it appears that the City will have deficient source capacity to serve all pressure zones except for 542 (UGA) by 2015. Please re-evaluate the capacities and clarify how the City will address any deficiencies. Please indicate whether the City will restrict new connections in any area.*	Table 4-13 shows the deficits if no improvements are made to the system and growth is allowed to continue as projected. Table 4-14 shows the deficits once the Crown Road Booster Station is constructed (3,200 gpm). This eliminates all deficiencies except for the 343 Zone and the 852 Zone. Well 14 has been designed, and after construction will add 1.44 MGD to the 343 Zone, eliminating the deficit. The 852 Zone deficit is eliminated with a temporary portable 125 gpm booster pump, which has been added to the CIP. Footers have been added to Table 4-14 to explain the pumping capacities: (3) The construction of Well 14 will produce an additional 1.44 MGD to the 343 Zone and eliminate this deficiency. (7) This deficit will be eliminated with a temporary portable 125 gpm booster pump.	4-18	
3	*It is difficult to identify the capacity limitations in each pressure zone and what steps the City is taking to address them. Please consider presenting the water system demands and capacities in a graphical form.*	Table 4-23 shows triggers for the CIP projects. Figure 8-1 shows the locations of CIP projects. An additional Table 8-8 has been included which summarizes the system deficiencies and the CIP projects the City is taking to eliminate them.	4-28, 4-29, Figure 8-1, Table 8-8	
4	*ERU estimates based on average day demands are only appropriate for evaluating annual water rights and, sometimes, standby storage. To evaluate source capacity and capacity-related storage in ERUs, please use estimates based on maximum day demands.*	The instantaneous water rights analysis on page 4-9, source analysis on page 4-13, and pumping analysis on page 4-17 uses maximum day demands (MDD). The ERU triggers in Table 4-23 uses MDD.	4-9, 4-13, 4-17, Table 4-23	

Ch 3: 1	*Page 3-3. Municipal water supplies must provide their service area policies and conditions of service including how new service will be provided per WAC 246-290-106 (4). Please provide a copy or discuss your current service area policies. This discussion should clearly define how service would be provided, how the water system will process applications, identify associated costs, and provide time frames for water service. In addition, the water system should discuss such things as the appeal process for a service condition or denial, whether only direct service is available or if you will consider remote service, latecomer agreements and differences between service within or outside the urban growth area (see Enclosed Fact Sheet Service Area Policies). Furthermore, you should discuss and reference the Clark County Coordinated Water System Plan.*	City policies are outlined and referenced in Table 2-2. The Clark County CWSP is referenced in Table 2-2 and discussed on page 2-12. Inter-local agreements establishing water service boundaries Vancouver and Washougal are included in Appendix G. The intertie agreement with Washougal is also included in Appendix G. Water service policies and referenced CMC's are included in Appendix G.	Appendix G	
Ch 3: 2	*Page 3-3. Proposed rules and guidelines relating to issues of plan consistency are set for final adoption in 2006". Please verify if this occurred.*	Deleted: 'Proposed rules and guidelines relating to issues of plan consistency are set for final adoption in 2006.' Replaced with: 'Rules and guidelines relating to issues of plan consistency were adopted by DOH in 2008 under the MWL.'	3-3	
Ch 3: 3	*Page 3-8. The City maintains two PRV interties with the City of Washougal. Please provide copies of any intertie agreements.*	Intertie agreements are located in Appendix G.	Appendix G	
Ch 3: 4	*Page 3-16. The N used to calculate PHD should be equal to the number of ERUs during peak demands. In other words, N = Max Day Production / Max Day Demand per ERU. Please revise the calculation.*	Using average values: N=8,458,333 gpd/(296*2.2)=12,989 ERUs PHD=(296*2.2/1440)(1.6*12,989+225) +18 =9,518 gpm PHD/MDD = 9,518/(8,458,333/1440) = 1.62 Using 2007 values: N=6,999,000/(284*1.86)=13,250 ERUs PHD=(284*1.86/1440)(1.6*13,250+225)+18 =7,877 gpm PHD/MDD = 7,877/(6,999,000/1440) = 1.62 Thus, the value of 1.8 is conservative and will be used throughout the Plan.	3-16 and 3-17	The value calculated in the Plan is higher than the actual value calculated here. The 1.8 value is used as it is more conservative.

Ch 3: 5	*On Page 3-17, the value of 280 gpd is used to represent ADD. However, Page 3-23 indicates the ADD value used to evaluate capacity should be 296 gpd. Please fix the discrepancy.*	The value of 296 gpd/ERU should have been used. Replaced in that sentence. Added: '(See DOH comment/response matrix for further explanation of this calculation.)	3-17	
Ch 3: 6	*On Page 3-17, the value of 647 gpd is used to represent MDD. The ADD assumption and the equation result appear to be incorrect. Please fix the discrepancy.*	Deleted: 'The total number of ERUs for the water system in the year 2007 was calculated by dividing the average day consumption of each customer class plus distribution system leakage by 296 gpd.' Replaced with: 'The number of service connections, N, is equal ot the maxium day production divided by the maximum day demand per ERU. The result is a total system ERU value of 12,989.' Deleted: 'MDD = 280 gpd/ERU * 2.2 = 647 gpd/ERU' Replaced with: 'MDD = 296 gpd/ERU * 2.2 = 651 gpd/ERU' Deleted: 'for the year 2007' Deleted: '9,318' Replaced with: '9,518' Deleted: 'entire system is 1.8. (9,318/(7,433,000/1440) = 1.8).' Replaced with: 'entire system is 1.62. (9,518/(8,458,333/1440) = 1.62).'	3-16 and 3-17	
Ch 4: 1	*Page 4-18, Note 2. "At this time" appears to be an incomplete sentence. Please clarify the intent.*	Deleted: 'At this time'	4-18	Table 4-14, footnote 2
Ch 4: 2	*Page 4-24. This section is written as a recommendation from the consultant and does not reflect what has actually been adopted by the system. The City should indicate which recommendations it plans to pursue by the time the final copy of the plan is approved. Additionally, the WSP should indicate what the City plans to do. Please revise the wording to document with certainty the description of what activities, both existing and future, have been formally adopted by the system.*	The language in this section has been modified to what the City 'will and shall' do to meet system deficiencies. 'It is recommended' phrases have been deleted from this section. Added: 'The City will pursue the latter option and limit growth within the NUGA until improvements are made.'	4-24 through 4-28 4-26	

Ch 5: 1	*Figure 5-1. Please indicate if the fire flow deficiencies have been communicated with the fire department.*	The City has communicated the fire flow deficiencies with the fire department.	Email attached	
Ch 5: 2	*Figure 5-3. Please include a figure of model results showing 2008 PHD without improvements or indicate why it is not necessary.*	This figure is included behind this matrix and before the TOC.	Figure attached	
Ch 6: 1	*"Unaccounted for water" does not have a standardized definition. Please use the term "authorized consumption" and "distribution system leakage" to comply with the Water Use Efficiency Rule.*	'Authorized consumption' and 'distribution system leakage' have been inserted where necessary to replace 'unaccounted for water' language.	6-4 through 6-13	
Ch 6: 2	*Page 6-9. Establishing Water Use Efficiency goals must be established thru a public process (WAC 246-290-830(4)(a)).Please provide documentation showing public process was followed by including the following: the date the notification was given, the date the meeting was held, a description of the notification process used and a summary of the meeting discussion.*	2008 WUE program was accepted through a public process. Notification was given 2 weeks ahead of the October 20, 2008 meeting on the City's website and at the post office. The revisited goals in this Plan were adopted at a meeting on June 7, 2010. Notification was given on the City website 2 weeks in advance. The Resolution will be forwarded on June 22, 2010.	Draft of meeting minutes attached.	
Ch 6: 3	*Page 6-12. WAC 246-290-100 (4) (c)) requires demand forecasts to include 6 and 20 year projections* ***with*** *and* ***without*** *water savings from your WUE program. Please provide these projections.*	These projections are included in Table 6-10.	6-13	
Ch 7: 1	*The City recently identified which tasks shift operators could perform at the Water Treatment Plant. Please consider including that policy (and others like it) in the plan.*	Included in Appendix M.	Appendix M	
Ch 8: 1	*Please evaluate current and future water system deficiencies and identify which capital improvements projects will remedy them. Explain how.*	A deficiencies table has been included to summarize the deficiencies and how each project remedies them. Table 8-8.	8-13 through 8-15	
Misc: 1	*Local Government Consistency. Please provide signed and dated Local Government Consistency Statements from Clark County and the City.*	Included in Appendix R	Appendix R	
Misc: 2	*Prior to ODW Final Approval of the WSP, an informational meeting of the water system consumers must be held (WAC 246-290-100(S) (a)). Please provide documentation showing this meeting took place.*	Attached. This Plan was approved on June 7, 2010. The resolution will be forwarded to DOH on June 22, 2010.	Draft of meeting minutes attached.	

Misc: 3	*Prior to ODW Final Approval of the WSP, the governing body or elected board must approve the WSP. Please submit documentation showing the WSP has been approved and adopted by the governing board.*	Attached. This Plan was approved on June 7, 2010. The resolution will be forwarded to DOH on June 22, 2010.	Draft of meeting minutes attached.	
Misc: 4	*Please clarify if a copy of the WSP has been sent to Clark County and adjacent water systems per the Coordinated Water System Plan (CWSP) requirements.*	Digital copies of this Plan have been sent to adjacent systems.		
App D: 1	*Please provide a signed and dated Determination of Non-significance (DNS).*	Included in Appendix D.	Appendix D	
App D: 2	*Please provide a signed and dated SEPA Checklist.*	Included in Appendix D.	Appendix D	
App H: 1	*Coliform Monitoring Plan. Please include a rotation schedule for each sample station.*	Included in Appendix H.	Appendix H	
App H: 2	*Three repeats for the Total Coliform Rule are required: (a) Same site, (b) up-line, and (c) down-line. Will sample stations be used or will taps located at service connections be used? Repeat sites need to be located for each sample station. Please include information about repeat sample locations if a routine sample station sample is unsatisfactory.*	Repeat sites and clarification are included in Appendix H.	Appendix H	An updated Coliform Monitoring Map is included.
App H: 3	*Only Well #5 (S06) has 4-log removal. Please be reminded that if a distribution sample collected for the Total Coliform Rule is unsatisfactory, all other wells need to be sampled within 24-hours of the unsatisfactory coliform sample PRIOR to treatment.*	Noted.		
App H: 4	*Please include the system ID number in the Coliform Monitoring Plan.*	Included.	Appendix H	
App N: 1	*Appendix N is listed as Chapter 5. Please revise.*	Revised as Appendix N.	Appendix N	
App N: 2	*The Emergency Response Plan does not address how the City would respond to localized emergency scenarios for water outages including but not limited to major water main breaks, reservoir failures, or GWR response after a coliform hit. Please provide information on how the system would respond to such scenarios and return the system hack to normal operations.*	Emergency plan scenario response is now included at the end of Appendix N.	Appendix N	

App N: 3	*Remove or revise the sections that use the word "should" or "recommend" with text that describes what the City has adopted for implementation. For Example, tables 5-5, 5-6, 5-7, 5-9, and 5-10 lists "recommended" actions for emergency response scenarios.*	Text has been revised to describe what the City will do.	Appendix N	
App N: 4	*Page N-9 states the emergency phone list is in Appendix G. This list seems to be missing. Please clarify.*	Emergency phone list included at the end of Appendix N.	Appendix N	
App N: 5	*Page N-14, bottom paragraph. The City should contact the Department of Health, Office of Drinking Water, Southwest Regional Operations at (360) 236-3030. Please revise.*	Revised.	Appendix N	
App N: 6	*Page N-20. Boil Water Notification. This paragraph states there is a suggested boil water notification form sample presented in appendix K. This form is missing. Please provide this form.*	Included.	Appendix N	
App N: 7	*The City should develop contact lists for susceptible populations such as schools, hospitals, elder cares, day cares, and food services. Communication and response strategies should be developed to contact these populations in the event of a health advisory or water interruption.*	Susceptible population contact list has been included in Appendix H: Coliform Monitoring Plan.	Appendix H	
App N: 8	*Please provide signatures and dates showing the Emergency Response Plan has been adopted.*	Accepted on June 7, 2010. The signed resolution will be forwarded to DOH on June 22, 2010.	Draft of meeting minutes attached.	
App P: 1	*Please provide documentation showing the City has notified regulatory agencies, local governments, and emergency incident responders (police and fire) of the location of potential and known sources of ground water contamination within the wellhead protection area boundaries (WAC 246-290-130 (3)).*	Included in Appendix P.	Appendix P	
App P: 2	*Please provide documentation showing the City has notified all owner/operators of the location of potential and known sources of ground water contamination within the wellhead protection area boundaries (WAC 246-290-130 (3)).*	Included in Appendix P.	Appendix P	

Ecology Comment No.	Ecology Comment	Water System Response	Page Number of Response	Other Water System Comments
1	***City of Camas Water System & Municipal Water Law*** *On June 11, 2008, King County Superior Court issued a decision in Lummi Indian Nation, el al. v. State, in which sections of the Municipal Water Law, RCW 90.03.015(3) and (4) were held to be unconstitutional because they violated separation of powers under the State Constitution. These particular subsections of the Municipal Water Law defined municipal water suppliers and municipal water supply purposes. The King County Superior Court decision has been appealed by all involved parties to the State Supreme Court and it may be one or more years before final resolution of this uncertainty. The State is urging the Supreme Court to reverse the King County Court's ruling and find that all parts of the 2003 Municipal Water Law are constitutional. Meanwhile the King County decision is the current law.*	No response required.		
2	***Water Right Self Assessment Table*** *The Water Rights Self Assessment (WRSA) tables found in Appendix C show the City holds 15 water rights authorizing a total instantaneous quantity of 14,045 gallons per minute and an annual quantity of 11,090 acre-feet per year for Municipal Supply purposes[1], However, since the instantaneous quantities of Surface Water Certificate (SWC) numbers 711 and 712 are not available for use during peak water use months, their quantities are not used in the instantaneous total for planning purposes. Thus, the tables show a total instantaneous quantity of 12,475 gpm. The information depicted in the WRSA tables is consistent with Ecology's records.* *[1] All water rights are for "Municipal Supply Purposes" except for SWC 711, which is for "Domestic Supply Purposes".*	No response required.		
WRSA table corrections 2-1	*The priority date of SWC 711 is listed in the WRSA as 9/05/90. The actual priority date of this water right is 9/05/30.*	Revised.		

2-2	*Claim no. 121022 or G2-CV1-2P159 should be listed as the first claim in the WRSA. However, the WRSA has Claim no. 121023 or G2-CV1-2P160 listed twice.*	The first claim has been revised.		
2-3	*The above errors should be amended on the "Existing Status", "6 Year Forecast", and "20 Year Forecast" tables.*	Revised in all forecasts.		
2-4	*The WRSA Table 1 does not include a total instantaneous quantity used by the System.*	Included.		
3	***Water Right Documents*** *The draft Plan does not contain copies of all the City's most current water right documents. The final Plan should contain these documents.*	All water right documentation is included.		
4	***Current Use and Future Demand*** *Existing Rights and Consumption* *Since WRSA Table 1 does not give a total instantaneous quantity, Table E-3 was used for review purposes. The City currently withdraws a peak instantaneous quantity of 5,378 gpm, and annual quantity of 3,460 afy. This is within limits authorized by water rights.* *Future Demand* *According to WRSA Table 2, the City anticipates water use in the 6 year planning period will equal about 9,054 gpm and 6,639 afy, within limits authorized by water rights. According to WRSA Table 3, the City anticipates water use in the 20 year planning period will equal 14,174 gpm and 10,523 afy. This exceeds the authorized instantaneous quantity. The City is aware of the need to secure additional water rights in order to meet future water demands. Pending applications are currently on file with Ecology.*	No revisions required.		
5	***Watershed Plan*** *Ecology has determined this Water System Plan is "not inconsistent" with the adopted watershed plan for WRIA 28 - the Salmon/Washougal Watershed.*	No revision required.		

RESOLUTION NO. 1188

A RESOLUTION adopting the Water System Plan, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, subject to required revisions from the Department of Health.

WHEREAS, the City has prepared an update to its Water System Plan, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, as required by State Law, and

WHEREAS, the City has submitted the updated Water System Plan, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, to the Department of Health for review, and

WHEREAS, the City has submitted additional materials to the Department of Health in response to Department of Health comments, and

WHEREAS, the City Council conducted a public hearing on the Water System Plan, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, on June 7, 2010, and

WHEREAS, the Council desires to adopt the Water System Plan, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, subject to any revisions required by the Department of Health in response to its review of the additional material submitted by the City,

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE CITY OF CAMAS as follows:

SECTION I

The City hereby adopts the Water System Plan, revised June 2010, including the Water Use Efficiency Program Update and Water System Emergency Response Plan found therein, subject to required revisions from the Washington State Department of Health.

ADOPTED BY THE COUNCIL AND APPROVED BY THE MAYOR AT A REGULAR MEETING this 21ST day of June, 2010.

SIGNED: _____
Mayor

ATTEST: _____
Clerk

APPROVED as to form:

_____
City Attorney

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
http://www.ci.camas.wa.us

STAFF REPORT
PUBLIC HEARING
WATER SYSTEM PLAN
GENERAL SEWER AND WASTEWATER FACILITY PLAN (2007), (REVISED 11/2009)
GENERAL SEWER PLAN AMENDMENT (APRIL 2010)

FILE #S WS-672, WS-656
STAFF REPORT DATE: JUNE 2, 2010

PROPOSAL: Public Hearing in consideration of adoption of the Water System Plan, General Sewer and Wastewater Facility Plan, and the General Sewer Plan Amendment.

TO: Mayor and City Council

FROM: Staff

HEARING DATE: June 7, 2010

LOCATION: Citywide.

INFORMATION: These three plans are in three different stages of review from State regulatory agencies.

- The *Water System Plan* has been through its first review with the Washington State Department of Health (DOH). Submittal of responsive information to DOH is imminent. This plan may be adopted "subject to required revisions from DOH."

- The 2007 *General Sewer Plan and Wastewater Facility Plan,* revised in November 2009, has been approved by the Washington State Department of Ecology (DOE) and may be adopted without contingency.

- The *General Sewer Plan and Wastewater Facility Plan*, last revised in April 2010, is currently in its second review by DOE. This plan may be adopted "subject to required revisions by DOE."

These plans provide the means for determining future projects to include in the Capital Facilities Plan (CFP). These projects are factored in the calculations that FCSG and staff provide as a means of recommending system development charges and monthly rates.
Included in the *Water System Plan* are Water Use Efficiency Goals, which must be established through a public process per WAC 246-290-830(4). An Emergency Response Program is found in Appendix N. Staff recommends that both the Water Efficiency Goals and the Emergency Response Program be addressed in a resolution that would adopt the *Water System Plan.*

Attached is a spreadsheet identifying City revisions and responses to DOH regarding their review comments on the *Water System Plan.* Staff intends to have the revised pages to this plan at the public hearing. The revisions will create the document that will be known as the *Water System Plan*, revised June 2010.

RECOMMENDATION: Staff recommends that Council hold the public hearing; consider any public testimony; and direct staff to prepare resolutions for adoption on June 21st for the following:

1. The *Water System Plan,* revised June 2010, including Water Efficiency Goals and the Emergency Response Plan, subject to required revisions from the Washington State Department of Health.
2. The 2007 *General Sewer and Wastewater Facility Plan*, revised November 2009.
3. The *General Sewer Plan Amendment,* revised April 2010, subject to required revisions from the Washington State Department of Ecology.

CITY OF CAMAS, WASHINGTON
CITY COUNCIL AGENDA
REGULAR MEETING

MONDAY, JUNE 7, 2010 **7:00 P.M.**

I. CALL TO ORDER:

II. ROLL CALL:
Roll call of Council members.

III. CONSENT AGENDA:

a. Approve minutes of the May 17, 2010, Camas City Council meeting and the work session minutes of May 17, 2010.
b. Approve claim checks as approved by the Finance Committee.
c. Authorize Mayor to sign an Antenna Lease Agreement with Verizon for the antenna site at Prune Hill Sports Park. Mayor's signature will be withheld until Verizon receives authorization through the City of Camas conditional use process that is on-going.
d. Authorize the Mayor to sign a Professional Service Agreement with Berger ABAM for a Phase I Environmental Site Assessment (ESA) of the Fallen Leaf Lake site.
e. Authorize Mayor to sign an Interlocal Agreement between the City of Washougal and the City of Camas for mutual support of professional staff in the field of protective inspection services (Building Inspection).
f. Authorize Mayor to sign a Professional Services Contract, related to the Osprey Landing civil regulatory order, with Normandeau Associates, Inc. for an amount not to exceed eight thousand, four hundred eighty-nine dollars($8,489.00).
g. Authorize Pay Estimate #5 for WS-664A Well #14 and Transmission Main to RC Northwest, Inc., in the amount of one hundred fifty-two thousand, fifteen dollars and four cents ($152,015.04).
h. Authorize Pay Estimate #2 on Project SS-540 2010 Maintenance & Plantings for NW Parker Street & NW Lake Road to Jones Landscape, Inc. in the amount of six thousand, one hundred ninety-two dollars and zero cents ($6,192.00).
i. Authorize Retainage Release for Project P-824 Fire Station 41 Remodel to Larry O'Collins, in the amount of fifteen thousand, five hundred seven dollars and five cents ($15,507.05).
j. Authorize Pay Estimate #3 for WS-656 Wastewater Treatment Facilities Improvements, Phase II, to McClure & Sons, Inc. in the amount of three hundred seventy-eight thousand, eight hundred seventy eight dollars and fifty-three cents ($378,878.53).
k. Authorize Pay Estimate #9 for P-820 Washougal River Trail to Tapani Underground, Inc., in the amount of one hundred thirty-six thousand, fourteen dollars and nine cents ($136,014.09).
l. Write-off ambulance billings that are uncollectible for twenty-five thousand, one dollar and twenty-nine cents ($25,001.29).

NOTE: Any item on the consent agenda may be removed from the consent agenda for general discussion or action.

IV. NON-AGENDA ITEMS:
- **a.** Public.
- **b.** Staff.
- **c.** Council.

V. MAYOR:
- **a.** Announcements.
- **b.** Appointments.

VI. PUBLIC WORKS:
- **a.** Public hearing to revise and extend the Comprehensive Six (6) Year Street Plan.
- **b.** Public hearing-Water System Plan, General Sewer and Wastewater Facility Plan, General Sewer Plan.

VII. COMMUNITY DEVELOPMENT:
- **a.** Public Hearing: 2010-2029 Capital Facilities Plan List.
- **b.** Meeting to consider a 10% annexation petition filed by Joseph and Martha LouAnne Witler (File No. Annex 10-02).

VIII. ADMINISTRATION:
- **a.** Resolution No. 1184 revising the job description and salary schedule for the Community Development Director.
- **b.** Resolution No. 1185 revising the job description and salary schedule for the Public Works Director position.
- **c.** Resolution No. 1186 creating a new position entitled "Public Works Operations Supervisor", and establishing the salary range for the position.

IX. EXECUTIVE SESSION:
- **a.** Real Property Acquisition
- **b.** Litigation

X. ADJOURNMENT:

NOTE: Accommodation of need for disabled persons can be made upon request. For more information, call 834-6864.

Draft minutes pending Council's approval on June 21, 2010.

Regular Council Meeting - 7:00 p.m.
June 7, 2010

CALL TO ORDER: Mayor Paul Dennis presided.

FLAG SALUTE:

COUNCIL:

Present: Anderson, Chaney, Dietzman, Gerde, Higgins, Hogan, and Smith.

Excused:

STAFF MEMBERS: Berquist, Bourquin, Carothers, Halverson, Knapp, and Levison.

PRESS: None present.

CONSENT AGENDA:
It was moved by Council member Hogan, seconded by Council member Gerde to approve the Consent Agenda of May 17, 2010, City Council Meeting. The motion carried unanimously.

- **a.** Approve minutes of the May 17, Camas City Council meeting and the work session minutes of May 17, 2010.
- **b.** Approve claim checks numbered 105868-105873 and 106174-106327 in the amount of one million, one hundred fifty-nine thousand, six hundred and fifteen dollars and seven cents ($1,159,615.07 as approved by the Finance Committee.
- **c.** Authorize Mayor to sign an Antenna Lease Agreement with Verizon for the antenna site at Prune Hill Sports Park. Mayor's signature will be withheld until Verizon receives authorization through the City of Camas conditional use process that is on-going.
- **d.** Authorize the Mayor to sign a Professional Service Agreement with Berger ABAM for a Phase I Environmental Site Assessment (ESA) of the Fallen Leaf Lake site.
- **e.** Authorize Mayor to sign an Interlocal Agreement between the City of Washougal and the City of Camas for mutual support of professional staff in the field of protective inspection services (Building Inspection).
- **f.** Authorize Mayor to sign a Professional Services Contract, related to the Osprey Landing civil regulatory order, with Normandeau Associates, Inc. for

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an amount not to exceed eight thousand, four hundred eighty-nine dollars ($8,489.00).

g. Authorize Pay Estimate #5 for WS-664A Well #14 and Transmission Main to RC Northwest, Inc., in the amount of one hundred fifty-two thousand, fifteen dollars and four cents ($152,015.04).

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k. Authorize Pay Estimate #9 for P-820 Washougal River Trail to Tapani Underground, Inc., in the amount of one hundred thirty-six thousand, fourteen dollars and nine cents ($136,014.09).

l. Write-off ambulance billings that are uncollectible for twenty-five thousand, one dollar and twenty-nine cents ($25,001.29).

NON-AGENDA ITEMS:

Public: There were no comments.

Mayor acknowledged Scout Troop 554's attendance. They are working toward their communications badge.

Staff: There were no comments.

Council: There were no comments.

MAYOR:

Appointments: Mayor appointed Carla Foth Christian to the Board of Adjustment to fill the unexpired term of Al Steinmann ending December 31, 2010.

It was moved by Gerde and seconded by Higgins to appoint Carla Foth Christian to fill the unexpired term of Al Steinmann ending December 31, 2010. The motion carried unanimously.

Mayor appointed Eric Levison as the new Public Works Director with the resulting three structural changes included.

It was moved by Chaney and seconded by Smith to appoint Eric Levison to the Public Works Director position. The motion carried unanimously.

Announcements: Mayor asked and Higgins responded that he will be attending the

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retirement for Tanis Knight.

PUBLIC WORKS:

Public Hearing – to Revise and Extend the Comprehensive Six Year Street Plan:

James Carothers, City Engineer, reviewed the proposed revisions and reason for the extension to the City of Camas Comprehensive Six Year Street Plan.

Mayor asked and there were no questions.

Mayor opened the public hearing at 7:06 p.m.

There was no public testimony.

Mayor closed the public hearing at 7:07 p.m.

It was moved by Higgins and seconded by Smith to direct the city attorney to prepare a resolution for revising and extending the City of Camas Comprehensive Six Year Street Plan. The motion carried unanimously.

Public Hearing – Water System Facility Plan, General Sewer and Wastewater Facility Plan, General Sewer Plan, and General Sewer Plan Amendment:

Carothers introduced Ken Alexander from Gray & Osborne, Inc., who introduced Mallory Taylor also of Gray & Osborne. Mr. Alexander gave a presentation including an overview of the plans, the history and purpose of the plans and what is being considered for approval.

Alexander mentioned the inclusion of the Water Use Efficiency Program Update and Water System Emergency Response Plan within the Water System Plan.

Mayor asked and there were no questions.

Mayor opened and closed the public hearing at 7:33 p.m. as there was no public testimony.

It was moved by Dietzman, seconded by Hogan to direct staff to prepare resolutions for adoption of the Water System Plan, the General Sewer and Wastewater Facility Plan and the General Sewer Plan and amendment for adoption. The motion carried unanimously.

COMMUNITY DEVELOPMENT:

Public Hearing – 2010-2029 Capital Facilities Plan List:

Phil Bourquin, Community Development Director, explained that the Capital Facilities Plan List is synonymous with the Capital Improvements Plan discussed at prior meetings. Bourquin clarified that the Comprehensive Six Year Street Plan, the Water System Plan, General Sewer and Wastewater Facility Plan, General Sewer Plan,

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and General Sewer Plan Amendments were considered in the Capital Facility Plan and all are consistent with the Comprehensive Plan.

Bourquin said staff's recommendation is to open the hearing, take public comment and to prepare an ordinance for adoption.

Questions were asked and clarifications were made.

Mayor opened and closed the public hearing at 7:35 p.m. as there was no public testimony.

It was moved by Gerde and seconded by Dietzman to direct the city attorney to prepare an ordinance for adoption of the 2010-2029 Capital Facilities Plan List. The motion carried unanimously.

10% Annexation Petition (Wittler Property) Meeting:

Bourquin stated that the 10% Annexation Petition was submitted by Joseph and Martha LouAnne Witler. Bourquin explained that the purpose of the petition request is to annex the property located at 2222 SE 283rd Ave.

Staff's recommendation is that Council accept the petition to include the subject property and modify the area to include all portions of the abutting right-of-way, to establish the zoning simultaneous with the annexation and to require assessment and taxation of all property at the same rate and at the same basis as the City of Camas as well as to assume the existing City indebtedness.

Approval of this petition enables filing the 60% petition.

Mayor asked and there were no questions.

It was moved by Higgins seconded by Chaney to accept the 10% petition and modify the geographic area to include Clark County Parcel No. 123232000 and all portions of the SE 283rd right-of-way abutting said property, require and determine the appropriate zoning simultaneous with annexation and require assessment and taxation of all property at the same rate and at the same basis as within the City of Camas and to require the area to be annexed to assume the existing City indebtedness. The motion carried unanimously.

ADMINISTRATION:

Resolution No. 1184 – Revising the Job Description and Salary Schedule for the Community Development Director:

Lloyd Halverson, City Administrator, explained the purpose of Resolution No. 1184.

Mayor asked and there were no questions.

It was moved by Gerde, seconded by Smith that Resolution No. 1184 be read by title only. The motion carried unanimously.

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It was moved by Gerde, seconded by Hogan that Resolution No. 1184 revising the job description and salary schedule for the Community Development Director be adopted. The motion carried unanimously.

Resolution No. 1185 – Revising Job Description and Salary Schedule for the Public Works Director:

Lloyd Halverson explained the purpose of Resolution No. 1185.

Mayor asked and there were no questions.

It was moved by Higgins, seconded by Smith that Resolution No. 1185 be read by title only. The motion carried unanimously.

It was moved by Gerde, seconded by Anderson that Resolution No. 1185 revising the job description and salary schedule for the Public works Director be adopted. The motion carried unanimously.

Resolution No. 1186 – Revising Job Description and Salary Schedule for the Public Works. Operations Supervisor:

Halverson explained the purpose of Resolution No. 1186.

Mayor asked and there were no questions.

It was moved by Higgins, seconded by Dietzman that Resolution No. 1186 be read by title only. The motion carried unanimously.

It was moved by Higgins, seconded by Dietzman that Resolution No. 1186 creating the position of Public Works Operations Supervisor, adopting a job description, and establishing a salary scale for the position be adopted. The motion carried unanimously

EXECUTIVE SESSION:

Real Property Acquisition and Litigation:

The meeting recessed at 7:43 p.m. for discussion regarding real property acquisition and litigation for an estimated 15 minutes with no further action anticipated.

ADJOURNMENT:

The meeting adjourned at 7:59 p.m.

Mayor

City Clerk

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NOTE:
INFORMATION ON THIS MAP WAS COLLECTED FROM SEVERAL SOURCES. THE CITY OF CAMAS EXPRESSLY DISCLAIMS ANY LIABILITY FOR ANY INACCURACIES THAT MAY BE PRESENT. USERS OF THIS INFORMATION SHOULD THEMSELVES CHECK ANY DETAILS FOR ACCURACIES.

Zone	Average Lot Size	Range of Lot Sizes[1]		Density	PRD[2] Density Bonus
		Minimum	Maximum	Units/Acre	Units/Acre
R-20	20,000	16,000	24,000	2.10	2.52
R-15	15,000	12,000	18,000	2.90	3.48
R-12	12,000	9,600	14,400	3.63	4.36
R-10	10,000	8,000	12,000	4.63	5.23
R-7.5	7,500	6,000	9,000	5.81	6.97
R-6	6,000	4,800	7,200	7.26	8.71
R-5	5,000	4,000	6,000	8.71	10.45

[1] 20% Range from / to average lot size

[2] Alll R zones may be developed as a PRD, provided that the minimum parcel(s) is 10 acres

City Limits
Urban Growth Boundary
Park
Green Space
Municipal Features
School Property
PID Overlay
Zoning Boundary

Zoning Overlay

Mixed-Use
Area 'E'

N

1 inch = 1,400 feet

zone09 12/1/09

The Zoning Map of the City of Camas

Amended by Ordinance (# 2569), December 7, 2009

Figure 3-1A

Mallory

Is this what you wanted as far as written confirmation from the Fire Marshall in regards to fire flow deficiencies?

>>> Randy Miller 5/28/2010 9:06 PM >>>
Greetings Eric and Mike,

The water supply serving Camas and the utilization of this system for the fire departments prevention and suppression needs has been a cooperative and successful effort with the water department to provide our business community and citizens life safety and property protection through a reliable water service.

The water department has historically in large fire events made rapid adjustments in the water system to increase pressure and or increase available water by utilizing the flexibility and capabilities of the system to meet our fire incident flow demands.

Many fires that occur throughout the year in Camas are successfully handled with our fire apparatus during suppression activities at "Engine Idle" needing only to utilize the available hydrant pressure. In the rare areas where water may have a significantly lower GPM it is being communicated to our suppression crews via the hydrants painted black. Temporary deficiencies due to repairs or other issues are directly communicated to the Fire Marshals office with a coordinated contingency plan put in place for water needs in potential fire incidents.

Significant cooperation and progressive thinking from the water department has occurred in helping the Fire Marshal's office provide our citizens the capability to provide adequate water flow for the installation of Life Safety Residential Fire Sprinklers. In the one thousand plus installations of Residential Fire Sprinklers in Camas there have been a small percentage where the standard "3/4 full" meter was not adequate and a one inch meter was necessary to meet the suppression systems design needs, overcoming friction loss and or overcoming lower water pressure. Residential Fire Sprinkler Systems are also helping to decrease the use of water in Camas since during a structure fire a sprinkler head operates at approx. 13 GPM to control and extinguish most fires at the incipient stage compared to a fire hose flow at 150 to 250 GPM or a 1000 GPM master stream flow during a free burning stage. Further water savings occurs through less incident site and equipment clean-up and a significant reduction in environmental impacts occur through minimizing toxic water run-off from the structure fire into our ground water. Significant and dramatic decreases in the use of resources for replacement materials also occur through minimal water use occurring at the early stages of a fire.

Forward thinking by the water department has also provided for a waiver in the increased water meter up-size fee from a 3/4 full to a 1 inch when required for the Residential Sprinkler, helping to keep these water reducing fire sprinkler systems affordable to our citizens.

The limited areas in Camas where the water system has not yet been developed but houses are being approved for construction, has the absence of hydrants mitigated through the effective use of an onsite tank and pump at the residence, providing a minimum 10 minute fire flow to the life safety residential fire sprinkler system.

Coordinated communication between the Water Department and the Fire Marshal's office are in place to minimize, but yet provide, adequate flushing for commercial fire sprinkler mains and newly constructed/installed hydrants in order to meet the National Fire Protection Association (NFPA) requirements as well as providing for accountability of water utilized to meet these standards.

I look forward to the continued cooperation and progressive thinking between the water department and the Fire Marshals office in the utilization of a reliable water source to serve and protect our Camas Community.

Regards

RM

Randy Miller
Fire Marshal
Camas Fire Department

PH 360-834-6191
Ext. 4531
FAX 360-834-8866
rmiller@ci.camas.wa.us

(Office Location)
Camas City Hall
616 NE 4th Avenue
Suite III
Camas WA 98607

"FIRE SPRINKLERS SAVE LIVES"

Have You Tested Your Smoke Detectors Lately ?

"The purest form of Fire Suppression
is through Fire Prevention and this
aspect is the hardest to measure"

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3

0 7,600 15,200 Feet

Legend

Pressure (psi)

- < 20
- 20 - 30
- > 30
- Urban Growth Boundary
- City Limits
- Water Service Boundary
- Pipe Lines

SOURCE: CITY OF CAMAS

CITY OF CAMAS WASHINGTON

DOH RESPONSE
2008 PHD PRESSURE
WITHOUT IMPROVEMENTS

L:\CAMAS\08495 WSP\Fig5-1.mxd

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
SOUTHWEST DRINKING WATER REGIONAL OPERATIONS
PO Box 47823, Olympia, Washington 98504-7823
TDD Relay 1-800-833-6388

MAR 16 2010

March 11, 2010

Michael Stevens
Camas Municipal Water Sewer System
1620 Southeast 8th Avenue
Camas, Washington 98607

Subject: Camas Municipal Water Sewer System, ID #108002, Clark County; Water System Plan, ODW Project #10-0101

Dear Michael Stevens:

Thank you for providing the Water System Plan for the Camas Municipal Water Sewer System (City) received by the Office of Drinking Water (ODW) on January 7, 2010.

The following comments need to be addressed before ODW can approve the plan.

1. According to Table 4-20, it appears the City has insufficient storage capacity in the 343 and 542 pressure zones. By 2015, it appears all pressure zones except 455 and 852 will be deficient. **Please re-evaluate the capacities and clarify how the City will address any deficiencies. Please indicate whether the City will restrict new connections in any area.**
2. According to Table 4-13, it appears the City will have deficient source capacity to serve all pressure zones except for 542 (UGA) by 2015. **Please re-evaluate the capacities and clarify how the City will address any deficiencies. Please indicate whether the City will restrict new connections in any area.**
3. It is difficult to identify the capacity limitations in each pressure zone and what steps the City is taking to address them. **Please consider presenting the water system demands and capacities in a graphical form.** For example, you could create a graph of demands vs. capacity (in gpd) for each year and for each pressure zone. Proposed improvements could be added as dashed lines on the capacity curve beginning the year the improvements are likely to be implemented.
4. ERU estimates based on average day demands are only appropriate for evaluating annual water rights and, sometimes, standby storage. **To evaluate source capacity and capacity-related storage in ERUs, please use estimates based on maximum day demands.**

CHAPTER 3

1. Page 3-3. Municipal water suppliers must provide their service area policies and conditions of service including how new service will be provided per WAC 246-290-106 (4). **Please**

provide a copy or discuss your current service area policies. This discussion should clearly define how service would be provided, how the water system will process applications, identify associated costs, and provide timeframes for water service. In addition, the water system should discuss such things as the appeal process for a service condition or denial, whether only direct service is available or if you will consider remote service, latecomer agreements and differences between service within or outside the urban growth area (see enclosed Fact Sheet Service Area Policies). Furthermore, you should discuss and reference the Clark County Coordinated Water System Plan.

2. Page 3-3. "Proposed rules and guidelines relating to issues of plan consistency are set for final adoption in 2006". **Please verify if this occurred.**
3. Page 3-8. The City maintains two PRV interties with the City of Washougal. **Please provide copies of any intertie agreements.**
4. Page 3-16. The N used to calculate PHD should be equal to the number of ERUs during peak demands. In other words, N = Max Day Production / Max Day Demand per ERU. **Please revise the calculation.**
5. On Page 3-17, the value of 280 gpd is used to represent ADD. However, Page 3-23 indicates the ADD value used to evaluate capacity should be 296 gpd. **Please fix the discrepancy.**
6. On Page 3-17, the value of 647 gpd is used to represent MDD. The ADD assumption and the equation result appear to be incorrect. **Please fix the discrepancy.**

CHAPTER 4

1. Page 4-18, Note 2. "At this time" appears to be an incomplete sentence. **Please clarify the intent.**
2. Page 4-24. This section is written as a recommendation from the consultant and does not reflect what has actually been adopted by the system. The City should indicate which recommendations it plans to pursue by the time the final copy of the plan is approved. Additionally, the WSP should indicate what the City plans to do. **Please revise the wording to document with certainty the description of what activities, both existing and future, have been formally adopted by the system.**

CHAPTER 5

1. Figure 5-1. **Please indicate if the fireflow deficiencies have been communicated with the fire department.**
2. Figure 5-3. **Please include a figure of model results showing 2008 PHD without improvements or indicate why it is not necessary.**

CHAPTER 6

1. "Unaccounted for water" does not have a standardized definition. **Please use the term "authorized consumption" and "distribution system leakage" to comply with the Water Use Efficiency Rule.**
2. Page 6-9. Establishing Water Use Efficiency goals must be established thru a public process (WAC 246-290-830 (4) (a)). **Please provide documentation showing public process was**

followed by including the following: the date the notification was given, the date the meeting was held, a description of the notification process used and a summary of the meeting discussion.

3. Page 6-12. WAC 246-290-100 (4) (c)) requires demand forecasts to include 6 and 20 year projections *with* and *without* water savings from your WUE program. **Please provide these projections.**

CHAPTER 7

1. The City recently identified which tasks shift operators could perform at the Water Treatment Plant. **Please consider including that policy (and others like it) in the plan.**

CHAPTER 8

1. **Please evaluate current and future water system deficiencies and identify which capital improvements projects will remedy them. Explain how.**

MISCELLANEOUS DOCUMENTS

1. Local Government Consistency. **Please provide signed and dated Local Government Consistency Statements from Clark County and the City.**
2. **Prior to ODW Final Approval of the WSP**, an informational meeting of the water system consumers must be held **(WAC 246-290-100(8) (a)). Please provide documentation showing this meeting took place.**
3. Prior to ODW Final Approval of the WSP, the governing body or elected board must approve the WSP. **Please submit documentation showing the WSP has been approved and adopted by the governing board.**
4. **Please clarify if a copy of the WSP has been sent to Clark County and adjacent water systems per the Coordinated Water System Plan (CWSP) requirements.**

APPENDIX D

1. **Please provide a signed and dated Determination of Non-significance (DNS).**
2. **Please provide a signed and dated SEPA Checklist.**

APPENDIX H

1. Coliform Monitoring Plan. **Please include a rotation schedule for each sample station.**
2. Three repeats for the Total Coliform Rule are required: (a) Same site, (b) up-line, and (c) down-line. Will sample stations be used or will taps located at service connections be used? Repeat sites need to be located for each sample station. **Please include information about repeat sample locations if a routine sample station sample is unsatisfactory.**
3. Only Well #5 (S06) has 4-log removal. **Please be reminded that if a distribution sample collected for the Total Coliform Rule is unsatisfactory, all other wells need to be sampled within 24-hours of the unsatisfactory coliform sample PRIOR to treatment.**

4. **Please include the system ID number in the Coliform Monitoring Plan.**

APPENDIX N

1. Appendix N is listed as Chapter 5. **Please revise.**
2. The Emergency Response Plan does not address how the City would respond to localized emergency scenarios for water outages including but not limited to major water main breaks, reservoir failures, or GWR response after a coliform hit. **Please provide information on how the system would respond to such scenarios and return the system back to normal operations.**
3. **Remove or revise the sections that use the word "should" or "recommend" with text that describes what the City has adopted for implementation.** For Example, tables 5-5, 5-6, 5-7, 5-9, and 5-10 lists "recommended" actions for emergency response scenarios.
4. Page N-9 states the emergency phone list is in Appendix G. This list seems to be missing. **Please clarify.**
5. Page N-14, bottom paragraph. The City should contact the Department of Health, Office of Drinking Water, Southwest Regional Operations at (360) 236-3030. **Please revise.**
6. Page N-20. Boil Water Notification. This paragraph states there is a suggested boil water notification form sample presented in appendix K. This form is missing. **Please provide this form.**
7. The City should develop contact lists for susceptible populations such as schools, hospitals, elder cares, day cares, and food services. Communication and response strategies should be developed to contact these populations in the event of a health advisory or water interruption.
8. **Please provide signatures and dates showing the Emergency Response Plan has been adopted.**

APPENDIX P

1. **Please provide documentation showing the City has notified regulatory agencies, local governments, and emergency incident responders (police and fire) of the location of potential and known sources of ground water contamination within the wellhead protection area boundaries (WAC 246-290-130 (3)).**
2. **Please provide documentation showing the City has notified all owner/operators of the location of potential and known sources of ground water contamination within the wellhead protection area boundaries (WAC 246-290-130 (3)).**

DEPARTMENT OF ECOLOGY

The enclosed copy of March 10, 2010, Ecology's comment letter identifies discrepancies with your water rights. Please work with Ecology on these and any other issues identified in their comment letter.

Please remember that ODW's approval of your WSP will not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or subsequent water rights

decisions by Ecology. Depending on Ecology's future actions on your water rights, additional planning or other submittals may be required.

Ecology has determined this WSP is "not inconsistent" with the adopted watershed plan for WRIA 28 – the Salmon/Washougal Watershed.

Please submit three copies of the revised WSP on or before June 10, 2010. In order to expedite the review of your revised submittal, please provide a summary on how these comments were addressed in the revised WSP and where each response is located (page numbers, appendices, etc.).

Regulations establishing a schedule of fees for review of planning, engineering, and construction documents were adopted August 3, 2007, (WAC 246-290-990). An itemized invoice for $3,705 is enclosed.

If you have any questions, please contact Darin Klein at (360) 236-3038 or Andy Anderson at (360) 236-3033.

Sincerely,

Darin Klein
Office of Drinking, Regional Planner

Andy Anderson P.E.
Office of Drinking Water, Regional Engineer

Enclosures

cc: Russ Porter, Gray & Osborne Inc.
Clark County Health
Clark County Planning
Amy Nielson, Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

GRAY & OSBORNE, INC.
RECD - SEATTLE
MAR 17 2010
JOB #

March 10, 2010

Michael Stevens
City of Camas Water System
1620 SE 8th Ave.
Camas, WA 98607

Darin Klein
Department of Health
Southwest Drinking Water Operations
PO Box 47823
Olympia, WA 98504-7823

Re: City of Camas Water System, ID #10800, Clark County; Water System Plan, ODW Project #10-0101

Thank you for the opportunity to review the documents associated with the City of Camas Water System. Consistent with the Memorandum of Understanding between the Department of Health and the Department of Ecology, I reviewed the relevant portions of the proposed Water System Plan (WSP) and offer the following comments.

City of Camas Water System and the Municipal Water Law

On June 11, 2008, King County Superior Court issued a decision in *Lummi Indian Nation, et al. v. State*, in which sections of the Municipal Water Law, RCW 90.03.015(3) and (4) were held to be unconstitutional because they violated separation of powers under the State Constitution. These particular subsections of the Municipal Water Law defined municipal water suppliers and municipal water supply purposes.

The King County Superior Court decision has been appealed by all involved parties to the State Supreme Court, and it may be one or more years before final resolution of this uncertainty. The State is urging the Supreme Court to reverse the King County Court's ruling and find that all parts of the 2003 Municipal Water Law are constitutional. Meanwhile the King County decision is the current law.

Water Right Self Assessment Table

The Water Rights Self Assessment (WRSA) tables found in Appendix C show the City holds 15 water rights authorizing a total instantaneous quantity of 14,045 gallons per minute and an annual quantity of 11,090 acre-feet per year for Municipal Supply purposes[1]. However, since the instantaneous quantities of Surface Water Certificate (SWC) numbers 711 and 712 are not available for use during peak water use months, their quantities are not used in the instantaneous total for planning purposes. Thus, the tables show a total instantaneous quantity of 12,475 gpm. The information depicted in the WRSA tables is consistent with Ecology's records.

[1] All water rights are for "Municipal Supply Purposes" except for SWC 711, which is for "Domestic Supply Purposes".

WRSA table corrections

1. The priority date of SWC 711 is listed in the WRSA as 9/05/90. The actual priority date of this water right is 9/05/30.
2. Claim no. 121022 or G2-CV1-2P159 should be listed as the first claim in the WRSA. However, the WRSA has Claim no. 121023 or G2-CV1-2P160 listed twice.
3. The above errors should be amended on the "Existing Status", "6 Year Forecast", and "20 Year Forecast" tables.
4. The WRSA Table 1 does not include a total instantaneous quantity used by the System.

Water Right Documents

The draft Plan does not contain copies of all the City's most current water right documents. The final Plan should contain these documents.

Current Use and Future Demand

Existing Rights and Consumption
Since WRSA Table 1 does not give a total instantaneous quantity, Table E-3 was used for review purposes. The City currently withdraws a peak instantaneous quantity of 5,378 gpm, and annual quantity of 3,460 afy. This is within limits authorized by water rights.

Future Demand
According to WRSA Table 2, the City anticipates water use in the 6 year planning period will equal about 9,054 gpm and 6,639 afy, within limits authorized by water rights.

According to WRSA Table 3, the City anticipates water use in the 20 year planning period will equal 14,174 gpm and 10,523 afy. **This exceeds the authorized instantaneous quantity.**

The City is aware of the need to secure additional water rights in order to meet future water demands. Pending applications are currently on file with Ecology.

Watershed Plan

Ecology has determined this Water System Plan is "not inconsistent" with the adopted watershed plan for WRIA 28 – the Salmon/Washougal Watershed.

Thank you for the opportunity to review this project. Please contact me at (360) 407-6116, or at amy.nielson@ecy.wa.gov if you have questions regarding my review or need additional information.

Sincerely,

Amy Nielson
Water Resources Program
Southwest Regional Office

AN:th

cc: Andy Anderson, P.E., DOH – ODW
Russell L. Porter, P.E., Gray & Osborne, Inc.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

CHAPTER 1 – INTRODUCTION AND EXISTING WATER SYSTEM

INTRODUCTION 1-1
PURPOSE 1-1
PLAN SUMMARY 1-2
HISTORY OF THE CITY 1-2
Development of the Water System 1-3
ORGANIZATION 1-4
EXISTING WATER SYSTEM COMPONENTS 1-4
Water Rights 1-5
EXISTING WATER SYSTEM FACILITIES 1-7
SOURCE OF SUPPLY 1-7
Boulder Creek and Jones Creek 1-7
Groundwater Sources 1-8
Water Treatment 1-9
Groundwater Under the Direct Influence of Surface Water 1-11
Storage Facilities 1-12
Butler Reservoir 1-12
Lower Prune Hill Reservoir 1-12
Upper Prune Hill Standpipe and Reservoir 1-13
Lacamas Reservoir 1-13
Gregg Reservoir 1-13
Transmission and Distribution Facilities 1-14
Water Mains 1-14
Pressure Zones 1-15
Pressure Reducing Stations 1-16
Booster Stations 1-18
Interties 1-23
SCADA 1-23

CHAPTER 2 – REGULATORY REQUIREMENTS

INTRODUCTION 2-1
APPLICABLE LEGISLATION, REGULATIONS AND PERMITS 2-1
Federal Clean Water Act 2-1
Safe Drinking Water Act 2-2
Endangered Species Act 2-2
Reclaimed Water Standards 2-4
National Environmental Policy Act 2-4
State Environmental Policy Act 2-4
Growth Management Act 2-5
Shoreline Management Act Permit 2-5
Floodplain Development Plan 2-5

Hydraulic Project Approval 2-5
Local Permits 2-6
Water Rights 2-6
REGULATORY AGENCIES 2-7
United States Environmental Protection Agency 2-7
United States Fish and Wildlife Service (USFWS) 2-7
The National Marine Fisheries Services (NMFS) 2-7
United States Army Corps of Engineers` 2-8
Washington State Department of Health 2-8
Washington State Department of Ecology 2-8
Washington State Department of Fish and Wildlife 2-8
Watershed Resource Inventory Area (WRIA) 2-9
Local Health Departments 2-9
County Planning Policies 2-9
City Policies 2-9
SYSTEM DESIGN STANDARDS 2-12
Clark County Coordinated Water System Plan 2-12
Minimum Department of Health Design Standards 2-12
WATER QUALITY STANDARDS 2-15
Current Drinking Water Standards 2-15

CHAPTER 3 – BASIC PLANNING DATA AND WATER USE FORECASTING

INTRODUCTION 3-1
GROWTH MANAGEMENT 3-1
STUDY AREA 3-2
Service Area 3-3
Retail Service Area 3-3
Physical Environment 3-3
LAND USE PLANNING 3-7
WASTEWATER SYSTEM 3-8
INTERGOVERNMENTAL COORDINATION 3-8
City of Vancouver 3-8
City of Washougal 3-8
Clark Public Utilities 3-8
RELATED PLANNING DOCUMENTS 3-9
Comprehensive Plans 3-9
Other Plans and Reports 3-9
PLANNING PERIOD 3-9
POPULATION 3-10
Current and Projected City Population 3-10
WATER USE CHARACTERIZATION 3-12
Water Service Connections 3-12
Water Use 3-13
Distribution System Leakage 3-19

Equivalent Residential Units....3-20
WATER USE FORECASTING....3-22
Projected Water Use....3-22
BUILDOUT PROJECTIONS....3-31

CHAPTER 4 – SYSTEM ANALYSIS

INTRODUCTION....4-1
WATER SYSTEM STANDARDS....4-1
WATER QUALITY ANALYSIS....4-2
Bacteriological....4-3
Disinfection Byproducts....4-4
Residual Disinfectant....4-5
Volatile Organic Chemicals....4-6
Synthetic Organic Chemicals....4-6
Lead and Copper....4-6
Radionuclides....4-6
Inorganic Compounds....4-7
Groundwater Under the Influence of Surface Water (GWI)....4-7
WATER RIGHTS ANALYSIS....4-7
Instantaneous Water Rights Analysis....4-8
Annual Water Rights Analysis....4-9
FACILITY ANALYSIS....4-11
Source of Supply....4-11
SOURCE ANALYSIS....4-13
NUGA Zone....4-14
Demand Distribution by Zone....4-15
PUMPING ANALYSIS....4-17
STORAGE ANALYSIS....4-18
Operational Storage....4-19
Equalizing Storage....4-19
Fire Suppression Storage....4-20
Standby Storage....4-21
Nesting Storage....4-22
Dead Storage....4-22
Total Storage....4-22
Recommendations....4-24

CHAPTER 5 – WATER SYSTEM HYDRAULIC ANALYSIS

INTRODUCTION....5-1
HYDRAULIC MODELING PROGRAM....5-2
HYDRAULIC MODEL DEVELOPMENT....5-2
Model Layout and Construction....5-2
System Demands....5-4
Model Calibration....5-7
MODEL SIMULATIONS AND RESULTS....5-9

Model Simulations 5-10
CONCLUSIONS 5-13

CHAPTER 6 – WATER USE EFFICIENCY PROGRAM

WATER USE EFFICIENCY RULE BACKGROUND 6-1
WATER USE EFFICIENCY REQUIREMENTS 6-2
SOURCE OF SUPPLY ANALYSIS 6-4
DISTRIBUTION SYSTEM LEAKAGE 6-4
PREVIOUS WATER USE EFFICIENCY PROGRAM 6-5
Conservation Measures 6-5
Unaccounted for Water/Leak Detection 6-6
Program Promotional and Customer Education 6-6
Construction Requirements 6-6
Customer Leak Detection 6-6
Irrigation Management 6-7
Landscape Management 6-7
Conservation Rate Structure 6-8
Conservation Kits 6-8
Water Audit Program/Rebate Program 6-8
Effects of Past Measures 6-8
NEW WATER USE EFFICIENCY PROGRAM 6-9
Goals 6-9
Water Use Efficiency Measures 6-10
Evaluation of Measures 6-11
Target Water Savings Projections 6-12
DEMAND FORECASTING 6-12
ANNUAL PERFORMANCE REPORTING 6-13
SUMMARY 6-13

CHAPTER 7 – OPERATIONS AND MAINTENANCE

INTRODUCTION 7-1
WATER SYSTEM MANAGEMENT AND PERSONNEL 7-2
Operator Certification 7-2
Professional Growth 7-3
ROUTINE SYSTEM OPERATION AND PREVENTATIVE MAINTENANCE 7-3
Water Sources 7-3
Surface Water Sources 7-3
Groundwater Sources 7-4
Treatment Facilities 7-5
Surface Water Chlorination Plant 7-5
Surface Water Filtration Plant 7-5
Booster Stations 7-7
PRVs 7-8
Storage Facilities 7-9
COLIFORM MONITORING PLAN 7-9

EMERGENCY RESPONSE PROGRAM 7-9
CROSS-CONNECTION CONTROL PROGRAM 7-9
City of Camas CCC Program 7-10
RECORDKEEPING AND REPORTING 7-11
O&M DEFICIENCIES 7-11

CHAPTER 8 – CAPITAL IMPROVEMENTS

INTRODUCTION 8-1
SOURCE AND WATER RIGHTS 8-2
Well 14 – Anderson Site (SR-1) 8-2
Boulder Creek Fish Screens (SR-2) 8-2
Filtration Plant Alternatives Analysis and Predesign Report (SR-3) 8-2
Well 17 – Camas Meadows Site (SR-4) (SR-6) 8-2
Filtration Plant Upgrades (SR-5) 8-2
Well 15 – Parkers Landing Site (SR-7) 8-2
NUGA Source Development (SR-8) 8-3
Well 16 – Wastewater Treatment Plant Site (SR-9) 8-3
Well 18 – Fire Station Site (SR-10) 8-3
Steigerwald Source Development (SR-11) 8-3
STORAGE FACILITIES 8-4
Lower Prune Hill Reservoir Evaluation and Replacement (S-1) (S-5) 8-4
Cemetery Reservoir (S-2) 8-4
Decommission and Demolition Butler Reservoir (S-3) 8-4
Additional Gregg Reservoir (S-4) 8-5
Green Mountain Reservoir (S-6) 8-5
TRANSMISSION AND BOOSTER STATION 8-5
Forest Home Booster Station Upgrade and Transmission (T-1, T-2, T-3) 8-5
Crown Road Transmission, Booster Station, and Expansion (T-4, T-5, T-15) 8-6
Portable Booster Station (T-6) 8-6
NUGA Transmission Mains (T-7, N-1 through N-7) 8-6
Cemetery Booster Station and Transmission Mains (T-8, T-9, T-10, T-11) 8-6
Lower Prune Hill Booster Station Upgrade (T-12) 8-7
Lacamas Booster Station Upgrade and Transmission (T-13, T-14) 8-7
14-Inch Steel Replacement (T-15) 8-7
Well 16 Transmission (T-17) 8-7
Jones and Boulder Creek Transmission Improvements (T-18) 8-7
DISTRIBUTION SYSTEM 8-9
WATER USE EFFICIENCY PROGRAM 8-11
Water Conservation Devices 8-11
Water Audits 8-11
Leak Detection Study 8-12
CAPITAL IMPROVEMENT SUMMARY 8-12

CHAPTER 9 – FINANCING

INTRODUCTION 9-1
CURRENT WATER RATES 9-1
Current Connection Fees 9-2
FINANCIAL OPERATIONS 9-3
SUMMARY OF PROJECTED FUNDING STATUS 9-7
AVAILABLE CAPITAL PROJECT FUNDING SOURCES 9-7
RECOMMENDATION 9-9

LIST OF TABLES

No.	Table	Page
E-1	Water Service Area Demand Projections	E-2
E-2	Analysis of Future Annual Water Rights	E-3
E-3	Instantaneous Water Right and Source Analysis	E-3
E-4	6-Year Capital Improvement Project Summary	E-6
1-1	City of Camas Water System Historical Timeline	1-3
1-2	City of Camas Water Right Summary	1-5
1-3	City of Camas Groundwater Sources	1-9
1-4	City of Camas Treatment Facilities	1-11
1-5	Existing Storage Facilities	1-14
1-6	2008 Pipe Diameter and Type	1-15
1-7	City of Camas Pressure Zones	1-16
1-8	Pressure Reducing Valves	1-17
1-9	City of Camas Booster Stations	1-23
1-10	SCADA System Control Setpoints	1-24
2-1	Relevant ESA Listings	2-3
2-2	City Policies	2-10
2-3	Radionuclide MCLs	2-19
2-4	Summary of Existing and Anticipated Drinking Water Requirements	2-21
3-1	Priority Anadromous and Resident Fish Presence	3-7
3-2	Land Use Designation for the UGA	3-7
3-3	Historical and Projected UGA Population	3-11
3-4	Build-Out Population for the Water Service Area Based on Land Use	3-12
3-5	Service Connections by Customer Class	3-13
3-6	2002 – 2007 Production: Average Day Production	3-14
3-7	2005 – 2007 Per Capita Production	3-14
3-8	2005 – 2007 Maximum Day Source Demand	3-15
3-9	2002 – 2007 Maximum Day Demand	3-16
3-10	2007 Customer Consumption	3-17
3-11	City of Camas Highest Water Users	3-19
3-12	Distribution System Leakage	3-19
3-13	2007 Equivalent Residential Units	3-21
3-14	Non-NUGA Water Demand Projections	3-23
3-15	Non-NUGA Water Demand Projections	3-24
3-16	NUGA Water Demand Projections	3-25
3-17	Total City and NUGA Water Demand Projections	3-26
3-18	2007 ERU Distribution	3-27
3-19	2007 ERU Distribution (Less Industrial and DSL)	3-28
3-20	Non-NUGA ERU Projections	3-29
3-21	NUGA ERU Projections	3-30
3-22	Total ERU Projections	3-31
3-23	Total Buildout Demands	3-32

No.	Table	Page
4-1	Water Quality Testing	4-2
4-2	Water Quality Monitoring Stations	4-3
4-3	D/DBP Standards	4-4
4-4	2007 D/DBP Testing Results	4-5
4-5	Instantaneous Water Right Versus Source Capacity	4-7
4-6	Instantaneous Water Right Analysis	4-9
4-7	Annual Water Right Analysis	4-10
4-8	Analysis of Future Annual Water Rights	4-11
4-9	Source Analysis	4-13
4-10	Source Analysis with Largest Source Out of Service	4-14
4-11	Demand Distribution by Zone	4-15
4-12	Available Pumping Capacity by Zone	4-16
4-13	Maximum Day Pumping Capacity (MGD)	4-17
4-14	Future Maximum Day Pumping Capacity (MGD)	4-18
4-15	Operational Storage	4-19
4-16	Equalizing Storage Distribution	4-20
4-17	Fire Suppression Storage	4-21
4-18	Standby Storage	4-21
4-19	Dead Storage	4-22
4-20	2008 Storage Requirements	4-23
4-21	2015 Storage Requirements	4-24
4-22	2029 Storage Requirements	4-24
4-23	Capital Improvement ERU Triggers	4-29
5-1	Element Labeling	5-3
5-2	Examples of Labeling Standards for Model Elements	5-3
5-3	2008 Production Distribution by Zone	5-5
5-4	2008 Demand Distribution by Zone	5-6
5-5	2015 and 2029 Demand Distribution by Zone	5-7
5-6	Model Calibration Conditions	5-8
5-7	Model Calibration Results	5-8
5-8	Reservoir Levels	5-10
5-9	Required Transmission Improvements	5-11
5-10	Developer Funded NUGA Transmission Improvements	5-12
5-11	Recommended Improvements	5-14
6-1	Summary of WUE Requirements	6-2
6-2	Meter and Data Collection Deadlines	6-3
6-3	Historic Distribution System Leakage	6-5
6-4	Historic Customer Water Rates Inside City Limits	6-8
6-5	Summary of DSL Reduction Goals	6-9
6-6	ERU Reduction Goal Summary	6-10
6-7	City WUE Program Measures	6-11
6-8	Projected Water Use Efficiency Savings	6-12
6-9	Demand Forecast without WUE Savings	6-13
6-10	Demand Forecast with WUE Savings	6-13

No.	Table	Page
7-1	Water System Group Classification	7-2
7-2	Water System Operator Certification	7-3
7-3	City of Camas Well Operating Settings	7-4
7-4	Booster Stations	7-7
7-5	Booster Station Settings	7-8
8-1	Source of Supply Capital Improvement Projects	8-4
8-2	Reservoir Capital Improvements	8-5
8-3	Transmission and Booster Station Improvements	8-8
8-4	NUGA Transmission Improvements	8-9
8-5	Distribution System Improvements	8-10
8-6	Developer Extension Improvements	8-11
8-7	Conservation Capital Improvements	8-12
8-8	Summary of System Deficiencies	8-13
8-9	6-Year Capital Improvement Summary	8-16
8-10	20-Year Capital Improvement Summary	8-18
8-11	6-Year Capital Improvement Project Schedule	8-21
9-1	Monthly Minimum Water Service Charge	9-2
9-2	Water Volume Charge	9-2
9-3	Connection Fees	9-3
9-4	2008 – 2015 Net Operation Cash Flow	9-4
9-5	2008 – 2015 Operation Funds Budget	9-5
9-6	2008 – 2015 Capital Funds Budget	9-6

LIST OF FIGURES

No.	Figure	On or Follows Page
1-1	Vicinity Map	1-4
1-2	Chlorination Plan and Headworks for Jones and Boulder Creek Intakes	1-8
1-3	Filtration Plant	1-10
1-4	Water System Facilities	1-12
1-5	3D Pressure Zone Schematic	1-16
1-6	Lower Prune Hill Booster Station	1-19
1-7	Forest Home Booster Station	1-19
1-8	Butler Booster Station	1-20
1-9	Angelo Booster Station	1-21
1-10	Lacamas Booster Station	1-21
1-11	Gregg Booster Station	1-22
1-12	Water System Flow Schematic	1-25
3-1	Study Area and Zoning	3-2
3-2	Retail Service Area	3-4
3-3	Topography	3-4
3-4	Wetland Areas	3-6
3-5	Floodplain Areas	3-6
3-6	Connections by Customer Class	3-18
3-7	Consumption by Customer Class	3-18
3-8	Historical Growth	3-21
5-1	2008 Available Fire Flow	5-14
5-2	2008 Available Fire Flow with 6-Year Improvements	5-14
5-3	Peak Hour Demand Pressures with 6-Year Improvements	5-14
5-4	2015 Available Fire Flow with 6-Year Improvements	5-14
7-1	Water System Organization Chart	7-2
8-1	Capital Improvements Plan	8-6

APPENDICES

Appendix A – WFI
Appendix B – DOH Checklist and Submittal Form
Appendix C – Water Rights Documentation
Appendix D – SEPA and DNS
Appendix E – City of Camas Design Standards
Appendix F – City of Camas 2008 Water Quality Report
Appendix G – City of Camas Intertie Agreement
Appendix H – Coliform Monitoring Plan
Appendix I – Volatile Organic Chemical Test Results
Appendix J – Lead and Copper Test Results
Appendix K – Inorganic Compound Test Results
Appendix L – Water Modeling Results
Appendix M – Preventative Maintenance Schedule
Appendix N – Emergency Response Program
Appendix O – Cross-Connection Control Ordinance
Appendix P – Wellhead Protection Program
Appendix Q – Watershed Control Program
Appendix R – Consistency Statement
Appendix S – Detailed Cost Estimates
Appendix T – FCS Group Financial Analysis – DRAFT

Executive Summary

INTRODUCTION

The City of Camas 2010 Water System Plan (Plan) provides a long-term planning strategy for the City's water utility for the 6- and 20-year planning periods. It has been prepared consistent with Department of Health requirements specified in Washington Administrative Code Chapter 246-290. The Department of Health, who will review this plan, considers this Plan to represent a commitment by the City to follow-up and implement the Plan's recommendations and capital improvements.

The City's water system currently consists of two surface water sources, one water treatment filtration plant, nine groundwater wells, seven storage reservoirs, nine booster stations, and approximately 130 miles of distribution and transmission piping. The City's Urban Growth Area (UGA) population has grown approximately 8 percent in the last 5 years.

The principal issues discussed in the Plan are as follows:

- Improvements to transmission and distribution capacity to supply the 544 and 455 Zone. These pressure zones, including the North Urban Growth Area (NUGA), encompass the majority of the City's projected growth in water consumption

- Development of a conservation program to reduce distribution system leakage, reduce 6-year and 20-year water system source and water right needs, and delay improvements.

- Financing for capital improvement program to meet projected growth and water system needs.

WATER DEMAND FORECASTING

Population projections suggest that the City's Water Service Area will grow in population by approximately 141 percent over the next 20 years. According to current land use and zoning, the City will reach buildout of its current UGA in 2038. Table E-1 illustrates the water use projections analyzed in the Plan.

Table E-1 Water Service Area Demand Projections

Year	Total Population	Total Residential and Commercial Demand (gpd)	Total Industrial Demand (gpd)	Total DSL[1] @ 11% (gpd)	Total ADD[2] (gpd)	Total MDD[3] (gpd)	Total PHD[4] (gpm)
2008	16,700	2,371,400	1,267,559	449,759	4,088,718	8,995,180	11,244
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2010	17,581	2,496,566	1,462,189	489,284	4,448,039	9,785,686	12,232
2011	18,817	2,659,001	1,559,503	521,388	4,739,892	10,427,763	13,035
2012	20,064	2,823,130	1,656,818	553,701	5,033,649	11,074,028	13,843
2013	21,324	2,988,997	1,754,133	586,230	5,329,359	11,724,590	14,656
2014	22,596	3,156,648	1,851,447	618,978	5,627,074	12,379,562	15,474
2015	23,881	3,326,130	1,948,762	651,953	5,926,845	13,039,059	16,299
2016	25,180	3,497,490	2,046,076	685,160	6,228,726	13,703,197	17,129
2017	26,492	3,670,776	2,143,391	718,605	6,532,772	14,372,098	17,965
2018	27,817	3,846,039	2,240,706	752,294	6,839,039	15,045,887	18,807
2019	29,158	4,023,331	2,338,020	786,234	7,147,586	15,724,689	19,656
2020	30,512	4,202,705	2,435,335	820,432	7,458,472	16,408,637	20,511
2021	31,882	4,384,214	2,532,650	854,893	7,771,757	17,097,865	21,372
2022	33,267	4,567,914	2,629,964	889,625	8,087,504	17,792,508	22,241
2023	34,668	4,753,863	2,727,279	924,635	8,405,777	18,492,710	23,116
2024	36,086	4,942,118	2,824,594	959,931	8,726,643	19,198,614	23,998
2025	37,520	5,132,741	2,830,000	984,159	8,946,900	19,683,180	24,604
2026	38,193	5,228,397	2,830,000	995,982	9,054,379	19,919,633	24,900
2027	38,885	5,326,545	2,830,000	1,008,112	9,164,657	20,162,246	25,203
2028	39,594	5,427,250	2,830,000	1,020,559	9,277,809	20,411,179	25,514
2029	40,321	5,530,578	2,830,000	1,033,330	9,393,908	20,666,597	25,833

(1) DSL – Distribution System Leakage.
(2) Average Daily Demand.
(3) Maximum Daily Demand.
(4) Peak Hour Demand.

WATER RIGHTS

Table E-2 summarizes the City's future annual water rights analysis. Table E-3 shows the analysis of future instantaneous water rights. As the tables show, the City's has adequate water rights to sustain growth through the planning period.

Table E-2 Analysis of Future Annual Water Rights

Year/ Demand	Total Annual Water Right (acre-ft)	Annual Demand (acre-ft)	Water Right Surplus (+) or Deficit (-) (acre-ft)
2008	11,090	4,139	+6,951
2015	11,090	6,639	+4,451
2029	11,090	10,523	+567

Table E-3 Instantaneous Water Right and Source Analysis

Year	Total Instantaneous Water Right (gpm)	Maximum Day Demand (gpm)	Source Capacity Surplus (+) or Deficit (-) (gpm)
2008	12,475	5,378	+7,097
2015	12,475	9,054	+3,421
2029	12,475	14,174	-1,699

WATER SUPPLY STRATEGY

The City's strategy to meet supply needs in the future consists of determining a plan for the surface water sources, improving transmission from the Washougal Wellfield to the upper zones, working with the City of Washougal to develop Stiegerwald regional sources consistent with the Watershed Plan, and developing redundant sources at Camas Meadows Wells.

JONES AND BOULDER CREEK

At the present time, the Jones and Boulder Creeks supply a maximum of 1,080 gpm to the City's water system. Based on an agreement between the City and the Department of Ecology, surface water sources are only used between November 1 and May 14. Prior to construction of the filtration plant, these sources were able to provide the entire 1,570 gpm capacity. At that time, the City did not have the head losses due to filtration, and these sources supplied the 343 Zone, rather than the higher head conditions of the 455 Zone that these sources currently supply. The capacity limitations are the 10-inch steel main between the creek intakes and the filter plant, and the capacity of the filter plant. The capacity of the City's pressure filter plant is 1,200 gpm, and the City's combined water right for these two sources is 3.5 cfs, or 1,570 gpm. Any increase in

supply from the surface water sources will require replacement of at least 4.5 miles of the 10-inch transmission main with 16-inch-diameter pipe, or additional pumping.

The City is considering three long-term options for its surface water sources:

1. Continue to use Jones and Boulder Creek at its current capacity and seasonal usage from November 1 through May 14. This option is attractive because it avoids the capital costs associated with an upgrade of the filter plant and the 4.5 miles of 10-inch steel transmission main. This source is advantageous because it is one of the few sources that is not located at the Washougal Well Field, increasing the City's source reliability. This source also is fed by gravity directly into the 455 Zone, which means lower system pumping costs when compared with the City's groundwater wells.

2. Discontinue use of the surface water sources altogether and transfer all the water rights to existing groundwater sources and new groundwater sources. The City could work out a water rights transfer with Ecology to develop new well sources closer to the City in exchange for the relinquishment of the Jones and Boulder Creek sources. This would only be worthwhile to the City if it could obtain equivalent groundwater rights closer to the City.

3. Construct a new treatment facility at a new location. The treatment facility is nearing 50 years in age and is due for replacement of some of its major components. Construction of a new treatment plant at a new location could allow the City to increase the capacity to the maximum instantaneous water right. If the treatment plant were located upstream of its current location, a portion of the 10-inch steel main could be abandoned, and the reduction in main length could provide additional capacity. Further, if located properly, the new treatment plant could serve future growth in the NUGA. A new treatment method would need to be selected and pumping facilities would more than likely be required for this option.

A more in depth study will be done by the City in the next 6 years to determine the most cost effective and beneficial alternative.

TRANSMISSION IMPROVEMENTS

The City has a number of transmission mains that are vital to the daily operation of the City. The City will determine if an upgrade of the existing 10-inch steel transmission main is appropriate once a long-term plan for the Jones and Boulder Creek sources has been identified.

Transmission mains will need to be constructed with the Crown Road Booster Station to serve the 544 Zone. Approximately 5,400 feet of 24-inch DI transmission main is

required from the discharge of the booster station to the intersection of SE 283rd Avenue and NE Nourse Road.

Additionally, transmission mains must be constructed within the NUGA in the 544 Zone to connect the Gregg NUGA and the Green Mountain NUGA. Approximately 24,800 feet of 24-inch DI transmission main is required to directly connect these portions of the NUGA. It is recommended that this improvement be made within the 6-year planning period in order to meet maximum day demand projections within the 544 Zone.

If this improvement is not made, then growth in the 544 Zone will be limited by the Lacamas Booster Station. In order to meet demands, the suction side transmission main to the Lacamas Booster Station must be upgraded to increase the capacity of the booster station. While Lacamas Booster Station has source capacity as currently configured, suction side improvements will be required to serve NUGA growth if the transmission main around the north side of the lake is not installed. Approximately 5,000 feet of 20-inch DI transmission main must be replaced if the NUGA transmission main is not constructed.

The remaining portions of the NUGA will be served by approximately 32,500 feet of 16-inch DI transmission main. These improvements are dependent on growth within the NUGA and are placed in the 20-year planning period.

CAPITAL IMPROVEMENT PROGRAM AND FINANCING

A summary of the City's 6-year CIP is shown in Table E-4. Projects in the 6-year planning period are an estimated $14,044,800.

The financial analysis shows that increased rates and SDCs, plus adjustments for projected inflation should support the water utility and planned improvements through the end of 2015. Depending upon the financing available for water system repairs and improvements, rates will be adjusted accordingly.

Table E-4 6-year Capital Improvement Project Summary

No.	Title	Year	City Project Cost[1]
SR-1	Well 14 Development - Anderson Site	2010	$ 1,650,000
SR-2	Boulder Creek Fish Screen	2010	$ 35,000
C-1	Water Conservation Device Distribution Program	2010	$ 5,000
C-2	Leak Detection Study	2010	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2010	$ 25,000
D-1	Pipeline Replacement	2010	$ 150,000
D-2	PRV Adjustments on NW 16th and NW McIntosh	2010	-
D-3	12-inch DI main on NW 38th Avenue	2010	$ 750,000
D-1	Pipeline Replacement	2011	$ 150,000
D-4	UPH PRV adjustments and looping around NW Astor	2011	$ 323,000
D-5	Butler Site PRV, 8-inch	2011	$ 89,000
T-1	Forest Home Booster Station Site Acquisition	2011	$ 50,000
C-2	Leak Detection Study	2011	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2011	$ 25,000
C-4	Residential Water Audit Program	2011	$ 50,000
SR-3	Treatment Plant Facility Plan	2012	$ 60,000
D-1	Pipeline Replacement	2012	$ 150,000
D-6	Couch Street Booster Pump Station	2012	$ 120,000
D-7	UPH looping from NW 16th to NW 12th Avenue	2012	$ 78,000
T-2	Forest Home Booster Station Upgrade	2012	$ 464,800
T-3	Forest Home Transmission Upgrade	2012	$ 358,000
T-4	Crown Road 24-inch Transmission Main	2012	$ 1,508,000
T-5	Crown Road Booster Station	2012	$ 213,000

Table E-4 6-year Capital Improvement Project Summary (continued)

No.	Title	Year	City Project Cost[(1)]
T-6	Portable Booster Pump	2012	$ 15,000
C-2	Leak Detection Study	2012	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2012	$ 25,000
C-4	Residential Water Audit Program	2012	$ 50,000
D-1	Pipeline Replacement	2013	$ 150,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2013	$ 2,300,000
C-2	Leak Detection Study	2013	$ 6,000
C-4	Residential Water Audit Program	2013	$ 50,000
D-1	Pipeline Replacement	2014	$ 150,000
S-1	Lower Prune Hill Reservoir Evaluation	2014	$ 80,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2014	$ 2,300,000
C-2	Leak Detection Study	2014	$ 6,000
SR-4	Well 17 Feasibility Study - Camas Meadows Site	2015	$ 50,000
D-1	Pipeline Replacement	2015	$ 150,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2015	$ 2,441,000
6-Year Capital Improvement Total			**$14,044,800[(2)]**

(1) CCI = 8,660.08 per ENR January 2010.
(2) CIP totals only include portion City will fund. Does not include NUGA (N) projects or developer (DE) projects.

Chapter 1
INTRODUCTION AND EXISTING WATER SYSTEM

INTRODUCTION
In accordance with Washington Administrative Code (WAC) 246-290-100 and the Washington State Department of Health (DOH), water system plans need to be updated every 6 years or more frequently, if necessary, to reflect the current conditions of the water system. The City of Camas (City) water system facilities identification number is 108002. A copy of the City's Water Facilities Inventory Form is provided in Appendix A. The DOH water system plan checklist, and DOH submittal form is provided in Appendix B. The City last completed a Water System Plan (Plan) in 2002.

PURPOSE
The purpose of this Plan is to assist the City in developing long term planning strategies for the City's water service area. This Plan will also evaluate the development of the area north of Lacamas Lake, the North Urban Growth Area (NUGA). The Plan evaluates the existing system and its ability to meet the anticipated State and Federal requirements for water source, quality, transmission, storage, and distribution across a 20-year planning horizon in accordance with the Growth Management Act (GMA). This Plan will evaluate the system capacity into the 6- and 20-year planning period, 2015 and 2029, respectively. This Plan will also analyze the strategic outlook for the system over the next 50 years. Water system improvement projects have been developed to meet

the changing demands of regulatory impacts, population growth and development, and infrastructure repair and replacement. The Plan also identifies the costs of the improvement projects and provides a financial plan for funding the projects.

PLAN SUMMARY

This Plan is presented in nine chapters. The contents of these chapters are summarized below:

- Chapter 1 provides an introduction, Plan summary, historical information about the water system, and a summary of existing facilities.
- Chapter 2 provides an overview of the regulatory requirements regarding legislation, regulatory agencies, system design standards, and water quality standards.
- Chapter 3 provides the basic planning data and water use projections used in developing the planning strategy for the next 20 years.
- Chapter 4 provides an analysis of the City's water quality, including Department of Health regulations, water treatment information, and recorded water quality information. This chapter also analyzes the water system components and their ability to meet the projected demands on the system.
- Chapter 5 provides the hydraulic analysis for the water system using H_2O Map modeling software. This chapter illustrates how the system responds to various modeling scenarios, including identifying available fire flows and system pressures.
- Chapter 6 outlines the City's water use efficiency program, including current conservation efforts, target water use reductions, and an investigation of the potential for water reuse as a component of the water use efficiency plan.
- Chapter 7 provides a summary of the operation and maintenance (O&M) program. This chapter summarizes water system management, system operations, emergency response planning, safety procedures, cross connection control, record keeping, and identifies O&M improvements.
- Chapter 8 presents the capital improvements, needed to address requirements identified by the analyses provided in Chapters 4 through 7.
- Chapter 9 presents the current financial status of the City, along with a discussion of funding for the identified capital improvement projects.

HISTORY OF THE CITY

The first known settler, David Parker, came to the City of Camas in 1845. In 1883 the La Camas Colony Company of Portland purchased 2,600 acres encompassing Lacamas, Round, and Dead Lakes, the stream connecting them to the Columbia River, and constructed dams for water power for new flour and paper mills, and a sawmill and furniture factory in the area. The City of Camas was incorporated in 1906. A vicinity

map showing the City limits is provided as Figure 1-1. Aerial photos were taken in 2006.

DEVELOPMENT OF THE WATER SYSTEM

The City's water system began operation in 1913 with the construction of the Jones Creek Intake and the Butler Reservoir. The City drilled Wells 1 and 2 in 1936. The City constructed the Chlorination Plant in 1952 and the Filter Plant in 1965, signifying the beginning of treatment of the City's water. Table 1-1 provides a timeline of events in the City's water system history.

Table 1-1 Water System Historical Timeline

Date	Event
1845	Camas first settled
1913	Jones Creek Intake constructed
1913	0.6 MG Butler Reservoir, South Half
1923	0.6 MG Butler Reservoir, North Half (1.2 MG total)
1931	Boulder Creek Intake constructed
1935	0.5 MG Lower Prune Hill Reservoir
1936	Wells 1 and 2 constructed
1945	Well 3 constructed
1948	Butler Booster Station - 800 gpm
1949	Forest Home Booster Station-450 gpm
1952	Chlorination Plant - injects chlorine into water from Jones Creek and Boulder Creek before it goes to the Filter Plant
1959	Well 4 constructed
1965	Filter Plant - 1,200 gpm - filters water from Jones Creek and Boulder Creek intakes
1965	10th Street Booster Station
1968	Well 5 constructed
1969	Well 6 constructed
1971	Well 7 constructed
1971	1.5 MG Lower Prune Hill Reservoir
1971	0.75 MG Upper Prune Hill Reservoir
1971	Lower Prune Hill Booster Station - 500 gpm, 500 gpm, 750 gpm
1977	Well 8 constructed 1,350 gpm
1978	0.1 MG Gregg Reservoir
1978	Old Gregg Booster Station - 500 gpm
1988	SCADA System installed
1993	2.0 MG Lacamas Reservoir
1993	Lacamas Booster Station - 500 gpm, 500 gpm, 1,500 gpm
1998	Forest Home Booster Station Upgrade – 1,000 gpm
1999	Butler Booster Station Upgrade
2000	Well No. 9 constructed – 650 gpm
2001	Angelo Booster Station constructed – 3,000 gpm capacity

Table 1-1 Water System Historical Timeline (Continued)

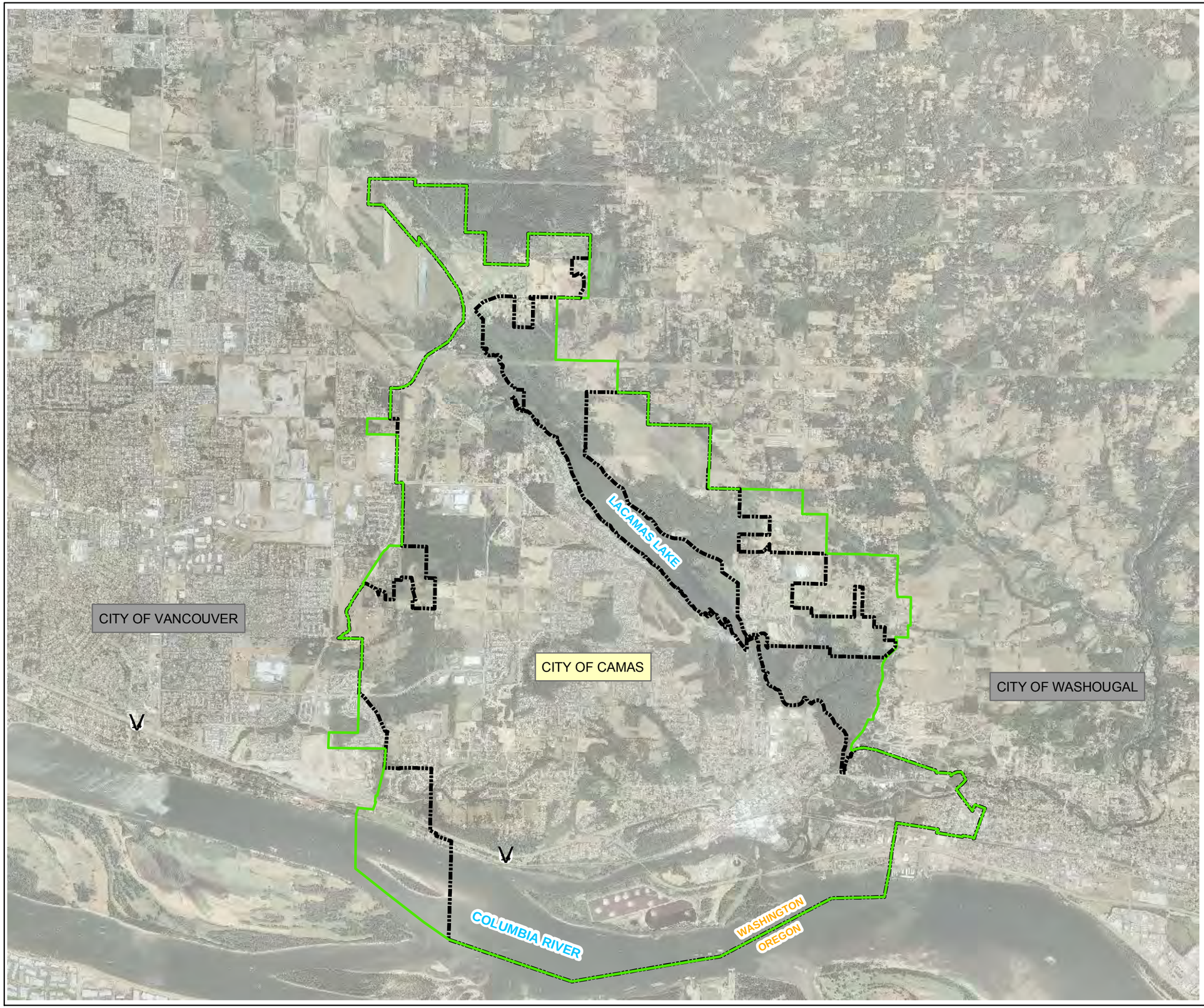
Date	Event
2001	Lower Prune Hill Booster Station Upgrade – 1,000 gpm replacement pump
2002	Upper Prune Hill Reservoir (2.4 MG) and Booster Station (2,900 gpm capacity) constructed
2002	New Gregg Zone Booster Station Constructed, 1,500 gpm
2002	Lower Prune Hill Upgrade, 2,000 gpm
2002	Jones and Boulder Creek intake metering
2002	Chlorine and CT improvements
2002	Well 1 & 2 abandoned
2003	Well 3 decommissioned
2003	Well 11, 1,200 gpm & 12 900 gpm constructed, Washougal Wellfield Chemical Feed Facility installed
2004	Well 10 constructed – 900 gpm
2007	Well 4 decommissioned
2008	Well 13 constructed, 1,325 gpm
2008	Washougal River 24-inch pipe crossing installed
2008	Ostenson Canyon Pipeline installed
2008	City and Department of Ecology sign agreement regarding use of surface water sources and increased water rights associated with groundwater.
2009	Well 14 constructed – 1,000 gpm
2009	Sodium hypochlorite disinfection system installed at Well 5 and 9

ORGANIZATION

The City's water system is owned and operated by the City of Camas. The City is governed by a mayor and seven council members, all of which are elected officials. The Public Works Director is appointed by the council and, as one of his duties, heads the City's water department. The water department is divided into two branches, engineering and operations.

EXISTING WATER SYSTEM COMPONENTS

The City owns and operates a water source, treatment, transmission, distribution, and storage system. The system consists of 16 pressure zones ranging from a hydraulic grade of 852 feet in the Upper Prune Hill Zone to 343 feet in the downtown area in the Butler Zone. The City currently operates nine groundwater wells, one surface water treatment plant, over 130 miles of pipe, seven reservoirs, eight booster stations, and 48 PRV stations.



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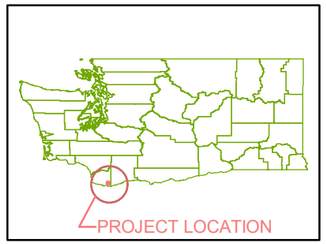
Feet



LEGEND:

City Limits

Urban Growth Boundary

SOURCE: CITY OF CAMAS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 1-1
VICINITY MAP

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WATER RIGHTS

The City currently has municipal water rights issued by the Washington State Department of Ecology (DOE) for two surface water sources and nine groundwater sources. Additionally, the City holds groundwater permits to develop production wells at three new sites and to expand production from existing wells at their Lower Washougal River wellfield. The combined water right on instantaneous quantity basis (Q_i) from all of the City's sources is 14,045 gallons per minute (gpm). The annual withdrawal allocated to the City is 11,090 ac-ft/yr.

A summary of the City's water rights are presented below in Table 1-2. Four of the wells listed in Table 1-2 are no longer in use: Wells 1, 2, 3, and 4. Water rights from these wells have been transferred to other sources as indicated. Copies of water rights are located in Appendix C.

Table 1-2 Water Right Summary

Source	ID Number	Priority Date	Instantaneous Qi (gpm)	Annual Qa (acre-ft/year)
Claims				
Well 1	G2-CV1-2P159 121022	06/11/74	900	320[1]
Well 2	G2-CV1-2P160 121023	06/11/74	900	230[1]
Well 10	Claims transferred from Wells 1 and 2[6]			
Well 12	Claims transferred from Wells 1 and 2[6]			
Certificates				
Boulder Creek[7]	S 712 CS2-SWC 712	08/22/23	1,120 (2.5 cfs)	977[2] (P) 843 P (Instream Flow)
Jones Creek[7]	S 711 CS2-SWC 711	09/05/30	450 (1.0 cfs)	393[3] (P) 337 P (Instream Flow)
Well 3	G 85-A	07/21/45	1,200	118 (P)
Well 4	G 4072-A	02/12/59	1,325	1,208 (P)
Well 5	G 6636-A	03/22/68	600	920[4] (P)
Well 6	G 6635-A	03/22/68	1,500	2,400[4] (P)
Well 7	G2-00501	03/22/71	1,000	530[5] (P)
Well 8	G2-24400	02/04/77	900	530[5] (P)
Well 11	Water Right transferred from Well 3[5]			
Well 13	Water Right transferred from Well 4[5]			

Table 1-2 Water Right Summary (Continued)

Source	ID Number	Priority Date	Instantaneous Qi (gpm)	Annual Qa (acre-ft/year)
Permits				
Well 9	G2-27384	08/13/86	650	210 (S)
Expanded Wellfield Permit	G2-30144	08/13/86	500	2,150 (P)
Anderson Site	G2-30145	08/13/86	1,000	880 (P)
Parkers Landing	G2-30146	08/13/86	1,000	880 (P)
Treatment Plant Well	G2-30147	08/13/86	1,000	880 (P)
Total			**14,045**	**11,090 (P) 210 (S)**

(1) Claims are considered valid until proven otherwise through an adjudication process.
(2) This source was formerly known as the Little Washougal River. The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 1,820 ac-ft/yr for Boulder Creek (S 712), based on continuous withdrawal at the instantaneous right specified.
(3) The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 730 ac-ft/yr. for Jones Creek (S 711), based on continuous withdrawal at the instantaneous right specified.
(4) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 3,300 ac-ft/yr."
(5) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 5,750 ac-ft/yr."
(6) Well 10, 11, and 12 were installed to replace Well 1, 2 and 3, which have failed due to collapsed well casings; see Pacific Groundwater Group report dated June 9, 2003. Well 13 replaced Well 4 after Well 4 was determined to be groundwater under the influence of surface water; see Pacific Groundwater Group report dated August 14, 2006.
(7) See Ecology agreement that limits withdrawal from May 15 through October 31.
(P) Primary water right, additive to other rights.
(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.

The surface water diversions for Jones Creek and Boulder Creek (formerly known as the Little Washougal River) are situated in Section 3, Township 2 North, Range 4 East, W.M. All of the wells, with the exception of Well 9, are located in Section 12, Township 1 North, Range 3 East, W.M. Well 9 is located in Section 4, Township 1 North, Range 3 East. The "place of use" specified by DOE on all certificates, permits, and claims is either "within the City limits of the City of Camas" or the "area served by the City of Camas." The purpose or "type of use" for certificates, permits, and claims is "municipal supply," except for Certificate S 711 (Jones Creek), which specifies a purpose of "domestic supplies."

Ecology and the City reached an agreement that eliminates the surface water withdrawals between May 15 and October 31, in exchange for additional groundwater rights. Diversions for the Boulder and Jones Creek sources are limited by the period of use agreed to between the City and Department of Ecology, and the rate of installed

capacity. Based on continuous operation between October 31 and May 15 the City is able to divert 1,370 ac-ft/yr from these combined sources. The remaining surface water rights (1,180 ac-ft/yr) have been placed in to a permanent seasonal trust through change applications CS2-SWC 712 and CS2-SWC 711.

The City has also submitted two water right applications for new wells in the Lacamas Creek basin. Application G2-30018 requests 350 gpm and 300 ac-ft/yr from a new well at Camas Fire Station 42. Application G2-30019 requests 1,000 gpm and 1,200 ac-ft/yr from two wells that will be installed at the Camas Meadows golf course. An additional application has been submitted for Stiegerwald rights in the 50-year planning period.

EXISTING WATER SYSTEM FACILITIES

The City's water system facilities are discussed in the following sections with respect to storage, transmission and distribution, and SCADA and control. The focus of these sections is to provide an overview of the City water system's identifying equipment and infrastructure.

SOURCE OF SUPPLY

The City currently obtains its water from nine groundwater wells and two surface water sources. Eight of the nine groundwater sources are located in the downtown area, in the Butler 343 Zone and Well 9 is located in the Lacamas 542 Zone. The City also chlorinates and filters surface water from Boulder and Jones Creeks. Well 14 is under construction and anticipated to be online in Spring 2010.

BOULDER CREEK AND JONES CREEK

Jones Creek has been providing the City of Camas with water since 1913. The Boulder Creek source was added in 1931. The intakes at Boulder and Jones Creeks consist of small settling basins and screens. Raw water from the Boulder and Jones Creek intakes is transmitted approximately 3.4 and 3.9 miles, respectively, to the chlorination plant where the water is pre-chlorinated. Water travels from the chlorination plant through over 6.5 miles of 10-inch steel pipe to the filter plant, where it receives further treatment. The water then flows by gravity to either the Lower Prune Hill Zone or the Butler Zone, depending upon the level in the Lower Prune Hill Reservoirs.

The City calls its groundwater sources only after demands cannot be met by production from the filter plant. The surface water sources have lower operating expenses because they can provide flow to two pressure zones without pumping, and have low silica content, which makes these sources more desirable to light industrial customers and their water quality sensitive industrial processes. However, these surface water sources are not available during peak water demand months.

The Jones and Boulder Creek sources historically had a combined capacity of 1,570 gpm. This capacity occurred prior to the installation of the filter plant, at which time the source discharged directly to the lower head conditions of the 343 Zone. The higher discharge pressure of the 455 Zone and the losses through the filter plant have limited the capacity of these sources to 1,050 gpm. An upgrade of the existing filter plant and to portions of the 6.5 miles of 10-inch transmission main are required to overcome the hydraulic limitations of the Jones and Boulder Creek sources.

The chlorination plant is located at the intersection of NE 49th Street and NE 312th Avenue in Clark County. The facility is a pre-chlorination facility that utilizes approximately 6.5 miles of 10-inch steel pipeline as contact time prior to treatment at the filter plant. Chlorine levels are monitored at the filter plant, which are relayed to the City's telemetry system. Figure 1-2 shows the location of the City's chlorination plant, and the headworks for Jones and Boulder Creek intakes.

The City's filter plant has a rated capacity of 1,200 gpm. However, the total capacity of Jones and Boulder Creek is approximately 1,050 gpm under normal system operation, as described above. Under the City's new water rights, the surface water sources will be limited to 6.5 months seasonal usage to reduce the amount of water withdrawn from the streams during the warmest part of the year for fish stream flow augmentation. Aluminum sulfate coagulant, polymer, sodium fluoride, and sodium hydroxide are added at the filter plant. The filter plant is a pressure filter plant and the influent pressure is 130 psi, while the effluent pressure is a function of the head loss through the filter. Water to the system is delivered at approximately 120 psi. This allows the plant to supply the Lower Prune Hill Reservoirs by gravity. Once the Lower Prune Hill Reservoirs have reached capacity, a solenoid valve at the Butler Booster Station called the Butler Valve redirects flow from Lower Prune Hill to the Butler Reservoir.

GROUNDWATER SOURCES

The City currently operates nine groundwater wells. Wells 7, 8, 10, 11, and 12 are located on SE 6th Avenue, in the eastern downtown area, and are referred to as the Washougal Wellfield. Well 6 is located farther east along SE 6th Avenue near the Camas/Washougal border. The well water is conveyed across the Washougal River via a 14-inch steel line under the river and a 24-inch ductile iron pipe on a bridge over the river. The two pipes join and an 18-inch transmission line carries water from the Washougal Wellfield up toward the Angelo Booster Station. Well 5 is located south of Well 6 on SE 8th Street. All of these wells are located in the 343 Zone. Well 9 was completed in August 2000 at a capacity of 650 gpm. It is located in the 544 Zone on NW 38th Avenue near Parker Street. Well 10 was completed in September 2004. Well 11 was completed in July 2003. Well 12 was completed in October 2003. Well 13 was completed in June 2008. Table 1-3 lists the City's groundwater sources and their

0 2,500 5,000 Feet

BOULDER CREEK INTAKE

JONES CREEK INTAKE

CHLORINATION PLANT

LEGEND:

- Water Lines
- Roads
- City Property
- Creek Watershed
- Water
- Streams

Contours:

4000 ft

0 ft

SOURCE: CITY OF CAMAS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 1-2
JONES AND BOULDER CREEK
HEADWORKS AND WATERSHED

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capacities. Well 14 is under construction and scheduled for completion in Spring 2010, and will add source capacity to the 343 Zone.

Table 1-3 Groundwater Sources

Source	Depth (feet)	Rated Capacity (gpm)	HP	Casing (inch)	Control Valve	Auxiliary Power
Well 5	71	500	75	8	3-inch	No
Well 6	85	1,450	150	16	6-inch	No
Well 7	84	950	100	14	3-inch	No
Well 8	87	1,350	150	14	4-inch	Yes
Well 9	253	650	100	16	6-inch	No
Well 10	92	900	200	16	8-inch	No
Well 11	105	1,200	200	16	8-inch	Yes
Well 12	106	900	200	16	8-inch	Yes
Well 13	102	1,325	200	20	8-inch	Yes
Well 14	-	1,000	200	20	8-inch	Yes
Total Source Capacity		**10,225 gpm**				

The City is currently investigating additional groundwater sources to continue to anticipate future demands. The City is continuing to pursue new sources of supply within its service area.

WATER TREATMENT

Surface Water

The City's surface water is chlorinated and filtered. Chlorination of the surface water occurs at the City's 12.5 percent liquid sodium hypochlorite plant, located several miles upstream of the filter plant. The distance between the Chlorination Plant and the Filter Plant provides 2.5 hours of prefiltration contact time.

The City operates two 750 gpm pressure filters (1,500 gpm total). The filters provide layers of media that vary from course to fine and provide the physical filtration required. Dechlorination is used for the filter backwash and bypass. The City also treats with sodium fluoride for dental benefits, alum and polymer for coagulation, and 25 percent caustic soda for pH adjustment at the filter plant. A photo of the filtration plant is shown below in Figure 1-3.

Figure 1-3 Filtration Plant

Groundwater

Treatment of the City's groundwater sources includes on-site chlorination, fluoridation, and caustic soda addition. A single chemical feed facility provides treatment for Wells 7, 8, 10, 11, and 12 due to their close proximity to one another. The remaining wells each have individual treatment facilities at the well locations. Fluoridation always occurs downstream of the well pump. Flourisilic acid is used at Wells 7, 8, 10, 11, and 12. Sodium fluoride is used at Wells 5, 6, 9 and 13. Caustic soda is added at each of the wells, with the exception of Well 9 due to natural pH, for corrosion control. The existing treatment facilities for the City's sources are shown in Table 1-4.

Table 1-4 Treatment Facilities

Source	Status	Filtration	Chlorination	Fluoridation	Corrosion Control
Boulder Creek	Active	Yes	Yes	Yes	Caustic Soda
Jones Creek	Active	Yes	Yes	Yes	Caustic Soda
Well 5	Active	No	Yes	Yes	Caustic Soda
Well 6	Active	No	Yes	Yes	Caustic Soda
Well 7	Active	No	Yes	Yes	Caustic Soda
Well 8	Active	No	Yes	Yes	Caustic Soda
Well 9(1)	Active	No	Yes	Yes	N/A
Well 10	Active	No	Yes	Yes	Caustic Soda
Well 11	Active	No	Yes	Yes	Caustic Soda
Well 12	Active	No	Yes	Yes	Caustic Soda
Well 13	Active	No	Yes	Yes	Caustic Soda
Well 14	Pre-Active	No	Yes	Yes	Caustic Soda

(1) Well pH above treatment limit.

Groundwater Under the Direct Influence of Surface Water

The federal definition of ground water under the direct influence of surface water (GWI) is a groundwater source located near a surface water such that it has significant occurrence of contamination from pathogens such as Giardia lamblia which is not normally found in groundwater. A GWI receives direct surface water recharge and is subject to rapid changes in water characteristics that correlate to surface water conditions. Sources determined as GWI are required to achieve 99.9 percent removal of Giardia lamblia and viruses by filtration and disinfection.

A hydraulic connection to nearby surface water is a potential GWI source. In order to determine if a hydraulic connection exists, a water system may conduct a hyrdogeologic investigation or use the water quality monitoring (WQM) method (WQM). The WQM method requires monitoring the groundwater and surface water source for 1 year for temperature and conductivity. If a significant correlation is determined from statistical analysis of the data, then the source is determined to be hydraulically connected to surface water. Less demanding requirements are required for hydraulically connected sources. These include eliminating the surface water influence, developing an alternate source, meet criteria to remain unfiltered, or install filtration.

A microscopic particulate analysis (MPA) is conducted in order to determine if a groundwater source is a GWI source. The City has completed MPA testing on Wells 6, 7, 10, 11, and 12 that indicate that these sources are hydraulically connected to surface water. Therefore, these sources are required by DOH to achieve a CT of 6. An

evaluation by Pacific Groundwater Group in 2006 states that Well 13 is not under the direct influence of surface water, but is hydraulically connected to surface water.

STORAGE FACILITIES

The City currently operates seven storage facilities with a combined total of 8.45 million gallons (MG). A discussion of each storage facility is provided in the following sections. A summary of the storage facilities is provided in Table 1-5. A map showing the location of the various water system facilities within the City is provided as Figure 1-4.

In the following discussion, 'normal operating conditions' describes the system operation during non-peak, winter months. During summer months, operations differ due to varied source operations, and higher water usage.

Butler Reservoir

The Butler Reservoir consists of two adjacent, partially buried concrete reservoirs. The two reservoirs share a common wall, with the north half being constructed in 1913, and the south half being completed in 1923. The reservoirs are covered and have a total storage capacity of 1.2 MG. The base elevation of the reservoir is approximately 328 feet and the overflow elevation is 343 feet. The entire capacity of the Butler Reservoir is usable storage.

Under normal operating conditions, the Butler Reservoir is supplied through 6,420 lineal feet of 12-inch cast iron transmission main. This transmission main connects with the dedicated 18-inch transmission main from Wells 6, 7, 8, 10, 11, 12, and 13 at NE 22nd Ave. and NE Everett Street.

The filter plant, which supplies the 455 Zone under normal conditions, can also supply the Butler Reservoir. When the water level in the Lower Prune Hill Reservoirs come within one foot of the 455 foot overflow, a solenoid operated control valve, located at the filter plant, is activated via telemetry. This valve, known as the Butler Valve, diverts the treated water to the Butler Reservoir and the 343 Zone.

Lower Prune Hill Reservoir

Storage in the Lower Prune Hill Zone is provided by two concrete ground level reservoirs with overflow elevations of 455 feet. The first reservoir was constructed in 1935 and has a total capacity of 0.5 MG. A second, 1.5 MG reservoir was added to the same site in 1971. The reservoirs are plumbed together to act as one reservoir, and both have a base elevation of approximately 432 feet.

All of the storage in the Lower Prune Hill Reservoirs is usable, either via gravity to the 455 Zone, or if pumped to the Upper Prune Hill Zone through the Lower Prune Hill Booster Station. Under normal system operation, water from the filter plant supplies the

3

0 4,000 8,000
Feet

BUTLER RESERVOIR
GREGG BPS
GREGG RESERVOIR
LACAMAS BPS
LACAMAS RESERVOIR
LACAMAS LAKE
WELL 9
ANGELO BPS
LOWER PRUNE HILL RESERVOIRS AND BPS
WELL 13
WASHOUGAL WELLFIELD WELLS 7, 8, 10, 11, 12
WELL 14
WELL 6
WELL 5
UPPER PRUNE HILL RESERVOIRS AND BPS
FRANCIS RD BPS
FOREST HOME BPS
SR14
COLUMBIA RIVER
WASHINGTON
OREGON

LEGEND:
- Reservoir
- Pump Station
- Water Treatment
- Wells
- Water Lines
- Water Service Boundary

Limits
- City Limits
- Urban Growth Boundary
- Clark Co. Parcels
- Water

SOURCE: CITY OF CAMAS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 1-4
WATER SYSTEM FACILITIES

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455 Zone and the reservoirs. Once the Lower Prune Hill Reservoirs are full, flow from the filter plant is diverted to the 343 Zone. The 455 Zone can also be supplied through pumping from the 343 Zone via the Forest Home, Butler, and Angelo Booster Stations.

The Lower Prune Hill Reservoirs can also supply the 544 Zone through the Lacamas Booster Station.

Upper Prune Hill Standpipe and Reservoir

The Upper Prune Hill Standpipe and Reservoir, constructed in 1971 and 2001, respectively, currently provide all of the storage for the Upper Prune Hill Zones. The standpipe has an overflow elevation of 852 feet, stands 100-feet tall, and has a total capacity of 0.75 MG. The standpipe sets the hydraulic grade line for the pressure zone.

The Upper Prune Hill Reservoir is below the HGL of the 852 zone and serves the zone by pumping through the Upper Prune Hill BPS to the UPH Standpipe. It has an overflow elevation of 816 feet, stands 64-feet tall, and has a total capacity of 2.4 MG. The booster station has a total pumping capacity of 2,900 gpm. Including the standpipe and reservoir, the 852 zone is supplied by the Lower Prune Hill BPS, 12-inch transmission line, and 16-inch Ostenson Canyon transmission line.

Lacamas Reservoir

The Lacamas Reservoir, constructed in 1993, has a total capacity of 2.0 MG. It has a base elevation of approximately 504 feet, and an overflow elevation of 544 feet. The Lacamas Reservoir is a ground level reservoir, with a base elevation high enough to make all of the storage available for use. The Lacamas Reservoir is primarily supplied from the Lower Prune Hill Zone via the Lacamas Booster Station or from the newly constructed Well 9. PRV stations from the Upper Prune Hill zone can also provide fire flow to the Lacamas Zone.

Gregg Reservoir

The Gregg Reservoir, a 100,000 gallon capacity steel standpipe, was constructed in 1978. It has a base elevation of approximately 472 feet, an overflow elevation of 542 feet, and is the only storage facility for the Gregg Zone. The Gregg Reservoir is supplied by the Gregg Booster Stations.

Table 1-5 Existing Storage Facilities

Reservoir	Butler	Lower Prune Hill No. 1	Lower Prune Hill No. 2	Upper Prune Hill No. 1	Upper Prune Hill No. 2	Gregg	Lacamas
Capacity (MG)	1.2	0.5	1.5	0.75	2.4	0.10	2.0
Diameter (ft)	100x100	61	105	36	90	16	84
Base Elevation (ft)	328	432	432	752	748	472	496
Overflow Elevation (ft)	343	455	455	852	798	542	544
Year Constructed	1913	1935	1971	1971	2002	1978	1993
Construction Type	Concrete	Concrete	Concrete	Steel	Steel	Steel	Steel
Location	707 NE 43rd Ave.	600 NW 18th Loop	600 NW 18th Loop	2822 NW 18th Ave.	2822 NW 18th Ave.	1709 SE 270th Pl.	1520 NW 41st Cir.

TRANSMISSION AND DISTRIBUTION FACILITIES

Transmission and distribution facilities allow the water supply to reach the City's customers. These facilities include transmission and distribution mains, booster pump stations and pressure reducing stations that allow water to flow between pressure zones, from one hydraulic grade to another.

Water Mains

Transmission mains are primarily used to convey water from one area of the system to another and may or may not provide water service to customers. Distribution mains are generally classified as water pipes with diameters of 12 inches and smaller and maintain adequate pressures for serving the City's customers. Pipe materials within the City currently include the following:

- Cast Iron (CI) Pipe
- Polyvinyl chloride (PVC) Pipe
- Ductile Iron (DI) Pipe
- Steel (ST) Pipe
- Galvanized Steel
- Copper

Table 1-6 provides a list of pipe diameters, pipe materials and the total length of each within the water system.

Table 1-6 2008 Pipe Diameter and Type

Diameter	Ductile Iron (DI) (ft)	Cast Iron (CI) (ft)	Steel (ST) (ft)	Polyvinyl Chloride (PVC) (ft)	Unknown (ft)	Total (ft)	Percentage
6-inch	73,775	69,470	20,259	0	16,982	180,486	25.8%
8-inch	146,109	19,501	12,226	0	68,613	246,449	35.2%
10-inch	4,221	0	10,563	0	29,857	44,641	6.4%
12-inch	53,928	21,118	3,533	0	44,982	123,561	17.6%
14-inch	4,371	0	9,343	0	75	9,418	1.3%
16-inch	9,576	764	1,571	0	744	3,079	0.4%
18-inch	44,068	77	181	0	41,414	85,739	12.2%
20-inch	0	0	0	6,895	0	6,895	1.0%
24-inch	4,322*	0	0	0	9,099	0	0.0%
Total	336,046	110,930	57,675	6,895	211,766	700,268	100.0%
Percentage	48.0%	15.8%	8.2%	1.0%	30.2%	100.0%	

(1) Current as of July 2007. Obtained from Water System Hydraulic Model, GIS based.

Pressure Zones

The City has five main areas that serve as pressure zones in the system. These are the 343 Zone - Butler, the 455 Zone - Lower Prune Hill, the 852 Zone - Upper Prune Hill, the 544 Zone - Lacamas, and the 542 Zone - Gregg. These areas are named after the reservoirs located within the area. The City's water system contains 16 pressure zones in all. With the exception of the 852 Zone, each area is a single pressure zone, with a hydraulic grade controlled by the reservoir located in the zone. The 852 Zone contains eight separate pressure zones located adjacent to the Upper Prune Hill Reservoir. These zones are set by PRVs and exist as a buffer between the high elevation of the 852 Zone and the lower zones such as the 544 Zone and the 455 Zone. Table 1-7 lists the City's pressure zones and corresponding hydraulic grade control. The location and size of the various pressure zones is shown in Figure 1-5. A system schematic showing the transmission and distribution facilities and storage facilities is included as Figure 1-4.

Table 1-7 Pressure Zones

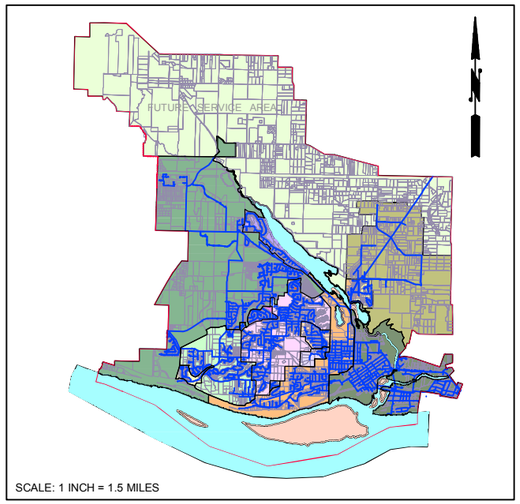
Pressure Zone	Hydraulic Grade Control
343	Butler Reservoir
428	PRV(1)
455	Lower Prune Hill Reservoirs
500	PRV(2)
542	Gregg Reservoir
544	Lacamas Reservoir
547	PRV(3)
650	PRV(3)
656	PRV(3)
680	PRV(3)
687	PRV(3)
697	PRV(3)
711	PRV(3)
760	PRV(3)
800	PRV(3)
852	Upper Prune Hill Reservoirs

(1) Dependent on the Lower Prune Hill Reservoirs.
(2) Dependent on the Lacamas Reservoir.
(3) Dependent on the Upper Prune Hill Reservoirs.

Pressure Reducing Stations

In order to operate on the sixteen pressure zones, the City maintains numerous pressure reducing stations as shown in Table 1-8. In most cases, there are two PRVs at each station. The smaller valve operates to provide the average daily demand to the zone that it serves. The larger valve, which is generally set five psi lower than the small valve, is primarily used for fire protection or large demand situations. The City's PRVs have pressure sustaining features, which are set to ensure that upstream pressures are maintained. Pressure relief valves have been installed at newer station to prevent over pressurizing the zone being fed.

The City has a contract with GC Systems to service the 68 PRVs located within the water system. This contract allows GC Systems to perform general maintenance and ensure that the valves are operating correctly, both on an individual and system-wide level.



SOURCE	CAPACITY
FILTER PLANT NO.	1,100 GPM
WELL NO. 5	500 GPM
WELL NO. 6	1,450 GPM
WELL NO. 7	950 GPM
WELL NO. 8	1,350 GPM
WELL NO. 9	650 GPM
WELL NO. 10	1,000 GPM
WELL NO. 11	1,000 GPM
WELL NO. 12	1,200 GPM
WELL NO. 13	1,325 GPM

PUMP	PUMP	CAPACITY
BUTLER	NO. 1	800 GPM
	NO. 2	600 GPM *
FOREST HOME	NO. 1	1,000 GPM
LOWER PRUNE HILL	NO. 1	100 GPM
	NO. 2	1,000 GPM
	NO. 3	750 GPM *
GREGG**	NO. 1	500 GPM
	NO. 2	500 GPM *
	NO. 3	1,500 GPM
	NO. 4	1,500 GPM
LACAMAS	NO. 1	1,000 GPM
	NO. 2	500 GPM
	NO. 3	500 GPM *
ANGELO	NO. 1	1,000 GPM
	NO. 2	1,000 GPM
	NO. 3	1,000 GPM
	NO. 4	1,000 GPM *
UPPER PRUNE HILL	NO. 1	750 GPM
	NO. 2	750 GPM
	NO. 3	1,400 GPM
	NO. 4	1,400 GPM *

* STAND-BY PUMP

LEGEND:

- RESERVOIR
- CONCRETE RESERVOIR
- PRESSURE REDUCING VALVE (PRV)
- BUTLER VALVE
- WELL
- STANDPIPE
- BOOSTER STATION
- WATER MAINS

PRESSURE ZONE ELEVATIONS

- 852
- 800
- 760
- 711
- 697
- 687
- 680
- 656
- 650
- 547
- 544
- 542
- 500
- 455
- 428
- 343

NUGA

COLUMBIA RIVER

LADY ISLAND

LAKE CAMAS

9

UPPER PRUNE HILL RESERVOIR, STANDPIPE AND BOOSTER STATION

75 MG

2.4 MG

LACAMAS RESERVOIR 2.0 MG

LOWER PRUNE HILL RESERVOIR AND BOOSTER STATION

0.5 MG

1.5 MG

FOREST HOME BOOSTER

LACAMAS BOOSTER STATION

FILTER PLANT

GREGG BOOSTER STATION

BUTLER BOOSTER STATION

BUTLER RESERVOIR 1.2 MG

ANGELO BOOSTER STATION

WASHOUGAL INTERTIE

CHLORINATION PLANT

0.1 MG

GREGG RESERVOIR 0.1 MG

13

10

11

12

7

8

6

5

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 1-5
3D PRESSURE ZONE SCHEMATIC

L:\CAMAS\081495 WSP\FIGURES\FIG1-5 PRESSURE_ZONES.DWG, FIGURE 1-5, 12/23/2009 2:05:24 PM, PDF-XCHANGE FOR ACROPLOT PRO, BY: P MARSHALL

Table 1-8 Pressure Reducing Valves

No	Location	Size (Inch)	Downstream Zone	Downstream Setting (psi)	Upstream Static Pressure (psi)
1	NW 22nd and Fargo	4	687	65	140
2	NW McIntosh	6	697	45	120
3	NW McIntosh	2	697	50	120
4	NW Payne Rd. and 18th	8	544	Closed	Closed
5	NW Payne Rd. and 18th	4	544	Closed	Closed
6	NW 16th Ave. and Klickitat	10	697	30	105
7	NW 16th Ave. and Klickitat	4	697	40	105
8	NW Ivy and Fargo	4	623	50	85
9	NW 23nd Ave. and Fargo St.	4	537	74	126
10	NW 19th Ave. and Fargo St.	4	687	75	150
11	NE 21st and Everett	8	343	55 back 40	110
12	NE 19th and Everett	6	343	55 back 40	110
13	NW 32nd Cir.	8	680	25	120
14	NW 32nd Cir.	2	680	30	120
15	NW Brady Rd. Deer Creek	8	517	25	105
16	NW Brady Rd. Deer Creek	3	517	30	105
17	NW Parker St. and Linear	8	518	30	135
18	NW Astor and 36th	8	544	50	120
19	NW Astor and 36th	2	544	65	120
20	NW 43rd and Sierra	8	544	30 back 55	190
21	SE 3rd and Whitney – Washougal Intertie	8	Washougal Water System	Closed	Closed
22	SE 3rd and Whitney – Washougal Intertie	11/2	Washougal Water System	Closed	Closed
23	NW Logan St. off NW 28th	6	760	45	90
24	NW Logan St. off NW 28th	2	760	50	90
25	NW 31st and NW Dahlia Dr.	6		Closed	Closed
26	NW 31st and NW Dahlia Dr.	2		Closed	Closed
27	NW 29th Ave. and NW Astor St.	2	800	58	90
28	NW 29th Ave. and NW Astor St.	6	800	53	90
29	NW Sierra Dr. and NW 38th Ave.	6	711	35	115
30	NW Sierra Dr. and NE 38th Ave.	2	711	40	115
31	Currawong Ct. and NW 40th Ave.	6	694	75	145
32	Currawong Ct. and NW 40th Ave.	2	694	80	145
33	NW 23rd Ave. and Icicle	8	685	58	130
34	NW 23rd Ave. and Icicle	2	685	63	130
35	NW Julia St.	8	544	Closed	Closed
36	NW Julia St.	2	544	Closed	Closed
37	SE Fern Ridge Dr.	2	499	40	110
38	SE Fern Ridge Dr.	8	499	35	110
39	NE Shepherd Road – Washougal Intertie	8	Washougal Water System	Closed	Closed
40	NE Shepherd Road – Washougal Intertie	11/2	Washougal Water System	Closed	Closed
41	NE 6th and Hayes	4	343	80	94
42	NE 6th and Hayes	12	343	70	94
43	SE 15th St. and Hayes – where?	6		Closed	Closed
44	SE 15th St. and Hayes – where?	2		Closed	Closed

Table 1-8 Pressure Reducing Valves (Continued)

No	Location	Size (Inch)	Downstream Zone	Downstream Setting (psi)	Upstream Static Pressure (psi)
45	East End Walden	2	423	32	84
46	East End Walden	6	423	22	84
47	West End Walden	11/2	423	72	118
48	West End Walden	6	423	65	118
49	NE 6th and Joy	6	343	64 back 74	92
50	Goot Park	3	343	115 back 123	138
51	Goot Park	10	343	110 back 123	138
	Well Field East	4	343	Closed	Closed
	Well Field East	12	343	Closed	Closed
52	Lake Ridge Lower	2	543	48	98
53	Lake Ridge Lower	6	543	43	98
54	Lake Ridge Middle	2	680	63	91
55	Lake Ridge Middle	6	680	58	91
56	Lake Ridge Upper	2	727	68	123
57	Lake Ridge Upper	6	727	63	123
58	Spyglass (Upper PRV in View Ridge)	2	686	30	100
59	Spyglass (Upper PRV in View Ridge)	6	686	25	100
60	Spyglass (Lower PRV in View Ridge)	2	505	35	110
61	Spyglass (Lower PRV in View Ridge)	6	505	40	110
62	Drewf's Farm Upper	2	691	50	63
63	Drewf's Farm Upper	6	691	45	63
64	Drewf's Farm Lower	2	669	50	130
65	Drewf's Farm Lower	6	669	45	130
66	NW Ivy and Ostenson Canyon	2	677	65	140
67	NW Ivy and Ostenson Canyon	6	677	60	140
68	Vista Del Rio	2	355	63	150

Booster Stations

The City currently operates nine booster stations. The Lower Prune Hill Booster Station is located at the Lower Prune Hill Reservoir site and pumps water from the 455 Zone to the 852 Zone. This pump station contains three pumps at a total rated capacity of 2,500 gpm, with the ability to add one additional pump. This station has the capacity for one additional pump. The Lower Prune Hill Booster Station is shown in Figure 1-6.

Figure 1-6 Lower Prune Hill Booster Station

The Forest Home Booster Station, located at 418 NW 10th Avenue, pumps from downtown in the 343 Zone to the 455 Zone. This station contains one pump at a rated capacity of 1,000 gpm. Figure 1-7 below, shows the Forest Home Booster Station.

Figure 1-7 Forest Home Booster Station

The Butler Booster Station is located at the Butler Reservoir site and also pumps from the 343 Zone to the 455 Zone. This station contains two pumps at a rated capacity of 700 gpm each, for a total rated capacity of 1,400 gpm. This station has the capacity for one additional pump. Figure 1-8 below, shows the Butler Booster Station.

Figure 1-8 Butler Booster Station

The Angelo Booster Station is located at Fallen Leaf Park and is the primary booster station that pumps from the 18-inch transmission main in the 343 Zone to serve the 455 Zone; it also feeds the suction side of the Lacamas Booster Station. This station contained four pumps at a rated capacity of 4,000 gpm. The Angelo Booster Station is shown below in Figure 1-9.

Figure 1-9 Angelo Booster Station

The Lacamas Booster Station, located at 4620 NW Sierra Street, pumps water from the 455 Zone to the 544 Zone. This station contains three pumps at a rated capacity of 2,500 gpm. Figure 1-10 below shows the Lacamas Booster Station.

Figure 1-10 Lacamas Booster Station

The Old and New Gregg Booster Stations are also located at the Butler Reservoir site and pump water from the 455 Zone to the 542 Zone. The Old Gregg Booster Station contains two pumps at a rated capacity of 500 gpm each. The New Gregg Booster Station contains two pumps at a rated capacity of 1,500 gpm each. Figure 1-11 below shows the Gregg Booster Station.

Figure 1-11 Gregg Booster Station

The ninth booster station, known as the 10th Avenue booster station, provides service pressures to only five connections located on the south east side of Prune Hill.

Table 1-9 Booster Stations

Booster Pump Station	No. of Pumps	Rated Capacity (gpm)	Year Constructed	Location
Butler	2	1,400	1948(1)	Butler Reservoir Site
Forest Home	1	1,000	1949(2)	418 NW 6th Ave.
Old Gregg	2	1,000	1978	Butler Reservoir Site
New Gregg	2	3,000	2003	Butler Reservoir Site
Lower Prune Hill	3	2,500	1971(3)	Lower Prune Hill Reservoir Site
Lacamas	3	2,500	1993	4620 NW Sierra St.
Angelo	4	4,000	2001	Fallen Leaf Park
Upper Prune Hill	4	2,900	2002	Upper Prune Hill Reservoir Site

(1) Pump replaced in 1998.
(2) Upgraded in 1999.
(3) Upgraded in 2002 and 2004.

A schematic of the City's existing water system is shown in Figure 1-12. This figure is a simplified hydraulic representation of how supply is transferred between the various zones.

INTERTIES

The City currently has an emergency intertie agreement with the City of Washougal to the east and the City of Vancouver to the west. A physical intertie does not exist with Vancouver, but the City has emergency access to two fire hydrants located at SE 1st and Friberg. The City has two one-way PRV interties with Washougal, located on SE Shepherd Road and at the intersection of SE 3rd Street and Whitney Street. These interties provide water from the City of Camas to the City of Washougal under low pressure conditions. The City does not have any other intertie agreements at the present time.

SCADA

The City has a Supervisory Control and Data Acquisition (SCADA) system with master control located at the City Operations Center. The system uses programmable control software, which can be controlled by a personal computer at the operations center, or from remote by a modem connected to a remote computer. The system monitors reservoir levels, well status, well flow rate, booster pump flow rates, pump status, run time, power usage, and alarm conditions. The system is able to record and display trending data for everything the City monitors. Table 1-10 indicates all of the data acquisition and control features of the SCADA system. The pump calls listed in Table 1-10 are typical, but not necessarily current. The City continually rotates well and booster pump calls to exercise the pumps and to evenly distribute wear on the pumps.

Table 1-10 SCADA System Control Setpoints

Pump	Capacity (gpm)	Called By	Winter Settings		Summer Settings	
			On Elevation (ft)	Off Elevation (ft)	On Elevation (ft)	Off Elevation (ft)
Well 5[(1)]	500	Butler Reservoir	17.0	18.0	18.5	20.0
Well 6	1,450	Butler Reservoir				
Well 7	950	Butler Reservoir	12.8	13.2		
Well 8	1,350	Butler Reservoir	13.8	14.1		
Well 9	650	Lacamas Reservoir	36.0	40.0		
Well 10	900	Butler Reservoir	13.6	13.9		
Well 11	1,000	Butler Reservoir	13.4	13.7		
Well 12	1,000	Butler Reservoir	14.0	14.3		
Well 13	1,325	Butler Reservoir	8.5	9.0		
Old Gregg Booster Station	500	Gregg Reservoir	58.0	65.0	58.0	65.0
New Gregg Booster Station	1,700	Gregg Reservoir	58.0	65.0	58.0	65.0
Forest Home Booster Station	1,000	Well 5	-	-	-	-
Butler Booster Station						
Pump No. 1	800	Lower Prune Hill Reservoir	15.5	16.0	15.5	16.0
Pump No. 2	600	Lower Prune Hill Reservoir	15.0	15.5	15.0	15.5
Angelo Booster Station						
Lead Pump	1,000	Lower Prune Hill Reservoir	20.0	21.5	21.0	22.0
Lag No. 1	1,000	Lower Prune Hill Reservoir	19.5	20.5	20.5	21.5
Lag No. 2	1,000	Lower Prune Hill Reservoir	18.5	19.5	19.5	20.5
Lag No. 3	1,000	Lower Prune Hill Reservoir	17.0	18.0	18.0	19.0
Lower Prune Hill Booster Station						
Lead Pump	850	Upper Prune Hill Reservoir	56.0	95.0	58.0	95.0
Lag No. 1	850	Upper Prune Hill Reservoir	54.0	94.0	56.0	95.0
Lag No. 2	850	Upper Prune Hill Reservoir	52.0	93.0	54.0	95.0
Upper Prune Hill Booster Station						
Lead Pump	730	Upper Prune Hill Standpipe	88.0	95.0	88.0	95.0

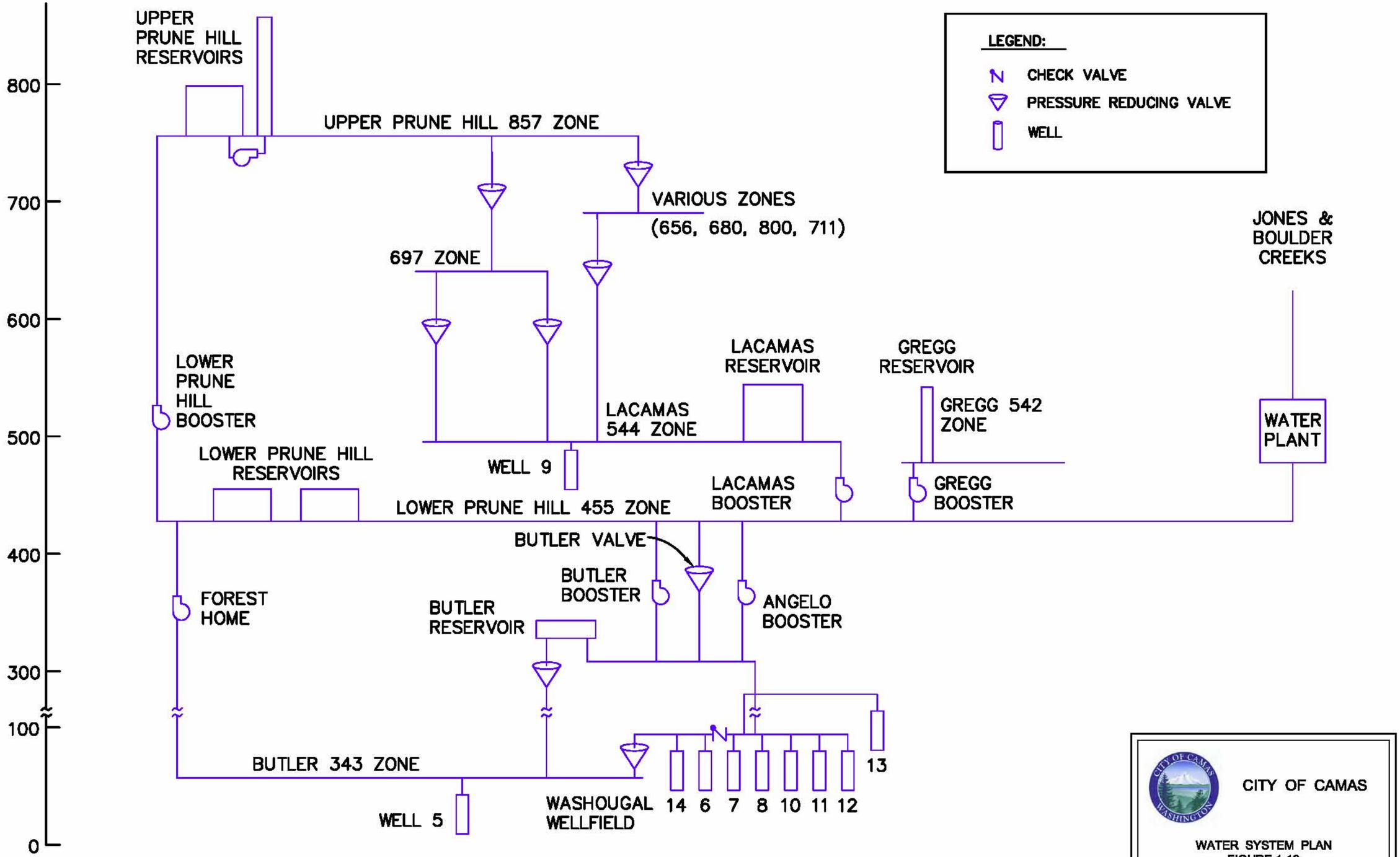

800
700
600
500
400
300
100
0
UPPER PRUNE HILL RESERVOIRS
UPPER PRUNE HILL 857 ZONE
VARIOUS ZONES
(656, 680, 800, 711)
697 ZONE
LOWER PRUNE HILL BOOSTER
LACAMAS RESERVOIR
LACAMAS 544 ZONE
GREGG RESERVOIR
GREGG 542 ZONE
JONES & BOULDER CREEKS
WATER PLANT
LOWER PRUNE HILL RESERVOIRS
WELL 9
LOWER PRUNE HILL 455 ZONE
LACAMAS BOOSTER
GREGG BOOSTER
BUTLER VALVE
BUTLER BOOSTER
ANGELO BOOSTER
FOREST HOME
BUTLER RESERVOIR
BUTLER 343 ZONE
WELL 5
WASHOUGAL WELLFIELD
14 6 7 8 10 11 12
13
LEGEND:
CHECK VALVE
PRESSURE REDUCING VALVE
WELL
CITY OF CAMAS
WASHINGTON
CITY OF CAMAS
WATER SYSTEM PLAN
FIGURE 1-12
WATER SYSTEM SCHEMATIC

Table 1-10 SCADA System Control Setpoints (Continued)

Pump	Capacity (gpm)	Called By	Winter Settings		Summer Settings	
			On Elevation (ft)	Off Elevation (ft)	On Elevation (ft)	Off Elevation (ft)
Lag No. 1	730	Upper Prune Hill Standpipe	86.0	93.0	86.0	93.0
Lag No. 2	1,200	Upper Prune Hill Standpipe	84.0	92.0	84.0	92.0
Lag No. 3	1,200	Upper Prune Hill Standpipe	80.0	88.0	80.0	88.0
Lacamas Booster Station						
Lead Pump	500	Lacamas Reservoir	40.0	44.0	42.0	44.0
Lag No. 1	500	Lacamas Reservoir	36.0	41.0	40.0	42.0
Lag No. 2	1,500	N/A	Manual	Manual		
Butler Valve[(2)] (Filter Plant)	1,050 gpm (Typical)	Lower Prune Hill Reservoirs	22.5	22.0	22.5	22.0

N/A – Not Applicable

(1) Wells 6, 8, 10, 11, 12, and 13 are rotated monthly as the lead well.

(2) The Butler Valve is a solenoid activated valve that diverts filter plant flow from the 455 Zone to the 343 Zone, when the Lower Prune Hill Reservoirs are full.

Chapter 2
REGULATORY REQUIREMENTS

INTRODUCTION
Water system planning is based on a careful analysis of a water utility's responsibility to comply with applicable regulatory requirements while providing service to existing and future customers. These regulatory requirements are the result of a number of state and federal laws. These laws are monitored and enforced by a number of federal, state and local agencies.

APPLICABLE LEGISLATION, REGULATIONS AND PERMITS
In this section, the various state and federal legislation that may affect City operations are discussed, as well as other relevant permits, programs, and regulations.

FEDERAL CLEAN WATER ACT
The Federal Water Pollution Control Act is the principal law regulating the water quality of the nation's waterways. Although originally enacted in 1948, it was significantly revised in 1972 and 1977, when it was given the common title of the "Clean Water Act." The Clean Water Act has been amended several times since 1977. The 1987 amendments replaced the Construction Grants program with the State Revolving Fund (SRF) which provides low-cost financing for a range of water quality infrastructure projects.

A Clean Water Act (CWA) Section 401 Water Quality Certification is required for any activity that may result in discharge to surface waters including excavation activities that occur in streams, wetlands, or other Waters of the United States. In Washington State, CWA Section 401 responsibility has been assumed by the Department of Ecology, and is required for projects with CWA Section 404 Permits.

Section 404 of the Clean Water Act regulates discharges of fill or dredged materials in wetlands, including any related draining, flooding and excavation. Pipeline and pump station projects in wetlands will require a Section 404 permit, in addition to any related local permits. CWA Section 404 Permits require Endangered Species Act (ESA) Section 7 consultation with the US Fish and Wildlife Service and the National Marine Fisheries Service as a result of recent listings of salmonids. Biological Assessments, Biological Opinions and their review have significantly lengthened the time required for issuance of CWA Section 404 Permits.

SAFE DRINKING WATER ACT

The Federal Safe Drinking Water Act (SDWA) was passed in 1974 and amended in 1986 and 1996. The Washington State Department of Health (DOH) adopted the federal standards under WAC 246-290, which became effective April 27, 2003. All public water systems as defined by the Environmental Protection Agency (EPA) are affected by the SDWA. A public water system is defined as one that serves piped water to at least 25 people, or 15 connections for at least 60 days per year. The SDWA contains regulations regarding water quality, sampling, treatment, and public notification requirements that are applicable to the City.

ENDANGERED SPECIES ACT

The Table 2-1 lists the Evolutionarily Significant Units (ESUs) of salmonid species present in the Camas area listed, or proposed for listing, under the authority of the Endangered Species Act:

Table 2-1 Relevant ESA Listings

Columbia River Species (ESU)	Status	Habitat
Columbia River Bull trout	Listed Threatened – 6-10-98	Critical Habitat – 9-25-05
Lower Columbia River Steelhead	Listed Threatened – 1-5-06	Critical Habitat – 9-2-05
Lower Columbia River Chinook	Listed Threatened – 6-28-05	Critical Habitat – 9-2-05
Columbia River Chum	Listed Threatened – 6-28-05	Critical Habitat – 9-2-05
Columbia River Cutthroat Trout	De-listed – 4-5-99	Not Applicable
Lower Columbia River Coho	Listed Threatened – 6-28-05	Critical Habitat – Under Development
Green Sturgeon	Listed Threatened - 2007	Critical Habitat – Under Development

The purpose of the 1972 ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved...." In pursuit of this goal, the ESA authorizes USFWS and NMFS to list species as endangered or threatened, and to identify and protect the critical habitat of listed species. USFWS has jurisdiction over terrestrial and freshwater plants and animals such as bull trout and cutthroat trout, while NMFS is responsible for protection of marine species including anadromous salmon. Under the ESA, endangered status is conferred upon "any species that is in danger of extinction throughout all or a significant portion of its range…," while threatened status is conferred upon "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The ESA defines critical habitat as the "geographical area containing physical and biological features essential to the conservation of the species."

Once a species is listed as endangered or threatened, the ESA makes it illegal for the government or individuals to "take" a listed species. "Take" has been interpreted by the federal courts to include "significant modification or degradation of critical habitat" that impairs essential behavior patterns. For species listed as endangered, the blanket prohibitions against "take" are immediate. However, threatened species may be protected through a more flexible Section 4(d) rule describing specific activities that are likely to result in a "take."

RECLAIMED WATER STANDARDS

The standards for the use of reclaimed water are outlined in the Revised Code of Washington (RCW) Section 90.46 and in a separate document published by the Washington State Departments of Health and Ecology entitled "Water Reclamation and Reuse Standards." Reclaimed water is the effluent derived in any part from wastewater from a wastewater treatment system that has been adequately and reliably treated, such that it is no longer considered wastewater and is suitable for a beneficial use or a controlled use that would not otherwise occur. The legislature has declared that "the utilization of reclaimed water by local communities for domestic, agricultural, industrial, recreational, and fish and wildlife habitat creation and enhancement purposes (including wetland enhancement) will contribute to the peace, health, safety, and welfare of the people of the State of Washington."

NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act was established in 1969 and requires federal agencies to conduct environmental review or assessments of projects to determine environmental impacts on all projects requiring federal permits or funding. If the project is determined to be environmentally insignificant a Finding of No Significant Impact (FONSI) is issued, otherwise an Environmental Impact Statement (EIS) is required. City activities requiring CWA Section 404 permits fall under the jurisdiction of NEPA.

The National Historic Preservation Act regulates federal activities with the potential to impact materials of historic, cultural or archaeological significance under Section 106, which requires consultation with affected Native American Tribes and the Washington State Department of Archaeology and Historic Preservation. Documentation of this consultation is included in National Environmental Policy Act (NEPA) Environmental Reports and Assessments. Recent decisions by the US Army Corps of Engineers require an independent NHPA Section 106 consultation process for projects permitted by the Corps, which can result in significant delays to project implementation.

The State of Washington regulates state funded projects with the potential to impact materials of historic, cultural or archaeological significance under Governor's Executive Order 05-05, which requires consultation with the Department of Archaeology and Historic Preservation and affected Tribes similar to the NHPA Section 106 process.

STATE ENVIRONMENTAL POLICY ACT

The State Environmental Policy Act (SEPA) ensures that environmental issues are taken into consideration during the planning process for Non-Federal projects. An Environmental Impact Statement (EIS) is required if a project will have a significant adverse environmental impact. The EIS looks at potential environmental problems that would be caused by the project, ways the project could be changed to minimize the

impact, and mitigation options. The City is currently pursuing alternate sources of supply, which may require an EIS depending on the type of projects that are involved. Most projects including water right applications and transfers, typically do not require an EIS. A SEPA checklist is prepared and a Determination of Non-significance is issued instead. This Plan will fall under the SEPA Checklist Non-Project Action requirement. The water system projects listed in the capital improvement plan will each be completed under a separate SEPA checklist. A SEPA checklist and Determination of Nonsignificance for the Plan is included in the Appendix D.

GROWTH MANAGEMENT ACT

The Washington State Growth Management Act (GMA) was enacted in 1990 and requires certain local governments to plan for the population growth that will occur over the next twenty years within an established Urban Growth Area (UGA). The GMA also requires cities to classify critical areas (wetlands, aquifer recharge areas, fish and wildlife habitat areas, geologically hazardous areas, and frequently flooded areas) and to establish development regulations to protect these areas. The City of Camas, in conjunction with the planning efforts of Clark County, is currently in the process of updating its City Comprehensive Plan, in compliance with the GMA. Minor changes to the UGA are anticipated during this update.

SHORELINE MANAGEMENT ACT PERMIT

A Shoreline Permit is required on all projects of $2,500 or more that are located on the water or shoreline area. Shorelines are lakes or reservoirs of 20 acres or greater, streams with a mean annual flow of 20 cubic feet per second or greater, marine waters, and an area within 200 feet of the ordinary high water mark. Areas within the City that are classified as shoreline are those areas along Lake Lacamas, the Washougal River, Little Washougal River, and the Columbia River.

FLOODPLAIN DEVELOPMENT PERMIT

Local governments that are participating in the National Flood Insurance Program are required to review projects (including water system facilities) in a mapped flood plain and impose conditions to reduce potential damage from flood water. A Floodplain Development Permit is required prior to construction. Areas where a Floodplain Development Permit may be required include the flood hazard areas which are discussed in further detail in Chapter 3.

HYDRAULIC PROJECT APPROVAL

Under Washington Administrative Code (WAC) 220-110, the Washington State Department of Fish and Wildlife requires a hydraulic project approval (HPA) for activities that will “use, divert, obstruct, or change the natural flow or bed” of any waters of the state. For City activities such as pipeline crossings of streams or outfall and intake improvements, an HPA will be required, and must include provisions necessary to minimize project specific and cumulative impacts to fish.

Because of ESA listings throughout Washington, the Washington State Department of Fish and Wildlife and NMFS are in the process of revising the Hydraulic Code to protect species listed as threatened or endangered. If NMFS determines that the revisions are sufficient to protect listed species, the State hopes the revised Code will constitute an acceptable Habitat Conservation Plan under Section 10 of the ESA. If the Habitat Conservation Plan is approved, NMFS may issue an Incidental Take Permit allowing incidental take of a listed species if the permittee has complied with the Habitat Conservation Plan. This Incidental Take Permit expires after an agreed upon period of time, and may then be revised by NMFS.

LOCAL PERMITS

The City has agreements with Clark County for the construction and maintenance of facilities in their respective rights-of-way. Under these agreements, a Right-of-Use permit is issued that specifies construction standards such as traffic control, work hours, and safety issues, as well as design and restoration standards.

WATER RIGHTS

A water right is the legal authorization to use a specified amount of public water for a certain beneficial purpose. Washington State law requires that permission in the form of a water right permit or certificate be granted for most appropriations of public water. Water rights are required to ensure proper allocation and management of water resources. Water rights are issued by the Washington State Department of Ecology (Ecology). The following sections provide definitions of key terms with regards to water rights.

Water Right Claim

A water right claim is a statement of claim to water use that began before the State Water Codes were adopted and is not covered by a permit or certificate. A claim may represent a valid water right if it describes the use of a surface water source that began before 1917 or the use of groundwater source that began before 1945. It can also represent a water right claim that was filed with the State during an open filing period designated under RCW 90.14, or is covered by the groundwater exemption.

Water Right Permit

A water right permit is issued by the state to water right applicants to begin developing their water right. A water right is developed when the applicant follows the provisions outlined in their permit such as using the water for the purposes and limits stated in the permit. A water right permit will remain in effect until the water right certificate is issued, if all terms of the permit are met, or the permit is canceled.

Water Right Certificate

A water right certificate is issued by Ecology to certify that the water user has the authority to withdraw a specific amount of water under certain conditions. The conditions are based on the beneficial use of water under the water right permit. The water right certificate is a legal document recorded at the county auditor's office. Issuance of the water right certificate is the final step in obtaining a water right.

REGULATORY AGENCIES

The above regulations, permits, and programs are administered by various local, state, and federal agencies. The history, purpose, and authority of these agencies are discussed below.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

The stated mission of the EPA is to protect human health and to safeguard the natural environment upon which life depends. The EPA's purpose includes protecting all Americans from significant human health risks, ensuring that national environmental efforts are based on the best available scientific information, ensuring that federal laws are enforced fairly, and that environmental protection contributes to making our communities and ecosystems diverse, sustainable, and economically productive. Ecology currently administers the State Revolving Fund (SRF) loans for the EPA.

UNITED STATES FISH AND WILDLIFE SERVICE (USFWS)

Under the ESA, USFWS is responsible for the protection of all non-marine life including birds, mammals, and non-anadomous fish, including bull trout and sea-run cutthroat. Although USFWS may choose to invoke the blanket prohibitions of Section 9, the "threatened" status of Bull Trout allows more flexibility to establish regulations designed to protect these species. These regulations, known collectively as a Section 4(d) rule, outline activities likely to result in a "take" of a threatened species, as well as exempted activities.

THE NATIONAL MARINE FISHERIES SERVICE (NMFS)

Under the ESA, NMFS is responsible for the protection of marine life, including anadromous salmon such as the Columbia River Chinook, Chum, and Steelhead. When a species is listed as "endangered" the prohibitions against "take" of the species are immediate under Section 9 of the ESA of the Act. Although NMFS may choose to invoke the blanket prohibitions of Section 9, the "threatened" status of the Columbia River Chinook, Coho, Chum, and Steelhead allows more flexibility to establish regulations designed to protect these species. These regulations, known collectively as a Section 4(d) rule, outline activities likely to result in a "take" of a threatened species, as well as exempted activities. The final 4(d) Rule was adopted on June 20, 2000.

UNITED STATES ARMY CORPS OF ENGINEERS

Under Section 404 of the Clean Water Act, the US Army Corps of Engineers (Corps) is authorized to regulate discharge of fill and dredged material to waters of the United States, including wetlands. A similar review process is employed for projects with the potential to impact navigable waters, including the Columbia River, under Section 10 of the Rivers and Harbors Act of 1899. This process applies to any work on outfalls to the Columbia River. The Corps employs a system of General or Nationwide Permits for blanket authorization of activities such as utility lines that have minimal adverse impact on the environment. In situations where projects are large and complex, or adverse impact is probable, the Corps may issue an Individual Permit after reviewing an alternatives analysis. Enforcement actions may be brought by the Corps or the EPA. Activities subject to Corps jurisdiction require NEPA and ESA review and consultation.

WASHINGTON STATE DEPARTMENT OF HEALTH

The Washington State Department of Health (DOH) has three primary functions: to regularly assess the State's health needs and resources; to develop and implement sound public policy; and to ensure the capacity of public health agencies to manage daily operations and respond to public health emergencies. The Department of Health was granted full authority and responsibility for the regulation and enforcement of the SDWA by the federal government in 1976. DOH also publishes guidelines for the preparation of water system plans, water conservation programs, design and drinking water quality standards, and watershed control programs. Water system comprehensive plans must be reviewed and approved by DOH. Construction plans and specifications must also be reviewed by DOH unless they are transmission or distribution improvements included in the Water System Comprehensive Plan Capital Improvement Program.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

The mission of Ecology's Water Quality Program is to protect, preserve and enhance the state surface and ground water quality and to promote the wise management of water for the benefit of current and future generations. Ecology performs various functions under state and federal authority and has both local and regional offices. Ecology oversees the allocation of water rights.

WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE

Under WAC 220-110 and RCW 75.20, any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any fresh water of the state requires hydraulic project approval from the Department of Fish and Wildlife. Approval would be required for all City construction projects that cross or otherwise take place in streams or shorelines.

WATERSHED RESOURCE INVENTORY AREA (WRIA)

Under WAC 173-500-040, Washington State was divided into 62 geographic areas, defined on the basis of surface water resources. These 62 geographic areas are defined as Water Resource Inventory Areas (WRIAs). The purpose of WRIAs is to implement effective planning involving all jurisdictions that fall within WRIA, including county, city, and other local, state, and national agencies.

The City of Camas and the Jones and Boulder Creek watersheds reside within WRIA 28. The City owns and controls a majority of the Jones and Boulder Creek watersheds, Figure 1-2, which are both tributaries of the Washougal River. The City is an active participant in regional watershed planning efforts.

LOCAL HEALTH DEPARTMENTS

The Clark County Department of Health is the local health department governing the City. In general, local health departments may adopt and enforce local regulations when they are consistent with and more stringent than state regulations.

COUNTY PLANNING POLICIES

City planning policies should be consistent with those of Clark County. Accordingly, this Plan will require approval by Clark County.

CITY POLICIES

Planning policies are important in guiding the development of a water system. The City has adopted many resolutions regarding water system planning that are included in the City Code. Table 2-2 lists various City policies and references where the policy is stated.

Table 2-2 City Policies

Policy Name	City of Camas Policy	Reference
Cross-Connection Control	A cross-connection control policy has been adopted by the City that provides written procedures for the abatement of cross connections and backflow prevention devices.	Chapter 13.32 of the City of Camas Municipal Code
Late-comer Agreements	Late-comer agreements may be granted when the cost of constructing water main extensions identified in the Comprehensive Plan exceeds the System Development Charges (SDC) to be collected from a plat.	Chapter 13.52 of the City of Camas Municipal Code
Developer Extensions/ Minimum Standards	Standards have been adopted which provide the minimum general standards required by the City for developer constructed water main extensions and improvements to be acquired by the City.	Chapter 13.48 of the City of Camas Municipal Code
Utility Rates and Charges	Utility service rates and charges have been adopted by the City which outline the service rates and charges, billing, connection fees, and miscellaneous charges.	Chapter 13.36 of the City of Camas Municipal Code
Watershed Management	City ordinances have been created establishing the boundaries of the City's watershed, the activities prohibited within the watershed, and the penalties for violating the provisions of these ordinances.	Chapter 13.56 of the City of Camas Municipal Code
City Service Water Supply	City ordinances have been created to establish a level of service to customers at the point of delivery.	Chapter 13.16.010 of the City of Camas Municipal Code
Conservation	The City utilizes SEPA and UPC provisions to promote beneficial reuse, recycling and conservation among industrial and residential customers.	15.08 UPC 16.28 SEPA

Table 2-2 City Policies (Continued)

Policy Name	City of Camas Policy	Reference
Water Shortage	City ordinances have been created that allow the City to impose restrictions during a water shortage.	Chapter 13.12.060 of the City of Camas Municipal Code
Design Standards	The City shall adhere to design standards and regulations established in the Clark County Coordinated Water System Plan (CWSP)	Clark County CWSP
Providing water service outside of City UGA Boundary	The City has a Water Service Area Boundary established by Clark County prior to GMA. The City will continue to provide water service to customers outside of the City's UGA Boundary but within the established Water Service Area. The City is not required to provide fire flow to such customers.	City of Camas 2010 Water System Comprehensive Plan
Developer Extensions outside of City UGA Boundary	The City will provide water service to developer extensions outside the City's existing UGA but within the established Water Service Boundary whenever reasonably possible. Developer extensions shall adhere to the established SDC.	City of Camas 2010 Water System Comprehensive Plan
New Water Service to Customers with Existing Wells	Developer extensions shall adhere to the established SDC and shall abandon all private wells and relinquish associated water rights to the City as a provision of the SDC. Water rights procured in this manner will be used to accommodate growth in the Water Service Area.	City of Camas 2010 Water System Comprehensive Plan
Fire Flow Analysis	Available fire flow shall be determined by an analysis using the city's hydraulic model or some other appropriate analytical tool. Available fire flow shall be based on 20 year, peak day conditions.	City of Camas 2010 Water System Comprehensive Plan

SYSTEM DESIGN STANDARDS

Performance and design criteria typically address the sizing and reliability requirements for source, storage, distribution, fire flow and water quality. The Department of Health has developed minimum standards pertaining to the performance and design of Group A Public Water Systems. The following sections describe the DOH standards that will later be used to evaluate the City's system in Chapter 4, System Analysis.

CLARK COUNTY COORDINATED WATER SYSTEM PLAN

The City conforms to all standards set forth in the Clark County Coordinated Water System Plan (CWSP). Clark County must approve the City's Water System Comprehensive Plan prior to DOH approval.

MINIMUM DEPARTMENT OF HEALTH DESIGN STANDARDS

DOH relies on various publications, agencies and the utility itself to develop and establish design criteria. WAC 246-290-200, Design Standards, lists the various criteria allowed by the DOH. This Plan will use the Department of Health's *Water System Design Manual (June 1999)* as the criteria for assessing the City's standards. This Design Manual serves as a guideline for the evaluation of existing facilities and in the preparation of plans and specifications for all Group A public water systems in compliance with WAC 246-290, which includes the City's water utility.

Level of Service

Water systems should be designed to maintain a certain level of service for their customers. This includes maintaining a minimum of 30 pounds per square inch (PSI) in the distribution system under peak hour demand and 20 PSI under fire flow conditions. On-site back-up power equipment or gravity standby storage is necessary to maintain service during power outages unless the power grid meets the DOH minimum reliability criteria. The system should also be designed such that sufficient valving is in place to keep a minimum number of customers out of service when water is turned off for maintenance or repair. The City's water system meets or exceeds the minimum pressure requirements, maintains auxiliary power for its pumped storage, and provides sufficient valving.

Minimum Pipe Sizes

The DOH Design Manual states that the minimum size distribution line shall not be less than 8 inches in diameter. Hydraulically justified smaller lines may be used on short line extensions. The City standards require that a minimum of 8-inch lines be installed except on short, dead-end lines into cul-de-sacs and fire lines.

Storage

Several components are considered when determining the amount of storage required for the operation of a water system. The following sections describe these storage components. The formulas presented in these sections will later be used to evaluate the City's existing storage facilities in Chapter 4, System Analysis.

Operational Storage

Operational storage is the volume of water in the reservoirs that, under normal operating conditions, supplies water to the system while the sources are not in operation. Operational storage for the City can be controlled by adjusting the reservoir levels with the City's Supervisory Control and Data Acquisition (SCADA) system.

Equalizing Storage

Equalizing storage must be provided as part of the total storage for the system to provide water during periods of peak demand that cannot be met by the source production capacity. The amount of equalizing storage required is calculated using the following equation:

$V_{ES} = (Q_{PH} - Q_S)*150$ minutes

V_{ES}= Equalizing storage

Q_{PH}= Peak hour demand

Q_S= Sum of all source capacities (except emergency sources)

Emergency (Standby) Storage

Emergency storage provides reliability for the system should sources fail or unusual conditions create higher than anticipated system demands. The DOH Design Manual requires a minimum of 2.0 times the average day demand volume. The amount of standby storage required is calculated using the following equation:

$V_{SB} = 2$ Days*((ADD) - (Q_T-Q_L))

V_{SB} = Standby storage

ADD = Average day demand

Q_T = Total Supply Flow

Q_L = Largest Supply Flow

The City is supplied from nine independent wells and from two surface water sources (Jones Creek and Boulder Creek). Having such a large number of independent sources reduces the amount of standby storage required for the City. This is illustrated in Chapter 4, System Analysis.

Fire Suppression Storage
Water systems must be capable of delivering pressurized flows in accordance with the adopted fire flow requirements. The required fire suppression storage is the product of the fire flow rate and duration. The amount of fire suppression storage required is calculated using the following equation:

V_{FSS} = NFF*T
V_{FSS} = Fire suppression storage
NFF = Needed fire flow
T = Time(minutes)

There are various fire flow requirements within the City depending on the type of building. The fire suppression storage component, however, just considers the maximum fire flow requirement. The maximum adopted fire flow requirement for the City is equal to 5,000 gallons per minute (gpm) for 4 hours.

Dead Storage
Dead storage is the amount of storage in a reservoir that is considered unusable because the hydraulic grade of the system cannot be maintained once the water level drops below a certain point.

DOH requires that all water systems have sufficient source capacity and water rights to meet the annual average day demand and peak day demand requirements on a reliable basis. The City has redundancy of source in its nine independent wells and two surface water sources. The City has a policy for imposing emergency water use restrictions and has an active emergency response program as a means of ensuring system reliability.

Fire Flow
Fire flow rate and duration requirement is as required by the local fire authority and/or the Public Water System Coordination Act. The City has an adopted minimum residential fire flow requirement of 1,000 gpm, and a minimum commercial and industrial fire flow requirement of 1,500 gpm. The City's maximum adopted fire flow requirement is 5,000 gpm for 4 hours.

Construction Standards
Construction standards set forth the actual materials and construction methods that contractors, developers, and the City must follow when constructing water system facility improvements.

City Design Standards
The City has adopted standard specifications for the design and construction of water system facilities. These standards identify the criteria for both the materials and the

methods of construction for the City's water system. A copy the City's design standards are included in the Appendix E.

WATER QUALITY STANDARDS

The 1974 SDWA, and its 1986 and 1996 amendments, established specific legislation for regulation of public water systems by federal and state governments. The federal government, specifically the EPA, is authorized to develop national drinking water regulations and oversee the implementation of the SDWA. Once federal regulations become effective or promulgated, the states may adopt the federal law as state law and accept the primary responsibility for implementation and enforcement of the law.

The State of Washington has adopted as state law all of the SDWA regulations promulgated by the EPA. The EPA has delegated the authority to oversee drinking water regulations to the State DOH. State drinking water regulations are published in WAC 246-290 and establish monitoring requirements, maximum contaminant levels, and requirements for follow-up actions. WAC 246-290 establishes the water quality standards that must be followed for Group A Public Water Systems. Group A Public Water Systems are defined as all systems serving 15 or more connections or 25 or more people per day for 60 or more days per year.

Minimum standards for water quality are often specified in terms of maximum contaminant levels (MCLs). Primary MCLs are based on chronic and/or acute human health effects. Secondary MCLs are based on factors other than health effects, such as the aesthetic quality of the water. Public water purveyors have the responsibility of meeting the requirements of the regulations on a day-to-day basis. Monitoring requirements are often established for regulated contaminants to ensure that water systems demonstrate compliance with MCLs or treatment technique requirements. Public water suppliers are also required to retain certain records and submit reports to the State DOH.

On August 6, 1996, additional amendments to the SDWA were signed into law as Public Law 104-182. The 1996 amendments updated the development of regulations concerning arsenic, radon, groundwater disinfection and filtration.

CURRENT DRINKING WATER STANDARDS

Current state law contains regulations of bacteriological contaminants, inorganic chemicals and inorganic physical parameters (IOCs), volatile organic chemicals (VOCs), synthetic organic chemicals (SOCs), radionuclides and trihalomethanes (THMs). The current drinking water standards are described below.

Bacteriological

Many serious diseases are caused by bacteria, a class of single celled organisms. Indicator organisms are often used in monitoring of bacterial contamination of drinking water. Typical indicator organisms are total coliform, fecal coliform, and *E. coli*. Coliforms are naturally occurring in the digestive systems of animals. Violations of bacteriological MCLs are as follows (WAC 246-290):

- During routine sampling, coliform is detected in more than one sample in a single month (for systems taking less than 40 samples per month)
- Fecal coliform present in a repeat sample, which is a sample collected to confirm the presence of fecal coliform detected in a previous analysis
- *E. coli* present in a repeat sample
- Coliform present in a set of repeat samples collected as a follow-up to a sample with fecal coliform or *E. coli* present

Disinfection By-products

WAC 246-290-300(7) requires purveyors of public water systems that provide water treated with chemical disinfectants to monitor for disinfectants and disinfection byproducts. The Disinfection/Disinfectants Byproduct Rule (D/DBP Rule) establishes residual disinfectant concentrations and maximum contaminant levels for disinfection byproducts.

Trihalomethanes (THMs) and five haloacetic acids (HAA5) are a group of organic compounds that can be formed as a result of drinking water disinfection by chlorine and are; therefore, often referred to as disinfection byproducts. Total trihalomethanes (TTHMs) include the sum of the concentrations of four disinfection byproducts: chloroform, bromoform, bromodichloromethane, and dibromochloromethane.

Stage 1 of the D/DBP Rule was published in November 1998 and became effective in 2000. Under Stage 1 of the D/DBP Rule, the MCLs for TTHM and HAA5 is 80 micrograms per liter (µg/L) and 60 µg/L, respectively, and is based on the running annual average of two annual samples. Systems are required to prepare and implement a disinfection byproducts monitoring plan. The Stage 1 D/DBP Rule will remain in effect for compliance until October 1, 2013.

Stage 2 of the D/DBP Rule was published in January 2006 and compliance with the new regulations begins on October 1, 2013. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 µg/L and 60 µg/L, respectively; however, compliance with the MCL is based on the running annual average of each individual sample instead of the running annual average of all samples combined. The number of samples taken is

dependent on the population served. Systems serving between 500 and 9,999 people must collect two samples per year and systems serving between 10,000 and 99,999 people must collect four samples per quarter.

Qualifying systems may be eligible for a 40/30 Certification Waiver. Systems granted a 40/30 Certification by EPA do not have to comply with the Stage 2 D/DBP requirements. In order to qualify, a system must not have any Stage 1 D/DBP TTHM or HAA5 violations, and samples taken during an eight-consecutive-quarter period for TTHM and HAA5's must be below 40µg/L and 30 µg/L, respectively.

Residual Disinfectant

According to WAC 246-290-300, systems providing disinfectant treatment shall measure residual disinfectant concentration within the distribution system when taking routine or repeat coliform samples. Water entering the distribution system must contain a residual disinfectant concentration of total free chlorine of at least 0.2 mg/L. Distribution system residual disinfectant concentrations measured as free chlorine must be detectable in at least 95 percent of the samples taken each calendar month. Residual disinfectant concentration within the distribution system is generally measured at the same time and location that routine bacteriological samples are collected.

Lead and Copper

The EPA published the final regulations for the Lead and Copper Rule (LCR) in 1991 as part of the 1986 SDWA Amendments. LCR is intended to reduce tap water concentrations of lead and copper. LCR requires an initial monitoring phase in which two rounds of water sampling for lead and copper are conducted. Lead samples collected according to Section 40 of the Code of Federal Regulations (CFR), must have concentrations below the "Action Level" of 0.015 mg/L in the 90th percentile. Similarly, copper samples must have concentrations less than 1.3 mg/L in the 90th percentile. Systems exceeding the action levels are required to provide public notification and implement a program for reducing lead and copper levels.

Based on the requirements of the EPA Lead and Copper Rule (40 CFR 141), lead and copper monitoring must be completed for two consecutive 6-month monitoring periods. If lead and copper action levels are not exceeded, then the number of samples may be reduced to one-half the original number for three consecutive annual periods. Assuming compliance with the action level is maintained, reduced sampling may continue once every 3 years thereafter.

IOCs, VOCs and SOCs

The State of Washington has adopted Federal MCLs and monitoring regulations for inorganic chemicals and physical parameters (IOCs), volatile organic compounds (VOCs), and synthetic organic compounds (SOCs). The Federal standards were

originally promulgated in the Phase I Rule and updated in the Phase II and Phase V rules. Monitoring for these chemicals is conducted at the source of the water supply.

Consumer Confidence Reports

Every July, water utilities must provide annual reports to their customers on the quality of their drinking water. These "consumer confidence" reports will tell customers whether their water meets state and federal drinking water standards, and if not, why not. The reports include information on the water source, the regulated and unregulated contaminants that have been detected in the water during the year and their concentration, disinfection byproducts or microbial contaminants in the water and their concentration, descriptions of possible health effects of contaminants present at concentrations greater than the MCL, identification of the likely source of any contamination, and a summary of any violations in monitoring, reporting or record keeping. The City provided information regarding water quality to its customers in their consumer confidence report entitled *City of Camas Annual Drinking Water Quality Report* which was published in May 2008. A copy of this Report is provided in the Appendix F.

Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) was incorporated into the WAC in April 1993. This Rule established water quality requirements for surface water sources and groundwater sources that are under the direct influence of surface water (i.e., GWI sources). The purpose of the SWTR is to protect against acute health risks from waterborne microbiological contaminants. Requirements for adequate disinfection and contact time are established. Filtration may be required in order to meet water quality standards and source requirements. Treatment technique requirements are established, instead of MCLs, for Giardia lamblia, viruses, heterotrophic plate count bacteria, Legionella and turbidity. Disinfection with or without filtration must achieve at least 99.9 percent removal and/or inactivation of Giardia lamblia cysts and 99.99 percent removal and/or inactivation of viruses.

Radionuclides and Radon Rule

Radionuclides include radioactive substances occurring naturally in subsurface waters. Regulated substances include radium-226, radium-228, uranium, and gross alpha and beta particles. Table 2-3 summarizes radionuclide MCLs as defined by EPA's Radionuclide Rule, WAC 246-290-310(7), and 40 CFR 141.66.

Table 2-3 Radionuclide MCLs

Radionuclide	MCL
Combined Radium -226 and -228	5 pCi/L
Uranium	30 μg/L
Gross Alpha (excluding uranium and radon)	15 pCi/L
Gross Beta	4 millirem/year

WAC 246-290-300(10) and 40 CFR 141.26 require radionuclide samples once every 4 years. A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis provided that the measured gross alpha particle activity does not exceed 5 pCi/L at a confidence level of 95 percent.

Though a radon MCL was included in the originally proposed Radionuclide Rule, it was determined that a radon MCL will now be issued as a separate rule. In November of 1999, EPA proposed a preliminary radon MCL of 300 pCi/L. EPA is considering an alternative MCL of 4,000 pCi/L if states or water purveyors implement a multimedia mitigation program aimed at reducing household indoor-air health risks from radon gas from soil as well as tap water. The date for publication of the final Radon Rule is unknown at this time.

Arsenic Rule

Arsenic is an inorganic chemical that has received significant attention due to recent rule revisions. Long-term exposure to low concentrations of arsenic in drinking water can lead to skin, bladder, lung, or prostate cancer. Non-cancer effects of ingesting arsenic at low levels include cardiovascular disease, diabetes, and anemia, as well as reproductive, developmental, immunological, and neurological effects.

After several proposals and revisions by EPA, a new arsenic standard was published in February 2001, and was to become effective in 2004, replacing the previous standard of 0.05 mg/L. Changes in EPA's new administration resulted in a set aside of the new standard. However, the MCL of 0.01 mg/L was reaffirmed in October 2001 and the law became effective in February 2002. Compliance with the new MCL standard of 0.01 mg/L is required for all systems by January 23, 2006.

The Arsenic Rule makes monitoring requirements consistent with monitoring for other IOCs. Groundwater sampling for arsenic is required once every 3 years. Any system that has a sampling point monitoring result exceed the MCL must increase the frequency of monitoring at that sampling point to quarterly sampling. Compliance with the MCL would be based on the running annual average of the samples. Systems triggered into increased monitoring would not be considered in violation of the MCL until they have completed one year of quarterly sampling. However, if any sample result will

cause the running annual average to exceed the MCL at any sampling point, the system is out of compliance with the MCL immediately.

Groundwater Rule

The Groundwater Rule is one of the 1986 amendments to the SDWA. This rule establishes a method for determining if disinfection of a groundwater source is required, and it establishes disinfection standards for those sources where disinfection is required.

Municipal Water Law: Water Use Efficiency

The Washington Legislature passed the Water Use Efficiency Act of 1989 (43.20.230 RCW), which directs DOH to develop procedures and guidelines relating to water use efficiency. In response to this mandate, Ecology, the Washington Water Utilities Council, and DOH jointly published a document titled *Conservation Planning Requirements* (1994). Water conservation measures for medium systems include water use data collection, water demand forecasts, public education, technical assistance, water metering, conservation incentives, and a water conservation plan.

In 2003, the Municipal Water Supply – Efficiency Requirements Act (Municipal Water Law) was passed and amended RCW 90.46 to require additional conservation measures. The Municipal Water Law (MWL), among other things, directed DOH to develop the Water Use Efficiency (WUE) requirements, which was adopted in October 2006.

The WUE requirements are an extension to the *Conservation Planning Requirements* and sets more stringent requirements for public water purveyors. The WUE requirements are comprised of four sections:

1. Planning requirements
2. Distribution leakage standard
3. Metering requirements
4. Goal setting and performance reporting requirements

The City's Water Use Efficiency Program will be discussed in further detail later in this Plan.

A summary of the existing and anticipated drinking water requirements are provided in Table 2-4.

Table 2-4 Summary of Existing and Anticipated Drinking Water Requirements

Rule	Monitored by the City	Contaminants Affected	Publication Date of Final Rule
Existing WAC 246-290 (includes Lead/Copper Rule and Phase II/V Rule)	Yes	Bacteriological, IOC, VOC, SOC, THM, Radionuclides	In Effect
Residual Disinfectant	Yes	Chlorine Residual	In Effect
Stage I/II Disinfectants /Disinfection By-Products Rule	Yes	THMs, HAA5, Chlorite, Bromate	In Effect
Radon	Yes	Radon	In Effect
Radionuclides	Yes	Radionuclides	In Effect
Long Term 1 Enhanced Surface Water Treatment Rule	Yes	Bacteriological	In Effect
Ground Water Rule	Yes	Bacteriological	In Effect
Arsenic Rule	Yes	Arsenic	In Effect
Long Term 2 Enhanced Surface Water Treatment Rule	Yes	Bacteriological	In Effect
Sulfate	Yes	Sulfate	In Effect
Information Collection Rule	Yes	Large Surface Water Systems: Bacteriological, DBP, IOCs	In Effect
Interim Enhanced Surface Water Treatment Rule	Yes	Large Surface Water Systems: Bacteriological	In Effect
GWI Portion of Existing WAC 246-290	Yes	Evaluation of Wells for Surface Water Influence	In Effect
MWL Water Use Efficiency	Yes	Water Conservation Requirements	In Effect

Chapter 3
BASIC PLANNING DATA AND WATER USE FORECASTING

INTRODUCTION

Planning is an important component for effective water utility management. Water system planning is essential for providing reliable, high quality water service, ensuring efficient use of the utility's water resources, complying with State and Federal requirements, assuring orderly growth of the system, and maintaining consistency with regional planning efforts. A well developed comprehensive plan is necessary to provide planning for the existing water service area as well as for future development within the planning area. Planning criteria that is essential for the evaluation of the City's water system is presented in this Chapter. This planning criteria includes growth management, elements of the study area, land use planning, intergovernmental coordination, and population projections for the planning period.

GROWTH MANAGEMENT

The Growth Management Act (GMA) was enacted by the Washington State Legislature in 1990 to address the population growth that occurred in areas of Washington State during the 1980s. To ensure a continuation of Washington's high quality of life, officials across the state have addressed growth management within various levels of government. The basic objective of the GMA is to encourage local county and city governments to develop and implement a 20-year comprehensive plan that incorporates their vision of the future, within the framework of the broader needs of the state.

Under the GMA, municipalities must complete their own planning and coordinate these planning efforts with those of the county and surrounding municipalities. The planning effort of a municipality includes the establishment of a future service area. Municipalities are to provide water service to areas within their established planning boundary.

STUDY AREA

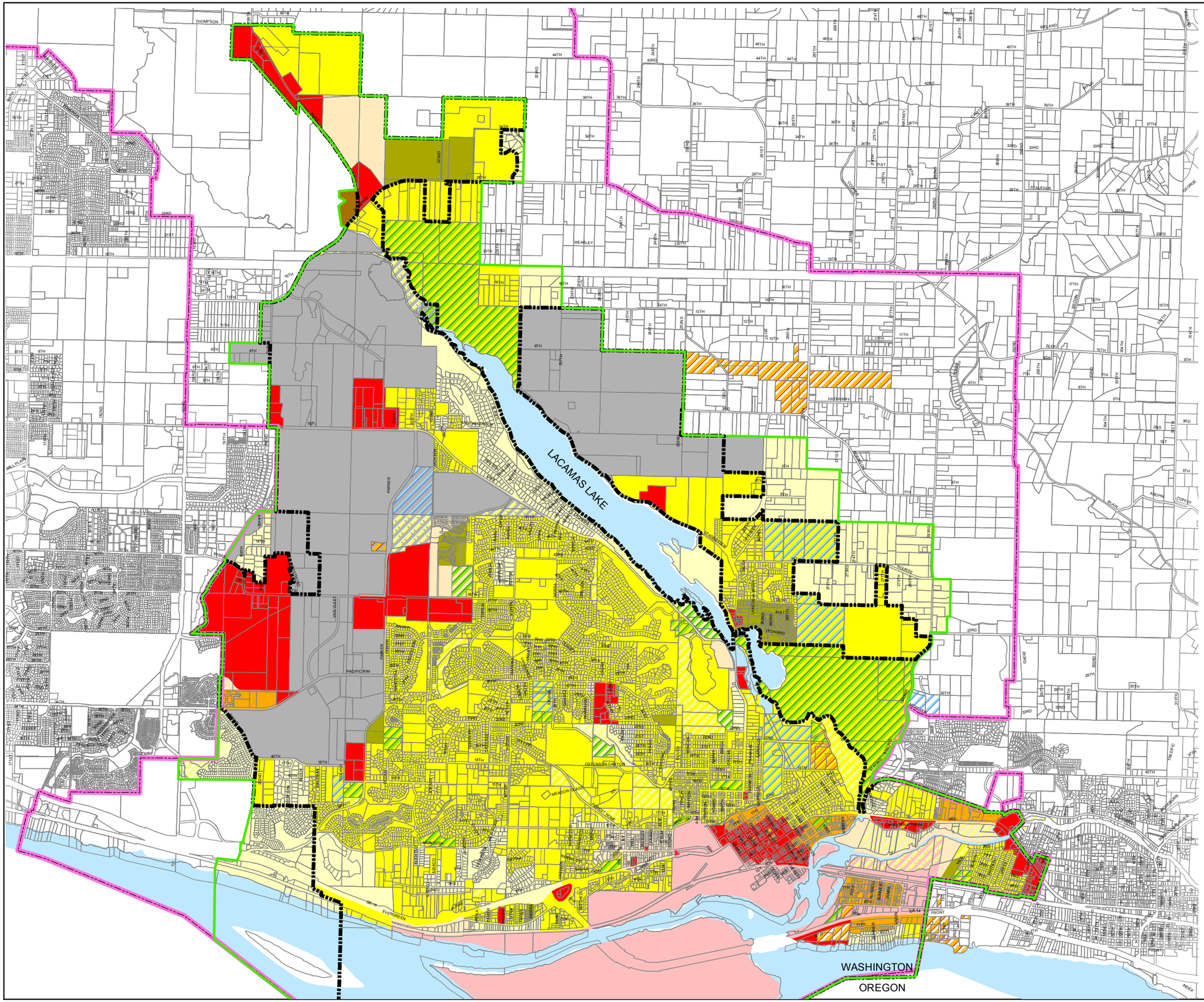
The Urban Growth Area (UGA) boundary for the City of Camas is located in Southwestern Washington and lies entirely within Clark County. The UGA boundary of the City is bordered by the Columbia River and the Washington/Oregon State line to the South, City of Vancouver UGA boundary to the West, and the City of Washougal UGA boundary to the East. An additional area north of Lacamas Lake is also included, and is referred to as the North Urban Growth Area (NUGA). Figure 3-1 shows the elements of the study area.

Before the adoption of the GMA, Clark County developed a coordinated regional plan for water service within Clark County. The purpose of this plan was to define water service areas for the water suppliers within Clark County, and to establish a hierarchy for water providers within the water service area. As a result of this plan, the City of Camas has inherited a water service area that is larger than the UGA. The City currently serves customers outside of its UGA boundary, the majority of who reside in the 542 Zone.

The study area includes those properties within the current City water service area boundary. This area, known as the Water Service Area, was defined as part of a coordinated county effort before the GMA was passed. The current City limits comprise of approximately 7,522 acres, while the NUGA is approximately 2,350 acres, as shown in Figure 3-1. The City also supplies water to Hewlett Packard, which resides within the City of Vancouver's UGA.

The Municipal Water Supply – Efficiency Requirements Act, Chapter 5, Laws of 2003 (MWL), amended several provisions of the State Water Code (RCW Chapters 90.03, 90.46, etc.) to provide municipal water systems more flexibility in managing their systems and greater certainty regarding the legal status of their water rights. In addition to providing these benefits, the MWL imposes new conservation and water use efficiency requirements. The Water Use Efficiency Rule was adopted under WAC 246-290 in September 2006.

Under the MWL, DOH was expressly charged with ensuring that new services described in water system plans are consistent with adopted local comprehensive plans and development regulations of the country or other general purpose government(s) where a municipal system may serve. To this end, DOH has developed a Consistency



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Note:
The Landuse shown was used in the analysis of this document. However, land use & zoning has been modified in recent months and may be modified through legislative action throughout the life of the plan.

LEGEND:

- City Limits
- Urban Growth Boundary
- Water Service Boundary
- Clark Co. Parcels
- Water
- School Property
- Municipal Features
- Park
- Green Space

City Of Camas Landuse:

- Single-Family - Low
- Single-Family - Medium
- Single-Family - High
- Multi-Family - Low
- Multi-Family - High
- Commercial
- Light Industrial / Business Park
- Industrial
- Mixed Use

SOURCE: CITY OF CAMAS 2008

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 3-1
STUDY AREA AND ZONING

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Statement to be signed by utility officials and attached to water system plans (and updates) for review and concurrence by county officials. Municipal water systems must also delineate where appropriate, retail, future, and wholesale service areas in their water system plan (updates). Rules and guidelines relating to issues of plan consistency were adopted by DOH in 2008 under the MWL.

SERVICE AREA

In accordance with the Municipal Water Law (MWL), the City is required to designate a retail service area within which it has a duty to serve all customers, and if appropriate, also designate a future service area and wholesale service area. At this time, the City provides only retail service within the service area established in Figure 3-2.

RETAIL SERVICE AREA

The City acknowledges that it has a duty to serve within its retail service area, which is co-extensive with the service area boundary. The City's retail service area is located entirely within Clark County. Figure 3-2 depicts the City's current and future retail service area. The existing service area included areas within the City limits, and all UGA areas. The future retail service area includes all areas outside of the NUGA, but inside the Coordinated Water System Plan Water Service Area.

For purposes of this plan, retail water service is generally defined as the provision of a direct service connection to a customer falling within the City's retail service area.

PHYSICAL ENVIRONMENT

The physical environment within the City and surrounding areas plays a key role in planning for the future water service of the City's population. The relevant components of the physical environment include topography, groundwater, climate, surface water, site sensitive areas, and geology and soils.

Topography

The ground slope and natural drainage features within the City play a significant role in the planning and design of the water distribution and storage facilities. The elevation within the City ranges from about 20 feet above sea level along the shores of the Columbia and Washougal Rivers, to approximately 752 feet (NGVD 29) at the Upper Prune Hill Standpipe located at the top of Prune Hill. The terrain in the City includes a flat plateau centered in the core of the City. The topography of the City and surrounding areas is shown in Figure 3-3.

Groundwater

The City currently uses groundwater as its primary water supply. The City has developed eight wells in the downtown area, located in the southeastern portion of the City. The City also has a well in the Grass Valley area, located in the northwest portion

of the City. The City is continuing to develop and establish new groundwater sources to accommodate residential and industrial growth.

Climate

The City receives an average of 59 inches of rain per year according to the National Oceanic and Atmospheric Administration data. December is historically the wettest month, and July the driest, with normal precipitation varying from 0.82 to 6.82 inches per month.

The average annual temperature is about 51 degrees Fahrenheit (°F). August is the warmest month with an average temperature of about 61°F and December is the coolest with an average temperature of about 41°F.

Surface Water

The surface water features within the City UGA boundary include Lacamas Lake, the Columbia River, the Washougal River, Lacamas Creek, Fallen Leaf Lake, and Round Lake. The City also owns the majority of the watershed for the Jones and Boulder Creeks north of the City's intakes for these sources. Jones and Boulder Creek are tributaries of the Little Washougal River, which is a tributary of the Washougal River. The basin characteristics for the creeks, streams, and rivers discussed below were obtained from stream gauging published by the U.S. Geological Survey.

The Columbia River begins in Canada, enters the United States in northeastern Washington, continues traveling southwest through eastern Washington, where it travels over a series of dams until it empties into the Pacific Ocean. The Columbia River forms the border between the states of Washington and Oregon from the point where it crosses the 46th Parallel until it empties into the Pacific Ocean. The Columbia River drainage area is approximately 241,000 square miles, with an average flow of 603,000 cubic feet per second (cfs).

Lacamas Lake is over 60 feet deep in places. It receives flow from Lacamas Creek and Dwyer Creek. The Lake then discharges into Lacamas Creek, which flows into the Washougal River. The water level is controlled by dam located at the south end of the lake. Fallen Leaf Lake and Round Lake are man-made lakes and are smaller parts of Lacamas Lake, separated from Lacamas Lake by Everett Street.

The Washougal River flows southwest from the Cascade Mountains to the City of Camas, where it empties into the Columbia River. The Washougal River drainage basin is approximately 108 square miles in size and historical records report average flows at approximately 9,000 cfs.

The Little Washougal River, of which Jones and Boulder Creeks are tributaries, flows to the southwest out of the Cascade Mountains. The Little Washougal turns to the

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LEGEND:

- Future Retail Service Area
- Retail Service Area
- Water Lines
- Water Service Boundary
- City Limits
- Urban Growth Boundary
- Clark Co. Parcels
- Water

SOURCE: CITY OF CAMAS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 3-2
RETAIL SERVICE AREA

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LACAMAS LAKE

WASHINGTON

OREGON

COLUMBIA RIVER

LEGEND:

- City Limits
- Urban Growth Boundary
- 10' Contours

SOURCE: CITY OF CAMAS & USGS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 3-3
TOPOGRAPHY MAP

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southeast before it crosses into the City of Camas UGA and empties into the greater Washougal River. The Little Washougal drainage basin covers approximately 23 square miles with historical average daily peak flows of approximately 1,317 cfs.

Site Sensitive Areas

Site sensitive areas within the City include those classified as wetlands, slide hazard areas, and water bodies. The wetland and floodplain areas within the City are shown in Figure 3-4 and 3-5, respectively. Information in this section was supplied by the City and Clark County GIS and Planning Departments.

Wetlands

There are approximately 835 acres within the City that are classified as wetlands. Wetlands are defined by the EPA as areas that are inundated for at least part of the year. Wetlands support valuable and complex ecosystems and consequently development is severely restricted if not prohibited in most wetlands. Wetlands within the City of Camas are shown in Figure 3-4.

Steep and Unstable Slopes

There are approximately 891 acres within the City that are classified as steep and unstable slopes. These areas are those that are prone to unstable behavior due to steep slopes, lack of vegetation, or unconsolidated soils.

Water Bodies

Lakes and streams are classified as sensitive areas due to the wide variety of plants and animals that they support. It should be noted that a majority of the regulations discussed in Chapter 2 are designed to protect natural water bodies and their associated ecosystems.

Flood Plains

Flood hazard areas are areas adjacent to lakes, rivers, and streams that are prone to flooding during peak runoff periods. Construction of buildings and other development in these areas is regulated in accordance with flood hazard construction standards. The Camas 100-year flood plain map (land that has a 1 percent chance of flooding each year) is depicted in Figure 3-5. Proposed development projects within 300 feet of a frequently flooded area are required by municipal code 16.80 to provide a critical area report.

Geology

The Clark County area exhibits traces of its geologic history including repeated inundation by fluctuating sea levels during glacial epochs, the sedimentary processes of the Columbia River, volcanic activity, periodic earthquakes, and other tectonic activity. The geologic units in Clark County reflect this varied history and can be placed into two general categories: older consolidated and volcanic rocks. These include Columbia River Basalts and Skamania and Goble volcanic series, and sedimentary rocks

incorporating unconsolidated gravels, silts, sands, and clays created by glacial and alluvial processes. There is an active fault in the region that runs under Lacamas Lake.

Soils

The majority of the soils within the City are classified as Hillsboro-Dollar-Cove Association by the NRCS. This soil class is defined as deep, dominantly level to sloping, well-drained to very poorly drained, medium textured terrace soil. The area near Lacamas Lake and portions of land that fall within the City's service area are classified as Hesson Olympic Association. This soil class is deep, nearly level to steep, moderately fine textured soils.

Endangered Species

As indicated in Chapter 2, the Columbia Bull trout, Coho, Green Sturgeon, Chinook, Chum, and Steelhead are listed as "threatened" under the ESA. Under the ESA, governments and individuals are prohibited from taking species, or degrading critical habitat of the species.

According to the National Marine Fisheries Service, critical habitat types necessary to support the chinook life cycle include juvenile rearing areas, juvenile migration corridors, areas for growth and development, adult migration corridors, and spawning areas. Essential features of critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover and shelter, food, riparian vegetation, space, and safe passage conditions. Compliance with the Section 4(d) rule finalized in June 2000 by the National Marine Fisheries Service will reduce the possibility of City activities such as stream crossings or other construction adjacent to streams that may adversely impact any of these critical habitat features.

The U.S. Fish and Wildlife Service have proposed listing the resident cutthroat and bull trout as threatened under the ESA. The U.S. Fish and Wildlife Service considers these sub-populations to be "depressed," with an estimated population of less than 5,000 and fewer than 500 spawners. Bull trout habitat requirements are similar to the chinook in many respects. However, spawning bull trout are often associated with colder water than the chinook. Bull trout may seek out groundwater seepages along the bottom of small tributary streams in the upper elevations of the watershed.

Table 3-1 lists the priority species present in the Washougal River Basin.

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LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON

OREGON

SR14

LEGEND:

- City Limits
- Urban Growth Boundary
- Water Service Boundary

Wetlands:

- 1988 NWI
- PMX
- Delineated
- Parcels
- Water

SOURCE: CITY OF CAMAS

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 3-4
WETLANDS MAP

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LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON

OREGON

SR14

LEGEND:

- City Limits
- Urban Growth Boundary
- Water Service Boundary
- Parcels

FEMA FLOOD ZONES:

A - AN AREA INUNDATED BY 100 YEAR FLOODING, FOR WHICH NO BFE'S HAVE BEEN ESTABLISHED

X500 - AN AREA INUNDATED BY 500 YEAR FLOODING; AN AREA INUNDATED BY 100-YEAR FLOODING WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; OR AN AREA PROTECTED BY LEVEES FROM 100 YEAR FLOODING

SOURCE: CITY OF CAMAS & NATIONAL WETLANDS INVENTORY

CITY OF CAMAS

WATER SYSTEM PLAN
FIGURE 3-5
FLOODPLAIN MAP

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Table 3-1 Priority Anadromous and Resident Fish Presence

Species	Columbia River	Washougal River	Little Washougal River	Boulder Creek	Jones Creek
Chinook Salmon	X	X	X		
Coho Salmon	X	X	X	X	X
Chum Salmon	X	X	X		
Sockeye Salmon	X				
Steelhead	X	X	X	X	X
Bull Trout	X				
Green Sturgeon	X	X			

Source: Salmon and Steelhead Stock Inventory for Salmon (Department of Fish and Wildlife) and Salmonid Stock Inventory for Bull Trout (Department of Fish and Wildlife)

LAND USE PLANNING

The current and future land use for the City is shown in Figure 3-1. The various land use classifications for the City are shown in Table 3-2. The total area of each land use designation as defined in Figure 3-1 is also given in Table 3-2. These zoning designations were utilized to develop build-out population estimates later in this chapter.

Table 3-2 Land Use Designation for the UGA

Land Use Designation	City Without North UGA (acres)	North UGA Expansion (acres)	Total within UGA (acres)	Percent of Total
Single-Family	3,281	965	4,247	43.0 %
Multi-Family	358	97	455	4.6 %
Commercial	6018	89	690	7.0 %
Industrial	979	0	979	9.9 %
Light Industrial/Business Park	1,473	551	2,024	20.5 %
Parks	146	646	792	8.0 %
Green Space	416	0	416	4.2 %
Municipal Facilities	36	0	36	0.4 %
Schools	233	0	233	2.4 %
Total	**7,523**	**2,349**	**9,872**	**100.0 %**

WASTEWATER SYSTEM

The City also owns and operates a wastewater collection system consisting of collection sewers, trunk sewers, lift stations, force mains, and a wastewater treatment facility.

INTERGOVERNMENTAL COORDINATION

Regional coordination is an important component of water system planning. The City currently provides water to areas outside of the UGA, including customers in Clark County to the Northeast of the City, and customers within the City of Vancouver's UGA. Adjacent purveyors to the City include the City of Vancouver to the west, the City of Washougal to the East, and the Clark County PUD to the north. The City maintains two interties with the City of Washougal.

CITY OF VANCOUVER

The City of Vancouver lies within Clark County and borders Camas to the west. The City of Vancouver was incorporated in 1857. Vancouver's population was 143,560 as of the 2000 Census. The City of Camas currently provides water service to a small area within Vancouver's UGA along Pacific Rim Blvd. Among these customers, Hewlett Packard is a significant water user that purchases water from both the City of Camas and the City of Vancouver. An emergency intertie exists between the City of Vancouver and the City of Camas via two fire hydrants.

CITY OF WASHOUGAL

The City of Washougal lies within Clark County and borders Camas to the east. Washougal was incorporated in 1908. As of the 2000 Census, Washougal has a population of 8,595. Camas currently has two one way PRV interties with the City of Washougal, which are located in the eastern part of downtown Camas. Washougal's primary water supply is a well field that pumps from the same aquifer as Camas' Well 5. A copy of the City's intertie agreement with the City of Washougal is located in Appendix G.

CLARK PUBLIC UTILITIES

Clark Public Utilities (CPU) serves areas to the north and west of the City's UGA. CPU serves more than 30,000 water customers within Clark County. Its service area covers approximately 200 square miles and includes the communities of Hazel Dell, Salmon Creek, Lakeshore, Felida, Mt. Vista, La Center, Brush Prairie, Hockinson, Venersborg, Heisson, Meadow Glade, Dollars Corner, Duluth, Pioneer, Manor, Amboy, and Yacolt. The utility also operates a number of satellite water systems for small residential developments throughout the County. Two such satellite systems reside within the City UGA.

CPU obtains its water from groundwater sources. The utility maintains 34 wells with a pumping capacity of 33 million gallons per day. Water is stored in 25 reservoirs with a

combined capacity of 11.7 million gallons. CPU is currently investigating alternative water sources for the future. The most feasible option appears to be the development of a wellfield southeast of Vancouver Lake. This development would yield approximately 36 mgd. CPU currently has two satellite systems located within the City of Camas Water Service Area Boundary. There are currently no interties or written agreements with CPU, with the exception of the Coordinated Water Plan.

RELATED PLANNING DOCUMENTS

The related planning documents listed in the following sections were utilized in the preparation of this document.

COMPREHENSIVE PLANS

- *Clark County Growth Management Plan, 2007*
- *2004 City of Camas Comprehensive Plan*
- *1996 City of Camas Water System Master Plan*
- *Clark County Coordinated Water System Plan (CWSP), 1999*
- *City of Camas WSP, 2001*
- *Watershed Plan*

OTHER PLANS AND REPORTS

- *NUGA Expansion Water and Sewer Infrastructure Evaluation, September 2007*
- *City of Camas Westside Test Well Drilling Program, Pacific Groundwater Group, March 2001*
- *2000 City of Camas Water/Sewer Utility Rate Study*
- *1999 City of Camas Water Utility System Development Charge*
- *2007 Metropolitan Transportation Plan for Clark County*
- *Washougal Wellfield Hydrogeologic Study*
- *General Sewer/Waste Water Facility Plan Update (Draft), 2007*
- *2009 Rate Study*

PLANNING PERIOD

Due to the City's growth history and the need to provide water services for future growth, the City's water system is in need of continuous evaluation and improvement. A planning period for the evaluation of the water utility should be long enough to be useful for an extended period of time, but not so long as to be impractical. The planning period for this plan is through 2029, coinciding with a 20-year planning interval. In general, it is assumed that mechanical and electrical equipment, such as pumps and controls, have a useful life of 20 years, while structures such as reservoirs and piping have a useful life of 50 to 75 years. This Plan will also provide and evaluation of the water system at buildout, when the City has grown to its full capacity.

POPULATION

To evaluate the operation of the existing facilities and to estimate the facilities required for future water service within the study area, the City's existing and projected populations are established based on historical data provided by the Washington State Office of Financial Management (OFM), input from City staff, and land use designations. In an effort to maintain consistency with the City's *General Sewer/Wastewater Facility Plan*, similar projections are used.

CURRENT AND PROJECTED CITY POPULATION

The current and future residential population of the City is listed in Table 3-3. Population projections between 2008 and 2029 are based upon a linear growth rate from the previous 4 years of growth within the City. This growth rate is based on the average from 2005 to 2007, 2.61 percent. The NUGA population projections are based on projections developed for the update to the *General Sewer/Wastewater Facility Plan.* These projections assume that ultimate buildout of the NUGA will occur by 2025, and that growth will not begin until 2011. The total projected population served by the City is estimated at 40,321 in 2029.

Table 3-3 Historical and Projected UGA Population

Year	City Population	NUGA Population Served by the City	Total
2005	15,460	-	15,460
2006	15,880	-	15,880
2007	16,280	-	16,280
2008	16,700	-	16,700
2009	17,135	-	17,135
2010	17,581	-	17,581
2011	18,039	777	18,817
2012	18,509	1,555	20,064
2013	18,992	2,332	21,324
2014	19,486	3,110	22,596
2015	19,994	3,887	23,881
2016	20,515	4,665	25,180
2017	21,049	5,442	26,492
2018	21,598	6,220	27,817
2019	22,160	6,997	29,158
2020	22,738	7,775	30,512
2021	23,330	8,552	31,882
2022	23,938	9,330	33,267
2023	24,561	10,107	34,668
2024	25,201	10,885	36,086
2025	25,858	11,662	37,520
2026	26,531	11,662	38,193
2027	27,223	11,662	38,885
2028	27,932	11,662	39,594
2029	28,695	11,662	40,321

*Population data is linked to the Land Use Map dated June 25, 2008, and is shown in Figure 3-1.

Water Service Area Build-out Population

Build-out population is based upon the maximum density and acreage of each land use classification. Table 3-4 shows the City's build-out population for the water service area based upon land use. Build-out for the City water service area is estimated to occur by 2038.

Table 3-4 Build-out Population for the Water Service Area Based on Land Use

Classification	Density (Dwelling Units per Acre)	Total Acreage	Residential Units	Population
Single-Family Low	2.6	1,612	4,191	10,058
Single-Family Medium	4.0	2,216	8,864	21,274
Multi-Family Low	12.0	147	1,764	4,233
Multi-Family High	36.0	94	3,384	8,122
Non-Residential	0	2,091	0	0
Unclassified*	0.2	7,666	1,533	3,679
Total	**1.4**	**13,826**	**19,736**	**47,366**

*No zoning classification is available for services outside of the UGA. A build-out density of 0.2 Dwelling Units per Acre was assumed.

Population projections should be revisited and reevaluated concurrently with any anticipated change to the City's UGA to ensure the City's ability to provide water service to areas outside the City's current UGA.

WATER USE CHARACTERIZATION

Water use characterization is an important aspect of water system planning. By evaluating the historical trends in the amount of water purchased and consumed, peaking factors, and the customer population, it is possible to provide forecasts of future demands on the water system. This is necessary in order to assess the capacity of the City's existing facilities and design future water system facilities.

The City's customer base is comprised of residential, commercial, and industrial connections. Approximately 51 percent of the City's total water use is from single-family residential customers, and approximately 35 percent industrial water use in 2007.

WATER SERVICE CONNECTIONS

The total number of water service connections within the City at the end of 2007 was 7,095.

Service Connections by Customer Class

The City classifies its customers based on various rate codes. For the purposes of this document, water usage has been divided into the following customer types: single family residential, multi-family residential, commercial, industrial, combined residential /commercial, and city services. These connections have meter sizes ranging from 5/8-inch to 6-inches.

Table 3-5 provides a summary of the connections for each type of customer class as of 2007. The difference between the number of units billed may vary from the number of connections due to either multiple units per meter or inactive connections. The raw connection data represented the number of connections at the end of each year. To provide a more accurate view of the connections throughout a given year, the end of year data was averaged from the given year, and the previous year.

Table 3-5 Service Connections by Customer Class

Customer Class	2003	2004	2005	2006	2007
Residential	3,948	4,543	5,192	5,909	6,435
Commercial	184	192	205	217	219
Industrial	29	29	29	29	29
City	34	34	34	34	35
Irrigation	122	133	142	148	159
Firelines	41	41	42	42	43
Total	**4,357**	**4,971**	**5,642**	**6,379**	**6,919**
Growth		**14.11%**	**13.50%**	**13.05%**	**8.47%**

WATER USE

Water use in the City can be broken down into three main components: Source production, customer consumption, and distribution system leakage. These three elements are discussed in the following sections.

Source Production

The City currently supplies water to its customers through production wells and two surface water sources. The surface water sources are combined and treated at the City's filter plant. Production is metered at the filter plant and at each individual well. Table 3-6 provides the water production from 2002 through 2007 for the filter plant and the wells. These totals are based upon daily meter reading at the respective sources.

Table 3-6 2002 – 2007 Production: Average Day Production

Source	2002 (gpd)	2003 (gpd)	2004 (gpd)	2005 (gpd)	2006 (gpd)	2007 (gpd)
Filter Plant	1,221,359	1,035,296	1,061,567	750,293	782,337	782,992
Well 3	480,981	-	-	-	-	-
Well 5	256,989	197,564	257,888	257,888	177,381	52,608
Well 6	846,304	982,553	137,921	137,921	243,648	468,838
Well 7	244,666	549,268	165,546	165,546	375,452	198,742
Well 8	860,260	844,759	386,488	386,488	669,963	667,542
Well 9	31,117	190,759	122,104	122,104	128,471	52,984
Well 10	-	-	537,388	537,388	257,867	205,348
Well 11	-	152,997	688,656	688,656	639,014	763,673
Well 12	-	36,242	567,595	567,595	866,531	570,274
Total	**3,941,676**	**3,989,438**	**3,925,152**	**3,613,878**	**4,140,664**	**3,763,001**

Table 3-7 provides a summary of the historical per capita production.

Table 3-7 2005 – 2007 Per Capita Production

Year	Water Service Area Population	ADD (gpd)	Production per Capita (gpcd)
2005	15,460	3,613,878	234
2006	15,880	4,140,664	261
2007	16,280	3,763,001	231
Average	**15,873**	**3,839,181**	**242**

Based on the average production from the City's sources over the last three years the per capita production 242 gallons per capita per day (gpcd). This value accounts for the possibility of fluctuations in water use, residential irrigation demands, and distribution system leakage. The average production per capita value is less than the previous Plan, 274 gpcd.

However, the industrial water use in the City is significantly high. To provide a more accurate view of the water use per capita, only water use for residential customers is considered. For 2007, the ADD for residential customers is 2,212,000 gpd. This water use includes distribution system leakage, but does not include industrial or commercial water use. With a population of 16,280, the per capita production for residential

customers is **136 gpcd**. This value will be used to calculate the demand projections discussed in subsequent sections.

Maximum Day Water Demand

Peak day demand is the maximum amount of water used in a 24-hour period for the year. Peak hour demand, or maximum instantaneous demand, is the largest amount of water used in a one-hour period for the year. Maximum day and peak hour demands usually occur during the summer months due to the added demands of irrigation. Table 3-8 presents the historical maximum day demand for each of the City's sources.

Table 3-8 2005 – 2007 Maximum Day Source Demand

Source	2005 (gpd)	2006 (gpd)	2007 (gpd)
Filter Plant	1,027,000	1,182,000	1,314,000
Well 5	476,000	504,000	301,000
Well 6	-	-	1,879,000
Well 7	707,000	2,083,000	871,000
Well 8	59,000	1,424,000	1,355,000
Well 9	752,000	695,000	269,000
Well 10	1,217,000	-	-
Well 11	1,520,000	-	1,454,000
Well 12	2,747,000	2,770,000	-
Total	**8,505,000**	**8,658,000**	**6,999,000**
Date	**August 27**	**July 15**	**July 10**

The City's telemetry records were used to determine the historical maximum day demands (MDD) on the system. Daily meter readings on the City's supply wells and surface water sources were used to determine the City's maximum production day. Table 3-9 presents the historical maximum day demands to average day peaking factors.

Table 3-9 2002 – 2007 Maximum Day Demand

Year	ADD (gpd)	MDD (gpd)	Peaking Factor
2002	3,941,676	9,585,000	2.43
2003	3,989,438	8,166,000	2.05
2004	3,648,184	8,837,000	2.42
2005	3,613,878	8,505,000	2.35
2006	4,134,317	8,658,000	2.09
2007	3,763,001	6,999,000	1.86
2008(1)	3,695,479	7,745,003	2.09
Average	**3,848,416**	**8,458,333**	**2.20**

(1) 2008 data is actual data, but this information was not available at the time this analysis was conducted, and therefore, is not included in the average calculation.

Based on the average peaking factor shown in Table 3-9, a conservative peak day to average day peaking factor of 2.2 will be used to project peak day demands on the system discussed in subsequent sections. The peak day to average day peaking factor was 1.9 in the City's previous WSP.

The maximum quantity of water produced in a 1-hour period during a maximum day demand is the peak hour demand. If precise records of peak hour demand are not available, peak hour is often expressed in terms of a peaking factor. A peaking factor is defined as the ratio of peak hour to the maximum day demand. It is generally accepted that peak hour factors range from 1.5 to 2.5. The DOH Water System Design Manual, August 2001, provides a methodology for calculating peak hour demand (PHD). The generalized equation is as follows:

$$PHD = (MDD/1440)[(C)(N) + F] + 18$$

Where:
PHD = Peak Hourly Demand, (gpm)
C = Coefficient Associated with Range of ERUs
N = Number of Service Connections, ERUs
F = Factor Associated with Ranges of ERUs
MDD = Maximum Day Demand, (gpd/ERU)

For the City, an ERU is equal to 296 gpd, as shown in subsequent sections and in Table 3-13. The number of service connections, N, is equal to the maximum day production divided by the maximum day demand per ERU. The result is a total system ERU value of 12,989.

The values for C and F of the peak hour demand formula are taken from the DOH Water System Design Manual, Table 5-1, page 5-8. C is equal to 1.6 and F is equal to 225. The MDD is estimated as MDD = 296 gpd/ERU * 2.2 = 651 gpd/ERU

By substituting these values into the equation above, the PHD is calculated to be 9,518 gallons per minute (gpm). Thus, the calculated peaking factor between peak hour demand and maximum day demand for the entire system is 1.62 (9,518/(8,458,333/1440) = 1.62). (See DOH comment/response matrix for further explanation of this calculation.)

A conservative peak hour to peak day peaking factor of **1.8** will be used to project peak hour demands on the system discussed in subsequent sections.

Consumption History

City water consumption is measured at individual service meters. Residential customers are billed for water service every two months, while commercial and municipal customers are billed monthly. The City's water connections and consumption, as it is related to customer class, is presented in Table 3-10 and Figures 3-6 and 3-7.

Table 3-10 2007 Customer Consumption

Customer Type	Annual Consumption (gallons)	Number of Connections	Percent of Total Connections	Percent of Total Consumption
Single-Family	631,634,388	6102	87.2%	46.0%
Multi-Family	24,167,880	405	5.9%	1.8%
Commercial	54,723,680	219	3.1%	4.0%
Industrial	429,112,640	29	0.4%	31.2%
City	6,456,736	35	0.5%	0.5%
Irrigation	70,828,120	158.5	2.3%	5.2%
Hydrants	3,716,064	43	0.6%	0.3%
NA	1,282,072	0	0.0%	0.1%
DSL	151,573,946	0	0.0%	11.0%
Total	**1,373,495,526**	**6,997**	**100.0%**	**100.0%**

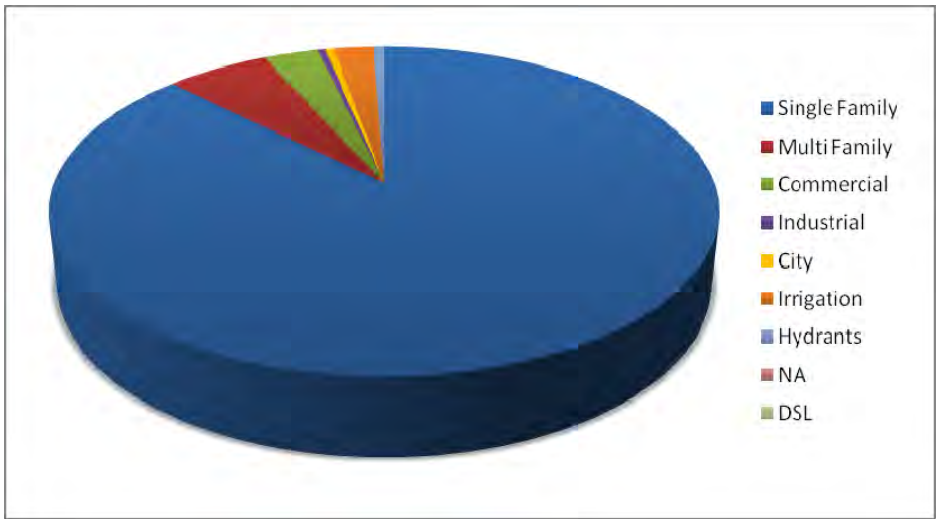

Figure 3-6 Connections by Customer Class

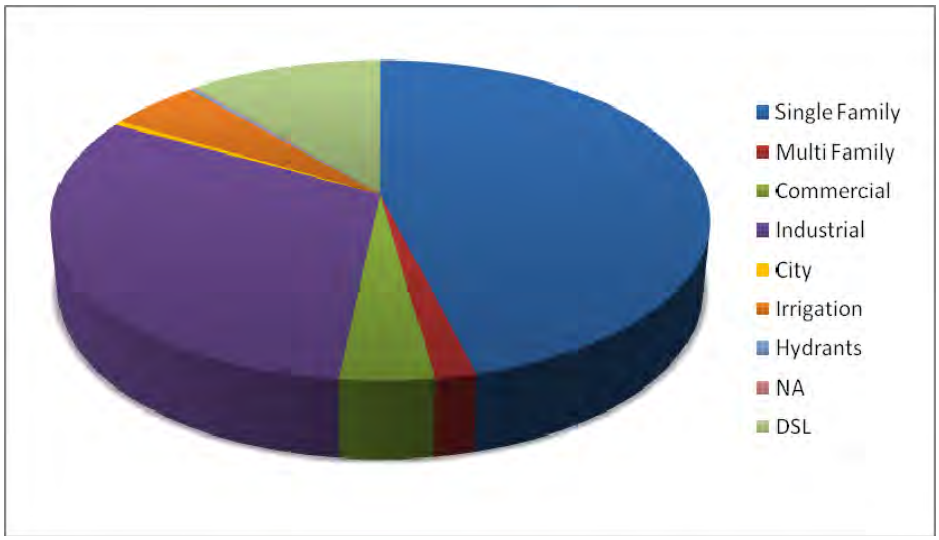

Figure 3-7 Consumption by Customer Class

Table 3-11 shows the City's highest water users. The majority of these users are from the industrial customer class that accounts for over 35 percent of the City's water usage. Note that Camas School District #117 has a number of different accounts, but is included as a single account.

Table 3-11 Highest Water Users

Customer	2005 ADD (gpd)	2006 ADD (gpd)	2007 ADD (gpd)
Wafertech Industries	570,385	625,521	597,593
Linear Technology	233,870	171,406	257,783
Georgia Pacific Mill	238,567	253,700	261,624
Camas School District #117	38,198	55,009	41,559
Sharp Electronics Corp	17,470	15,494	14,488
Hewlett-Packard	40,647	29,633	21,329
Green Mountain Golf Course	0	20,146	0
Heraeus Shin-estu	12,657	14,543	12,789
Underwriters Laboratory	20,222	24,751	22,558
Camas Washington Associates	8,499	8,641	9,143
Bodycote	7,030	6,640	8,122

DISTRIBUTION SYSTEM LEAKAGE

Distribution system leakage (DSL) is defined as the difference between metered source production and all accounted for sources of water usage. Prior to DOH instituting the new Water Use Efficiency requirements, all non-revenue water was called "lost and unaccounted for water." However under the new rules, all non-revenue water is simply considered DSL, whether it is resulting from actual leakage in the distribution system or is caused by some other factor such as unmetered usage, unaccounted for hydrant flushing, or inaccurate meters. Table 3-12 provides the historical distribution system leakage for water from 2002 through 2007.

Table 3-12 Distribution System Leakage

Year	Production (gallons)	Consumption (gallons)	DSL (gallons)	Percent DSL	3-year Rolling Average
2002	1,438,711,600	1,093,178,064	345,533,536	24.0%	-
2003	1,456,144,700	1,163,908,194	292,236,506	20.1%	-
2004	1,460,213,119	1,211,462,296	248,750,823	17.0%	20.4%
2005	1,319,065,600	1,235,318,260	83,747,340	6.3%	14.5%
2006	1,509,025,682	1,265,488,092	243,537,590	16.1%	13.2%
2007	1,373,495,526	1,221,921,580	151,573,946	11.0%	11.2%
Average	**1,426,109,371**	**1,198,546,081**	**227,563,290**	**15.8%**	

The City has a relatively high distribution system leakage percentage. Water systems with high pressures (greater than 120 psi), like those found in the 343 Zone, typically show large quantities of DSL. Fire flow requirements and existing sprinkler systems may prevent the City from adjusting and re-aligning the existing 343 Zone to reduce pressures. The feasibility of adjusting pressures in the 343 Zone will be analyzed due to its potential for conservation and reduction of distribution system leakage. This analysis is included as part of the hydraulic analysis, located in Chapter 5. As part of the Municipal Water Law, the City's goal is to reduce DSL to an average of 10 percent using a 3-year rolling average. As of 2007, the City is very close to meeting this goal, with an average of 11.2 percent DSL.

EQUIVALENT RESIDENTIAL UNITS

The conversion of total water use to equivalent residential units (ERUs) provides a way to express water use by non-residential customers as an equivalent number of single family residential customers. The average volume of water used per residential connection is calculated by dividing the total volume of water used in the single family residential customer class by the total number of single family residential connections. This number defines the average single family residential water use per connection. The volume of water used by the other customer classes can then be converted to an equivalent number of single family residential services. ERUs for other customer classes are calculated by dividing the number of connections by the average single family residential water use per connection. The average volume of water used per single family residential connection in 2007 was approximately **284 gallons per day** (gpd). Table 3-13 provides the number of water service connections by customer class, the average daily consumption per customer class for 2007, the ERUs, and the average ERUs per connection.

Table 3-13 2007 Equivalent Residential Units

Customer Type	Total Demand (gpd)	Number of Connections[(1)]	Equivalent Residential Units[(2)]	ERUs per Unit
Single-Family	1,730,505	6102	6,102	1.00
Multi-Family	66,213	405	233	0.58
Commercial	149,928	219	529	2.41
Industrial	1,175,651	29	4,146	142.95
City	17,690	35	62	1.78
Irrigation	194,050	159	684	4.32
Hydrants	10,181	43	36	0.83
NA	3,513	0	12	-
DSL	415,271	0	1,464	-
Total	**3,763,001**	**6,992**	**13,269**	

(1) Number of connections for each customer class is equal to the average end of year connection values from 2006 and 2007.

(2) ERUs = Total Demand / 283.6 gpd per ERU

Figure 3-8 is a graph that shows the normalized City growth from 2002 through 2007 based on water service connections and average day production. This graph shows that while the number of connections has steadily increased since 2002, production has remained relatively flat.

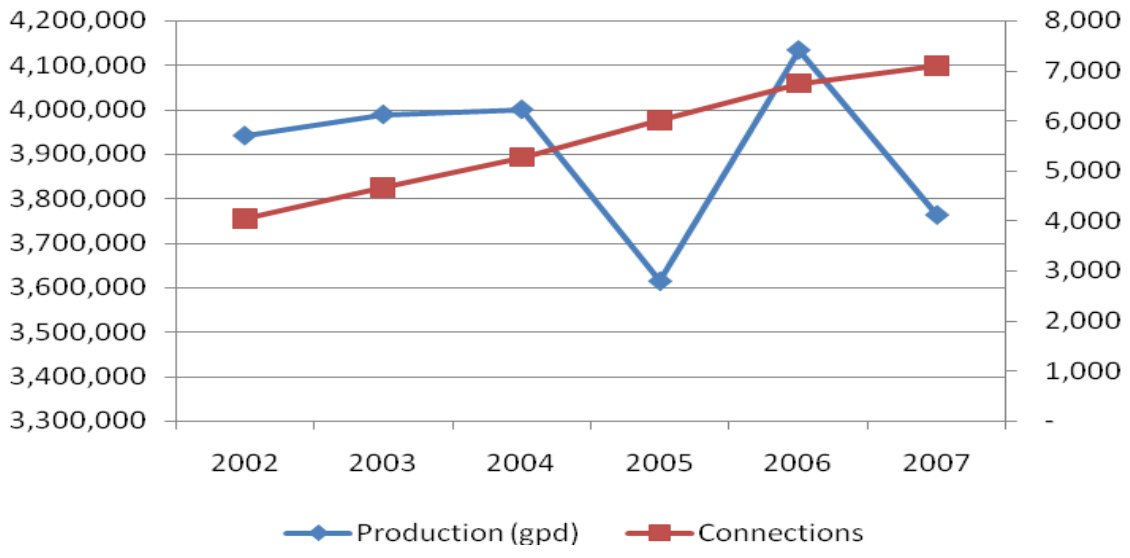

Figure 3-8 Historical Growth

City Water Use Efficiency Program

The City's water use efficiency (WUE) program includes conservation information on their web site, leak detection surveys, a water main replacement program, and a meter replacement program. More information regarding the City's WUE program, including recommended improvements, is provided in Chapter 6.

WATER USE FORECASTING

Water use forecasting uses the population projections presented in Table 3-4 along with per capita water usage to project the water demands that the system must support as its population increases. The demand forecasts will be used in the system analysis and to develop demand sets for the hydraulic analysis.

PROJECTED WATER USE

Water use projections have been made based on the City's population within the water service area boundary. The water use projections were calculated assuming an average water use of 142 gpcd for non-industrial water users. This value was calculated using 2005 through 2007 water production less industrial demand and DSL, divided by the population data.

Because industrial water use comprises such a large percentage of the City's water use and can grow independently from City population growth, industrial water use has been projected separately. Over the past 6 years, the number of industrial connections has not increased; it has remained constant at a value of 26 connections. The peak day to average day peaking factor is 2.2, and the peak hour to peak day peaking factor of 1.8 will be used. In order to make the system analysis more conservative, water conservation was not included. However, water use projections incorporating conservation are provided in Chapter 6. The projected average day and peak day water demands for the water service area were shown in Table 3-11, and peak hour water demands were presented in Table 3-12.

Industrial use was projected assuming a consumption factor of 3,000 gallons per day per acre of light industrial land. Assuming a buildout year of 2025, the water use projections for the light industrial land use classification were extrapolated from existing water consumption to simulate industrial growth over the next 20 years. All land zoned as light industrial was considered developable to complete these projections. Wetland areas and other areas unsuitable for development were removed from the water use projections, since these lands are not developable. The City does not want to understate the potential for light industrial growth within the urban growth boundary.

Wafertech, the City's largest individual water user, is in the planning stages of expanding its current manufacturing plant. Wafertech used approximately 0.60 mgd in 2007, and it is anticipated that Wafertech will require as much as 0.70 mgd at its current capacity.

Table 3-14 summarizes the different values calculated in this chapter, and how these values are used to analyze the City's water usage.

Table 3-14 Summary of Planning Data Values

Value	Unit	Description
242	gpcd	Average day production per capita for all uses. Three-year average. See Table 3-7.
142	gpcd	Average day production per capita less industrial use and DSL (includes all residential and commercial). Three-year average. Used for Non-NUGA demand projections.
136	gpcd	2007 residential average day demand per capita. Includes residential consumption only.
116	gpcd	Residential average day demand per capita. Based on single and multifamily consumption data. Three-year average. Used for NUGA residential projections.
2.20	-	Historical average maximum day demand peaking factor. See Table 3-9. Used to convert ADD to MDD in projections.
1.80	-	2007 peaking factor to convert MDD to PHD. Used for projections.
284	gpd	2007 ERU value. The average single family residential consumption.
296	gpd	2004-2007 average ERU value. Used to convert demand projections to ERUs.

Table 3-15 Non-NUGA Water Demand Projections

Year	Non-NUGA Population	Residential, Commercial, and City Demand[1] (gpd)	Industrial Demand[2] (gpd)	DSL @ 11%[3] (gpd)	Total ADD[4] (gpd)	MDD[5] (gpd)	PHD[6] (gpm)
2008[7]	16,700	2,371,400	1,267,559	449,759	4,088,718	8,995,180	11,244
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2010	17,581	2,496,566	1,462,189	489,284	4,448,039	9,785,686	12,232
2011	18,039	2,561,605	1,559,503	509,351	4,630,459	10,187,010	12,734
2012	18,509	2,628,339	1,656,818	529,626	4,814,783	10,592,522	13,241
2013	18,992	2,696,811	1,754,133	550,117	5,001,060	11,002,332	13,753
2014	19,486	2,767,067	1,851,447	570,828	5,189,341	11,416,551	14,271
2015	19,994	2,839,153	1,948,762	591,765	5,379,679	11,835,295	14,794
2016	20,515	2,913,117	2,046,076	612,934	5,572,127	12,258,680	15,323
2017	21,049	2,989,008	2,143,391	634,341	5,766,740	12,686,828	15,859
2018	21,598	3,066,876	2,240,706	655,993	5,963,575	13,119,864	16,400
2019	22,160	3,146,772	2,338,020	677,896	6,162,688	13,557,914	16,947
2020	22,738	3,228,750	2,435,335	700,055	6,364,141	14,001,109	17,501
2021	23,330	3,312,864	2,532,650	722,479	6,567,993	14,449,584	18,062
2022	23,938	3,399,169	2,629,964	745,174	6,774,307	14,903,475	18,629
2023	24,561	3,487,722	2,727,279	768,146	6,983,147	15,362,923	19,204
2024	25,201	3,578,582	2,824,594	791,404	7,194,579	15,828,075	19,785
2025	25,858	3,671,809	2,830,000	803,594	7,305,404	16,071,888	20,090
2026	26,531	3,767,465	2,830,000	815,417	7,412,882	16,308,341	20,385
2027	27,223	3,865,613	2,830,000	827,548	7,523,161	16,550,954	20,689
2028	27,932	3,966,318	2,830,000	839,994	7,636,312	16,799,887	21,000
2029	28,659	4,069,646	2,830,000	852,765	7,752,411	17,055,305	21,319

(1) Non-NUGA Population * 142 gpcd, 142 gpcd is equal to the average of total production from 2005 to 2007 less industrial demand and DSL, divided by the population. Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 gpd for Wafertech.

(2) Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 for Wafertech.

(3) DSL = Total ADD * 0.11

(4) Total ADD = Sum(Residential, Commercial, City, and Industrial Demand) / 0.89

(5) MDD = ADD * 2.2

(6) PHD = MDD * 1.8 / (24 * 60)

(7) 2008 is actual data from OFM and is not projected, 2009 OFM data shows a population of 16,950. Methodology for population projection is described on page 3-10.

Table 3-16 NUGA Water Demand Projections

Year	NUGA Population	Residential Demand[1] (gpd)	LI/BP Demand[2] (gpd)	Commercial Demand[3] (gpd)	DSL @ 11%[4] (gpd)	Total ADD[5] (gpd)	MDD[6] (gpd)	PHD[7] (gpm)
2008	-	-	-	-	-	-	-	-
2009	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	-
2011	777	90,186	4,286	2,923	12,038	109,433	240,753	301
2012	1,555	180,372	8,573	5,846	24,075	218,866	481,506	602
2013	2,332	270,558	12,859	8,769	36,113	328,299	722,258	903
2014	3,110	360,745	17,146	11,692	48,151	437,732	963,011	1,204
2015	3,887	450,931	21,432	14,615	60,188	547,165	1,203,764	1,505
2016	4,665	541,117	25,718	17,538	72,226	656,599	1,444,517	1,806
2017	5,442	631,303	30,005	20,460	84,263	766,032	1,685,270	2,107
2018	6,220	721,489	34,291	23,383	96,301	875,465	1,926,022	2,408
2019	6,997	811,675	38,578	26,306	108,339	984,898	2,166,775	2,708
2020	7,775	901,861	42,864	29,229	120,376	1,094,331	2,407,528	3,009
2021	8,552	992,047	47,150	32,152	132,414	1,203,764	2,648,281	3,310
2022	9,330	1,082,234	51,437	35,075	144,452	1,313,197	2,889,034	3,611
2023	10,107	1,172,420	55,723	37,998	156,489	1,422,630	3,129,786	3,912
2024	10,885	1,262,606	60,010	40,921	168,527	1,532,063	3,370,539	4,213
2025	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2026	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2027	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2028	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2029	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514

(1) Linearly distributed based on a total buildout population of 11,662 (determined from the City and in the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 116 gpcd. 116 gpcd is equal to the average residential consumption from 2005 to 2007, divided by the population.

(2) Linearly distributed based on total employees on the developable acreage, 2,819 (determined from the City and in the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 18 gpd/employee from the *Washington DOH Water System Design Manual*.

(3) Linearly distributed based on the developable acreage, 66.4 (determined from the City and in the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 660 gpd/acre for commercial use. This value was determined based on the average commercial water use in 2007, 150,000 gpd, over the existing 227 commercial acres in the City (150,000 / 227 = 660 gpd/acre).

(4) DSL = Total ADD * 0.11

(5) NUGA Total ADD = Sum(Residential , LI/BP, and Commercial Consumption) / 0.89

(6) NUGA MDD = NUGA ADD * 2.2

(7) NUGA PHD = NUGA MDD * 1.8 / (24 * 60)

Table 3-17 Total City and NUGA Water Demand Projections

Year	Total Population	Total Residential, Commercial, LI, and BP Demand (gpd)	Total Industrial Demand (gpd)	Total DSL @ 11% (gpd)	Total ADD (gpd)	Total MDD (gpd)	Total PHD (gpm)
2008	16,700	2,371,400	1,267,559	449,759	4,088,718	8,995,180	11,244
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2010	17,581	2,496,566	1,462,189	489,284	4,448,039	9,785,686	12,232
2011	18,817	2,659,001	1,559,503	521,388	4,739,892	10,427,763	13,035
2012	20,064	2,823,130	1,656,818	553,701	5,033,649	11,074,028	13,843
2013	21,324	2,988,997	1,754,133	586,230	5,329,359	11,724,590	14,656
2014	22,596	3,156,648	1,851,447	618,978	5,627,074	12,379,562	15,474
2015	23,881	3,326,130	1,948,762	651,953	5,926,845	13,039,059	16,299
2016	25,180	3,497,490	2,046,076	685,160	6,228,726	13,703,197	17,129
2017	26,492	3,670,776	2,143,391	718,605	6,532,772	14,372,098	17,965
2018	27,817	3,846,039	2,240,706	752,294	6,839,039	15,045,887	18,807
2019	29,158	4,023,331	2,338,020	786,234	7,147,586	15,724,689	19,656
2020	30,512	4,202,705	2,435,335	820,432	7,458,472	16,408,637	20,511
2021	31,882	4,384,214	2,532,650	854,893	7,771,757	17,097,865	21,372
2022	33,267	4,567,914	2,629,964	889,625	8,087,504	17,792,508	22,241
2023	34,668	4,753,863	2,727,279	924,635	8,405,777	18,492,710	23,116
2024	36,086	4,942,118	2,824,594	959,931	8,726,643	19,198,614	23,998
2025	37,520	5,132,741	2,830,000	984,159	8,946,900	19,683,180	24,604
2026	38,193	5,228,397	2,830,000	995,982	9,054,379	19,919,633	24,900
2027	38,885	5,326,545	2,830,000	1,008,112	9,164,657	20,162,246	25,203
2028	39,594	5,427,250	2,830,000	1,020,559	9,277,809	20,411,179	25,514
2029	40,321	5,530,578	2,830,000	1,033,330	9,393,908	20,666,597	25,833

(1) The sum of Non-NUGA Demands from Table 3-15, and NUGA Demands from Table 3-16.

For comparison purposes, Table 3-18 shows the breakdown of ERUs for the total production in 2007. The total number of ERUs in 2007 was 13,269.

Table 3-18 2007 ERU Distribution

Customer Type	Total Demand (gpd)	Number of Connections(1)	Equivalent Residential Units(2)	ERUs per Unit
Single-Family	1,730,505	6102	6,102	1.00
Multi-Family	66,213	405	233	0.58
Commercial	149,928	219	529	2.41
Industrial	1,175,651	29	4,146	142.95
City	17,690	35	62	1.78
Irrigation	194,050	158.5	684	4.32
Hydrants	10,181	43	36	0.83
NA	3,513	0	12	-
DSL	415,271	0	1,464	-
Total	**3,763,001**	**6,992**	**13,269**	

(1) Number of connections for each customer class is equal to the average end of year connection values from 2006 and 2007.

(2) ERUs = Total Demand / 283.6 gpd per ERU

The 2007 ERU value is based on actual data single family data from 2007. The ERU value for 2007 is 283.6 gpd/ERU.

The following table represents the 2007 ERU distribution without industrial demand or DSL. This data is used to separate the non-NUGA demand projections from Table 3-15, Column 3 by customer type.

Table 3-19 2007 ERU Distribution (less Industrial and DSL)

Customer Type	Demand (gpd)	Equivalent Residential Units[1]	Percentage of Total ERUs [2]
Single-Family	1,730,505	6,102	0.80
Multi-Family	66,213	233	0.03
Commercial	149,928	529	0.07
City	17,690	62	0.01
Irrigation	194,050	684	0.09
Hydrants	10,181	36	0.00
NA	3,513	12	0.00
Total	**2,172,079**	**7,659**	**1.0**

(1) Equal to the annual consumption divided by 283.6 gpd/ERU

(2) Equal to the number of ERUs for each customer class divided by 7,659

The following tables project ERUs for the City through the 20-year planning period. These projections are based on an average ERU value from 2004 to 2007. The following projections use a value of 296 gpd/ERU.

Table 3-20 Non-NUGA ERU Projections

Year	Residential[(1)]	Commercial[(2)]	City[(3)]	Irrigation[(4)]	Industrial[(5)]	DSL @11%[(6)]	Total ERUs[(7)]
2008	6,650	561	80	721	4,282	1,519	13,813
2009	6,823	575	82	740	4,611	1,586	14,417
2010	7,001	590	84	759	4,940	1,653	15,027
2011	7,183	606	87	779	5,269	1,721	15,643
2012	7,370	622	89	799	5,597	1,789	16,266
2013	7,562	638	91	820	5,926	1,859	16,895
2014	7,759	654	93	841	6,255	1,928	17,532
2015	7,961	671	96	863	6,584	1,999	18,175
2016	8,169	689	98	886	6,912	2,071	18,825
2017	8,381	707	101	909	7,241	2,143	19,482
2018	8,600	725	104	932	7,570	2,216	20,147
2019	8,824	744	106	957	7,899	2,290	20,820
2020	9,054	764	109	982	8,227	2,365	21,500
2021	9,289	783	112	1,007	8,556	2,441	22,189
2022	9,531	804	115	1,034	8,885	2,517	22,886
2023	9,780	825	118	1,060	9,214	2,595	23,592
2024	10,035	846	121	1,088	9,543	2,674	24,306
2025	10,296	868	124	1,116	9,561	2,715	24,680
2026	10,564	891	127	1,146	9,561	2,755	25,044
2027	10,839	914	131	1,175	9,561	2,796	25,416
2028	11,122	938	134	1,206	9,561	2,838	25,798
2029	11,412	962	137	1,237	9,561	2,881	26,191

(1) Residential ERUs = SF + MF ERU percentage from Table 3-17 (0.83)* third column in Table 3-15.
(2) Commercial ERUs = Commercial ERU percentage from Table 3-19 (0.07) * third column in Table 3-15.
(3) City ERUs = City ERU percentage from Table 3-19 (0.01) * third column in Table 3-15.
(4) Irrigation ERUs = Irrigation ERU percentage from Table 3-19 (0.09) * third column in Table 3-15.
(5) Industrial ERUs = Industrial Demand from Table 3-15, Column 4 / 296 gpd per ERU.
(6) DSL ERUs = DSL Demand from Table 3-15, Column 5 / 296 gpd per ERU.
(7) Total ERUs = sum of Residential, Commercial, City, Irrigation, Industrial, and DSL ERUs.

Table 3-21 NUGA ERU Projections

Year	Residential[1]	LI/BP[2]	Commercial[3]	DSL @ 11%[4]	Total ERUs[5]
2008	-	-	-		-
2009	-	-	-		-
2010	-	-	-		-
2011	305	14	10	41	370
2012	609	29	20	81	739
2013	914	43	30	122	1,109
2014	1,219	58	39	163	1,479
2015	1,523	72	49	203	1,849
2016	1,828	87	59	244	2,218
2017	2,133	101	69	285	2,588
2018	2,437	116	79	325	2,958
2019	2,742	130	89	366	3,327
2020	3,047	145	99	407	3,697
2021	3,352	159	109	447	4,067
2022	3,656	174	118	488	4,436
2023	3,961	188	128	529	4,806
2024	4,266	203	138	569	5,176
2025	4,570	217	148	610	5,546
2026	4,570	217	148	610	5,546
2027	4,570	217	148	610	5,546
2028	4,570	217	148	610	5,546
2029	4,570	217	148	610	5,546

(1) Residential ERUs = Residential Demand from Table 3-16, Column 3 / 296 gpd per ERU.

(2) LI/BP ERUs = LI/BP Demand from Table 3-16, Column 4 / 296 gpd per ERU.

(3) Commercial ERUs = Commercial Demand from Table 3-16, Column 5 / 296 gpd per ERU.

(4) DSL ERUs = DSL Demand from Table 3-16, Column 6 / 296 gpd per ERU.

(5) Total ERUs = Sum of Residential, LI/BP, Commercial, and DSL ERUs.

Table 3-22 Total ERU Projections(1)

Year	Residential	Commercial	Industrial, LI, and BP	City	Irrigation	DSL	Total ERUs
2008	6,650	561	4,282	80	721	1,519	13,813
2009	6,823	575	4,611	82	740	1,586	14,417
2010	7,001	590	4,940	84	759	1,653	15,027
2011	7,488	616	5,283	87	779	1,761	16,013
2012	7,979	641	5,626	89	799	1,871	17,006
2013	8,476	667	5,970	91	820	1,981	18,005
2014	8,978	694	6,313	93	841	2,091	19,010
2015	9,485	721	6,656	96	863	2,203	20,023
2016	9,997	748	6,999	98	886	2,315	21,043
2017	10,514	776	7,343	101	909	2,428	22,070
2018	11,037	804	7,686	104	932	2,542	23,105
2019	11,566	833	8,029	106	957	2,656	24,147
2020	12,100	862	8,372	109	982	2,772	25,198
2021	12,641	892	8,716	112	1,007	2,888	26,256
2022	13,188	922	9,059	115	1,034	3,005	27,323
2023	13,741	953	9,402	118	1,060	3,124	28,398
2024	14,300	985	9,745	121	1,088	3,243	29,482
2025	14,866	1,016	9,778	124	1,116	3,325	30,226
2026	15,134	1,039	9,778	127	1,146	3,365	30,589
2027	15,410	1,062	9,778	131	1,175	3,406	30,962
2028	15,692	1,086	9,778	134	1,206	3,448	31,344
2029	15,982	1,180	9,778	137	1,237	3,491	31,805

(1) The sum of Non-NUGA ERU projection from Table 3-20 and NUGA ERU projections from Table 3-21.

BUILDOUT PROJECTIONS

Buildout projections have been developed using the assumptions described in previous sections for areas within the City limits and the Urban Growth Area (UGA). Ultimate buildout is estimated to occur by 2038. The average daily demand within the city limits and UGA includes Phase I of Waftertech and is 10.58 million gallons per day (mgd), or 11,856 acre-feet per year (ac-ft/yr).

The ultimate water uses for the City include Phases II and III of the Waftertech expansion and buildout within the City's water service boundary (WSB) as defined in the Coordinated Water System Plan (CWSP), which includes areas outside of the city limits and UGA. The acreage within the WSB that was not included in the original analysis is 3,151 acres. Using an estimate of three dwelling units per acre, an additional

9,454 equivalent residential units (ERUs) are estimated within the WSB and outside of the city limits and UGA. Based on the ERU value of 296 gpd/ERU, an additional 2.79 mgd, or 3,134 ac-ft/yr, are anticipated within the WSB.

The ultimate expansion of Waftertech Phase III has a demand of 3.50 mgd. Phase I includes 0.70 mgd for Waftertech. Therefore, an additional 2.80 mgd, or 3,136 ac-ft/yr, from Wafertech must be accounted for at ultimate buildout for the City. The following table summarizes the demands that can be expected for the City at buildout.

Table 3-23 Total Buildout Demands

Demand Source	ADD (mgd)	Annual Demand (acre-ft)
WSP – City Limits, UGA, Wafertech Phase I	10.58	11,856
WSB	2.79	3,136
Wafertech Phase II and III	2.80	3,136
Total Buildout Demands	16.17	18,126

Chapter 4
SYSTEM ANALYSIS

INTRODUCTION

The purpose of this chapter is to determine if the existing water system facilities are able to supply sufficient quality and quantity of water to meet existing and projected demands. In this section, three major planning components will be analyzed in detail:

- Water Quality Analysis
- System Component Analysis
- Summary of Deficiencies

The design and construction standards identify the standards that apply to the City's water system facilities. The system component analyses compare the various design standards to the City's existing facilities. Based on these analyses, a summary of deficiencies is provided. Recommended improvements, project costs, and prioritization of recommended improvements are presented in Chapter 8 of this report.

WATER SYSTEM STANDARDS

The City complies with water quality standards established by the Washington State Department of Health.

Design standards established by the Washington State Department of Health are used to evaluate the City's water system in this Chapter.

The City has updated construction standards in May 2007. The water details can be found in Appendix E.

WATER QUALITY ANALYSIS

The City obtains its water from both surface water and groundwater sources. All of the City's sources are treated with chlorine and fluoride. Surface water is also treated via a rapid sand pressure filter plant. The City began corrosion control in April, 2000, consisting of soda ash addition at the filter plant and caustic soda addition at the groundwater sources.

The following sections provide a discussion of the water quality monitoring conducted by the City as well as the coordination with SPU for regional water quality monitoring programs.

A detailed review of the City's water quality is included in the *City of Camas Annual Drinking Water Quality Report*, located in the Appendix F. The City monitors for over 150 compounds, including turbidity, lead and copper, bacteriological contaminants, and disinfection by-products. Table 4-1 lists the City's regular water quality testing schedule. In addition to the items listed in Table 4-1, the City tests for Synthetic Organic Compounds (SOCs), radionuclides, lead and copper, and all other water quality testing required to meet DOH and EPA regulatory compliance.

Table 4-1 Water Quality Testing

Water Quality Parameter	Source(s)	Testing Frequency
Water Turbidity	Filter Plant	Continuous and daily
Coliform	Boulder Creek, Jones Creek, Distribution System	One combined monthly sample for surface water, Five weekly in distribution system
Volatile Organic Chemicals (VOCs)	Boulder Creek, Jones Creek, Wells	Every 36 months
Inorganics	Boulder Creek and Jones Creek, Wells	One combined annual sample for surface water, every 36 months for wells
Fluoride	Filter Plant Wells Distribution System	Daily Daily Four Weekly Samples
Temperature	Filter Plant	Daily
pH	Filter Plant Distribution System	Daily Continuous at Angelo and Upper Prune Hill Booster Stations Four Weekly Samples
Chlorine Residual	Filter Plant Wells Distribution System	Continuous and Daily Daily Five Weekly Samples

BACTERIOLOGICAL

All bacteriological sampling is conducted by the City at the sampling locations listed in Table 4-2. The City monitors for bacteriological contaminants in accordance with its Water Quality Monitoring Plan. The number of required monthly samples is provided annually from DOH on the Water Quality Monitoring Report. The City is required to collect 20 samples per month per WAC 246-290-300. The number of required samples is based on the population served by the water system.

The City has been in compliance with WAC regulations for sampling and follow-up actions. The City had a sample test positive for total coliform in 2007 with E. coli absent. Follow-up testing revealed that sample was negative for coliform. The coliform monitoring plan is located in Appendix H of this plan. The follow up monitoring locations are not listed in the following table, but are included in the appendix.

Table 4-2 Water Quality Monitoring Stations*

Service Area	Location
Surface Water Sources	Influent of Chlorine Plant
852 Zone - Upper Prune Hill	NW 24th and Elgin
852 Zone - Upper Prune Hill	NW 24th and Maryland
852 Zone - Upper Prune Hill	Lower Prune Hill Booster
852 Zone - Upper Prune Hill	Upper Prune Hill Booster
852 Zone - Upper Prune Hill	NW 9th and Hoquiam
852 Zone - Upper Prune Hill	SE Grandridge Drive
455 Zone - Lower Prune Hill	Forest Home Booster
455 Zone - Lower Prune Hill	Angelo Booster Station
455 Zone - Lower Prune Hill	Crown Park – NE 17th and Dallas
343 Zone - Butler	1707 NE Ione St.
343 Zone - Butler	616 NE 4th Ave.
343 Zone - Butler	NE 2nd and Yale
343 Zone - Butler	Butler Booster
343 Zone - Butler	SE 11th and Polk
542 Zone - Gregg	27200 SE Robinson Road
542 Zone - Gregg	Gregg Booster
544 Zone - Lacamas	Underwriters Lab
544 Zone - Lacamas	4302 NW Dahlia
544 Zone - Lacamas	Lacamas Booster Station
544 Zone - Lacamas	3263 NW 45th Court
544 Zone - Lacamas	Fire Station #42 (Parker Street)

*Only 20 samples are taken each month. Sample sites are rotated between locations listed.

DISINFECTION BYPRODUCTS

The Disinfection/Disinfection Byproducts (D/DBP) Rule establishes residual disinfectant concentrations and maximum contaminant levels for disinfection byproducts. The rule was implemented in two stages. Stage 1 was published in the November 1998 and became effective in December 2001. Stage 2 was published in January 2006 and compliance begins on October 1, 2013. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 µg/L and 60 µg/L, respectively; however, compliance with the MCL is based on the running annual average of each individual sample instead of the running annual average of all samples combined. The number of samples taken is dependent on the population served. Table 4-3 summarizes the D/DBP Rule standards.

Table 4-3 D/DBP Standards

Parameter	MCL (Final)
TTHM (Total Trihalomethanes)	80 µg/L
HAA5 (Sum of five Haloacetic Acids)	60 µg/L
Bromate	10 µg/L
Chlorite	1.0 mg/L
Residual Chlorine	4.0 mg/L

The City currently tests quarterly for disinfection byproducts and is in full compliance with the Stage 1 requirements. The City has been approved for a 40/30 certification waiver because all of their Stage 1 D/DBP sample results are below 40 µg/L for TTHM and 30 µg/L for HAA5 and they have no monitoring violations. The City received a 40/30 certification waiver for Stage 2 of the D/DBP Rule in a letter from DOH dated April 21, 2006. The City's reduced monitoring requirement is to collect a total of five TTHM and five HAA5 samples per quarter. Table 4-4 shows the results of the City's 2007 disinfection by-product testing. All results meet the EPA standards for disinfection byproducts.

Table 4-4 2007 D/DBP Test Results

Date	Test Location	HAA (5) (µg/L)	Total Trihalomethanes (µg/L)
6/13/2007	SE 8th and Polk	0.9	1.1
6/13/2007	NW 9th and Hoquam	4.3	5.6
6/13/2007	NW 18th and Beech	2.9	6.6
6/13/2007	Underwriter Lab - Camas	9.0	9.2
6/13/2007	Green Mnt. Golf Course	18.1	14.9
3/29/2007	1620 SE 8th Avenue	ND	1.5
3/29/2007	NW Maryland and 24th	6.3	6.9
3/29/2007	616 NE 4th	ND	1.0
3/29/2007	Fire Station 42	17.7	11.6
3/29/2007	27224 SE Robinson Road	6.2	8.0
8/29/2007	West End Macintosh	2.2	5.8
8/29/2007	NW 9th and Hoquam	1.7	5.9
8/29/2007	SW 6th - END	1.3	5.6
8/29/2007	616 NE 4th	ND	0.9
8/29/2007	NE 2nd and Yale	ND	2.0
12/5/2007	NE 2nd and Yale	2.7	4.3
12/5/2007	1620 SE 8th Avenue	2.0	3.1
12/5/2007	27224 SE Robinsen	9.9	12.3
12/5/2007	Underwriters Lab - Camas	2.3	2.0
12/5/2007	616 NE 4th	2.1	1.6

RESIDUAL DISINFECTANT

According to WAC 246-290-300, systems providing disinfection treatment shall measure residual disinfectant concentration within the distribution system when taking routine or repeat coliform samples. The City is required to maintain a minimum chlorine residual of 0.2 mg/L throughout its distribution system. To ensure adequate chlorine residual, the City monitors the filter plant effluent continuously, and takes daily samples of the filter plant influent and at each of the groundwater wells. The City also tests five distribution samples each week for chlorine residual, to ensure adequate levels are being maintained throughout the distribution system. City records indicate that chlorine residual in the distribution system typically ranges between 0.5 and 1.2 mg/L.

VOLATILE ORGANIC CHEMICALS

The City tests for VOCs every three years, in accordance with WAC 246-290-300. The City's last testing period occurred in September 2007 and 2006. Results indicated no detection of VOCs at the wells. The City's next round of VOC sampling is scheduled for 2009, during which time the City will test all existing wells. The City's latest VOC results are located in Appendix I.

SYNTHETIC ORGANIC CHEMICALS

The City tests for SOCs every 3 years, in accordance with WAC 246-290-300. The City's last testing period occurred in April 2007, and results indicated no detection of SOCs at the Filter plant or any of the wells. The City's next round of SOC testing is scheduled for 2010.

LEAD AND COPPER

After the Lead and Copper Rule (LCR) was adopted in 1991, the City performed a corrosion control study to determine methods to bring the water system into compliance. As a result of the study, the City has provided pH treatment to its surface water sources and groundwater sources with caustic soda. This treatment method provides the least impact on the City's customers, while raising the City's groundwater to acceptable pH levels. The City began corrosion control of its groundwater sources in April 2000. Lead and copper testing indicates that the corrosion control measures are effective. The latest lead and copper testing results are located in Appendix J.

RADIONUCLIDES

WAC 246-290-300(10) and 40 CFR 141.26 require radionuclide samples once every 4 years. A gross alpha particle activity measurement may be substituted for the required radium-226 and radium-228 analysis provided that the measured gross alpha particle activity does not exceed 5 pCi/L at a confidence level of 95 percent.

Though a radon MCL was included in the originally proposed Radionuclide Rule, it is determined that a radon MCL will now be issued as a separate rule. In November of 1999, EPA proposed a preliminary radon MCL of 300 pCi/L. EPA is considering an alternative MCL of 4,000 pCi/L if states or water purveyors implement a multimedia mitigation program aimed at reducing household indoor-air health risks from radon gas from soil as well as tap water. The date for publication of the final Radon Rule is unknown at this time.

The City began testing for radionuclides in 1995. Since that time, the City has been in compliance with all adopted radionuclide regulations. The City collected radionuclide samples for radium in 2004 and 2008. In all of the samples the result was below the detection level. The next round of radionuclide testing will be in 2012.

INORGANIC COMPOUNDS

The City tests annually for Inorganic Compounds (IOCs) in accordance with WAC 246-290-300. The City's most recent IOCs were taken in 2007, these results can be found in Appendix K. Results indicated that the City does not have any MCL violations.

GROUNDWATER UNDER THE INFLUENCE OF SURFACE WATER (GWI)

None of the City's sources are GWI. Well 4 was determined as a GWI source, but has since been abandoned. The Washougal Wellfield wells are designated as hydraulically connected to surface water. These wells, Wells 6, 7, 8, 10, 11, 12, and 13, are required to meet a CT of 6. In addition, any other sources developed within the wellfield must also meet a CT of 6. This includes Well 14, which is currently under construction, and the remaining two wells that have yet to be designed.

WATER RIGHTS ANALYSIS

A summary of the City's existing water rights is provided in Table 1-3 of Chapter 1. Both the maximum instantaneous and the annual withdrawals from surface water and groundwater sources must comply with the limitations of these water rights. A comparison of instantaneous water rights for each of the City's sources to current source pumping capacity is presented in Table 4-5.

Table 4-5 Instantaneous Water Right versus Source Capacity

Source	Instantaneous Diversion or Withdrawal (gpm)	Nominal Pumping Capacity (gpm)[1]	Water Right Surplus (+) or Deficit (-) (gpm)
Boulder Creek	1,120 [2.5 cfs]	590[2]	+530
Jones Creek	450 [1.0 cfs]	450[2]	0
Well 5	600	500	+100
Well 6	1,500	1,450	+50
Well 7	1,000	950	+50
Well 8	900	1,350	-450
Well 9	650	650	0
Well 10	900	900	0
Well 11	1,200	1,200	0
Well 12	900	900	0
Well 13	1,325	1,325	0
Wellfield Water Right[3]	500	0	+500
Future Anderson Site Well 14	1,000	0	+1,000
Future Parkers Landing	1,000	0	+1,000
Future Treatment Plant Well	1,000	0	+1,000
2008 Total	**14,045[4]**	**10,265**	**+3,780**

Table 4-5 Instantaneous Water Right versus Source Capacity (continued)

Source	Instantaneous Diversion or Withdrawal (gpm)	Nominal Pumping Capacity (gpm)(1)	Water Right Surplus (+) or Deficit (-) (gpm)
Pending Applications			
Fire Station	350	0	0
Camas Meadows	1,000	0	0

(1) Hydraulic pumping capability may vary depending on which sources are running.
(2) For the two surface water sources, pumping capacity is considered to be the maximum flow rate through the gravity pipeline system. These sources are seasonal sources which are available between November 1 and May 14, and are not available during May 15 through October 31. Surface water capacity is approximately 1,040 gpm based on meter data. This is the hydraulic limitation of the existing transmission pipeline.
(3) This is a floating water right for the Washougal Wellfield that may be used on Wells 5, 6, 7, 8, 10, 11, 12, or 13.
(4) Total does not include pending applications. All water rights are not available for use at the same time.

As demonstrated by this comparison of instantaneous water rights to source diversion and pumping capacity, a surplus water rights capacity of 3,780 gpm exists. The majority of the surplus of water rights over pumping capacity is due to the recently approved ecology applications for three future well sites. Additional capacity is due to an inability to completely utilize the Jones and Boulder Creek instantaneous water right capacity due to transmission and filter plant limitations. The City prefers to transfer surface water rights rather than upgrade the existing facilities. Currently, Jones and Boulder Creek are used as a seasonal source, and are not available between May 15 and October 31.

INSTANTANEOUS WATER RIGHTS ANALYSIS

An analysis of the ability of the City's total instantaneous water rights and pumping capacity to meet current and future water system production needs is presented in Table 4-6.

Table 4-6 Instantaneous Water Right Analysis

Year	Total Instantaneous Water Right[(1)] (gpm)	Maximum Day Demand [(2)] (gpm)	Source Capacity Surplus (+) or Deficit (-) (gpm)
2008	12,475	5,378	+7,097
2015	12,475	9,054	+3,421
2029	12,475	14,174	-1,699

(1) Jones and Boulder Creek are not available as source water during maximum day demand usage. Total instantaneous water right does not include these surface water rights.

(2) The MDD is from Table 3-17, converted from gpd to gpm.

This table demonstrates that at this time, instantaneous water rights are sufficient to meet maximum day demands for the water system. Assuming that the City develops the three wells for which they have water rights, instantaneous water rights will meet the demands in the 6-year planning period. A minimal deficiency is shown in the 20-year planning period. This deficiency can be addressed through conservation, approval of pending water right applications at the Fire Station and Camas Meadows, or other source options provided for in the WIRA Plan or allowed by Ecology. Once the pending water right applications are approved by Ecology, the City will have a deficiency of water rights in the 20-year planning period of 349 gpm.

ANNUAL WATER RIGHTS ANALYSIS

With respect to annual water withdrawal requirements, Table 4-7 provides an analysis of the City's ability to meet existing and future demands.

Table 4-7 Annual Water Right Analysis

Source	Annual Water Right (acre-feet)		Annual Source Production-2008 (acre-feet)(1)	Surplus (+) or Deficit (-) (acre-feet)
Boulder Creek	1,820 (P)		679(2)	+2,288
Jones Creek	730 (P)			
Well No. 5	920 (P)	Capped at 5,900 acre-ft per year	3,333	
Well No. 6	2,400 (P)			
Well No. 7	530 (P)			
Well No. 8	530 (P)			
Well No. 10	320 (P)			
Well No. 11	118 (P)			
Well No. 12	230 (P)			
Well No. 13	1,208 (P)			
Well No. 9	210 (S)		127	+83
Anderson Site	880 (P)		0	+880
Parkers Landing	880 (P)		0	+880
Treatment Plant Well	880 (P)		0	+880
2008 Total	**11,090 (P) 210 (S)**		**3,460**	**+7,630 (P)(3) +83 (S)**

(1) Annual production values from Table 3-6, converted to acre-feet.
(2) Individual surface water source data unavailable. Annual production reflects the total source production from Boulder and Jones Creek.
(3) The surplus annual water rights shown for individual sources do not add to the total shown due to the fact that some are categorized as supplementary rights and there is a limitation to the total annual right based on conditions in Permits and Reports of Examination.
(P) Primary water right, additive to other rights.
(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.

As shown in Table 4-7, the City has sufficient annual water rights to meet existing average day demands. Based on 2008 production records, there is a surplus of 4,928 acre-feet per year.

An analysis of the ability of the City's annual water rights to meet future water system production needs is presented in Table 4-8.

Table 4-8 Analysis of Future Annual Water Rights

Year/ Demand	Total Annual Water Right (acre-ft)	Annual Demand (acre-ft)(1)	Water Right Surplus (+) or Deficit (-) (acre-ft)
2008	11,090	4,139	+6,951
2015	11,090	6,639	+4,451
2029	11,090	10,523	+567

(1) Projected water demands from Table 3-15, converted to acre-feet. Conservation is not included in Table 3-15.

Review of Table 4-8 indicates that the City has sufficient annual water rights to meet demand through the end of the 6-year planning period. If growth occurs as projected in Chapter 3, the City will need to acquire additional annual water rights to meet the demands in the 20-year planning period.

Total buildout demands were described in Chapter 3, Table 3-22. These demands include Wafertech Phase II and III, and buildout of the City's entire water system boundary. Total demands equal 18,126 acre-feet, which results in a water right deficit of 7,036 acre-feet.

FACILITY ANALYSIS

The following sections provide a facility analysis based on the ability of the system to meet the existing and projected water system demands.

SOURCE OF SUPPLY

As discussed in Chapter One, the City supplies water to its customers via two surface water sources and nine groundwater wells. The following sections describe the ability of each source to meet system demands and identify deficiencies at the sources.

Surface Water - Jones and Boulder Creeks

At the present time, the Jones and Boulder Creeks supply a maximum of 1,080 gpm to the City's water system. Based on an agreement between the City and the Department of Ecology, surface water sources are only used between November 1 and May 14. Prior to construction of the filtration plant, these sources were able to provide the entire 1,570 gpm capacity. At that time, the City did not have the head losses due to filtration, and these sources supplied the 343 Zone, rather than the higher head conditions of the 455 Zone that these sources currently supply. The capacity limitations are the 10-inch steel main between the creek intakes and the filter plant, and the capacity of the filter plant. The capacity of the City's pressure filter plant is 1,200 gpm, and the City's combined water right for these two sources is 3.5 cfs, or 1,570 gpm. Any increase in

supply from the surface water sources will require replacement of at least 4.5 miles of the 10-inch transmission main with 16-inch diameter pipe, or additional pumping.

The City is considering three long-term options for its surface water sources:

1. Continue to use Jones and Boulder Creek at its current capacity and seasonal usage from November 1 through May 14. This option is attractive because it avoids the capital costs associated with an upgrade of the filter plant and the 4.5 miles of 10-inch steel transmission main. This source is advantageous because it is one of the few sources that is not located at the Washougal Well Field, increasing the City's source reliability. This source also is fed by gravity directly into the 455 Zone, which means lower system pumping costs when compared with the City's groundwater wells.

2. Discontinue use of the surface water sources altogether and transfer all the water rights to existing groundwater sources and new groundwater sources. The City could work out a water rights transfer with Ecology to develop new well sources closer to the City in exchange for the relinquishment of the Jones and Boulder Creek sources. This would only be worthwhile to the City if it could obtain equivalent groundwater rights closer to the City.

3. Construct a new treatment facility at a new location. The treatment facility is nearing 50 years in age and is due for replacement of some of its major components. Construction of a new treatment plant at a new location could allow the City to increase the capacity to the maximum instantaneous water right. If the treatment plant were located upstream of its current location, a portion of the 10-inch steel main could be abandoned, and the reduction in main length could provide additional capacity. Further, if located properly, the new treatment plant could serve future growth in the NUGA. A new treatment method would need to be selected and pumping facilities would more than likely be required for this option.

A more in depth study will be conducted by the City in the next 6 years to determine the most cost effective and beneficial alternative.

Washougal Wellfield

The City's groundwater sources, with the exception of Well 9, are located near the Washougal River. These wells make up the Washougal Wellfield. These wells have the capacity to produce 8,575 gpm, but currently can only produce approximately

5,750 gpm. This is due to transmission deficiencies out of the 343 Zone. Specific transmission problems and solutions will be discussed in Chapter 5.

Well 6
Well 6 has a capacity of 1,450 gpm and is required to meet a CT of 6. To meet CT requirements, the City has restricted flow at Goot Park to 800 gpm from Well 6 into the downtown grid. The City also installed a check valve at the intersection of SE 6th Street and SE Polk Avenue, to allow flow from Well 6 into the Washougal Well Field, across the Washougal River and through the 18-inch transmission main to maximize the capacity of the well. As part of the Well 14 construction, a new treatment facility with on-site chlorine generation, fluoridation, caustic addition, and CT piping is being installed at the Well 6 site. The improvements will serve Well 6 and the construction of Well 14, and will maximize the wells' operational flexibility by enabling them to pump directly into the One-stop shopping area and the 343 Zone distribution grid without any flow restrictions. This project is scheduled for completion in 2009.

Well 14 – Anderson Site
Well 14 is a new well scheduled for construction in Spring 2010 and will have a capacity of 1,000 gpm. A treatment facility will be installed that will serve Well 14 and Well 6. CT will be achieved at this site, which will improve flow to the distribution system for Well 6.

SOURCE ANALYSIS

The following analysis demonstrates the sources ability to meet current and future maximum day demands. Table 4-9 assumes a 24-hour pumping period during the maximum day, and the current pumping and transmission configuration. Table 4-10 also assumes a 24-hour pumping period and current system configurations, but includes reliability by taking the largest source out of service. Well 6 is the largest source in this scenario. The surface water sources are not available during this period.

Table 4-9 Source Analysis

Year	Nominal Pumping Capacity (gpd)	MDD(1) (gpd)	Surplus/Deficit (gpd)
2008(2)	10,000,000	7,745,003	+2,254,997
2015	10,000,000	13,039,059	-3,039,059
2029	10,000,000	20,666,597	-10,666,597

(1) From projections presented in Table 3-17.
(2) Flow tests by Gray & Osborne on January 22, 2009 show that Wells 7, 8, 10, 11, 12, and 13 can produce 5,250 gpm. Assumes Well 5 operates at 500 gpm, Well 6 can produce at least 545 gpm, and Well 9 operates at 650 gpm. Total = (5,250+500+545+650)*60*24 = 10,000,000 gpd

Table 4-10 Source Analysis with Largest Source Out of Service

Year	Nominal Pumping Capacity (gpd)	MDD[(1)] (gpd)	Surplus/Deficit (gpd)
2008[(2)]	9,216,000	7,745,003	+1,470,997
2015	9,216,000	13,039,059	-3,823,059
2029	9,216,000	20,666,597	-11,450,597

(1) From projections presented in Table 3-15.

(2) Flow tests by Gray & Osborne on January 22, 2009 show that Wells 7, 8, 10, 11, 12, and 13 can produce 5,250 gpm. Assumes Well 5 operates at 500 gpm, and Well 9 operates at 650 gpm. Well 6 is the largest source when operating by itself, and is assumed out of service for reliability. Total = (5,250+500+650)*60*24 = 9,216,000 gallons

Each source analysis scenario shows a significant source deficit in the 6 and 20-year planning periods. The wells are not capable of pumping to their full capacities due to transmission issues. If the existing wells were utilized to their full pumping capacity, the City would have a maximum day pumping capacity of 13,664,000 gallons. This would sustain the City through the 6-year planning period.

With the addition of the three 1,000 gpm wells, the City would have a maximum day pumping capacity of 17,964,000 gallons, assuming full transmission capability. This volume would require approximately 2.7 MG of additional capacity to support the City through the 20-year planning period.

NUGA ZONE

Initial development within the NUGA is anticipated to occur within two areas. The first area is within the southeast portion in and around the Gregg Annexation area, while the second is within the northwest portion in and around Green Mountain. Subsequent growth is expected to occur in the area between the southeast and northwest. For the purpose of this analysis, the southeast portion of the NUGA will be referred to as NUGA (Gregg), and the northwest portion of the NUGA will be referred to as NUGA (Green Mountain).

The pressure zones for the NUGA are based on existing hydraulic gradients within the City's water system. The NUGA (Green Mountain) is proposed to be part of the City's existing 544 Zone, which is served by the Lacamas Reservoir. As the NUGA (Gregg) develops, it will be part of the 542 Zone, and served by the Gregg Reservoir. However, as development continues, it is expected that the 542 Zone and the 544 Zone will eventually merge and become a single 544 Zone, with the installation of an altitude valve on the Gregg Reservoir.

DEMAND DISTRIBUTION BY ZONE

To accurately distribute demand requirements throughout the City's facilities, 2008 demands are divided amongst the five major service regions (Butler, Lower Prune Hill, Upper Prune Hill, Lacamas, and Gregg) and assigned to the storage facility that serves that region. Demands are established based on the wells and booster stations that serve each zone. Projections are based on the total demands established in Chapter 3. A modest growth rate of one percent is assumed for the Butler Reservoir; Lower Prune Hill Reservoirs, and existing Gregg Reservoir service areas. NUGA demands have been established separately in Chapter 3. The Upper Prune Hill projections are based on a technical memo titled *Upper Prune Hill Buildout Potential* (Gray and Osborne, June 2008). The remaining demands are assigned to the Lacamas Reservoir service area. Table 4-11 below summarizes the projection demands by reservoir service area used throughout the Plan.

Table 4-11 Demand Distribution by Zone

Zone	2008[1]			2015		2029	
	ADD (gpd)	MDD (gpd)	Peaking Factor	ADD (gpd)	MDD (gpd)	ADD (gpd)	MDD (gpd)
343 - Butler	839,693	1,437,128	1.71	900,265	1,540,796	1,034,831	1,771,105
455 - LPH	439,898	778,086	1.77	471,630	834,213	542,127	958,907
542 - Gregg	106,928	294,382	2.75	114,641	315,617	131,777	362,794
542 – NUGA Gregg	0	0	0	273,586	601,882	820,748	1,805,646
542 - Total	106,928	294,382	2.75	388,227	917,499	952,525	2,168,440
544 - Lacamas	1,066,043	2,390,433	2.24	2,255,820	5,396,916	3,617,539	8,409,190
544 – NUGA Green Mtn.	0	0	0	273,586	601,882	820,748	1,805,646
544 - Total	1,066,043	2,390,433	2.24	2,529,406	5,998,798	4,438,287	10,214,836
852 - UPH	1,242,917	2,844,974	2.29	1,637,324	3,747,752	2,426,138	5,553,309
TOTAL	**3,695,479**	**7,745,003**	**2.15**	**5,926,845**	**13,039,059**	**9,393,908**	**20,666,597**

(1) 2008 values based on actual data.

A summary of the pumping capacity for each zone is presented in Table 4-12.

Table 4-12 Available Pumping Capacity by Zone

Source	Nominal Pumping Capacity (gpm)
Zone 343 - Butler	
Well 5	500
Well 6	545[(1)]
Well 7	5,250[(2)]
Well 8	
Well 10	
Well 11	
Well 12	
Well 13	
343 Total	6,295
Zone 455 - LPH	
Forest Home	1,000
Butler	1,400
Angelo	3,500
455 Total	5,900
Zone 542 - Gregg	
Old Gregg	500
New Gregg	1,500
542 Total	2,000
Zone 544 - Lacamas	
Lacamas	1,200
Well 9	650
544 Total	1,850
Zone 852 - UPH	
LPH	2,500
852 Total	2,500

(1) Well 6 is assumed to be capable of supplying at least 545 gpm with the rest of the wells in service.

(2) Pump tests performed on January 22, 2009 indicate that these wells are capable of pumping 5,250 gpm.

PUMPING ANALYSIS

The pumping analysis shown below in Table 4-13 is based on the demand distributions presented in Table 4-11, and the existing pumping capacities of each zone presented in Table 4-12.

Table 4-13 Maximum Day Pumping Capacity (MGD)

Zone	Nominal 24-hour Pumping Capacity[1]	2008		2015		2029	
		MDD	Surplus/ Deficit	MDD	Surplus/ Deficit	MDD	Surplus/ Deficit
343 – Butler[2]	9.06	6.81	2.26	12.10	(3.04)	19.73	(10.67)
455 – LPH[3]	8.50	5.37	3.12	10.56	(2.07)	17.96	(9.46)
542 – Gregg[4]	2.88	0.29	2.59	0.32	2.56	0.36	2.52
542 – NUGA Gregg[4]	-	-	-	0.60	(0.60)[5]	1.81	(1.81)
542 - Total	2.88	0.29	2.59	0.92	1.96	2.17	0.71
544 – Lacamas[4]	2.66	2.39	0.27	5.40	(2.73)	8.41	(5.75)
544 – NUGA Green Mtn.	-	-	-	0.60	(0.60)	1.81	(1.81)
544 - Total	2.66	2.39	0.27	6.00	(3.33)	10.22	(7.56)
852 – UPH[4]	3.60	2.84	0.76	3.75	(0.15)	5.55	(1.95)

(1) Pumping capacity from Table 4-12, and converted mgd.
(2) The 343 Zone maximum day demands include the demands for all of the zones, less the supply from Well 9, because all zones rely on water from the Butler zone for supply.
(3) The 455 Zone maximum day demands include demands from the 542, 544, and 852 zones, less the supply from Well 9. Water supply for these zones must pass through the Lower Prune Hill zone.
(4) The maximum day demands for these zones only include the volume required to meet each zones demand. No water leaves these zones to supply other areas of the system.
(5) The existing Gregg booster stations are capable of supplying the NUGA Gregg through 2029; however, deficits in the 343 and 455 Zone require additional pumping capacity.

With the development of the NUGA, 544, and 852 Zones, pumping and/or source facilities must be developed in order to serve these areas within the 20-year planning period. The existing facilities that currently serve the 542 Gregg zone will be sufficient to serve the NUGA Gregg through the 20-year planning period. The deficiencies in the 343 Zone will be improved by increasing transmission from the Washougal Wellfield to the distribution system. These improvements will be discussed in detail in Chapter 5.

The Crown Road Booster Pump Station is a project planned for construction and has already been designed. The station will pump from the Washougal Wellfield to the 544 zone. As the NUGA begins to develop, the City will eventually combine the 542 and

544 zones in order to better serve the area. Initially, the capacity of the station will be 3,200 gpm, with the potential to expand to 4,800 gpm. Table 4-14 shows the pumping analysis with the Crown Road Booster Station operating at 3,200 gpm into the 544 zone.

Table 4-14 Future Maximum Day Pumping Capacity (MGD)

Zone	Nominal 24-hour Pumping Capacity[1]	2008		2015		2029	
		MDD	Surplus/ Deficit	MDD	Surplus/ Deficit	MDD	Surplus/ Deficit
343 – Butler[2]	11.06	6.81	2.26	12.10	(1.04)[3]	19.73	(8.67)
455 – LPH[4]	8.50	2.98	5.52	5.95	2.55	13.35	(4.85)
544 – Gregg, NUGA, Lacamas[5]	10.15	2.68	7.47	6.92	3.24	12.38	(2.23)
852 – UPH[6]	3.60	2.84	0.76	3.75	(0.15)[7]	5.55	(1.95)

(1) Pumping capacity from Table 4-12, and converted mgd. 544 Zone includes 3,200 gpm from Crown Road Booster Station. 343 Zone includes an estimated 2.0 mgd of increased pumping capacity due to transmission improvements associated with Crown Road Booster Station.

(2) The 343 Zone maximum day demands include the demands for all of the zones, less the supply from Well 9, because all zones rely on water from the Butler zone for supply. The addition of Crown Road Booster Station will increase the pumping capacity of the Washougal Wellfield, and the deficit will be reduced.

(3) The construction of Well 14 will produce an additional 1.44 mgd to the 343 Zone and eliminate this deficiency.

(4) The 455 Zone maximum day demands include demands from the 542, 544, and 852 zones, less the supply from Well 9 and the supply from Crown Road Booster Station. Water supply for these zones must pass through the Lower Prune Hill zone.

(5) Maximum day demand for this zone is the addition of the demands from the Gregg, NUGA, and Lacamas zones.

(6) The maximum day demand for this zone only includes the volume required to meet demands within UPH.

(7) This deficit will be eliminated with a temporary portable 125 gpm booster pump.

Additional pumping improvements needed within the 6 and 20-year planning period will be discussed later in this chapter.

STORAGE ANALYSIS

The City currently has seven reservoirs with a combined storage capacity totaling 8.45 MG. A storage analysis was completed for the City's water service area. In order to determine whether or not the existing storage facilities operated by the City are adequate to meet existing and future demands on the system, the required volumes of the following five storage components need to be calculated.

- Operational Storage
- Equalizing Storage
- Standby Storage
- Fire Suppression Storage
- Dead Storage

The formulas for calculating these components of the storage requirements are provided in the DOH 2001 Water System Design Manual.

OPERATIONAL STORAGE

Operational storage is the volume of water that is used under normal operating circumstances. Water level sensors installed at storage facilities are used to control pump operations, and the volume of water used between the "on" and "off" set-points is the operational storage volume. In the case of Butler Reservoir, if the reservoir water level drops 3 feet, a well is called which will pump until the Butler Reservoir is full again. The 3 feet of storage comprises the operational storage of the Butler Reservoir. Table 4-15 shows the operational storage requirements for the City.

Table 4-15 Operational Storage

Reservoir	Volume/Height (gallon/ft.)	Pump Call Level (ft.)	Operational Storage (Gal.)
343 - Butler	80,000	3	240,000
455 - Lower Prune Hill No. 1	21,740	2.5	54,400
455 - Lower Prune Hill No. 2	65,217	2.5	163,000
542 - Gregg	1,430	10	14,300
544 - Lacamas	44,444	6	266,700
852 - Upper Prune Hill Standpipe	7,500	10	75,000
852 - Upper Prune Hill Reservoir	37,500	5	187,500
Total			**1,000,900**

EQUALIZING STORAGE

Equalizing storage must be provided as part of the total storage for the system to provide water during periods of peak demand that cannot be met by the source production capacity. In order to determine the amount of equalizing storage required by the City, the following equation was used from the DOH Design Manual:

$ES = (PHD - Q_s)(150 \text{ min.})$

Where: ES = Equalizing storage, in gallons

PHD = Peak hourly demand, in gpm

Q_s = Sum of all active sources of supply, in gpm

The amount of equalizing storage required in each reservoir is calculated based on the percentage of the total demand that is used in each pressure zone, and applied to the total equalizing storage required. Table 4-16 provides the projected equalizing storage distribution required through build-out. The demands for the 343 and 455 Zones are based on the peak hour demand for the zone, plus the pumping capacity from the zone to the upper zones.

Table 4-16 Equalizing Storage Distribution

Zone	2008			2015		2029	
	Peak Hour Demand (gpm)(1)	Qs (gpm)(2)	ES (gallons)	Peak Hour Demand (gpm)(1)	ES (gallons)	Peak Hour Demand (gpm)(1)	ES (gallons)
343 - Butler	7,696	6,295	210,212	7,826	229,652	8,114	272,832
455 - LPH	4,823	5,900	-	4,893	-	5,049	-
542 - Gregg	325	2,000	-	395	-	453	-
542 – NUGA Gregg	-	-	-	723	112,854	2,257	338,559
542 - Total	-	-	-	1,148	112,854	2,710	338,559
544 - Lacamas	2,988	1,850	170,706	6,746	734,433	10,511	1,299,223
544 – NUGA Green Mtn.	-	-	-	723	112,854	2,257	338,559
544- Total	2,988	1,850	170,706	7,469	847,287	12,768	1,637,782
852 - UPH	3,556	2,500	158,433	4,685	327,711	6,942	666,245

(1) Based on the total peak hour demand for the system, presented in Table 3-16, and distributed based on the percentage of total ADD for each Zone, as presented in Table 4-11. PHD for the 343 includes the demand for the 343 Zone and 5,900 gpm, the maximum pumping capacity out of the 343 Zone. PHD for the 455 Zone includes the demand for the 455 Zone and 3,850 gpm, the maximum pumping capacity out of the 455 Zone.

(2) From Table 4-12.

FIRE SUPPRESSION STORAGE

Water systems must be capable of delivering fire flows in accordance with the adopted fire flow requirements. The maximum adopted fire flow requirement for the City is equal to 5,000 gpm for 4 hours. The required fire suppression storage is the product of the fire flow rate and duration, or 1.20 MG. Minimum residential fire flow requirements are 1,000 gpm, and minimum commercial and industrial fire flow requirements are 1,500 gpm. Table 4-17 shows the maximum fire flow requirements for each of the City's storage facilities.

Table 4-17 Fire Suppression Storage

Reservoir	Greatest Fire Flow Requirement (gpm)	Time Requirement (Hrs)	Storage Requirement (MG)	Location
343 - Butler	4,000	4	0.96	Camas High School, Businesses-4th and Franklin
455 - LPH	4,000	4	0.96	Georgia Pacific -10th and Benton
542 - Gregg	2,000	2	0.24	Camas High School
542/544 - NUGA	1,500	2	0.18	Single family home
544 - Lacamas	5,000	4	1.20	Wafertech Industries
852 - UPH	2,000	2	0.24	Dorothy Fox Elementary

STANDBY STORAGE

Standby storage provides reliability for the system should sources fail or unusual conditions create higher than anticipated system demands. Standby storage is defined in the DOH manual as two times the average day demand with the largest source out of service, or 200 gallons per ERU.

For each service area, points of supply are considered, and the largest source taken out of service. For some pressure zones, such as the zones served by the Upper Prune Hill Standpipe, the largest source of supply is a booster pump.

Table 4-18 Standby Storage

Zone	2008 ERUs	2015 ERUs	2029 ERUs	2008 SBS (gallons)	2015 SBS (gallons)	2029 SBS (gallons)
343 - Butler	2,837	3,041	3,496	567,360	608,287	699,210
455 - LPH	1,486	1,593	1,832	297,228	318,669	366,302
542 - Gregg	361	387	445	72,248	77,460	89,038
542 – NUGA Gregg	-	925	2,773	-	184,853	554,560
542 - Total	361	1,312	3,218	72,248	262,313	643,598
544 - Lacamas	3,601	7,621	12,221	720,300	1,524,203	2,444,283
544 – NUGA Green Mtn.	-	925	2,773	-	184,853	554,560
544 - Total	3,601	8,546	14,994	720,300	1,709,056	2,988,843
852 - UPH	4,199	5,531	8,196	839,808	1,106,300	1,639,282
Total	**12,485**	**20,023**	**31,736**	**2,496,945**	**4,004,625**	**6,347,235**

NESTING STORAGE

Due to the large emergency storage requirements, the City has elected to nest its standby and fire suppression storage. Nesting allows the City to consolidate standby and fire suppression storage for the purpose of the storage analysis. DOH allows nesting of standby and fire suppression storage per WAC 246-290-235 (4), provided the local fire protection authority does not require them to be additive. The City Fire Marshall has indicated that nesting fire suppression and standby storage is acceptable.

DEAD STORAGE

Dead storage is the volume of unusable water stored in the reservoirs because it is not available to all customers at a minimum pressure of 30 psi. The base elevation of the Butler, Lower Prune Hill, and Lacamas Reservoirs are such that the full capacity of the reservoir can be used to supply all of its customers while maintaining 30 psi. The Gregg Reservoir and Upper Prune Hill Standpipe have dead storage levels of 32 and 67 feet, respectively. The Upper Prune Hill Reservoir has a booster station that makes all of its 2.4 MG of storage usable; however, the City does not fully deplete the reservoir, and maintains a minimum of 5 feet of storage. Table 4-19 provides a summary of the dead storage analysis.

Table 4-19 Dead Storage

Reservoir	Base Elevation (ft.)	Highest Service Elevation (ft.)	Minimum Hydraulic Grade (ft.)	Dead Storage Level (ft.)	Dead Storage (MG)
343 -Butler	328	220	289	0	-
455 - Lower Prune Hill 1	432	362	432	0	-
455 - Lower Prune Hill 2	432	362	432	0	-
542 - Gregg	472	435	504	32	0.05
544 - Lacamas	504	410	479	0	-
852 - Upper Prune Hill Standpipe	752	750	819	67	0.51
852 - Upper Prune Hill Reservoir	752	750	819	5	0.19
Total					**0.75**

TOTAL STORAGE

Tables 4-20 through 4-22 show the total storage requirements for the 6-year and 20-year planning periods. Currently, the City has a surplus of storage in the Lower Prune Hill, Lacamas, and Upper Prune Hill reservoirs, and deficiencies in the Butler and Gregg reservoirs. Transferring storage, via pumping and PRVs, from reservoirs with a surplus

of storage, alleviates current storage deficits in the Butler and Gregg and reservoirs. Additional storage for each zone, except the 852 zone, is required between the 6 and 20-year planning period. As development is expected to occur within the NUGA, an additional reservoir on Green Mountain, in the 544 zone, is an option that the City is considering.

The deficits shown in Tables 4-20 and 4-21 are for a single zone analysis. Excess storage is available in other zones to eliminate any single zone deficiencies. The City has adequate total system storage through the 6-year planning period.

The total storage analysis assumes that the existing pumping capacity of the system is constant through the 20-year planning period. The addition of source and pumping capacity reduces the required storage volume significantly, and may provide a less costly alternative to the construction of new reservoirs.

Table 4-20 2008 Storage Requirements

Zone	OS	ES	FSS	SBS	DS	Total Required	Available	Difference
	(MG)					(MG)		
343 - Butler	0.24	0.21	0.96	0.57	-	1.41	1.2	(0.21)[1]
455 - LPH	0.22	-	0.96	0.30	-	1.18	2	0.82
542 - Gregg	0.01	-	0.24	0.07	0.05	0.30	0.1	(0.20)[2]
544 - Lacamas	0.27	0.17	1.2	0.72	-	1.64	2	0.36
852 - UPH	0.26	0.16	0.24	0.84	0.70	1.96	3.15	1.19
Total System	**1.00**	**0.54**	**3.60**	**2.50**	**0.75**	**6.49**	**8.45**	**1.96**

(1) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 343 Butler Zone.
(2) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 542 Gregg Zone.

Table 4-21 2015 Storage Requirements

Zone	OS	ES	FSS	SBS	DS	Total Required	Available	Difference
	(MG)					(MG)		
343 -Butler	0.24	0.23	0.96	0.61	-	1.43	1.2	(0.23)[1]
455 - LPH	0.22	-	0.96	0.32	-	1.18	2.0	0.82
542 -Gregg	0.01	-	0.24	0.08	0.05	0.30	0.1	(0.20)[2]
542 –NUGA Gregg	0.08	0.11	0.09	0.18	-	0.37	0.0	(0.37)[3]
542 - Total	0.09	0.11	0.24	0.26	0.05	0.51	0.10	(0.41)
544 -Lacamas	0.27	0.73	1.20	1.52	-	2.53	2.00	(0.53)[4]
544 – NUGA Green Mtn.	0.08	0.11	0.09	0.18	-	0.37	-	(0.37)[3]
544 - Total	0.34	0.85	1.20	1.71	-	2.90	2.00	(0.90)
852 - UPH	0.26	0.33	0.24	1.11	0.70	2.39	3.15	0.76
Total	**1.15**	**1.52**	**3.60**	**4.00**	**0.75**	**8.41**	**8.45**	**0.04**

(1) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 343 Butler Zone.
(2) Excess storage in the 455 LPH Zone eliminates the deficit shown in the 542 Gregg Zone.
(3) NUGA growth is dependent on the construction of additional storage by developers.
(4) Excess storage in the 852 UPH Zone eliminates the deficit shown in the 544 Lacamas Zone.

Table 4-22 2029 Storage Requirements

Zone	OS	ES	FSS	SBS	DS	Total Required	Available	Difference
	(MG)					(MG)		
343 -Butler	0.24	0.27	0.96	0.70	-	1.47	1.2	(0.27)
455 - LPH	0.22	-	0.96	0.37	-	1.18	2.0	0.82
542 -Gregg	0.01	-	0.24	0.09	0.05	0.30	0.1	(0.20)
542 –NUGA Gregg	0.08	0.34	0.09	0.55	-	0.97	-	(0.97)
542 - Total	0.09	0.34	0.24	0.64	0.05	1.27	0.10	(1.02)
544 -Lacamas	0.27	1.30	1.20	2.44	-	4.01	2.00	(2.01)
544 – NUGA Green Mtn.	0.08	0.34	0.09	0.55	-	0.97	-	(0.97)
544 - Total	0.34	1.64	1.20	3.00	-	4.98	2.00	(2.98)
852 - UPH	0.26	0.67	0.24	1.64	0.70	3.27	3.15	(0.12)
Total	**1.15**	**2.92**	**3.60**	**6.35**	**0.75**	**12.02**	**8.45**	**(3.57)**

RECOMMENDATIONS

A summary of recommendations for the water system facilities, based on findings in the system analysis, is as follows.

Source

To maximize the City's water rights and accommodate growth, the City will make the modifications necessary to utilize all existing groundwater water rights. The primary modifications necessary to utilize the water rights within the Washougal Wellfield, are transmission improvements. Moving source water from the 343 zone to upper zones is the primary deficiency. Transmission and distribution improvements will be discussed in detail in Chapter 5, hydraulic analysis.

Additional source capacity will be provided by the three approved water right applications, totaling 3,000 gpm. Well 14, the Anderson Site Well is currently under construction. Assuming the full capacity of Well 14 can be utilized, Well 15 must be developed when an additional 9,350 ERUs are added to the system. If the Well 17 water right, the Camas Meadows Well, is approved in the 6-year planning period, it will be developed first to meet demands in the 544 Zone. The next well, Well 16 or 17, must be developed when an additional 11,475 ERUs are added to the system. This is when the MDD will exceed the City's source capacity.

The pending Camas Meadows water right application for 1,000 gpm, will be located within the NUGA once it is approved by Ecology, and developed by the City. By developing a source within the 544 Zone, pumping requirements of the 343 Zone will be reduced. The City also has a 350 gpm pending water right at the Fire Station in the 544 Zone. Both of these sources are valuable to meet increasing demands in this area. These sources shall take priority for development when approved.

The City is searching for additional sources within the NUGA and the Steigerwald area. Additional demand may be required due to unforeseen industrial growth within the area. The City will continue to search for additional sources in these areas.

A fish screen has already been installed at the headworks to Jones Creek. A screen will also be installed at the Boulder Creek headworks to improve fish passage.

Booster Stations

Lacamas

The Lacamas Booster Station, constructed in 1993, has a 2,500 gpm rated capacity, but is only able to supply 1,200 gpm at this time. The Lacamas Booster Station consists of two 500 gpm pumps, and one 1,500 gpm pump outfitted with a VFD. Flow tests with the 1,500 gpm pump have indicated that the booster station is suction side-limited by the 7,000 lineal feet of 14-inch transmission main that supplies the booster station. There is an empty port available in the booster station to install a fourth pump.

The 544 Zone will require additional pumping capacity if transmission improvements are not developed within the NUGA. The current pumping capacity of the Lacamas Booster

Station is 1.73 mgd, or 2,692 maximum day ERUs, based on a 24-hour pumping period. Well 9 supplies the 544 Zone with 0.94 mgd, or 1,458 maximum day ERUs, for a total supply of 2.66 mgd or 4,149 ERUs to the 544 Zone. The Lacamas Booster Station can support approximately 426 additional ERUs to the 544 Zone before improvements are required.

According to the WAC, transmission mains are required to maintain a minimum of 5 psi, as opposed to distribution mains which must maintain a minimum pressure of 30 psi. By reclassifying the 14-inch suction side main to the Lacamas Booster Station as a transmission main and allowing lower suction side pressure, the capacity is increased to 1,800 gpm or 2.6 mgd. This improvement increases the total pumping capacity to the 544 Zone to 3.53 mgd. Using 2008 MDD data in Table 4-13, a total of 1,750 ERUs are added to the 544 Zone once this improvement is made ([3.53 mgd – 2.39 mgd] / [296 gpd/ERU * 2.2]).

An upgrade of the Lacamas Booster Station to 2.6 mgd increases the total flow into the 544 Zone to 3.53 mgd but this will not provide enough flow to meet demands in the zone through the 6-year planning period. Significant industrial growth is anticipated within the zone, and approximately ten percent of the total 6-year demand is generated from growth within the NUGA. Options to meet the 6-year demand of 6.0 mgd in the 544 Zone include development of sources within the NUGA, replacement of the 14-inch transmission main on the suction side of the Lacamas Booster Station, or completing the NUGA transmission main along the north side of the lake to connect the 542 and 544 Zone. An upgrade to the 14-inch transmission main also requires an upgrade to the Lacamas Booster Station. Completing the NUGA transmission main along the north side of the lake requires the completion of the Crown Road Booster Station. The City will pursue the later option and limit growth within the NUGA until improvements are made.

Forest Home

The Forest Home Booster Station has a current capacity of 1,000 gpm. A pumping deficit is projected to the 455 Zone in the six year planning period. In order to meet these demands, this station shall be upgraded to 2,500 gpm, and will increase the total pumping capacity to the 455 Zone to 10.6 mgd. This will meet demands in the Zone through the 6-year planning period.

Crown Road

The Crown Road Booster Station has already been designed, and will provide 3,200 gpm, or 4.61 mgd, from the 343 Zone to the 542 Zone. This provides an additional 15,574 ERUs to the 542 Zone.

This improvement will be made within the 6-year planning period in order to increase transmission out of the 343 Zone, and to meet maximum day demands projected in the 542 Zone in 2015. When the transmission line around the north side of Lacamas Lake is completed to connect the 542 and 544 Zone, this upgrade will provide enough flow to the 544 Zone to meet maximum day demands through the 6-year planning period.

Lower Prune Hill
The Lower Prune Hill Booster Station has a rated capacity of 2,750 gpm, but can only currently supply 2,500 gpm to the 852 Zone. The City shall upgrade this station to increase the capacity to a total of 4,000 gpm, or 5.76 mgd. This will sustain the maximum day demands in the 852 Zone through the 6- and 20-year planning period.

10th Ave/Francis Booster Station
The 10th Avenue Booster Station serves approximately ten connections on the south east side of Upper Prune Hill. The City has indicated that they would like to eliminate this station by serving these connections from the 852 Zone. This improvement is scheduled for the 6-year planning period.

Upper Green Mountain
A portion of the NUGA around the Green Mountain area is above the 544 Zone and must be served by individual booster stations on an as needed basis. The timing of this project is dependent on the rate of growth within the NUGA. This project is placed in the 20-year planning period.

Transmission and Distribution
The City has a number of transmission mains that are vital to the daily operation of the City. The City will determine if an upgrade of the existing 10-inch steel transmission main is appropriate once a long-term plan for the Jones and Boulder Creek sources has been identified.

Transmission mains will need to be constructed with the Crown Road Booster Station to serve the 544 Zone. Approximately 5,400 feet of 24-inch DI transmission main is required from the discharge of the booster station to the intersection of SE 283rd Avenue and NE Nourse Road.

Additionally, transmission mains must be constructed within the NUGA in the 544 Zone to connect the Gregg NUGA and the Green Mountain NUGA. Approximately 24,800 feet of 24-inch DI transmission main is required to directly connect these portions of the NUGA. This improvement will be made within the 6-year planning period in order to meet maximum day demand projections within the 544 Zone.

If this improvement is not made, then growth in the 544 Zone will be limited by the Lacamas Booster Station. In order to meet demands, the suction side transmission

main to the Lacamas Booster Station must be upgraded to increase the capacity of the booster station. Approximately 5,000 feet of 20-inch DI transmission main must be replaced if the NUGA transmission main is not constructed.

The remaining portions of the NUGA will be served by approximately 32,500 feet of 12-inch DI transmission main. These improvements are dependent on growth within the NUGA and are placed in the 20-year planning period.

Additional analysis of the City's transmission and distribution mains will occur during the hydraulic analysis, presented in Chapter 5.

Storage

The City currently has sufficient storage to accommodate existing demands. A storage deficiency is anticipated within the 6- and 20-year planning period.

Although Table 4-20 shows a deficit in the 343 and 542 Zone, excess storage in the upper zones currently supplement the deficient zones.

In Table 4-21, excess storage in the 455 Zone will supplement the 343 Zone. Excess storage in the 852 Zone will supplement the 544 Lacamas Zone. Growth within the NUGA will be dependent on the construction of additional storage in the 544 NUGA and 542 NUGA Zones by developers. There is currently a City policy that limits growth within the 542 Gregg Zone based on available storage. These restrictions result in adequate storage through the 6-year planning horizon.

The existing Butler Reservoir was constructed more than 80 years ago and must be replaced. A leak detection test has been performed on the Butler Reservoir and revealed significant leakage. A reservoir and booster pump station at the cemetery site is scheduled as a replacement. This reservoir will provide an additional 2.0 MG of storage. It will serve the 343 Zone and a new 290 pressure zone downtown, and the booster pump will pump from the reservoir to the 455 Zone. This improvement is placed in the 20-year planning period.

The City will build a new storage facility within the existing 542 Zone. The 542 and 544 Zone each have a projected storage deficit in the 20-year planning period. The site should be large enough to accommodate at least 2.0 MG of storage, and be at an elevation suitable to serve the 544 Zone. This improvement is placed in the 20-year planning period.

The City will require an additional reservoir in the Green Mountain NUGA within 20-year planning period. This reservoir will be at an elevation of 489 feet with an overflow at 544 feet to serve the NUGA. At 75 feet in diameter, this reservoir will add

approximately 2.0 MG of storage to the zone. The following table shows the required growth in areas of the City to trigger the recommended improvement projects.

Table 4-23 Capital Improvement ERU Triggers

Project	Trigger
Source Improvements	
Well 14 – Anderson Site	Currently under construction
Well 17 – Camas Meadows Site	9,350(1) additional ERUs system wide
Well 15 – Parkers Landing Site	11,475(2) additional ERUs system wide
Well 16 – Wastewater Treatment Plant Site	13,772(3) additional ERUs system wide
Well 18 – Fire Station Well	15,984(4) additional ERUs system wide
Steigerwald Source Development	Future Demand beyond 20-year planning period
NUGA Source Development	NUGA Growth and Demand
Storage Improvements	
Cemetery Reservoir	343 Zone currently deficient, Butler Reservoir requires replacement
Gregg Reservoir	542 Zone currently deficient
Green Mountain Reservoir	1,600 additional ERUs in the NUGA 544 Zone
Booster Station Improvements	
Forest Home BS Upgrade	4,556 additional ERUs in all zones less 343
Crown Road BS	180 additional ERUs within the 542 Zone
Cemetery BS	8,120(5) additional ERUs in all zones less 343
LPH BS Upgrade	1,167 additional ERUs within the 852 Zone
Lacamas BS Upgrade	2,922(6) additional ERUs within the 544 Zone
Crown Road BS Upgrade	7,373 additional ERUs within the 542/544 Zone
Transmission Improvements	
24-inch NUGA Transmission	2,922(6) additional ERUs in the 544 Zone

(1) Assumes full water rights from Well 14 are pumped into the system. Relies on transmission improvements.

(2) Assumes full water rights from Well 14 and 17 are pumped into the system. Relies on transmission improvements.

(3) Assumes full water rights from Well 14, 17, and 15 are pumped into the system. Relies on transmission improvements.

(4) Assumes full water rights from Well 14, 17, 15, and 16 are pumped into the system. Relies on transmission improvements.

(5) Assumes upgrade of Forest Home Booster Station has been completed.

(6) The Lacamas BS Upgrade or the 24-inch NUGA transmission improvement must be made. Both not required.

Chapter 5
WATER SYSTEM HYDRAULIC ANALYSIS

INTRODUCTION

The operation of the City's municipal water system involves a variety of interactions among various water system components, including source, storage, transmission, and distribution system facilities. These interactions and their effect on the level of service provided to the City's customers are dependent on the distribution and magnitude of water demands within the system and the performance characteristics of the water system. In addition to normal diurnal demands, infrequent demand events, such as fires, can create significant stress on the water system. Such factors must be considered in analyzing the ability of the water system to meet future demands while maintaining an adequate level of customer service.

The development of a computer hydraulic model, which can simulate the response of a water system under a variety of conditions, has become an increasingly important element in the planning, design, and analysis of municipal water systems. The Washington State Department of Health's WAC 246-290 requires hydraulic modeling as a component of water system comprehensive plans. This Chapter presents the development and use of a computer hydraulic model for the City's water system.

HYDRAULIC MODELING PROGRAM

The hydraulic model of the City's water system was constructed using MWSoft's H_2O Map hydraulic modeling software that operates in a GIS environment. The H_2O Map model is configured with a graphical user interface. Each model element, including pipes, valves, pumps, and reservoirs, is assigned a unique graphical representation within the program. Each element is also assigned a number of attributes specific to its function and representation. Element attributes include spatial coordinates, elevation, water demand, pipe length, diameter, and pipe status, as well as pump and reservoir characteristics. Model input is accomplished through the creation and manipulation of these objects and their attributes. The H_2O Map modeling package also includes a number of tools, which facilitate the presentation of model results. The results for a given simulation can be presented either graphically or in a tabular report format to indicate flow, demand, pressure, headloss, and hydraulic grade for various system elements.

A steady state analysis can be used to evaluate the conditions in the system at an instantaneous moment in time or an extended period analysis can be run to simulate the changing conditions of the system over time. The steady state analysis determines pipe flows and system pressures according to a specified system demand, configuration, and operational conditions. The steady state analysis is a useful tool for looking at how the system responds to high demand events, such as analyzing the available fire flow in the system. For the purpose of the Plan, only steady state analyses are applied.

HYDRAULIC MODEL DEVELOPMENT

One of the primary goals in the development of the City's hydraulic model is to create a model that realistically represents the current water system. The hydraulic model includes elements representing reservoirs, pipes, pumps, valves, master meter connections and junction nodes, which establish points of connections between pipes. Input information for each of these elements must be as accurate as possible in order to develop a realistic representation of the water system as a whole. A node map is provided at the end of the Plan.

MODEL LAYOUT AND CONSTRUCTION

The City's model is constructed using information from City's water system base maps. Meetings with City staff regarding the operation of various components of the system were also a crucial element in developing an accurate model. Model element elevations are based on ten foot contour maps and spot elevations provided by the City.

Model Labeling

A system of labeling is applied to the model in order to group model elements. Junctions and pipes are assigned a number that corresponds to one of the five major regions of the water system: Butler, Lower Prune Hill, Upper Prune Hill, Lacamas, and Gregg. These regions correspond to water system pressure zones, except for the Upper Prune Hill Region, which consists of several smaller pressure zones. These numbers are the prefixes for the pipe and node numbers, and are shown in Table 5-1.

Table 5-1 Element Labeling

Region	Model Pipe Designation	Model Node Designation
343 - Butler	P1-XXX	J1-XXX
455 - Lower Prune Hill	P2-XXX	J2-XXX
852 - Upper Prune Hill	P3-XXX	J3-XXX
544 - Lacamas	P4-XXX	J4-XXX
542 - Gregg	P5-XXX	J5-XXX
542/544 - NUGA	P6-XXX	J6-XXX

Pipes and nodes in the system are grouped and labeled using the region number that corresponds to their location. Reservoirs in the system are labeled as they are named by the City. For example, the Lacamas Reservoir is labeled in the model as "LACAMAS." Booster Stations are labeled similarly. For example, the Lacamas Booster Station Pump No. 1 is labeled "LACAMAS-1." The City's sources of supply wells are labeled according to the well number, and the City's surface water sources are labeled according to their creek name. Table 5-2 illustrates typical labeling for the various elements.

Table 5-2 Examples of Labeling Standards for Model Elements

Element Type	Element Label	Region	Region Number	Description
Junction (Node)	J1-118	Butler	1	Prefix indicates Region
Pipe	P4-693	Lacamas	4	Prefix indicates region.
Valve	PRV-12	Upper Prune Hill	3	PRVs labeled by City number. Flow-control valves labeled by well number.
Pump	Gregg-1	Gregg	5	Name indicates booster station and pump number.
Reservoir	Lacamas	Lacamas	4	Reservoirs labeled by name.
Well	Well-8	Butler	1	Wells labeled by name.
Surface Water Source	Jones	Raw Water	R	Jones and Boulder Creek are labeled by name. "R" signifies raw water transmission main.

Water Supply

The City's surface water sources and groundwater wells are modeled using reservoirs with constant hydraulic grade lines and flow control valves. The fixed hydraulic grade line allows the well or surface water sources to deliver water at a set pressure, while the flow control valve allows the user to control the capacity of the source at any given time. For the City's model, groundwater wells are set to deliver water at a pressure of 150 psi, with the exception of Well 6, which delivers at 170 psi. Well delivery pressures are based upon information from City staff and on-site pump tests. Capacities are based upon the rated capacities of the well pumps.

Reservoirs

In H_2O Map, reservoirs are modeled as "tanks" with finite size, using actual reservoir dimensions and elevations. The model includes all of the City's existing reservoirs.

Pressure Reducing Valves

In H_2O Map, pressure reducing valves (PRVs) are modeled as pipes that require a pressure setting. City Staff provided settings for PRVs in the model, as shown in Table 1-8. Many of the City's PRV stations have two or more PRVs in parallel. The smaller diameter PRVs are set to provide flow under normal operating conditions and the larger PRVs are set to open during high demand scenarios such as a fire, when the smaller PRV can no longer maintain the necessary hydraulic grade. In order to simplify the model, parallel PRVs are modeled as a single PRV, using the larger diameter PRV and setting.

Booster Stations

All of the City's existing booster stations are included in the hydraulic model. Manufacturers' pump curves are entered into the model to simulate head and flow conditions at the Lower Prune Hill, Angelo, Lacamas, New Gregg, and Upper Prune Hill Booster Stations. If pump curves are not available, design points have been entered into the model using known pump capacities and head conditions. Pump curves are not available for the Butler, Old Gregg, and Forest Home Booster Stations. The software extrapolates pump curves from the design points if the pumps are active during model runs.

SYSTEM DEMANDS

The distribution of system demands is very important in creating an accurate model. City water production data from 2008 is used to identify the total demand of each pressure zone. System demands are spread evenly across each reservoir service area.

The modeling software allows numerous modeling scenarios to be loaded into the model. The DOH Water System Design Manual states that water system comprehensive plans should evaluate the 6- and 20-year planning periods. For the purposes of this Plan, the following scenarios have been analyzed.

- 2008 Average Daily, Peak Daily, and Peak Hourly Demand
- 2015 Average Daily, Peak Daily, and Peak Hourly Demand
- 2029 Average Daily, Peak Daily, and Peak Hourly Demand

Demand conditions are based upon current and projected water use, as defined in Chapter 3, and distributed by zone in Table 4-11. The 2015 modeling scenarios will assist in identifying and scheduling projects in the six-year capital improvement plan. The 2029 modeling scenarios will be utilized to develop a more conceptual approach to water system planning and improvements due to the unpredictability of population growth and water demands within these longer planning periods.

Existing System

The average daily demands for the 2008 system are entered into the model using water consumption data. Consumption records for the ten highest water users are entered into the model at their exact address.

The production data was compiled for January and July of 2008 for each pressure zone based on the volume of water pumped into each zone. The ADD for 2008 was determined by calculating the percentage of demand pumped into each pressure zone compared to the total pumped. An average percent distribution is calculated based on the January and July production records. The following table shows the weighted distribution of production demand.

Table 5-3 2008 Production Distribution by Zone

Region	January		July		Average Percentage of Total
	Volume Pumped (gpd)	Percent of Total	Volume Pumped (gpd)	Percent of Total	
343 – Butler(1)	781,200	26.9%	1,202,400	18.6%	**22.7%**
455 – LPH(2)	399,800	13.8%	651,000	10.0%	**11.9%**
542 – Gregg(3)	57,700	2.0%	246,300	3.8%	**2.9%**
544 – Lacamas(4)	779,500	26.8%	2,000,000	30.9%	**28.8%**
852 – UPH(5)	887,100	30.5%	2,380,300	36.7%	**33.6%**
Total	2,905,300	100.0%	6,480,000	100.0%	**100.0%**

(1) Equals the volume pumped into the 343 Zone (Wells 5-8, 10-13), less the volume pumped out of the 343 Zone (Forest Home BS, Butler BS, and Angelo BS).
(2) Equals the volume pumped into 455 Zone (Jones and Boulder Creek, Forest Home BS, Butler BS, and Angelo BS), less the volume pumped out (LPH BS, Lacamas BS, and Old and New Gregg BS).
(3) Equals the volume pumped into 542 Zone (Old and New Gregg BS).
(4) Equals the volume pumped into 544 Zone (Lacamas BS).
(5) Equals the volume pumped into 852 Zone (LPH BS).

The weighted average percentages from January and July of 2008, shown in Table 5-3, are used to distribute the production data from 2008 to obtain the ADD. The July peak month weighted percentages are used to obtain the MDD for 2008. Table 5-4 shows the distribution of demands by zone for 2008.

Table 5-4 2008 Demand Distribution by Zone

Region	ADD[(1)] (gpd)	MDD[(2)] (gpd)	PHD[(3)] (gpm)
343 – Butler	839,693	1,437,128	1,796
455 – LPH	439,898	778,086	973
542 – Gregg	106,928	294,382	368
544 – Lacamas	1,066,043	2,390,433	2,988
852 – UPH	1,242,917	2,844,974	3,556
Total	**3,695,479**	**7,745,003**	**9,681**

(1) Equal to the total average day production from 2008, shown in Table 3-9, multiplied by column 6 in Table 5-3.
(2) Equal to the total maximum day production from 2008, shown in Table 3-9, multiplied by column 5 in Table 5-3.
(3) Equal to the MDD in column 3 of this table, multiplied by the peaking factor of 1.8, as defined in Chapter 3 of the Plan.

Future Growth

For future growth, the water service area demand projections described in Chapter 3 are used to calculate growth factors. The 20-year demands for the City and the NUGA are presented in Table 3-14 and 3-15, respectively. The 343, 455, and 542 Zones are assumed to grow at a rate of one percent due to the limited available land for expansion. The ultimate build out of the 852 Zone is based on available land use outlined in the *Upper Prune Hill Build-Out Memo* by Gray & Osborne. The 544 Zone is based on the 6- and 20-year demands from Chapter 3, less the demands from the other zones.

Table 5-5 2015 and 2029 Demand Distribution by Zone

Region	2015			2029		
	ADD (gpd)	MDD (gpd)	PHD (gpm)	ADD (gpd)	MDD (gpd)	PHD (gpm)
343 – Butler	900,265(1)	1,540,796(6)	1,926(7)	1,034,831(1)	1,771,105(6)	2,214(7)
455 – LPH	471,630(1)	834,213(6)	1,043(7)	542,127(1)	958,907(6)	1,199(7))
542 – Gregg	114,641(1)	315,617(6)	395(7)	131,777(1)	362,794(6)	453(7)
542/544 – NUGA	547,165(2)	1,203,764(2)	1,505(2)	1,641,496(2)	3,611,292(2)	4,514(2)
544 – Lacamas	2,255,820(3)	5,396,916(3)	6,746(7)	3,617,539(3)	8,409,190(3)	10,511(7)
852 – UPH	1,637,324(4)	3,747,752(6)	4,685(7)	2,426,138(4)	5,553,309(6)	6,942(7)
Total(5)	**5,926,845**	**13,039,059**	**16,299**	**9,393,908**	**20,666,597**	**25,833**

(1) ADD equal to the 2008 ADD increased by 1 percent each year.
(2) ADD, MDD, and PHD projections defined in Chapter 3, Table 3-15.
(3) Equal to the total, defined in Chapter 3, less demands from 343, 455,542/544, and 852 Zones.
(4) ADD based on land use in the *Upper Prune Hill Build Out* memo by Gray & Osborne.
(5) From Chapter 3, Table 3-16.
(6) MDD equal to the ADD multiplied by the peaking factor for each zone according to 2008 demand distribution in Table 5-4.
(7) PHD equal to the MDD multiplied by the peaking factor of 1.8.

MODEL CALIBRATION

The final step in the development of the City's water system hydraulic model is calibration. As shown in Table 5-3, the model is calibrated according to the results of ten hydrant flow tests conducted on May 13, 2009, by City Operations staff and Gray & Osborne. The model calibration simulations were conducted under 2008 average daily demand conditions. Flow into the system from the City's wells, surface water sources, and the reservoir levels, as shown on the telemetry system at the beginning of the hydrant flow tests, are shown in Table 5-6.

Table 5-6 Model Calibration Conditions

Parameter	Condition
Butler Reservoir	13.7-foot water level
Lower Prune Hill Reservoir	19.3-foot water level
Upper Prune Hill Reservoir	56.7-foot water level
Upper Prune Hill Standpipe	91.9-foot water level
Lacamas Reservoir	40.5-foot water level
Gregg Reservoir	58.0-foot water level
Lacamas Booster Station	567-gpm production
Angelo Booster Station	1,070-gpm production
Upper Prune Hill Booster Station	1,325-gpm production
Filter Plant	920-gpm production
Well 10	900-gpm production
Well 13	1,325-gpm production

The locations of the hydrant flow tests along with a comparison of the field and model results are provided in Table 5-7.

Table 5-7 Model Calibration Results

Location	Flow (gpm)	Field Results (psi)			Model Results (psi)			Δ between Field and Model
		Static	Residual	Δ	Static	Residual	Δ	
NW Lacamas Dr. and NW Valley Ct.	920	86.5	70	16.5	87	70.3	16.7	**0.2**
NW Leadbetter Blvd. and NW Fremont St.	1,350	96	92	4	96	90	6	**2**
NW Pacific Rim Dr. and NW Julia St.	1,500	98	92	6	98	93.8	4.2	**1.8**
NW 47th Ave. and NW Trout St.	1,300	80	78	2	79	77.5	1.5	**0.5**
NW Sierra Dr and NW 28th Ave.	1,240	71	65	6	71	66.2	4.8	**1.2**
NW 26th Ave. and NW Quartz St.	1,190	76	65	11	76	57	19	**8**

Table 5-7 Model Calibration Results (continued)

Location	Flow (gpm)	Field Results (psi)			Model Results (psi)			Δ between Field and Model
		Static	Residual	Δ	Static	Residual	Δ	
NW 44th Ave. and NW Oregon St.	1,270	76	64	12	76	63	13	**1**
NE Ione St. and NE 38th Ave.	1,150	86	64	22	86	69	17	**5**
19400 SE 42nd Cr.	1,380	94	83	11	93	80.5	12.5	**1.5**
5299 NW 17th Cr.	1,280	94	78	16	94	75.8	18.2	**2.2**

Δ: Change in pressure

As indicated in Table 5-7, all but one of the ten model results are within 5 psi of field tests. The location with the higher differential is NW 26th Avenue and NW Quartz Street with an 8 psi differential. This location is supplied directly from the 852 Zone. The 8 psi discrepancy is believed to be caused by an incorrect gage reading during the field test. The model results are conservative for calibration and show a greater residual drop in pressure than those measured in the field. The calibration is considered to be acceptable due to the conservative model result, and the accuracy of the other nine calibration points.

MODEL SIMULATIONS AND RESULTS

Hydraulic model analyses have been conducted to simulate the response of the City's water system under a variety of conditions to include peak hour and fire flow demands. The hydraulic model is also used to develop and assess a variety of potential system improvement projects. Piping improvement projects are divided into three groups:

- Transmission Improvements
- Fire Flow Improvements
- Peak Hour Demand Pressure Improvements

Repair and replacement projects are included to upgrade dead end and undersized lines and to provide looping to improve fire flow, peak hour pressures, and water quality. Fire flow improvement projects are those identified and developed through fire flow modeling to improve flow availability at locations where potential deficiencies are indicated. Transmission improvements are established to support anticipated future growth and demands.

MODEL SIMULATIONS

Reservoir levels are calculated using the depleted fire suppression storage, equalization storage, and operational storage outlined in the Chapter 4 Storage Analysis. For 2008 levels, the Gregg Reservoir levels only account for operational storage, because it has no equalizing storage, and fire suppression storage was transferred to the Lower Prune Hill Reservoirs. Fire suppression storage for the Butler Reservoir is applied to the Lower Prune Hill Reservoirs, the Lacamas Reservoir, and the Upper Prune Hill Reservoir. Table 5-8 shows the reservoir levels for both the peak hour and fire flow analyses for each planning period.

Table 5-8 Reservoir Levels

Reservoir	Overflow Height (ft)	Volume (MG)	Volume/ Height	PHD Levels (ft)			Fire Flow Levels (ft)		
				2008	2015	2029	2008	2015	2029
Butler	15	1.2	80,000	9.4	9.1	-	9.4	5.1	-
Cemetery Reservoir	70	2.0	28,571	-	-	58.0	-	-	24.4
Lower Prune Hill – 1	23	0.5	21,740	20.5	20.5	20.5	6.0	6.0	6.0
Lower Prune Hill - 2	23	1.5	65,217	20.5	20.5	20.5	6.0	6.0	6.0
Gregg	70	0.1	1,429	60.0	60.0	60.0	60.0	60.0	60.0
New Gregg NUGA	70	2.0	28,571	-	-	55.6	-	-	44.0
Lacamas	45	2	44,444	35.2	22.5	9.7	8.2	3.5	9.7
Green Mountain NUGA	70	2.0	28,571	-	-	55.6	-	-	10.45
Upper Prune Hill Reservoir	50	2.4	375,000	40.8	36.3	27.1	8.8	3.3	20.7
Upper Prune Hill Standpipe	100	0.75	7,500	90.0	90.0	90.0	90.0	90.0	90.0

Model Results

Results from the previously described scenarios, under the previously defined system conditions, are included in the Appendix L. Modeling results revealed the following system deficiencies, listed as transmission, level of service, and available fire flow deficiencies.

Transmission Improvements

In order to meet 2015 and 2029 pumping requirements for the 544 Zone, the 14-inch suction side transmission main from Everett Street to the Lacamas Booster Station must be upgraded to support the higher pumping capacities required. Otherwise, the NUGA

transmission main must be completed. The transmission improvements for the Lacamas Booster Station assume that the City will not be able to develop new sources in the 544 Zone during the 20-year planning period. Additional source capacity in the 544 Zone reduces the pumping needs at the Lacamas Booster Station. Table 5-9 list the required transmission improvements.

Table 5-9 Required Transmission Improvements

Diameter (inches)	Quantity (LF)	Improvement
12	1,400	Replace existing 6-inch main with 12-inch main to minimize headloss from Well 6 and 14 to the upgraded Forest Home Booster Station.
24	19,650	24-inch transmission main within NUGA to connect the 542 Zone to the 544 Zone.
20	5,000	Suction-side 20-inch transmission main parallel to existing 14 inch between Lacamas Booster Station and Everett St. *Required only if 544 Zone demands exceed the transmission capabilities of the 14-inch main before the NUGA transmission main is completed.*
24	7,800	24-inch Crown Road Booster Station suction and discharge transmission main to connect to the 542 Zone, from SE Crown Road and SE V Street to SE 283rd Ave and SE 7th Street.
12	2,300	Replace existing 6 and 8-inch main with 12-inch transmission main along SE Polk St. for increased transmission from the proposed WWTP Well. To connect to existing transmission main at SE 6th and Polk.
16	4,200	Transmission main along 22nd to connect Cemetery BS to the 455 Zone, connection at Division and 22nd.
12	2,300	Transmission main from Cemetery Reservoir to new 260 Zone, connection at 6th and Oak.

Table 5-10 shows the additional transmission improvements that are required to move supply from the proposed wells to the upper zones, and within the NUGA.

Table 5-10 Developer Funded NUGA Transmission Improvements

Diameter (inches)	Quantity (LF)	Improvement
12	15,600	12-inch transmission main within the NUGA for added transmission within the 544 Zone from the Green Mountain Reservoir.
12	5,300	12-inch transmission main from SE 283rd Ave. and Hathaway Rd. from SE 7th St. to connect to existing main.
12	1,900	Replace existing 6-inch main with 12-inch transmission main for additional transmission within the NUGA.
12	11,200	12-inch transmission main within the NUGA for added transmission along the north side of Lacamas Lake.
12	2,600	12-inch transmission main within the NUGA for added transmission from the Crown Rd Booster Station, from the north side of the lake to connect to existing transmission along NE Everett St.
12	7,900	12-inch transmission main to increase transmission within the NUGA.
12	5,700	12-inch transmission main to increase transmission within the NUGA.

Level of Service

In order to evaluate the water system's ability to meet future demands, the existing system is modeled under the projected peak hour demand conditions for 2015 and 2029. WAC 246-290-230 (5) requires that public water systems be designed to deliver peak hour demand while maintaining minimum system-wide pressures of 30 psi, with equalizing storage depleted from the City's reservoirs. The storage analysis, which provides a breakdown of the storage components, is presented in Chapter 4.

To accurately simulate the system's distribution and transmission capacity, pumping, transmission, and storage improvements associated with the development of the NUGA is assumed to have been completed for the 2015 and 2029 model runs.

Results that display the system-wide pressure distribution for the peak hour demand conditions with depleted equalization storage for 2015 and 2029 scenarios are provided in the Appendix L. Capital improvement projects have been identified in Chapter 8 that correct each peak hour deficiency.

Available Fire Flows

The hydraulic model was also used to assess the availability of fire flows throughout the City. WAC 246-290-230 (6) requires systems providing fire flow to be designed to provide peak daily demand plus the required fire flow, while maintaining minimum system-wide pressures of 20 psi. In addition, fire suppression storage and all equalizing storage are depleted from the City's reservoirs for the analysis. Transmission, pumping, and storage improvements recommended in Chapter 4 were included in all fire flow modeling.

Figure 5-1 gives a color-coded node map of available fire flow for 2008. Figure 5-2 shows the available fire flow in 2008 after the recommended 6-year improvements have been completed. Figure 5-3 shows the peak hour demand pressures in the City after the recommended 6-year improvements have been completed. Figure 5-4 shows the available fire flow in 2015 after the recommended 6-year improvements have been completed. Complete fire flow modeling results are available in the Appendix L.

Future Available Fire Flows

Complete fire flow results are located in the Appendix L. A minimum residential fire flow requirement of 1,000 gpm was used to determine deficiencies, and at specific locations where fire flow requirements are higher. Available fire flow deficiencies are identified as specific projects in the capital improvement plan, located in Chapter 8.

CONCLUSIONS

The City's hydraulic model shows that the City has a very strong system capable of meeting DOH pressure and fire flow regulations through 2029, provided storage and pumping deficiencies discussed in Chapter 4 are addressed. Results from the hydraulic modeling analysis revealed the following improvements, identified in Table 5-11. Cost estimates for projects identified in Table 5-11 shall be included in the capital improvement program, located in Chapter 8.

Table 5-11 Recommended Improvements

System Deficiency	Recommended Improvement
Fire Flow Deficiency along SE Payne Rd, NW Astor St, and NW 12th Lane	Open the PRV station located on NW 18th Avenue, close the valve along NW 9th Avenue, south of Hoquiam Court, and adjust PRV settings at NW Astor and 36th. Construct 1,600 LF of 8-inch main from NW Eagle Street to NW 15th Circle and from NW 12th Circle to NW Astor to increase looping.
Peak Hour Pressure Deficiency on Couch St.	Install 50 gpm booster station to provide service pressures on Couch Street between NW 21st Avenue and NW 22nd Avenue. Include check features to allow 455 Zone to provide fire flow.
Low Peak Hour Pressure on Hathaway Road	2,000 LF of 12-inch main on NE Everett Road and NE 3rd Street to increase looping
Low Peak Hour Pressure on NW 14th Ave.	Raise hydraulic grade of 697 Zone to 710 feet by adjusting PRVs on NW 16th Avenue and NW McIntosh Road.
Peak Hour Pressure Deficiencies on UPH	Upgrade 320 LF of outlet piping from UPH Standpipe to 12 inches.
Peak Hour Pressure Deficiencies on UPH	1,300 LF of 12-inch main from NW Hood and 16th to NW Cascade Street and 16th to increase looping.
Peak Hour Pressure Deficiencies on UPH	300 LF of 12-inch main from NW 9th Avenue to NW 12th Avenue to increase looping.

0 7,500 15,000 Feet

Legend

- Urban Growth Boundary
- City Limits
- Water Service Boundary
- Pipe Lines

2008 Fire Flow

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3000
- 3001 - 4000
- 4001 - 5000
- < 5000

SOURCE: CITY OF CAMAS

CITY OF CAMAS WASHINGTON

FIGURE 5-1

2008 AVAILABLE FIRE FLOW

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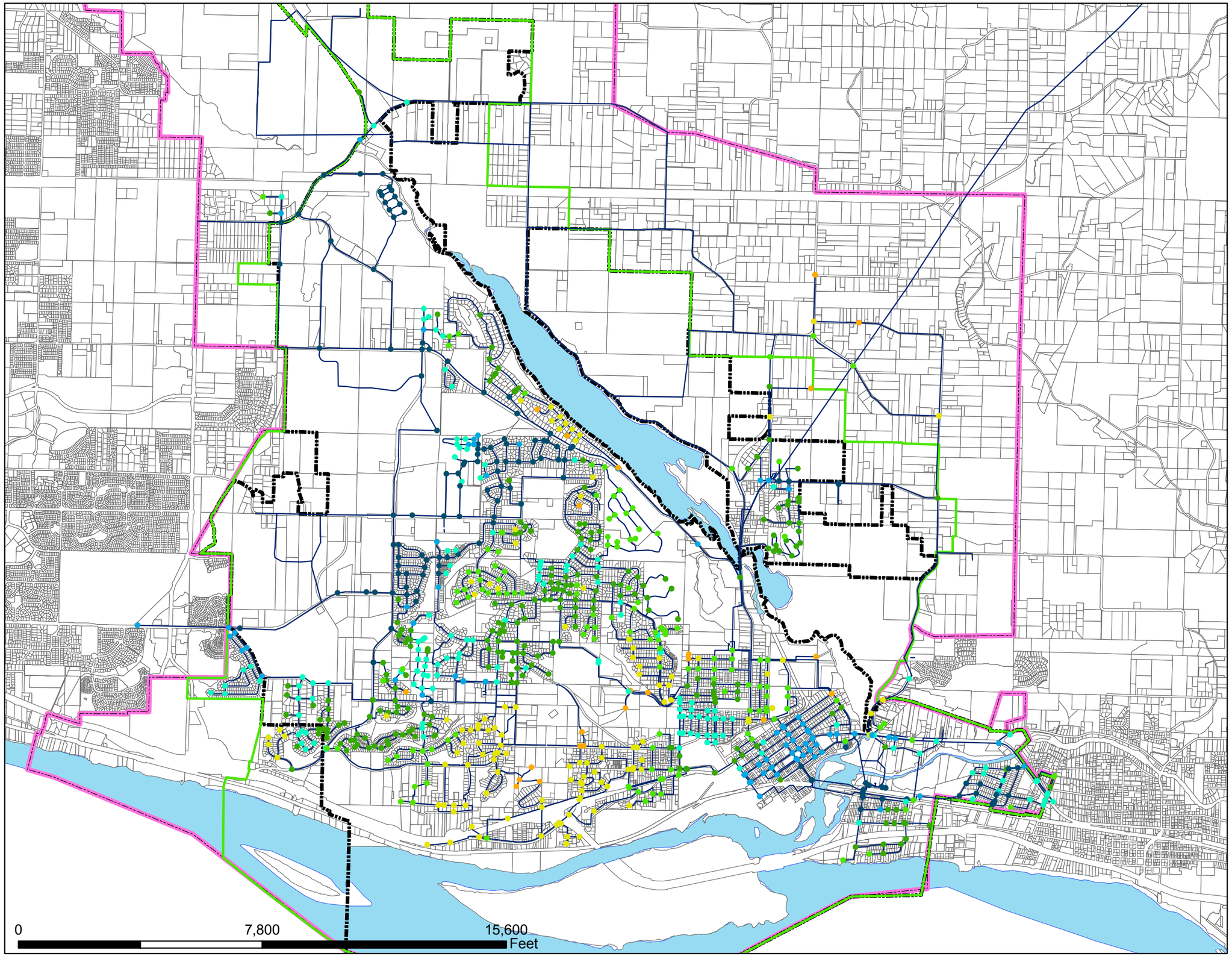

Legend

- Urban Growth Boundary
- City Limits
- Water Service Boundary
- Pipe Lines

2008 Fire Flow

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3000
- 3001 - 4000
- 4001 - 5000
- < 5000

SOURCE: CITY OF CAMAS

CITY OF CAMAS WASHINGTON

FIGURE 5 - 2

2008 FIRE FLOW WITH IMPROVEMENTS

L:\CAMAS\08495 WSP\Fig5-2.mxd

0 7,750 15,500 Feet

Legend

Pressure (PSI)

- > 20
- > 30
- Urban Growth Boundary
- City Limits
- Water Service Boundary
- Pipe Lines

SOURCE: CITY OF CAMAS

FIGURE 5 - 3

2008 PHD PRESSURE WITH IMPROVEMENTS

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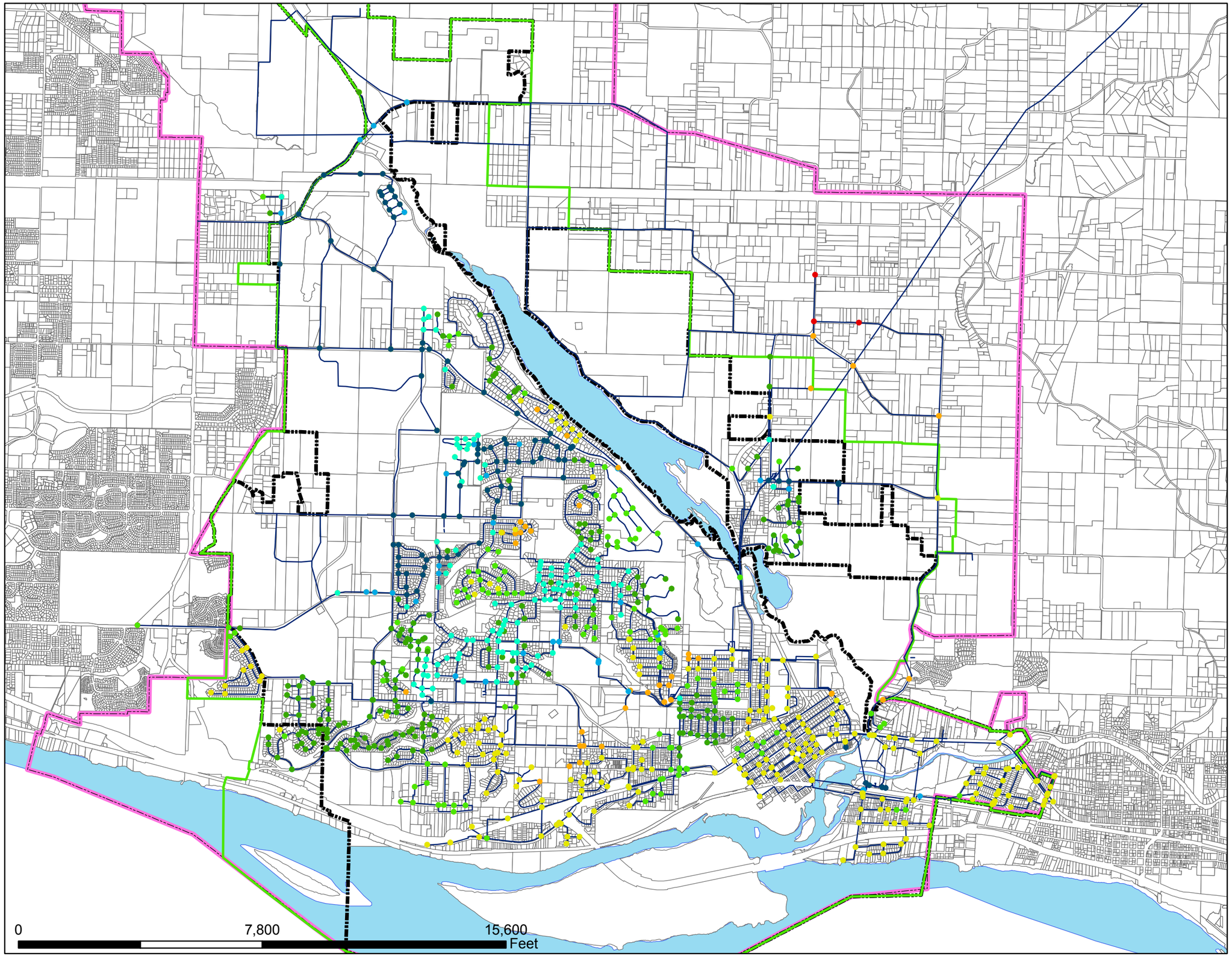

Legend

- Urban Growth Boundary
- City Limits
- Water Service Boundary
- Pipe Lines

2015 Fire Flow

- 0 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3000
- 3001 - 4000
- 4001 - 5000
- < 5000

SOURCE: CITY OF CAMAS

CITY OF CAMAS WASHINGTON

FIGURE 5 - 4

2015 FIRE FLOW WITH IMPROVEMENTS

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Chapter 6
WATER USE EFFICIENCY PROGRAM

The objectives of this chapter are to identify the conservation and water use efficiency requirements pertaining to the City of Camas, evaluate past conservation efforts, and describe the City's water use efficiency program.

WATER USE EFFICIENCY RULE BACKGROUND

The Washington Legislature passed the Water Use Efficiency Act of 1989 (43.20.230 RCW), which directs Department of Health (DOH) to develop procedures and guidelines relating to water use efficiency. In response to this mandate, Department of Ecology (Ecology), the Washington Water Utilities Council, and DOH jointly published a document titled *Conservation Planning Requirements* (1994). In 2003, the Municipal Water Supply - Efficiency Requirements Act (Municipal Water Law) was passed and amended RCW 90.46 to require additional conservation measures. The Municipal Water Law, among other things, directed DOH to develop the Water Use Efficiency Rule (WUE Rule), which is outlined in the *Water Use Efficiency Guidebook* and became effective January 22, 2007. These documents provide guidelines and requirements regarding the development and implementation of conservation and efficiency programs for public water systems. Conservation and efficiency programs developed in compliance with these documents are required by DOH as part of water system planning documents and by Ecology as part of a public water system water right application. Conservation must be evaluated and implemented as an alternate source of supply before state agencies approve applications for new or expanded water rights.

As an extension to the *Conservation Planning Requirements*, the WUE Rule sets more stringent requirements for public water purveyors. The WUE Rule is comprised of eight chapters:

1. Introduction to Water Use Efficiency Requirements
2. Water Meters
3. Data Collection
4. Demand Forecasting
5. Water Use Efficiency Program
6. Distribution System Leakage
7. Goal Setting and the Public Forum
8. Annual Performance Report

This chapter provides a discussion of the chapters, requirements, and the impact the WUE Rule has on the City.

WATER USE EFFICIENCY REQUIREMENTS

The *Water Use Efficiency Guidebook* establishes varying implementation and evaluation requirements for municipal water suppliers (MWS). The new requirements focus on the importance of measuring water usage and evaluating the effectiveness of the WUE program. There are three fundamental elements to the Rule, including planning, distribution leakage standards, and goal setting and performance reporting.

Table 6-1 provides a summary of the WUE Rule requirements applicable to the City.

Table 6-1 Summary of WUE Requirements

Requirement	Deadline for MWS with 1,000 or more connections
Begin collecting production and consumption data	January 1, 2007
Include WUE program in planning documents	January 22, 2008
Set WUE goals	January 22, 2008
Submit service meter installation schedule	July 1, 2008
Submit first annual performance report	July 1, 2008
Meet distribution leakage standard (based on 3-year rolling average)	July 1, 2010, or 3 years after installing all service meters
Complete installation of all service meters	January 22, 2017

WATER METERS

Metering all water production and consumption is critical for determining system wide and individual water use efficiency. The Rule has set deadlines for meter installation and data collection, which are shown in Table 6-2.

Table 6-2 Meter and Data Collection Deadlines

Requirement	Deadline for MWS with 1,000 or more connections
Install production meter(s)	January 22, 2007
Begin collecting production and consumption data	January 1, 2007
Submit service meter installation schedule	July 1, 2008
Complete installation of all service and intertie meters	January 22, 2017

As Table 6-2 indicates, the WUE Rule currently requires production meters on all existing and new water sources, and requires consumption meters on all customer connections by 2017.

The City meters all existing customer connections and will continue to meter all new connections. All sources are metered as well. The City is in full compliance with metering requirements.

The City has one emergency intertie with the City of Washougal, which is normally closed. As described in WAC 246-290-132(4), emergency interties are exempt from metering requirements.

DATA COLLECTING

The WUE Rule requires regular collection of production and consumption data. Data must be reported in the City's planning documents and annual performance report to DOH. Water use data will be used for the following:

- Calculating leakage;
- Forecasting demand for future water needs;
- Identifying areas for more efficient water use;
- Evaluating the success of your WUE program;
- Describing water supply characteristics;
- Aiding in decision-making about water management.

The City submitted their first annual report on July 1, 2008. The next report is due July 1, 2010.

The Rule also sets requirements for collecting source and service data. Source meters must be read monthly and reported as monthly and annual totals. Service meter totals only have to be reported in annual amounts, although it is recommended to read all service meters every one to two months. The City currently reads source meters daily and service meters bimonthly. They will report monthly and annual water produced, annual water consumed, annual totals for each customer class, and customer class seasonal variations.

The City has established six customer classes: single-family residential, multi-family residential, commercial, irrigation, industrial and fire lines. By separating customers into different categories, the City can track the effects of their WUE program more accurately.

SOURCE OF SUPPLY ANALYSIS

A source of supply analysis was presented in Chapter 3.

DISTRIBUTION SYSTEM LEAKAGE

The 1994 *Conservation Planning Requirements* set the maximum allowable rate of distribution system leakage, at 20 percent of total source production. The WUE Rule now requires that water distribution systems have a leakage rate of less than 10 percent of finished water production based on a three year rolling average. The City must meet the three-year rolling average requirement by July 1, 2010.

Distribution system leakage (DSL) is defined as the difference between total water produced or purchase and all authorized water consumed. Known or credibly estimated losses can be excluded from the leakage calculation and may include uses such as construction, fire fighting, and flushing. The City is currently developing a tracking system to more accurately account for these uses. The leakage totals in Table 6-3 are a combination of leakage and unauthorized use.

Distribution system leakage (DSL) for the City equals the difference between the treated supply volume and volume measured at the customers' meters plus any other credibly estimated usage. Since 2002, distribution system leakage has ranged from 83.7 to 345.5 MG, and has had a rate between 6.3 percent and 24.0 percent of total treated supply. Table 6-3 provides annual data of distribution system leakage from 2002 to 2007.

Table 6-3 Historic Distribution System Leakage

Year	Production (gallons)	Authorized Consumption (gallons)	DSL (gallons)	Percent DSL	3-year Rolling Average
2002	1,438,711,600	1,093,178,064	345,533,536	24.0%	-
2003	1,456,144,700	1,163,908,194	292,236,506	20.1%	-
2004	1,460,213,119	1,211,462,296	248,750,823	17.0%	20.4%
2005	1,319,065,600	1,235,318,260	83,747,340	6.3%	14.5%
2006	1,509,025,682	1,265,488,092	243,537,590	16.1%	13.2%
2007	1,373,495,526	1,221,921,580	151,573,946	11.0%	11.2%
Average	**1,426,109,371**	**1,198,546,081**	**227,563,290**	**15.8%**	

The DSL rate fluctuates significantly between the years 2004 through 2007. This may be due to new construction, main leaks and two leaking reservoirs. The City's 3-year rolling average in 2007 is 11 percent. The City will improve record keeping on authorized consumption to help determine actual leakage loss. If the City does not meet the new DSL requirement by 2010, they will include a water loss control action plan in the next planning document.

PREVIOUS WATER USE EFFICIENCY PROGRAM

The following section describes the City's current water use efficiency goals taken from Chapter 6 of the 2002 Water System Comprehensive Plan (WSP) and specific tasks or items that the City is conducting.

CONSERVATION MEASURES

The following conservation measures were included in the City's Capital Improvement Program (CIP) for the development of the City's Water Conservation Program.

- Include consumption history on utility billing forms.
- Conduct a water system leak detection survey in 2002.
- Update City Sprinkling Ordinance to include water conservation measures and inclined block rate structure.
- Obtain and distribute Department of Health water conservation brochure and update website with enhanced conservation measures.
- Continue to supply and distribute water conservation kits.
- Install central control irrigation system and weather station for City parks, playfields, and schools, and make data and control features available to large irrigation customers.
- Institute water audit program for commercial, industrial, municipal, residential, and irrigation customers.

- Institute residential landscape management program by offering water savings devices such as rain barrels and soaker hoses at at-cost or subsidized rates. Make this program a cooperative effort with nurseries or other jurisdictions.
- Consider offering rebates on water and energy-efficient appliances.
- Examine feasibility of inclined block rate structure during the City's next rate study.

UNACCOUNTED FOR WATER/LEAK DETECTION

Since 2002, the City has contracted for three to five days of leak detection services per year. Each year this allow for testing of approximately 25 to 30 percent of the distribution system. In 2007, the contractor detected leaks totaling 10 MG measured on an annualized basis. Nearly 44 MG in leaks have been detected and repaired as a result of these surveys over the past five years. In March of 2007, the City performed a leak analysis on Lower Prune Hill Reservoir. The test revealed a water loss of 4,608 gpd at this site. The City contracted with Hydro Tech International to perform repairs on this tank. In June 2007 the City performed a leak analysis on this tank and showed no loss. Butler Reservoir was also surveyed for leaks in April 2007. Leaks totaling 3,500 gpd were detected. Hydro Tech performed some point repairs at this time. Visual leaks are still evident at this site. This problem will be addressed in Chapter 8 of this plan.

PROGRAM PROMOTION AND CUSTOMER EDUCATION

The water conservation brochures (Irrigation Tips & Regulations, and Leaks), and the City's annual Water Quality Report provide water conservation tips, and are available to the public at the City's Water Utility Billing Department, and Water Department, and website at www.ci.camas.wa.us. Also, information is available at an information booth during Camas Days (held once a year). The City's local newspaper is also used to inform the public of any voluntary or required odd/even days when water usage during the summer is at its highest.

CONSTRUCTION REQUIREMENTS

The City building code requires new construction to install low flow toilets and showerheads. Low flow toilet tanks are rated at 1.6 gallons and showerheads are rated at 2.5 gallons per minute. These requirements apply to both new residential and commercial construction.

CUSTOMER LEAK DETECTION

Springbrook and Neptune software (City software for billing and meter use) have parameters for flagging overuse or under use water consumption. When a customer's usage changes significantly from the previous year, the utility notifies customers of possible leaks on the residential side of the meter. The utility offers a billing adjustment when the customer provides proof of repair to the billing department.

Bills Showing Consumption History

The City's water bills indicate water consumption history. By allowing customers to track and compare their usage, they can monitor their water use more closely, increasing conservation and also awareness of potential leaks.

IRRIGATION MANAGEMENT

The City has employed several rules and restrictions for lawn sprinkler systems to reduce improper use. Installation of a residential lawn sprinkler system requires a plumbing permit issued by the City of Camas. All underground lawn sprinkler systems are required to have a backflow prevention assembly installed on the sprinkler system. An annual test must be performed by a certified tester and submitted to the City. All testing is the responsibility of the property owner. Reminder notices are mailed each year regarding annual testing of the backflow prevention assembly. The City requires that all non-residential water services must have a backflow prevention assembly installed at the water meter or elsewhere as required by the City. Failure to comply with irrigation regulations may result in severing the connection to the backflow assembly or discontinuation of City water service.

The City has started a pilot project with Deer Creek Homeowner Associations (HOA) providing a free evaluation of their existing system. The evaluation showed considerable room for improvement. The City is currently working to develop a rebate or incentive program to encourage the HOA to make the recommended upgrades to their system. The goal is to demonstrate that significant savings can be gained with proper maintenance, hardware and technology including smart controllers, head and nozzle changes, and repair of damaged heads. These improvements will reduce customer billing and reduce water use. The City is contemplating additional design and performance standards for new irrigation system installations.

LANDSCAPE MANAGEMENT

The City encourages the following landscape management ideas:

- Set sprinkler system timers to irrigate only when needed.
- Water lawns and plants in the early morning or late evening to limit water loss due to evaporation.
- Place a layer of mulch around plants and trees to avoid excessive evaporation.
- Monitor irrigation so to water only as rapidly as the soil can absorb the water.
- Install drip irrigation systems for a slow, steady supply of water to the plant roots.
- Position sprinklers or drip irrigation systems to water only the root areas of plants and not sidewalks, gutters, or streets.
- Consider native plants when landscaping.

CONSERVATION RATE STRUCTURE

Historically the City has charged a discounted rate for irrigation. In 2003, the City conducted a rate study and implemented a structure that removed the discount for irrigation over time and provided a true cost rate. The rate was gradually increased to ease the burden on major irrigators like the school district who are tied to an annual budget. Historic water rates are shown in Table 6-4. The City has contemplated an inclined block rate during the rate study but has chosen to remain with a uniform rate structure for this rate horizon. Future rate studies will reevaluate the rate structure.

Table 6-4 Historic Customer Water Rates Inside City Limits

Customer Class	2003 ($/ccf)	2004 ($/ccf)	2005 ($/ccf)	2006 ($/ccf)	2007 ($/ccf)	2008 ($/ccf)
Residential	$1.26	$1.16	$1.20	$1.22	$1.24	$1.24
Commercial	$1.68	$1.35	$1.40	$1.45	$1.50	$1.50
Industrial	$1.08	$1.12	$1.16	$1.20	$1.25	$1.25
Cemetery	$0.56	$0.56	$0.56	$0.56	$0.56	$0.56
Irrigation	$0.76	$0.76	$0.95	$1.10	$1.25	$1.40

CONSERVATION KITS

The City has purchased conservation kits over that last 5 years for distribution to the public. A main focus has been at Camas Days, an annual community event that draws large crowds. The City also participates at HP earth day where kits are distributed to HP employees many of which live in Camas.

WATER AUDIT PROGRAM/ REBATE PROGRAM

As described above, the City is currently working to develop a rebate or incentive program to encourage the HOA to make the recommended upgrades to their system and provide a model to establish a working audit and rebate program for other customers in our system. The City continues to offer industrial customers the opportunity to develop an audit program specific to their needs. Georgia Pacific has shown some interest in doing an evaluation of water use within their facility but has not committed at this time.

EFFECTS OF PAST MEASURES

Since the City laid out their last conservation plan in 2002, there has been significant reduction in distribution system leakage (from 27 percent in 2000 to 11 percent in 2007) and much lower water usage during irrigation periods. The City attributes this to increased customer education on conservation due to the establishment of conservation ordinances, media press releases and billing inserts.

NEW WATER USE EFFICIENCY PROGRAM

Under the WUE Rule, the City must set water use efficiency goals and measures progress each year toward meeting these goals. Goals must include a measurable outcome, address water supply or demand characteristics, and include an implementation schedule. The City must also evaluate or implement efficiency measures to help meet these goals.

GOALS

The City plans to reduce its total water use in several ways. The City's primary goal will be to reduce DSL to meet WUE requirements of less than 10 percent. Second, the City will promote conservation by its customers to reduce overall water demand.

Goal No. 1 of the water use efficiency program is to continue to reduce distribution system leakage. In 2008, the City lost nine percent of the water produced from leaks and unaccounted for water losses. However, the average distribution system leakage rate for 2006 through 2008 is 12.1 percent.

The City will increase efforts to minimize the amount of leakage and unaccounted for water and accurately track all water used including estimating the amount of unmetered water used. In order to have a 3-year rolling average of less than 10 percent by July 1, 2010, the City must continue to reduce annual DSL through 2010. Table 6-5 summarizes the target DSL reductions through 2015. The City will continue to be aggressive in leak detection and repair, accurate accounting for authorized consumption and continue with meter replacement and maintenance program.

Table 6-5 Summary of DSL Reduction Goals

Year	Distribution System Leakage (%)	3-yr Rolling Average
2007	Actual - 11%	11.2%
2008	Actual – 9.2%	12.1%
2009	At or Below 9%	9.7%
2010	At or Below 9%	9.1%
2011	At or Below 9%	9%
2012	At or Below 9%	9%
2013	At or Below 9%	9%
2014	At or Below 9%	9%
2015	At or Below 9%	9%

Goal No. 2 of the WUE program is to reduce the customer consumption per Equivalent Residential Unit (ERU) by 1 percent or approximately 2 gpd per year over the six-year

planning period. An ERU is equal to annual single-family residential consumption divided by the number of single-family residential connections.

Table 6-6 ERU Reduction Goal Summary

Year	ERU Value (gpd/ERU)
2008	283.6
2009	231
2010	228
2011	226
2012	224
2013	222
2014	219
2015	217

WATER USE EFFICIENCY MEASURES

The WUE Rule states several measures that must be implemented or evaluated and provides a list of measures you can count as additional measures in the WUE Program. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. The City serves 7,095 connections, and therefore must evaluate or implement six supplementary water use efficiency measures in addition to the mandatory measures. The following sections describe both the mandatory and supplementary water use efficiency measures evaluated and indicate which have been or will be implemented by the City.

Mandatory Implementation - Source and Service Metering and Meter Calibration

As stated previously, the City currently meters all customers and sources. The City meters all new customers and sources as well. The City currently tests and calibrates all industrial meters annually and replaces approximately 500 residential meters per year, or as budget allows.

Mandatory Implementation - Leak Detection and Water Accounting

The City will continue their current leak detection and water accounting program in an effort to reduce distribution system leakage. The City will increase their efforts to reduce leakage and increase documentation of authorized consumption.

If the City cannot reduce DSL to have a three-year rolling average of 10 percent or less by July 1, 2010, the City must develop a Water Loss Control Action Plan (WLCAP). If by this date they do not meet the DSL requirement but are implementing a WLCAP, they will be in compliance with the WUE Rule. Chapter 6 of the *WUE Guidebook* provides more information on WLCAP.

Mandatory Implementation - Customer Education
As described above, the City provides information and tips for efficient water use for customers on their web page and in brochures available at several City offices. The City will continue to make educational resources available to the public.

Mandatory Evaluation – Rates that Encourage Efficiency
The City contemplated an inclined block rate during their last rate study but chose to remain with a uniform rate structure for this rate horizon. A rate study is scheduled in 2010 and will reevaluate the rate structure in accordance with the regulations.

Mandatory Evaluation – Reclaimed Water Opportunities
The City has been active in using treated wastewater for wash down and process use at the wastewater treatment plant (WWTP). Treated sewage effluent is used in many non-potable water applications such as landscape irrigation at the WWTP. Treatment plant hoses are also plumbed so that staff can wash down facilities at the plant.

The City will also provide a comprehensive look at reuse in their next Wastewater Facility Plan, which was submitted to Ecology as a first draft in November 2009.

Supplementary Measures
The City will continue implementing all of their current measures described above as part of their new Water Use Efficiency Program. Table 6-7 summarizes these measures.

Table 6-7 City WUE Program Measures

Implemented Measure	Applicable Customer Classes
Program Promotion and Customer Education	5
Conservation Kits	2
Construction Requirements	3
Customer Leak Detection	5
Bills Showing Consumption History	5
Irrigation Management	3
Landscape Management	4
Water Audits	5
Rebate Program	3
Total Measures Counted	**35**

EVALUATION OF MEASURES
Many of the measures selected for continued implementation require little funding, such as including consumption history in bills and notifying customers of potential leaks. The City will track the finances associated with each measure and compare it to water saved

to evaluate the effectiveness of each measure. If measures do not provide enough savings to meet their goals, additional measures will be considered.

TARGET WATER SAVINGS PROJECTIONS

If these goals are realized, the City will see significant savings in water use and distribution system leakage.

Table 6-8 compares the average day demand with and without water use efficiency savings. The water use efficiency savings projections include a decrease in the ERU value of 1 percent per year until 2015 and a constant rate of distribution system leakage of 11 percent. At the end of the 6-year planning period (2015), these water use efficiency measures will account for a total savings of 686,985 gpd.

Table 6-8 Projected Water Use Efficiency Savings

Year	Number of ERUs	ADD w/o WUE (gpd)	ADD w/WUE (gpd)	WUE Savings (gpd)
2008	13,813	4,088,718	3,878,260	210,458
2009	14,417	4,267,475	4,007,337	260,138
2010	15,027	4,448,039	4,135,126	312,914
2011	16,013	4,739,892	4,362,383	377,510
2012	17,006	5,033,649	4,586,416	447,233
2013	18,005	5,329,359	4,807,294	522,065
2014	19,010	5,627,074	5,025,086	601,988
2015	20,023	5,926,845	5,239,859	686,985

DEMAND FORECASTING

The WUE Rule has added new criteria to consider when preparing demand forecasts. It is now required to project demands both with and without anticipated savings from the water use efficiency program. This additional forecast can help determine whether capital improvements can be delayed or eliminated, and how much additional growth may be permitted. It also provides a basis to measure actual water use data against to monitor conservation success.

Complete demand forecasts are provided in Chapter 3 of this plan. A summary is included in Table 6-9. These forecasts do not include anticipated reductions in use from conservation and efficient water use efforts.

Table 6-9 Demand Forecast without WUE Savings

Year	Projected Service Area Population	Projected Average Day Production (gpd)	Projected Max Day Production (gpd)	Projected Peak Hour Production (gpm)
2009	17,135	4,267,475	9,388,444	11,736
2015	23,881	5,926,845	13,039,059	16,299
2029	40,321	9,393,809	20,666,597	25,833

Table 6-10 Demand Forecast with WUE Savings

Year	Projected Service Area Population	Projected Average Day Production (gpd)	Projected Max. Day Production (gpd)	Projected Peak Hour Production (gpm)
2009	17,135	4,007,337	8,816,141	11,020
2015	23,881	5,239,859	11,527,690	14,410
2029	40,321	8,323,183	18,311,003	22,889

ANNUAL PERFORMANCE REPORTING

The City must submit a performance report to the Department of Health by July 1, 2010, and each year thereafter. DOH has developed a standard reporting form to help summarize the City's progress toward meeting their goals. The annual report must include:

- Total source production and system wide consumption
- Distribution system leakage in percentage and volume
- Goal description, schedule, and progress toward meeting goals

DOH has developed a report form to make the process easier. The final report will also be made available to the public when it is submitted to DOH.

SUMMARY

To comply with the new requirements set forth in the Water Use Efficiency Rule and to reduce overall water use, the District has set a goal to reduce approximately two gpd per ERU per year and to reduce DSL through 2010 to meet requirements.

The City will employ several measures to accomplish these goals, which are as follows:

- Bills showing consumption history
- Conservation Kits
- Construction requirements

- Customer education
- Customer leak detection
- Irrigation management
- Landscape management
- Leak detection surveys
- Program promotion
- Rebate Program
- Water Audits

If the City's goals cannot be met with the implemented measures, the City will consider additional measures to help them do so. However, the City expects that their new WUE program will be more than adequate to accomplish their goals and increase water use efficiency and conservation.

Chapter 7
OPERATIONS AND MAINTENANCE

INTRODUCTION

The objective of this chapter is to present the City's operation and maintenance (O&M) program to assure satisfactory management of the water system operations in accordance with WAC 246-290.

The O&M Program includes the following elements:

- Water System Management and Personnel
- Operator Certification
- System Operation and Control
- Preventive Maintenance Program
- Coliform Monitoring Plan
- Emergency Response Program
- Cross-Connection Control Program
- Record Keeping and Reporting
- O&M Improvements

WATER SYSTEM MANAGEMENT AND PERSONNEL

The City of Camas water system is owned and operated by the City of Camas. The City is governed by a mayor and seven council members, all of which are elected officials. Figure 7-1 provides the organization of the water system.

OPERATOR CERTIFICATION

Department of Health (DOH) requires all Group A water systems to have at least one certified Water Distribution Manager (WDM) under WAC 246-292-050. The WDM must further be certified at a level equal to or higher than the water system's classification rating as described in Table 7-1 and in accordance with WAC 246-292-040.

Table 7-1 Water System Group Classification

Classification	Population Served
Group 1	Less than 1,500
Group 2	1,501 to 15,000
Group 3	15,001 to 50,000
Group 4	Greater than 50,000

The City is currently classified as a Group 3 system, which also corresponds to the level of certification required. Under the current certification requirements, the one mandatory certified position that the City must have on staff is a Water Distribution Manager (WDM) Level 3 and CCS. It is also required that personnel with supporting certifications be available as back-up for the mandatory certified position. These supporting certifications may be one grade lower than the required Level 3.

Table 7-2 provides the name and certifications of the City personnel. In addition to the mandatory certification, the City maintains additional certifications held by supporting personnel. Many of the employees hold multiple levels of certification. The City must notify the Water Works Certification Board in the event of any changes in the mandatory or supporting certification personnel. All of the required certifications are current with respect to continuing education unit (CEU) requirements.

CITY OF CAMAS
WATER SYSTEM ORGANIZATION CHART

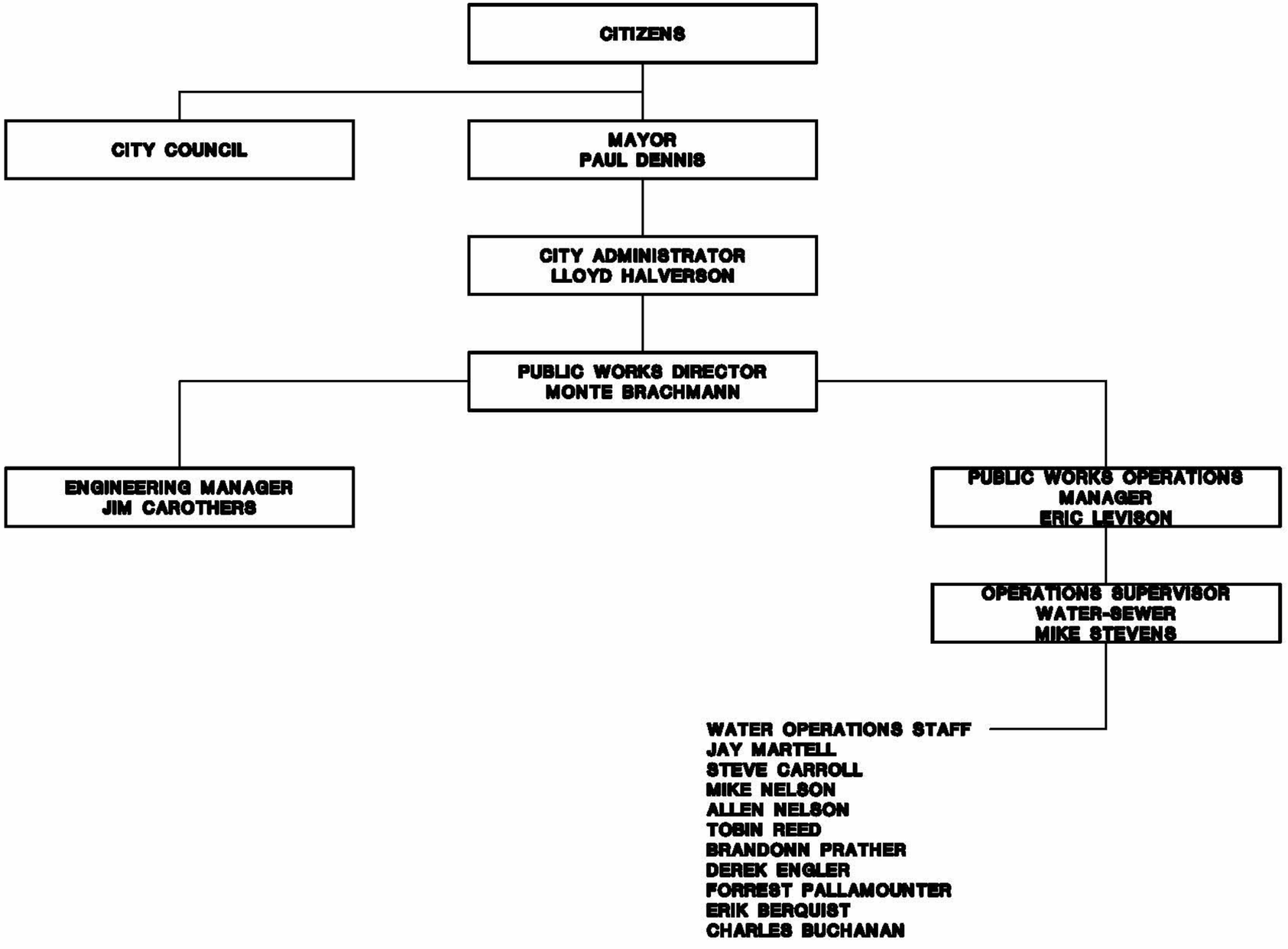

FIGURE 7-1

WATER SYSTEM
ORGANIZATION CHART

Table 7-2 Water System Operator Certifications

City Personnel	Water System Certifications	Certification Number
Monte Brachmann	WDM 4, WDS 2, WTPO 2,	751
Mike Stevens	WDM 3, WTPO 3, CCS	4946
Mike Nelson	WDM 2, WTPO 3, CCS	7509
Tobin Reed	WDM 2, WTPO 1, CCS	10297
Brandon Prather	WDM 2,	
Derek Engler	WDM 2	
Allen Nelson	WDM3, CCS	
Steve Carroll	WTPO 1, WDM 1	
Charles Buchanan	WDM 1	

PROFESSIONAL GROWTH

In order to promote and maintain expertise for the various grades of operator certification, Washington State requires that all certified operators meet professional growth requirements by completing no less than three CEUs within each three year period. Programs sponsored by both Washington Environmental Training Resources Center (WETRC) and the American Water Works Association (AWWA) Pacific Northwest Subsection are the most popular source of CEUs for certified operators in Washington State. The professional growth requirement may also be met by advancement by examination or certification by examination in a different classification. The City's Water Utility staff and personnel have traditionally been active in operator training programs. The City includes approximately 25 hours per year for each employee of the water department.

ROUTINE SYSTEM OPERATION AND PREVENTATIVE MAINTENANCE

The City's staff is responsible for the daily operation of its surface water sources, wells, treatment facilities, booster stations, PRVs, storage facilities, and distribution system. In addition to daily operation they also perform preventative maintenance on the system. The following sections describe the basic operation of the City's facilities. The preventative maintenance schedule and activities are listed in Appendix M.

WATER SOURCES

The City has two surface water sources and nine groundwater sources.

Surface Water Sources

Jones Creek has been providing the City of Camas with water since 1913. The intake consists of a dam, a small settling basin and dual coarse screens. A covered facility,

which used to house a fine screen, is located downstream of the uncovered coarse screen. To shut off flow from this source into the transmission main, a valve located downstream of the coarse screen and immediately inside the screen house is manually closed. This source is metered using an 8-inch Sparling propeller flow meter located inside the screen house immediately downstream of the shut off valve.

The Boulder Creek source was added in 1931. The intake consists of a dam, a small settling basin and screen. A covered facility housing a fine screen is located downstream of the uncovered coarse screen. To shut off flow from this source into the transmission main, a valve located downstream of the coarse screen and upstream of the screen house is manually closed. This source is metered using a 10-inch Sparling propeller flow meter in a vault located approximately 20 feet south of the screen house.

When flow from the two surface water sources is discontinued during the period May 15 to October 31 the transmission line is drained into Lacamas Lake by opening the bypass valve at the Surface Water Filtration Plant.

Groundwater Sources

The City operates nine groundwater sources. The City operates its well facilities by rotating sources. Generally the City will operate at least three wells with operational settings as summarized in Table 7-3.

Table 7-3 Well Operation Settings

Well Designation	Butler Reservoir Level			
	Summer On	Summer Off	Winter On	Winter Off
Lead[1]	14.3	14.6	13.8	14.2
First Lag[1] [2]	14.1	14.3	13.5	14
Second Lag[1]	13.8	14.1	13	13.5
Lower Prune Hill Reservoir Level				
Well No. 5[3]	18.5	20	17	18
Lacamas Reservoir Level				
Well No. 9	36	40	n/a	n/a

(1) Designation applies to Wells 6, 7, 8, 10, 11, 12 and 13.
(2) This well is tied to maintaining suction side pressure at Angelo Booster Station.
(3) This well operates in conjunction with Forest Home Booster Station.

Well No. 5 operates off of the Lower Prune Hill reservoir level in conjunction with the Forest Home Booster Station to meet demands in the Lower Prune Hill (455) Zone.

Well No. 9 is a seasonal supplemental source well that operates based on the level in the Lacamas Reservoir when needed to meet seasonal demands in the Lacamas (544) Zone.

The remaining wells (Nos. 6, 7, 8, 10, 11, 12 and 13) are rotated monthly and operated based on the level in the Butler Reservoir as shown in Table 7-3. If more than three wells are needed to meet demand, additional wells will be operated on an as-needed basis.

TREATMENT FACILITIES

The City operates and maintains their treatment facilities which include the surface water chlorination plant, surface water filtration plant, and treatment at the wells.

Surface Water Chlorination Plant

The Surface Water Chlorination Plant consists of chlorine addition to inactivate pathogenic organisms. Liquid sodium hypochlorite (12.5 percent) is injected directly into the surface water transmission main conveying the two surface water sources to a target dose of approximately 2 mg/L. Dose varies seasonally due to temperature fluctuations.

The liquid sodium hypochlorite is pumped directly into the 10-inch transmission main using a diaphragm metering pump. This metering pump is manually set. On-line chlorine residual monitoring occurs at the surface water filtration plant and the metering pump is adjusted when the on-line monitoring indicates this is needed.

Chlorinated water travels from the surface water chlorination plant through over 6.5 miles of 10-inch steel pipe to the filter plant, where it receives additional treatment. This treatment facility has an auxiliary power system that is powered by propane.

Surface Water Filtration Plant

The filtration plant consists of the following basic components:

Filtration – Consists of alum coagulant addition, polymer filter aid addition, two multimedia pressure filters and a backwash system that includes a dechlorination chemical addition step prior to discharging the backwash water to a settling lagoon that discharges to Lacamas Lake. Typical alum dose is 7 – 8 mg/L. Typical polymer dose is 0.055 mg/L. A streaming current monitor is available to control chemical dosing.

Fluoridation – Consists of fluoride addition for the purpose of preventing dental decay. A sodium fluoride saturator and metering pump is used to inject fluoride into the filtered water to a target dose of 0.8 – 1.3 mg/L.

Disinfection – No disinfection occurs at the surface water filtration plant. Residual chlorine is monitored in the finished water to ensure the chlorine

residual of water reaching the Surface Water Chlorination Plant is adequate (1.0 mg/L or higher).

Corrosion Control – Consists of sodium hydroxide addition for pH adjustment to a target level of 7.5. This typically requires a dose of 5 to 6 mg/L NaOH, which is injected into the filtered water before exiting the treatment facility.

Backwash Disposal – Consists of a backwash collection system that operates by reversing flow through the filters and collection of backwash water in a waste pipe that discharges by gravity to two backwash basins north of the plant. A thiosulfate feed system is used to dechlorinate the water prior to discharge to the backwash basins. Suspended solids settle out in the backwash basins and backwash water flows by gravity to Lacamas Lake.

Finished water from the Surface Water Filtration Plant feeds directly into an adjacent 12-inch main to feed the 14-inch line in NE Everett Street that serves as the backbone of the Lower Prune Hill (455) Pressure Zone. The surface water plant feeds the 455 Zone along with the Lacamas and Gregg Booster Stations. The Surface Water Filtration Plant operates on gravity flow. When the plant is in operation there is always flow through the plant based on system demand in the 455 Zone. Flow through the plant will vary depending on system demand.

Backwash occurs automatically either by a headloss or effluent turbidity setting. The operator selects these settings at the main filter control panel. Prior to initiating backwash, a surface wash of the top of the pressure filter media occurs using a pump that delivers water from the finished water line. Once the surface wash is complete, backwash is initiated by shutting off the influent valve to the pressure filter to be backwashed, causing the direction of flow through the filter to reverse and back up into the influent line. A pressure relief valve opens at 150 psi and raw water is taken to the lagoons.

A backwash valve that connects the influent line to the waste line opens and directs backwash water into the waste line that goes to the backwash basins north of the filter building. The backwash basins consist of two shallow earthen basins with a bentonite liner. Backwash water enters the basins via an inlet structure equipped with gate valves that allows each basin to be isolated. A wood screen downstream of the inlet keeps large debris from entering the outlets that collect the supernatant from the basins and allow it to flow to Lacamas Lake. The outlet from each basin is also equipped with a valve to prevent the basins from draining into Lacamas Lake if necessary. Normally all inlet and outlet valves are left open.

When the surface water treatment facility is taken offline, the two filtration systems are backwashed every 2 weeks to keep the media from getting compacted due to lack of

use. Water in the distribution system is used for backwashing since the transmission line is drained.

BOOSTER STATIONS

The City of Camas operates nine booster stations within its water system, as summarized in Table 7-4.

Table 7-4 Booster Stations

Booster Pump Station	Year Built	No. of Pumps	Pump horse power	Pump Capacity (gpm)	Total Pump Station Capacity (gpm)	Auxiliary Power
Old Gregg	1978	2	40	500	500	None
			40	500		
New Gregg	2003	2	100	1,500	1,500	300 kW
			100	1,500		
Butler	1948(1)	2	40	600	1,400	None
			50	800		
Forest Home	1949(2)	1	50	1,000	1,000	None
Angelo	2001	4	75	1,000	3,500	200 kW
			75	1,000		
			75	1,000		
			75	1,000		
Lacamas	1993	3	25	500	1,500	60 kW
			25	500		
			100	1,500		
Lower Prune Hill	1971(3)	3	150	1,000	2,245	300 kW
			150	1,000		
			100	750		
Upper Prune Hill	2002	4	20	750	4,300	Portable Generator
			20	750		
			40	1,400		
			40	1.400		
Francis Road	Unknown	1	7.5	80	80	None

(1) Pump replaced in 1998.
(2) Pump replaced in 1999.
(3) Upgraded in 2002 and 2004.

Table 7-5 shows the winter and summer settings for each booster station.

Table 7-5 Booster Station Settings

Booster Station	Capacity (gpm)	Called By	Winter On	Winter Off	Summer On	Summer Off
Old Gregg	500	Gregg Reservoir	58.0	65.0	58.0	65.0
New Gregg	1,500		58.0	65.0	58.0	65.0
Forest Home	1,000	Well 5	-	-	-	-
Francis Road	80	-	-	-	-	-
Butler Booster Station						
Pump No. 1	800	LPH Reservoirs	15.5	16.0	15.5	16.0
Pump No. 2	600		15.0	15.5	15.0	15.5
Butler Valve	1,050 (Typical)		22.5	22.0	22.5	22.0
Angelo Booster Station						
Pump No. 1	1,000	LPH Reservoirs	20.0	21.5	21.0	22.0
Pump No. 2	1,000		19.5	20.5	20.5	21.5
Pump No. 3	1,000		18.5	19.5	19.5	20.5
Pump No. 4	1,000		17.0	18.0	18.0	19.0
Lower Prune Hill (LPH) Booster Station (UPH Standpipe Open)						
Pump No. 1	1,000	ON - UPH Reservoir OFF-UPH Standpipe	56.0	95.0	58.0	95.0
Pump No. 2	1,000		54.0	94.0	56.0	95.0
Pump No. 3	750		52.0	93.0	54.0	95.0
Upper Prune Hill (UPH) Booster Station (UPH Standpipe Open)						
Pump No. 1	750	UPH Standpipe	88.0	95.0	88.0	95.0
Pump No. 2	750		86.0	93.0	86.0	93.0
Pump No. 3	1,400		84.0	92.0	84.0	92.0
Pump No. 4	1,400		80.0	88.0	80.0	88.0
Lacamas Booster Station						
Pump No. 1	500	Lacamas Reservoir	40.0	44.0	42.0	44.0
Pump No. 2	500		36.0	41.0	40.0	42.0
Pump No. 3	1,500	N/A	Manual	Manual	-	-

PRVs

Most of the City's PRV stations contain two parallel PRVs. The first PRV is the smaller of the two valves, has a lower allowable capacity, and provides flow for normal or low demands in the downstream pressure zone. The second PRV is the larger of the two valves and opens under higher demand conditions, such as a fire flow. The larger PRVs are not capable of providing low flows that occur during low demand. The larger PRV is usually set approximately 5 psi lower than the smaller PRV. As flow and head losses through the smaller valve increase, the larger valve will open to provide additional flow.

This arrangement allows each valve to operate within its optimal range of flow, which will require less maintenance and increase the life of the PRV. This differs from a single

PRV that is required to operate over the entire range of minimum and maximum flows. The City's PRVs do not have pressure sustaining features.

The City has a contract with GC Systems to service PRVs located within the water system. This contract allows GC Systems to perform general maintenance and ensure that the valves are operating correctly, both on an individual and system-wide level.

STORAGE FACILITIES

The City currently operates seven storage facilities with a combined total of 8.45 MG. A discussion of each storage facility and its basic operation was described in Chapter 1.

COLIFORM MONITORING PLAN

As required by DOH the City has a regular coliform monitoring plan in place to check for bacterial contamination of the distribution system. Samples are taken monthly at various locations which rotate throughout the year. A map of coliform sampling locations and the plan are located in Appendix H.

EMERGENCY RESPONSE PROGRAM

Water utilities have the responsibility to provide an adequate quantity and quality of water in a reliable manner at all times. To do this, utilities must reduce or eliminate the effects of natural disasters, accidents and intentional acts. Most utilities routinely deal with small scale emergency situations. Large scale emergency situations occur far less frequently, but may manifest themselves in the same way as the routine emergencies. If a utility is well prepared to handle routine emergencies, then they will also be better prepared to handle more disastrous ones as well. The complete emergency response program is located in Appendix N.

CROSS CONNECTION CONTROL PROGRAM

As required by WAC 246-290-490, Cross Connection Control, utilities have the responsibility to protect customers from water contamination due to cross connections. A cross connection control program is required to be included in the Water System Comprehensive Plan under WAC 246-290-100.

A cross connection is any physical arrangement where the potable water supply is connected, directly or indirectly, to any liquid of unknown or unsafe quality that may contaminate the public water supply through backflow. The regulation also requires utilities to develop and implement a comprehensive program to control cross connections within the system. An acceptable cross connection control program must address the following elements:

- Establishment of legal authority and program policies;
- Evaluation of premises for cross-connection hazards;

- Elimination and/or control of cross connections;
- Provision of qualified personnel;
- Inspection and testing of backflow prevention assemblies;
- Quality control of testing process;
- Response to backflow incidents;
- Public education for consumers;
- Record keeping for CCC program.

CITY OF CAMAS CCC PROGRAM

City ordinance 1504 addresses cross connections and their prevention. The ordinance is in the Camas Municipal Code under Water Use Regulations, Chapter 13.32.

This ordinance and corresponding Municipal Code provide the City's water department the ability to protect the water supply from contamination by prohibiting cross connections, requiring backflow prevention devices, declaring prohibited cross connections to be unlawful, establishing fees for the inspection of cross connection assemblies, and adopting State standards for cross connection regulations. The ordinance and corresponding Municipal Code provides procedures for the abatement of cross connections and the installation of backflow prevention devices.

The City has four employees certifies as cross-connection control specialists. The City's cross-connection control program and records are continually updated and files of each cross-connection device are on file with the City. The Public Works Department and the Building Department coordinate notification to customers who have devices that need to be tested. The city has the following information on file:

- Date of last inspection
- Results of inspection
- Recommended protection
- List of approved assemblies
- Test and maintenance reports
- List of certified testers
- Customer account number, billing address, service address, phone numbers, device history and maintenance records.

The City's Cross-Connection Control Program requires the inspection of backflow prevention devices at the time of installation. These devices are also scheduled to be inspected annually after installation, after the device is repaired, after the device is relocated or reinstated, and as necessary if tests indicate repeated failure. Owners of backflow prevention devices are notified by mail that their devices are due for inspection. However, it is the responsibility of the customer to see that their device is

tested. Failure to provide the city with a backflow prevention device inspection report from a certified cross connection control specialist will result in the customer's water service being terminated. This termination is then reported to the Department of Health.

A copy of the City's Cross-Connection Control Ordinance and Plan can be found in Appendix O.

RECORDKEEPING AND REPORTING

Records of various operational and maintenance parameters of the system are maintained by the City.

O&M DEFICIENCIES

There are no operation and maintenance deficiencies at the City.

Chapter 8
CAPITAL IMPROVEMENTS

INTRODUCTION

This Chapter presents the elements and proposed schedule of the 6-year Capital Improvement Plan (CIP) in accordance with the requirements of WAC 246-290. Water system capital improvements have been scheduled and prioritized on the basis of water quality concerns, growth, regulatory requirements, component reliability, system benefit, and financial priority. Additional projects for the 20-year planning period have also been identified. When the Water System Plan is updated at the end of the 6-year planning period, the projects presented for the 20-year planning period should be reevaluated and scheduled for the subsequent 6-year planning period if necessary. A City water system base map indicating proposed improvement projects is included at the end of this document.

In the future, other projects may arise which are not identified as part of the City's CIP. Such projects may be deemed necessary for ensuring water quality, preserving emergency water supply, addressing unforeseen problems with the City's water system, or accommodating transportation improvements proposed by other agencies. The City retains the flexibility to reschedule proposed projects and to expand or reduce the scope of proposed projects, as best determined by the City's Staff and as new information becomes available for evaluation. Each capital improvement project should be reevaluated to consider the most recent planning efforts as the proposed completion date for the project approaches. Detailed cost estimates for these projects are located in Appendix S.

SOURCE AND WATER RIGHTS

Based upon future water use projections shown in Chapter 3, and the water rights analysis shown in Chapter 4, the City will need to maximize their current sources and acquire new water rights in order to meet growth in the next 20 years. The following projects will address the deficiencies outlined in Chapter 4.

WELL 14 – ANDERSON SITE (SR-1)

This project is currently under construction and will have a capacity of 1,000 gpm. A treatment facility and CT piping will also be included in this project and will also serve Well 6. This project is listed as SR-1 in Table 8-1, is scheduled for completion in 2010, and has an estimated cost of $1,650,000.

BOULDER CREEK FISH SCREENS (SR-2)

The installation of a fish screen at the intake of Boulder Creek to minimize fish impacts is planned in 2010, and has an estimated cost of $35,000.

FILTRATION PLANT ALTERNATIVES ANALYSIS AND PREDESIGN REPORT (SR-3)

An analysis of the surface water filtration plant is required to determine necessary upgrades. This improvement is scheduled for 2012, and has an estimated cost of $60,000.

WELL 17 – CAMAS MEADOWS SITE (SR-4) (SR-6)

The City has applied for a 1,000 gpm water right for an additional well in the 544 Zone at Camas Meadows Golf Course. The application is currently pending. Once approved, site acquisition will be required as a portion of the well development. The City prefers to develop this well prior to Well 15 and 16 due to its location in the 544 Zone where demand is needed. This improvement is scheduled for 2018, when the maximum day demand will exceed the City's developed water rights. However, it is recommended that this improvement be made as soon as the application is approved due to the high demands expected in this zone within the 6-year planning period. The feasibility assessment is scheduled for 2015 at an estimated cost of $50,000. This project is listed as SR-4 in Table 8-1. The development of Well 17 is scheduled for 2018 and is listed as SR-6 in Table 8-1 and has an estimated cost of $1,650,000.

FILTRATION PLANT UPGRADES (SR-5)

An upgrade to the current filtration plant to a 1,000 gpm membrane filtration plant is scheduled for 2017, and has an estimated cost of $6,000,000. This project is contingent on the results of the Filtration Plant Analysis (SR-3).

WELL 15 – PARKERS LANDING SITE (SR-7)

Water rights have already been obtained for this project from Ecology. The capacity of this well will be 1,000 gpm. The Well 15 site is located approximately 700 feet southwest of Well 5. The maximum day demand, as shown in Table 3-16, will exceed

the City's existing developed water rights in 2022. This project is scheduled for completion in 2022, and has an estimated cost of $1,650,000.

NUGA Source Development (SR-8)

The City will pursue potential source development within the NUGA to support anticipated growth. It is recommended that the City continue to pursue additional source development in this area, and apply for water rights accordingly.

It is recommended that the City budget approximately $500,000 for continued source development. This project includes purchase and administrative costs for obtaining existing water rights from owners in this part of the service area. This project is listed as SR-8 in Table 8-1.

Well 16 – Wastewater Treatment Plant Site (SR-9)

Water rights have already been obtained for this project from Ecology. The capacity of this well will be 1,000 gpm. The Well 16 site is located at the City's Wastewater Treatment Plant. According to the maximum day demand projections provided in Table 3-16, after Well 15 is developed, additional water rights will be required in 2024. This project is scheduled for completion in 2024, and has an estimated cost of $1,650,000.

Well 18 – Fire Station Site (SR-10)

The City has applied for a 350 gpm water right for an additional well in the 544 Zone located at the Fire Station. The application is currently pending. Once approved, site acquisition will be required as a portion of the well development. This improvement is anticipated in 2026, and has an estimated cost of $1,000,000.

A summary of the source of supply capital improvements are shown in Table 8-1. All costs are in 2010 dollars.

Steigerwald Source Development (SR-11)

The City will actively pursuing potential source development in the Steigerwald area to support anticipated growth. The City will budge approximately $500,000 for source development in this area. This project is listed as SR-10 in Table 8-1.

A summary of the source of supply capital improvements are shown in Table 8-1. All costs are in 2010 dollars.

Table 8-1 Source of Supply Capital Improvement Projects

Project No.	Year	Description	Cost[1]
SR-1	2010	Well 14 Development – Anderson Site	$1,650,000
SR-2	2010	Boulder Creek Fish Screens	$35,000
SR-3	2012	Filtration Plant Facility Plan	$60,000
SR-4	2015	Well 17 Feasibility Study – Camas Meadows Site	$50,000
SR-5[2]	2017	Filtration Plant Upgrades	$6,000,000
SR-6	2018	Well 17 Development – Camas Meadows Site	$1,650,000
SR-7	2022	Well 15 Development – Parkers Landing Site	$1,650,000
SR-8	2022	NUGA Source development	$500,000
SR-9	2024	Well 16 Development – WW Treatment Plant Site	$1,650,000
SR-10	2026	Well 18 Development – Fire Station Site	$1,000,000
SR-11	2026	Steigerwald Source Development	$500,000

(1) CCI = 8,660.08 per ENR January 2010.
(2) This project is a place holder and depends on the evaluation, listed as project SR-3.

STORAGE FACILITIES

LOWER PRUNE HILL RESERVOIR EVALUATION AND REPLACEMENT (S-1) (S-5)

Due to the age and condition of the Lower Prune Hill Reservoirs, continued leak detection and a structural evaluation is planned within the 6 year planning period. This project will include a feasibility assessment that evaluates leakage, structural integrity, and short term rehabilitation options. This project is scheduled for completion in 2014 and is listed as project S-1 in Table 8-2 at an estimated cost of $80,000. The smaller of the two reservoirs will be decommissioned and demolished, and a new 0.5 MG steel welded tank will be constructed in its place. This improvement includes significant site and foundation work. This project is listed as project S-5 and is scheduled for completion in 2020 at an estimated cost of $1,539,000.

CEMETERY RESERVOIR (S-2)

A new 2.0 MG reservoir will be constructed to serve a new 290 Zone downtown, and the existing 343 Zone. The reservoir will set the hydraulic grade for the 290 Zone, and a booster station will also be constructed to supply the 455 Zone. The Cemetery Reservoir is identified as project S-2 and is scheduled for completion by 2016 at an estimated cost of $2,188,000.

DECOMMISSION AND DEMOLITION BUTLER RESERVOIR (S-3)

Due to the age and condition of the Butler Reservoir, it shall be decommissioned and replaced by the new Cemetery Reservoir. This project is identified as project S-3 and is scheduled for 2016 at an estimated cost of $40,000.

ADDITIONAL GREGG RESERVOIR (S-4)

As shown in the storage analysis in Chapter 4, additional storage is required in the 542 Zone as the NUGA develops. The additional Gregg Reservoir is scheduled for completion by 2018, and is estimated at $2,188,000.

GREEN MOUNTAIN RESERVOIR (S-6)

Based upon the storage analysis presented in Chapter 4, the City will require a new 2.0-MG reservoir within the 20-year planning period with development occurring within the NUGA. The Green Mountain Reservoir is scheduled for completion by 2024, and is estimated at $2,188,000. These projects are summarized in Table 8-2.

Table 8-2 Reservoir Capital Improvements

Project No.	Year	Description	Cost[(1)]
S-1	2014	Lower Prune Hill Reservoir Evaluation	$80,000
S-2	2016	Cemetery Reservoir, 2.0 MG	$2,188,000
S-3	2016	Decommissioning and Demolition of Butler Reservoir	$40,000
S-4	2018	Gregg Reservoir, 2.0 MG	$2,188,000
S-5	2020	Lower Prune Hill Reservoir Replacement	$1,539,000
S-6	2024	Green Mountain Reservoir, 2.0 MG	$2,188,000

(1) CCI = 8,660.08 per ENR January 2010.

TRANSMISSION AND BOOSTER STATION

The City's pumping and transmission requirements will depend upon the extent and rate of growth within the NUGA. The following is a description of the recommended transmission and booster station projects.

FOREST HOME BOOSTER STATION UPGRADE AND TRANSMISSION (T-1, T-2, T-3)

As demands on the 455 Zone increase and the Cemetery Reservoir and Booster Station are being constructed, an interim upgrade is planned at the Forest Home Booster Station to accommodate growth. The station will be upgraded from 1,000 gpm to 2,500 gpm to meet growth through the 6-year planning period, as shown in Chapter 4. The completion of this project will increase the total pumping capacity to the 455 Zone to 10.6 mgd. The upgrade will include a new building, pumps, and auxiliary generator. This is improvement requires site acquisition, listed as project T-1 in Table 8-3. The booster station upgrades are listed as project T-2. With the upgrade to the booster station, transmission improvements are required to minimize head losses from Well 6 and 14 to the 455 Zone. Approximately, 1,400 LF of 6-inch pipe must be replaced with 12-inch pipe. This is listed as project T-2 in Table 8-3 and is scheduled for completion by 2012.

CROWN ROAD TRANSMISSION, BOOSTER STATION, AND EXPANSION (T-4, T-5, T-15)

The Crown Road Booster Station has already been designed, and will provide 3,200 gpm from the 343 Zone to the 542 Zone and the NUGA, with the potential to expand to 4,800 gpm. It is recommended that this improvement be made in the 6-year planning period in order to increase transmission out of the Washougal Wellfield, and meet maximum day demands in the 544 Zone in 2015. As part of this project, 7,800 LF of 24-inch transmission main must be installed to connect the 343 Zone to the 542 Zone. This project will ultimately serve the NUGA, and the expansion of the booster station will be dependent on the rate of growth within the NUGA. Because this project is driven by growth, developers will fund the equivalent of an 8-inch transmission main, and 70 percent of the booster station. The transmission main and booster station are scheduled for completion by 2012, and are listed as projects T-4 and T-5, respectively, in Table 8-3. The expansion of the booster station is scheduled for completion by 2024 and is listed as project T-15 in Table 8-3.

PORTABLE BOOSTER STATION (T-6)

In order to meet maximum day demands in the 6-year planning period, a 125 gpm package booster pump station is required at the LPH Booster Station. This is an interim project to meet 6-year demands before the LPH Booster Station upgrade takes place to meet 20-year demands. This improvement is listed as project T-6 and is scheduled for 2012.

NUGA TRANSMISSION MAINS (T-7, N-1 THROUGH N-7)

In order to serve the anticipated development within the NUGA, a network of transmission mains must be constructed. See Figure 8-1 for the layout of recommended transmission mains within the NUGA. If growth occurs as projected, the 24-inch main that connects the 542 and 544 Zone must be constructed to meet demands. This project totals 19,650 LF, is scheduled for completion by 2015, and is listed as project T-7 in Table 8-3. An additional network of transmission mains within the NUGA will be developer funded. These projects are listed in Table 8-4 as projects N-1 through N-7, and are scheduled for construction in the 20-year planning period.

CEMETERY BOOSTER STATION AND TRANSMISSION MAINS (T-8, T-9, T-10, T-11)

As part of decommissioning the Butler Reservoir, and constructing the new Cemetery Reservoir, an additional 2,300 LF of 12-inch transmission main is required to connect the Cemetery Reservoir inlet to the 290 Zone at 6th and Oak. This is listed as project T-8 and is scheduled for completion by 2016. A new booster station will be constructed to provide 4,000 gpm from the new 290 Zone to the 455 Zone; this is listed as project T-9. As part of this improvement, 4,200 LF of 16-inch transmission main is required to connect the Cemetery Booster Station with the 455 Zone. This is listed as project T-10. Once the Crown Road Booster Station and Cemetery Reservoir are constructed, the existing 12-inch CI pipe may be converted to serve the 455 Zone. This is listed as

project T-11. The booster station and associated transmission projects are scheduled for completion by 2016.

LOWER PRUNE HILL BOOSTER STATION UPGRADE (T-12)

In order to meet maximum day demands through the 6-year planning period in the 852 Zone, the Lower Prune Hill Booster Station must be upgraded from its current capacity of 2,500 gpm to 4,000 gpm to meet 20 year demands. This project is listed as T-12 in Table 8-3.

LACAMAS BOOSTER STATION UPGRADE AND TRANSMISSION (T-13, T-14)

If the NUGA transmission main is not constructed, then growth in the 544 Zone must be served through the Lacamas Booster Station. This will require an upgrade of the Lacamas Booster Station and the 12-inch suction-side transmission main. The phasing and capacity requirements vary, depending upon the rate of growth within the zone. These improvements are listed as projects T-13 and T-14 in Table 8-3.

14-INCH STEEL REPLACEMENT (T-15)

6,000 LF of 14-inch steel main provides transmission to the 455 Zone. This must be replaced within the 20-year planning period and is listed as project T-15 in Table 8-3.

WELL 16 TRANSMISSION (T-17)

Transmission improvements are required once Well 16 is developed. Approximately 2,300 LF of 6-inch main will be replaced with 12-inch main along Polk Street. This project is included in the 20-year planning period and is listed as project T-17 in Table 8-3.

JONES AND BOULDER CREEK TRANSMISSION IMPROVEMENTS (T-18)

If Jones and Boulder Creek continue as a surface water source for the City, a new transmission main from the creeks to the filtration plant must be constructed. This project is a placeholder and is dependent on the findings of the Filtration Plant Facility Plan (SR-3). If needed, construction will include approximately 48,000 LF of 10-inch transmission main. This project is included in the 20-year planning period and is listed as project T-18 in Table 8-3.

Table 8-3 Transmission and Booster Station Improvements

Project No.	Year	Description	Capacity/ Length	Cost[1]
T-1	2010	Forest Home Booster Station Site Acquisition	-	$50,000
T-2	2012	Forest Home Booster Station Upgrade	2,500 gpm	$464,800
T-3	2012	Forest Home Transmission Upgrade	1,400 LF	$358,000
T-4[2]	2012	24-inch Crown Road BS suction and discharge transmission main from 3rd to 15th.	7,800 LF	$2,973,000
T-5[3]	2012	Crown Road Booster Station	3,200 gpm	$713,000
T-6	2012	Upper Prune Hill Portable Booster Pump	125 gpm	$15,000
T-7	2015	24-inch transmission main within the NUGA to connect the 542 Zone to the 544 Zone and the proposed Green Mountain Reservoir	19,650 LF	$7,041,000
T-8	2016	12-inch transmission main from Cemetery Reservoir inlet to 6th and Oak	2,300 LF	$514,000
T-9	2016	Cemetery Booster Station	4,000 gpm	$784,300
T-10	2016	16-inch transmission main to connect Cemetery BS with 455 Zone at 22nd and Division	4,200 LF	$1,275,000
T-11	2016	Convert existing 12-inch CI pipe to supply 455 Zone	-	$50,000
T-12	2018	Lower Prune Hill Booster Station Upgrade	4,000 gpm	$483,000
T-13	2020	Lacamas Booster Station Upgrade	3,500 gpm	$177,000
T-14	2020	20-inch suction-side transmission main to Lacamas Booster Station	5,000 LF	$1,731,000
T-15[2]	2023	Replace 14-inch steel transmission main from Butler Site to 455 Zone	6,000 LF	$1,563,000
T-16	2024	Crown Road Booster Station Upgrade	4,800 gpm	$80,300
T-17	2024	12-inch main along SE Polk St. for increased transmission from proposed Well 16	2,300 LF	$514,000
T-18	2025	Jones and Boulder Creek Transmission Improvements	48,000 LF	$6,974,000

(1) CCI = 8,660.08 per ENR January 2010.
(2) Developers will pay for approximately $1,465,000 of this project.
(3) Developers will pay for approximately $500,000 of this project.

0 4,000 8,000 Feet

LEGEND:

- City Limits
- Urban Growth Boundary
- Water Service Boundary

Water Lines

- 1
- 4
- 6
- 8
- 10
- 12
- 14
- 16
- 18
- 20
- 24
- 36

- New Well
- Existing Well
- New Pump Station
- New Reservoir
- Existing Operations Center
- Existing Pump Station
- Existing Reservoir
- Existing Standpipe
- Existing Water Treatment
- NUGA Improvements
- Distribution Improvements
- 6-year Improvement Projects
- 20-year Improvement Projects
- Existing Facilities

SOURCE: CITY OF CAMAS

FIGURE 8-1
CAPITAL IMPROVEMENT PROJECTS

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Table 8-4 NUGA Transmission Improvements

Project No.	Year	Improvement	Cost(1)
N-1	2017	12-inch transmission main within the NUGA for added transmission within the 544 Zone from the Green Mountain Reservoir, 15,600 LF 12 inch.	$3,434,000
N-2	2018	12-inch transmission main along SE 283rd Avenue and Hathaway Road, 5,300 LF 12 inch.	$1,292,000
N-3	2019	Replace existing 6-inch main with 12-inch transmission main for additional transmission within the NUGA, 1,900 LF 12 inch.	$590,000
N-4	2020	12-inch transmission main within the NUGA for added transmission along the north side of Lacamas Lake, 11,200 LF 12 inch.	$2,519,000
N-5	2021	12-inch transmission main within the NUGA for added transmission from the north side of the lake to connect to existing transmission along NE Everett Street, 2,600 LF 12 inch.	$735,000
N-6	2022	12-inch transmission main to increase transmission within the NUGA, 7,900 LF 12 inch.	$1,835,000
N-7	2023	12-inch transmission main to increase transmission within the NUGA, 5,700 LF 12 inch.	$1,379,000

(1) CCI = 8,660.08 per ENR January 2010.

DISTRIBUTION SYSTEM

Approximately 62 percent of the City's distribution system consists of ductile iron pipe. City staff has indicated that ductile iron became the City's standard pipe material in the late 1970s. Other materials within the water system include cast iron and steel. The cast iron pipe located within the distribution system requires relatively infrequent repairs and appears to be serviceable for some time to come. The steel pipe was installed in the 1940s. The City has a policy of replacing old steel pipe coinciding with road and developer projects, and shall continue to do so as part of the capital improvement program.

Additional hydraulic improvements were selected in order to improve system pressures, improve fire flows, and improve water quality by the looping of dead end lines.

Table 8-5 shows the City's distribution system improvements scheduled through the 20-year planning period. These new main locations were selected to increase system looping in order to improve water quality and fire flow, and were identified as deficiencies in the hydraulic analysis in Chapter 5. The cost estimates operate under the assumption that water lines will be placed in existing right-of-way or be placed in

future right-of-way as a result of developer extensions. These projects are identified as project numbers D-1 through D-8 in Table 8-5.

Table 8-5 Distribution System Improvements

Project No.	Year	Project Description	Purpose	Cost(1)
D-1	Annual	Pipeline Replacement	Level of Service	$150,000/year
D-2	2010	PRV adjustment on NW 16th and NW McIntosh, raise 697 Zone to 710 Zone	Peak Hour Deficiencies	-
D-3	2010	12-inch DI main on NW 38th Ave. from NW Parker St. to Water Service Area Boundary, 5,800 LF	Extension project	$750,000
D-4	2011	UPH PRV adjustments and looping around NW Astor, 1,600 LF of 8 inch	Fire Flow Deficiencies	$323,000
D-5	2011	Butler Site PRV Station, 8 inch	With Crown Road BPS, allow flow to 455 Zone, utilize existing 14-inch	$89,000
D-6	2012	Couch Street BS, 50 gpm	Peak Hour Deficiencies	$120,000
D-7	2012	UPH looping from NW 9th Avenue to NW 12th Avenue, 300 LF of 12 inch	Peak Hour Deficiencies	$78,000
D-8	2020	UPH Standpipe outlet piping upgrade, 320 LF of 24 inch	Peak Hour Deficiencies	$151,000

(1) CCI = 8,660.08 per ENR January 2010.

Table 8-6 presents projects that will be developer driven, will only be completed when demand is present, and will only be partially funded by the City. These projects are identified as project numbers DE-1 through DE-5 in the following table.

Table 8-6 Developer Extension Improvements

Project No.	Year	Project Description	Cost(1)
DE-1	2016	DI main between NW Camas Meadows Dr. to NW Lake Road, 4,000 LF of 12 inch	$985,000
DE-2	2017	UPH looping along NW 16th Avenue, 1,300 LF of 12 inch	$323,000
DE-3	2018	542 Zone looping along NE Everett Road and NE 3rd Street, 2,000 LF of 12 inch	$494,000
DE-4	2019	Decommission 10th Ave./Francis Booster Station, area served by UPH	$471,000
DE-5	2024	Upper Green Mountain Booster Station, 1,500 gpm	$419,200

(1) CCI = 8,660.08 per ENR January 2010.

WATER USE EFFICIENCY PROGRAM

The state's *Water Use Efficiency Rule* includes the development of a conservation program as a requirement for approval of water comprehensive plans and water rights. Components of a conservation program that include associated capital costs are typically measures that include ongoing programs for device distribution, irrigation central control, water audits, and leak detection.

WATER CONSERVATION DEVICES

As part of the Capital Improvement Program, the City will distribute water conservation devices. The devices can be distributed as kits or individual components and can be distributed over a number of years to existing customers. The requirement for installation of the kit components could be included in the City's plumbing code for new connections. New connections would be charged and supplied with a kit at the time of hookup. If the City maintained a supply of individual components, the kits could be detailed specifically for the new customer. Typical conservation kits consist of low-flow showerheads, shower timers, kitchen and bathroom aerators, toilet tank bags, toilet dye capsules, and instructions for use and installation. If a quantity of 1,000 kits was purchased, the above kit would cost approximately $4.00 per unit (bulk prices would be lower). Estimated water use savings of approximately 30 gallons per person per day have been attributed to water conservation devices.

WATER AUDITS

An ongoing water audit program is recommended to provide assistance to residential, commercial, and industrial customers. Under this program, trained personnel will visit a home or facility and make recommendations as to adjustments for water saving. The service could be provided free and on a voluntary basis for existing customers. The City is considering offering such a program to new and existing customers, particularly large industrial and commercial customers.

LEAK DETECTION STUDY

Leak detection is an integral element of a Water Use Efficiency Program. The City's three-year average for lost and unaccounted for water is equivalent to 11.2 percent. The City anticipates performing a leak detection survey during 2010.

A summary of the capital improvements relating to conservation and their anticipated costs are presented in Table 8-7.

Table 8-7 Conservation Capital Improvements

Project No.(1)	Year	Description	Cost
C-1	2010	Water Conservation Device Distribution Program	$5,000
C-2	2010-2014	Leak Detection Study	$6,000/year
C-3	2010-2012	Commercial/Industrial Water Audit Program	$25,000/year
C-4	2011-2013	HOA Water Audit Program	$50,000/year

(1) CCI = 8,660.08 per ENR January 2010.

CAPITAL IMPROVEMENT SUMMARY

Table 8-8 summarizes the system deficiencies from Chapters 4 and 5 and how the CIP project will remedy each deficiency.

Table 8-9 provides a summary of the system improvements for the City for the 6-year capital improvement program. Table 8-10 provides the improvements for the 20-year planning period. All cost estimates are based on 2010 dollars and are not adjusted for inflation. These improvements and their approximate locations are shown on the map provided at the end of this document.

Table 8-8 Summary of System Deficiencies

Deficiency	CIP Project
Existing and 6-year Deficiencies	
Source Capacity, 6-year deficit (page 4-13)	The City will increase the nominal pumping capacity (Table 4-12) with the construction of Forest Home Booster Station, Crown Road Booster Station, and Crown Road transmission mains to meet 6-year maximum day demands. By using the City's existing wells at their full capacity the pumping capacity is 13.66 MGD. This meets the City's 6-year MDD. Additional source capacity will come from Well 14. CIP Projects: SR-1, T-1, T-2, T-3, T-4, T-5
343 Zone MDD 6-year pumping deficiency (page 4-17)	The pumping deficiency is eliminated with Forest Home Booster Station, Crown Road Booster Station, Crown Road transmission mains, and connection of the 542 and 544 Zones through the NUGA. Well 14 also provided additional pumping capacity. CIP Projects: SR-1, T-1, T-2, T-3, T-4, T-5, T-7
455 Zone MDD 6-year pumping deficiency (page 4-17)	The pumping deficiency is eliminated with Crown Road Booster Station, and Crown Road transmission mains. CIP Projects: T-4, T-5
544 Lacamas and NUGA Zone 6-year MDD pumping deficiency (page 4-17)	The pumping deficiency is eliminated with Forest Home Booster Station, Crown Road Booster Station, Crown Road transmission mains, and connection of the 542 and 544 Zones through the NUGA. Well 14 also provided additional pumping capacity. CIP Projects: SR-1, SR-4, T-1, T-2, T-3, T-4, T-5, T-7, D-5

Table 8-8 Summary of System Deficiencies (Continued)

Deficiency	CIP Project
852 UPH Zone 6-year MDD pumping deficiency (page 4-17)	The pumping deficiency is eliminated with Forest Home Booster Station, Crown Road Booster Station, Crown Road transmission mains, and a portable booster pump. Well 14 also provided additional pumping capacity. CIP Projects: SR-1, SR-4, T-1, T-2, T-3, T-4, T-5, T-6, T-7
343, 542 Gregg, and 544 Lacamas Zone existing and 6-year storage deficiency (page 4-23)	Excess storage in other zones eliminates the deficit in these zones. The total storage of the City meets existing and 6-year storage requirements.
542 and 544 NUGA 6-year storage deficiency	NUGA growth is dependent on developer funded storage. The Gregg and Green Mountain Reservoirs are listed as CIP project for these areas. CIP Projects: S-4, S-6
PHD deficiencies (page 5-14)	Hydraulic modeling projects have been identified to eliminate these deficiencies. CIP Projects: D-2, D-6, D-7
Fire flow deficiencies (page 5-14)	Hydraulic modeling projects have been identified to eliminate these deficiencies. CIP Projects: D-4
20-year Deficiencies	
Instantaneous Water Right deficiency (page 4-9)	Pending water right applications for the Fire Station and Camas Meadows will add an additional 1,350 gpm. However, additional rights are still required. The City will pursue Steigerwald and NUGA Sources to secure additional water rights. CIP Projects: SR-4, SR-6, SR-8, SR-10, SR-11

Table 8-8 Summary of System Deficiencies (Continued)

Deficiency	CIP Project
Source Capacity, 20-year deficit (page 4-13)	In addition to the 6-year CIP projects listed above, the City will develop additional wells, upgrade the Crown Road Booster Station, upgrade the Lower Prune Hill Booster Station, construct the Cemetery Booster Station, and pursue additional water rights in the Steigerwald and NUGA areas. CIP Projects: SR-4, SR-6, SR-7, SR-8, SR-9, SR-10, SR-11, T-8, T-9, T-10, T-11, T-12, T-13, T-14, T-15, T-16
Maximum Day, 20-year Pumping deficiency (page 4-13)	In addition to the 6-year CIP project listed above, the City will develop additional wells, upgrade the Crown Road Booster Station, upgrade the Lower Prune Hill Booster Station, construct the Cemetery Booster Station, and pursue additional water rights in the Steigerwald and NUGA areas. CIP Projects: SR-4, SR-6, SR-7, SR-8, SR-9, SR-10, SR-11, T-8, T-9, T-10, T-11, T-12, T-13, T-14, T-15, T-16
20-year Storage Deficiency (page 4-24)	The Cemetery Reservoir will replace the Butler Reservoir and eliminate the zone deficiency. An additional Gregg Reservoir will be constructed to eliminate the deficiency. An additional Green Mountain Reservoir will be constructed to serve the 544 NUGA Zone. This provides an additional 4.8 MG of storage to the system, eliminating the total storage deficit shown in Table 4-22. CIP Projects: S-2, S-3, S-4, S-5, S-6
PHD deficiencies, 20-year (page 5-14)	Hydraulic modeling projects have been identified to eliminate these deficiencies. CIP Project: D-8

Table 8-9 6-year Capital Improvement Project Summary

No.	Title	Year	City Project Cost[(1)]
SR-1	Well 14 Development - Anderson Site	2010	$ 1,650,000
SR-2	Boulder Creek Fish Screen	2010	$ 35,000
C-1	Water Conservation Device Distribution Program	2010	$ 5,000
C-2	Leak Detection Study	2010	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2010	$ 25,000
D-1	Pipeline Replacement	2010	$ 150,000
D-2	PRV Adjustments on NW 16th and NW McIntosh	2010	-
D-3	12-inch DI main on NW 38th Avenue	2010	$ 750,000
D-1	Pipeline Replacement	2011	$ 150,000
D-4	UPH PRV adjustments and looping around NW Astor	2011	$ 323,000
D-5	Butler Site PRV, 8-inch	2011	$ 89,000
T-1	Forest Home Booster Station Site Acquisition	2011	$ 50,000
C-2	Leak Detection Study	2011	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2011	$ 25,000
C-4	Residential Water Audit Program	2011	$ 50,000
SR-3	Treatment Plant Facility Plan	2012	$ 60,000
D-1	Pipeline Replacement	2012	$ 150,000
D-6	Couch Street Booster Pump Station	2012	$ 120,000
D-7	UPH looping from NW 16th to NW 12th Avenue	2012	$ 78,000
T-2	Forest Home Booster Station Upgrade	2012	$ 464,800
T-3	Forest Home Transmission Upgrade	2012	$ 358,000
T-4	Crown Road 24-inch Transmission Main	2012	$ 1,508,000
T-5	Crown Road Booster Station	2012	$ 213,000
T-6	Portable Booster Station	2012	$ 15,000

Table 8-9 6-year Capital Improvement Project Summary (Continued)

No.	Title	Year	City Project Cost[(1)]
C-2	Leak Detection Study	2012	$ 6,000
C-3	Commercial/Industrial Water Audit Program	2012	$ 25,000
C-4	Residential Water Audit Program	2012	$ 50,000
D-1	Pipeline Replacement	2013	$ 150,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2013	$ 2,300,000
C-2	Leak Detection Study	2013	$ 6,000
C-4	Residential Water Audit Program	2013	$ 50,000
D-1	Pipeline Replacement	2014	$ 150,000
S-1	Lower Prune Hill Reservoir Evaluation	2014	$ 80,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2014	$ 2,300,000
C-2	Leak Detection Study	2014	$ 6,000
SR-4	Well 17 Feasibility Study - Camas Meadows Site	2015	$ 50,000
D-1	Pipeline Replacement	2015	$ 150,000
T-7	NUGA 544 Zone - 24 inch Transmission Main	2015	$ 2,441,000
6-Year Capital Improvement Total			**$14,044,800[(2)]**

(1) CCI = 8,660.08 per ENR January 2010.
(2) CIP totals only include portion City will fund. Does not include NUGA (N) projects or developer (DE) projects.

Table 8-10 20-year Capital Improvement Project Summary

No.	Title	Year	City Project Cost[(1)]
D-1	Pipeline Replacement	2016	$ 150,000
DE-1	DI main between NW Camas Meadows Drive to SE 1st Street	2016	$ 985,000
T-8	Transmission from Cemetery Reservoir to 290 Zone	2016	$ 514,000
T-9	Cemetery Booster Station	2016	$ 784,250
T-10	Transmission from Cemetery BS to 455 Zone	2016	$ 1,275,000
T-11	Convert 12-inch CI to supply 455 Zone	2016	$ 50,000
S-2	2.0-MG Cemetery Reservoir	2016	$ 2,188,000
S-3	Decommission Butler Reservoir	2016	$ 40,000
SR-5	Treatment Plant Upgrades	2017	$ 6,000,000
D-1	Pipeline Replacement	2017	$ 150,000
DE-2	UPH looping along NW 16th Avenue	2017	$ 323,000
N-1	15,600 LF of 12-inch NUGA Transmission Main	2017	$ 3,434,000
SR-6	Well 17 Development - Camas Meadows Site	2018	$ 1,650,000
T-12	Lower Prune Hill Booster Station Upgrade	2018	$ 483,000
D-1	Pipeline Replacement	2018	$ 150,000
DE-3	542 Zone looping	2018	$ 494,000
S-4	2.0 MG Gregg Reservoir	2018	$ 2,188,000
N-2	5,300 LF of 12-inch NUGA Transmission Main	2018	$ 1,294,000
D-1	Pipeline Replacement	2019	$ 150,000
DE-4	Decommission 10th Avenue/Francis Street Booster Station	2019	$ 471,000
N-3	1,900 LF of 12-inch NUGA Transmission Main	2019	$ 590,000
S-5	Lower Prune Hill Reservoir Replacement	2020	$ 1,539,000
D-1	Pipeline Replacement	2020	$ 150,000

Table 8-10 20-year Capital Improvement Project Summary (Continued)

No.	Title	Year	City Project Cost[(1)]
D-8	UPH Standpipe outlet piping upgrade, 24-inch	2020	$ 151,000
T-13	Lacamas Booster Station Upgrade	2020	$ 177,000
T-14	20-inch Suction Side Transmission to Lacamas Booster Station	2020	$ 1,731,000
N-4	11,200 LF of 12-inch NUGA Transmission Main	2020	$ 2,519,000
D-1	Pipeline Replacement	2021	$ 150,000
N-5	2,600 LF of 12-inch NUGA Transmission Main	2021	$ 735,000
SR-7	Well 15 Development - Parkers Landing Site	2022	$ 1,650,000
SR-8	NUGA Source Development	2022	$ 500,000
D-1	Pipeline Replacement	2022	$ 150,000
N-6	7,900 LF of 12-inch NUGA Transmission Main	2022	$ 1,835,000
D-1	Pipeline Replacement	2023	$ 150,000
T-15	Replace 14-inch Steel Transmission from Butler Site to 455 Zone	2023	$ 1,563,000
N-7	5,700 LF of 12-inch NUGA Transmission Main	2023	$ 1,379,000
SR-9	Well 16 Development - Wastewater Treatment Plant Site	2024	$ 1,650,000
D-1	Pipeline Replacement	2024	$ 150,000
DE-5	Upper Green Mountain Booster Station	2024	$ 419,200
S-6	2.0 MG Green Mountain Reservoir	2024	$ 1,838,000
T-16	Crown Road Booster Station Upgrade	2024	$ 80,250
T-17	12-inch along Polk Street for Well 16 transmission	2024	$ 514,000
T-18	Jones and Boulder Creek Transmission Improvements	2025	$ 6,974,000
D-1	Pipeline Replacement	2025	$ 150,000

Table 8-10 20-year Capital Improvement Project Summary (Continued)

No.	Title	Year	City Project Cost[1]
D-1	Pipeline Replacement	2026	$ 150,000
SR-10	Well 18 Development - Fire Station Site	2026	$ 1,000,000
SR-11	Steigerwald Source Development	2026	$ 500,000
D-1	Pipeline Replacement	2027	$ 150,000
D-1	Pipeline Replacement	2028	$ 150,000
D-1	Pipeline Replacement	2029	$ 150,000
6-Year Capital Improvement Total			**$14,044,800**
20-Year Capital Improvement Total			**$37,139,500**
Complete Capital Improvement Total			**$56,358,300[2]**

(1) CCI = 8,660.08 per ENR January 2010.
(2) CIP totals only include portion City will fund. Does not include NUGA (N) projects or developer (DE) projects.

Table 8-11 6-year Capital Improvement Project Schedule

No.	Total	2010	2011	2012	2013	2014	2015
SR-1	$ 1,650,000	$1,650,000					
SR-2	$ 35,000	$ 35,000					
SR-3	$ 60,000						
SR-4	$ 50,000			$ 60,000			$ 50,000
D-1	$ 900,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000	$ 150,000
D-2		$ -					
D-3	$ 750,000	$ 750,000					
D-4	$ 323,000		$ 323,000				
D-5	$ 89,000		$ 89,000				
D-6	$ 120,000			$ 120,000			
D-7	$ 78,000			$ 78,000			
S-1	$ 80,000					$ 80,000	
T-1	$ 50,000	$ 50,000					
T-2	$ 464,800		$ 200,000	$ 264,800			
T-3	$ 358,000		$ 150,000	$ 208,000			
T-4	$ 1,508,000		$ 750,000	$ 758,000			
T-5	$ 213,000		$ 115,000	$ 98,000			
T-6	$ 15,000			$ 15,000			
T-7	$ 7,041,000				$2,300,000	$2,300,000	$2,441,000
C-1	$ 5,000	$ 5,000					
C-2	$ 30,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000	$ 6,000	
C-3	$ 75,000	$ 25,000	$ 25,000	$ 25,000			
C-4	$ 150,000		$ 50,000	$ 50,000	$ 50,000		
TOTAL	**$14,044,800**	**$2,671,000**	**$1,858,000**	**$1,832,800**	**$2,506,000**	**$2,536,000**	**$2,641,000**

Chapter 9
FINANCING

INTRODUCTION
This chapter analyzes the City's ability to finance the water improvements outlined in the previous chapters. The potential funding sources, financial status of the water utility, the funding required to pay for the scheduled improvements, and the impact of water improvements on water rates are presented.

CURRENT WATER RATES
Water rates for the City are defined in the Camas Municipal Code (CMC) Chapter 13.36.010. Rates are set by ordinance. Current rates were set in March 2009 by Ordinance No. 2539 and updated in December 2009. Water service is charged a flat monthly minimum service fee based on meter size, plus a commodity charge per hundred cubic foot based on customer classification. Customers outside the city limits are charged more for the monthly minimum service charge and consumption. Table 9-1 shows the current inside city and outside city minimum monthly service charges based on meter size. Table 9-2 shows the existing water commodity charge per hundred cubic feet by customer classification.

Table 9-1 Monthly Minimum Water Service Charge

Meter Size	Inside City	Outside City
5/8 Inch	$6.75	$10.13
3/4 Inch	$7.32	$10.98
1 Inch	$9.03	$13.55
1-1/4 Inch	$10.16	$15.24
1-1/2 Inch	$11.31	$16.97
2 Inch	$17.57	$26.36
3 Inch	$63.68	$95.52
4 Inch	$80.77	$121.16
6 Inch	$120.62	$180.93
8 Inch	$166.17	$249.26
10 Inch	$217.41	$326.12

Table 9-2 Water Volume Charge(1)

Customer Classification	Inside City	Outside City
Residential	$1.30 per 100 c.f.	$1.95 per 100 c.f.
Commercial	$1.58 per 100 c.f.	$2.36 per 100 c.f.
Industrial	$1.31 per 100 c.f.	$1.97 per 100 c.f.
Irrigation	$1.47 per 100 c.f.	$2.21 per 100 c.f.
Cemetery	$0.59 per 100 c.f.	$0.88 per 100 c.f.

(1) In one hundred cubic feet (100 cf) consumed per month.

CURRENT CONNECTION FEES

City water utilities are authorized by RCW 35.92.025 to charge connection fees based on an equitable share of existing and planned water system costs. The present City connection fees were established by Ordinance 2539. The current connection fees schedule is illustrated in Table 9-3.

Table 9-3 Connection Fees

Meter Size	Single-Family Residential[(2)]	Commercial	Industrial	Irrigation
5/8 Inch	$1,714	$1,673	$9,987	$3,263
3/4 Inch	$2,317	$2,182	$13,984	$4,790
1 Inch	$3,549	$3,224	$22,004	$7,871
1-1/2 Inch	$6,539	$5,738	$41,964	$11,676
2 Inch	$10,288	$8,917	$66,078	$15,481
3 Inch	$21,632	$18,741	$131,729	$24,775
4 Inch		$28,198	$203,992	$50,907
6 Inch		$58,122	$404,375	$78,711
8 Inch		$85,127	$644,731	$155,597

FINANCIAL OPERATIONS

The City performs financial analysis of their utility services periodically. The most recent study by FCS Group was performed in June 2009. FCS coordinated with Gray & Osborne to reflect the growth projections provided in Chapter 3, and the CIP projects presented in Chapter 7. Table 9-4 provides a summary of the City's 2008/2009 cash flow, and projected 6 year cash flow. The majority of this analysis was performed by FCS Group. However, the FCS Group analysis scope did not include growth within the NUGA. A conservative estimate has been provided for rate revenues within the NUGA. Projections also include an increase of rates to support the CIP. The rate increase is a 5 percent per year increase between 2010 and 2013. Water utility revenues, expenditures, and the resulting effects on water utility cash and investments for the years 2008-2015 is summarized in Table 9-4. The preliminary financial study by FCS Group is located in Appendix T. Table 9-5 summarizes the operating water fund balance from 2008 to 2015. Table 9-6 summarizes the capital water fund balance from 2008 to 2015.

Table 9-4 2008 – 2015 Net Operation Cash Flow[1]

Revenues	2008[2]	2009	2010	2011	2012	2013	2014	2015
Rate Revenue[3]	$2,765,100	$3,145,704	$3,424,819	$3,650,001	$3,889,989	$4,145,755	$4,207,941	$4,271,060
NUGA Revenue[4]	$ -	$ -	$ -	$ 90,860	$ 181,474	$ 272,334	$ 363,194	$ 454,054
Non-Rate Revenue	$ 330,300	$ 216,088	$ 232,008	$ 247,410	$ 257,712	$ 273,029	$ 286,680	$ 301,014
Total Revenue	**$3,095,400**	**$3,361,792**	**$3,656,827**	**$3,988,271**	**$4,329,175**	**$4,691,118**	**$4,857,816**	**$5,026,129**
Expenses	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Operating Expenses	$2,325,196	$2,607,902	$2,709,642	$2,815,625	$2,925,971	$3,041,027	$3,162,668	$3,289,175
Existing Debt Service	$ 380,659	$ 402,641	$ 403,908	$ 401,061	$ 401,757	$ 400,917	$ 400,917	$ 400,917
New Debt Service	$ -	$ 201,605	$ 272,261	$ 272,261	$ 559,428	$ 650,395	$ 650,395	$ 650,395
Additional Taxes from Rate Increase	$ -	$ 17,055	$ 28,974	$ 38,150	$ 48,038	$ 58,686	$ 58,686	$ 58,686
Rate Funded System Reinvestment	$ -	$ -	$ -	$ 200,000	$ 200,000	$ 200,000	$ -	$ -
Total Expenses	**$2,705,855**	**$3,229,203**	**$3,414,785**	**$3,727,097**	**$4,135,194**	**$4,351,025**	**$4,272,666**	**$4,399,173**
Net Cash Flow after Rate Increase	**$ 389,545**	**$ 132,589**	**$ 242,042**	**$ 261,174**	**$ 193,981**	**$ 340,093**	**$ 585,150**	**$ 626,956**

(1) 2008 – 2013 analysis conducted by FCS Group. 2014 and 2015 values projected by Gray & Osborne. Projections will be revisited by City personal as new information becomes available.
(2) Actual values used from records for 2008 data.
(3) Includes 5 percent per year rate increase from 2010 to 2013.
(4) Projected based on ERU growth within the NUGA as shown in Chapter 3. Conservative NUGA revenues based on 2008 residential rate revenue per ERU.

Table 9-5 2008 – 2015 Operating Funds Budget[1]

Operating Budget	2008[2]	2009	2010	2011	2012	2013	2014	2015
Beginning balance	$479,154	$573,337	$643,044	$668,131	$694,264	$721,472	$749,842	$779,835
Net cash flow after rate increase	$389,545	$132,589	$242,042	$261,174	$193,981	$340,093	$585,150	$626,956
Transfer to capital fund	($295,362)	($ 62,882)	($216,955)	($235,041)	($166,773)	($311,724)	($555,157)	($595,763)
Ending balance	**$573,337**	**$643,044**	**$668,131**	**$694,264**	**$721,472**	**$749,842**	**$779,835**	**$811,028**

(1) 2008 – 2013 analysis conducted by FCS Group. 2014 and 2015 values projected by Gray & Osborne.
(2) Actual values used from records for 2008 data.

Table 9-6 2008 – 2015 Capital Funds Budget[1]

Summary Capital Cash Flows	2008[2]	2009	2010	2011	2012	2013	2014	2015
Beginning Balance	**$ 181,256**	**$ 226,195**	**$1,258,181**	**$1,580,212**	**$1,162,618**	**$2,661,145**	**$3,573,592**	**$ 592,721**
(+) Rate funded system reinvestment	$ -	$ -	$ -	$ 200,000	$ 200,000	$ 200,000	$ -	$ -
(+) Grants/Developer donations/Outside sources	$ -	$ 390,000	$2,232,968	$ 363,657	$ -	$2,676,451	$ -	$ -
(+) Transfer from REET	$ 500,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -
(+) Existing bond proceeds	$4,084,800	$ -	$ -	$ -	$ -	$ -	$ -	$ -
(+) Connection charges	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104
(+) Net debt proceeds available for projects	$ -	$2,140,000	$ 750,000	$ -	$3,220,000	$1,020,000	$ -	$2,000,000
(+) Interest earnings[3]	$ 5,673	$ -	$ 41,763	$ 51,273	$ 38,137	$ 84,714	$ 112,427	$ 18,879
(+) Transfer from operating fund	$ 295,362	$ 62,882	$ 216,955	$ 235,041	$ 166,773	$ 311,724	$ 555,157	$ 595,763
(-) Total Capital Expenses[4]	($5,030,000)	($1,750,000)	($3,106,000)	($1,454,383)	($2,313,390)	($3,567,328)	($3,852,043)	($3,089,000)
Ending Balance	**$ 226,195**	**$1,258,181**	**$1,580,212**	**$1,162,618**	**$2,661,145**	**$3,573,592**	**$ 576,591**	**$ 290,332**

(1) 2008 – 2013 analysis conducted by FCS Group. 2014 and 2015 values projected by Gray & Osborne.
(2) Actual values used from records for 2008 data.
(3) Interest rate = 3.1 percent.
(4) Total of CIP projects from Chapter 8, inflated to the year the project takes place at a rate of 4.1 percent.

SUMMARY OF PROJECTED FINANCIAL STATUS

The City will continue to update their financial report with FCS Group as new information is received. They have managed their funds responsibly in the past and will continue to make funds available for the required CIP. Rate increases are planned in the 6-year planning period, and funding is available.

AVAILABLE CAPITAL PROJECT FUNDING SOURCES

This section describes several funding sources available to the City without reference to any specific project, including information on the following:

Grants: USDA Rural Development (RD)

Loans: Public Works Trust Fund Loan
Drinking Water State Revolving Fund
USDA Rural Development (RD)
Community Economic Revitalization Board

Bonds: Revenue Bonds

USDA Rural Development

USDA Rural Development (RD) has a loan program that, under certain conditions, includes a limited grant program. Grant determination is based on a formula that incorporates existing debt service and existing utility water service rates.

In addition, RD has a loan program for needy communities that cannot obtain funding by commercial means through the sale of revenue bonds. The loan program provides long-term 30- to 40-year loans at interest rates that are based on federal rates and vary with the commercial market. Interest rates currently range from 4.5 percent to 5.25 percent and require a 1.1 debt coverage payment to a capital reserve.

Public Works Trust Fund

The Public Works Trust Fund (PWTF) is a revolving loan fund designed to help local governments finance needed public works projects through low-interest loans and technical assistance. The PWTF, established in 1985 by the legislature, offers loans below market rates, payable over periods ranging up to 20 years.

Interest rates are 0.5 percent, 1.0 percent, or 2.0 percent, with the lower rates providing an incentive for a higher financial share. The local community to qualify for a 2.0 percent loan must provide a minimum of 5 percent of the project's costs. A 10 percent local share qualifies the applicant for a 1.0 percent interest rate and a 15 percent local share qualifies for a 0.5 percent loan. The useful life of the project determines the loan term, with a maximum term of 20 years.

To be eligible, an applicant must be a local government such as a City, Town, County, or special purpose utility district, and have a long-term plan for financing its public work needs. If the applicant is a City, Town, or County it must adapt the 1/4 percent real estate excise tax dedicated to capital purposes. Eligible public works systems include streets and roads, bridges, storm sewers, sanitary sewers, and domestic water. Loans are presently offered only for purposes of repair, replacement, rehabilitation, reconstruction or improvement of existing service users. A recent change has now made projects intended to meet reasonable growth (as detailed in a twenty year growth management plan) eligible for PWTF funding.

The funding program operates on an annual cycle, with April and August application dates. The August application date is for preconstruction only, and pre-construction money is typically available by the end of the year. The April application date is both pre-construction and construction loans, with money available in May of the following year.

Drinking Water State Revolving Fund

Loans of up to $2,000,000 are available from this program, which involves the administration of federal funds by two state agencies. Applications are due in July of each year. Terms of the loan vary according to the market interest rate and financial hardship considerations. The most recently offered terms were an interest rate of 3.5 percent over a 20-year repayment period, with no local match requirement. There is also a 2 percent loan origination fee that can be included in the loan request. Lower interest rates and longer repayment periods are available in cases of financial hardship.

Community Economic Revitalization Board (CERB)

This low interest loan and grant program is sponsored by the Department of Trade and Economic Development. Funding is available for infrastructure that supports projects, which will result in specific private developments or expansions in manufacturing, and businesses that support the trading of goods and services outside the state's border. Funding is not available to support retail shopping developments or acquisition of real property. The projects must create or retain jobs. The funding is one job per $3,000 of CERB financing. The interest rate fluctuates with the state bond rate.

Revenue Bonds

A common source of funds for construction of major utility improvements is the sale of revenue bonds. The tax-free bonds would be issued by the City, and the bonds are repaid and backed by water service rate revenue. In order to market revenue bonds, the issuer must typically show that its net water utility operating income (gross income less expenses) is equal to or greater than a factor, typically 1.2 – 1.4, times the annual debt service on all par debt issued. This 1.4 factor is commonly referred to as the debt coverage factor and is applicable to revenue bonds sold on the commercial market. The required debt coverage factor may be specified in previous revenue bond ordinances. If not, it will be determined at the time of bond issue.

RECOMMENDATION

Scheduled capital improvement projects can be funded by operating revenues, system development charges, and PWTF loan financing. Financial reserves are projected to be adequate and available for operations, contingencies, and capital replacement. The City should aggressively pursue PWTF loan financing for capital improvements, closely monitor revenues, expenditures and reserve fund balances, adjusting water utility rates accordingly.

List of Appendices

APPENDICES:

Appendix A WFI
Appendix B DOH Checklist and Submittal Form
Appendix C Water Rights Documentation
Appendix D SEPA and DNS
Appendix E City of Camas Design Standards
Appendix F City of Camas 2008 Water Quality Report
Appendix G City of Camas Intertie Agreement
Appendix H Coliform Monitoring Plan
Appendix I Volatile Organic Chemical Test Results
Appendix J Lead and Copper Test Results
Appendix K Inorganic Compound Test Results
Appendix L Water Modeling Results
Appendix M Preventative Maintenance Schedule
Appendix N Emergency Response Program
Appendix O Cross Connection Control Ordinance
Appendix P Wellhead Protection Program
Appendix Q Watershed Control Program
Appendix R Consistency Statement
Appendix S Detailed Cost Estimates
Appendix T FCS Group Financial Analysis - DRAFT

Appendix A

WFI

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter 1
Updated: 03/03/2009
Printed: 11/24/2009
WFI Printed For: On-demand
Submission Reason: Pop/Connect Update

RETURN TO: Southwest Regional Office, PO Box 47823, Olympia, WA, 98504

1. SYSTEM ID NO	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
10800 2	CAMAS MUNICIPAL WATER SEWER SYSTEM	CLARK	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

STEVENS MICHAEL A. [OPERATIONS SUP
1620 SE 8TH AVE
CAMAS, WA 98607

7. OWNER NAME & MAILING ADDRESS — **8. Owner Number** 000789

CAMAS, CITY OF
MONTE BRACHMANN — TITLE: PUBLIC WORKS DI
PO BOX 1055
CAMAS, WA 98607

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS 616 NORTHEAST FOURTH AVE
CITY CAMAS STATE WA ZIP 98607

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone:	(360) 817-1567 x4283	Owner Daytime Phone:	(360) 817-1534
Primary Contact Mobile/Cell Phone:	(360) 921-2872	Owner Mobile/Cell Phone:	(360) 921-3799
Primary Contact Evening Phone:	(xxx)-xxx-xxxx	Owner Evening Phone:	(xxx)-xxx-xxxx
Fax: (360) 834-0215	E-mail: mstevens@ci.camas.wa.us	Fax: (360) 834-1535	E-mail: mbrachmann@ci.camas.wa.us

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed — SMA NAME: _____ SMA Number: _____
- [ ] Managed Only
- [ ] Owned Only

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

[ ] Agricultural	[ ] Hospital/Clinic	[x] Residential
[x] Commercial / Business	[x] Industrial	[x] School
[x] Day Care	[x] Licensed Residential Facility	[ ] Temporary Farm Worker
[x] Food Service/Food Permit	[x] Lodging	[x] Other (church, fire station, etc.):
[ ] 1,000 or more person event for 2 or more days per year	[ ] Recreational / RV Park	

13. WATER SYSTEM OWNERSHIP (mark only one)				14. STORAGE CAPACITY (gallons)
[ ] Association	[ ] County	[ ] Investor	[ ] Special District	8,500,000
[x] City / Town	[ ] Federal	[ ] Private	[ ] State	

--- SEE NEXT PAGE FOR A COMPLETE LIST OF SOURCE

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
10800 2	CAMAS MUNICIPAL WATER SEWER SYSTEM	CLARK	A	Comm

15	16	17	18										19			20	21						22	23	24			
	SOURCE NAME	INTERTIE	SOURCE CATEGORY										USE				TREATMENT						DEPTH		SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456. IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME. Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	BOULDER CREEK									X				X		Y		X	X	X		X		500	SW NE	04	02N	04E
S02	JONES CREEK									X				X		Y		X	X	X		X		500	SE SW	03	02N	04E
S06	DEEP WELL #5 AFP623		X										X			Y		X		X		X	71	600	SW SE	12	01N	03E
S07	DEEP WELL #6 AFP624		X										X			Y		X		X		X	85	1400	NE SW	12	01N	03E
S08	DEEP WELL #7 AFP628		X										X			Y		X		X		X	84	950	NW SW	12	01N	03E
S09	DEEP WELL #8 AFP629		X										X			Y		X		X		X	90	1350	NW SW	12	01N	03E
S11	WELL #9 AFP631		X											X		Y		X		X			161	650	NE NW	04	01N	03E
S13	WELL #11 AHM259		X										X			Y		X		X		X	80	1200	NW SW	12	01N	03E
S14	WELL #12 AHM266		X										X			Y		X		X		X	81	1300	NW SW	12	01N	03E
S15	WELL #10 AGP495		X										X			Y		X		X		X	82	1300	NW SW	12	01N	03E
S16	WELL #13 ALL997		X										X			Y		X		X		X	80	1325	SW NW	12	01N	03E

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
10800 2	CAMAS MUNICIPAL WATER SEWER SYSTEM	CLARK	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	6966	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	6398		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	128		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180	568		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	0	0	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	275	275	
28. TOTAL SERVICE CONNECTIONS		7241	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days p: 17415

30. PART-TIME RESIDENTIAL POPULATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many part-time residents are present each month?												
B. How many days per month are they present?												

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?												
B. How many days per month is water accessible to the public?												

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	3969	3969	3969	3969	3969	3969	1857	1857	3969	3969	3969	3969
B. How many days per month are they present?	20	20	20	20	20	20	20	20	20	20	20	20

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	20	20	20	20	20	20	20	20	20	20	20	20

35. Reason for Submitting WFI:

☐ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other _____

36. I certify that the information stated on this WFI form is correct to the best of my knowledge.

SIGNATURE: _____ DATE: _____

PRINT NAME: _____ TITLE: _____

WS ID	WS Name
10800	CAMAS MUNICIPAL WATER SEWER SYSTEM

Total WFI Printed: 1

Appendix B

DOH Checklist and Submittal Form

Water System Plan Submittal Form

This form is required to be submitted along with the Water System Plan (WSP). It will serve to expedite review and approval of your WSP. WSPs will not be reviewed until submittal form and checklist are completed.

City of Camas	10800	City of Camas
1. Water System Name	2. PWS ID# or Owner ID#	3. System Owner Name
Mike Stevens	(360) 817-1563	Operations Supervisor
4. Contact Name for Utility	Phone Number	Title
1620 SE 8th Ave	Camas	WA 98607
Contact Address	City	State Zip
Russ Porter, P.E. Gray & Osborne, Inc.	(206) 284-0860	Project Manager
5. Project Engineer	Phone Number	Title
701 Dexter Ave North, Suite 200	Seattle	WA 98109
Project Engineer Address	City	State Zip
6. Billing Contact Name (required if not the same as #4)	Billing Phone Number	Billing Fax Number
Billing Address	City	State Zip

6. How many services are presently connected to the system? 7,095
7. Is the system expanding? (seeking to extend service area or increase number of approved connections) ☒ Yes ☐ No
8. If number of services is expected to increase, how many new connections are proposed in the next six years? _____
9. If the system is private-for-profit, is it regulated by the State Utilities and Transportation Commission? ☐ Yes ☒ No
10. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)? ☒ Yes ☐ No
11. Is the system a customer of a wholesale water purveyor? ☐ Yes ☒ No
12. Will the system be pursuing additional water rights from the State Department of Ecology in the next twenty years? ☒ Yes ☐ No
13. Is the system proposing a new intertie? ☐ Yes ☒ No
14. Do you have projects currently under review by the Department of Health? ☐ Yes ☒ No
15. Are you requesting distribution main project report and construction document submittal exception, and if so, does the WSP contain standard construction specifications for distribution mains? ☒ Yes ☐ No
16. Are you requesting distribution related project report and construction document submittal exception, and if so, does the WSP contain distribution facilities design and construction standards, including internal engineering review procedures? ☒ Yes ☐ No
17. Have you sent copies of the draft WSP or notice to adjacent purveyors for their review? ☒ Yes ☐ No
18. Have you sent copies of the draft WSP to local governments with jurisdiction within your service area for their review? ☒ Yes ☐ No
19. Are you proposing a change in the place of use of your water right? ☐ Yes ☒ No

If answer to questions 17 and 18 is yes, list adjacent utilities/entities that have received a copy of the draft WSP: Clark County PUD, Clark County, City of Vancouver, and the City of Washougal.

Is this plan: ☐ an Initial Submittal ☒ a Revised Submittal

Please enclose the following number of copies of the WSP:

2 copies for Department of Health
1 copy for Department of Ecology
1 additional copy if you answered "yes" to question 9

3 Total copies attached

Please return completed form to the Office of Drinking Water regional office checked below.

☐ **Northwest Drinking Water Operations**
Department of Health
20435 72nd Ave. S, Ste 200
Kent, WA 98032-2358
(253) 395-6750

☒ **Southwest Drinking Water Operations**
Department of Health
PO Box 47823
Olympia, WA 98504-7823
(360) 236-3030

☐ **Eastern Drinking Water Operations**
Department of Health
1500 W. Fourth Ave, Suite 305
Spokane, WA 99201
(509) 456-3115

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WATER SYSTEM PLAN (WSP) CHECKLIST

	√ Required	Content Description	WSP Page #
	(√)	**Water System Plan Submittal Form**	
Chapter 1		**Description of Water System**	
	(√)	Ownership and management (updated/current WFI)	7-2, Apx A
	(√)	System history and background	1-2, 1-3
	(√)	Brief inventory of existing facilities	1-7, Fig 1-4
	(√)	Related plans: City/County land use map, CWSP, adjacent utilities	3-11, Fig 3-1
	(√)	Maps: existing, future and retail service area	Fig 3-2
	(√)	Discussion of service area agreements and policies, conditions of service, Satellite Management Agency	3-2
	(√)	Duty to serve policies for retail service area	3-3
	(√)	Local Government Consistency from **planning** agencies	Apx R
	(√)	"Not-inconsistent" statement from Ecology for **water resource inventory area** (WRIA) **WRIA #_28_**	Apx R
Chapter 2		**Basic Planning Data**	
	(√)	Current: Population, service connections, & ERU's	3-11, 3-13, 3-20
	(√)	Population, service connections, & ERU projections for 6 & 20 years	3-26, 3-31
	(√)	Demand forecasts w/ & w/o expected WUE savings for 6 & 20 years	3-26, 6-13
	(√)	DSL percentage and volume	3-19
	(√)	Water Use Data: Monthly and annual production and consumption totals per source, annual usage by customer class, annual usage for water supplied to, or purchased from, other systems	3-14, 3-17
Chapter 3		**System Analysis**	
	(√)	System design standards (fire flow, system pressures, etc.)	2-10 to 2-14
	(√)	System inventory, description and analysis	1-7, 4-11
	(√)	Source	4-13
	(√)	Storage	4-18
	(√)	Distribution system/hydraulics (with equalization & FFS depleted)	5-9
	(√)	Add pressure zones	1-15
	(√)	Treatment	1-11, 4-2
	(√)	Capacity analysis source/storage/water rights/other	4-7, 4-17
	(√)	Water quality analysis	4-2
	(√)	Summary of system deficiencies	4-24
	(√)	Analysis of possible improvement projects	4-24
Chapter 4		**Water Use Efficiency (WUE) Program and Water Rights**	
	(√)	Water Use Efficiency Program per WAC 246-290-810	6-1
	(√)	Describe your current WUE program	6-5
	(√)	Identification of efficiency goal and meet public process requirements	6-9
	(√)	Evaluation of measures for cost-effectiveness w/schedule & budget	6-12

√ Required	Content Description	WSP Page #
(√)	Description of consumer education process ☆	6-11
(√)	Estimate of projected water savings from selected measures	6-12
(√)	Description of process to determine effectiveness of program	6-11
( )	**Greater than 1000 Connections** ♦ Estimate projected savings from efficiency measures for past 6 yrs ♦ Extra demand forecast if not implementing all measures ♦ Marginal cost identified ♦ Cost-effective evaluation of measures if shared with other systems ♦ Quantitative or qualitative evaluation of societal perspective	6-12, 6-13
( )	**Less Than 1000 Connections** ♦ Description of evaluation process used to select measures	
(√)	**Distribution System Leakage (DSL*)** Total Production and Purchased (TP): ♦ Add any water purchased from other water suppliers ♦ Subtract any water sold to another water system ♦ Subtract all estimated authorized consumption (e.g. fire flow, flushing of mains, etc.) ♦ Subtract any estimated transmission line loss, if applicable Total annual amount of water delivered to customers from service meter records (AC) Annual Distribution System Leakage (DSL)* in percent and volume, gallons or millions of gallons *DSL = [(TP – AC) / (TP)] X 100 *Where:* DSL = Percent of Distribution System Leakage (%) TP = Total Water Produced and Purchased AC = Authorized Consumption	6-5
( )	Not fully metered: ♦ Schedule for installation, including interties ♦ Funding and meter account identified in budget ♦ Percentage of meters to install each year identified ♦ Activities to minimize leakage ♦ Leak detection survey scheduled ♦ Identify date for meter installation status report	
( )	Clustered entity, designated by land use or local zoning, (campground, RV park, apartment bldg, designated mobile home park)	
( )	Alternate methodology to calculate distribution leakage	
(√)	**Control Plan (use 3 yrs of data)** **>10% Distribution System Leakage for 3-yr average** ♦ Schedule and Budget ♦ Technical and economic concerns addressed ♦ **>10% - < 19%** assessment of data accuracy and data collection ♦ **>19% - < 29%** assessment of data accuracy and data collection, and field activities to reduce leakage w/in 12 mos. ♦ **>29%** assessment of data accuracy and data collection, field activities to reduce leakage w/in 6 months	6-11
( )	**>10% DSL for last 3-year avg & < 500 request for 20% allowance** ♦ Production volume identified ♦ Distribution system leakage volume identified ♦ Evidence of leak detection survey w/in past 6 yrs ♦ All leaks repaired ♦ Unable to locate additional leaks ♦ Active program to minimize leakage identified	

☆Counts as an efficiency measure if implemented

√ Required	Content Description	WSP Page #
	♦ Describes system specific characteristics that justify higher leakage	

	(√)	**Water Rights** - 1) Description of water right status. 2) Legal description from water right. 3) Include a copy of water right certificate(s). 4) Capacity table. 5) Water right self assessment forms for existing, 6 & 20 year projections. 6) Well log and USGS map showing point of withdrawal/diversion and place of use.	1-5, 1-6 Apx C, Apx P
	(√)	Water supply characteristics, description & discussion on effect of water use	1-7, 1-8, 1-9
	(√)	Source of supply analysis and evaluation of supply alternatives	4-11
	(√)	Interties	1-23
	(√)	≥1,000 connections explore reclaimed water opportunities☆	6-11
Chapter 5		**Source Water Protection (Check One or Both)**	
	(√)	Wellhead protection program or two year update	Apx P
	(√)	Watershed control program	Apx Q
Chapter 6		**Operation and Maintenance Program**	
	(√)	Water system management and personnel	7-2
	(√)	Operator certification	7-3
	(√)	Routine operating procedures and preventive maintenance	7-3, Apx M
	(√)	Water quality sampling procedures & program	4-2
	(√)	Coliform monitoring plan	Apx H
	(√)	Emergency program, water shortage plan, service reliability per WAC 246-290-420	Apx N
	(√)	Safety procedures	Apx N
	(√)	Cross-connection control program (> 1,000 provide copies of annual summary report form)	7-9, Apx O
	(√)	Recordkeeping, reporting, and customer complaint program	7-11
	(√)	Summary of O&M deficiencies	7-11
Chapter 7		**Distribution Facilities Design and Construction Standards**	
	(√)	Standard construction specification for distribution mains	Apx E
Chapter 8		**Improvement Program**	
	(√)	Capital improvement schedule for 6 and 20 years	8-13, 8-15
Chapter 9		**Financial Program (See Financial Viability Manual)**	
	(√)	≥1000 connections – Balanced 1-year budget / UTC	9-6
	( )	<1000 connections – Balanced 6-year budget, w/ Financial Viability-Feasibility	
	(√)	Revenue and cash flow stability to fund capital and emergency improvements	9-4, 9-5, 9-6
Chapter 10		**Miscellaneous Documents**	
	( )	Meeting of the consumers (date and description)	
	( )	Local Government / Adjacent Utility Correspondence	
	(√)	State Environmental Policy Act (SEPA) Determination >1,000	Apx D
	( )	Agreements	
	( )	Satellite Management Contract and Water User Agreement	

*All maps should be a minimum of 11"x17".
*When DOH is ready to approve the final WSP, the plan must be adopted by the governing body (i.e. city council, board, etc.).

*If requesting source approval with WSP, please include all source approval documents in a separate section.

Appendix C

Water Rights Documentation

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712(1)		8/22/23	SO1/Boulder Creek		1120	1820	590	679	530	2288
2. S 711 CS2-SWC 711(1)		9/05/30	SO2/ Jones Creek		450	730	450		0	
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118	1200	3333 (includes SO14, SO15, and expanded wellfield permit below)	0	
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208	1325		0	
5. G 6636-A		3/22/68	SO6/Well 5		600	920	500		100	
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400	1450		50	
7. G2-00501		3/22/71	SO8/Well 7		1000	530	950		50	
8. G2-24400		2/04/77	SO9/Well 8		900	530	900		0	
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)	650	127	0	83 (S)
10. G2-30144		8/13/86	Expanded Wellfield		500	2150	450(4)	Included above	50	Included above
11. G2-30145(2)		8/13/86	Anderson Site		1000	880	0		1000	880
12. G2-30146(2)		8/13/86	Parkers Landing		1000	880	0		1000	880
13. G2-30147(2)		8/13/86	Treatment Plant Well		1000	880	0		1000	880
Claims 1.G2-CV1-2P159 121022		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320	900	Included above	0	Included above

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230	900		0	
TOTAL	**********	**********	**********	**********	12,475	11,090	8,695	3,460	3,780	7,630

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Camas Meadows				1000	
3.					
4.					

(1) These rights are not available for use during peak water use months. Only available between November 1 and May 14. Not included in instantaneous total.
(2) These site are not yet developed.
(3) Wells 5, 6, 7, 8, 10, 11, 12, and 13 are capped at 5,900 acre-ft per year.
(4) Excess wellfield right being utilized at Well 8.

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To return form, please see reverse side.

Please return completed form to the Office of Drinking Water regional office checked below.

☐ NWRO Drinking Water
Department of Health
20435 72nd Ave. S, Ste 200
Kent, WA 98032-2358
Fax: (253) 395-6750

☒ SWRO Drinking Water
Department of Health
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Olympia, WA 98504-7823
Fax: (360) 664-8058

☐ ERO Drinking Water
Department of Health
1500 W. Fourth Ave, Suite 305
Spokane, WA 99201
Fax: (509) 456-3115

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 2

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712(1)		8/22/23	SO1/Boulder Creek		1120	1820				
2. S 711 CS2-SWC 711(1)		9/05/30	SO2/ Jones Creek		450	730				
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118				
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208				
5. G 6636-A		3/22/68	SO6/Well 5		600	920				
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400				
7. G2-00501		3/22/71	SO8/Well 7		1000	530				
8. G2-24400		2/04/77	SO9/Well 8		900	530				
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)				
10. G2-30144		8/13/86	Expanded Wellfield		500	2150				
11. G2-30145(2)		8/13/86	Anderson Site		1000	880				
12. G2-30146(2)		8/13/86	Parkers Landing		1000	880				
13. G2-30147(2)		8/13/86	Treatment Plant Well		1000	880				
Claims 1.G2-CV1-2P159 121022		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320				

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230				
TOTAL	**********	**********	**********	**********	12,475	11,090	9,054	6,639	3,421	4,451

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Camas Meadows				1000	

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DOH Form #331-372 (09/07)

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☐ NWRO Drinking Water
Department of Health
20435 72nd Ave. S, Ste 200
Kent, WA 98032-2358
Fax: (253) 395-6750

☒ SWRO Drinking Water
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Olympia, WA 98504-7823
Fax: (360) 664-8058

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Department of Health
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Spokane, WA 99201
Fax: (509) 456-3115

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 3

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712(1)		8/22/23	SO1/Boulder Creek		1120	1820				
2. S 711 CS2-SWC 711(1)		9/05/30	SO2/ Jones Creek		450	730				
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118				
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208				
5. G 6636-A		3/22/68	SO6/Well 5		600	920				
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400				
7. G2-00501		3/22/71	SO8/Well 7		1000	530				
8. G2-24400		2/04/77	SO9/Well 8		900	530				
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)				
10. G2-30144		8/13/86	Expanded Wellfield		500	2150				
11. G2-30145(2)		8/13/86	Anderson Site		1000	880				
12. G2-30146(2)		8/13/86	Parkers Landing		1000	880				
13. G2-30147(2)		8/13/86	Treatment Plant Well		1000	880				
Claims 1.G2-CV1-2P159 121022		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320				

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230				
TOTAL	**********	**********	**********	**********	12,475	11,090	14,174	10,523	-1,699	567

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Cathas Meadows				1000	

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Olympia, WA 98504-7823
Fax: (360) 664-8058

☐ ERO Drinking Water
Department of Health
1500 W. Fourth Ave, Suite 305
Spokane, WA 99201
Fax: (509) 456-3115

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION

WATER RIGHT CLAIM

RECEIVED
DEPT. OF ECOLOGY
JUL 17 1974
132-272
NUMBER NONE

1. NAME CITY OF CAMAS, WASHINGTON

ADDRESS 616 N.E. 4th Avenue

Camas, Washington ZIP CODE 98607

2. SOURCE FROM WHICH THE RIGHT TO TAKE AND MAKE USE OF WATER IS CLAIMED: Ground (SURFACE OR GROUND WATER)

W.R.I.A. 28 (LEAVE BLANK)

A. IF GROUND WATER, THE SOURCE IS Deep Well No. 1

B. IF SURFACE WATER, THE SOURCE IS

3. THE QUANTITIES OF WATER AND TIMES OF USE CLAIMED:

A. QUANTITY OF WATER CLAIMED 900 gpm PRESENTLY USED 900 gpm
(CUBIC FEET PER SECOND OR GALLONS PER MINUTE)

B. ANNUAL QUANTITY CLAIMED 320 PRESENTLY USED Average 300
(ACRE FEET PER YEAR)

C. IF FOR IRRIGATION, ACRES CLAIMED PRESENTLY IRRIGATED

D. TIME(S) DURING EACH YEAR WHEN WATER IS USED: All Year

4. DATE OF FIRST PUTTING WATER TO USE: MONTH Unknown YEAR Before 1942

5. LOCATION OF THE POINT(S) OF DIVERSION/WITHDRAWAL: 2159 FEET North AND 667 FEET East FROM THE Southwest CORNER OF SECTION 12

BEING WITHIN Southwest quarter OF SECTION 12 T. 1 N., R. 3 E (E.OR W.) W.M.

IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, LOT BLOCK OF

Within the City limits of the City of Camas
(GIVE NAME OF PLAT OR ADDITION)

6. LEGAL DESCRIPTION OF LANDS ON WHICH THE WATER IS USED: Municipal supply

Clark COUNTY Washington

7. PURPOSE(S) FOR WHICH WATER IS USED: Municipal - Domestic Supply

8. THE LEGAL DOCTRINE(S) UPON WHICH THE RIGHT OF CLAIM IS BASED:

DO NOT USE THIS SPACE

THE FILING OF A STATEMENT OF CLAIM DOES NOT CONSTITUTE AN ADJUDICATION OF ANY CLAIM TO THE RIGHT TO USE OF WATERS AS BETWEEN THE WATER USE CLAIMANT AND THE STATE OR AS BETWEEN ONE OR MORE WATER USE CLAIMANTS AND ANOTHER OR OTHERS. THIS ACKNOWLEDGEMENT CONSTITUTES RECEIPT FOR THE FILING FEE.

DATE RETURNED THIS HAS BEEN ASSIGNED WATER RIGHT CLAIM REGISTRY NO.

FEB 7 1975 21022

DIRECTOR - DEPARTMENT OF ECOLOGY

I HEREBY SWEAR THAT THE ABOVE INFORMATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

X CITY OF CAMAS, WASHINGTON

DATE June 11, 1974

IF CLAIM FILED BY DESIGNATED REPRESENTATIVE, PRINT OR TYPE FULL NAME AND MAILING ADDRESS OF AGENT BELOW.

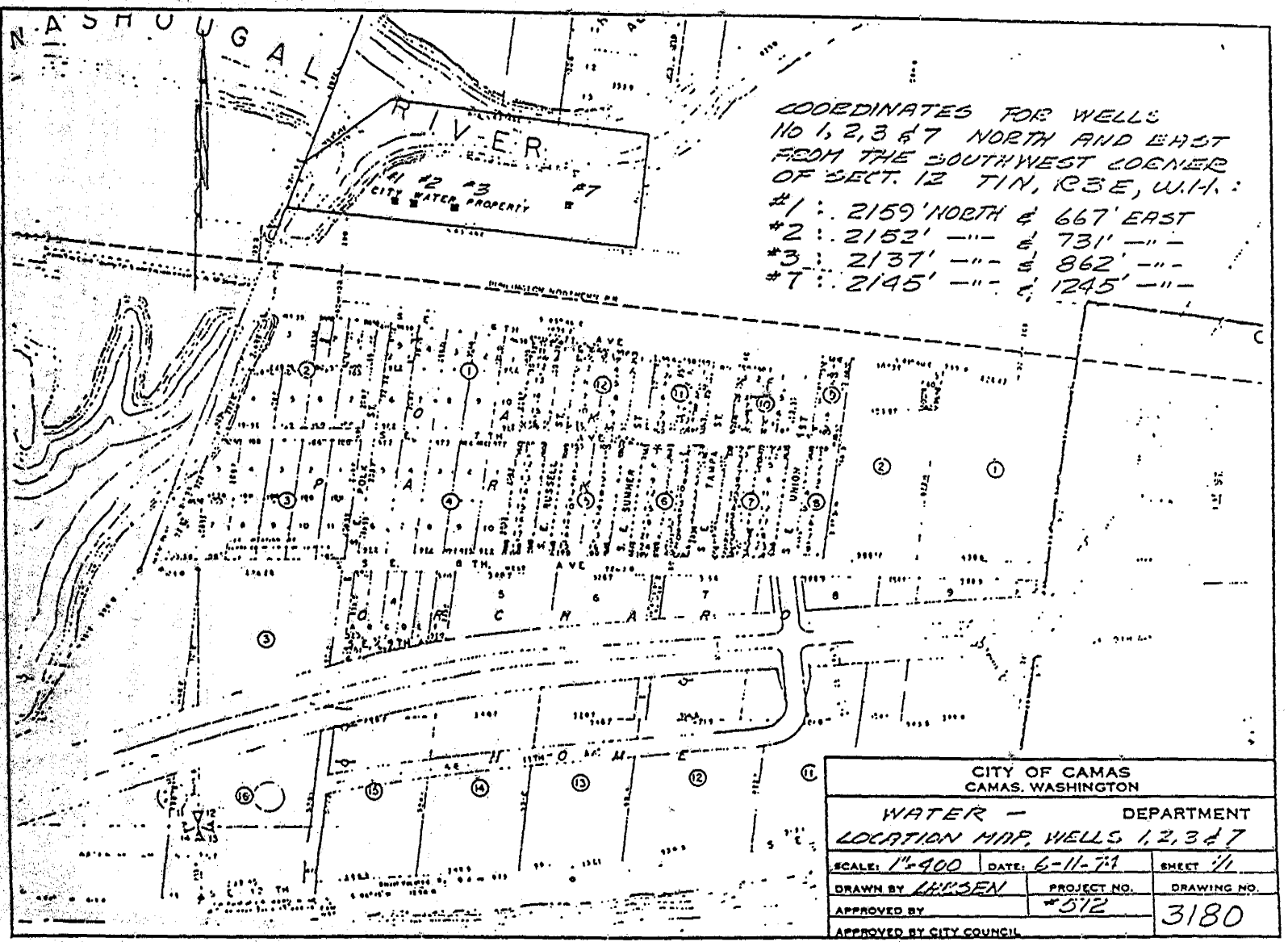
BY: Lewis Angelo
Lewis Angelo, Director of Public Works

☐ ADDITIONAL INFORMATION RELATING TO WATER QUALITY AND/OR WELL CONSTRUCTION IS AVAILABLE.

A FEE OF $2.00 MUST ACCOMPANY THIS WATER RIGHT CLAIM

ORIGINAL DWR

RETURN ALL THREE COPIES WITH CARBONS INTACT, ALONG WITH YOUR FEE TO:
DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION
P.O. BOX 829 OLYMPIA, WASHINGTON 98504


N. ASHOUGAL RIVER
#1 #2 #3 #7
CITY WATER PROPERTY
COORDINATES FOR WELLS
#1, 2, 3 & 7 NORTH AND EAST
FROM THE SOUTHWEST CORNER
OF SECT. 12 T1N, R3E, W.M.:
#1 : 2159' NORTH & 667' EAST
#2 : 2152' —"— & 731' —"—
#3 : 2137' —"— & 862' —"—
#7 : 2145' —"— & 1245' —"—
CITY OF CAMAS
CAMAS, WASHINGTON
WATER — DEPARTMENT
LOCATION MAP, WELLS 1, 2, 3 & 7
SCALE: 1"=400
DATE: 6-11-71
SHEET 1/1
DRAWN BY LARSEN
PROJECT NO. 512
DRAWING NO. 3180
APPROVED BY
APPROVED BY CITY COUNCIL

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION

WATER RIGHT CLAIM

RECEIVED
DEPARTMENT OF ECOLOGY
JUN 21 1974
132273
CASH ___ CHECK ___ MONEY ORDER ___

1. NAME CITY OF CAMAS, WASHINGTON

ADDRESS 616 N.E. 4th Avenue

Camas, Washington ZIP CODE 98607

2. SOURCE FROM WHICH THE RIGHT TO TAKE AND MAKE USE OF WATER IS CLAIMED: Ground (SURFACE OR GROUND WATER)

W.R.I.A. 28 (LEAVE BLANK)

A. IF GROUND WATER, THE SOURCE IS Deep Well No. 2

B. IF SURFACE WATER, THE SOURCE IS

3. THE QUANTITIES OF WATER AND TIMES OF USE CLAIMED:

A. QUANTITY OF WATER CLAIMED 900 gpm PRESENTLY USED 900 gpm
(CUBIC FEET PER SECOND OR GALLONS PER MINUTE)

B. ANNUAL QUANTITY CLAIMED 230 PRESENTLY USED 200
(ACRE FEET PER YEAR)

C. IF FOR IRRIGATION, ACRES CLAIMED PRESENTLY IRRIGATED

D. TIME(S) DURING EACH YEAR WHEN WATER IS USED: The months of May through August

4. DATE OF FIRST PUTTING WATER TO USE: MONTH Unknown YEAR Before 1945

5. LOCATION OF THE POINT(S) OF DIVERSION/WITHDRAWAL: 2152 FEET North AND 731 FEET East FROM THE Southwest CORNER OF SECTION 12

BEING WITHIN Southwest quarter OF SECTION 12 T. 1 N., R. 3 E (E.OR W.) W.M.

IF THIS IS WITHIN THE LIMITS OF A RECORDED PLATTED PROPERTY, LOT ___ BLOCK ___ OF Within the City limits of the City of Camas
(GIVE NAME OF PLAT OR ADDITION)

6. LEGAL DESCRIPTION OF LANDS ON WHICH THE WATER IS USED: Municipal supply

Clark COUNTY Washington

7. PURPOSE(S) FOR WHICH WATER IS USED: Municipal - Domestic Supply

8. THE LEGAL DOCTRINE(S) UPON WHICH THE RIGHT OF CLAIM IS BASED:

DO NOT USE THIS SPACE
THE FILING OF A STATEMENT OF CLAIM DOES NOT CONSTITUTE AN ADJUDICATION OF ANY CLAIM TO THE RIGHT TO USE OF WATERS AS BETWEEN THE WATER USE CLAIMANT AND THE STATE OR AS BETWEEN ONE OR MORE WATER USE CLAIMANTS AND ANOTHER OR OTHER PERSONS. NOR DOES IT CONSTITUTE EVIDENCE FOR THE PURPOSE OF ESTABLISHING ANY RIGHT.
DATE RETURNED: THIS HAS BEEN AMENDED BY
WATER RIGHT CLAIM REGISTRY NO.
FEB 7 10 21 0 28
DIRECTOR, DEPARTMENT OF ECOLOGY

I HEREBY SWEAR THAT THE ABOVE INFORMATION IS TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

X CITY OF CAMAS, WASHINGTON

DATE June 11, 1974

IF CLAIM FILED BY DESIGNATED REPRESENTATIVE, PRINT OR TYPE FULL NAME AND MAILING ADDRESS OF AGENT BELOW.

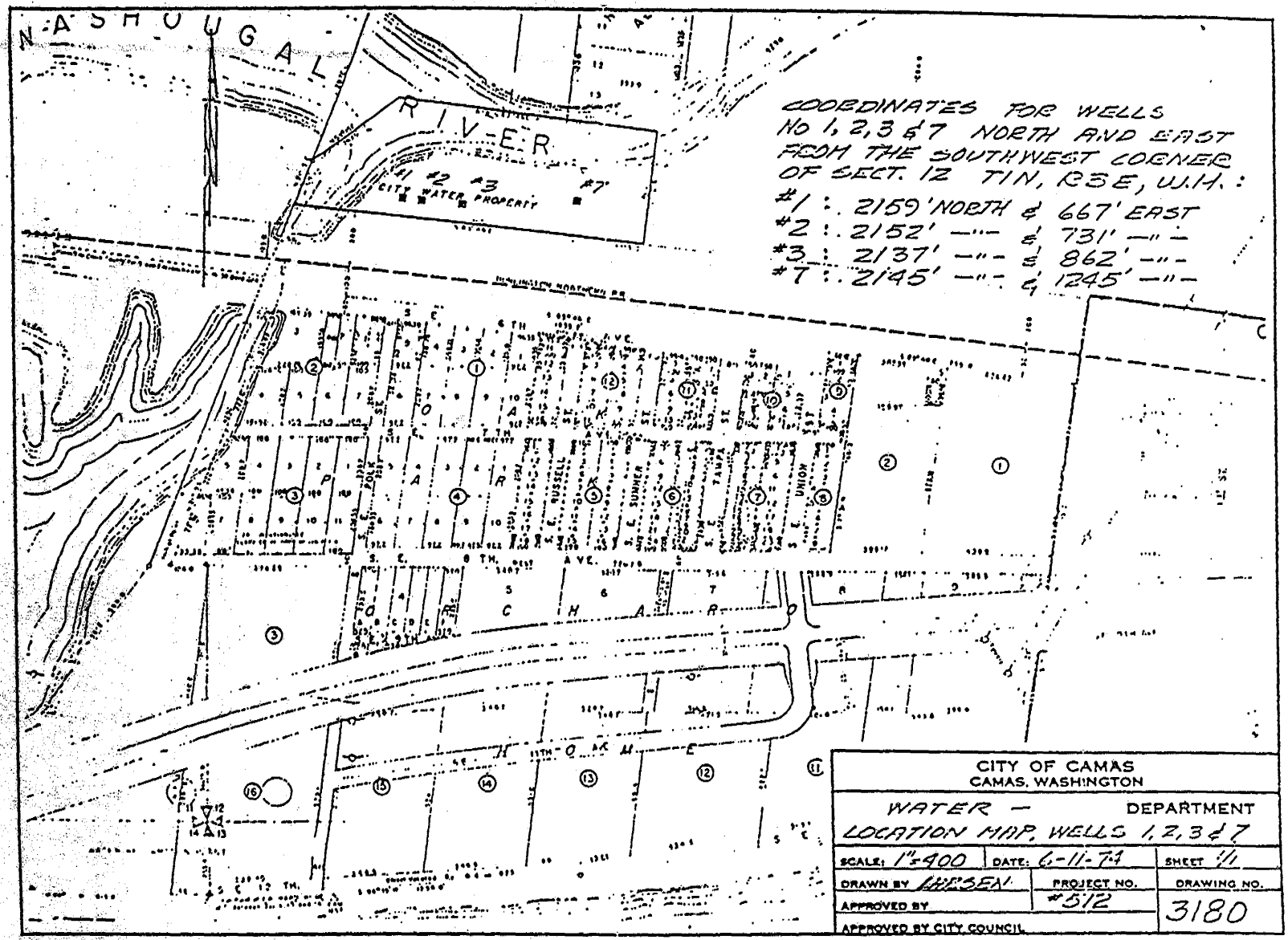
BY: Lewis Angelo
Lewis Angelo, Director of Public Works

☐ ADDITIONAL INFORMATION RELATING TO WATER QUALITY AND/OR WELL CONSTRUCTION IS AVAILABLE.

A FEE OF $7.00 MUST ACCOMPANY THIS WATER RIGHT CLAIM

ORIGINAL DWR

RETURN ALL THREE COPIES WITH CARBONS INTACT, ALONG WITH YOUR FEE TO:
DEPARTMENT OF ECOLOGY
WATER RIGHT CLAIMS REGISTRATION
P.O. BOX 829 OLYMPIA, WASHINGTON 98504


N A S H O U G A L
R I V E R
#1 #2 #3 #7
CITY WATER PROPERTY
COORDINATES FOR WELLS
No 1, 2, 3 & 7 NORTH AND EAST
FROM THE SOUTHWEST CORNER
OF SECT. 12 T1N, R3E, W.M.:
#1 : 2159' NORTH & 667' EAST
#2 : 2152' —"— & 731' —"—
#3 : 2137' —"— & 862' —"—
#7 : 2145' —"— & 1245' —"—
CITY OF CAMAS
CAMAS, WASHINGTON
WATER — DEPARTMENT
LOCATION MAP, WELLS 1, 2, 3 & 7
SCALE: 1"=400
DATE: 6-11-74
SHEET 1/1
DRAWN BY
PROJECT NO. #512
DRAWING NO. 3180
APPROVED BY
APPROVED BY CITY COUNCIL

Form No. 369—1923. Approved as to Form by Dept. of Efficiency. 8509.

CERTIFICATE RECORD NO. 2, PAGE NO. 711

STATE OF WASHINGTON, COUNTY OF Clark

CERTIFICATE OF WATER RIGHT

(For rights perfected under original, enlargement or secondary permits.)

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and the regulations of the State Hydraulic Engineer thereunder.)

This is to certify, that City of Camas, *of* Camas, *State of* Washington, *has made proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of the waters of* Jones Creek, *a tributary of* Little Washougal River *for the purposes of* domestic supplies, *under* Appropriation *Permit No.* 1575, *of the State Supervisor of Hydraulics, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in Volume* 2, *at Page* 711, *on the* 28th *day of* July, *19*33; *that the right hereby confirmed dates from* September 5th, *19*30; *that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 1.0 *cubic feet per second.*

A description of the lands under such right, and to which the water hereby confirmed is appurtenant, or if for other purposes, the place where such water is put to beneficial use, is as follows:

PLACE OF USE			LEGAL SUBDIVISION	[illegible]	[illegible]
Section	Township	Range			
			City of Camas		

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of herein described, except as provided in Section 39, Chapter 117, Session Laws 1917.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 28th *day of* July, *19*33.

Chas. H. Lee

State Supervisor of Hydraulics.

ENGINEERING DATA

O.K. [illegible]

NOTICE OF PETITION FOR CHANGE OF
POINT OF DIVERSION OF WATER.

TO WHOM IT MAY CONCERN:

Notice is hereby given that the City of Camas, Clark County, Washington, has filed a petition with the State Supervisor of Hydraulics, Olympia, Washington, for a permit to change the point of diversion of one cubic foot per second of the waters of Jones Creek from a point set out in water right permit 1575 as NW¼ of NW¼ of Sec. 10, Twp. 2 N., Rge. 4 E.W.M., to a point within the SW¼ of SW¼ of Sec. 3, Twp. 2 N., Rge. 4 E.W.M., such point being approximately one-half mile above the point of diversion described in permit, all in Clark County, Wash.

Any person, firm or corporation whose right will be injuriously affected by the granting of said petition may file with the Supervisor of Hydraulics, at Olympia, Washington, such objections or representations, in writing, as he may desire to make within thirty (30) days after the date of last publication, which date is _____.

Witness my hand and official seal this 24th day of April, 1933.

CHAS. J. BARTHOLET
State Supervisor of Hydraulics

PERMIT

This is to certify that I have examined the foregoing application and do hereby grant the same, subject to the following limitations and conditions. ~~If for irrigation, this appropriation shall be subject to such reasonable rotation system as may be ordered by the State Supervisor of Hydraulics.~~ And is further subject to rights of C. W. Cottrell under certificate #121, for the appropriation and use of waters of Little Washougal River of which Jones Creek is a tributary.

The amount of water appropriated shall be limited to the amount which can be applied to beneficial use and not to exceed 1.0 *cubic feet per second, or its equivalent in case of rotation.*

The priority date of this permit is September 5th, 1950.

Actual construction work shall begin on or before December 1st, 1951 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before* December 1st, 1952

Complete application of the water to the proposed use shall be made on or before December 1st, 1953.

Given under my hand and the seal of this office at Olympia, Washington, this 2nd *day of* December, 1950

Chas. J. Bartholomew
State Supervisor of Hydraulics.

Application No. 3[illegible]6
Permit No. 1575

PERMIT
To Appropriate Public Waters of the State of Washington

Filed by City of Camas
County of Clark

This instrument was first received in the office of the State Supervisor of Hydraulics, Olympia, Washington, on the 5th *day of* September, 19 50, *at* 8:30 *o'clock* A. M.

Approved December 2nd, 1950
Recorded in Book No. 7 *of Permits, on Page* 1575

CHAS. J. BARTHOLOMEW
State Supervisor of Hydraulics.

JAY P. GROTE, PUBLIC PRINTER

Before your certificate of water right is issued it will be necessary for you to file with the State Supervisor of Hydraulics a copy of each of the following reports:

1st. Progress reports (in case temporary permit is issued).
2nd. Affidavit of publication of notice of water right application.
3rd. Notice of beginning of construction.
4th. Notice of prosecution of work with diligence.
5th. Notice of completion of construction.
6th. Notice of application of water to a beneficial use.
7th. Proof of appropriation of water.

Upon a satisfactory showing that the appropriation has been perfected as provided by statute the State Supervisor of Hydraulics will issue a water right certificate.

[illegible]-ks will be furnished by the office of State Supervisor of Hydraulics.

APPLICATION NO. 5126

CITY OF CAMAS

Examination made November 3rd & 4th, 1930

This application is for 1.0 c.f.s. for domestic use from Jones Creek a tributary of Washougal River.

November 3rd I talked to Mr. R. C. Sugg, Attorney for Mr. C. W. Cottrell who is making protest against the issuance of permit on this application. He stated he questioned the City of Camas right to Jones Creek but suggested I go over the ground with Mr. Cottrell.

November 4th I went over the ground with Mr. W. H. Barber, City Clerk and Superintendent of Water for City of Camas, also, in reference to application No. 924. Mr. Barber stated that a survey was made in 1925 and this system installed same year from the Little Washougal consisting of two reservoirs on hill above Camas and approximately 11 miles of pipe line. The main from reservoirs to "Y" is of 10 inch steel pipe the portion from "Y" to diversion of Little Washougal is of 8 inch steel pipe. The "Y" was installed for the purpose of diverting a portion of Jones Creek when the city needed the additional water.

There is approximately 6.0 c.f.s. in Jones Creek today.

I then went with Mr. Cottrell over the ground on Washougal River. There is approximately 15.0 c.f.s. in the Little Washougal at the mouth. Mr. Cottrell has a 75 K.W. plant on Washougal River about one-half mile below mouth of Little Washougal which is a part of supply. There is approximately 12.0 c.f.s. going over dam not utilized today.

Mr. Cottrell has another 2 unit hydro plant on Washougal River above mouth of Little Washougal which this application does not affect, it develops 362 K.W. He also has a 340 K.W. Diesel plant at Washougal.

Mr. Barber stated that the water supply from Little Washougal was so inadequate this summer that rigid restrictions were necessary and if they would of had fires the storage supply would have been exhausted.

Mr. Cottrell stated that shortage was experienced only at extreme low water.

The City of Camas has no other means of water supply. A permit should be issued the applicant for 1.0 c.f.s. subject to existing rights.

A. E. Hanson

Signed this 15 day of Nov. 1930.

OK. For Permit and to Permit 465

Form No. 349—1933. Approved as to Form by Dept. of Efficiency. 8189.

CERTIFICATE RECORD NO. 2, PAGE NO. 712

STATE OF WASHINGTON, COUNTY OF Clark

CERTIFICATE OF WATER RIGHT

(For rights perfected under original, enlargement or secondary permits.)

(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and the regulations of the State Hydraulic Engineer thereunder.)

This is to certify, that City of Camas, *of* Camas, *State of* Washington, *has made proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of the waters of* Little Washougal River, *a tributary of* Washougal River, *for the purposes of* municipal supply, *under* Appropriation Permit No. 1576, *of the State Supervisor of Hydraulics, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in Volume* 2, *at Page* 712, *on the* 28th *day of* July, 1933; *that the right hereby confirmed dates from* August 22nd, 19 23; *that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed* 2.5 *cubic feet per second.*

A description of the lands under such right, and to which the water hereby confirmed is appurtenant, or if for other purposes, the place where such water is put to beneficial use, is as follows:

PLACE OF USE			LEGAL SUBDIVISION	[illegible]	[illegible]
Section	Township	Range			
			City of Camas		

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Section 39, Chapter 117, Session Laws 1917.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 28th *day of* July, 19 33.

Chas. Danckaert
State Supervisor of Hydraulics.

PERMIT

STATE OF WASHINGTON, }
COUNTY OF THURSTON. } ss.

This is to certify that I have examined the foregoing application and do hereby grant the same, subject to the following limitations and conditions. ~~If for irrigation, this appropriation shall be subject to such reasonable rotation system as may be ordered by the State Hydraulic Engineer.~~ And is further subject to rights of C. W. Cottrell under certificate #121, for the appropriation and use of waters of Little Washougal River of which Jones Creek is a tributary.

The amount of water appropriated shall be limited to the amount which can be applied to beneficial use and not to exceed 2½ *cubic feet per second, or its equivalent in case of rotation.*

The priority date of this permit is August 22nd, 1923

Actual construction work shall begin on or before December 1st, 1931 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before* December 1st, 1932

Complete application of the water to the proposed use shall be made on or before December 1st, 1933

WITNESS my hand this 2nd *day of* December, *19*30.

Chas. J. Barnhart
State Hydraulic Engineer.

This form approved by the State Hydraulic Engineer, 1917.

Application No. 924
Permit No. 1576

PERMIT
To Appropriate the Public Waters of the State of Washington

Issued to City of Camas

County of Clark

This instrument was first received in the office of the State Hydraulic Engineer, Olympia, Washington, on the 22nd *day of* August, *19*23, *at* 1:45 *o'clock* P. M.

Returned to applicant for correction

Corrected Application received .....

Approved December 2nd, 1930

Recorded in Book No. 7 *of Permits, on Page* 1576

CHAS. J. BARNHART
State Hydraulic Engineer,

FRANK M. LAMBORN, PUBLIC PRINTER, OLYMPIA

Before your certificate of water right is issued it will be necessary for you to fill out and file with the State Hydraulic Engineer a copy of each of the following reports:

1st. Progress report.
2nd. Notice of water right application.
3rd. Notice to begin construction.
4th. Notice of prosecution of work with diligence.
5th. Notice of completion of construction.
6th. Notice of application of water to a beneficial use.
7th. Proof of appropriation of water.

Upon a satisfactory showing that the appropriation has been perfected as provided by statute the State Hydraulic Engineer will issue a water right certificate.

(Blanks will be furnished by the office of State Hydraulic Engineer.)

APPLICATION NO. 924

CITY OF CAMAS

Examination made November 4, 1950

This application is for 2.5 c.f.s. from Little Washougal a tributary to Washougal River for domestic and municipal supply.

Mr. Sugg stated he did not question in his mind the legal right of this application.

I went over the ground with Mr. W. H. Barber, City Clerk and Superintendent of City Water and found the following:

This system was installed in 1923 after a survey had been made, a part of which included a survey for pipe line extended to Jones Creek. The main is of 10" steel pipe from the two reservoirs on a hill about a mile above town of Camas a distance of about 9 miles to a "Y" then approximately 2 miles of 8" pipe to point of diversion. There is approximately 2.5 c.f.s. now running in pipe line and approximately 1.5 c.f.s. going past intake.

Mr. Barber stated that they were taking all of the water up to the recent rains about a week ago and was not filling the pipe and the City of Camas was under a dangerous water shortage.

This application is in reference to application No. 5126.

A. G. Stevens

Signed this 15 day of Nov. 1950.

V.K.
Subject to prior Permit #465

WELL No3

CERTIFICATE RECORD No. 1 PAGE No. 85-A

STATE OF WASHINGTON, COUNTY OF Clark

Certificate of Ground Water Right

Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and the rules and regulations of the State Supervisor of Hydraulics thereunder.

THIS IS TO CERTIFY That THE CITY OF CAMAS

of Camas, Washington, has made proof to the satisfaction of the State Supervisor of Hydraulics of Washington, of a right to the use of the ground waters of a Well

located within the NW¼ of SW¼ of Sec. 12 Twp. 1 N. Rge. 3 E.W.M.

for the purpose of Municipal Supply

under Ground Water Permit No. 2 issued by the State Supervisor of Hydraulics, and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Hydraulics of Washington and entered of record in Volume 1 at page 85-A ; that the quantity of ground water to which such right is entitled and hereby confirmed for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1200 gallons per minute; 118 acre-feet per year; That the right hereby confirmed dates from July 21, 1945.

~~for irrigation of xxxxxxxxxxxxxx acres.~~

A description of the lands under such right to which the ground water hereby confirmed is appurtenant, and the place where such water is put to beneficial use, is as follows:

City of Camas, Clark County, Washington.

The right to the use of the ground water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Hydraulics affixed this 13th day of November, 19 47

State Supervisor of Hydraulics.

S. F. No. 7334—6-45—3C. 9235.

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT
DIVISION OF HYDRAULICS

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 1 of Ground Water Permits, on page 2 under Application No. 4

The City of Camas

of City Hall, Camas, Washington

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is July 21, 1945

Source of the proposed ground water appropriation is a well

within area, sub-area

zone. Name or number of works is

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1200 gallons per minute; 118 acre-feet per year, to be used for the following purposes: Municipal supply

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is North 7°31' East 480 feet and South 83°46' East 112 feet from the Northwest corner of Block 1 of Oak Park Addition to the City of Camas, being within NW¼ of SW¼ of Sec. 12, Twp. 1 N., Rge. 3 E.W.M., county of Clark

Use, or uses to which water is to be applied:

For municipal supply: 1200 gallons per minute; acre-feet per year, to supply The City of Camas

For irrigation: gallons per minute; acre-feet per year, for the irrigation of acres.

For miscellaneous uses: gallons per minute; acre-feet per year, for

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

City of Camas, Clark County, Washington

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be Drilled (Dug or drilled) and have a diameter of 14 inches, and depth of 95 feet.

Description of tunnel or infiltration trench:

(Please read carefully provisions below)

Particular specifications required by the Supervisor of Hydraulics for the purpose of preventing waste of public waters:

Construction work shall begin on or before July 1, 1946 and shall thereafter be prosecuted with reasonable diligence and completed on or before October 1, 1946 and complete application of water to proposed use shall be made on or before October 1, 1947

Given under my hand and the seal of this office at Olympia, Washington, this 20th day of September 1945

CLARENCE B. SHAIN
State Supervisor of Hydraulics

By: Chas. J. Carstens
Deputy.

GROUND WATER

APPLICATION NO. 4

... City of Camas.

The application of the City of Camas for the appropriation of 1200 gallons per minute from ground water through a well, which will be designated Well No. 3, was approved for a permit on September 6.

On September 21 the undersigned visited the locality, accompanied by Mr. Arthur K. Piper, Ground Water Geologist.

The City has a gravity water supply and an additional water supply from two wells. The supply from both of which sources does not furnish sufficient water for the town during the dry months. It was therefore found by the City officials that additional water had to be obtained in order to meet its requirements. For that reason they planned a third well to augment the water supply during critical periods.

Judging from the wells now in use, the amount of water applied for will be available and will be put to an important beneficial use.

Permit has been approved.

Signed this 25th day of September, 1945.

CHAS. J. BARTHOLET
Consulting Engineer

S. F. No. 1361—5-60—3M. 42306.

CERTIFICATE RECORD NO. 9 PAGE NO. 4072-A

STATE OF WASHINGTON, COUNTY OF Clark

Certificate of Ground Water Right

Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the State Supervisor of Water Resources thereunder.

THIS IS TO CERTIFY That CITY OF CAMAS, WASHINGTON

of _____, has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the ground waters of a well located within NW¼ NW¼ Sec. 12, Twp. 1 N., R. 3 E. W.M., for the purpose of municipal supply under and subject to provisions contained in Ground Water Permit No. 4804 issued by the State Supervisor of Water Resources and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Water Resources of Washington and entered of record in Volume 9 at page 4072-A, that the right hereby confirmed dates from February 12, 1959; that the quantity of ground water under the right hereby confirmed for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1325 gallons per minute; 1208 acre-feet per year for municipal supply.

Special provisions required by the Supervisor of Water Resources: _____

A description of the lands to which such ground water right is appurtenant:

City of Camas, Clark County, Washington.

The right to the use of the ground water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in Sections 6 and 7, Chapter 122, Laws of 1929.

WITNESS the seal and signature of the State Supervisor of Water Resources affixed this 24th day of November, 19 61.

M Gunaker

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 10 of Ground Water Permits, on page 404 under Application No. 5130

CITY OF CAMAS, WASHINGTON

or

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is February 12, 1959

Source of the proposed ground water appropriation is a well

within _____ area, _____ sub-area,

_____ zone. Name or number of works is _____

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1500 gallons per minute; 1206 acre-feet per year, to be used for the following purposes: municipal supply

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is N.10°E. 150 feet from west quarter corner of sec.12

being within NW¼NW¼, sec.12, T.1 N., R.3 E.W.M.

county of Clark

Use, or uses to which water is to be applied:

For municipal supply: 1500 gallons per minute; 1206 acre-feet per year, to supply the City of Camas.

For irrigation: _____ gallons per minute; _____ acre-feet per year, for the irrigation of _____ acres.

For miscellaneous uses: _____ gallons per minute; _____ acre-feet per year for _____

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

City of Camas, Clark County, Washington.

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be drilled and have a diameter of 16 inches and depth of 135 feet.
(dug or drilled)

Description of tunnel or infiltration trench:

(Please read carefully provisions below).

Particular specifications required by the Supervisor of Water Resources for the purpose of preventing waste of public waters:

Construction work shall begin on or before May 1, 1960

and shall thereafter be prosecuted with reasonable diligence and completed on or before November 1, 1960

and complete application of water to proposed use shall be made on or before November 1, 1961

Given under my hand and the seal of this office at Olympia, Washington, this 6th day of May, 1959.

M. O. Watkins

State Supervisor of Water Resources

RETURN TO:
DIVISION OF WATER RESOURCES
335 GENERAL ADMINISTRATION BLDG.
OLYMPIA

RECEIVED
JUL 15 1959

RECORD BY WELL DRILLER OR OTHER CONSTRUCTOR OF WORKS FOR WITHDRAWAL OF GROUND WATER

Under Permit No. G. W. 4804

("The well driller or other constructor of works for the withdrawal of public ground waters shall be obligated to furnish the permittee a certified record of the factual information necessary to show compliance with the provisions of this section." Sec. 8, Chap. 263, Laws of 1945.)

1. City of Camas, Washington
(Name and address of owner of well or other works for withdrawal of water)

2. Type; name or number of works where water is taken Well
(Well, tunnel or infiltration trench)

3. Date on which work on well or other structure was started June 2, 1959

4. Date on which work was completed July 7, 1959

5. If work on well or other structure was abandoned, give date _____

and reason for abandonment _____

6. DESCRIPTION OF WORKS:

(a) WELL: Depth 112 ft. Diameter 16 in. or ft. Dug or drilled Drilled

Flowing or pump well _____ Water Temp. 46 degrees

IF PUMP WELL: Type and size of pump is Test pump: 1500 g.p.m. pump 11½" bowl
9" pump column

Type and size of motor or engine is Gulberson Diesel 210 h.p.

Depth from ground surface to water level before pumping 35 ft.

After continuous operation for 8 hours (At least four), the measured discharge of the pump is 1500 g.p.m., and the drawdown of water level is 24 ft. (Pumping level minus static water level)

Recovery data (taken after pump has been shut off) (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level
Immediate recovery.			

Date of test June 29, 1959

IF FLOWING WELL: Measured discharge _____ g.p.m. on _____ (Date)

Shut-in pressure at ground surface _____ lbs. per sq. in. on _____ (Date)

Water is controlled by _____ (Cap, valve, etc.)

CASING: (Give diameter, commercial specifications and depth below ground surface of each casing size.)

16 in. diameter _____ from 0 to 112 ft.

_____ in. diameter _____ from _____ to _____ ft.

_____ in. diameter _____ from _____ to _____ ft.

_____ in. diameter _____ from _____ to _____ ft.

Describe and show depth of shoe, plug, adapter, liner or other details:

Grout seal from 32-35.
Grout seal from 15-18

OK

Perforated casing or screens:

60 perf. per ft. each perf. 1&3/8 by 3/8" from 82 to 102 ft.
(Describe perforations or slots)

from ____ to ____ ft.

from ____ to ____ ft.

from ____ to ____ ft.

from ____ to ____ ft.

LOG OF WELL OR TUNNEL: (Describe each stratum or formation clearly, indicate if water bearing, and give thickness and depth as indicated.)

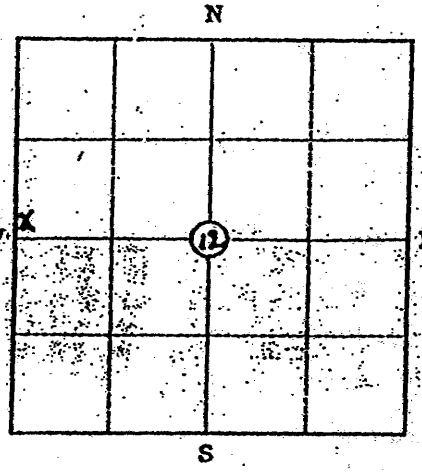
MATERIAL	Thickness (Feet)	Depth to bottom (Feet)
Top soil	3	3
Gravel and boulders	9	12
Gravel, some binder	9	21
Gravel and boulders	11	32
Cemented gravel	21	53
Loose sand and gravel, some silt	22	75
Loose sand and gravel, water-bearing	24	99
Large gravel and sand	11	110
Clay and gravel	2	112

(b) INFILTRATION TRENCH OR TUNNEL: Type ____

Dimensions: ____
(Tunnel—length, course, and cross-sectional size) (Trench—minimum and maximum depths)

Bottom width ____ ft. Discharge ____ g.p.m. Date of test ____

Position of water bearing stratum with reference to portal of tunnel ____



Scale: 1" = 2000'

Sec. 12 Twp. 1N Rge. 3E

Show approximate location of well or other works with (X) on section plat at left.

W. A. Shaw
Signature of well driller or other constructor

8110 S.E. Sunset Lane, Portland, Ore.
Address

STATE PRINTING PLANT OLYMPIA, WASH., 1947

well #4

Report of Examination on Ground Water

Received date 2-5-59 Date of exam 2-12-59 Appl. No 5130

Name City of Camas Address Camas, Washington

Type of works well Dimensions 16"x125'

Progress of works not begun

Quantity applied for 1500 g.p.m. acre-feet per year

Legal sub. NW¼NE¼ Sec. 12 Twp. 1 N. Rge. 3 E. County Clark

Use municipal water supply

Irrigation-acreage: Present Planned Feasible

Municipal: Population 5391 as of 1959

Industrial

Time pump will be operated

Other water rights appurtenant to this land Cert's. 711, 712 & 85 A

Proximity to existing works, springs, wells, or streams approximately 300' to Washougal River; approx. 35' above river level

Area Sub-area Zone

RECOMMENDATIONS

Approved for 1500 g.p.m. 1208 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

The water requirement for municiapl supply is calculated on a per capita consumption of 200 gallons a day or 0.224 acre-feet per year, a total of 1208 acre-feet per year for 5391 persons, less any quantity diverted to this use under existing water rights.

The installation of an access port to well as described in attached Ground Water Bulletin No. 1 is recommended.

Signed this 13th day of April, 1959.

DEE MOLENAAR, Geologist
Division of Water Resources

S. F. No. 2361—(Rev. 10-69)—10-69—534 1500.

CERTIFICATE RECORD NO. 14, PAGE NO. 6636-A

STATE OF WASHINGTON, COUNTY OF Clark

CERTIFICATE OF GROUND WATER RIGHT

(Issued in accordance with the provisions of Chapter 263, Laws of Washington of 1945, and amendments thereto, and the rules and regulations of the Department of Water Resources thereunder.)

THIS IS TO CERTIFY That CITY OF CAMAS

of Camas, Washington, has made proof to the satisfaction of the Department of Water Resources of a right to the use of the public ground waters of the State of Washington from a well

located within Lot 9, Plat of Orchard Home within the City of Camas and road right of way abutting thereto to the east, of Sec. 12, Twp. 1 N., R. 3 E., W.M.,

for the purpose(s) of Municipal supply

under and specifically subject to provisions contained in Ground Water Permit No. 8627 issued by the Department of Water Resources and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the Department of Water Resources and entered of record in Volume 14 at page 6636-A; that the priority of the right hereby confirmed dates from March 22, 1968; that the quantity of ground water under the right hereby confirmed for the aforesaid purposes, is limited to an amount actually beneficially used for said purposes, and shall not exceed 600 gallons per minute, 920 acre-feet per year for municipal supply continuously during entire year to supply an estimated population of 8550 by 1970.

16636-A

A description of the lands to which such ground water right is appurtenant is as follows:

City of Camas

The right to use of water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390 and 90.44.020.

This certificate of ground water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

WITNESS the seal and signature of the Assistant Director, Division of Water Management, Department of Water Resources, affixed this 17th day of November, 19 69

Glen L. Liddell

Assistant Director
Division of Water Management
Department of Water Resources

Engineering Data

S. F. No. 7234—OS—4-67.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
DIVISION OF WATER MANAGEMENT

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 18 of Ground Water Permits, on page 8627 under Application No. 9326

CITY OF CAMAS

of Camas, Washington

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is March 22, 1968

Source of the proposed ground water appropriation is a well

within _____ area, _____ sub-area

_____ zone. Name or number of works is _____

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 700 gallons per minute; 1120 acre-feet per year, to be used for the following purposes: municipal supply

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is 2760 feet east and 840 feet north of southwest corner of Sec. 12

being within Lot 9, Plat of Orchard Home within City of Camas and road right-of-way abutting thereto to the east, of Sec. 12, T. 1 N., R. 3 E.W.M.

county of Clark

Use, or uses to which water is to be applied:

For municipal supply: 700 gallons per minute; 1120 acre-feet per year,

to supply municipal supply for estimated population of 8500 by 1970

For irrigation: _____ gallons per minute; _____ acre-feet per year,

for the irrigation of _____ acres.

For miscellaneous uses: _____ gallons per minute; _____ acre-feet per year,

for _____

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

City of Camas

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be drilled (Dug or drilled) and have a diameter of 8 inches, and depth of 70 feet.

Description of tunnel or infiltration trench:

Please read carefully provisions below)

Particular specifications required by the Department of Water Resources for the purpose of preventing waste of public waters:

Issued as a supplementary supply to Surface Water Certificates 711 and 712, Ground Water Certificates 85-A and 4072-A and concurrent Ground Water Application 9325, for 700 gallons per minute and ~~1120~~ 2240 acre-feet per year; the total quantity withdrawn or diverted from all sources is not to exceed 3300 acre-feet per year.

Construction work shall begin on or before Started

and shall thereafter be prosecuted with reasonable diligence and completed on or before September 1, 1969

and complete application of water to proposed use shall be made on or before September 1, 1970

Given under my hand and the seal of this office at Olympia, Washington, this 21st day of August, 19 68.

Glen H. Fuller
Assistant Director
Division of Water Management
Department of Water Resources

File Original and First Copy with the Division of Water Resources
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 9326

Permit No. 8627

(1) OWNER: Name City of Camas Address 616 N.E. 4th Avenue

(2) LOCATION OF WELL: County Clark - Lot 9, Plat of Orchard Sq ¼ SE ¼ Sec. 12 T. 1 N. R. 3E W.M.

Bearing and distance from section or subdivision corner: Home within City of Camas& road right of way abutting thereto the East of Sec. 12 TIN R3 East of WM

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 5
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches. Drilled 71 ft. Depth of completed well 71 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used
SIZE of perforations 3/8" in. by 1-1/4" in.
408 perforations from 44'6" ft. to 65 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐ To what depth? 22 ft.
Material used in seal Concrete grout
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off gravity

(7) PUMP: Manufacturer's Name Johnson
Type: V.H.S. Turbine H.P. 75

(8) WATER LEVELS: Land-surface elevation above mean sea level 36 ft.
Static level 36 ft. below top of well Date 7-25-68
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? O.J. Norris
Yield: 450 gal./min. with 1 ft. drawdown after 8 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test 3-16-68
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 53° Was a chemical analysis made? Yes ☒ No ☐

See attached copy

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Surface dirt with small boulder	0	3
Gravel & Bouxlers, very little binder	3	7
Gravel & boulders w/ clay binder	7	21
Large gravel & small boulders, loose	21	24
Med. size gravel, fairly loose	24	33
Med size gravel	33	35
Large to fine gravel, some red gravel	35	45
Started making water at 35 feet		
Med. to fine gravel, clean some red - very little sand	45	48
Some larger gravel	48	56
Med. to fine gravel, clean & loose	56	60
Med to fine gravel clean, loose	60	65
Med to fine gravel, clean, loose	65	67' 6"
Loose gravel formation	67'6"	68' 6"
Loose gravel formation	68'6"	69' 6"
Fine yellow sand	69'6"	71
Sealed bottom with concrete	71	

Work started Feb. 14 19 68 Completed Mar. 19 19 68

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME O.J. NORRIS - WATER WELL DRILLING
(Person, firm, or corporation) (Type or print)
Address 4411 N.E. 59th Avenue Vancouver, Washington

[Signed] O. J. Norris
(Well Driller)

License No. 223 02 4069 Date Sept. 9, 19 68

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7154—(Rev. 2-66)—3-66—5M

WR

Report of Examination on Ground Water

Received date March 22, 1968 Date of exam May 28, 1968 Appl. No. 9326

Name City of Camas Address 616 N.E. 4th Ave., Camas, Wash. 98607

Type of works a well Dimensions 8" x 70'

Progress of works Started

Quantity applied for 700 g.p.m. acre-feet per year

Legal sub / Sec 12 Twp 1 N. Rge 3 E. County Clark

Lot 9, Plat of Orchard Home within City of Camas & road right of way abutting thereto to the east

Use Municipal supply

Irrigation-acreage: Present Planned Feasible

Municipal: Population 8500 as of 1970

Industrial

Time pump will be operated May 1st through September 30th

Other water rights appurtenant to this land SW Cert. 711 for 1.0 cfs from Jones Cr. for dom. supply; SW Cert. 712 for 2.5 cfs from Little Washougal R. for Munic. supply; GW Cert. 85-A for 1200 gpm, 118 ac-ft/yr for munic. supply; GW Cert. 4072-A for 1325 gpm; 1208 ac-ft/yr for mun. sup.; and concurrent GW App. 9325 for 1500 gpm for mun. supply.

Proximity to existing works, springs, wells, or streams / City of Washougal, northeasterly 1200 feet

Area Sub-area Zone

RECOMMENDATIONS

Approved for 700 g.p.m. 1120 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

It is noted that the well site and water transmission facilities therefrom are not located upon the land owned by the applicant. Applicant is, accordingly, advised that the issuance of permit by this department for appropriation of the waters in question does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtainment of such right is a private matter between applicant and owner of that land.

Use of the waters to be appropriated under this application will be for a public water supply. State Board of Health rules require every owner of a public water supply to obtain written approval from the State Director of Health prior to any new construction or alterations of a public water supply. The applicant is advised to contact the Washington State Department of Health, 304 Public Health Building, Olympia, with regard to the need for compliance.

The following water rights are appurtenant to this land:

Certificate Number	c.f.s./g.p.m.
Surface Water Cert. 711	1.0 c.f.s.
Surface Water Cert. 712	2.5 c.f.s.
Ground Water Cert. 85-A	1200 g.p.m.
Ground Water Cert. 4072-A	1325 g.p.m.
Concurrent Ground Water Appli. 9325	1500 g.p.m.

(over)

The total requirement based on an engineering study is 345 gallons per capita per day for all purposes for an estimated population of 8500 by 1970, or approximately 3300 acre-feet per year.

The quantity recommended under this application is 700 gallons per minute pumping continuously, or 1120 acre-feet per year.

The permit when issued will carry the following provision: "Issued as a supplementary supply to Surface Water Certificates 711 and 712, Ground Water Certificates 85-A and 4072-A and concurrent Ground Water Application 9225, for 700 gallons per minute and 1120 acre-feet per year, the total quantity withdrawn or diverted from all sources is not to exceed 3300 acre-feet per year."

Signed at Olympia, Washington
this 5 day of June, 1968

B. A. CAMERON, Engineer
Division of Water Management

S. F. No. 7361—(Rev. 10-801—10-60—33M 12000.

CERTIFICATE RECORD NO. 14, PAGE NO. 6635-A

STATE OF WASHINGTON, COUNTY OF Clark

CERTIFICATE OF GROUND WATER RIGHT

(Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Water Resources thereunder.)

THIS IS TO CERTIFY That CITY OF CAMAS

of Camas, Washington, has made proof to the satisfaction of the Department of Water Resources of a right to the use of the public ground waters of the State of Washington from a well

located within David C. Parker D.L.C. No. 48

Sec. 12, Twp. 1 N., R. 3 E. W.M.,

for the purpose(s) of Municipal supply

under and specifically subject to provisions contained in Ground Water Permit No. 8344

issued by the Department of Water Resources and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the Department of Water Resources and entered of record in Volume 14 at page ~~6435-A~~ 6635-A; that the priority of the right hereby confirmed dates from March 22, 1968; that the quantity of ground water under the right hereby confirmed for the aforesaid purposes, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1500 gallons per minute, 2400 acre-feet per year for municipal supply to supply a population of 8500 by 1970 continuously during entire year.

A description of the lands to which such ground water right is appurtenant is as follows:

City of Camas

The right to use of water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390 and 90.44.020.

This certificate of ground water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

WITNESS the seal and signature of the Assistant Director, Division of Water Management, Department of Water Resources, affixed this 17th day of November, 19 69

C-37

Glen H. Lidke

S. F. No. 7334—OS—4-61.

STATE OF WASHINGTON
DEPARTMENT OF WATER RESOURCES
DIVISION OF WATER MANAGEMENT

Permit to Appropriate Public Ground Waters of the State of Washington

Book No. 18 of Ground Water Permits, on page 8544 under Application No. [illegible]

CITY OF CAMAS

of Camas, Washington

is hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights, and to the limitations and provisions set out herein.

Priority date of this permit is March 22, 1968

Source of the proposed ground water appropriation is a well

within _____ area, _____ sub-area

_____ zone. Name or number of works is _____

Quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1500 gallons per minute; 2400 acre-feet per year, to be used for the following purposes: municipal supply

as more definitely set out below.

Location of the well, tunnel, or infiltration trench is 2300 feet east and 1800 feet north of southwest corner of Sec. 12

being within David C. Parker D.L.C. No. 48 of Sec. 12, T. 1 N., R. 3 E.W.M.

county of Clark

Use, or uses to which water is to be applied:

For municipal supply: 1500 gallons per minute; 2400 acre-feet per year, to supply a population of 8500 by 1970 continuously during entire year.

For irrigation: _____ gallons per minute; _____ acre-feet per year, for the irrigation of _____ acres.

For miscellaneous uses: _____ gallons per minute: _____ acre-feet per year, for _____

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

City of Camas

DESCRIPTION OF WORKS FROM WHICH WATER IS TO BE WITHDRAWN

The well will be drilled (Dug or drilled) and have a diameter of 16 inches, and depth of 85 feet.

Description of tunnel or infiltration trench:

Please read carefully provisions below)

Particular specifications required by the Department of Water Resources for the purpose of preventing waste of public waters: 1) The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final Certificate of Water Right. 2) Issued as a supplementary supply to Surface Water Certificates 711 and 712, Ground Water Certificates 85-A and 4072-A and concurrent Ground Water Application 9126, for 1500 gallons per minute and 2400 acre-feet per year; the total quantity withdrawn or diverted from all sources is not to exceed 3300 acre-feet per year.

(Gallons per min.) 2400

Construction work shall begin on or before July 1, 1969

and shall thereafter be prosecuted with reasonable diligence and completed on or before July 1, 1970

and complete application of water to proposed use shall be made on or before July 1, 1971

Given under my hand and the seal of this office at Olympia, Washington, this 20th day of June, 1968

Glen H. Fuller

Assistant Director
Division of Water Management
Department of Water Resources

WELL #6

Report of Examination on Ground Water

Received date March 22, 1968 Date of exam. May 28, 1968 Appl. No. 9325

Name City of Camas Address 616 N.E. 4th Ave., Camas, Wash. 98607

Type of works a well Dimensions 16" x 85'

Progress of works Not started

Quantity applied for 1500 g.p.m. 2300 acre-feet per year

David C. Parker D.L.C. No. 48

Legal sub. / Sec. 12 Twp. 1 N. Rge. 3 E. County Clark

Use Municipal supply

Irrigation-acreage: Present Planned Feasible

Municipal: Population 8500 as of 1970

Industrial

Time pump will be operated Continuously

Other water rights appurtenant to this land SW Cert. 711 for 1.0 cfs from Jones Cr. for dom. supply; SW Cert. 712 for 2.5 cfs from Little Washougal R. for munic. supply; GW Cert. 85-A for 1200 gpm, 118 ac-ft/yr for munic. supply; GW Cert. 4072-A for 1325 g.p.m; 1208 ac-ft/yr for mun. sup.; and concurrent GW App. 9326 for mun. supply, 700 gpm.

Proximity to existing works, springs, wells, or streams /

City of Camas, west 1300 feet:

City of Washougal, east 1300 feet

Area Sub-area Zone

RECOMMENDATIONS

Approved for 1500 g.p.m. 2400 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

It is noted that the well site and water transmission facilities therefrom are not located upon the land owned by the applicant. Applicant is, accordingly, advised that the issuance of permit by this department for appropriation of the waters in question does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtainment of such right is a private matter between applicant and owner of that land.

Use of the waters to be appropriated under this application will be for a public water supply. State Board of Health rules require every owner of a public water supply to obtain written approval from the State Director of Health prior to any new construction or alterations of a public water supply. The applicant is advised to contact the Washington State Department of Health, 304 Public Health Building, Olympia, with regard to the need for compliance.

The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final Certificate of Water Right. The applicant may, for his own convenience, wish to install an air-line and gage in addition to the access port.

(over)

The following water rights are appurtenant to this land:

Certificate Number	c.f.s./g.p.m.
Surface Water Cert. 711	1.0 c.f.s.
Surface Water Cert. 712	2.5 c.f.s.
Ground Water Cert. 85-A	1200 g.p.m.
Ground Water Cert. 4072-A	1325 g.p.m.
Concurrent Ground Water Appli. 9326	700 g.p.m.

The total requirement based on an engineering study is 345 gallons per capita per day for all purposes for an estimated population of 8500 by 1970, or approximately 3300 acre-feet per year.

The quantity recommended under this application is 1500 gallons per minute pumping continuously, or 2400 acre-feet per year.

The permit when issued will carry the following provision: "Issued as a supplementary supply to Surface Water Certificates 711 and 712, Ground Water Certificates 85-A and 4072-A and concurrent Ground Water Application 9326, for 1500 gallons per minute and 2400 acre-feet per year; the total quantity withdrawn or diverted from all sources is not to exceed 3300 acre-feet per year."

Signed at Olympia, Washington
this 2 day of June, 1968

B. A. CAMERON, Engineer
Division of Water Management

File Original and First Copy with the Division of Water Resources
Second Copy -- Owner's Copy
Third Copy -- Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 9325

Permit No. 8544

(1) OWNER: Name City of Camas Address 616 N.E. 4th Avenue

(2) LOCATION OF WELL: County Clark David C Parker D.L.C. #48 NE¼ SW¼ Sec. 12 T. 1 N. R. 3E W.M.

Bearing and distance from section or subdivision corner.

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 6
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 85 ft. Depth of completed well 85 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16"OD Diam. from 0 ft. to 85 ft.
Threaded ☐ ____" Diam. from ____ ft. to ____ ft.
Welded ☒ ____" Diam. from ____ ft. to ____ ft.

Perforations: Yes ☒ No ☐
Type of perforator used Mill knife
SIZE of perforations 5/16 in. by 3-1/2 in.
____ perforations from ____ ft. to ____ ft.
552 perforations from 56 ft. to 80 ft.
____ perforations from ____ ft. to ____ ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ____
Type ____ Model No. ____
Diam. ____ Slot size ____ from ____ ft. to ____ ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ____
Gravel placed from ____ ft. to ____ ft.

Surface seal: Yes ☒ No ☐ To what depth? 22 ft.
Material used in seal Concrete grout
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? ____ Depth of strata 27
Method of sealing strata off ____

(7) PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

(8) WATER LEVELS: Land-surface elevation above mean sea level 48 ft.
Static level 45 ft. below top of well Date 6-29-68
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? City
Yield: 1600 gal./min. with 5 ft. drawdown after 12 hrs
" " " "
" " " "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test June 29, 1968
Bailer test ____ gal./min. with ____ ft drawdown after ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water 53° Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Surface Soil	0	2
Gravel & Small Boulders	2	6
Gravel & Boulders	6	10
Gravel & Small Boulders	10	14
Boulders	14	15
Pea Gravel	15	17
Boulders	17	19
Boulders	19	21
Large to Medium gravel	21	26
Medium to fine gravel, some sand	26	30
Medium to fine gravel with a few boulders	30	40
Med. to fine gravel with fine sand	40	48'6"
Med to fine gravel with some sand	48'6"	53
Water bearing gravel and sand	53	55
Med to fine gravel, water bearing	55	59
Med to fine gravel, water bearing	59	69
Med to fine gravel, some black sand water bearing	69	76
Med to large gravel	76	80
Gravel & small boulders, very tight formation	80	83'9"
Med hard gray rock	83'9"	85

Work started June 5, 1968 Completed 6-27-68, 19

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME O.J. NORRIS-WATER WELL DRILLING
(Person, firm, or corporation) (Type or print)
Address 4411 N.E. 59th Avenue Vancouver, Washington

[Signed] O. J. Norris
(Well Driller)

License No. 223 02 4069 Date Sept. 9, 1968

See Enclosed

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 1386—(Rev. 3-66)—3-66—5M. 4516

CK/WCL

S. F. No. 2361—(Rev. 6-70).

WELL No 7

CERTIFICATE RECORD NO. —, PAGE NO. G 2-00501 C

STATE OF WASHINGTON, COUNTY OF Clark

CERTIFICATE OF GROUND WATER RIGHT

(Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology thereunder.)

THIS IS TO CERTIFY That CITY OF CAMAS

of Camas, Washington, has made proof to the satisfaction of the Department of Ecology of a right to the use of the public ground waters of the State of Washington from a well

located within a portion of David C. Parker D.L.C. #48 lying within the SW¼ within the city limits of Camas

Sec. 12, Twp. 1 N., R. 3 E., W.M.,

for the purpose(s) of municipal supply

under and specifically subject to provisions contained in Ground Water Permit No. 10515 issued by the Department of Ecology and that said right to the use of said ground waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the Department of Ecology and entered of record in Volume — at page 1 G 2-00501 C ; that the priority of the right hereby confirmed dates from March 22, 1971 ; that the quantity of ground water under the right hereby confirmed for the aforesaid purposes, is limited to an amount actually beneficially used for said purposes, and shall not exceed 1000 gallons per minute; 530 acre-feet per year, during entire year for municipal supply.

A description of the lands to which such ground water right is appurtenant is as follows:

Area served by the City of Camas.

The right to use of water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390 and 90.44.020.

This certificate of ground water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and seal of this office at Olympia, Washington, this 16th day of February, 1973.

JOHN A. BIGGS, Director
Department of Ecology

by R. L. Bolton

Engineering Data
TM

C-43

S. F. No. 7354—(Rev. 6-70)

Well No 7

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Permit to Appropriate Public Waters of the State of Washington

Book No. 22 of Ground Water Permits, on page 10515 under Application No. 11718

CITY OF CAMAS

of CAMAS, WASHINGTON

is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public ground waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

Priority date of this permit is March 22, 1971

Source(s) of the proposed ground water appropriation is/~~are~~ a well

The quantity of water appropriated shall be limited to the amount which can be beneficially applied and not to exceed 1000 gallons per minute; 530 acre-feet per year, to be used for the following purposes: municipal supply

as more definitely set out below.

Approximate location(s) of the point(s) of withdrawal is/~~are~~ 1245 feet east and 2145 feet north of southeast corner of Sec. 12

being within A portion of David C. Parker D.L.C. # 48 lying within the SW¼ within the city limits of Camas

of Sec. 12, Twp. 1 N., Rge. 3 E. W.M., Clark County.

The use, or uses, to which water is to be applied:

~~Domestic~~/municipal supply: 1000 gallons per minute; 530 acre-feet per year, during entire year.

Irrigation: gallons per minute; acre-feet per year from to each year, for the irrigation of acres.

Other use(s): gallons per minute: acre-feet per year, from to each year, for

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Camas

ADDITIONAL LIMITATIONS AND PROVISIONS: The installation and maintenance of an access port as described in Ground Water Bulletin No. ' shall be required prior to issuance of final Certificate of Water Right.

The total amount of water to be withdrawn or diverted, which includes the amounts as approved in Surface Water Certificates No. 711 and 712 and Ground Water Certificates Nos. 85, 4072, 6635 and 6636 shall not exceed 5750 acre-feet per year.

Nothing in this permit shall **be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.**

DESCRIPTION OF PROPOSED WORKS:

The well will be drilled (Dug or drilled) and have a diameter of 14 inches, and depth of 85 feet.

Description of tunnel or infiltration trench: _____

DEVELOPMENT SCHEDULE:

Construction work shall begin on or before Started

and shall thereafter be prosecuted with reasonable diligence and completed on or before November 1, 1972

and complete application of water to proposed use shall be made on or before November 1, 1973

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Olympia, Washington, this 10th

day of November 19 71

JOHN A. BIGGS, *Director*
Department of Ecology

by R. Jerry Bollen

ENGINEERING DATA

File Original and First Copy with the Division of Water Resources
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 11716
Permit No. .....

(1) OWNER: Name CITY OF CAMAS, WASH Address 616 NE 4TH AVE CAMAS, WASH

(2) LOCATION OF WELL: County CLARK NE¼ SW¼ Sec 12 T 1 N. R 3E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 7
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 14 inches.
Drilled 84 ft. Depth of completed well 84 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 14" Diam. from +5 ft. to 84 ft.
Threaded ☒ ..." Diam. from ... ft. to ... ft.
Welded ☒ ..." Diam. from ... ft. to ... ft.

Perforations: Yes ☒ No ☐
Type of perforator used STAR
SIZE of perforations 3/8 in. by 1¼ in.
520 perforations from 49 ft. to 77 ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes ☐ No ☒
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes ☐ No ☒ Size of gravel: ...
Gravel placed from ... ft. to ... ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft.
Material used in seal CEMENT GROUT
Did any strata contain unusable water? Yes ☐ ☒
Type of water? ... Depth of strata ...
Method of sealing strata off ...

(7) PUMP: Manufacturer's Name ...
Type: Submersible Turbine HP 100

1-25-75 JM

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 8.5 ft. below top of well Date 6/22/71
Artesian pressure ... lbs. per square inch Date ...
Artesian water is controlled by ... (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? STRASSER
Yield: 1000 gal./min. with 4 ft. drawdown after 1½ hrs.
" 1425 " 5 " 6 "
" 1200 " 4 " 24 "

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
IMMEDIATE	RECOVERY				

Date of test JUNE 22, 1971
Bailer test ... gal./min. with ... ft. drawdown after ... hrs.
Artesian flow ... g.p.m. Date ...
Temperature of water 57 Was a chemical analysis made? Yes ☐ No ☒

OK/WRR

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
GRAVEL AND BOULDERS	0	8
GRAVEL, SOME CLAY	8	18
CEMENTED GRAVEL	18	20
LOOSE GRAVEL	20	30
PACKED GRAVEL	30	36
GRAVEL AND GREY CLAY	36	39
LOOSE GRAVEL (WATER)	39	65
MEDIUM GRAVEL (WATER)	65	70
LARGE GRAVEL (WATER)	70	81
RED CLAY	81	84

RECEIVED
DEPARTMENT OF ECOLOGY
JUL 1 1971
AM
7 8 9 10 11 12 1 2 3 4 5 6 PM

Work started JUNE 7, 19 71 Completed JUNE 25, 19 71

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME R.J. STRASSER DRILLING CO (Person, firm, or corporation) (Type or print)
Address 8110 SE SUNSET LANE PORTLAND ORE
[Signed] Robert L Strasser (Well Driller)
License No 223022806 Date JULY 12, 1971

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7256—(Rev. 2-68)—1M—4516.

well #7

Report of Examination on Ground Water

Received date March 22, 1971 Date of exam. August 31, 1971 Appli. No. 11718

Name City of Camas Address 616 N.E. 4th Ave., Camas WA 98607

Type of works A well Dimensions 14" x 85'

Progress of works Well drilled and capped

Quantity applied for 1000 g.p.m. 530 acre-feet per year of David C. Parker P.L.C. #48 within the City of Camas (lying within the SW¼)

Legal sub A portion/Sec. 12 Twp. 1 Rge. 3 E. County Clark

Use Municipal supply

Irrigation-acreage: Present Planned Feasible

Municipal: ~~Population~~ Area served 15,000 as of 1990

Industrial

Time pump will be operated Continuously

Other water rights appurtenant to this land See Surface Water Certificates Nos. 712 & 711; Ground Water Certificates Nos. 85, 4072, 6635 and 6636

Proximity to existing works, springs, wells, or streams City of Camas, west 400'; City of Camas, southeasterly 1000'; City of Camas, north; Washougal River, north 200'

Area Sub-area Zone

RECOMMENDATIONS

Approved for 1000 g.p.m. 530 acre-feet per year, subject to existing water rights. (1 acre-foot 325,850 gallons.)

The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The applicant may, for his own convenience, wish to install an airline and gage in addition to the access port.

Use of the waters to be appropriated under this application will be for a public water supply. State Board of Health rules require every owner of a public water supply to obtain written approval from the Assistant Secretary, Division of Health prior to any new construction or alterations of a public water supply. The applicant is advised to contact the Washington State Division of Health, Public Health Bldg. No. 7, Thurston Airdustrial Center, Olympia, with regard to the need for compliance.

The following water rights are appurtenant to this land:

Certificate No.	c.f.s./g.p.m.	ac-ft per yr.
SWC 711	1.0 c.f.s.	730
SWC 712	2.5 c.f.s.	1820
GWC 85-A	1200 g.p.m.	118
GWC 4072-A	1325 g.p.m.	1208
GWC 6635	1500 g.p.m.	2400
GWC 6636	600 g.p.m.	920

The total requirement based on an engineering study is 345 gallons per capita per day for all purposes for an estimated population of 15,000 by 1990 or approximately 5,750 acre-feet per year.

The quantity recommended under this application is 1000 gallons per minute not to exceed 530 acrefeet per year as requested in the application.

The permit when issued will carry the following provision: 'The total amount of water to be withdrawn or diverted, which includes the amounts as approved in Surface Water Certificates Nos. 711 and 712 and Ground Water Certificates Nos. 85, 4072, 6635 and 6636 shall not exceed 5,750 acre-feet per year."

Additionally, the permit when issued shall carry the following provision: "Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971."

Signed at Olympia, Washington
this 28th day of September, 1971.

JERRY LOUTHAIN, Engineer
Department of Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
February 4, 1977	G 2-24400	G 2-24400 P	G 2-24400 C

NAME
CITY OF CAMAS

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
P.O. Box 1055	Camas	Washington	98607

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	900	530

QUANTITY, TYPE OF USE, PERIOD OF USE		
530 acre-feet per year	municipal supply	continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1375 feet East and 2145 feet North of Southwest corner of Section 12.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW¼	12	1	3 E	28	Clark

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the Camas Municipal water system.

PROVISIONS

"The total amount of water to be withdrawn or diverted, which includes the amounts as approved in Surface Water Certificate No. 711 and 712 and Ground Water Certificate Nos. 85A, 4072 A, 6635 A and G 2-00501 and this certificate shall not exceed 5750 acre-feet per year."

↑ 6635A ?

The access port as required on your permit shall be maintained at all times.

"All water wells constructed within the state shall meet the minimum standards for construction and maintenance as provided under Chapter 18.104 RCW (Washington Water Well Construction Act of 1971) and Chapter 173-160 WAC (Minimum Standards for Construction and maintenance of Water Wells)."

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Olympia *Washington, this* 23rd *day of* May, *19* 79

WILBUR G. HALLAUER, DIRECTOR
Department of Ecology

by E.W. Asselstine
E.W. ASSELSTINE, Regional Manager

ENGINEERING DATA
OK RPP
OTES

FOR COUNTY USE ONLY

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. 52-24400P
Permit No.

(1) OWNER: Name City of Camas Address Camas, Washington

(2) LOCATION OF WELL: County Clark NW¼ SW¼ Sec. 12 T. 1 N. R. 3E W.M.
Bearing and distance from section or subdivision corner 1375 E. & 2145' N of SW Cor of Sec 12

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one) 8
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 14 inches.
Drilled 87 ft. Depth of completed well 87 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 14" Diam. from 0 ft. to 87 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.
(3' riser added for future fill)
Perforations: Yes ☒ No ☐
Type of perforator used Mills Knife
Size of perforations 3/8 in. by 3½ in.
8 rows perforations from 44 ft. to 79 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 20 ft
Material used in seal Cement
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 33.2 ft. below top of well Date 5/10/77
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☒ No ☐ If yes, by whom? driller
Yield: 1,040 gal./min. with 1.15 ft. drawdown after ½ hrs.
" 1,791 " 3.60 " 6 "
" 1,921 " 3.65 " 7 "
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
0:00	36.85				
7:00	34.00				
minutes					

Date of test 5/10/77
Baller test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 50° Was a chemical analysis made? Yes ☒ No ☐

OK PMS

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
Topsoil	0	6"
Gravel, small boulders	6"	4'
Gravel, boulders	4'	21'
Gravel, small boulders, brown clay seams	21'	37'
Gravel, loose, some brown clay	37'	39'
Gravel, sand, gray	39'	42'
Gravel, sand, gray, water bearing	42'	49'
Gravel, medium size, sand, gray, loose, water bearing	49'	55'
Gravel, small to large, loose, water bearing	55'	75'
Gravel, medium to large, loose	75'	79'
Gravel, large, red clay	79'	82'
Clay, red	82'	87'

RECEIVED
JUL 6 '77
DEPARTMENT OF ECOLOGY
SOUTHWEST REGIONAL OFFICE

Work started 4/14 19 77 Completed 5/19 19 77

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME NORRIS DRILLING & PUMP CO., INC.
(Person, firm, or corporation) (Type or print)
Address 11026 N.E. St. Johns Blvd. Vancouver, Washington 98665

[Signed] O. J. Norris
(Well Driller)

License No. 0366 Date June 6 19 77

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
February 4, 1977	G 2-24400	G 2-24400 P	

NAME
CITY OF CAMAS

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
616 NE 4th Ave. PO Box 1065	Camas	Washington	98607

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

PUBLIC WATER TO BE APPROPRIATED

SOURCE
well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	900	530

QUANTITY, TYPE OF USE, PERIOD OF USE
530 acre-feet per year — municipal supply — continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1375 feet East and 2145 feet North of Southwest corner of Section 12.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW¼	12	1	3 E	28	Clark

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the Camas Municipal water system.

DESCRIPTION OF PROPOSED WORKS

Well 14" x 85', 100 HP pump to municipa water system.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	July 1, 1979	July 1, 1980

PROVISIONS

"The total amount of water to be withdrawn or diverted, which includes the amounts as approved in surface water certificate No. 711 and 712 and Ground Water Certificate Nos. 85A, 4072 A, 5635 A and G2-00501 and this permit shall not exceed 5750 acre-feet per year.

The installation of an access port as described in Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The permittee, may for his own convenience, wish to install an airline and gage in addition to the access port.

"All water wells constructed within the state shall meet the minimum standards for construction and maintenance as provided under Chapter 18.104 RCW (Washington Water Well Construction Act of 1971) and Chapter 173-160 WAC (Minimum Standards for Construction and maintenance of Water Wells)."

Nothing in this permit shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Olympia *Washington, this* 15th *day of* March, *19* 78

WILBUR HALLAUER, DIRECTOR
Department of Ecology

by E.W. Asselstine

E.W. Asselstine, Regional Manager

ENGINEERING DATA
OK RPB

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION
TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
February 4, 1977	G 2-24400		

NAME
CITY OF CAMAS

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
616 NE 4 th Ave	Camas	Washington	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
well

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	900	530

QUANTITY, TYPE OF USE, PERIOD OF USE
530 acre-feet per year — municipal supply — continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1375 feet East and 2145 feet North of Southwest corner of Section 12.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW¼	12	1	3 E	28	Clark

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the Camas Municipal water system.

DESCRIPTION OF PROPOSED WORKS

1 14" x 85', 100 HP pump to municipal water system.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
Started	July 1, 1979	July 1, 1980

PROVISIONS

Recommend this application be approved for 900 gallon per minute and 530 acre-feet per year for a municipal supply for the City of Camas.

The following water rights are appurtenant to this land.

Certificate No.	CFS/GPM	Acre-feet per year
SWC 711	1.0 CFS	730
SWC 712	2.5 CFS	1820
GWC 85-A	1200 GPM	118
GWC 4072 A	1325 GPM	1208
GWC 6635	1500 GPM	2400
GWC 6636	600 GPM	920
G2 - 00501 C	1000 GPM	530

total requirement based on an engineering study is 345 gallons per capita per day for all poses for an estimated population of 15,000 by 1990 or approximately 5,750 acre-feet per year. The permit when issued will carry the following provision: "The total amount of water to be withdrawn or diverted, which includes the amounts as approved in surface water certificate Nos. 711 and 712 and Ground Water Certificate Nos. 85A, 4072A, 6635 A 6636 A and G2-00501 and this application shall not exceed 5750 acre-feet per year.

The installation of an access port as described in attached Ground Water Bulletin No. 1 shall be required prior to issuance of final certificate of water right. The applicant may for his own convenience, wish to install an airline and gage in addition to the access port.

Use of the waters to be appropriated under this application will be for a public water supply. State Board of Health rules require every owner of a public water supply to obtain written approval from the Water Supply and Waste Section, Department of Social and Health Services, Mail Stop 4-1, Building 4, Olympia, Washington, 98504, prior to any new construction or alterations of a public water supply.

"All water wells constructed within the state shall meet the minimum standards for construction and maintenance as provided under Chapter 18.104 RCW (Washington Water Well Construction Act of 1971) and Chapter 173-160 WAC (Minimum Standards for Construction and Maintenance of Water Wells)."

Nothing in this application shall be construed as excusing the applicant from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including those administered by local agencies under the Shoreline Management Act of 1971.

ned at Olympia, Washington,
...is 4 day of August, 1977.

Robert P. Burrell
Robert P. Burrell
Department of Ecology

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 13, 1986	G2-27384	G2-27384 P	

NAME
City of Camas

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
616 NE 4th Avenue	Camas	Washington	98607

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions specified herein.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well No. 9

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	650	210 Supplemental

QUANTITY, TYPE OF USE, PERIOD OF USE		
210 acre-feet per year Supplemental to existing rights	Municipal Supply	Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
600 feet south and 700 feet west of the north quarter corner of Section 4.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼NW¼	4	1	3E	28	Clark

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Camas.

This permit is subject to the implementation of the minimum requirements established in the Interim Guidel for Public Water Systems Regarding Water Use Reporting, Demand Forecasting Methodology and Conserva Programs, July 1990.

Under RCW 90.03.005 and 90.54.020(6), conservation and improved water use efficiency must be emphas in the management of the states water resources, and must be considered as a potential new source of w Accordingly, as part of the terms of this permit, the applicant shall prepare and implement a water conserva plan approved by Department of Health. The standards for such a plan may be obtained from either Department of Health or the Department of Ecology.

The Water Resources Act of 1971 specifies certain criteria regarding utilization and management of the wa of the state in the best public interest. Use of water may be subject to regulation at certain times, based on necessity to maintain water quantities sufficient for preservation of the natural environment.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

REPORT OF EXAMINATION

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

☐ Surface Water (issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regu... the Department of Ecology.)

☒ Ground Water (issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regu... the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 13, 1986	G2-27384		

NAME
City of Camas

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
616 NE 4th Avenue	Camas	Washington	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Well No. 9

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
	650	210 Supplemental

QUANTITY, TYPE OF USE, PERIOD OF USE		
210 acre-feet per year Supplemental to existing rights	Municipal Supply	Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION–WITHDRAWAL
600 feet south and 700 feet west of the north quarter corner of Section 4.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NE¼NW¼	4	1	3E	28	Clark

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the City of Camas.

Existing City of Camas rights. The City of Camas has several surface and ground water rights and clair shown below:

Little Washougal River (reach now known as Boulder Creek), Certificate No. S 711 C, is for 1.0 cfs an acre-feet per year (AF/Y). This source is subject to low flow conditions in the summer.

Jones Creek, Certificate No. S 712 C, is for 2.5 cfs and 1820 AF/Y. This source goes low in the summer

Well No. 1, Claim No. 121022 for vested rights, is for 900 gpm and 320 AF/Y. The well is no longer use a regular basis.

Well No. 2, Claim No. 121023 for vested rights, is for 900 gpm and 230 AF/Y. The well is no longer use a regular basis.

Well No. 3, Certificate No. G 85-A C, is for 1200 gpm and 118 AF/Y.

Well No. 4, Certificate No. G 4072 C, is for 1325 gpm and 1208 AF/Y.

Well No. 5, Certificate No. G 6636 C, is for 600 gpm and 920 AF/Y.

Well No. 6, Certificate No. G 6635 C, is for 1500 gpm and 2400 AF/Y.

Well No. 7, Certificate No. G2-00501, is for 1000 gpm and 530 AF/Y.

Well No. 8, Certificate No. G2-24400, is for 900 gpm and 530 AF/Y.

Under the provisions of Certificates No. G2-00501C and G2-24400, the total annual quantity allowed u existing rights is 5,750 AF/Y.

Clark County Reservation. Under the provisions of Chapter 173-592 WAC, Reservation of Future Public W Supply for Clark County, ground water was reserved for future beneficial use for public water supply in C County. Since the enactment of this reservation, water rights issued pursuant to WAC 173-592 have rece a priority date of August 13, 1986, the effective date of said regulation. The total reservation quantity is 97 gpm and 65,300 AF/Y prorated by aquifer as follows:

1) Columbia River Alluvium (1A) and Sandy River Mudstone (1C) 77,000 gpm, 51,800 AF/Y;

2) Upper Troutdale (1B-2B) 20,000 gpm, 13,500 AF/Y.

The subject well is completed within the Upper Troutdale sediments. This appropriation, therefore, falls ur WAC 173-592 and will, when permitted, be debited against the reserved quantity for the Upper Trout aquifers. In addition, the permit will carry the August 13, 1986, priority date of the reservation.

Annual quantity supplemental to existing rights. The total annual allocation under the City's existing rig 5,750 AF/Y, was based on a projected population of 15,000. The City of Camas' actual water use for the 1989 amounted to 1,930 acre-feet for a population of 6,600 (Clark County Coordinated Water system P Update, April 1991; Intergovernmental Resource Center population summary, March 1990).

The City's annual water use should remain within existing rights (5,750 AF/Y) for the foreseeable fut Therefore the annual quantity recommended for this permit will be supplemental to existing rights, augmen system supply within the 5,750 AF/Y already authorized.

Quantities from this well. Due to the apparent limitations of the aquifer, this well is probably not suitable use as a major production well, but it could serve to boost system capacity during peak periods. Mr. Levi requested that the permit authorize a maximum withdrawal of 650 gpm up to 20% of the time on average allow the City to determine the optimum rate and pumping schedule. Accordingly, the permit will autho 650 gpm and 210 AF/Y from Well 9, subject to the provisions below.

Water right certificate. Pursuant to RCW 90.03.330 and 90.44.080, a final certificate will be issued upo showing satisfactory to the Department that the appropriation has been perfected in compliance with the ter of the subject permit. The certificated withdrawal rate and annual quantity will reflect a sustainable yield a protection of senior rights, within the amounts specified on the permit. Monitoring and data submittal will required under the certificate as well as the permit.

The Water Resources Act of 1971 specifies certain criteria regarding utilization and management of the
of the state in the best public interest. Favorable consideration of this application has been based on suf
waters available, at least during portions of the year. However, it is pointed out to the applicant that th
of water may be subject to regulation at certain times, based on the necessity to maintain water qua
sufficient for preservation of the natural environment.

REPORTED BY: Vennie Wright DATE: October 12, 1992

The statutory permit fee for this application is $20.00.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
REPORT OF EXAMINATION

Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[X] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 21, 2003	G2-30144		

NAME

City of Camas

ADDRESS (STREET)	CITY	STATE	ZIP CODE
616 NE Fourth Avenue	Camas	WA	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE

8 Wells (Lower Washougal Wellfield)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	500	2,150

QUANTITY, TYPE OF USE, PERIOD OF USE

2,150 acre-feet per year	Municipal	Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL

Well 5: 2600ft E & 790ft N of SW corner of Section 12, T1NR3E; Parcel=87268000; Lat=45.58059763; Long=122.38336343
Well 6: 2410ft E & 1795ft N of SW corner of Section 12, T1NR3E; Parcel=89927000; Lat=45.58340428; Long=122.38412204
Well 7: 1280ft E & 2110ft N of SW corner of Section 12, T1NR3E; Parcel=89891000; Lat=45.58431461; Long=122.38852327
Well 8: 1410ft E & 2080ft N of SW corner of Section 12, T1NR3E; Parcel=89888000; Lat=45.58426809; Long=122.38802699
Well 10: 790ft E & 2170ft N of SW corner of Section 12, T1NR3E; Parcel=89866000; Lat=45.58447735; Long=122.39044258
Well 11: 1060ft E & 2145ft N of SW corner of Section 12, T1NR3E; Parcel=89892000; Lat=45.58439709; Long=122.38937969
Well 12: 1030ft E & 2145ft N of SW corner of Section 12, T1NR3E; Parcel=89892000; Lat=45.58439492; Long=122.38950256
Well 13: 15ft E & 3410ft N of SW corner of Section 12, T1NR3E; Parcel=90928000; Lat=45.58783343; Long=122.39350782

SMALLEST SUBDIVISION	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
	12	1 N	3 E.W.M.	28	Clark

POINT OF WITHDRAWAL NAME	PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM NAD 83 (orthophoto)
Washougal River Wellfield	See above	See above	See above	

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED
[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal]

Area served by the City of Camas. The place of use of this water right is the service area described in the currently approved Water System Plan as approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.

DESCRIPTION OF PROPOSED WORKS

8 Existing Wells in the Lower Washougal Wellfield

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
August 1, 2008	August 1, 2015	August 1, 2025

PROVISIONS

Monitoring

The City of Camas shall develop a monitoring plan that includes the following:

a.) Monitor water levels in existing wells (TW-C and Well 4) and three new monitoring wells. The new monitoring wells must be installed as a cluster in the lower Washougal River in general proximity to the Georgia Pacific wellfield (where the largest drawdown occurs in the area). Two wells must be completed in the lower permeability streambed unit that lies beneath the river, and the third well must be completed in the more permeable PAA aquifer. All water levels must be measured to the nearest tenth of a foot, on an hourly basis during baseflow periods. New monitoring wells must be accurately located within 10 feet horizontally and 0.1 foot vertically. All monitoring wells must be constructed according to WAC 173-160-400.

b.) The City shall install a continuous river stage monitoring station in vicinity of the new monitoring wells. The monitoring station must include a staff gage which is accurately located within 10 feet horizontally and 0.1 foot vertically. Stage readings shall also be recorded on an hourly basis.

c.) Aquifer tests on the new Camas production wells must coincide with summer/fall low-flow periods and include seepage surveys during testing events. New supply wells must be accurately located within 10 feet horizontally and 0.1 foot vertically.

d.) The City shall submit water level data from their monitoring network for the previous year by January 31 to the Department of Ecology. Data shall be provided in a digital format along with a two page summary attached. A more thorough monitoring report must be provided after 5 years from the date of issuance of this water right or when this permit is perfected (whichever comes first), to further evaluate the effects of pumping on the Washougal River.

Operations of Surface Water System

1. Prior to groundwater being withdrawn under this water right, the City of Camas must cease their surface water diversions from Jones and Boulder Creeks between May 15 and October 31 of each year. At the State's discretion, the water rights associated with these diversions will be placed into the State's Trust Water Program as permanent, seasonal donations.

Metering and Reporting Diversions

1. An approved measuring device shall be installed and maintained for each of the wells authorized by this water right, in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

2. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/. If you do not have Internet access, contact the Southwest Regional Office for forms to submit your data.

3. Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation, and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements."

4. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions and may inspect, at reasonable times, any measuring device used to meet the above conditions.

Development Schedule

1. The development schedule shall be as follows:

   - Construction shall begin by August 1, 2008

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
REPORT OF EXAMINATION

Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[X] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 21, 2003	G2-30145		

NAME
City of Camas

ADDRESS (STREET)	CITY	STATE	ZIP CODE
616 NE Fourth Avenue	Camas	WA	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Proposed Well (Anderson Site)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	1000	880

QUANTITY, TYPE OF USE, PERIOD OF USE
880 acre-feet per year Municipal Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL
1900 feet north and 2050 feet west of SE corner of Section 12

SMALLEST SUBDIVISION	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
NW 1/4 SE 1/4	12	1 N	3 E.W.M.	28	Clark

POINT OF WITHDRAWAL NAME	PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM
Anderson proposed well	91045003	45.58349161	122.38087177	NAD 83 (orthophoto)

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED
[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal]

Area served by the City of Camas. The place of use of this water right is the service area described in the currently approved Water System Plan as approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.

DESCRIPTION OF PROPOSED WORKS

A proposed well

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
August 1, 2008	August 1, 2015	August 1, 2025

PROVISIONS

Monitoring

The City of Camas shall develop a monitoring plan that includes the following:

a.) Monitor water levels in existing wells (TW-C and Well 4) and three new monitoring wells. The new monitoring wells must be installed as a cluster in the lower Washougal River in general proximity to the Georgia Pacific wellfield (where the largest drawdown occurs in the area). Two wells must be completed in the lower permeability streambed unit that lies beneath the river, and the third well must be completed in the more permeable PAA aquifer. All water levels must be measured to the nearest tenth of a foot, on an hourly basis during baseflow periods. New monitoring wells must be accurately located within 10 feet horizontally and 0.1 foot vertically. All monitoring wells must be constructed according to WAC 173-160-400.

b.) The City shall install a continuous river stage monitoring station in vicinity of the new monitoring wells. The monitoring station must include a staff gage which is accurately located within 10 feet horizontally and 0.1 foot vertically. Stage readings shall also be recorded on an hourly basis.

c.) Aquifer tests on the new Camas production wells must coincide with summer/fall low-flow periods and include seepage surveys during testing events. New supply wells must be accurately located within 10 feet horizontally and 0.1 foot vertically.

d.) The City shall submit water level data from their monitoring network for the previous year by January 31 to the Department of Ecology. Data shall be provided in a digital format along with a two page summary attached. A more thorough monitoring report must be provided after 5 years from the date of issuance of this water right or when this permit is perfected (whichever comes first), to further evaluate the effects of pumping on the Washougal River.

Operations of Surface Water System

1. Prior to groundwater being withdrawn under this water right, the City of Camas must cease their surface water diversions from Jones and Boulder Creeks between May 15 and October 31 of each year. At the State's discretion, the water rights associated with these diversions will be placed into the State's Trust Water Program as permanent, seasonal donations.

Metering and Reporting Diversions

1. An approved measuring device shall be installed and maintained for each of the wells authorized by this water right, in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

2. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/. If you do not have Internet access, contact the Southwest Regional Office for forms to submit your data.

3. Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation, and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements."

4. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions and may inspect, at reasonable times, any measuring device used to meet the above conditions.

Development Schedule

1. The development schedule shall be as follows:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
REPORT OF EXAMINATION

☐ Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

☒ Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 21, 2003	G2-30146		

NAME
City of Camas

ADDRESS (STREET)	CITY	STATE	ZIP CODE
616 NE Fourth Avenue	Camas	WA	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Proposed Well (Parkers Landing)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	1000	880

QUANTITY, TYPE OF USE, PERIOD OF USE

880 acre-feet per year	Municipal	Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL

200 feet north and 2500 feet west of the SE corner of Section 12

SMALLEST SUBDIVISION	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW 1/4 SE 1/4	12	1 N	3 E.W.M.	28	Clark

POINT OF WITHDRAWAL NAME	PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM
Parkers Landing proposed well	73134162	45.57960601	122.38210695	NAD 83 (orthophoto)

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED
[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal]

Area served by the City of Camas. The place of use of this water right is the service area described in the currently approved Water System Plan as approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.

DESCRIPTION OF PROPOSED WORKS

A proposed well

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
August 1, 2008	August 1, 2015	August 1, 2025

PROVISIONS

Monitoring

The City of Camas shall develop a monitoring plan that includes the following:

a.) Monitor water levels in existing wells (TW-C and Well 4) and three new monitoring wells. The new monitoring wells must be installed as a cluster in the lower Washougal River in general proximity to the Georgia Pacific wellfield (where the largest drawdown occurs in the area). Two wells must be completed in the lower permeability streambed unit that lies beneath the river, and the third well must be completed in the more permeable PAA aquifer. All water levels must be measured to the nearest tenth of a foot, on an hourly basis during baseflow periods. New monitoring wells must be accurately located within 10 feet horizontally and 0.1 foot vertically. All monitoring wells must be constructed according to WAC 173-160-400.

b.) The City shall install a continuous river stage monitoring station in vicinity of the new monitoring wells. The monitoring station must include a staff gage which is accurately located within 10 feet horizontally and 0.1 foot vertically. Stage readings shall also be recorded on an hourly basis.

c.) Aquifer tests on the new Camas production wells must coincide with summer/fall low-flow periods and include seepage surveys during testing events. New supply wells must be accurately located within 10 feet horizontally and 0.1 foot vertically.

d.) The City shall submit water level data from their monitoring network for the previous year by January 31 to the Department of Ecology. Data shall be provided in a digital format along with a two page summary attached. A more thorough monitoring report must be provided after 5 years from the date of issuance of this water right or when this permit is perfected (whichever comes first), to further evaluate the effects of pumping on the Washougal River.

Operations of Surface Water System

1. Prior to groundwater being withdrawn under this water right, the City of Camas must cease their surface water diversions from Jones and Boulder Creeks between May 15 and October 31 of each year. At the State's discretion, the water rights associated with these diversions will be placed into the State's Trust Water Program as permanent, seasonal donations.

Metering and Reporting Diversions

1. An approved measuring device shall be installed and maintained for each of the wells authorized by this water right, in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

2. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/. If you do not have Internet access, contact the Southwest Regional Office for forms to submit your data.

3. Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation, and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements."

4. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions and may inspect, at reasonable times, any measuring device used to meet the above conditions.

Development Schedule

1. The development schedule shall be as follows:

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
REPORT OF EXAMINATION

Surface Water (Issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[X] Ground Water (Issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
August 21, 2003	G2-30147		

NAME

City of Camas

ADDRESS (STREET)	CITY	STATE	ZIP CODE
616 NE Fourth Avenue	Camas	WA	98607

PUBLIC WATERS TO BE APPROPRIATED

SOURCE

Proposed Well (Treatment Plant Well)

TRIBUTARY OF (IF SURFACE WATERS)

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE FEET PER YEAR
	1000	880

QUANTITY, TYPE OF USE, PERIOD OF USE

880 acre-feet per year — Municipal — Year-round, as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION—WITHDRAWAL

200 feet north and 200 feet west of the SW corner of Section 12

SMALLEST SUBDIVISION	SECTION	TOWNSHIP N.	RANGE, (E. OR W.) W.M.	W.R.I.A.	COUNTY
SW 1/4 SW ¼	12	1 N	3 E.W.M.	28	Clark

POINT OF WITHDRAWAL NAME	PARCEL NUMBER	LATITUDE	LONGITUDE	DATUM
Treatment Plant proposed well	87360000	45.57902697	122.39273145	NAD 83 (orthophoto)

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

[Attachment 1 shows location of the authorized place of use and point(s) of diversion or withdrawal]

Area served by the City of Camas. The place of use of this water right is the service area described in the currently approved Water System Plan as approved by the Washington State Department of Health. RCW 90.03.386 may have the effect of revising the place of use of this water right if the criteria in section RCW 90.03.386(2) are met.

DESCRIPTION OF PROPOSED WORKS

A proposed well

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE:
August 1, 2008	August 1, 2015	August 1, 2025

PROVISIONS

Monitoring

The City of Camas shall develop a monitoring plan that includes the following:

a.) Monitor water levels in existing wells (TW-C and Well 4) and three new monitoring wells. The new monitoring wells must be installed as a cluster in the lower Washougal River in general proximity to the Georgia Pacific wellfield (where the largest drawdown occurs in the area). Two wells must be completed in the lower permeability streambed unit that lies beneath the river, and the third well must be completed in the more permeable PAA aquifer. All water levels must be measured to the nearest tenth of a foot, on an hourly basis during baseflow periods. New monitoring wells must be accurately located within 10 feet horizontally and 0.1 foot vertically. All monitoring wells must be constructed according to WAC 173-160-400.

b.) The City shall install a continuous river stage monitoring station in vicinity of the new monitoring wells. The monitoring station must include a staff gage which is accurately located within 10 feet horizontally and 0.1 foot vertically. Stage readings shall also be recorded on an hourly basis.

c.) Aquifer tests on the new Camas production wells must coincide with summer/fall low-flow periods and include seepage surveys during testing events. New supply wells must be accurately located within 10 feet horizontally and 0.1 foot vertically.

d.) The City shall submit water level data from their monitoring network for the previous year by January 31 to the Department of Ecology. Data shall be provided in a digital format along with a two page summary attached. A more thorough monitoring report must be provided after 5 years from the date of issuance of this water right or when this permit is perfected (whichever comes first), to further evaluate the effects of pumping on the Washougal River.

Operations of Surface Water System

1. Prior to groundwater being withdrawn under this water right, the City of Camas must cease their surface water diversions from Jones and Boulder Creeks between May 15 and October 31 of each year. At the State's discretion, the water rights associated with these diversions will be placed into the State's Trust Water Program as permanent, seasonal donations.

Metering and Reporting Diversions

1. An approved measuring device shall be installed and maintained for each of the wells authorized by this water right, in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

2. Reported water use data shall be submitted via the Internet. To set up an Internet reporting account, access https://fortress.wa.gov/ecy/wrx/wrx/Meteringx/. If you do not have Internet access, contact the Southwest Regional Office for forms to submit your data.

3. Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation, and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements."

4. Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable times, to the records of water use that are kept to meet the above conditions and may inspect, at reasonable times, any measuring device used to meet the above conditions.

Development Schedule

1. The development schedule shall be as follows:

RECEIVED
SEP 04 2001
Washington State

For Ecology Use
Fee Paid _____
Date _____

State of Washington
Application for a Water Right

Please follow the attached instructions to avoid unnecessary delays.

Section 1. APPLICANT - PERSON, ORGANIZATION, OR WATER SYSTEM

Name City of Camas Home Tel:( ) -

Mailing Address 616 NE 4th Ave. Work Tel:(360) 834 - 3451

City Camas State WA Zip+4 98607 + FAX:(360) 834 - 1535

Section 2. CONTACT - PERSON TO CALL ABOUT THE APPLICATION

☐ Same as above

Name Eric Levison Home Tel:( ) -

Mailing Address 616 NE 4th Ave. Work Tel:(360) 834 - 3451

City Camas State WA Zip+4 98607 + FAX:(360) 834 - 1535

Relationship to applicant Engineering Manager - City of Camas

Section 3. STATEMENT OF INTENT

Municipal

The applicant requests a permit to use not more than 1,000 (☒ gallons per minute or ☐ cubic feet per second) from a ☐ surface water source or ☒ ground water source (check only one) for the purpose(s) of Domestic/Public Supply. **ATTACH A "LEGAL" DESCRIPTION OF THE PLACE OF USE.** (See instructions.) *NOTE: A tax parcel number or a plat number is not sufficient.* Area served by City of Camas.

Estimate a maximum annual quantity to be used in acre-feet per year: 1200 AF/YR

☐ Check if the water use is proposed for a short-term project. Indicate the period of time that the water will be needed:

From ___/___/___ to ___/___/___

Section 4. WATER SOURCE

If SURFACE WATER	If GROUNDWATER
Name the water source and indicate if stream, spring, lake, etc. If unnamed, write "unnamed spring," "unnamed stream," etc.: Number of diversions:	A permit is desired for 2 well(s).
Source flows into (name of body of water):	Size & depth of well(s): 12-inch deep 150 feet deep

LOCATION

Enter the north-south and east-west distances in feet from the point of diversion or withdrawal to the nearest section corner: 1600 feet east and 1000 feet south of the NW 1/4 of Section 28, Township 2 North, Range 3 East

¼ of	¼ of	Section	Township	Range(E/W)	County	If location of source is platted, complete below: Lot	Block	Subdivision
NE	NW	28	2N	3E	Clark			

For Ecology Use Date Received: 9-4-01 Priority Date: 9.4.01

SEPA: Exempt/Not Exempt FERC License # Dept. Of Health #

Date Accepted As Complete 9-21-01 By SC Date Returned By WRIA: 28

ECY 040-1-14 Rev. 9/95 F

APPLICATION

Appl. No.: G2-30019

Q 9-3201d

98

Section 5. GENERAL WATER SYSTEM INFORMATION

A. Name of system, if named: Camas Municipal Water-Sewer System

B. Briefly describe your proposed water system. (See instructions.)

Two 12-inch supply wells will be constructed to depths of 150 feet. The wells will be used to provide water supply to municipal and industrial water users that are served by the City of Camas in the Lacamas Basin area. See 1996 Water System Plan documents for other related water system information.

C. Do you already have any water rights or claims associated with this property or system? ☒ YES ☐ NO
PROVIDE DOCUMENTATION. See list of City Water Rights and claims that are attached.

Section 6. DOMESTIC / PUBLIC WATER SUPPLY SYSTEM INFORMATION
(Completed for all domestic/public supply uses.)

A. Number of "connections" requested: 4896 (current number of connections) Type of connection Municipal Industrial Hookup (Homes, Apartment, Recreational, etc.)

B. Are you within the area of an approved water system? ☒ YES ☐ NO
If yes, explain why you are unable to connect to the system. *Note: Regional water systems are identified by your County Health Department.* The applicant (City of Camas) is the regional water provider.

Complete C. and D. only if the proposed water system will have fifteen or more connections.

C. Do you have a current water system plan approved by the Washington State Department of Health? ☒ YES ☐ NO
If yes, when was it approved? 1996 Please attach the current approved version of your plan.
Note: City is currently updating water system plan. New plan should be approved in early 2002.

D. Do you have an approved conservation plan? ☒ YES ☐ NO
If yes, when was it approved? 1996 Please attach the current approved version of your plan.
Note: Water Conservation Plan incorporated into 1996 Water System Plan, which is currently being updated.

Section 7. IRRIGATION/AGRICULTURAL/FARM INFORMATION
(Complete for all irrigation and agriculture uses.) N/A

A. Total number of acres to be irrigated: _____

B. List total number of acres for other specified agricultural uses:

Use _____ Acres _____
Use _____ Acres _____
Use _____ Acres _____

C. Total number of acres to be covered by this application: _____

D. Family Farm Act (Initiative Measure Number 59, November 3, 1977)
Add up the acreage in which you have a controlling interest, including only:
‡ Acreage irrigated under water rights acquired after December 8, 1977;
‡ Acreage proposed to be irrigated under this application;
‡ Acreage proposed to be irrigated under other pending application(s).

1. Is the combined acreage greater than 2000 acres? ☐ YES ☐ NO
2. Do you have a controlling interest in a Family Farm Development Permit? ☐ YES ☐ NO
If yes, enter permit no: _____

E. Farm uses:
Stockwater - Total # of animals _____ Animal type _____ (If dairy cattle, see below)
Dairy - # Milking _____ # Non-milking _____

Section 8. WATER STORAGE

Will you be using a dam, dike, or other structure to retain or store water? ☐ YES ☒ NO

NOTE: If you will be storing 10 acre-feet or more of water and/or if the water depth will be 10 feet or more at the deepest point, and some portion of the storage will be above grade, you must also apply for a reservoir permit. You can get a reservoir permit application from the Department of Ecology.

Section 9. DRIVING DIRECTIONS

Provide detailed driving instructions to the project site. From Lacey, WA, go southbound on I-5. Take I-205 exit at Hazel Dell. Proceed southbound on I-205 to SR-14. Take SR-14 eastbound to Brady Road. Proceed north on Brady Road which turns into NW Parker Avenue. Continue northbound on NW Parker to SE 1st Street. Go westbound on NW 1st to 216th Ave. Take 216th Ave. northbound to Camas Meadows Golf Course. Take service road through golf course to well site.

Section 10. REQUIRED MAP

A. Attach a map of the project. (See instructions.)

Section 11. PROPERTY OWNERSHIP

A. Does the applicant own the land on which the water will be used? ☐ YES ☒ NO
If no, explain the applicant's interest in the place of use and provide the name(s) and address(es) of the owner(s):

The City will use the water for supply within their service area.

B. Does the applicant own the land on which the water source is located? ☐ YES ☒ NO
If no, submit a copy of agreement:
The City will purchase property as part of the supply well development.

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I grant staff from the Department of Ecology access to the site for inspection and monitoring purposes. Even though I may have been assisted in the preparation of the above application by the employees of the Department of Ecology, all responsibility for the accuracy of the information rests with me.

CITY OF CAMAS E. Levison ERIC LEVISON — 8/29/01
Applicant (or authorized representative) — Date

Landowner for place of use (if same as applicant, write "same") — Date

Use this page to continue your answers to any questions on the application. Please indicate section number before answer.

We are returning your application for the following reason(s):	
_____ Examination fee was not enclosed	APPLICANT PLEASE RETURN TO CASHIER, PO BOX 5128, LACEY, WA 98509-5128
_____ Section number(s) _____ is/are incomplete	APPLICANT PLEASE RETURN TO THE APPROPRIATE REGIONAL OFFICE
Explanation:	
Please provide the additional information requested above and return your application by _____ _____ *(date).*	

Ecology staff_____ Date_____

To receive this document in alternative format, contact Lisa Newman at (360) 407-6604 (Voice) or (360) 407-6006 (TDD).

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

October 1, 2001

City of Camas
Attn Eric Levison
616 NE 4th Avenue
Camas WA 98607

Re: Water Right Application No. G2-30018

This letter is to acknowledge that the Washington State Department of Ecology received your water right application. We have assigned your application the number indicated above. Please include this number in future correspondence regarding your application with the Department of Ecology.

When we begin actively evaluating applications in your area, we will prepare a public notice and send it to you with publication instructions. It will be sometime before we are able to begin working in your area. In the meantime, please notify Ecology of changes such as address, property ownership, or variations in your proposed water use plans.

The availability of water in Washington state is a serious problem. Much of the water in our state has already been appropriated. The competition for water has escalated with our state's increasing population, conflicting water policy issues, and grave declines in salmon and other fish populations. A new watershed management law brings us a step closer to addressing some of these issues. It sets into motion a locally based process to address water quantity, quality, and habitat issues. Watershed management will help meet challenges for getting water to people, industries, farms, and fish.

In some areas of the state, we are continuing to evaluate applications within watersheds where we have previously gathered information and completed watershed assessments. We are also continuing to process water right permit or change applications that are intended to address public health and safety emergencies, the natural environment, or are for nonconsumptive withdrawals. All other applications are grouped by watershed and processed according to the date of submittal, and when we have enough information and staff resources to make decisions.

If you would like further information on your application, please contact the Southwest Regional Office at (360) 407-0240.

Sincerely,

J. Mike Harris

J. Mike Harris
Water Resources Supervisor
Southwest Regional Office

JMH:th (applet.doc)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

October 1, 2001

City of Camas
Attn Eric Levison
616 NE 4th Avenue
Camas WA 98607

Re: Water Right Application No. G2-30019

This letter is to acknowledge that the Washington State Department of Ecology received your water right application. We have assigned your application the number indicated above. Please include this number in future correspondence regarding your application with the Department of Ecology.

When we begin actively evaluating applications in your area, we will prepare a public notice and send it to you with publication instructions. It will be sometime before we are able to begin working in your area. In the meantime, please notify Ecology of changes such as address, property ownership, or variations in your proposed water use plans.

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Sincerely,

J. Mike Harris

J. Mike Harris
Water Resources Supervisor
Southwest Regional Office

JMH:th (applet.doc)

CITY OF CAMAS
616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
http://www.ci.camas.wa.us

RECEIVED
DEPT. OF ECOLOGY/SWRO

'01 SEP -4 A10 :37

August 29, 2001

DEPARTMENT OF PUBLIC WORKS

Mr. Mike Harris
Department of Ecology
300 Desmond Drive
P.O. Box 47600
Olympia, WA 98504-7600

Subject: ***Water Right Application Submittals***
City of Camas

Dear Mr. Harris:

Enclosed you will find two water right applications along with the statutory examination fee of $10.00 for each water right application (total of $20.00). The enclosed applications are for new water supply sources in the Lacamas Basin.

The City of Camas would like to develop three new supply wells under these applications to meet the rapid growth, which is occurring in the western portion of our service area. We recently completed an extensive test well drilling program in this area. The results of the exploratory drilling and aquifer testing are summarized in the attached report titled *City of Camas, Westside Test Well Drilling Program (PGG, 2001).*

At your convenience, we would like to schedule a meeting with you and your staff to discuss the results of our test well program and strategies for obtaining water right permits for new production wells.

We appreciate your assistance on this matter.

Sincerely,

Eric Levison
Engineering Manager

Enclosures: Water Right Applications

rls:g:\pworks\eric\harris 082901.doc

Printed By: Dawn Merryman
On: 09/07/2001 At: 10:10 am

RECEIPT

Receipt Number **02-005123**

Department of Ecology (4610)
PO Box 5128
Lacey, WA 98509-5128
(360) 407-7095

Current Document Number **461G0355CJ** Date **09/10/2001** FM **03**

Remitter Name **CAMAS CITY** Receipt Name

Check/Draw Number **4149**
Document Amount **$20.00**
Method of Payment **Check**
Comment Description **WATER RIGHTS**

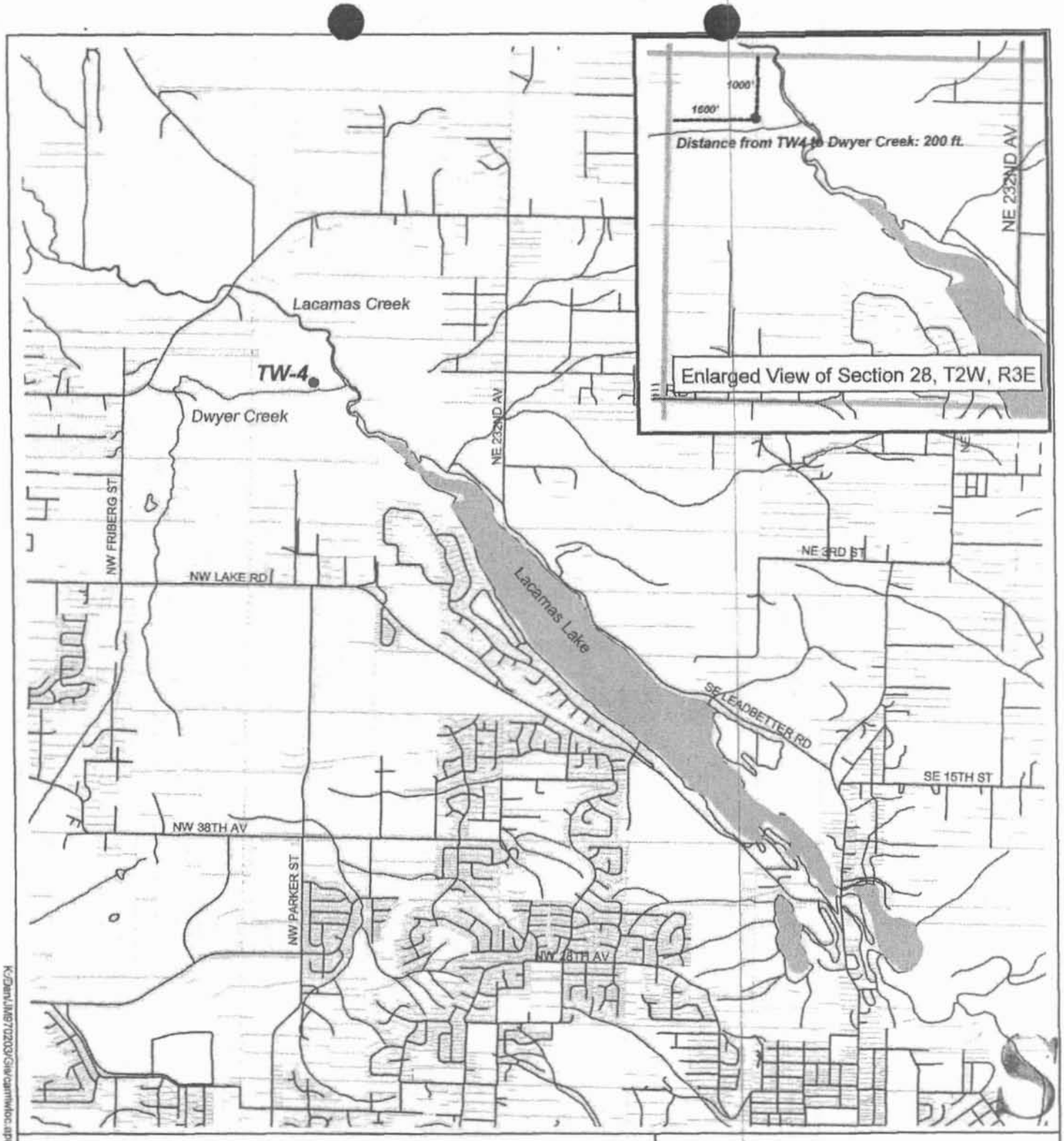
Ref Doc Nr	Ref Doc Sfx	Inv Nr	Id Nr	Prgm Cd	T C	R	Fund	Maj Grp	Maj Src	Sub Src	Cnty	Work Cls	PIC	AI	Org	Prj	Sub Prj	Prj Phs	Sub Obj	Sub Sub Obj	Var GL	Sub Sid Dr	Sub Sid Cr	Alloc Amt
				H00	001		001	02	85	000010														$20.00

TABLE 1-3

City of Camas Water Right Summary

Source	Location of Diversion	Identification Number	Priority Date	Instantaneous Quantity Q_i (gpm)	Annual Quantity Q_a (ac-ft/yr.)
Claims					
Well No. 1	2159 ft. N, 667 ft. E, from the SW corner, S12, T1N, R3E	121022	6/11/74	900	320(1)
Well No. 2	2152 ft. N, 731 ft. E, from the SW corner, S12, T1N, R3E	121023	6/11/74	900	230(1)
Certificates					
Boulder Creek	(need this info)	S 712 C	8/22/23	1120 [2.5 cfs]	1820(2) (P)
Jones Creek	SE1/4, SW1/4, S3, T2N,R4E	S 711 C	9/5/30	450 [1.0 cfs]	730(3) (P)
Well No. 3	NW1/4, SW1/4, S12,T1N, R3E	G 85-A C	7/21/45	1200	118 (P)
Well No. 4	W1/2, NW1/4, S12, T1N, R3E	G 4072-A C	2/12/59	1325	1208 (S)
Well No. 5	Lot 9 of Orchard Homes, 2760 ft. E, 840 ft. N from SW corner, S12, T1N, R3E	G 6636-A C	3/22/68	600	920(4) (P)
Well No. 6	2300 ft. E, 1800 ft. N from SW corner, S12, T1N, R3E	G 6635-A C	3/22/68	1500	2400(4) (P)
Well No. 7	1245 ft. E, 2145 ft. N from SW corner, S12, T1N, R3E	G2-00501 C	3/22/71	1000	530(5) (P)
Well No. 8	1375 ft. E, 2145 ft. N from SW corner, S12, T1N, R 3E	G2-24400 C	2/4/77	900	530(5) (P)
Permits					
Well No. 9	600 ft. S, 700 ft. W from N1/4 corner, S4, T1N, R3E	G4-27384 P	8/13/86	650	210(5) (S)
Total	Sum of all existing water right certificates and permits. **These values do not include claims.**			**SW = 1570 gpm** **GW = 7175 gpm** **Total = 8745 gpm**	**SW = 2550 ac-ft.** **GW = 3200 ac-ft.** **Total = 5750 ac-ft.**

(1) Claims must go through an adjudication procedure in state court to determine validity.
(2) This source was formerly known as the Little Washougal River. The certificate refers to an instantaneous quantity (Q_i) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights including 1820 ac-ft/yr. for Boulder Creek (S 712 C) based on continuous withdrawal at the instantaneous right specified.
(3) The certificate refers to an instantaneous quantity (Q_i) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights including 730 ac-ft/yr. for Jones Creek (S 711 C) based on continuous withdrawal at the instantaneous right specified.
(4) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 3300 ac-ft/yr."
(5) The Permit and Report of Examination preceding this certificate provided for "the total amount of water to be withdrawn or diverted, which includes the amounts as approved in Surface Water Certificates No. 711 and 712 and Ground Water Certificates No. 85,4072, 6635, 6636, shall not exceed 5750 ac-ft/yr."
(P) Primary water right, additive to other rights.
(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.



Legend

- Proposed Supply Well Site
- Roads
- Parcels
- Rivers, Streams
- Water bodies

N

0 4000 Feet

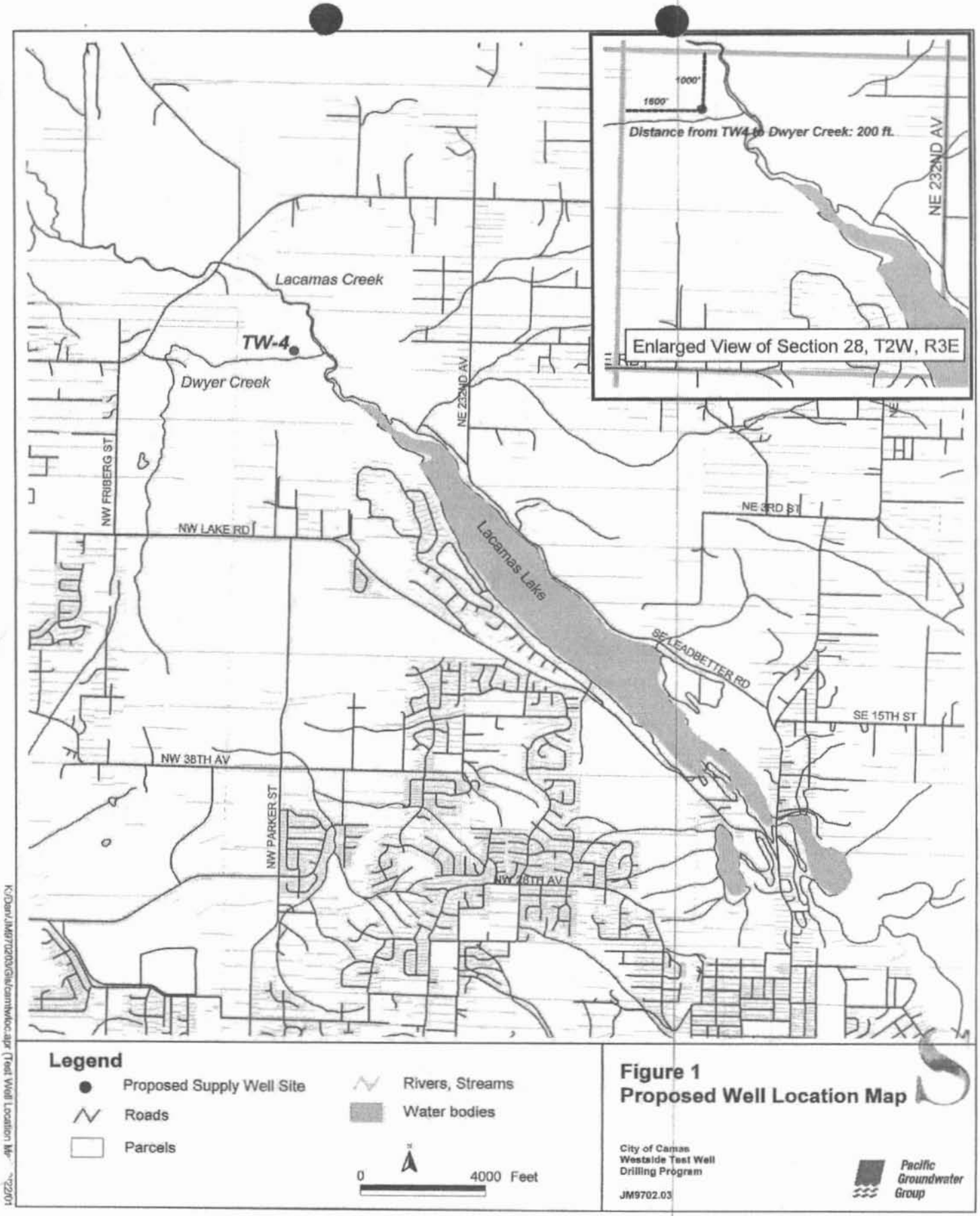
Figure 1
Proposed Well Location Map

City of Camas
Westside Test Well
Drilling Program

JM9702.03

Pacific Groundwater Group

K:\Data\JM9702\03\Siw\camwloc.apr (Test Well Location Map), 2/22/01


Lacamas Creek
TW-4
Dwyer Creek
NW FRIBERG ST
NW LAKE RD
NE 232ND AV
NE 3RD ST
Lacamas Lake
SE LEADBETTER RD
SE 15TH ST
NW 38TH AV
NW PARKER ST
NW 28TH AV
1000'
1600'
Distance from TW4 to Dwyer Creek: 200 ft.
Enlarged View of Section 28, T2W, R3E
Legend
Proposed Supply Well Site
Roads
Parcels
Rivers, Streams
Water bodies
N
0
4000 Feet
Figure 1
Proposed Well Location Map
City of Camas
Westside Test Well
Drilling Program
JM9702.03
Pacific Groundwater Group

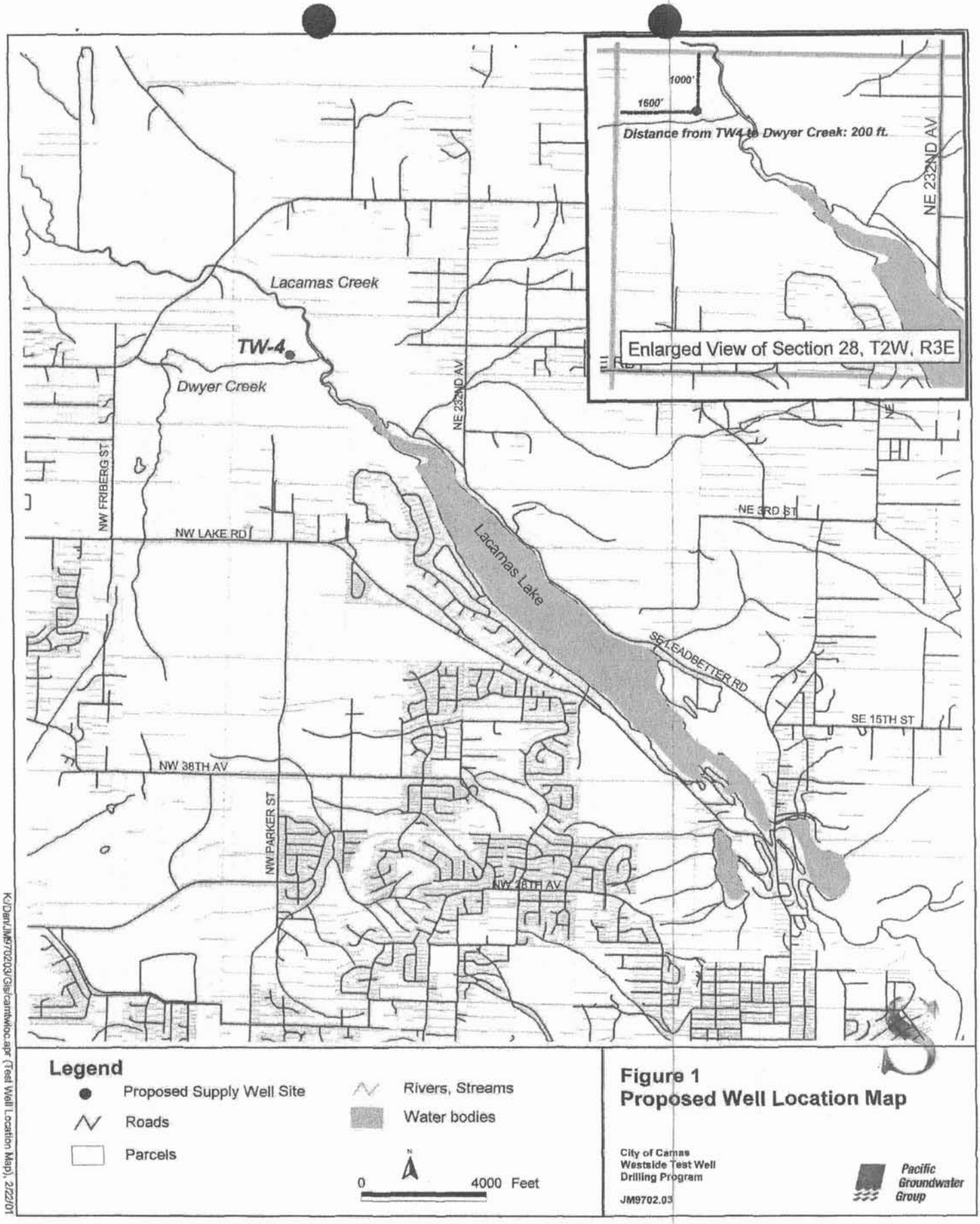


Figure 1
Proposed Well Location Map

City of Camas
Westside Test Well
Drilling Program

JM9702.03

Pacific Groundwater Group

K:\Dart\JM9702.03\Gis\camtwloc.apr (Test Well Location Map), 2/22/01

Account Transfers | Recurring Transfers | Third-Party Transfers | External Transfers
IRA/ESA Certificate Add-On

Third Party Transfer Confirmation

Transfer of funds successfully completed. See the new account balances below.

From Account:	Share Savings 1274297009 KENNETH C ALEXANDER
From Account Balance:	$14.25
To Account:	EveryDay Checking 1274297710 ERNESTINE P ALEXANDER
Payment Amount:	$3,325.00
Effective Date:	03/09/2009
Confirmation Number:	304756

Print Receipt

ROTORK CONTROLS, INC.
SCOPE OF WORK
START UP/COMMISSIONING OF ROTORK ACTUATORS

JOB SITE LOCATION: WARDEN, WASHINGTON

Rotork Field Engineer will:

1. Inspect all installed Rotork actuators for proper orientation.
2. Inspect all installed Rotork actuators for proper wiring terminations.
3. Electrically power up Rotork actuators and perform initial programming.
4. Set both the Open and Closed limits on the Rotork actuators.
5. Electrically stroke all valves with Rotork actuators to ensure proper operation.
6. Provide customer with the Field Service Report for their records.
7. Correct any discrepancies found during this course of work.

rotork
factory service

2180 South Mc Dowell Blvd. Suite B
Petaluma, CA 94954
Phone: (707) 769-4880
Fax: (707) 769-4888

Service Report

Job No.:
Engineer:
Date:
Site:

Site Contact:
Phone Number:
Date Service Performed:
PO Number:
Type of Service:

Serial Number:	**Type:**	**WD:**	**RPM:**	**Volts:**
Gearbox Type:	**Valve Type:**		**Service Type:**	**Valve Tag No:**

Reported Problem:

Work Completed:

If there is additional work needed, please explain:

Rotork Site Training Syllabus (for IQT)

I. Introduction to Rotork

A. Tech introduction
B. Rotork Controls, Inc.
C. Types and models of actuators. Sizing, classifications. Nameplates.
D. Documentation, Rotork.com
   1) IQT- E110, E120, E175, E185, Wiring diagrams

II. IQT

A. Nomenclature and parts ID.
   1) Gearcase, center column, drive bushings, battery, seals and o-rings.
   2) Motor & wormwheel, resolver.
   3) Handwheel, hand/auto lever, H/A cover.
   4) Electronics- Cover (UV Window/ local controls), main pcb, power module, motor control pcb
   5) Options, if applicable

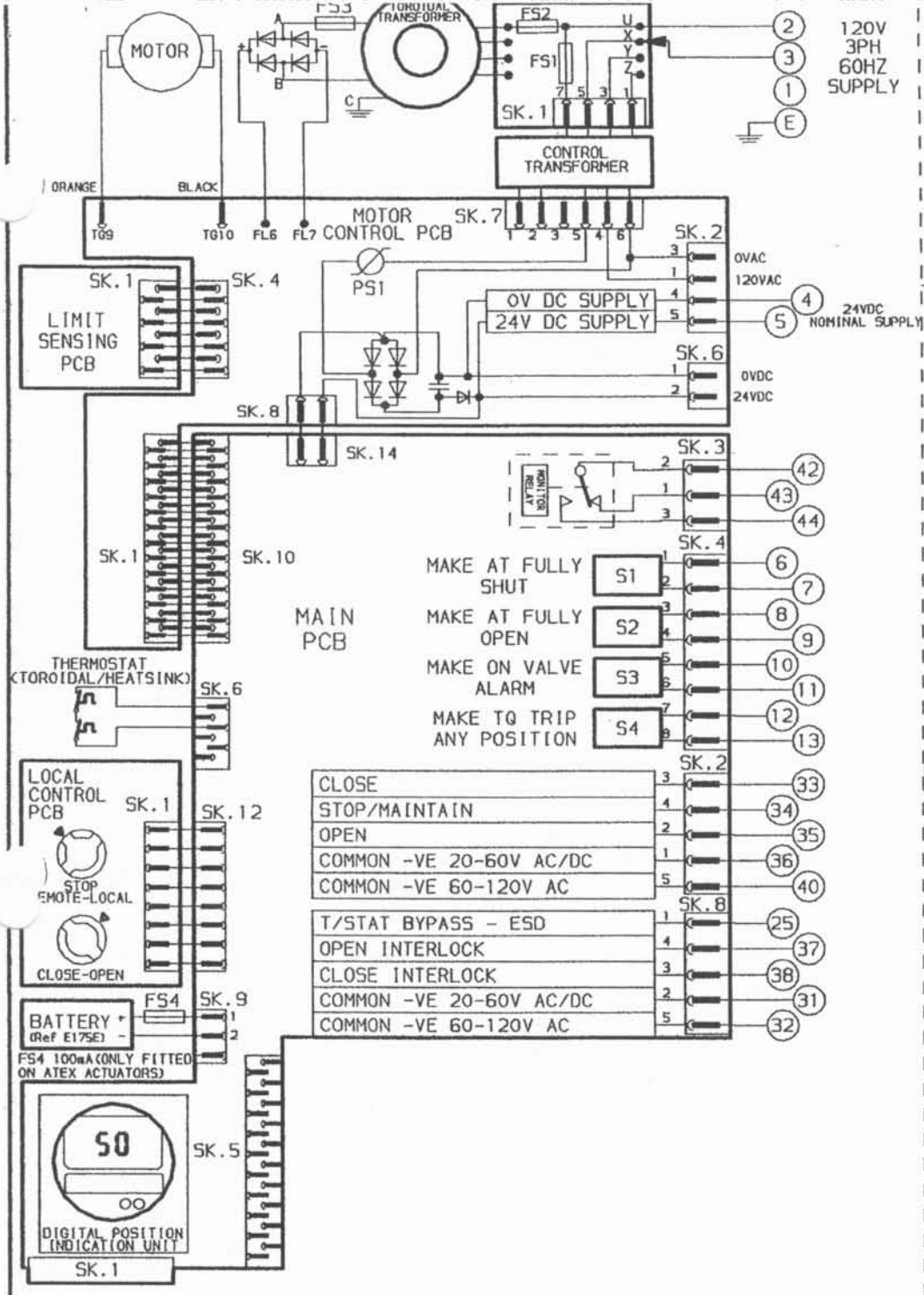
III. Operation, set-up and calibration (using live demo actuator)

A. Manual operation B. Setting tool and display
C. Menu structure and functions
   1) Torque display, password screen
   2) Primary functions- open/close action, torque setting, limit setting.
   3) Secondary functions-Indication, ESD(emerg shut down), options, IQT type and speed.
D. Local operation
E. Remote operation
   1) Remote voltage supplies 2) Remote control configurations 3) Network options
F. Installation and adaption
G.Troubleshooting
   1) Alarms 2) Help screens 3) Common faults and checks
H. Maintenance - 1) Lubrication 2) inspection 3) spares

IV. Advanced Functions and Utilities (using laptop and PDA)

A. Insight
B. Configuration Files
C. Datalogger files
   1) Torque profiles (for baseline files/trending, torque issues)
   2) Event logging and review

V. Conclusion- Review and Follow-up



RWS300

TRANSFORMER TAPPING

TYPE 1

TAP	NOM	RANGE
Z	120	96-144
FS1-250mA A/S FS2-5A A/S		

FUSE FS3 - 20A ATO FAST ACTING

PS1 SELF RESETTING FUSE

NOTE

REFER TO PUBLICATION E175E FOR APPROVED FUSES FS1, FS2 AND FS3.

MAX EXTERNAL LOAD ON TERMINALS 4 & 5 TO BE 5W.

CONTROL SIGNAL THRESHOLD VOLTAGES TO BE MINIMUM 'ON' 20V AC/DC
MAXIMUM 'OFF'= 3V
MINIMUM CONTROL SIGNAL DURATION TO BE 300mS.

CURRENT DRAWN FROM EACH REMOTE CONTROL SIGNAL IS 5mA ON 24V DC OR 12mA ON 120V AC

WIRES ARE IDENTIFIED AT EACH END BY TERMINAL No. OR TAG No.

INDICATION CONTACTS S1-S4 ARE SHOWN IN THEIR DEFAULT CONFIGURATION. CONTACTS MAY BE CONFIGURED FOR ANY OF THE FUNCTIONS DESCRIBED IN E175E

IQT

No	DATE	REVISION DETAILS
01	061008	FIRST ISSUE

www.rotork.com

CONFIG BY TPW
DATE 061008

6000-000 B1, C1, 41, M1
CUSTOMER SPECIFIC

Rotork Site Training Syllabus (for IQMKII)

I. Introduction to Rotork

A. Tech introduction
B. Rotork Controls, Inc.
C. Types and models of actuators. Sizing, classifications. Nameplates.
D. Documentation, Rotork.com
   1) IQMKII- E110, E120, E170E2, E170E3, E180, Wiring diagrams

II. IQMKII

A. Nomenclature and parts ID.
   1) Gearcase, center column, resolver drive, battery, terminal block/cover, seals and o-rings.
   2) Motor & wormwheel, torque transducer (piezo assembly).
   3) Handwheel (THW, SHW), Hand/Auto (H/A) lever
   4) Electronics- Cover (UV window, local controls), main pcb, power module, resolver
   5) Bases, drive bushings.
   6) Options, gearboxes, if applicable

III. Operation, set-up and calibration

A. Manual operation
B. Setting tool and display
C. Menu structure and functions
   1) Torque display, password screen
   2) Primary functions- open/close action, torque setting, limit setting.
   3) Secondary functions-Indication, ESD(emerg shut down), options
D. Local operation
E. Remote operation
   1) Remote voltage supplies 2) Remote control configurations 3) Network options
F. Installation and adaption
G.Troubleshooting
   1) Alarms 2) Help screens 3) Common faults and checks
H. Maintenance
   1) Lubrication 2) Inspection 3) Spares

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A. Insight
B. Configuration Files
C. Datalogger files
   1) Torque profiles (for baseline files/trending, torque issues)
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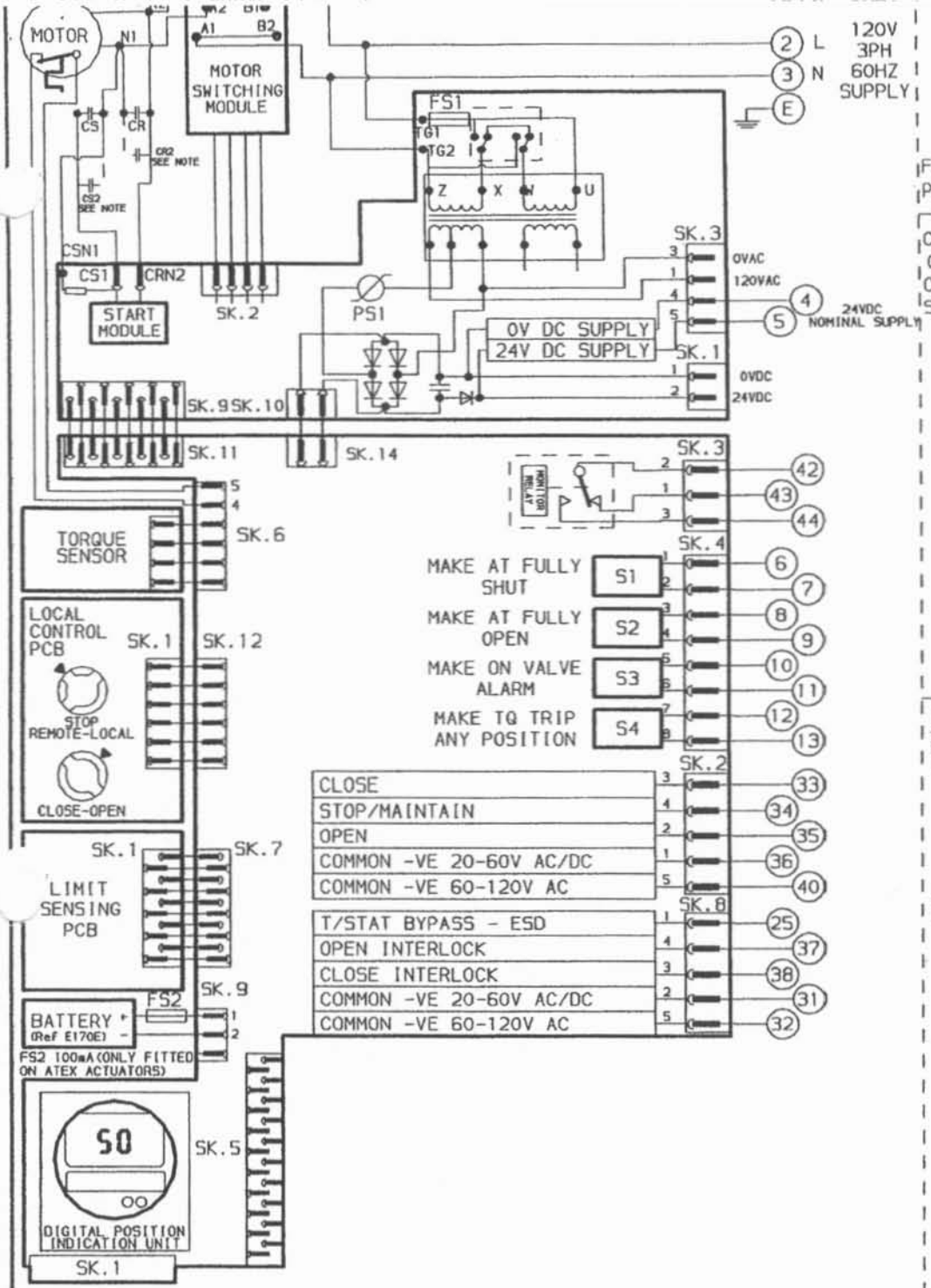
V. Conclusion- Review and Follow-up



RWS300

TRANSFORMER TAPPING

VOLTAGE	60HZ
LOW	92-135

FUSE FS1 - 500mA ANTI-SURGE
PS1 SELF RESETTING FUSE.

CAPACITOR START/RUN
(CS/CS2 and CR/CR2)
COMBINATIONS & VALUES VARY WITH
SUPPLY VOLTAGE & ACTUATOR SIZE.

NOTE

REFER TO PUBLICATION E170E FOR APPROVED FUSES FS1 AND FS2.

MAX EXTERNAL LOAD ON TERMINALS 4 & 5 TO BE 5W.

CONTROL SIGNAL THRESHOLD VOLTAGES
TO BE MINIMUM 'ON' 20V AC/DC
MAXIMUM 'OFF'= 3V
MINIMUM CONTROL SIGNAL DURATION
TO BE 300mS.

CURRENT DRAWN FROM EACH REMOTE CONTROL SIGNAL IS 5mA ON 24V DC OR 12mA ON 120V AC

WIRES ARE IDENTIFIED AT EACH END BY TERMINAL No. OR TAG No.

INDICATION CONTACTS S1-S4 ARE SHOWN IN THEIR DEFAULT CONFIGURATION. CONTACTS MAY BE CONFIGURED FOR ANY OF THE FUNCTIONS DESCRIBED IN E170E

1Q

No	DATE	REVISION DETAILS
01	061008	FIRST ISSUE

www.rotork.com

CONFIG BY TPW
DATE 061008

3001-000 B1, C1, 41, M1
CUSTOMER SPECIFIC

CITY OF CAMAS
616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
http://www.ci.camas.wa.us

RECEIVED
DEPT. OF ECOLOGY/SWRO

'01 SEP -4 A10 :37

August 29, 2001

DEPARTMENT OF PUBLIC WORKS

Mr. Mike Harris
Department of Ecology
300 Desmond Drive
P.O. Box 47600
Olympia, WA 98504-7600

Subject: ***Water Right Application Submittals***
City of Camas

Dear Mr. Harris:

Enclosed you will find two water right applications along with the statutory examination fee of $10.00 for each water right application (total of $20.00). The enclosed applications are for new water supply sources in the Lacamas Basin.

The City of Camas would like to develop three new supply wells under these applications to meet the rapid growth, which is occurring in the western portion of our service area. We recently completed an extensive test well drilling program in this area. The results of the exploratory drilling and aquifer testing are summarized in the attached report titled *City of Camas, Westside Test Well Drilling Program (PGG, 2001).*

At your convenience, we would like to schedule a meeting with you and your staff to discuss the results of our test well program and strategies for obtaining water right permits for new production wells.

We appreciate your assistance on this matter.

Sincerely,

Eric Levison
Engineering Manager

Enclosures: Water Right Applications

rls:g:\pworks\eric\harris 082901.doc

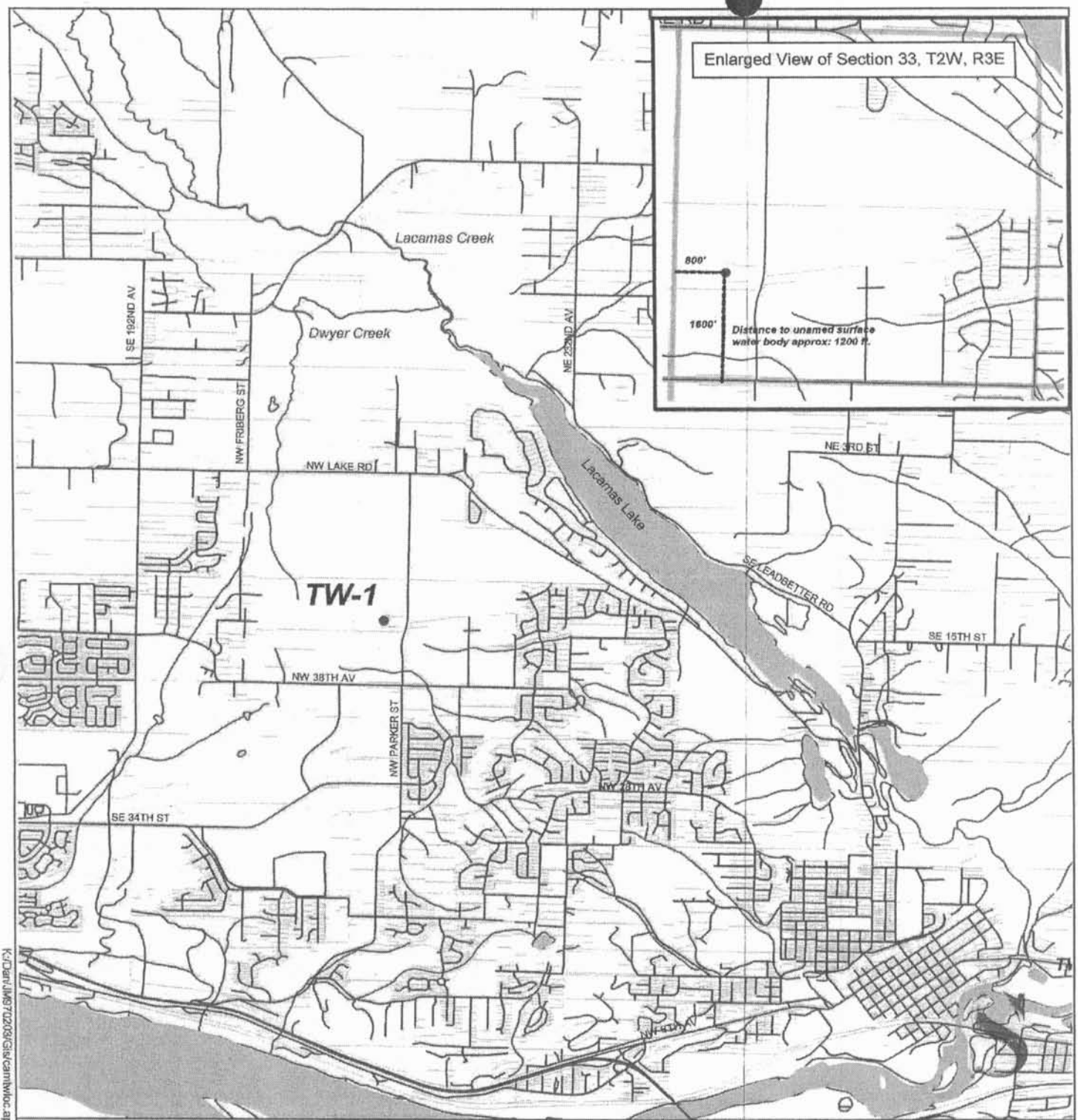


Figure 1
Proposed Well Location Map

City of Camas
Westside Test Well
Drilling Program

JM9702.03

Pacific Groundwater Group

K:\Darv\JM9702\03\Gis\camtwloc.apr (Test Well Location Map) 1/22/01

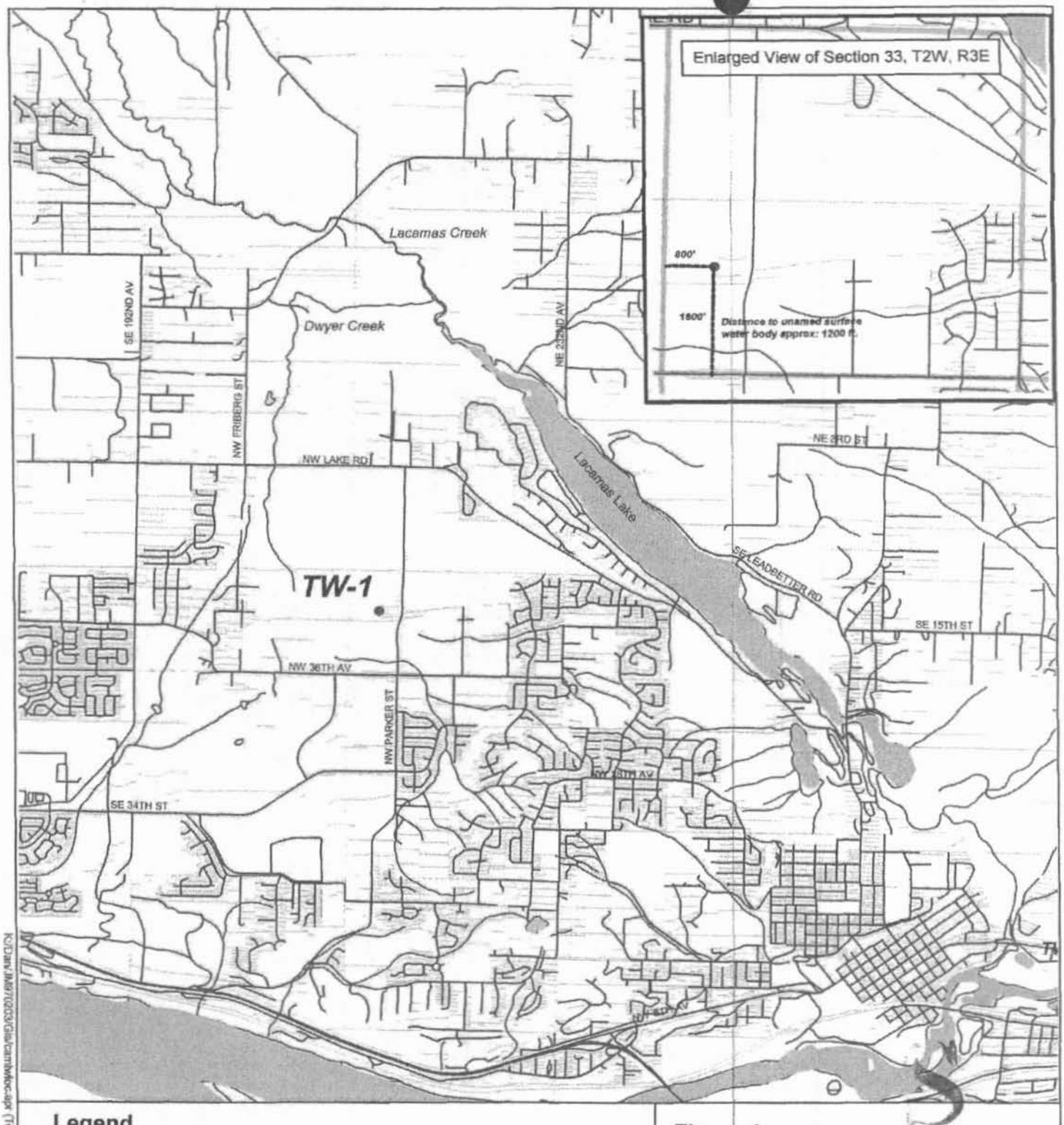


Figure 1
Proposed Well Location Map

City of Camas
Westside Test Well
Drilling Program

JM9702.03

Pacific Groundwater Group

K:\Data\JM\9702\03\Gis\camlvlocmap (Test Well Location Map), 2/22/01

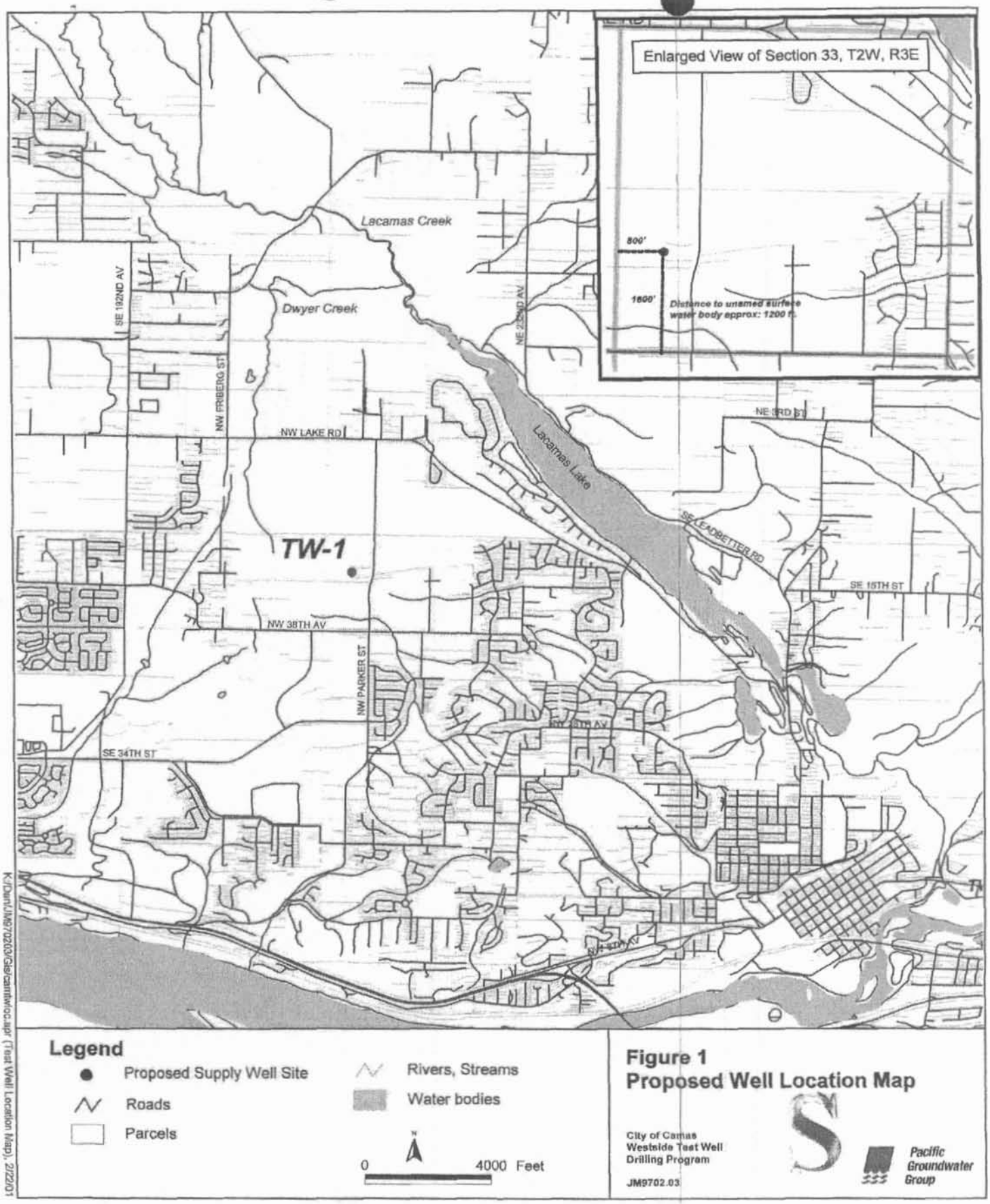


Figure 1
Proposed Well Location Map

City of Camas
Westside Test Well
Drilling Program
JM9702.03

Pacific Groundwater Group

K:\Dwrt\JM9702\03\Gis\camtwloc.apr (Test Well Location Map), 2/22/01

TABLE 1-3

City of Camas Water Right Summary

Source	Location of Diversion	Identification Number	Priority Date	Instantaneous Quantity Q_i (gpm)	Annual Quantity Q_a (ac-ft/yr.)
Claims					
Well No. 1	2159 ft. N, 667 ft. E, from the SW corner, S12, T1N, R3E	121022	6/11/74	900	320(1)
Well No. 2	2152 ft. N, 731 ft. E, from the SW corner, S12, T1N, R3E	121023	6/11/74	900	230(1)
Certificates					
Boulder Creek	(need this info)	S 712 C	8/22/23	1120 [2.5 cfs]	1820(2) (P)
Jones Creek	SE1/4, SW1/4, S3, T2N,R4E	S 711 C	9/5/30	450 [1.0 cfs]	730(3) (P)
Well No. 3	NW1/4, SW1/4, S12,T1N, R3E	G 85-A C	7/21/45	1200	118 (P)
Well No. 4	W1/2, NW1/4, S12, T1N, R3E	G 4072-A C	2/12/59	1325	1208 (S)
Well No. 5	Lot 9 of Orchard Homes, 2760 ft. E, 840 ft. N from SW corner, S12, T1N, R3E	G 6636-A C	3/22/68	600	920(4) (P)
Well No. 6	2300 ft. E, 1800 ft. N from SW corner, S12, T1N, R3E	G 6635-A C	3/22/68	1500	2400(4) (P)
Well No. 7	1245 ft. E, 2145 ft. N from SW corner, S12, T1N, R3E	G2-00501 C	3/22/71	1000	530(5) (P)
Well No. 8	1375 ft. E, 2145 ft. N from SW corner, S12, T1N, R 3E	G2-24400 C	2/4/77	900	530(5) (P)
Permits					
Well No. 9	600 ft. S, 700 ft. W from N1/4 corner, S4, T1N, R3E	G4-27384 P	8/13/86	650	210(5) (S)
Total	Sum of all existing water right certificates and permits. These values do not include claims.			**SW = 1570 gpm GW = 7175 gpm Total = 8745 gpm**	**SW = 2550 ac-ft. GW = 3200 ac-ft. Total = 5750 ac-ft.**

(1) Claims must go through an adjudication procedure in state court to determine validity.
(2) This source was formerly know as the Little Washougal River. The certificate refers to an instantaneous quantity (Q_i) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights including 1820 ac-ft/yr. for Boulder Creek (S 712 C) based on continuous withdrawal at the instantaneous right specified.
(3) The certificate refers to an instantaneous quantity (Q_i) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights including 730 ac-ft/yr. for Jones Creek (S 711 C) based on continuous withdrawal at the instantaneous right specified.
(4) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 3300 ac-ft/yr."
(5) The Permit and Report of Examination preceding this certificate provided for "the total amount of water to be withdrawn or diverted, which includes the amounts as approved in Surface Water Certificates No. 711 and 712 and Ground Water Certificates No. 85,4072, 6635, 6636, shall not exceed 5750 ac-ft/yr."
(P) Primary water right, additive to other rights.
(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.

Printed By: Dawn Merryman
On: 09/07/2001 At: 10:10 am

RECEIPT

Receipt Number **02-005123**

Department of Ecology (4610)
PO Box 5128
Lacey, WA 98509-5128
(360) 407-7095

Current Document Number **461G0355CJ** Date **09/10/2001** FM **03**

Remitter Name **CAMAS CITY** Receipt Name

Check/Draw Number **4149**
Document Amount **$20.00**
Method of Payment **Check**
Comment Description **WATER RIGHTS**

Ref Doc Nr	Ref Doc Sfx	Inv Nr	Id Nr	Prgm Cd	T C	R	Fund	Maj Grp	Maj Src	Sub Src	Cnty	Work Cls	PIC	AI	Org	Prj	Sub Prj	Prj Phs	Sub Obj	Sub Sub Obj	Var GL	Sub Sid Dr	Sub Sid Cr	Alloc Amt
				H00	001		001	02	85	000010														$20.00

State of Washington
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N • Olympia, WA 98501-1091 • (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building • 1111 Washington Street SE • Olympia, WA

RECEIVED
DEPT. OF ECOLOGY/SWRO
'01 NOV -5 A11 :26

October 31, 2001

Department of Ecology
Southwest Regional Office
7272 Cleanwater Lane
Olympia, Washington 98504-6811

WATER RIGHT APPLICATION REVIEW

Application Number: G230018

Applicant: City of Camas
616 NE 4th Avenue
Camas, Washington 98607

WRIA: 28
Water: Well near Lacamas Lake and the Columbia River.
This water and/or affected reaches downstream are inhabited by:

Based on: ☐ Site-specific observations ☐ WDFW database or GIS
☐ Literature ☐ Knowledge of this type of stream

Amount: cfs 359.00 gpm 300.00 acre-ft
Point of diversion: NW1/4 SW1/4 of S33 T2N R3E.
Point of use:

WDFW recommended conditions:

☐ Instream flows in WAC 173-5

☐ This water right should be subject to any established lake levels, if any.

Instream flows based on: ☐ IFIM study ☐ USGS toe-width ☐ Tennant
☐ Other:

WDFW requests that water right be subject to the following instream flows or natural flow, whichever is less:

Jan
Feb
Mar
Apr
May
Jun

Jul
Aug
Sep
Oct
Nov
Dec

Instream flows to be measured at:

Other conditions requested by WDFW indicated by ☐:

☐ HPA

☐ Screen intake if accessible to fish (to be determined during application for HPA) according to WDFW standards.

☐ Based upon review of fish resources present, type and amount of water use, condition of habitat, and amount of water available, WDFW REQUESTS DENIAL of this application, in accordance with RCW 75.20.050, IF THIS SPACE IS CHECKED.

☐ WDFW recommends modification of this proposal to minimize impacts to fish.

☐ WDFW is a landowner and water user that will be affected by this proposed use.

☐ Please HOLD this application pending field review. WDFW staff will provide detailed response by

☐ Granting this water right application would adversely affect WDFW's existing water rights for a facility. We request the following conditions for this water right if it is granted.

Rationale for WDFW recommendations if not based on existing rules or statutes: WDFW has no objections to this application.

Additional Comments:

Karen Kloempken

Karen Kloempken
Water Rights Biologist
360-902-2615
Fax: 360-902-2946
E-mail: kloemkak@dfw.wa.gov

State of Washington
Application for a Water Right

Please follow the attached instructions to avoid unnecessary delays.

For Ecology Use
Fee Paid _____
Date _____

Section 1. APPLICANT - PERSON, ORGANIZATION, OR WATER SYSTEM

Name City of Camas Home Tel:( ) -
Mailing Address 616 NE 4th Ave. Work Tel:(360) 834 - 3451
City Camas State WA Zip+4 98607 + FAX:(360) 834 - 1535

Section 2. CONTACT - PERSON TO CALL ABOUT THE APPLICATION

☐ Same as above

Name Eric Levison Home Tel:( ) -
Mailing Address 616 NE 4th Ave. Work Tel:(360) 834 - 3451
City Camas State WA Zip+4 98607 + FAX:(360) 834 - 1535
Relationship to applicant Engineering Manager - City of Camas

Section 3. STATEMENT OF INTENT

Municipal

The applicant requests a permit to use not more than 350 (☒ gallons per minute or ☐ cubic feet per second) from a ☐ surface water source or ☒ ground water source (check only one) for the purpose(s) of Domestic/Public Supply. **ATTACH A "LEGAL" DESCRIPTION OF THE PLACE OF USE.** (See instructions.) *NOTE: A tax parcel number or a plat number is not sufficient.* Area served by City of Camas
Estimate a maximum annual quantity to be used in acre-feet per year: 300 AF/YR

☐ Check if the water use is proposed for a short-term project. Indicate the period of time that the water will be needed:
From ___/___/___ to ___/___/___

Section 4. WATER SOURCE

If SURFACE WATER	If GROUNDWATER
Name the water source and indicate if stream, spring, lake, etc. If unnamed, write "unnamed spring," "unnamed stream," etc.: Number of diversions:	A permit is desired for 1 well(s).
Source flows into (name of body of water):	Size & depth of well(s): 12-inch well 400 feet deep

LOCATION

Enter the north-south and east-west distances in feet from the point of diversion or withdrawal to the nearest section corner: 1600 feet north and 800 feet east of the SW 1/4 of Section 33, Township 2 North, Range 3 East

¼ of	¼ of	Section	Township	Range(E/W)	County	If location of source is platted, complete below: Lot	Block	Subdivision
NW	SW	33	2N	3E	Clark			

For Ecology Use Date Received: 9-4-01 Priority Date: 9-4-01
SEPA: Exempt/Not Exempt FERC License # Dept. Of Health #
Date Accepted As Complete 9-21-01 By SC Date Returned By WRIA 28

ECY 040-1-14
Rev. 9/95 F

APPLICATION

Appl. No.: G2-30018

G9-30018

Section 5. GENERAL WATER SYSTEM INFORMATION

A. Name of system, if named: Camas Municipal Water-Sewer System

B. Briefly describe your proposed water system. (See instructions.)

One 12-inch supply well will be constructed to a depth of 400 feet. The well will be used to provide water supply to municipal and industrial water users that are served by the City of Camas in the Lacamas Basin Area. See City's 1996 Water System Plan documents for other related water system information.

C. Do you already have any water rights or claims associated with this property or system? ☒ YES ☐ NO
PROVIDE DOCUMENTATION. See list of city water right permits and claims that are attached.

Section 6. DOMESTIC / PUBLIC WATER SUPPLY SYSTEM INFORMATION
(Completed for all domestic/public supply uses.)

A. Number of "connections" requested: 4896 Type of connection Municipal Industrial Hookup
(Homes, Apartment, Recreational, etc.)

B. Are you within the area of an approved water system? ☒ YES ☐ NO
If yes, explain why you are unable to connect to the system. *Note: Regional water systems are identified by your County Health Department.* The applicant (City of Camas) is the regional water provider.

Complete C. and D. only if the proposed water system will have fifteen or more connections.

C. Do you have a current water system plan approved by the Washington State Department of Health? ☒ YES ☐ NO
If yes, when was it approved? 1996 Please attach the current approved version of your plan.
Note: City is currently updating their Waster System Plan. The new plan should be approved in early 2002.

D. Do you have an approved conservation plan? ☒ YES ☐ NO
If yes, when was it approved? 1996 Please attach the current approved version of your plan.
Note: Water Conservation Plan incorporated into 1996 Water System Plan which is currently being updated.

Section 7. IRRIGATION/AGRICULTURAL/FARM INFORMATION
(Complete for all irrigation and agriculture uses.) N/A

A. Total number of acres to be irrigated: _____

B. List total number of acres for other specified agricultural uses:

Use _____ Acres _____
Use _____ Acres _____
Use _____ Acres _____

C. Total number of acres to be covered by this application: _____

D. Family Farm Act (Initiative Measure Number 59, November 3, 1977)
Add up the acreage in which you have a controlling interest, including only:
‡ Acreage irrigated under water rights acquired after December 8, 1977;
‡ Acreage proposed to be irrigated under this application;
‡ Acreage proposed to be irrigated under other pending application(s).

1. Is the combined acreage greater than 2000 acres? ☐ YES ☐ NO
2. Do you have a controlling interest in a Family Farm Development Permit? ☐ YES ☐ NO
If yes, enter permit no: _____

E. Farm uses:
Stockwater - Total # of animals _____ Animal type _____ (If dairy cattle, see below)
Dairy - # Milking _____ # Non-milking _____

Section 8. WATER STORAGE

Will you be using a dam, dike, or other structure to retain or store water? ☐ YES ☒ NO

NOTE: If you will be storing 10 acre-feet or more of water and/or if the water depth will be 10 feet or more at the deepest point, and some portion of the storage will be above grade, you must also apply for a reservoir permit. You can get a reservoir permit application from the Department of Ecology.

Section 9. DRIVING DIRECTIONS

Provide detailed driving instructions to the project site. From Lacey, WA, go southbound on I-5. Take I-205 exit at Hazel Dell. Proceed southbound on I-205 to SR-14. Take SR-14 eastbound to Brady Road. Proceed northbound on Brady Road, which turns into NW Parker Avenue, continue northbound on NW Parker Avenue past 20th Street NW. Turn into Fire Station Property, which is located on west side of NW Parker Avenue.

Section 10. REQUIRED MAP

A. Attach a map of the project. (See instructions.)

Section 11. PROPERTY OWNERSHIP

A. Does the applicant own the land on which the water will be used? ☐ YES ☒ NO
If no, explain the applicant's interest in the place of use and provide the name(s) and address(es) of the owner(s):

The City will use the water for supply within their service area.

B. Does the applicant own the land on which the water source is located? ☐ YES ☐ NO
If no, submit a copy of agreement:

The City will purchase the property as part of the supply well development.

I certify that the information above is true and accurate to the best of my knowledge. I understand that in order to process my application, I grant staff from the Department of Ecology access to the site for inspection and monitoring purposes. Even though I may have been assisted in the preparation of the above application by the employees of the Department of Ecology, all responsibility for the accuracy of the information rests with me.

City of Camas E. Levison Eric Levison — 8/20/01

Applicant (or authorized representative) — Date

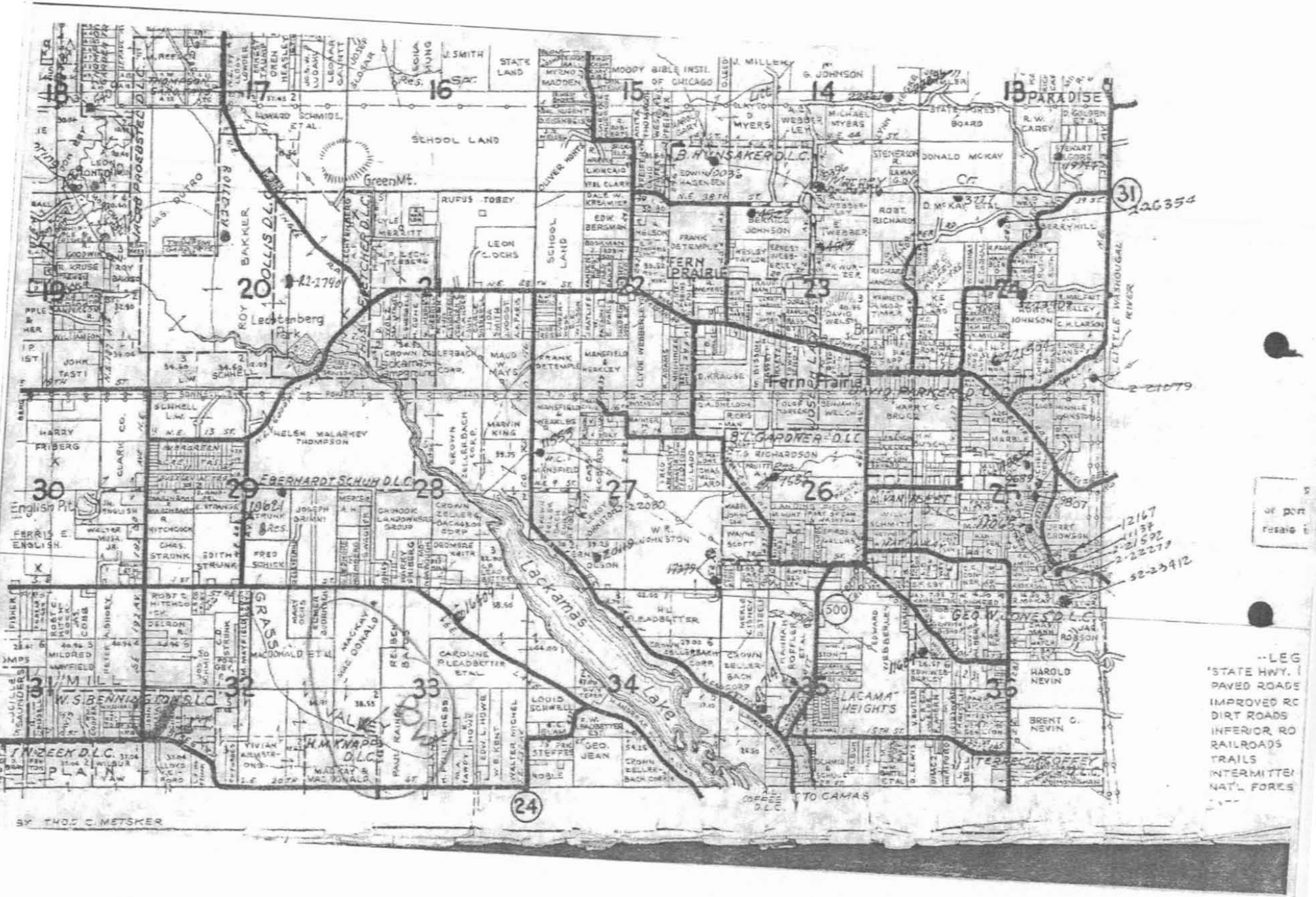
Landowner for place of use (if same as applicant, write "same") — Date

Use this page to continue your answers to any questions on the application. Please indicate section number before answer.

We are returning your application for the following reason(s):	
_____ Examination fee was not enclosed	APPLICANT PLEASE RETURN TO CASHIER, PO BOX 5128, LACEY, WA 98509-5128
_____ Section number(s) _____ is/are incomplete	APPLICANT PLEASE RETURN TO THE APPROPRIATE REGIONAL OFFICE
Explanation:	
Please provide the additional information requested above and return your application by _____ _____ *(date).*	

Ecology staff_____ Date_____

To receive this document in alternative format, contact Lisa Newman at (360) 407-6604 (Voice) or (360) 407-6006 (TDD).


SCHOOL LAND
GreenMt.
Leadbetter Park
FERN PRAIRIE
Fern Prairie
Brunner Hill
Lackamas Lake
LACAMA HEIGHTS
PARADISE
MILL
PLAIN
VALLEY
TO CAMAS
BY THOS. C. METSKER
--LEG
STATE HWY.
PAVED ROADS
IMPROVED RO
DIRT ROADS
INFERIOR RO
RAILROADS
TRAILS
INTERMITTE
NAT'L FORES

616 NE 4th Avenue
PO Box 1055
Camas WA 98607

WASHINGTON STATE DEPARTMENT OF ECOLOGY

STATE OF WASHINGTON
CERTIFICATE OF CHANGE ON A CLAIM

Document Title: Certificate of Water Right

Agency: Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

Applicant: **City of Camas**
616 NE 4th Ave
PO Box 1055
Camas, WA 98607

Reference Number:

PRIORITY DATE	CLAIM NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
3/09/2001	G2-121022		G2-CV1-2P159

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE	TRIBUTARY OF (IF SURFACE WATERS)
Well 12	

MAX. CUBIC FEET PER SECOND	MAX GALLONS PER MINUTE	MAX. ACRE-FEET PER YEAR
	900 GPM	320 AF/Y

QUANTITY/TYPE OF USE/PERIOD OF USE

320 Acre-feet per year Municipal Supply Year-round, as needed

LEGAL DESCRIPTION OF LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF WITHDRAWAL

2240 feet North and 1000 feet East of the Southwest corner of Section 12.

¼ ¼	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R.I.A.	COUNTY
NW ¼ SW ¼	12	1	3E	28	Clark

PARCEL # 89892000

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

1/4 1/4	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R I.A.	COUNTY
N/A	N/A	N/A	N/A	28	Clark

PARCEL #

Area served by City of Camas for municipal supply.

N/A

CONTINUED LEGAL DESCRIPTION FOR PROPERTY ON WHICH WATER IS TO BE USED

N/A

PROVISIONS

All conditions and requirements contained in reports of examination or permits previously issued apply to this certificate unless specifically noted below.

The water appropriated under this application will be used for public water supply. The State Board of Health rules require public water supply owners to obtain written approval from the Office of Water Supply, Department of Health, 1112 SE Quince Street, PO Box 47890, Olympia, Washington 98504-7890, prior to any new construction or alterations of a public water supply system.

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

Water use data shall be recorded monthly. The maximum rate of diversion/withdrawal and the annual total volume shall be submitted to Ecology by January 31st of each calendar year.

The following information shall be included with each submittal of water use data: owner, contact name if different, mailing address, daytime phone number, WRIA, Permit/Certificate/Claim No., source name, annual quantity used including units, maximum rate of diversion including units, monthly meter readings including units, peak monthly flow including units, Department of Health WFI water system number and source number(s), well tag number, and period of use. In the future, Ecology may require additional parameters to be reported or more frequent reporting. Ecology prefers web based data entry, but does accept hard copies. Ecology will provide forms and electronic data entry information. Submit data to: Department of Ecology, SWRO/WR PO Box 47775, Olympia, WA 98504-7775.

Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable

(continued on page 3)

The right to use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.100.

This certificate of water right is specifically subject to relinquishment for non-use of water as provided in Chapter 90.14 RCW.

Given under my hand and the seal of this office at Olympia, Washington, this 5th *day of* February, *2008.*

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

Jay Manning, Director
Department of Ecology

By Thomas Loranger
Thomas Loranger Section Manager

OK

Provisions Continued

times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

All wells constructed in the State shall meet the construction requirements of Chapter 173-160 WAC entitled "Minimum Standards for the Construction and Maintenance of Wells" and Chapter 18-104 RCW entitled "Water Well Construction, Act (1971)."

In accordance with Chapter 173-160 WAC, wells shall not be located within certain minimum distances of potential sources of contamination. These minimum distances shall comply with local health regulations, as appropriate. In general, wells shall be located at least 100 feet from sources of contamination. Wells shall not be located within 1,000 feet of a solid waste landfill.

Nothing in this approval shall be construed as lessening or enlarging any water rights represented by Water Right Claim No's 121022 & 121023. The water use authorized under this filing (fill in with water right no.) shall be considered supplemental to any water rights confirmed for said claim as a result of a general adjudication through Superior Court, should adjudication be undertaken.

PO Box 1055
Camas WA 98607

STATE OF WASHINGTON
CERTIFICATE OF CHANGE ON A CLAIM

Document Title: Certificate of Water Right

Agency: Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

Applicant: **City of Camas**
616 NE 4th Ave
PO Box 1055
Camas, WA 98607

Reference Number:

PRIORITY DATE	CLAIM NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
4/06/2001	G2-121023		G2-CV1-2P160

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE	TRIBUTARY OF (IF SURFACE WATERS)
Well 10	

MAX. CUBIC FEET PER SECOND	MAX. GALLONS PER MINUTE	MAX. ACRE-FEET PER YEAR
	900	230

QUANTITY/TYPE OF USE/PERIOD OF USE

230 Acre-feet per year Municipal Supply Seasonal Use, May 1 – August 31

LEGAL DESCRIPTION OF LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF WITHDRAWAL

2220 feet North and 710 feet East of the Southwest corner of Section 12.

¼ ¼	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R I.A.	COUNTY
NW ¼ SW ¼	12	1	3E	28	Clark

PARCEL # 89866000

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

1/4 1/4	SECTION	TOWNSHIP N.	RANGE (E. OR W.) W.M.	W.R I.A.	COUNTY
N/A	N/A	N/A	N/A	28	Clark

PARCEL #

Area served by City of Camas for municipal supply.

N/A

CONTINUED LEGAL DESCRIPTION FOR PROPERTY ON WHICH WATER IS TO BE USED

N/A

PROVISIONS

All conditions and requirements contained in reports of examination or permits previously issued apply to this certificate unless specifically noted below.

The water appropriated under this application will be used for public water supply. The State Board of Health rules require public water supply owners to obtain written approval from the Office of Water Supply, Department of Health, 1112 SE Quince Street, PO Box 47890, Olympia, Washington 98504-7890, *prior to any new construction* or alterations of a public water supply system.

An approved measuring device shall be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", Chapter 173-173 WAC.

Water use data shall be recorded monthly. The maximum rate of diversion/withdrawal and the annual total volume shall be submitted to Ecology by January 31st of each calendar year.

The following information shall be included with each submittal of water use data: owner, contact name if different, mailing address, daytime phone number, WRIA, Permit/Certificate/Claim No., source name, annual quantity used including units, maximum rate of diversion including units, monthly meter readings including units, peak monthly flow including units, Department of Health WFI water system number and source number(s), well tag number, and period of use. In the future, Ecology may require additional parameters to be reported or more frequent reporting. Ecology prefers web based data entry, but does accept hard copies. Ecology will provide forms and electronic data entry information. Submit data to: Department of Ecology, SWRO/WR PO Box 47775, Olympia, WA 98504-7775.

Chapter 173-173 WAC describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition Ecology for modifications to some of the requirements. Installation, operation and maintenance requirements are enclosed as a document entitled "Water Measurement Device Installation and Operation Requirements".

Department of Ecology personnel, upon presentation of proper credentials, shall have access at reasonable

(continued on page 3)

The right to use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.100.

This certificate of water right is specifically subject to relinquishment for non-use of water as provided in Chapter 90.14 RCW.

Given under my hand and the seal of this office at Olympia, Washington, this 5th *day of* February, *2008.*

DEPARTMENT OF ECOLOGY STATE OF WASHINGTON

Jay Manning, Director
Department of Ecology

OK

By Thomas Loranger
Thomas Loranger, Section Manager

Provisions Continued

times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

All wells constructed in the State shall meet the construction requirements of Chapter 173-160 WAC entitled "Minimum Standards for the Construction and Maintenance of Wells" and Chapter 18-104 RCW entitled "Water Well Construction, Act (1971)."

In accordance with Chapter 173-160 WAC, wells shall not be located within certain minimum distances of potential sources of contamination. These minimum distances shall comply with local health regulations, as appropriate. In general, wells shall be located at least 100 feet from sources of contamination. Wells shall not be located within 1,000 feet of a solid waste landfill.

Nothing in this approval shall be construed as lessening or enlarging any water rights represented by Water Right Claim No's 121022 & 121023. The water use authorized under this filing (fill in with water right no.) shall be considered supplemental to any water rights confirmed for said claim as a result of a general adjudication through Superior Court, should adjudication be undertaken.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712[1]		8/22/23	SO1/Boulder Creek		1120	1820	590	679	530	
2. S 711 CS2-SWC 711[1]		9/05/90	SO2/ Jones Creek		450	730	450		0	
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118	1200	3333 (includes SO14, SO15, and expanded wellfield permit below)	0	2288
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208	1325		0	
5. G 6636-A		3/22/68	SO6/Well 5		600	920	500		100	
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400	1450		50	
7. G2-00501		3/22/71	SO8/Well 7		1000	530	950		50	
8. G2-24400		2/04/77	SO9/Well 8		900	530	900		0	
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)	650	127	0	83 (S)
10. G2-30144		8/13/86	Expanded Wellfield		500	2150	450[4]	Included above	50	Included above
11. G2-30145[2]		8/13/86	Anderson Site		1000	880	0		1000	880
12. G2-30146[2]		8/13/86	Parkers Landing		1000	880	0		1000	880
13. G2-30147[2]		8/13/86	Treatment Plant Well		1000	880	0		1000	880
Claims 1.G2-CV1-2P160 121023		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320	900	Included above	0	Included above

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230	900		0	
TOTAL	**********	********	********	**********	**12,475**	**11,090**		**3,460**	**3,780**	**7,630**

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Camas Meadows				1000	
3.					
4.					

(1) These rights are not available for use during peak water use months. Only available between November 1 and May 14. Not included in instantaneous total.
(2) These site are not yet developed.
(3) Wells 5, 6, 7, 8, 10, 11, 12, and 13 are capped at 5,900 acre-ft per year.
(4) Excess wellfield right being utilized at Well 8.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388). For additional copies of this form, call 1-800-521-0323. This and other forms are available at http://www.doh.wa.gov/ehp/dw

DOH Form #331-371 (09/07)

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 2

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712(1)		8/22/23	SO1/Boulder Creek		1120	1820				
2. S 711 CS2-SWC 711(1)		9/05/90	SO2/ Jones Creek		450	730				
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118				
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208				
5. G 6636-A		3/22/68	SO6/Well 5		600	920				
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400				
7. G2-00501		3/22/71	SO8/Well 7		1000	530				
8. G2-24400		2/04/77	SO9/Well 8		900	530				
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)				
10. G2-30144		8/13/86	Expanded Wellfield		500	2150				
11. G2-30145(2)		8/13/86	Anderson Site		1000	880				
12. G2-30146(2)		8/13/86	Parkers Landing		1000	880				
13. G2-30147(2)		8/13/86	Treatment Plant Well		1000	880				
Claims 1.G2-CV1-2P160 121023		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320				

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230				
TOTAL	**********	********	********	**********	**12,475**	**11,090**	**9,054**	**6,639**	**3,421**	**4,451**

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Camas Meadows				1000	

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DOH Form #331-372 (09/07)

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 3

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S 712 CS2-SWC 712(1)		8/22/23	SO1/Boulder Creek		1120	1820				
2. S 711 CS2-SWC 711(1)		9/05/90	SO2/ Jones Creek		450	730				
3.G 85-A		7/21/45	SO13/Well 3 (transferred to Well 11)		1200	118				
4. G 4072-A		2/12/59	SO16/Well 4 (transferred to Well 13)		1325	1208				
5. G 6636-A		3/22/68	SO6/Well 5		600	920				
6. G 6635-A		3/22/68	SO7/Well 6		1500	2400				
7. G2-00501		3/22/71	SO8/Well 7		1000	530				
8. G2-24400		2/04/77	SO9/Well 8		900	530				
9. G2-27384		8/13/86	SO11/Well 9	210 Qa is supplemental	650	210 (S)				
10. G2-30144		8/13/86	Expanded Wellfield		500	2150				
11. G2-30145(2)		8/13/86	Anderson Site		1000	880				
12. G2-30146(2)		8/13/86	Parkers Landing		1000	880				
13. G2-30147(2)		8/13/86	Treatment Plant Well		1000	880				
Claims 1.G2-CV1-2P160 121023		6/11/74	SO14/Well 1, (transferred to Well 10 & 12)		900	320				

2. G2-CV1-2P160 121023		6/11/74	SO15/Well 2 (transferred to Well 10 & 12)		900	230				
TOTAL	**********	*********	*********	**********	**12,475**	**11,090**	**14,174**	**10,523**	**-1,699**	**567**

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1. Fire Station				350	
2. Camas Meadows				1000	

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DOH Form #331-373 (09/07)

To return form, please see reverse side.

Appendix D

SEPA and DNS

CITY OF CAMAS
616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
PH: 360-834-6864 • F: 360-834-1535
http://www.ci.camas.wa.us

Curleigh Carothers Engineering Manager

COMMUNITY DEVELOPMENT DEPARTMENT

Date Published: April 6, 2010

To Whom It May Concern:

Please find enclosed a Determination of Nonsignificance (DNS) for the **City of Camas Water System Plan Update (SEPA10-04)** that was issued pursuant to the State Environmental Policy Act (SEPA) Rules, Chapter 197-11, Washington Administrative Code. The enclosed review comments reflect evaluation of the environmental checklist by the lead agency as required by WAC 197-11-330(1)(a)(i).

A CD is enclosed that contains the draft Camas Water System Plan Update.

Written comments may be submitted on this determination within fourteen (14) days of its issuance, April 20, 2010, after which the DNS will be reconsidered in light of the comments received.

Please address all correspondence to:

City of Camas, SEPA Official
Community Development Department
616 NE Fourth Avenue / P.O. Box 1055
Camas, Washington 98607

Distribution

Bureau of Indian Affairs
C-Tran
Camas School District, Heidi Rosenberg
Camas Mayor Paul Dennis
Camas City Administrator, Lloyd Halverson
Camas Council Members (7)
Camas Engineering Department, James Carothers
Camas Fire Department, Randy Miller
Camas Finance Director, Joan Durgin
Camas Operations Manager, Eric Levison
Camas Parks and Recreation, Jerry Acheson
Camas Planning Commission (7)
Camas Police Chief, Mitch Lackey
Camas Public Works Director, Monte Brachmann
Camas Public Library, David Zavortink
Chinook Indian Nation
City of Vancouver
City of Washougal
Cultural Resource Program, Cowlitz Indian Tribe, Dave Burlingame
Cultural Resource Program, Yakama Indian Nation, Clifford Washines
Cultural Resource Program, Yakama Indian Nation, Johnson Meninick
Clark County Community Development
Clark County Department of Transportation, Steve Schulte
Clark County Parks Department, Jeroen Kok
Clark County Natural Resources Council
Clark Public Utilities
CPU Const., Service Manager
Department of Ecology
Department of Fish and Wildlife
Department of Health, Washington State
Department of Natural Resources, SEPA Center
Department of Natural Resources, Pacific Cascade Region
Department of Transportation, Washington State
Parks & Recreation Commission
Port of Camas-Washougal
Post Record Publications
Southwest Air Pollution Control Authority
US Army Corps of Engineers
Washington Office of Archaeology & Historic Preservation
UCAN (United Camas Neighborhood Association)

STATE ENVIRONMENTAL POLICY ACT

DETERMINATION OF NON-SIGNIFICANCE
(Non-project Action)

CASE NO: SEPA10-04 – City of Camas Water System Plan Update

APPLICANT: City of Camas

REQUEST: Adopt the City of Camas Water System Plan Update to provide a long-term planning strategy for the City's water utility for the 6-year and 20-year planning periods.

Location:
The proposal covers the corporate limits of the City of Camas.

Legal Description:
The planning area is bounded by:
Portions of Township 2 North, Range 3E, Sections 17, 20, 21, 27, 28, 29, 32, 33, 34, 35 and 36;
Portions of Township 1 North, Range 3 E, Sections 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16; and
Portions of Township 1 North Range 4E, Section 7, and further defined as the Camas City Limits.

SEPA Determination:
Determination of Non-Significance. (Non-project Action)

Comment Deadline:
April 20, 2010

As lead agency under the State Environmental Policy Act (SEPA) Rules [Chapter 197-11, Washington Administrative Code (WAC)], the City of Camas must determine if there are possible significant adverse environmental impacts associated with this proposal. The options include the following:

- DS = Determination of Significance (The impacts cannot be mitigated through conditions of approval and, therefore, requiring the preparation of an Environmental Impact Statement (EIS).
- MDNS = Mitigated Determination of Non-Significance (The impacts can be addressed through conditions of approval), or;
- DNS = Determination of Non-Significance (The impacts can be addressed by applying the Camas Municipal Code).

Published: Post Record on *April 6, 2010.*
Posted: Camas Post Office, City Hall, Camas Library, & City of Camas web site at:
http://www.ci.camas.wa.us/govern/publicnotice.htm

Determination:
Determination of Non-Significance (DNS). The City of Camas, as lead agency for review of this proposal, has determined that this proposal does not have a probable significant adverse impact on the environment. An Environmental Impact Statement (EIS) is not required under RCW 43.21C.030(2)(e). This decision was made after review of a completed environmental checklist and other information on file with the City.

Date of Publication & Comment Period:
Publication date of this DNS is April 6, 2010, and is issued under WAC 197-11-340. The lead agency will not act on this proposal until the close of the 14-day comment period which ends on April 20, 2010.

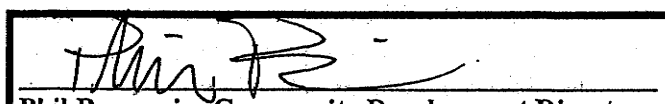
SEPA Appeal Process:
An appeal of any aspect of this decision, including the SEPA determination and any required mitigation, must be filed with the Community Development Department within fourteen (14) calendar days from the date of the decision notice. The letter of appeal should contain the following information.

1. The case number designated by the City of Camas and the name of the applicant; and,
2. The name and signature of each person or group (petitioners) and a statement showing that each petitioner is entitled to file an appeal as described under Section 16.28.060 of the Camas Municipal Code. If multiple parties file a single petition for review, the petition shall designate one party as the contact representative with the City Planner. All contact with the City Planner regarding the petition, including notice, shall be with this contact person.

The appeal request and appropriate fee is to be submitted to the Community Development Department between 8:00 a.m. and 5:00 p.m. Monday through Friday, at the address listed below:

Appeal to the City of Camas SEPA Official
Community Development Department
616 NE Fourth Avenue / P.O. Box 1055
Camas, Washington 98607

Staff Contact Person: James Carothers (360) 817-1561
Responsible Official: Phil Bourquin (360) 817-1562



Phil Bourquin, Community Development Director and Responsible Official

April 6, 2010
Date

Published: Post Record on *April 6, 2010.*
Posted: Camas Post Office, City Hall, Camas Library, & City of Camas web site at:
http://www.ci.camas.wa.us/govern/publicnotice.htm

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:
   City of Camas Water System Plan Update

2. Name of applicant:
   City of Camas Public Works Department

3. Address and phone number of applicant and contact person:

   Monte Brachmann
   616 NE Fourth Avenue
   Camas, Washington 98607
   360 817-1561

4. Date checklist prepared:
   February 2, 2010

5. Agency requesting checklist:
   City of Camas

6. Proposed timing or schedule (including phasing, if applicable):
Adoption of plan anticipated in 2010.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
This Plan will provide a 6-year capital improvement plan (CIP). These projects will be implemented based on need and available financing.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
None

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
No

10. List any government approvals or permits that will be needed for your proposal, if known.
This Plan will require approval by the Washington Department of Health prior to adoption by the City.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)
- **Chapter 1 provides an introduction, Plan summary, historical information about the water system, and a summary of existing facilities.**
- **Chapter 2 provides an overview of the regulatory requirements regarding legislation, regulatory agencies, system design standards, and water quality standards.**
- **Chapter 3 provides the basic planning data and water use projections used in developing the planning strategy for the next twenty years.**
- **Chapter 4 provides an analysis of the City's water quality, including Department of Health regulations, water treatment information, and recorded water quality information. This chapter also analyzes the water system components and their ability to meet the projected demands on the system.**
- **Chapter 5 provides the hydraulic analysis for the water system using H2O Map modeling software. This chapter illustrates how the system responds to various modeling scenarios, including identifying available fire flows and system pressures.**
- **Chapter 6 outlines the City's water use efficiency program, including current conservation efforts, target water use reductions, and an investigation of the potential for water reuse as a component of the water use efficiency plan.**
- **Chapter 7 provides a summary of the operation and maintenance (O&M) program. This chapter summarizes water system management, system operations, emergency response planning, safety procedures, cross connection control, record keeping, and identifies O&M improvements.**
- **Chapter 8 presents the capital improvements, needed to address requirements identified by the analyses provided in Chapters 4 through 7.**
- **Chapter 9 presents the current financial status of the City, along with a discussion of funding for the identified capital improvement projects.**

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.
The City of Camas water service area and Jones and Boulder Creeks' watershed area and transmission main.

B. ENVIRONMENTAL ELEMENTS

This is a nonproject action, therefore a number of the environmental elements will not apply. A general answer will be provided where appropriate. The answers will apply generally to the Water Company's service area.

1. Earth

a. General description of the site (underline one): Flat, rolling, hilly, steep slopes, mountainous, other ____.
Topography in the area ranges from flat in the older core of Camas and on the west side of Prune Hill, to hilly on the flanks of Prune Hill, to steep slopes in some areas of Prune Hill and in some canyons on the south side of Prune Hill. On the northeast side of Lacamas Lake the topography ranges from flat to hilly, with some steep slopes.

b. What is the steepest slope on the site (approximate percent slope)?
The steepest slope in the area is well over 40%, in the southern area of Prune Hill overlooking the Columbia River.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.
The US Soil Conservation Service survey of Clark County shows a number of soils series in the Camas area. The area northeast of Lacamas Lake contains approximately 330 acres in agricultural use.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
There are areas of potentially unstable soils within the City Limits. This plan would have no affect on soils.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.
The adoption of the proposed plan would not directly result in filling or grading.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Non-project action.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?
Non-project action.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
None.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, and industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.
None.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
Non-project action.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
None.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.
There are six main surface water bodies in the area: Lacamas Lake, Round Lake, Fallen Leaf Lake, Lacamas Creek, Washougal River, and Columbia River.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.
No

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetland, and indicate the area of the site that would be affected. Indicate the source of fill material.
None

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose and approximate quantities, if known.
No

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
There are areas within the City of camas that lie within the 100-year floodplains of the Columbia River, the Washougal River or Lacamas Creek.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.
No.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose and approximate quantities, if known.
No. This proposed plan is a non-project action.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: domestic sewage; industrial; containing the following chemicals...; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) is expected to serve.
None.

c. Water Runoff (including storm water):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
Non-project action.

2) Could waste materials enter ground or surface waters? If so, generally describe.
No.

d. Proposed measures to reduce or control surface, ground and runoff water impacts, if any:
None.

4. Plants

a. Check or underline types of vegetation found on the site:
_X_ deciduous tree: alder, maple, aspen, other
_X_ evergreen tree: fir, cedar, pine, other
_X_ shrubs
_X_ grass
_X_ pasture
_X_ crop or grain
_X_ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
_X_ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?
None.

c. List threatened or endangered species known to be on or near the site.
Non-project action.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:
Non-project action.

5. Animals

a. Underline any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other: _osprey, waterfowl_
mammals: deer, bear, elk, beaver, raccoon, possum
fish: bass, salmon, trout, herring, shellfish, other: _____

b. List any threatened or endangered species known to be on or near the site.
Five salmonoid species – Fall Chinook, Chum and Coho salmon, Summer and Winter steelhead, and Bull trout – are present within Lacamas Creek, the Washougal River and the Columbia River within the community. Bald eagles have been known to be along the Lacamas Lake/Lacamas Creek corridor and the Columbia River.

c. Is the site part of a migration route? If so, explain.
Portions of the City are within the Pacific Flyway, which is used by migratory waterfowl species.

d. Proposed measures to preserve or enhance wildlife, if any:
None.

6. Energy and Natural Resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.
Non-project action.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
No

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.
Non-project action.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

The proposed plan will not result in any health hazards.

1) Describe special emergency services that might be required.
None.

2) Proposed measures to reduce or control environmental health hazards, if any:
None.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?
None

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.
Non-project action.

3) Proposed measures to reduce or control noise impacts, if any:
None.

8. **Land and Shoreline Use**

a. What is the current use of the site and adjacent properties?
Camas is an urbanized and urbanizing community that has a variety of land uses from a large historic pulp and paper manufacturer to a modern semi-conductor plant, and from older residential neighborhoods to new subdivisions, as well as some areas in agricultural use. Commercial development centers are in the downtown core near the pulp and paper mill, and in outlying corridors. Camas also has natural open spaces, parks, and other public areas.

b. Has the site been used for agriculture? If so, describe.
Portions of the community (in Grass Valley) were in agricultural use in the past, and some southern portions appear to still be used for hay production or pasture. Approximately 330 acres northeast of Lacamas Lake are currently being used for agriculture.

c. Describe any structures on the site.
There are several thousand structures in the city, including more than 6,400 dwelling units.

d. Will any structures be demolished? If so, what?
The proposed plan will not result in structures being demolished.

e. What is the current zoning classification of the site?
The City of Camas has adopted the following zoning districts throughout the community.

District	Symbol	Comprehensive Plan Designation
Residential -- 20,000	R-20	Single-family Low
Residential -- 15,000	R-15	Single-family Low
Residential -- 12,000	R-12	Single-family Medium
Residential -- 10,000	R-10	Single-family Medium
Residential -- 7,500	R-7.5	Single-family Medium
Residential -- 6,000	R-6	Single-family High
Residential -- 5,000	R-5	Single-family High
Multifamily -- 10	MF-10	Multifamily Low
Multifamily -- 18	MF-18	Multifamily High
Multifamily -- 24	MF-24	Multifamily High
Neighborhood Commercial	NC	Commercial
Community Commercial	CC	Commercial
Regional Commercial	RC	Commercial
Mixed Use	MX	Commercial
Downtown Commercial	DC	Commercial
Light Industrial	LI	Industrial
Light Industrial/ Business Park	LI/BP	Light Industrial/Business Park

f. What is the current comprehensive plan designation of the site? **Please see table above.**

g. If applicable, what is the current shoreline master program designation of the site?
Non-project action.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.
No.

i. Approximately how many people would reside or work in the completed project?
The City of Camas has a current population of approximately 16,950, with a forecasted population of approximately 22,000 in a twenty-year planning horizon.

j. Approximately how many people would the completed project displace?
The proposed plan will not displace any people.

k. Proposed measures to avoid or reduce displacement impacts, if any:
None.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The Plan will be reviewed by all applicable land use authorities for compatibility. This includes Growth Management planning requirements.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle or low-income housing.
None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
None.

c. Proposed measures to reduce or control housing impacts, if any:
None.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
The proposed plan will not result in structural construction.

b. What views in the immediate vicinity would be altered or obstructed?
None.

c. Proposed measures to reduce or control aesthetic impacts, if any:
None.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Non-project action.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
No.

c. What existing off-site sources of light or glare may affect your proposal?
Non-project action.

d. Proposed measures to reduce or control light and glare impacts, if any:
None.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?
There are numerous active and passive recreational opportunities within the City of Camas and the immediate vicinity. Active recreational opportunities exist in the twelve developed parks, and on the major waterways within city limits. Passive recreation opportunities exist within the approximately 436 acres of open space areas within the city. A 312-acre regional park (Lacamas Lake County Park) provides both active and passive recreation. Numerous paved and unpaved trails within residential developments, parks, and open space areas also provide both active and passive recreational opportunities.

b. Would the proposed project displace any existing recreational uses? If so, describe.
Non-project action.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any: **None.**

13. **Historic and Cultural Preservation**

a. Are there any places or objects listed on, or proposed for, national, state or local preservation registers known to be on or next to the site? If so, generally describe.
Several sites within the City of Camas are listed on national, state or local preservation registers.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific or cultural importance known to be on or next to the site.
There are five sites on the Clark County Heritage Register, twenty-one sites on the Clark County Historical Resources Inventory, and two sites on the National Register of Historical Places.

c. Proposed measures to reduce or control impacts, if any:
None.

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.
The basic roadway system providing circulation to and from Camas is the federal and state highway system: Interstate 5, Interstate 205, State Route 14, and State Route 500. The interstates link Camas and surrounding areas to Portland to the south, as well as Olympia and Seattle to the north. State Route 14 is the major east-west connection from Camas to I-205 and I-5. State Route 500 provides access to the northern parts of the County.

There are some major arterials: Pacific Rim Boulevard, SE 1st/Lake Road, Leadbetter Road, Brady/Parker Road, and NE 3rd Avenue, to name a few, and several minor arterials that provide circulation between Camas and communities to the east and west. These arterials also provide a significant amount of circulation within the community.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?
Yes, the City is served by public transit. This proposal will not affect any routes.

c. How many parking spaces would the completed project have? How many would the project eliminate?
None.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).
Non-project action.

e. Will the project use (or occur in the immediate vicinity of) water, rail or air transportation? If so, generally describe.
Non-project action.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.
Non-project action.

g. Proposed measures to reduce or control transportation impacts, if any:
None.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.
No

b. Proposed measures to reduce or control direct impacts on public services, if any.
None.

16. **Utilities**

a. Circle utilities currently available at the site: **electricity**, **natural gas**, **water**, **refuse service**, **telephone**, **sanitary sewer**, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.
The proposed plan will not result in utility construction.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Matt Buchanan

Date Submitted: 2/4/2010

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; pro-duction, storage, or release of toxic or hazardous substances; or production of noise?

It is not anticipated that the proposed plan will increase discharge to water; emissions to air; production, storage or release of toxic or hazardous substances; or production of noise.

Proposed measures to avoid or reduce such increases are:
Construction Best Management practices.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The proposed plan is not likely to affect plants, animals, fish or marine life.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:
N/A

3. How would the proposal be likely to deplete energy or natural resources?

The proposed plan will not likely deplete energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:
None

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The potential for construction related affects to wetlands and the floodplain does exist, however, construction is expected to occur on or adjacent to municipal roads and/or property, outside of environmentally sensitive areas as much as possible.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Project-specific affects to sensitive areas will be minimized and, if necessary, mitigated.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The proposed projects in the capital improvement plan are compatible with existing plans.

Proposed measures to avoid or reduce shoreline and land use impacts are:

None

6. How would the proposal be likely to increase demands on transportation or public services and utilities?
The proposed plan would not increase demands on transportation. Demands on public services and utilities will be determined on a project specific basis.

Proposed measures to reduce or respond to such demand(s) are:

The proposed plan is intended to address supplying future demands to the Camas Water System.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.
The proposed plan does not knowingly conflict with any local, state or federal laws.

Appendix E

City of Camas Design Standards

City of Camas Water Details ~ INDEX

Detail No.	Detail Name	Rev.	Rev. Date
W1	Water Notes	1	5/1/2007
W2	1" Water Service - New (Subdivision)	1	5/1/2007
W3	1" Water Service - Replacement	1	5/1/2007
W4	1" Water Service - Meter Relocation	1	5/1/2007
W5	1" Water Service - Rural	1	5/1/2007
W6	2" Water Service	1	5/1/2007
W7a & b	3" Water Service	1	5/1/2007
W8	2" Standard Blowoff	2	9/18/2007
W9	6" Low Point Blowoff - Ditch	1	5/1/2007
W10	6" Low Point Blowoff - Street	1	5/1/2007
W11	Fire Hydrant	1	5/1/2007
W12	Valve Box and Riser	1	5/1/2007
W13	Water Main Line and Valve	1	5/1/2007
W14	Pipe Joint Restraint	1	5/1/2007
W15	Thrust Block	1	5/1/2007
W16	2" Air/Vacuum Release Valve	2	9/18/2007
W17	2" Pressure Relief Valve Assembly	1	5/1/2007
W18	4" Vacuum Relief Valve	1	5/1/2007
W19a & b	6"x2" PRV Station with 3" Relief	1	5/1/2007
W20	Above Ground PRV Relief Drain	1	5/1/2007
W21	Water Quality Sampling Station	1	5/1/2007
W22a & b	Standard Double Check Detector Valve Assembly	1	5/1/2007
W23	Utility Crossing Detail	1	5/1/2007

WATER CONSTRUCTION NOTES:

1. ALL TRENCH EXCAVATION AND PIPE INSTALLATION SHALL CONFORM TO THE MOST CURRENT A.W.W.A. STANDARDS, AND THE MOST RECENTLY ADOPTED EDITION OF THE W.S.D.O.T. STANDARD SPECIFICATIONS SECTION 7-08.3(1) AND SECTION 7-08.3(2). ALL EXCESS MATERIAL FROM THE TRENCH EXCAVATION SHALL BE DISPOSED OF AT AN APPROVED SITE.

2. PIPE BEDDING, PIPE ZONE MATERIAL AND TRENCH BACKFILL SHALL BE AN APPROVED GRANULAR MATERIAL OF EITHER WASHED SCREENINGS OR 5/8 INCH MINUS CRUSHED ROCK. SAND BACKFILL IS NOT ALLOWED.

3. TRENCH COMPACTION SHALL CONFORM TO THE MOST RECENTLY ADOPTED EDITION OF THE W.S.D.O.T. STANDARD SPECIFICATIONS SECTION 7-08.3(3). CONTRACTOR TO DETERMINE THE TYPE OF EQUIPMENT AND METHOD USED TO ACHEIVE THE REQUIRED COMPACTION AND BE APPROVED BY THE CITY OF CAMAS. EACH LIFT SHALL BE COMPACTED TO A MINIMUM OF 95 PERCENT OF THE MAXIMUM DENSITY AS DETERMINED BY THE A.A.S.H.T.O. T-180 TEST METHOD.

4. SETTLEMENT OF THE FINISHED SURFACE WITHIN THE WARRANTY PERIOD SHALL BE CONSIDERED TO BE A RESULT OF IMPROPER COMPACTION AND SHALL BE PROMPTLY REPAIRED BY THE CONTRACTOR AT NO EXPENSE TO THE CITY.

5. ALL VALVES 10 INCHES OR LESS IN DIAMETER SHALL BE A.W.W.A. APPROVED RESILIENT WEDGE GATE VALVES, BUBBLE TIGHT AT 200PSI, HAVE NON RISING STEMS, AND OPEN BY TURNING TO THE LEFT. PROVIDE A 2 INCH SQUARE NUT TO CONFORM TO A.W.W.A. C-504. ALL VALVES 12 INCHES OR LARGER IN DIAMETER SHALL BE A.W.W.A. APPROVED BUTTERFLY VALVES.

6. ALL WATER PIPE 12 INCHES OR LESS IN DIAMETER SHALL BE DUCTILE IRON CLASS 52 PIPE. ALL WATER PIPE 14 INCHES IN DIAMETER AND LARGER SHALL BE DUCTILE IRON CLASS 51 PIPE. RUBBER GASKET TYPE SHALL BE U.S. PIPE, TYTON OR APPROVED EQUAL. ALL FITTINGS SHALL BE DUCTILE IRON AND SHALL CONFORM TO THE A.W.W.A. STANDARD C-110.

7. ALL TEES, FLANGES, CAPS, BENDS AND OFFSETS, AS WELL AS ALL OTHER APPURTENCES WHICH ARE SUBJECT TO UNBALANCED THRUST, SHALL BE PROPERLY BRACED BY ONE OF THE FOLLOWING METHODS:
   A. CONCRETE THRUST BLOCKING- AS DETAILED IN THE PLANS, SHALL BE PLACED AT BENDS, TEES, DEAD ENDS AND CROSSES. BLOCKING SHALL BE 3000 PSI CONCRETE POURED IN PLACE. CONCRETE BLOCKING SHALL BE AGAINST SOLID UNDISTURBED EARTH AT THE SIDES AND BOTTOM OF THE TRENCH EXCAVATION AND SHALL BE SHAPED SO AS NOT TO OBSTRUCT ACCESS TO THE JOINTS OF THE PIPE. 6 MIL. PLASTIC SHALL BE USED TO INSULATE PIPE.
   B. MECHANICAL JOINT RESTRAINT-USE "EBBA IRON SERIES 1100 MEGA LUG MECHANICAL JOINT THRUST RESTRAINT" OR APPROVED EQUAL. CONTRACTOR TO RESTRAIN THE MINIMUM REQUIRED PIPE LENGTH WITH "FIELD-LOK" GASKETS OR APPROVED EQUAL.

8. ALL WATER MAINS SHALL BE TESTED AT 200PSI IN ACCORDANCE WITH SECTION 7-11.3(11) OF THE STANDARD SPECIFICATIONS. THE CITY SHALL BE NOTIFIED 48 HOURS IN ADVANCE OF ACCEPTANCE TESTING. MAXIMUM LENGTH OF PIPE TO BE TESTED AT ONE TIME IS 1000 FT.

9. CHLORINATION SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 7-11.3(12) OF THE STANDARD SPECIFICATIONS. CITY INSPECTOR WILL TAKE SAMPLES AND DELIVER TO LABORATORY FOR BACTERIA TESTING, NEGATIVE SAMPLE RESULTS SHALL BE CONFIRMED, PRIOR TO PRESSURE TESTING. DECLORINATION OR DISPOSAL TO SANITARY MAIN MAY BE REQUIRED.

10. APPROPRIATE DISPOSAL AND OR DECHLORINATION OF FLUSHED WATER DURING BLOWOFF IS THE RESPONSIBILITY OF THE CONTRACTOR. METHOD USED SHALL BE APPROVED BY CITY AND OTHER REGULATING AUTHORITIES.

11. WATER MAIN TO HAVE A MINIMUM COVER OF 30 INCHES. WATER SERVICES TO HAVE A MINIMUM 24" OF COVER.

12. ALL EXISTING VALVES TO BE OPERATED BY CITY OF CAMAS WATER/SEWER DEPARTMENT PERSONNEL ONLY.

13. NO CONNECTIONS TO EXISTING WATER MAINS SHALL BE MADE PRIOR TO SATISFACTORY PRESSURE TESTING, DISINFECTION, AND THE CONFIRMATION OF A NEGATIVE BACTERIA TEST.

REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

WATER CONSTRUCTION NOTES

James C. Carothers 5-8-07

DETAIL APPROVED BY DATE

NO SCALE

DETAIL NO. W1

WTR-NOTES.DWG

REV. NO.	DATE	BY	APPR.
1	7/17/06	RES1071	COUNCIL
2	5/1/07	SD	JC

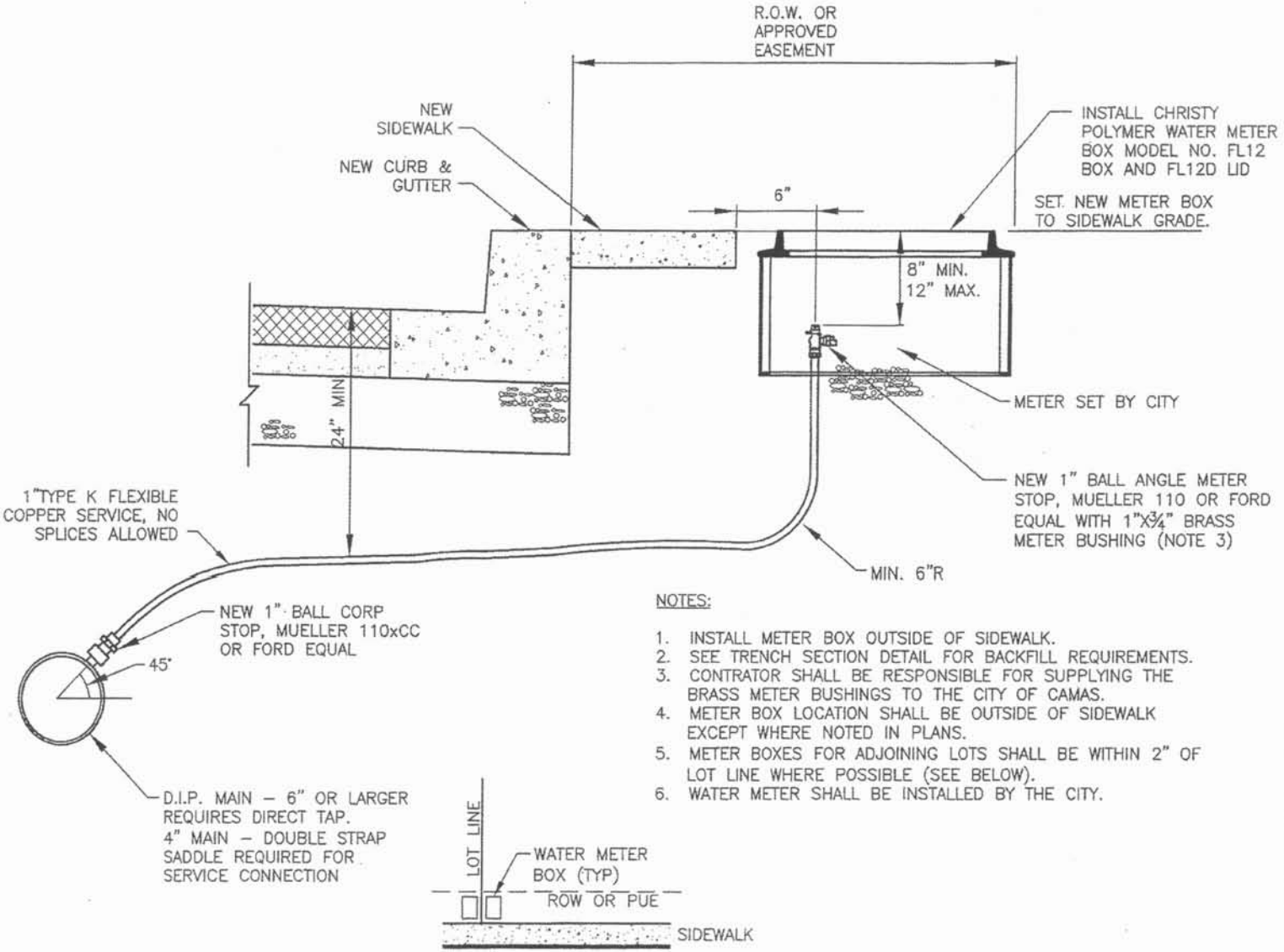
CITY OF CAMAS ~ WATER DETAIL

1" WATER SERVICE – NEW (SUBDIVISION)

DETAIL APPROVED BY: [signature] DATE: 5-8-07

NO SCALE

DETAIL NO. W2

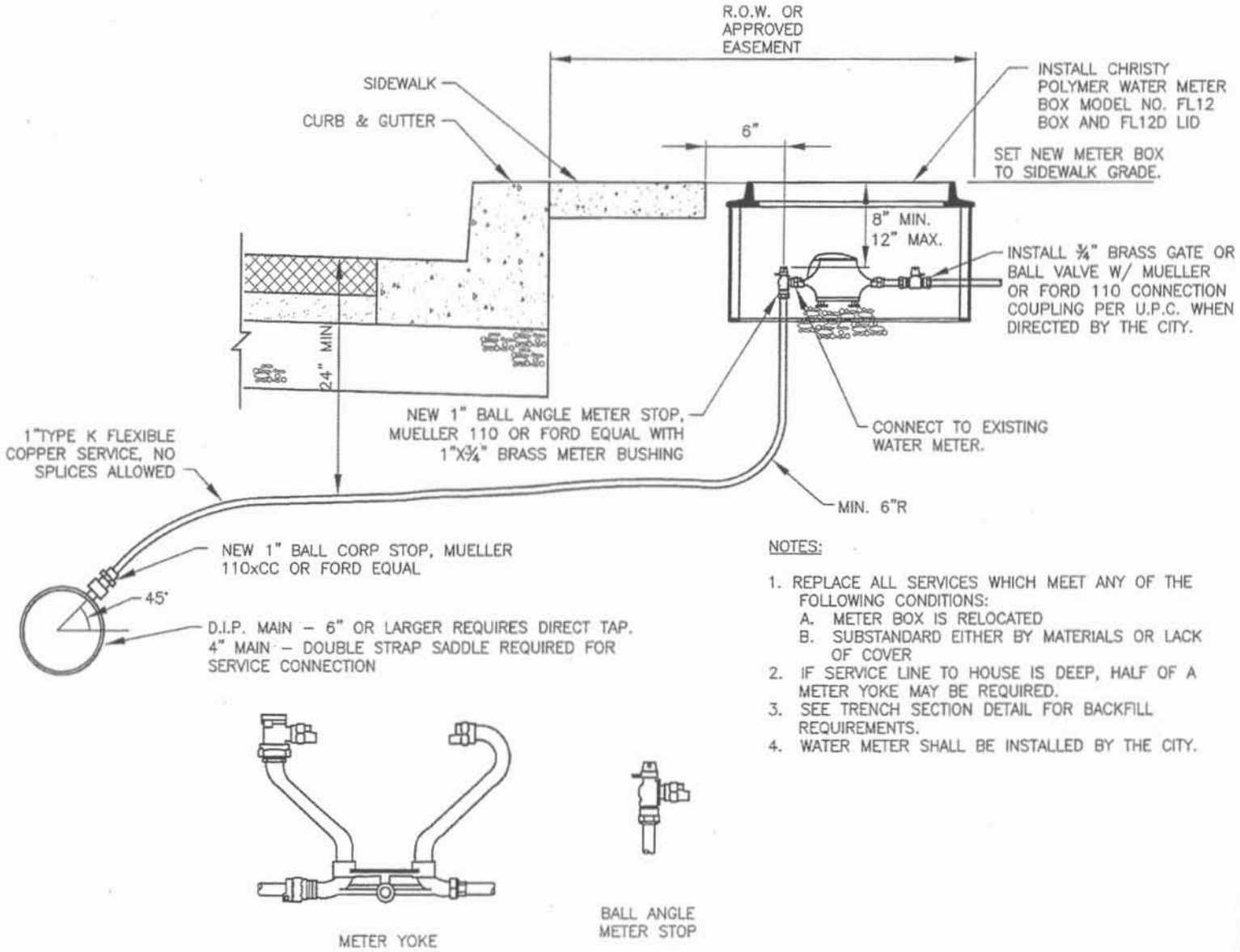


NOTES:

1. INSTALL METER BOX OUTSIDE OF SIDEWALK.
2. SEE TRENCH SECTION DETAIL FOR BACKFILL REQUIREMENTS.
3. CONTRATOR SHALL BE RESPONSIBLE FOR SUPPLYING THE BRASS METER BUSHINGS TO THE CITY OF CAMAS.
4. METER BOX LOCATION SHALL BE OUTSIDE OF SIDEWALK EXCEPT WHERE NOTED IN PLANS.
5. METER BOXES FOR ADJOINING LOTS SHALL BE WITHIN 2" OF LOT LINE WHERE POSSIBLE (SEE BELOW).
6. WATER METER SHALL BE INSTALLED BY THE CITY.

LOCATION OF ADJOINING LOT METER BOXES

WTR-WS.DWG



NOTES:

1. REPLACE ALL SERVICES WHICH MEET ANY OF THE FOLLOWING CONDITIONS:
   A. METER BOX IS RELOCATED
   B. SUBSTANDARD EITHER BY MATERIALS OR LACK OF COVER
2. IF SERVICE LINE TO HOUSE IS DEEP, HALF OF A METER YOKE MAY BE REQUIRED.
3. SEE TRENCH SECTION DETAIL FOR BACKFILL REQUIREMENTS.
4. WATER METER SHALL BE INSTALLED BY THE CITY.

REV. NO.	DATE	BY	APPR.
1	7/17/08	RES1071	COUNCIL
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

1" WATER SERVICE – REPLACEMENT

DETAIL APPROVED BY: Jason P. Gauthier 5-8-07 DATE

NO SCALE

DETAIL NO. W3

WTR–WS.DWG

REV. NO.	DATE	BY	APPR.
1	7/17/06	RES1071	COUNCIL
2	5/1/07	SD	JC

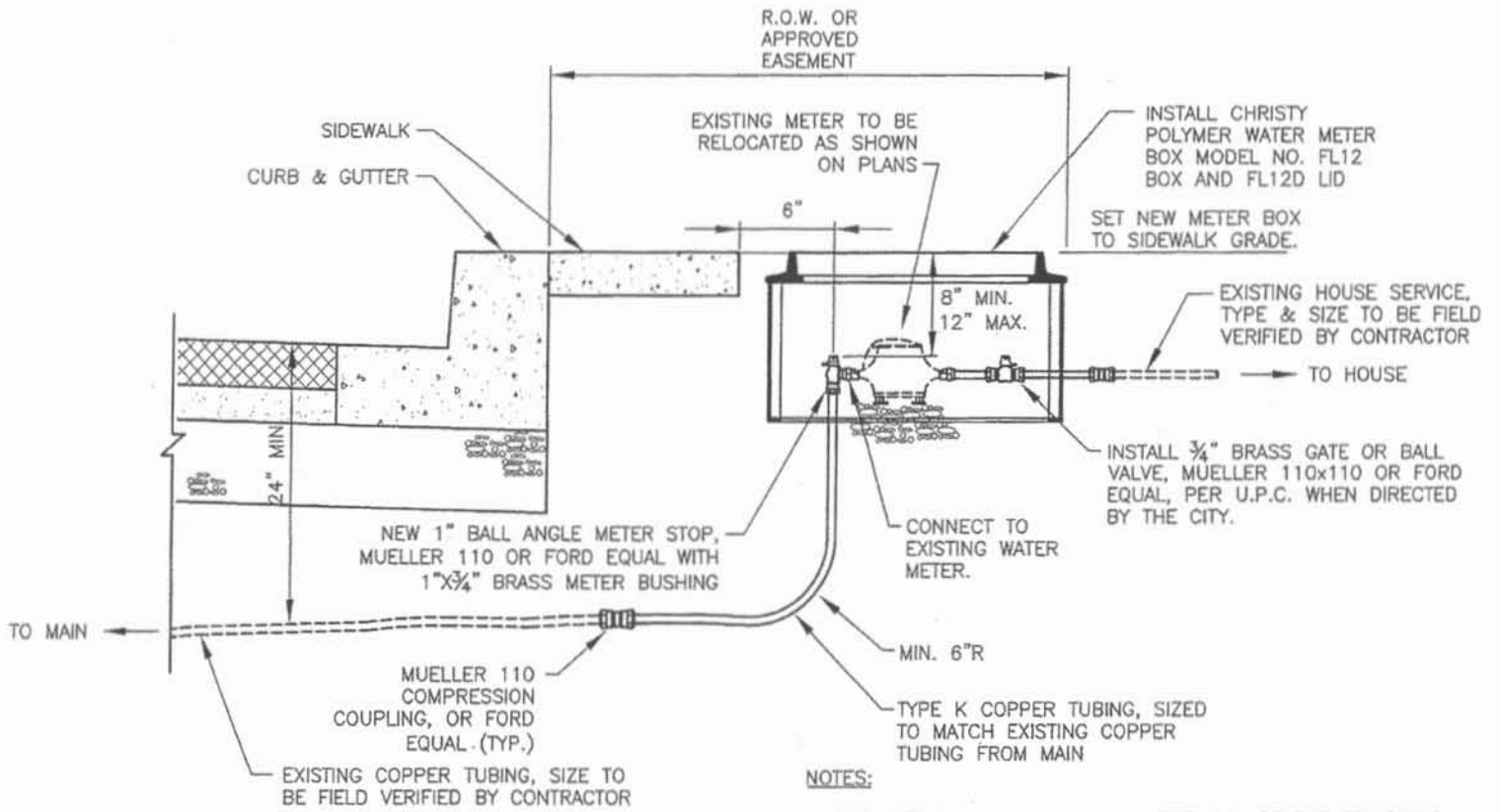
CITY OF CAMAS ~ WATER DETAIL

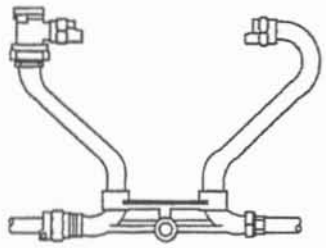
1" WATER SERVICE – METER RELOCATION

DETAIL APPROVED BY _____ DATE 5-8-07

NO SCALE

DETAIL NO. W4





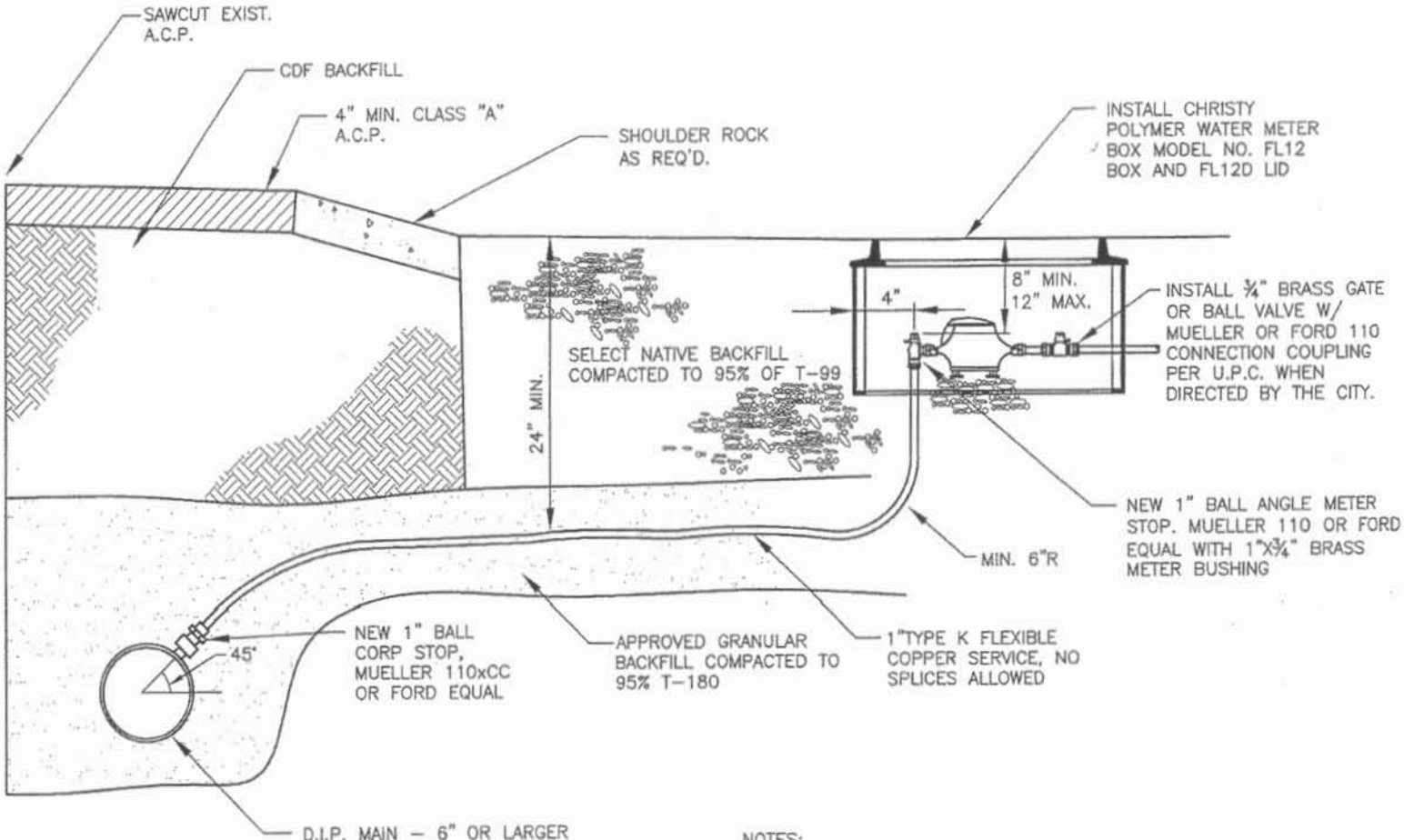
METER YOKE

BALL ANGLE METER STOP

NOTES:

1. REPLACE ALL SERVICES WHICH MEET ANY OF THE FOLLOWING CONDITIONS:
   A. METER BOX IS RELOCATED
   B. SUBSTANDARD EITHER BY MATERIALS OR LACK OF COVER
   C. METER IS TOO DEEP AND A YOKE MUST BE ADDED.
2. IF SERVICE LINE TO HOUSE IS DEEP, HALF OF A METER YOKE MAY BE REQUIRED.
3. IF SERVICE IS NOT COPPER, CONTRACTOR IS TO REFER TO DETAIL W3 (REPLACEMENT WATER SERVICE) FOR INSTALLATION.
4. FOR SERVICE RELOCATIONS, ONLY ONE FITTING IS ALLOWED BETWEEN THE CORP STOP AND THE METER STOP. A METER ADAPTER REDUCING FROM A 1" SERVICE TO A SMALLER METER MAY BE ALLOWED IN ADDITION TO THE ONE FITTING.
5. INSTALL METER BOX OUTSIDE OF SIDEWALK
6. CALL FOR INSPECTION OF COUPLING UNDER PRESSURE PRIOR TO BACKFILLING.
7. SEE TRENCH SECTION DETAIL FOR BACKFILL REQUIREMENTS.
8. WATER METER SHALL BE INSTALLED BY THE CITY.

WTR-WS.DWG



NOTES:

1. BACKFILL REQUIREMENTS PER CITY/COUNTY/STATE ROAD CUT PERMIT. CONTRACTOR MUST SECURE PERMIT PRIOR TO START OF CONSTRUCTION AND COORDINATE INSPECTION WITH APPROPRIATE JURISDICTION.
2. WATER METER SHALL BE INSTALLED BY THE CITY

REV. NO.	DATE	BY	APPR.
1	7/17/08	RES1071	COUNCIL
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

1" WATER SERVICE – RURAL

DETAIL APPROVED BY

5-8-07
DATE

NO SCALE

DETAIL NO. W5

WTR-WS.DWG

REV. NO.	DATE	BY	APPR.
1	7/17/06	RES1071	COUNCIL
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

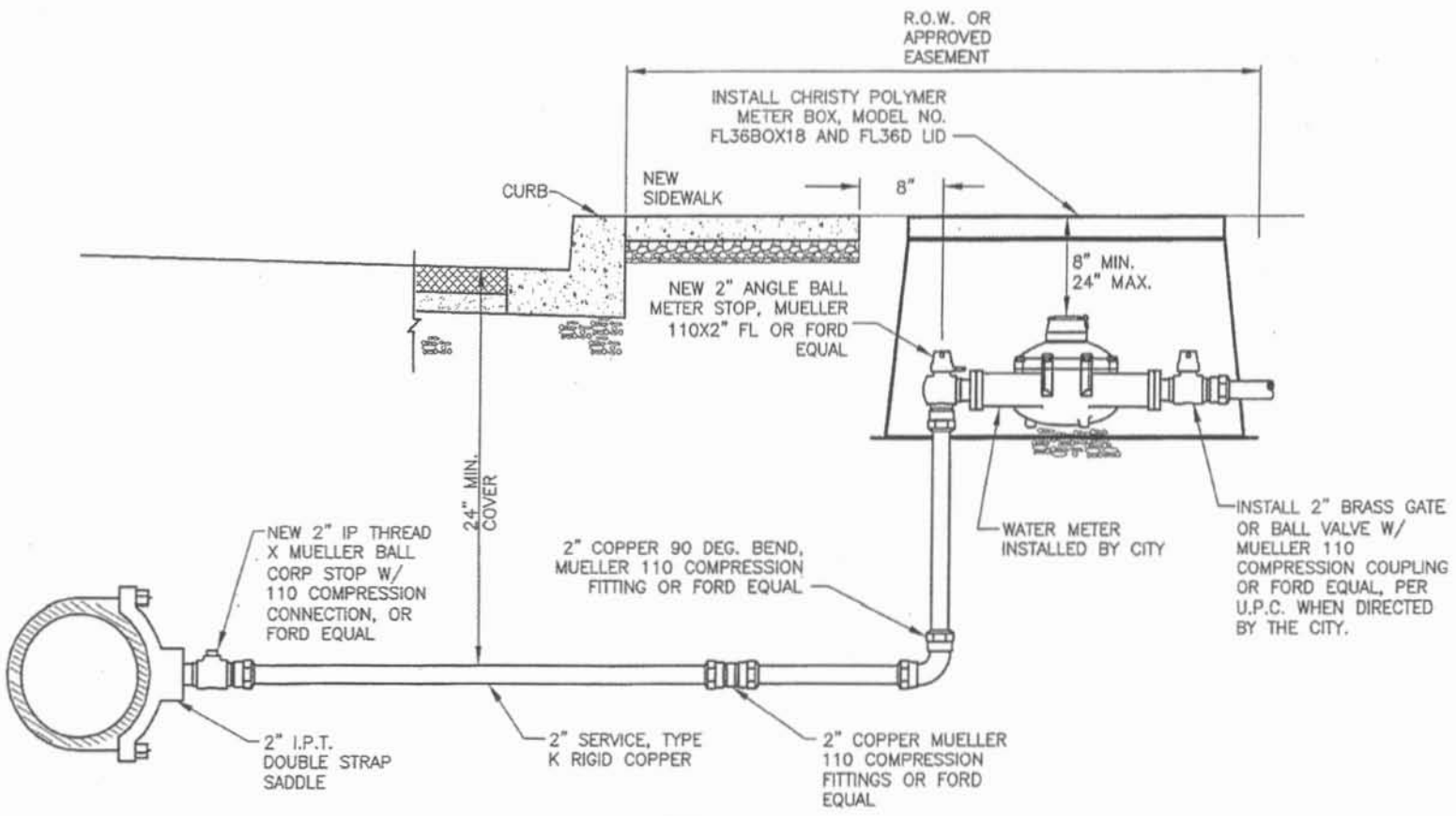
2" WATER SERVICE

DETAIL APPROVED BY

5-8-07
DATE

NO SCALE

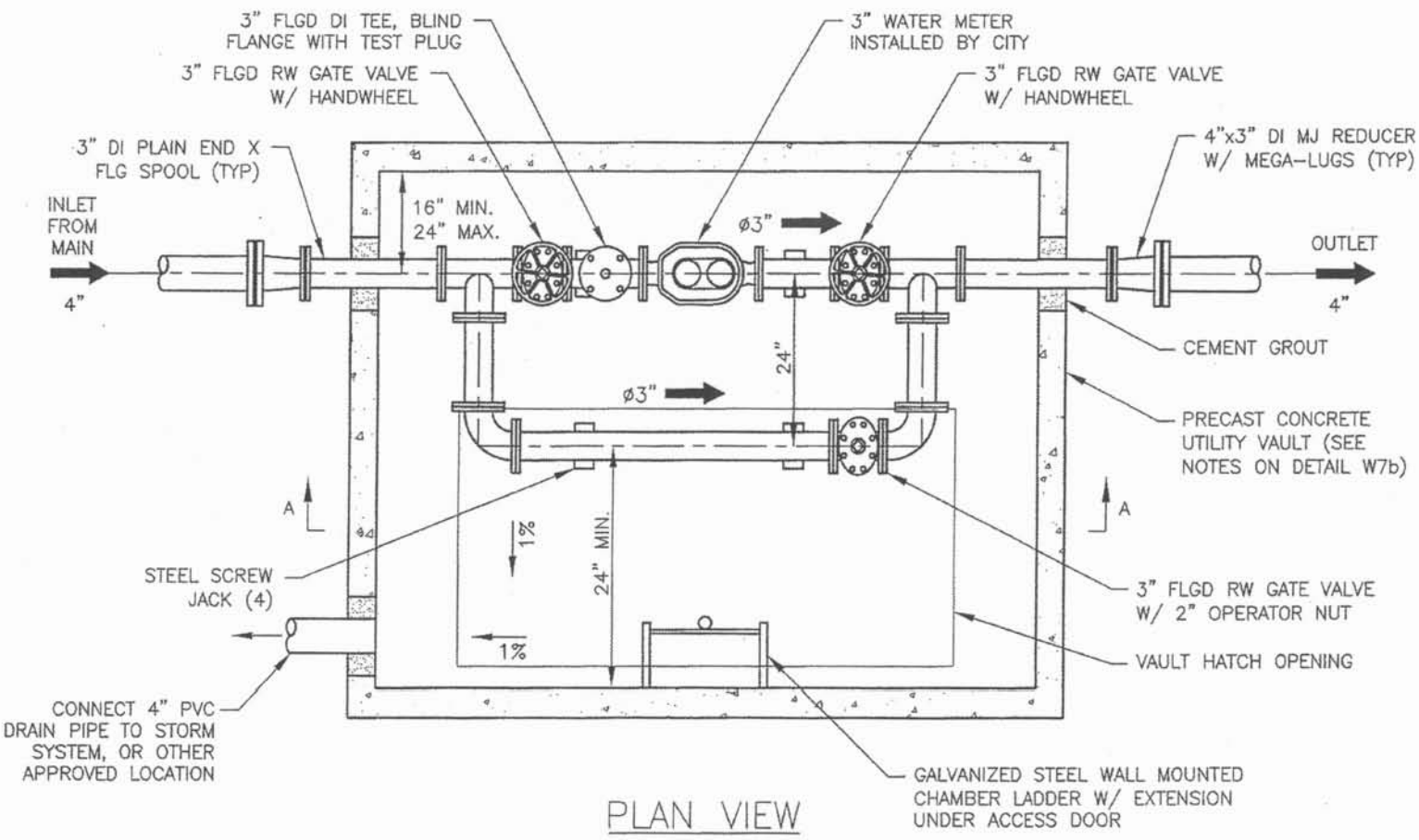
DETAIL NO. W6



NOTES:

1. REPLACE ALL SERVICES WHICH MEET ANY OF THE FOLLOWING CONDITIONS:
   A. METER BOX IS RELOCATED
   B. SUBSTANDARD EITHER BY MATERIALS OR LACK OF COVER
2. INSTALL CHRISTY POLYMER METER BOX, MODEL NO. FL36BOX18 AND FL36D LID, OUTSIDE OF SIDEWALK. INSTALL FL36X6 OR FL36X8 BASE EXTENSIONS AS REQUIRED.
3. INSTALL COMPRESSION FITTINGS OUTSIDE OF STREET WHERE POSSIBLE.
4. SEE TRENCH SECTION DETAIL FOR BACKFILL REQUIREMENTS.
5. WATER METER SHALL BE INSTALLED BY THE CITY.

WTR-WS2.DWG



PLAN VIEW

WATER METER NOTES:

1. FOR NEW MAINS, INSTALL MAIN SIZE MJ x 4" FL TEE. FOR EXISTING MAINS, LIVE TAP TO BE PERFORMED BY APPROVED TAPPING CONTRACTOR.
2. PROVIDE APPROVED JOINT RESTRAINT FOR ALL JOINTS ON 4" DUCTILE IRON PIPE. MINIMUM COVER 30".
3. PROVIDE FLANGED CONNECTIONS FOR ALL JOINTS ON 3" DUCTILE IRON PIPE AND FITTINGS.

REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

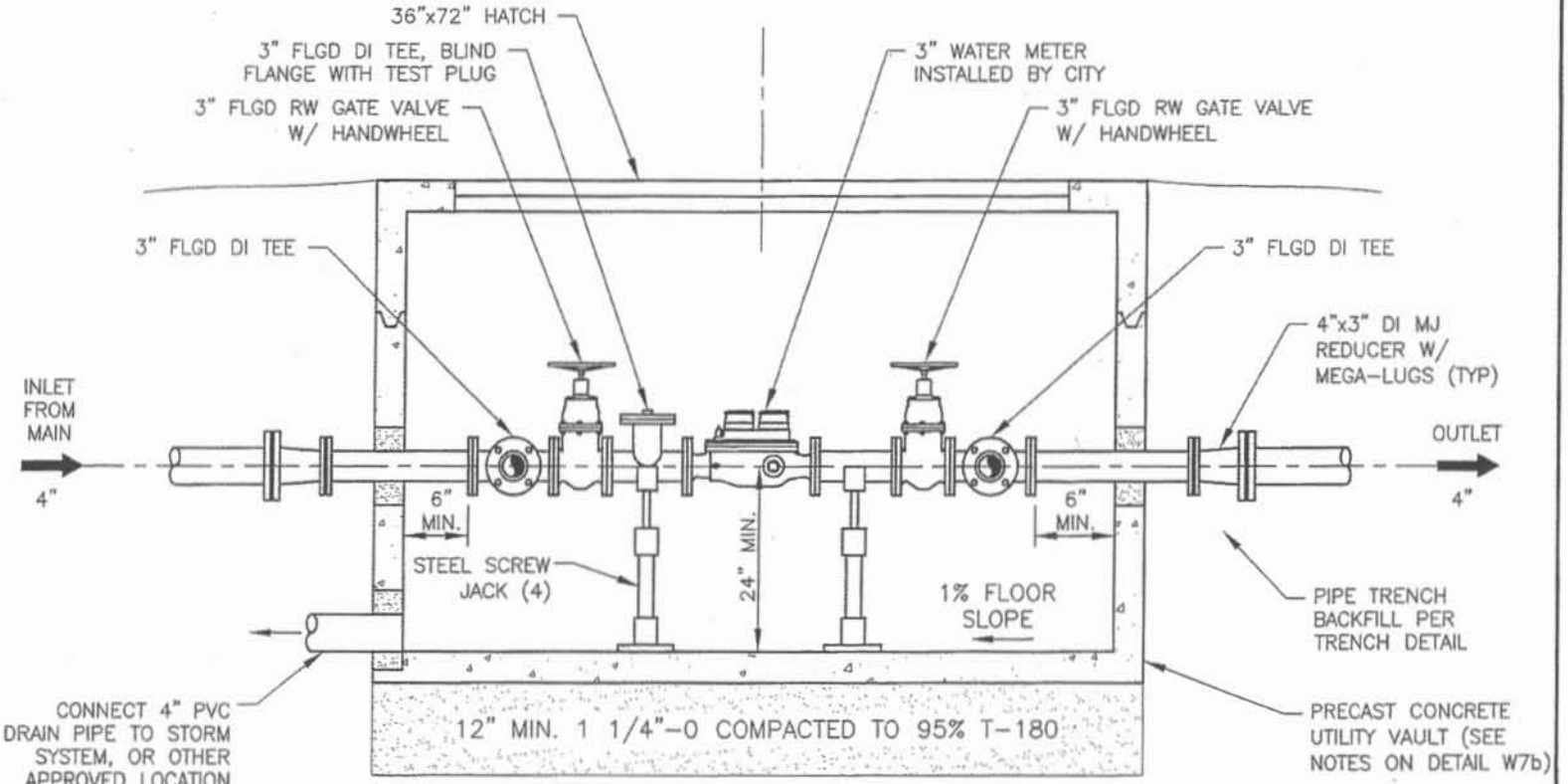
3" WATER SERVICE

DETAIL APPROVED BY: Steven E. Gaither 5-8-07 DATE

NO SCALE

DETAIL NO. W7a

WTR-WS3.DWG



SECTION A–A

(BY–PASS LINE REMOVED FOR CLARITY)

VAULT CONSTRUCTION NOTES:

1. VAULT SHALL BE PRE–APPROVED PRIOR TO INSTALLATION.
2. VAULTS SHALL HAVE A MINIMUM OF 3' CLEARANCE FROM ALL STRUCTURES.
3. APPROVED VAULT SHALL BE RATED FOR H20 LOADING AND INCLUDE AN EXTENSION LADDER, MINIMUM INSIDE DIMENSIONS 8'Lx6'Wx5'H.
4. VAULT SHALL BE SET FOR 1% SLOPE TO DRAIN.
5. ALL BACKFILL SHALL BE APPROVED GRANULAR MATERIAL.
6. HATCH SHALL BE AN H20 RATED, 36"x72" SPRING ASSISTED, HOT DIPPED GALVANIZED DIAMOND PLATE DOUBLE DOOR. FOR TRAFFIC INSTALLATIONS A 30" MANHOLE LID SHALL BE USED INSTEAD OF A HATCH.
7. SUMP PUMP MAY BE REQUIRED ON INSTALLATIONS WHERE DRAIN PIPE CANNOT BE CONNECTED TO ADEQUATE STORM DRAIN SYSTEM. THE APPROVED SUMP PUMP SHALL BE A COMMERCIAL GRADE WATER POWERED VENTURI DESIGN WITH BACKFLOW PREVENTION, SIZED TO PROVIDE 10GPM AT 10 FEET OF HEAD AT THE AVAILABLE SYSTEM WATER PRESSURE. BACKFLOW DEVICE SHALL BE CERTIFIED BY WASHINGTON STATE CERTIFIED BACKFLOW TESTER AFTER INSTALLATION AND PRIOR TO ACCEPTANCE. TEST RESULTS SHALL BE SENT TO CITY OF CAMAS WATER DEPARTMENT.

REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

3" WATER SERVICE

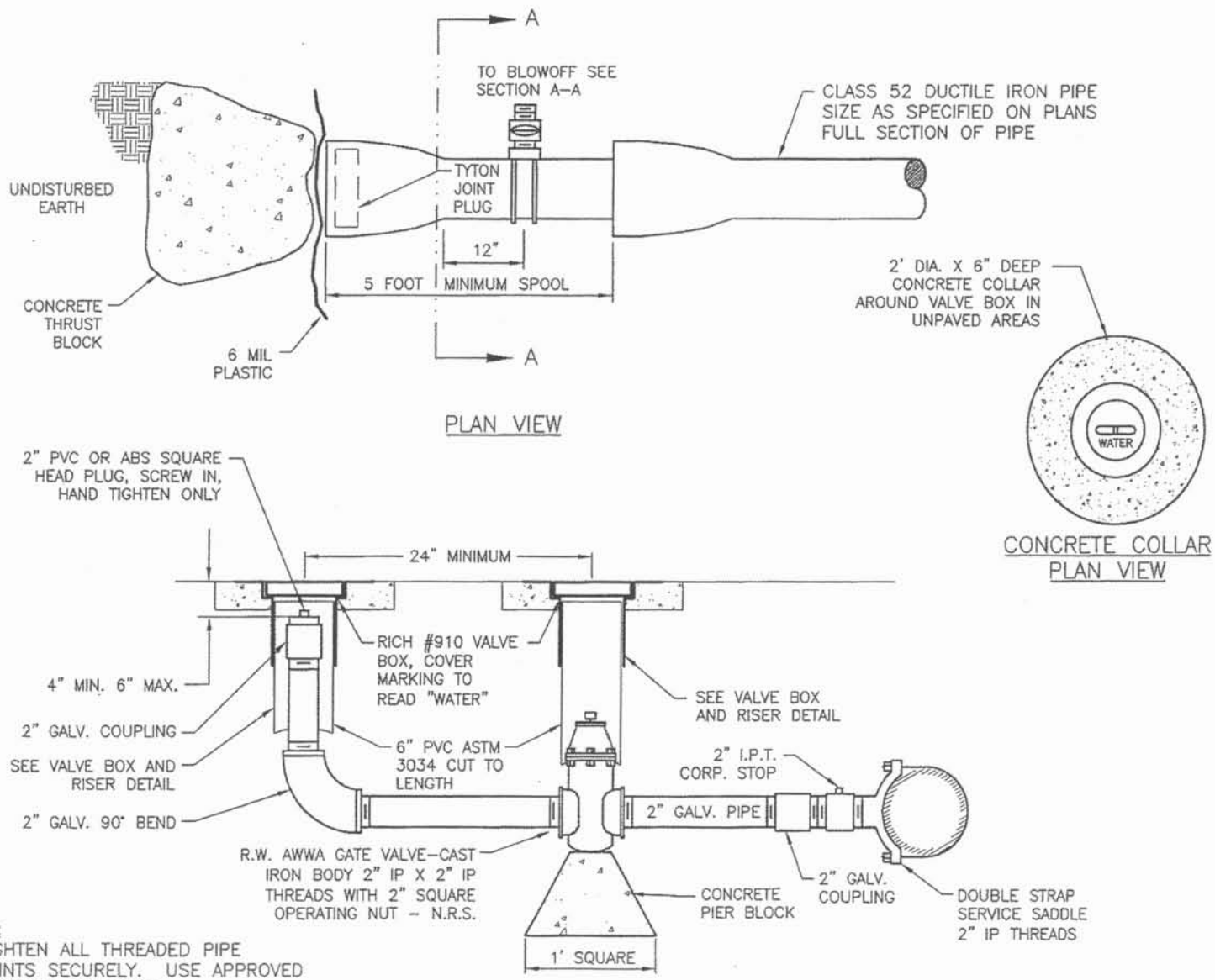
DETAIL APPROVED BY

5-6-07
DATE

NO SCALE

DETAIL NO. W7b

WTR–WS3.DWG



NOTES:
1. TIGHTEN ALL THREADED PIPE JOINTS SECURELY. USE APPROVED JOINTING COMPOUND.
2. SWAB ALL PIPE WITH CHLORINE MIXTURE PRIOR TO SERVICE.

REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC
3	9/18/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

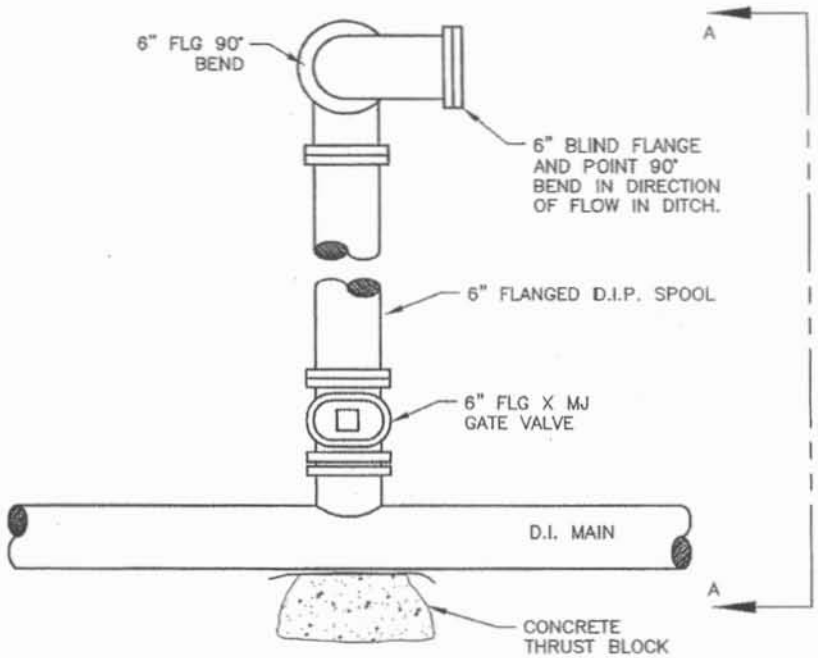
2" STANDARD BLOWOFF

DETAIL APPROVED BY: Spencer C. Gottlieb 9-21-07 DATE

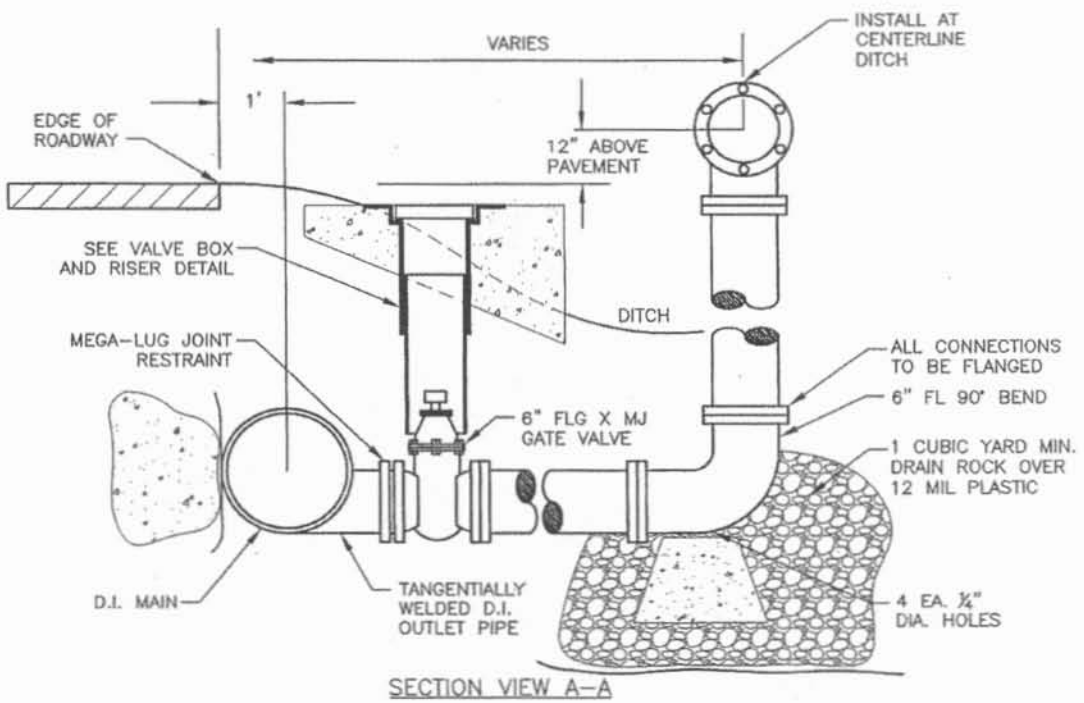
NO SCALE

DETAIL NO. W8

WTR–BLWOFF.DWG



PLAN VIEW



SECTION VIEW A-A

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

6" LOW POINT BLOW OFF – DITCH

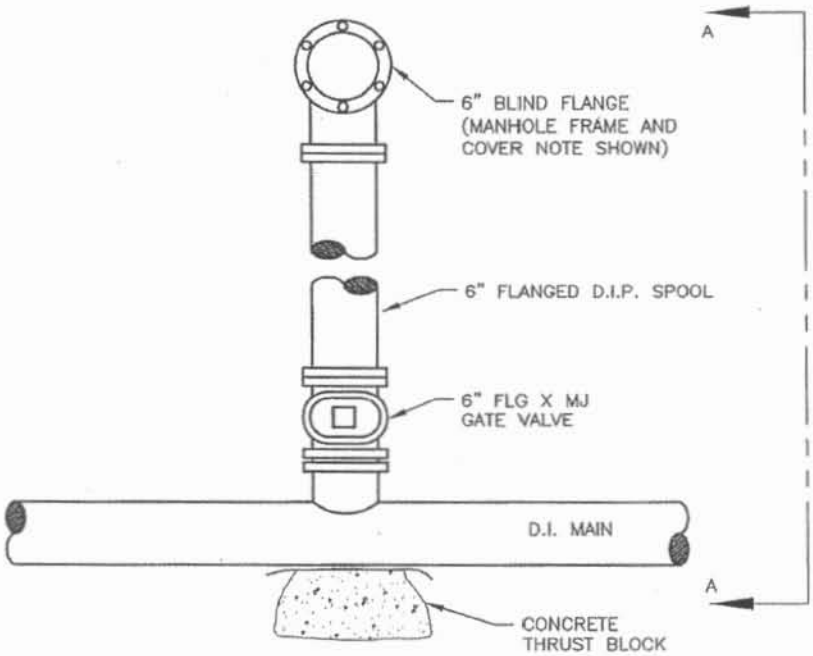
Jann E. Cantlon 5-8-07

DETAIL APPROVED BY DATE

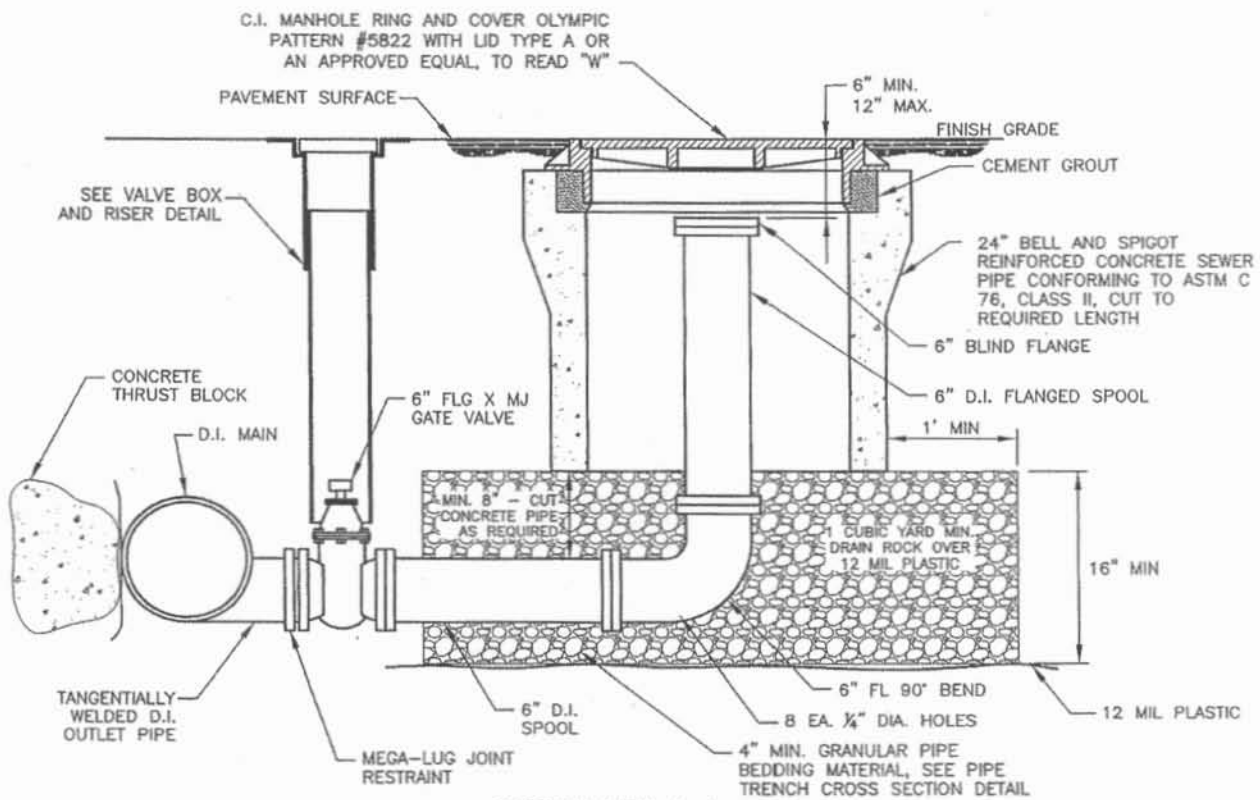
NO SCALE

DETAIL NO. W9

6BLOWOFF.DWG



PLAN VIEW



SECTION VIEW A–A

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

6" LOW POINT BLOW OFF – STREET

James C. Carothers 5-8-07

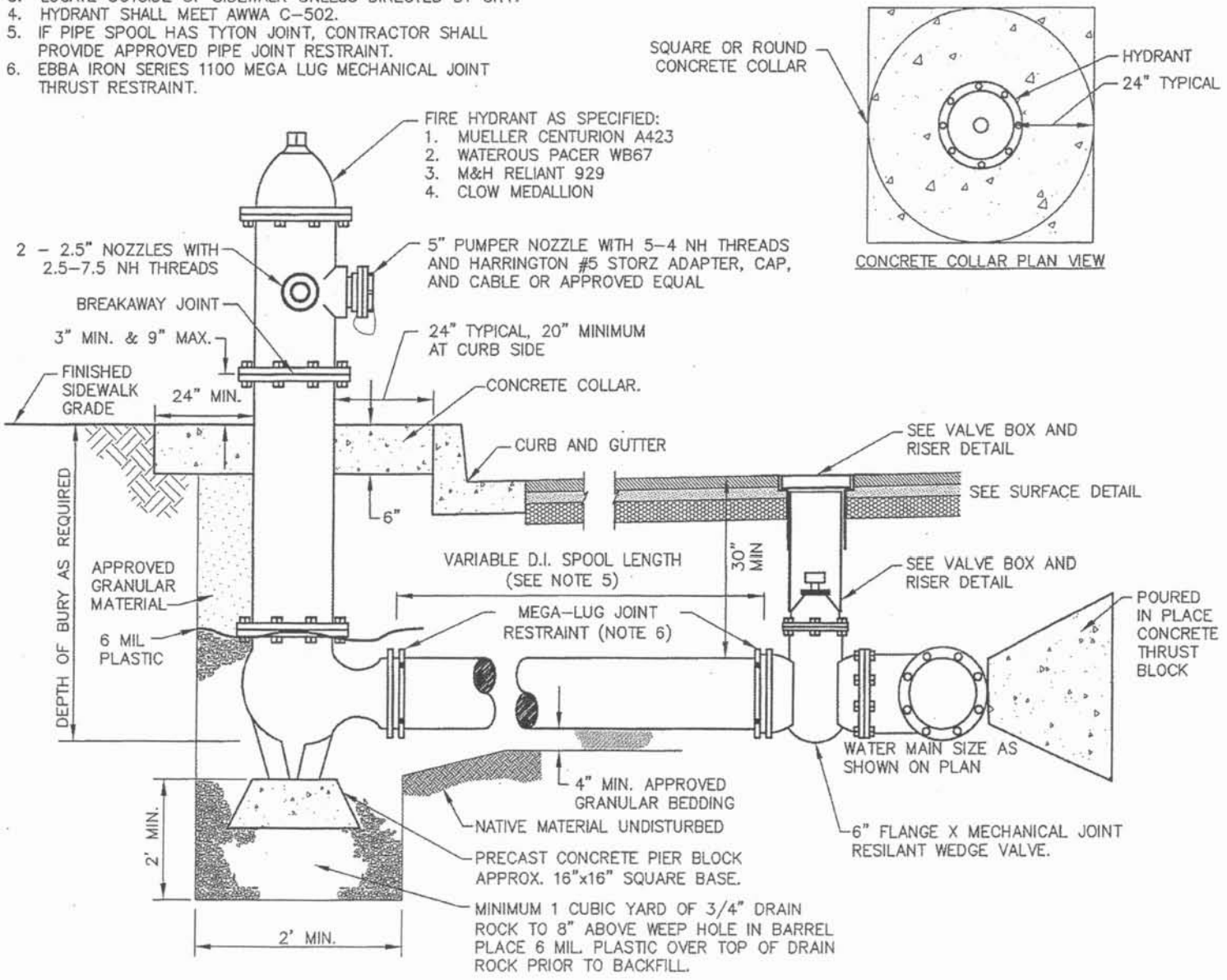
DETAIL APPROVED BY DATE

NO SCALE

DETAIL NO. W10

6BLOWOFF.DWG

NOTES:
1. HYDRANT SHALL BE SET PLUMB.
2. HYDRANT TO BE PAINTED WITH TWO COATS OF PAINT, TYPE AND COLOR SPECIFIED BY CITY.
3. LOCATE OUTSIDE OF SIDEWALK UNLESS DIRECTED BY CITY.
4. HYDRANT SHALL MEET AWWA C-502.
5. IF PIPE SPOOL HAS TYTON JOINT, CONTRACTOR SHALL PROVIDE APPROVED PIPE JOINT RESTRAINT.
6. EBBA IRON SERIES 1100 MEGA LUG MECHANICAL JOINT THRUST RESTRAINT.



REV. NO.	DATE	BY	APPR.
1	7/17/06	RES1071	COUNCIL
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

FIRE HYDRANT

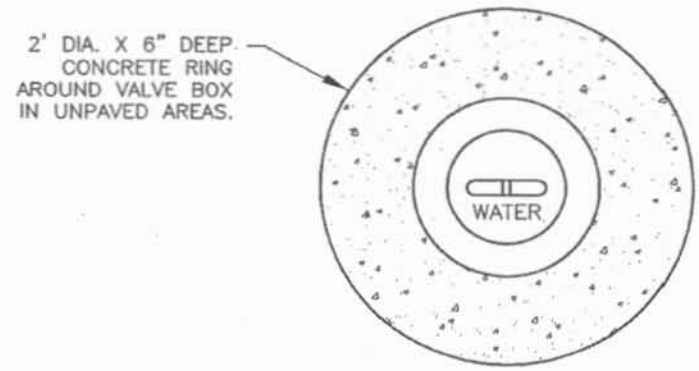
DETAIL APPROVED BY

5-8-07
DATE

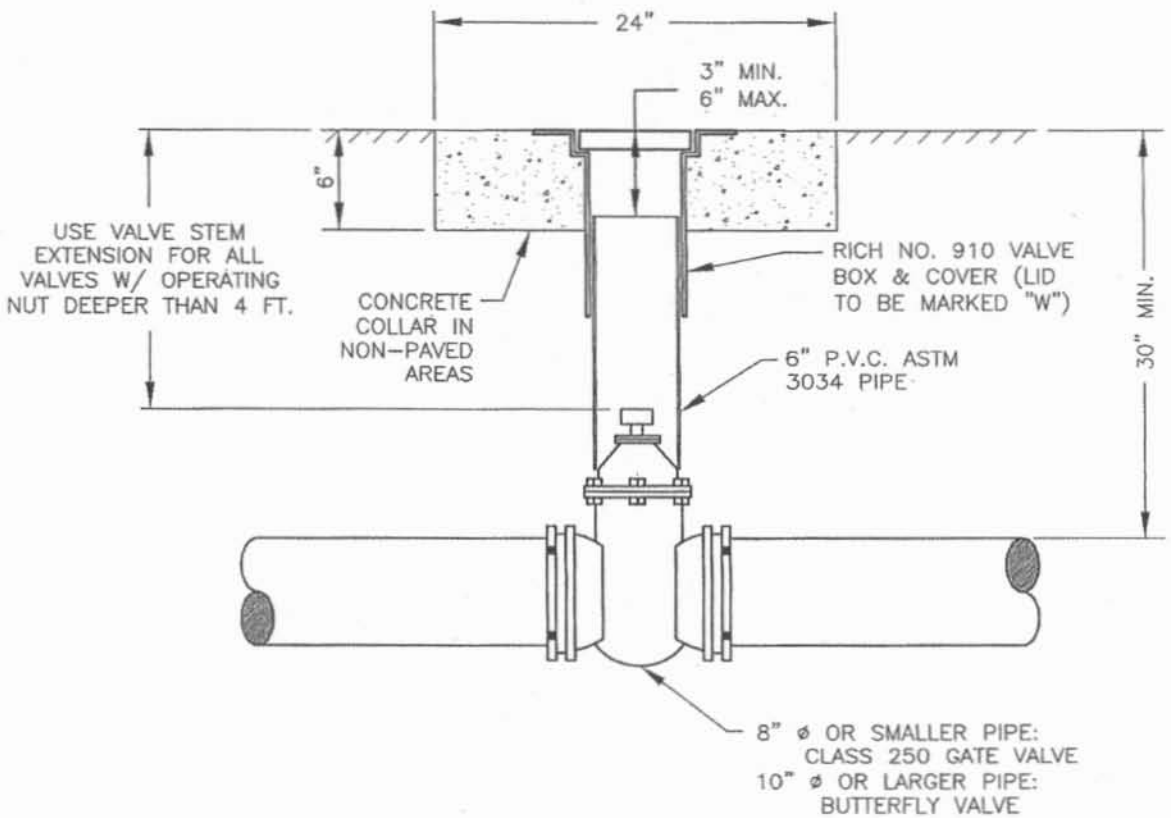
NO SCALE

DETAIL NO. W11

WTR-FHYD.DWG



CONCRETE COLLAR PLAN VIEW



REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

VALVE BOX AND RISER

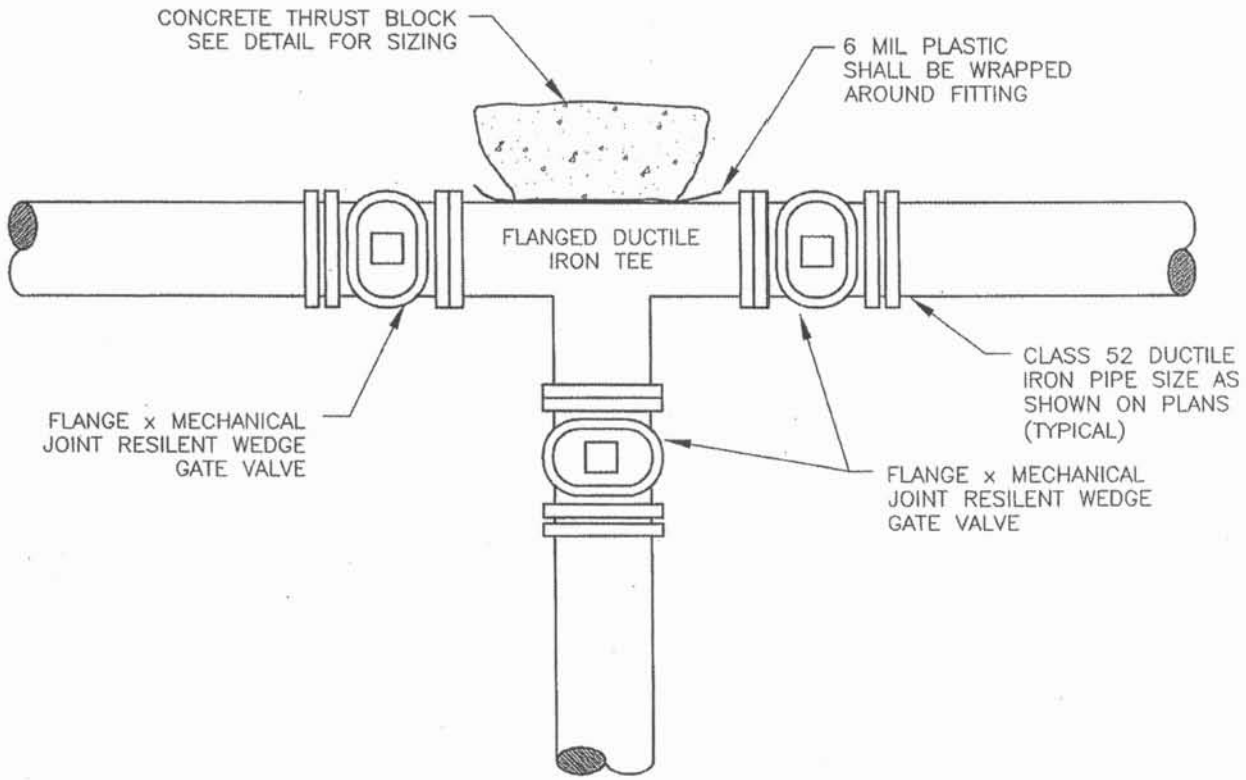
James P. Carothers 5-8-07

DETAIL APPROVED BY DATE

NO SCALE

DETAIL NO. W12

WTR-RISER.DWG



NOTES:

1. VALVES TO BE INSTALLED AT ALL BRANCHES. FOR LONG MAIN LINE RUNS INLINE VALVE SPACING NOT TO EXCEED 500'. LOOP WATER SYSTEM WHEREVER POSSIBLE. KEEP DEAD ENDS TO A MINIMUM.
2. MECHANICAL THRUST RESTRAINT MAY BE USED DUE TO UNSTABLE SOILS OR THE ENGINEER'S DISCRETION

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JH

CITY OF CAMAS ~ WATER DETAIL

WATER MAIN LINE AND VALVE

James E. Hudtlon 5-8-07

DETAIL APPROVED BY DATE

NO SCALE

DETAIL NO. W13

WTR-VALVE.DWG

REV. NO.	DATE	BY	APPR.
1	7/17/06	RES1071	COUNCIL
2	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

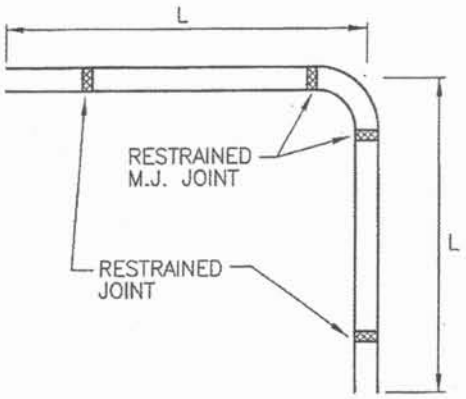
PIPE JOINT RESTRAINT

DETAIL APPROVED BY: Steven C. Hogan 5-8-07 DATE

NO SCALE

DETAIL NO. W14

FOR HORIZONTAL BENDS:



MINIMUM REQUIRED PIPE LENGTHS FOR RESTRAINED JOINTS

BEND IN DEGREES	PIPE DIAMETER 6"	8"	10"	12"
90	25'	33'	39'	45'
45	10'	13'	16'	19'
22 1/2	5'	6'	8'	9'
11 1/2	3'	3'	4'	4'

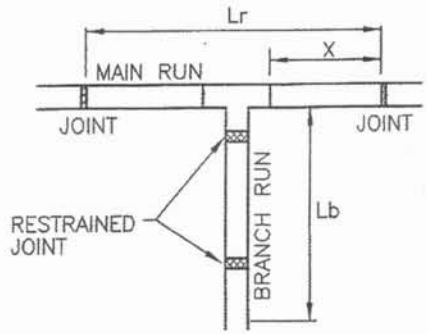
NOTE: CHART USES WORKING PRESSURE OF 200 PSI

FOR PRESSURES OTHER THAN 200 PSI USE:

$$\frac{(L) \times (\text{PRESSURE})}{200}$$

NOTE: FIELD-LOCK GASKETS ARE APPROVED FOR RESTRAINED JOINT INSTALLATION.

TEES:



MINIMUM REQUIRED PIPE LENGTHS FOR RESTRAINED JOINTS

FOR 6" TEES USE FORMULA
Lb=50 − 1.63 (Lr)

WHERE:
Lb= THE MINIMUM REQUIRED RESTRAINED PIPE (IN FEET) ON THE BRANCH LINE
Lr= THE TOTAL LENGTH (IN FEET) BETWEEN THE FIRST JOINTS ON EITHER SIDE OF THE TEE ON THE MAIN RUN.

NOTE: CONDITIONS TO BE FIELD VERIFIED BY ENGINEER.

IF (X) IS LESS THAN 5 FEET THEN PIPE MUST BE RESTRAINED TWO FULL LENGTHS.

FOR 8" TEE USE FORMULA
Lb=64 − 1.65(Lr)

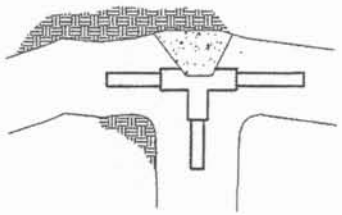
FOR 12" TEE USE FORMULA
Lb=90 −1.67(Lr)

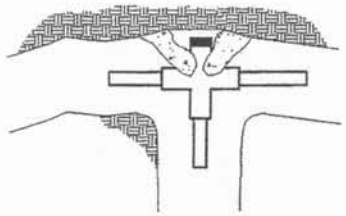
WTR-JOINT.DWG

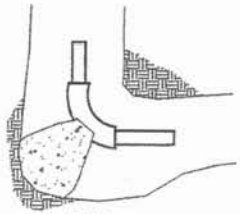
REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL	RES1071
2	5/1/07	SD	JC

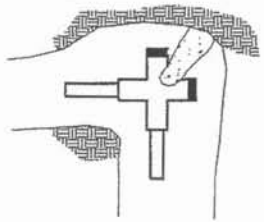
FITTING SIZE	TEE, WYE, PLUG OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED ON RUN		45° BEND	22 1/2° BEND	11 1/2° BEND
			A1	A2			
4	1.0	1.4	1.9	1.4	1.0	--	--
6	2.1	3.0	4.3	3.0	1.6	1.0	--
8	3.8	5.3	7.6	5.4	2.9	1.5	1.0
10	5.9	8.4	11.8	8.4	4.6	2.4	1.2
12	8.5	12.0	17.0	12.0	6.6	3.4	1.7
14	11.5	16.3	23.0	16.3	8.9	4.6	2.3
16	15.0	21.3	30.0	21.3	11.6	6.0	3.0
18	19.0	27.0	38.0	27.0	14.6	7.6	3.8
20	23.5	33.3	47.0	33.3	18.1	9.4	4.7
24	34.0	48.0	68.0	48.0	26.2	13.6	6.8

NOTES:
1. CONCRETE THRUST BLOCKING TO BE POURED AGAINST UNDISTURBED EARTH
2. KEEP CONCRETE CLEAR OF JOINTS AND ACCESSORIES.
3. THE REQUIRED THRUST BEARING AREAS FOR SPECIAL CONNECTIONS ARE SHOWN ENCIRCLED ON THE PLANS. e.g. (15) INDICATES 15 SQUARE FEET BEARING AREA REQUIRED.
4. IF NOT SHOWN ON PLANS REQUIRED BEARING AREAS AT FITTINGS SHALL BE AS INDICATED BELOW, ADJUSTED IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWED SOIL BEARING STRESS(ES) STATED IN THE SPECIAL SPECIFICATIONS.
5. BEARING AREAS AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS. TAKE PRECEDENCE OVER BEARING AREAS AND BLOCKING DETAILS SHOWN ON THIS STANDARD DETAILS.
6. ALL FITTINGS SHALL BE WRAPPED IN 6 MIL PLASTIC PRIOR TO THRUST BLOCK PLACEMENT. MAKING SURE THE BOLTS AND NUTS ARE PROTECTED.
7. THRUST BLOCKS SHALL BE GIVEN 72 HOURS TO SET UP PRIOR TO PRESSURIZING LINE OR AS DIRECTED BY CITY INSPECTOR.


TEE


PLUGGED CROSS


BEND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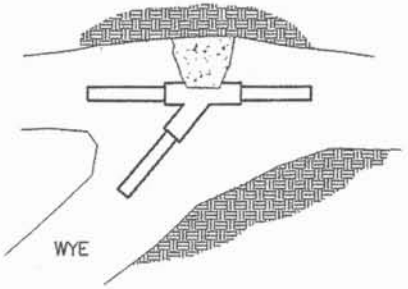
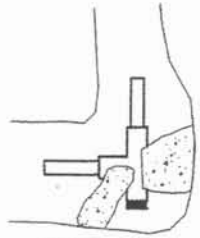
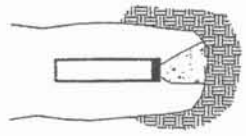

WYE


PLUGGED TEE


PLUG OR CAP

NOTES:
ABOVE BEARING AREAS BASED ON TEST PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING STRESS OF 2,000 LBS. PER SQUARE FOOT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSESM USE THE FOLLOWING EQUATION:
BEARING AREA= (TEST PRESSURE/150)x(2000/SOIL BEARING STRESS)x(TABLE VALUE)

EACH AREA IS 1/2 OF REQUIRED TOTAL AREA

CITY OF CAMAS ~ WATER DETAIL

THRUST BLOCK DETAIL

DETAIL APPROVED BY _____ DATE 5-8-07

NO SCALE

DETAIL NO. W15

WTR-THRUST.DWG

REV. NO.	DATE	BY	APPR.
1	7/17/06	COUNCIL RES1071	JC
2	5/1/07	SD	JC
3	9/18/07	SD	JC

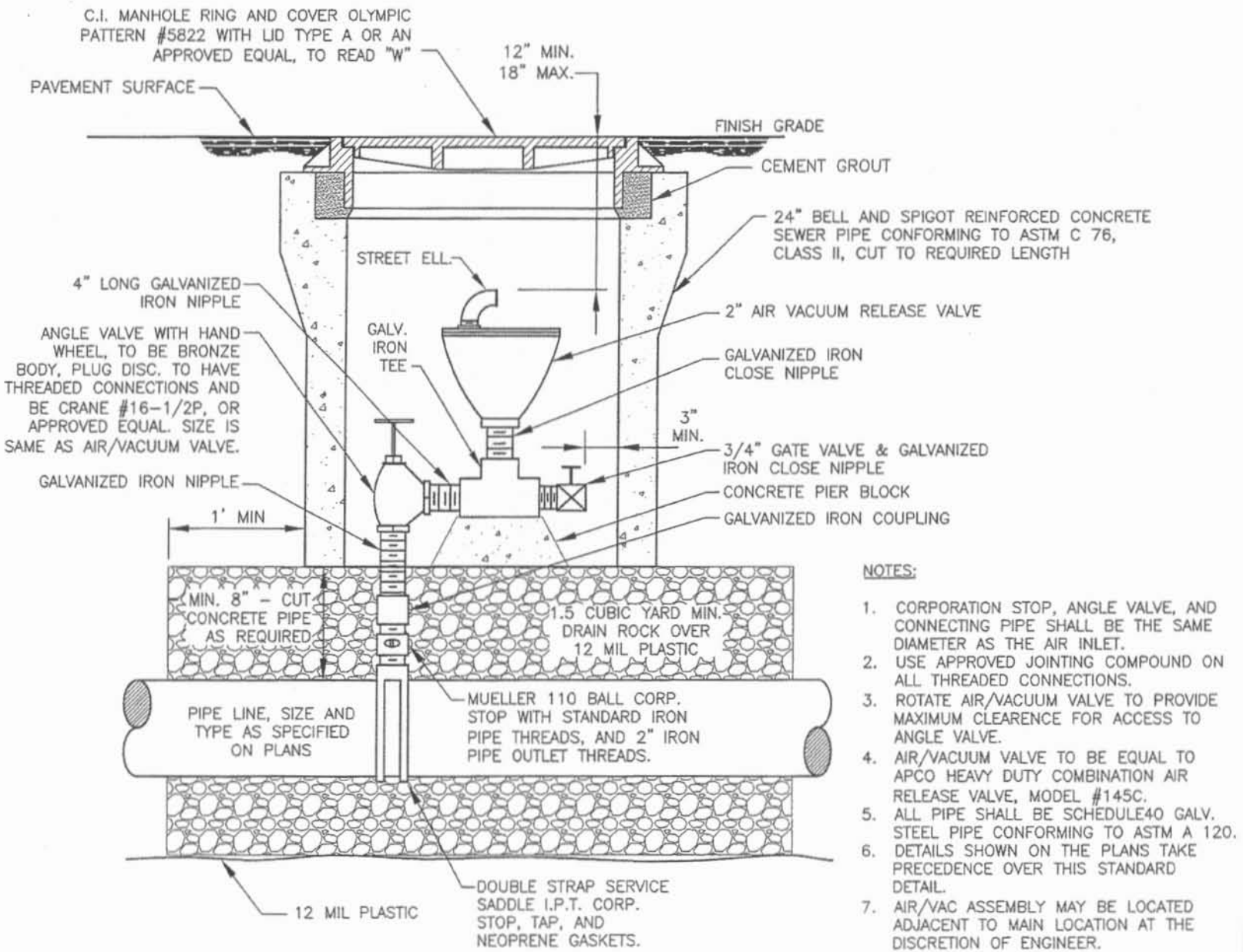
CITY OF CAMAS ~ WATER DETAIL

2" AIR/VACUUM RELEASE VALVE

DETAIL APPROVED BY: Steven C. Carlstrom DATE: 9-21-07

NO SCALE

DETAIL NO. W16

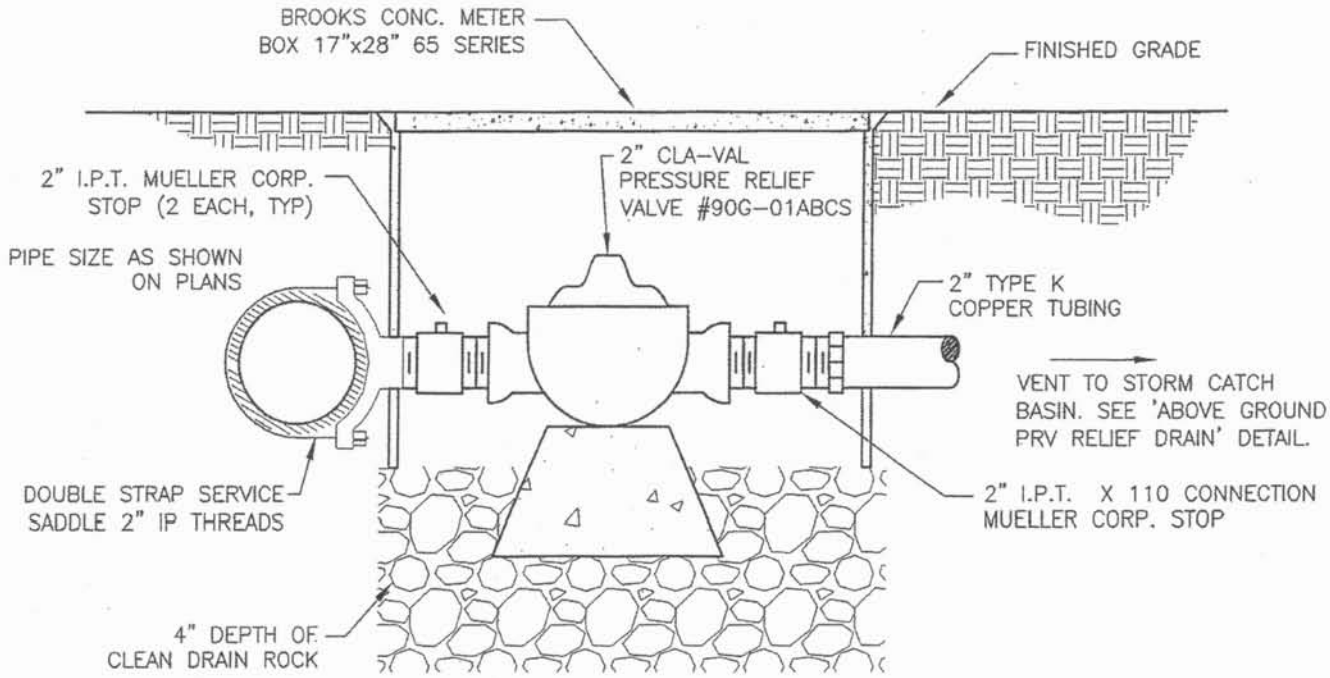


NOTES:

1. CORPORATION STOP, ANGLE VALVE, AND CONNECTING PIPE SHALL BE THE SAME DIAMETER AS THE AIR INLET.
2. USE APPROVED JOINTING COMPOUND ON ALL THREADED CONNECTIONS.
3. ROTATE AIR/VACUUM VALVE TO PROVIDE MAXIMUM CLEARENCE FOR ACCESS TO ANGLE VALVE.
4. AIR/VACUUM VALVE TO BE EQUAL TO APCO HEAVY DUTY COMBINATION AIR RELEASE VALVE, MODEL #145C.
5. ALL PIPE SHALL BE SCHEDULE40 GALV. STEEL PIPE CONFORMING TO ASTM A 120.
6. DETAILS SHOWN ON THE PLANS TAKE PRECEDENCE OVER THIS STANDARD DETAIL.
7. AIR/VAC ASSEMBLY MAY BE LOCATED ADJACENT TO MAIN LOCATION AT THE DISCRETION OF ENGINEER.

WTR-2VACVLV.DWG

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC



CITY OF CAMAS ~ WATER DETAIL

2" PRESSURE RELIEF VALVE ASSEMBLY

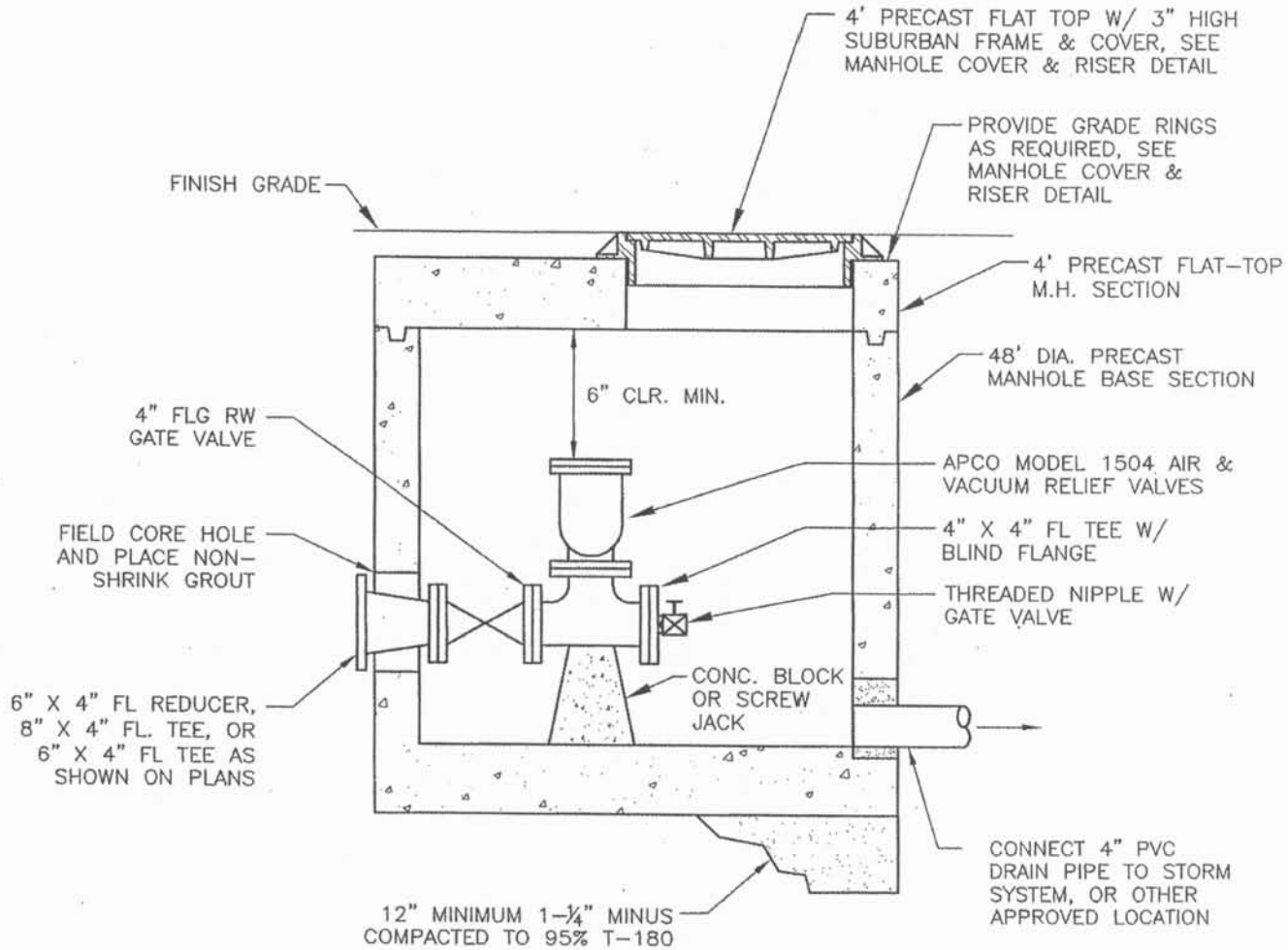
DETAIL APPROVED BY

5-8-07
DATE

NO SCALE

DETAIL NO. W17

2PRV.DWG



NOTES:

1. MANHOLE SHALL CONFORM TO ASTM C-478.
2. MASTIC SEAL REQUIRED ON ALL KEYLOCK JOINTS.
3. VAULT SHALL BE SET FOR 1% SLOPE TO DRAIN.
4. ALL BACKFILL SHALL BE APPROVED GRANULAR MATERIAL.
5. SUMP PUMP MAY BE REQUIRED ON INSTALLATIONS WHERE DRAIN PIPE CANNOT BE CONNECTED TO ADEQUATE STORM DRAIN SYSTEM. THE APPROVED SUMP PUMP SHALL BE A COMMERCIAL GRADE WATER POWERED VENTURI DESIGN WITH BACKFLOW PREVENTION, SIZED TO PROVIDE 10GPM AT 10 FEET OF HEAD AT THE AVAILABLE SYSTEM WATER PRESSURE. BACKFLOW DEVICE SHALL BE CERTIFIED BY WASHINGTON STATE CERTIFIED BACKFLOW TESTER AFTER INSTALLATION AND PRIOR TO ACCEPTANCE. TEST RESULTS SHALL BE SENT TO CITY OF CAMAS WATER DEPARTMENT.

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

4" VACUUM RELIEF VALVE

Jason E. Carothers 5-8-07

DETAIL APPROVED BY DATE

NO SCALE

DETAIL NO. W18

WT4-4ARV.DWG

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

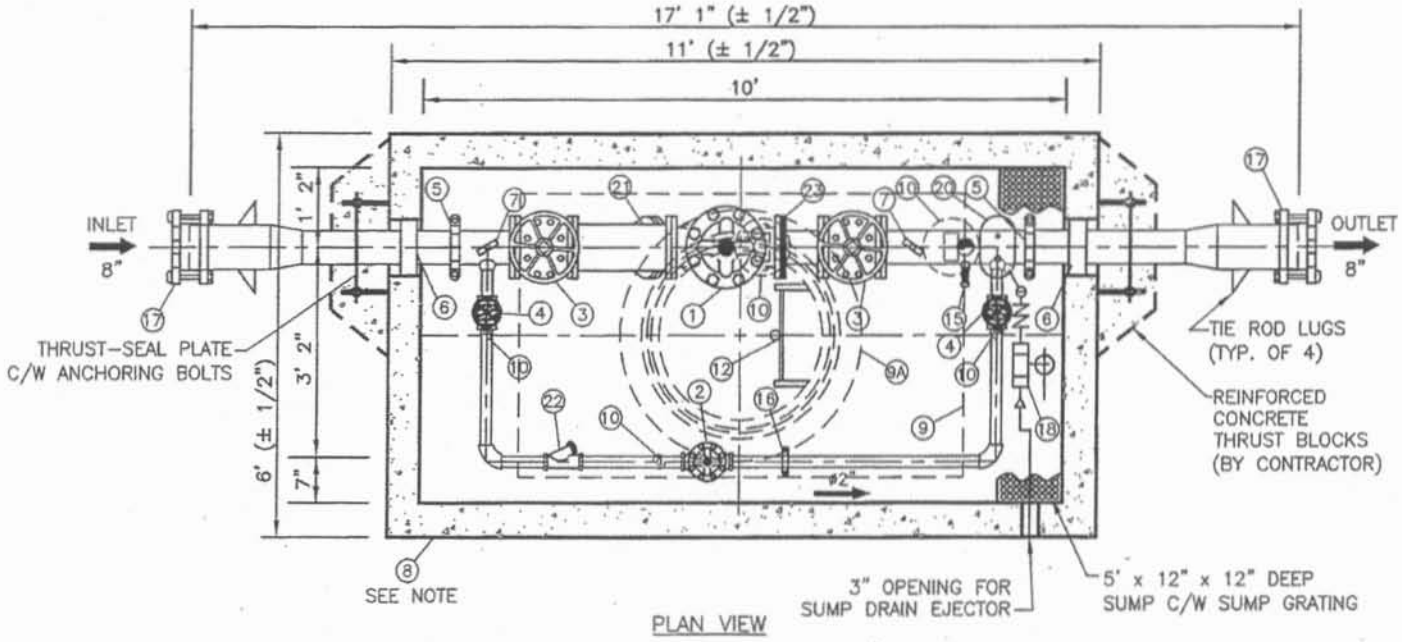
6"X2" PRV STATION W/ 3" RELIEF

DETAIL APPROVED BY

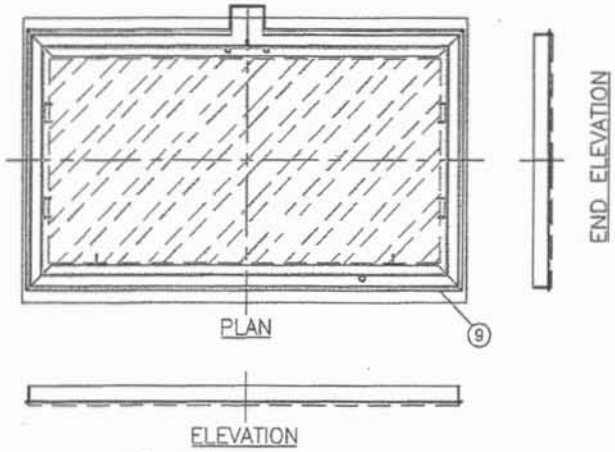
DATE 5-8-07

NO SCALE

DETAIL NO. W19a



PLAN VIEW



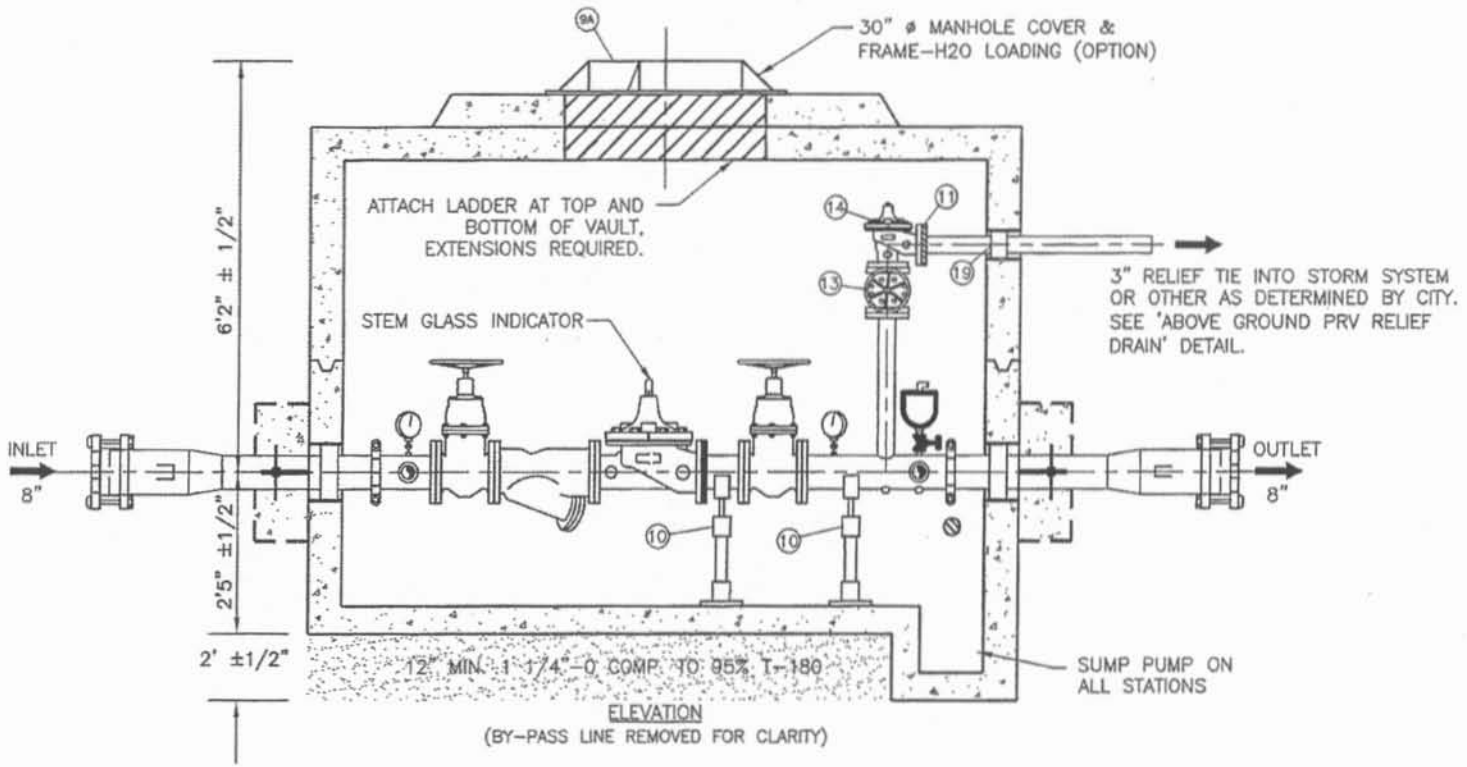
36" x 72" ALUMINUM HATCH
(30"ø MANHOLE SHALL BE USED
AS APPROVED BY CITY OF CAMAS)

NOTES:
VAULT #10565 (H20 LOADING) INSIDE DIMENSIONS 10'LX5'WX6'6"H

STANDARD FABRICATION & FINISHING SPECIFICATION:
ALL 2" AND SMALLER PIPE TO BE THREADED BRASS. ALL 3" AND LARGER PIPE, INSIDE WETTED SURFACES TO BE SANDBLASTED, EPOXY LINED AND COATED TO AWWA C-210 AND NSF-61 SPECIFICATION. FINISH COATING WILL BE BLUE ENAMEL.

FABRICATED STEEL PIPE & FITTINGS TO BE SCHEDULE NO. 40 STEEL PIPE FOR SIZES TO 10" AND ⅜" WALL FOR 12" AND LARGER.

WTR-PRV3RELIEF.DWG



MATERIALS

ITEM	QTY.	DESCRIPTION
1	1	6" CLA–VAL 90–01YBCS PRESSURE REDUCING VALVE
		C/W X 101 POSITION INDICATOR, DIBT–#150 FLG (15–75PSI)
2	1	2" CLA–VAL 90–01YBCS PRESSURE REDUCING VALVE
		C/W X 101 POSITION INDICATOR, DIBT–THREADED (15–75 PSI)
3	2	6" MUELLER A2360–6W41 NRS GATE VALVE C/W HANDWHEEL –#125 FLGD
4	2	2" MUELLER A2360–8 RW NRS GATE VALVE C/W HANDWHEEL–THREADED
5	2	6" VICTAULIC #07 COUPLING
6	2	6" PIPE SEAL ASSEMBLY
7	2	4" WIKA (0–200PSI) PRESSURE GAUGE C/W GAUGE COCK
8	1	#10565 PRECAST CONCRETE VAULT C/W WHITE INTERIOR, BLACK EXTERIOR
9	1	36"x72" ALUMINUM HATCH W/ SPRING ASSIST
10	5	ADJUSTABLE PIPE SUPPORTS
11	1	3" VICTAULIC #741 FLANGE ADAPTER ADAPTOR

ITEM	QTY.	DESCRIPTION
12	1	ALUMINUM LADDER WITH LADDER–UP ASSEMBLY
13	1	3" MUELLER A2360–6W41 NRS GATE VALVE C/W
		HANDWHEEL–#125 FLGD.
14	1	3" CLA–VAL 50A–01B PRESSURE RELIEF VALVE
		C/W DIBT–150# FLG (20–200 PSI)
15	1	3/4" HOSE BIB ASSEMBLY
16	1	2" VICTAULIC #07 COUPLING
17	1	8" SMITH BLAIR ST X DI TRANSITION COUPLING
18	1	SUMP DRAIN INJECTOR
19	1	3" PIPE SEAL ASSEMBLY
20	1	1" APCO 143C.1 COMB. A.R.V. C/W ISOLATION VALVE
21	1	6" MUELLER 758 Y–STRAINER – #125 FLGD
22	1	2" MUELLER 35' Y–STRAINER – THD
23	1	6" VICTAULIC #741 FLANGE ADAPTOR

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS – WATER DETAIL

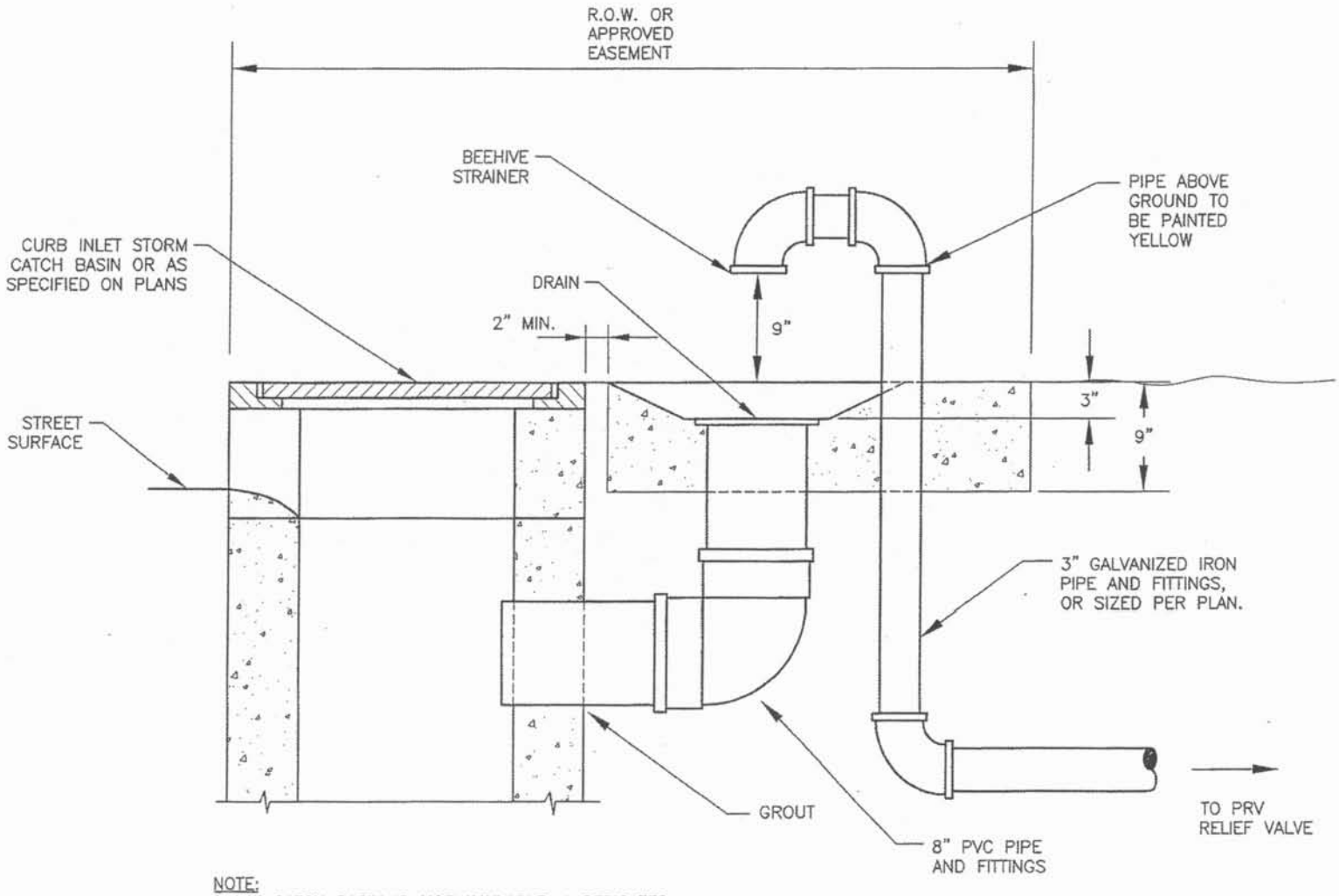
6"X2" PRV STATION W/ 3" RELIEF

DETAIL APPROVED BY: Jeff Carothers 5-8-07 DATE

NO SCALE

DETAIL NO. W19b

WTR–PRV3RELIEF.DWG



NOTE:
1. IF CATCH BASIN IS NOT AVAILABLE, A DEDICATED STORM LATERAL MAY BE REQUIRED.

REV. NO.	DATE	BY	APPR.
1	5/1/06	SD	JC

CITY OF CAMAS ~ WATER DETAIL

ABOVE GROUND PRV RELIEF DRAIN

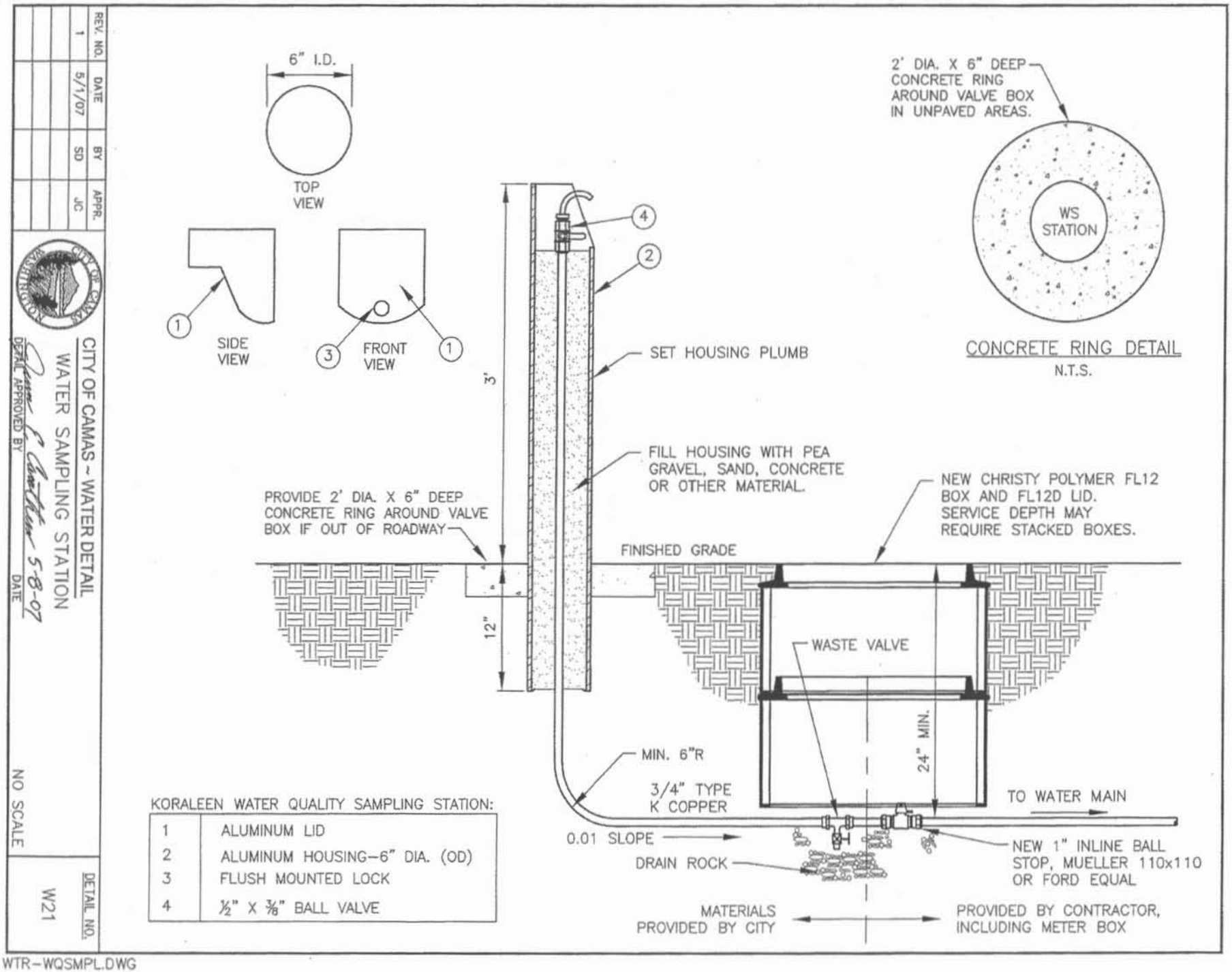
DETAIL APPROVED BY

5-8-07
DATE

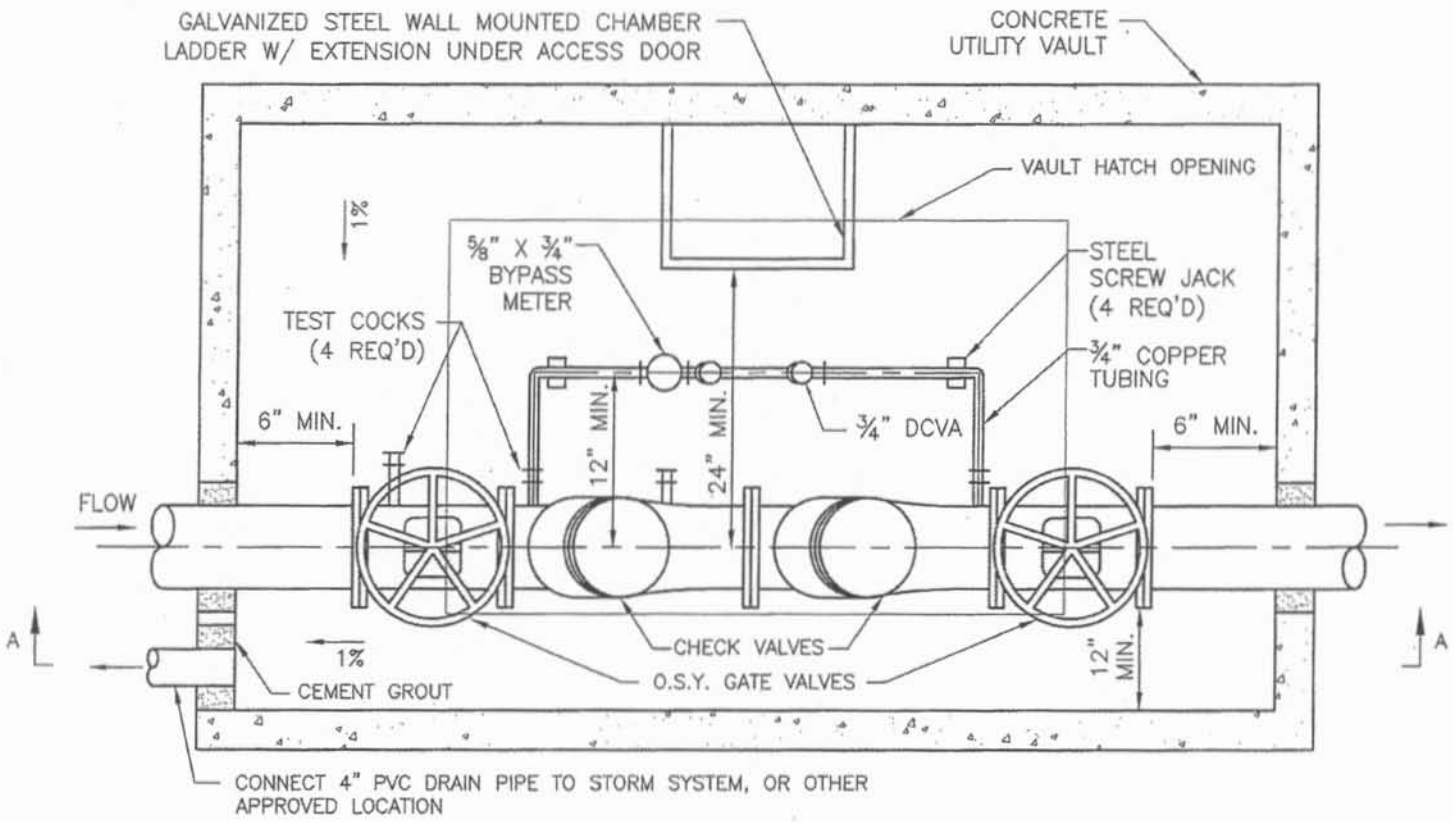
NO SCALE

DETAIL NO.
W20

WTR-RELIEFDRN.DWG



WTR–WQSMPL.DWG



PLAN VIEW

DOUBLE CHECK DETECTOR VALVE ASSY. NOTES:

1. APPROVED DOUBLE CHECK DETECTOR VALVE ASSEMBLY TO LAY HORIZONTAL WITH THE GROUND, SHALL BE INSTALLED ON FIRE PROTECTION SYSTEMS WHEN CONNECTED TO POTABLE WATER SUPPLY. THE ASSEMBLY SHALL BE A COMPLETE ASSEMBLY INCUDING UL LISTED RESILIENT SEATED OSY SHUTOFF VALVES AND TEST COCKS. THE UNIT SHALL BE UL/FM APPROVED WITH UL/FM APPROVED OSY SHUTOFF VALVES. THE AUXILIARY LINE SHALL CONSIST OF AN APPROVED BACKFLOW PREVENTER AND WATER METER. THE ASSEMBLY SHALL MEET THE BASIC REQUIREMENTS OF ASSE 1048; AWWA STD. C510 FOR DOUBLE CHECK VALVES, AND BE APPROVED BY THE FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH AT THE UNIVERSITY OF SOUTHERN CALIFORNIA.
2. SYSTEM SHALL BE DESIGNED FOR BACK SIPHONAGE AND BACK PRESSURE.
5. THE WATER LINE SHALL BE DISINFECTED, FLUSHED, AND PRESSURE TESTED PRIOR TO INSTALLING THE BACKFLOW ASSEMBLY. THE BACKFLOW ASSEMBLY SHALL BE PROTECTED FROM FREEZING AND FLOODING.
4. ALL PIPE, VALVE, AND FITTING JOINTS FROM THE SUPPLY MAIN SHALL BE FLANGED AND RESTRAINED. MINIMUM COVER 30". GROUT PIPE ENTRANCE AND EXIT IN VAULT WITH WATER TIGHT GROUT.
5. THE BACKFLOW ASSEMBLY SHALL BE TESTED AFTER INSTALLATION AND PRIOR TO ACCEPTANCE AND ALSO YEARLY THEREAFTER BY A WASHINGTON STATE CERTIFIED BACKFLOW TESTER. TEST RESULTS SHALL BE SENT TO THE CITY OF CAMAS WATER DEPARTMENT.
6. ALL BACKFILL SHALL BE APPROVED GRANULAR MATERIAL.

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

STANDARD DOUBLE CHECK DETECTOR VALVE ASSY.

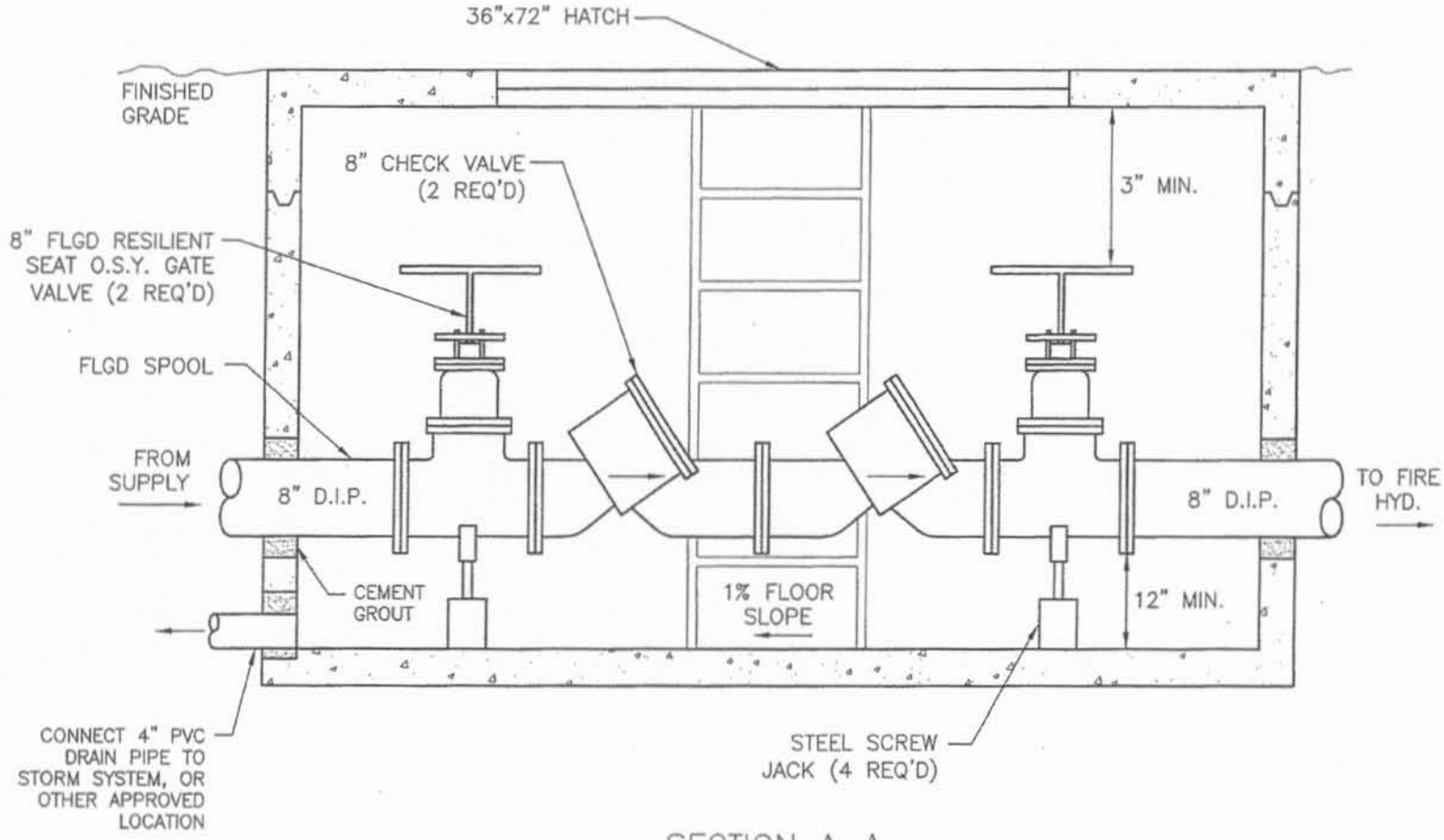
DETAIL APPROVED BY: [signature] DATE: 5-3-07

NO SCALE

DETAIL NO. W22a

WTR-DCDVA.DWG

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC



SECTION A–A

VAULT CONSTRUCTION NOTES:

1. VAULT SHALL BE PRE-APPROVED PRIOR TO INSTALLATION.
2. VAULT SHALL BE INSTALLED AT PROPERTY LINE OR EASEMENT LINE AND ON OWNERS PROPERTY.
3. VAULTS SHALL HAVE A MINIMUM OF 3' CLEARANCE FROM ALL STRUCTURES.
4. APPROVED VAULT SHALL BE RATED FOR H20 LOADING AND INCLUDE AN EXTENSION LADDER, MINIMUM INSIDE DIMENSIONS 8'Lx5'Wx6'H.
5. VAULT SHALL BE SET FOR 1% SLOPE TO DRAIN.
6. ALL BACKFILL SHALL BE APPROVED GRANULAR MATERIAL.
7. HATCH SHALL BE AN H20 RATED, 36"x72" SPRING ASSISTED, HOT DIPPED GALVANIZED DIAMOND PLATE DOUBLE DOOR. FOR TRAFFIC INSTALLATIONS A 30" MANHOLE LID SHALL BE USED INSTEAD OF A HATCH.
8. SUMP PUMP MAY BE REQUIRED ON INSTALLATIONS WHERE DRAIN PIPE CANNOT BE CONNECTED TO ADEQUATE STORM DRAIN SYSTEM. THE APPROVED SUMP PUMP SHALL BE A COMMERCIAL GRADE WATER POWERED VENTURI DESIGN WITH BACKFLOW PREVENTION, SIZED TO PROVIDE 10GPM AT 10 FEET OF HEAD AT THE AVAILABLE SYSTEM WATER PRESSURE. BACKFLOW DEVICE SHALL BE CERTIFIED BY WASHINGTON STATE CERTIFIED BACKFLOW TESTER AFTER INSTALLATION AND PRIOR TO ACCEPTANCE. TEST RESULTS SHALL BE SENT TO CITY OF CAMAS WATER DEPARTMENT.

CITY OF CAMAS - WATER DETAIL

STANDARD DOUBLE CHECK DETECTOR VALVE ASSY.

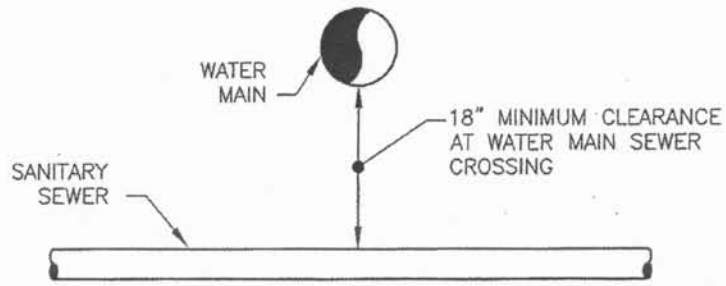
DETAIL APPROVED BY: [signature] DATE: 5-3-07

NO SCALE

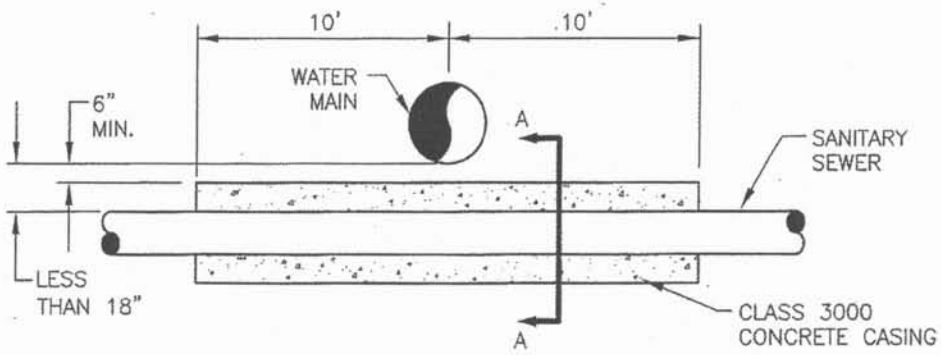
DETAIL NO. W22b

WTR-DCDVA.DWG

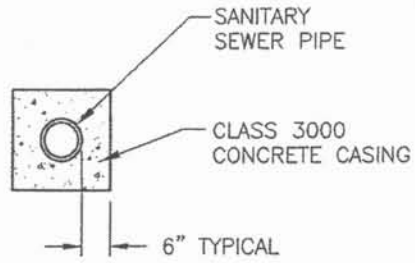
NOTE:
1. IF VERTICAL CLEARANCE IS LESS THAN 18", THE SEWER PIPE SHALL BE ENCASED. MINIMUM CLEARANCE WITH CASING SHALL BE 6".
2. CASING SHALL BE A 20' LENGTH OF CLASS 200 P.V.C. WITH BOTH ENDS PLUGGED, OR 6" CLASS 3000 CEMENT CONCRETE AS SHOWN BELOW.
3. MINIMUM VERTICAL CLEARANCE FOR WATER–ENCASEMENT, WATER–STORM OR SANITARY–STORM CROSSINGS SHALL BE 6".



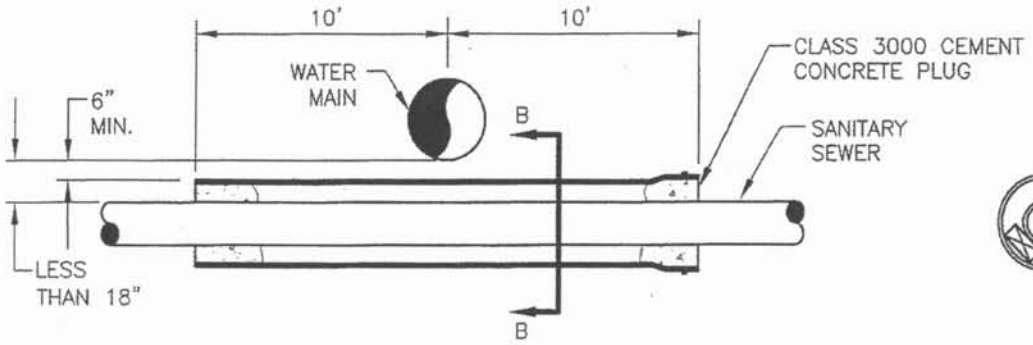
CROSSING WITHOUT ENCASEMENT



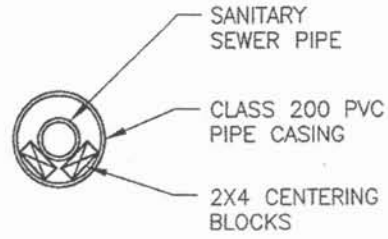
CEMENT CONCRETE ENCASEMENT



SECTION A–A



PVC PIPE ENCASEMENT



SECTION B–B

REV. NO.	DATE	BY	APPR.
1	5/1/07	SD	JC

CITY OF CAMAS ~ WATER DETAIL

UTILITY CROSSING DETAIL

DETAIL APPROVED BY: James L. Carothers 5-8-07 DATE

NO SCALE

DETAIL NO. W23

CROSSING.DWG

Appendix F

City of Camas 2008 Water Quality Report

City of Camas Public Water System ID 108002

2008 Water Quality Report

City of Camas Consumer Confidence Report

HOW TO CONTACT US:

Water Department

817-1567

Operations Center

817-1563

Billing (Finance) Dept.

834-2462

Finance Dept. Location:

616 NE Fourth Avenue

Camas, WA 98607

Emergency After Hours/ Holidays: 737-0592

City of Camas Website:

www.ci.camas.wa.us

City Council Meetings:

Two Workshops/Council meetings every 1st and 3rd Monday.

Workshops start at 4:30 p.m., followed by a Council meeting at 7:00 p.m.

Note: If Monday is a holiday, the workshop and council meeting are on the following business day.

The City of Camas Water Department is Ensuring the Quality of Your Water is Safe

Attention Non-English Speaking Customers

This report contains important information about your drinking water. Translate it or speak with someone who can translate it for you.

Russian
Это сообщение содержит важную информацию о вашей питьевой воде. Переведите это или говорите с кем - то, кто может перевести это для Вас.

Spanish
Este informe contiene informa-ción importante acerca de su agua potable. Haga que alguien lo traduzca para usted, o hable con alguien que lo entienda.

2008 Water Quality Report

We are pleased to report that our drinking water is safe, and meets Federal and State requirements.

At the City of Camas we understand how important it is to ensure the quality of the water we provide. The health of our consumers and their families is paramount. Our goal is to provide you with a safe and dependable supply of drinking water. We work diligently to provide top quality water to more than 16,700 consumers (this equates to 6,801 utility customers which include residential, industrial and commercial users) each day. We are therefore pleased to report that our drinking water is safe, and surpasses all State and Federal health standards.

We ask that all of our customers help us protect our water sources, which are the heart of our community, our way of life, and our children's future. This report provides a summary of the tests and processes performed to ensure the safety of your drinking water. For more information or questions about this report, please contact Mike Stevens at 817-1563, extension 4283. This report can also be found on our website at www.ci.camas.wa.us.

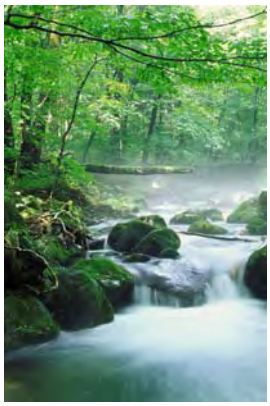
Conserve and Protect Our Water Resources

2009 Rate Increase

Financial Consulting Solutions Group conducted a water, sewer, sanitation, and stormwater rate study that was presented to the City Council on February 2, 2009. Subsequently, an increase in the water rates was approved and became effective in April, 2009. For a typical customer using approximately 800 cubic feet of water per month, the water portion of their bill will increase 82 cents per month. In the coming months, City staff will be briefing the City Council about necessary system improvements and future rate implications. The rate study presentation can be viewed at the City of Camas website at www.ci.camas.wa.us.

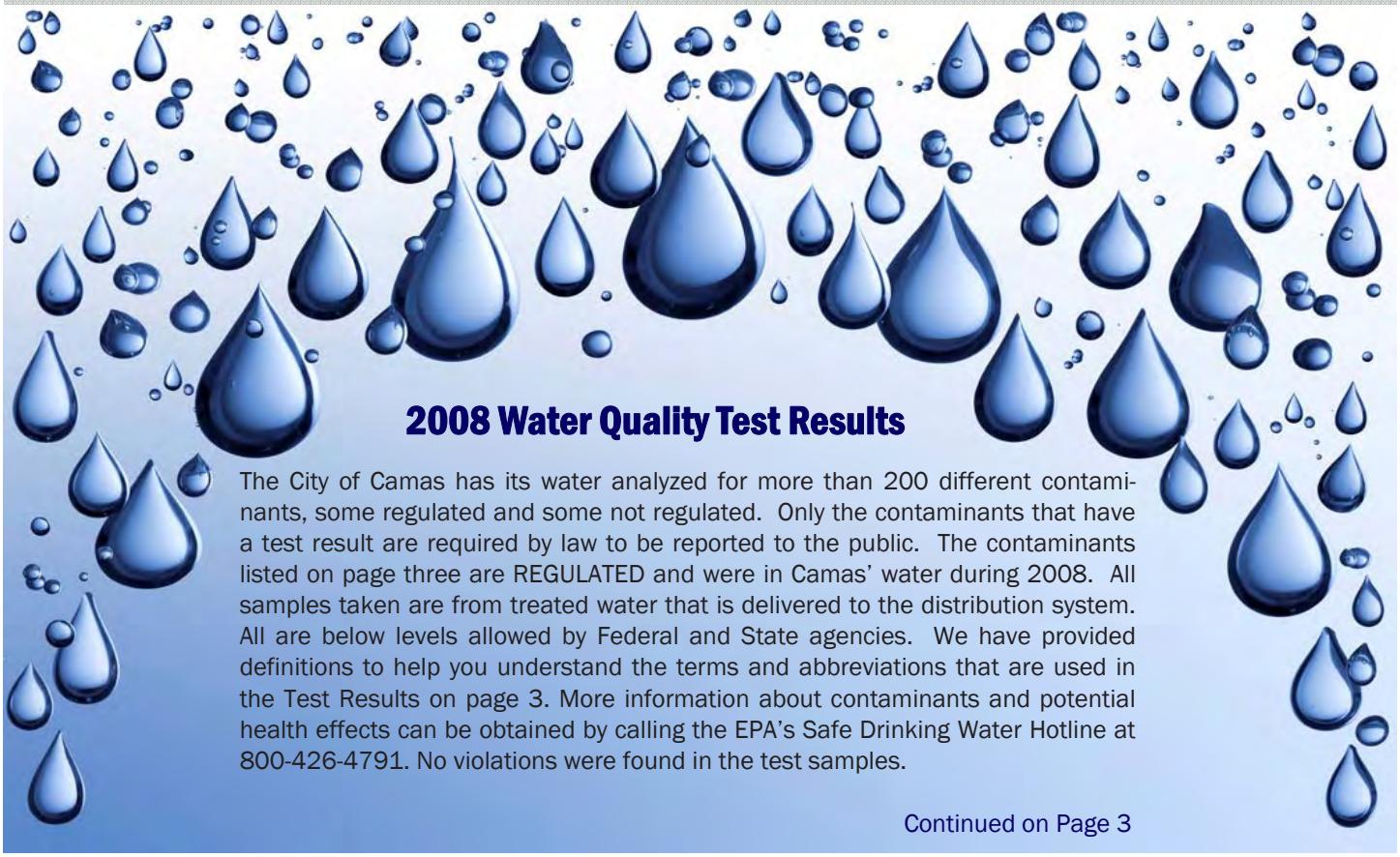
What's Ahead

Water is a precious resource. Let's use it wisely!



Our water system continues to change and expand to keep pace with the demand for reliable clean water for industrial, commercial, and residential use. In 2008 the Department of Ecology granted Camas new water rights that will meet the projected demand for the next 20 years. As part of the water right's grant, the City will forgo use of our surface source from May 15th through October 31st of 2009. To replace the surface source during the summer months, the City will start construction on Well 14 in 2009.

This year the City will complete an update of the Water Facility Plan that is required every six years. The plan analyzes our water system operations, capacity, infrastructure, regulatory compliance, and outlines improvements needed for deficiencies that are found.



2008 Water Quality Test Results

The City of Camas has its water analyzed for more than 200 different contaminants, some regulated and some not regulated. Only the contaminants that have a test result are required by law to be reported to the public. The contaminants listed on page three are REGULATED and were in Camas' water during 2008. All samples taken are from treated water that is delivered to the distribution system. All are below levels allowed by Federal and State agencies. We have provided definitions to help you understand the terms and abbreviations that are used in the Test Results on page 3. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline at 800-426-4791. No violations were found in the test samples.

Continued on Page 3

Important Health Information

Please report possible water pollution (illicit discharge) to the City of Camas at 360-817-1561, or the Department of Ecology Southwest Regional Office at 360-407-6300

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radio-active material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- Pesticides and herbicides, which may come from a variety of sources such as agriculture and residential uses.
- Radioactive contaminants, which are naturally occurring.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline at 800-426-4791.

2008 Water Quality Test Results

Terms and Abbreviations:

Color Units - Color may be indicative of dissolved organic material, inadequate treatment, high disinfectant demand and the potential for the production of excess amounts of disinfectant by-products. Inorganic contaminants such as metals are also common causes of color. In general, the point of consumer complaint is variable over a range from 5 to 30 color units, though most people find color objectionable over 15 color units.

Maximum Contaminant Level – The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal – The "Goal" (MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Milligrams Per Liter (MG/L) - a unit used in reporting the concentration of matter in water as determined by water analyses.

Nephelometric Turbidity Unit (NTU) - Nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Ug/L – Units of measurement in micrograms/liter. A unit of concentration for dissolved substances based on their weights.

uMhos/cm (Micromos Per Centimeter) – Used to measure conductivity. Conductivity is the numerical expression of the ability of water to carry an electrical current. It is determined by the number of ionic particles present.

Contaminant (Unit Measurement)	Violation	Range of Level Detected	Ideal Goal (MCLG)	Maximum Allowed (MCL)	Description & Origin of Substance
Health Related (Primary) Standards: Inorganic					
Fluoride (MG/L)	No	1.06	2.0	4.0	sodium fluoride added to Camas water to maintain good dental hygiene
Chloride (MG/L)	No	3.90	250	250	chlorides in groundwater can be naturally occurring in deep aquifers or caused by pollution from brine, or industrial or domestic wastes
Copper (MG/L)	No	.034	0.0	1.3	corrosion of household plumbing systems; erosion of natural products
Iron (MG/L)	No	.25	.30	.30	erosion of natural deposits
Nitrate (MG/L) (As Nitrogen)	No	1.46	5.0	10.0	runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural products
Nitrite (MG/L) (As Nitrogen)	No	.10	1.0	1.0	runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural products
Sodium (MG/L)	No	18.6*	N/A	N/A	erosion of natural deposits and ph adjustment
Aesthetic (Secondary) Standards and Other Characteristics (Physical)					
Turbidity (NTU)	No	.29 to 2.45**	1.0	1.0	naturally occurring; soil runoff
Color (color units)	No	<5	15	15	naturally occurring
Conductivity (uMhos/cm)	No	241	700	700	naturally occurring
Sulfate (MG/L)	No	10.97	250	250	naturally occurring
Disinfection By-Products and Residuals within the Distribution System					
Haloacetic acids	No	.90-12.3	48	60	by-product of drinking water disinfection
Total *** Trihalomethanes (Ug/L)	No	1.1-11.8	60	80	chlorination by-product caused by the reaction of chlorine with organic matter

Table Notes

*A recommended level of concern for those on diets with daily sodium intake restrictions. This "Level Detected" was the highest level detected in one of many samples taken throughout the water system in 2008.

** Number 9 Well exceeded MCL in May, 2008.

*** The sum of the concentration in milligrams per liter of the trihalomethane compounds (trichloromethane (chloroform), dibromo-chloromethane, bromodichloromethane and tribromomethane (bromoform)), rounded in two significant figures.

Water Quality Monitoring

The City of Camas routinely monitors for constituents in your drinking water according to Federal and State laws. Field and laboratory analyses include tests for bacteria, as well as chemical and physical indicators. Reports are submitted monthly to the Department of Health to report that your water meets all drinking water standards. Should there ever be a public health concern, you would be notified immediately.

Water Conservation & Protection

The average daily consumption of water for Camas in 2008 was 3.71 millions of gallons per day (mgd). During our peak day on June 28th, the temperature in Camas was 97° F, and we consumed 7.8 mgd. Most of this increase in the summer months is due to irrigation demand.

We are once again asking for your help to reduce the amount of water wasted this year by implementing a voluntary odd/even lawn watering program for residential customers. Water on odd days if your house number ends in an odd number, and even days if it ends in an even number.

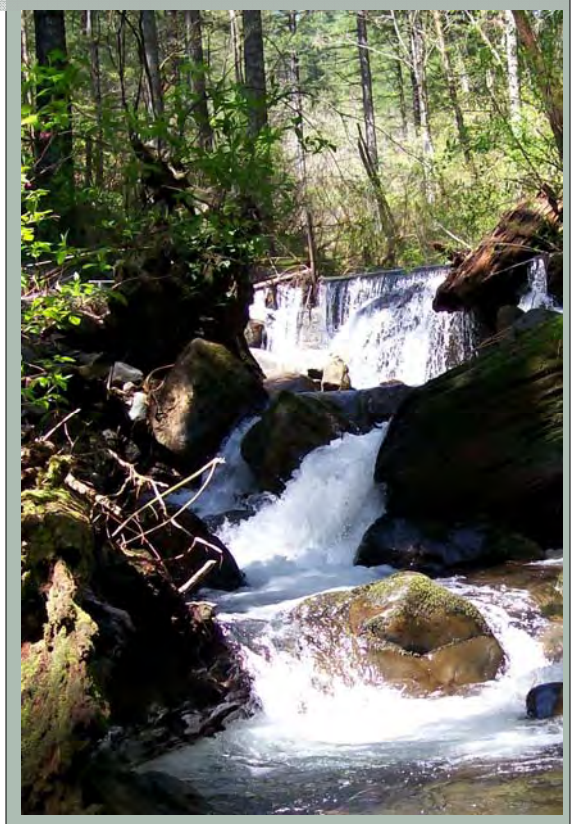
Tips for Conserving and Protecting Water Resources

- Fix leaks inside and outside, including old leaky faucets, toilets, hoses and sprinkler systems.
- Choose water saving fixtures and appliances, such as high-efficiency clothes washers and water-efficient dishwashers, which use 30% less water than traditional machines.
- Sweep porches, driveways, and sidewalks rather than hosing, to not only conserve water, but to avoid runoff.
- Water late at night or early in the morning (10p.m. to 6a.m.). **An inch of water per week is enough to keep lawns green.** Amend your soil, which allows the soil to more easily absorb water.

For more water saving ideas see our newsletters, news releases, printed material available at City Hall and the Operations Center, or visit our website at ci.camas.wa.us/services/forms/Utilities/WaterConservation.pdf, or the State website at ecy.wa.gov/programs/wr/ws/wtrcnsv.html.

Our Water System

The City of Camas has multiple water sources that include surface and ground water. The surface water sources, Boulder and Jones Creeks, are located on the south side of Larch Mountain, north-east of Camas. This surface water is disinfected, and then filtered at the Water Filtration Plant located near Lacamas Lake, before it enters the distribution system. The ground water sources include eight wells near the Washougal river, and one well in Grass Valley. All water sources are treated with chlorine for disinfection, fluoride for good dental health, and sodium hydroxide to reduce the corrosion of copper piping to meet State and EPA standards. Water pressure and fire flows are maintained throughout the service area with six distribution reservoirs, seven pumping stations, and over 137.5 miles of pipeline.



Surface Water Source Boulder Creek

Irrigation Systems

Washington State law requires every irrigation system to have a backflow device installed and inspected annually by a certified backflow tester to ensure it is working properly. Backflow devices are important because they prevent irrigation pipe contaminants from backing up into our community's drinking water supply. A list of certified backflow testers can be obtained from the City of Camas Building Department, or our City website above. For questions regarding backflow device testing, please leave a message on the City of Camas' Backflow Hotline at 817-1569. For more information go to www.ci.camas.wa.us/services/utilities/irrigation.

Newest Water Source

Our newest water source is Well 13. It was built to look like a residence to blend into the existing neighborhood. It produces 1,325 gallons per minute, and will be a great water asset during the hot summer days.

Water Leaks

Check out this helpful website www.epa.gov/watersense/fixaleak

The majority of leaks in residential plumbing systems are found at the toilet tank (fill and flapper valves). Locate your master water supply valve and label it.. The master supply-valve can be turned off easily in case of a major leak or broken pipe.

Other Common Leaks

- Lawn irrigation valves and lines
- Hose in yard turned on or leaking
- Ornamental fountains, fish ponds
- Relief valve or fittings on water heater
- Leaking pipes or fittings in the house
- Line between the meter and the house
- Dripping faucets in bathrooms or sinks
- Outside faucet open or dripping

Appendix G

City of Camas Intertie Agreement

Water service requirements: Process, cost, time frame and appeal process

In-City:

- Application for water service is made through the Building department and in accordance with CMC 13.52.050.
- Fees for service are in accordance with CMC 13.36.050-Connection Charges and CMC 13.52.060 – System Development Charges.
- Typical process time is two to six weeks after payment of fees.
- Appeals for water service related issues will be addressed by City Council in accordance with CMC 13.12.100

Retail Service area in UGA:

- Application for water service is made in accordance with CMC 13.52.050.
- Prior to staff approval, the request is processed through City council for approval.
- Fees for service are in accordance with CMC 13.36.050-Connection Charges and CMC 13.52.060 – System Development Charges.
- Typical process time is one to two months from time of application to Council approval. Service installation is two to six weeks after payment
- Appeals for water service related issues will be addressed by City Council in accordance with CMC 13.12.100. Applicants may also file suit in Superior Court

Service area boundary out of UGA:

- Application for water service is made in accordance with CMC 13.52.050.
- Prior to staff approval, the request is processed through City council for approval.
- Fees for service are in accordance with CMC 13.36.050-Connection Charges and CMC 13.52.060 – System Development Charges.
- Typical process time is one to two months
- Appeals for water service related issues will be addressed by City Council in accordance with CMC 13.12.100. Applicants may also file suit in Superior Court

Referenced CMC's

13.36.050 Connection charges.

A. Charges for connection to the city water system including setting the meter, installing a service line and tapping the water main shall be computed as follows:

1. Except as hereinafter provided, the connection charge shall be the cost of materials, the labor costs for city personnel billed at then existing rates for such personnel, and any fees or charges that were necessary to be paid to third parties in order to make such connection.

2. For installing a water meter for services one inch or smaller, the connection charge shall be: TABLE INSET:

5/8"	$325.00
3/4"	350.00
1"	395.00

or the actual cost to the city calculated as in accordance with subsection (A)(1) of this section, whichever is greater.

3. For installing a water meter, service line, and tapping the water main for a service one inch or smaller, the connection charge shall be one thousand five hundred dollars or the actual cost to the city calculated in accordance with subsection (A)(1) of this section, whichever is greater.

B. There shall be no charge for connecting a sprinkler system to a water main for fire protection other than the installation cost of the same, providing that such system shall include a detector to record water usage.

13.48.010 Water main extensions.

A. Extensions to water mains will be made only upon proper petitions to the city. The city shall have the right to reject such petitions or enter into contract with the petitioners under such conditions as the city may elect.

B. All water main extensions installed, whether within or without the corporate limits of the city, shall be six inches in diameter or larger.

C. All extensions of mains required to serve new customers shall be constructed at the expense of such customers.

D. If in the judgment of the water department of the city, it is in the best interest of the city and of the general area where a new main is contemplated to install a larger main than that required by the immediate development, the city may install such larger main and shall pay the increased difference in cost between installation of the smaller and of the larger main.

E. Every service pipe shall be provided with a stopcock and service box at suitable location, either on or off the premises to be served, which shall be accessible to employees of the city water department only. Where curbs and walks are in place, or where space has been provided for future curbs and walks, the stopcock and service box shall be located in said space or between said walk and curb. There shall be a short piece of pipe and a union placed in the stopcock or meter, as the case may be, so the service can be extended to the premises or place of consumption.

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
http://www.ci.camas.wa.us

November 4, 2004

DEPARTMENT OF PUBLIC WORKS

Elaine Spray
City of Vancouver
PO Box 1995
Vancouver, WA 98668-1995

SUBJECT: Inter-Local Agreement—Water Service Boundary

Dear Elaine:

Please find the enclosed "Interlocal Agreement For Establishing Water Utility Service Boundaries". It has been signed by your PW Director and our Mayor. This adjusts the City of Camas/Vancouver water service boundary so that the City of Vancouver can serve the Evergreen School District and the Glad Tidings Church site between NW Friburg Street (Camas) and NE 192nd Ave. on NE 1st Street. I see that the agreement is supposed to be approved by the Clark County Commissioners. Since the agreement originated with the City of Vancouver, I will let you folks carry that through.

If you have questions about this, please call me at 817-1534. Thanks for your help!

Sincerely,

Monte Brachmann
Public Works Director

INTERLOCAL AGREEMENT FOR ESTABLISHING WATER UTILITY SERVICE BOUNDARIES

BETWEEN

City of Vancouver and City of Camas

THIS AGREEMENT, entered into by and between City of Vancouver and City of Camas, (hereinafter referred to as the WATER PURVEYORS), WITNESS THAT:

WHEREAS, Clark County and the WATER PURVEYORS conduct capital facilities and land use planning under the Growth Management Act as adopted by the State of Washington and subsequently amended; and

WHEREAS, RCW 70.116 Public Water System Coordination Act, and WAC 246-293-250 require development of a Coordinated Water System Plan, including establishment of service area boundaries; and

WHEREAS, the designation of service area boundaries will help facilitate efficient planning and delivery of water services within Clark County, will help ensure that unnecessary duplication of service is avoided, and will provide predictability to the WATER PURVEYORS, Clark County, and to citizens using water services; and

WHEREAS, the designation of service area boundaries will help assure that water reserved for public water supply proposed within the CWSSA will be utilized in the future in an efficient planned manner;

NOW THEREFORE, in consideration of covenants, conditions, performances, and promises hereinafter contained, the undersigned parties hereto agree as follows:

1. Service Area Boundaries. The undersigned acknowledges that the maps identifying their service area boundaries, dated May 28, 2004 and attached to this agreement, accurately identifies the water system's future service area. This signed Interlocal Agreement verifies that there are no service area conflicts with adjacent water utilities.

2. Boundary Streets. Where streets or portions of streets serve as a service area boundary, both WATER PURVEYORS may extend service within the street itself. The utility which is located to the north and/or east of the portion of the street serving as a boundary will also be entitled to extend service across the boundary to abutting streetside lots. Any other service extensions into adjacent service area boundaries shall require agreement of the WATER PURVEYORS involved.

3. Boundary Adjustments. If, at some time in the future, it is in the best interests of the undersigned parties to make service area boundary adjustments, such modifications must have the written concurrence of all involved parties and the proper legislative authority(ies), and must be noted and filed with Clark County and Washington State Department of Health.

As specified in WAC 246-293-250, Service Area Agreements-Requirements, this Agreement shall become effective once this document is approved by the Clark County Board of Commissioners.

This Interlocal agreement for establishing water utility service boundaries is hereby approved.

Utility Representative
Brian K. Carlson

Public Works Director
Title City of Vancouver

5/28/04
Date

Utility Representative
Paul Dennis

Mayor
Title City of Camas

10-12-04
Date

APPROVED BY CLARK COUNTY BOARD OF COMMISSIONEERS

Chair

Resolution No.

Date:

NE 6th ST
NE 194th PL
NE 193rd AVE
NE 196th AVE
NE 192nd AVE
NE 202nd AVE
Glad Tidings Church
Evergreen School District
NE 1st ST
SE 197th CT (P)
SE 199th AVE (P)
EXISTING BOUNDARY
PROPOSED BOUNDARY
100 200 400
8/04 GPH

CITY OF VANCOUVER

Post Office Box 1995 - Vancouver, Washington 98668-1995

November 22, 2004

Mr. Monte Brachmann
Public Works Director
P.O. Box 1055
Camas, Washington 98607

SUBJECT: Camas/Vancouver Inter-Local Agreement as signed 10/12/04 - CORRECTED MAP

Dear Monte –

Thank you for returning the recently signed Inter-Local Agreement documenting the proposed changes to the Camas/Vancouver Water Service Boundary in the vicinity of SE 1st St and SE 192nd Ave. As you had noted, the document still needs to be signed by the County Commissioners. In order to complete this last step, the Agreement is now with our Public Works Director, Brian Carlson. After we get all signatures on the final document, I make sure you get a copy for your records.

While we were reviewing these documents, we realized the original map had an incorrect scale on it. Please use this updated map, re-plotted with the correct scale, as the permanent attachment for these records.

Thank you again for assisting us with coordinating this revision to our respective Service Area Boundaries. If you have any questions, please do not hesitate to call me at 360-696-8008.

Sincerely,

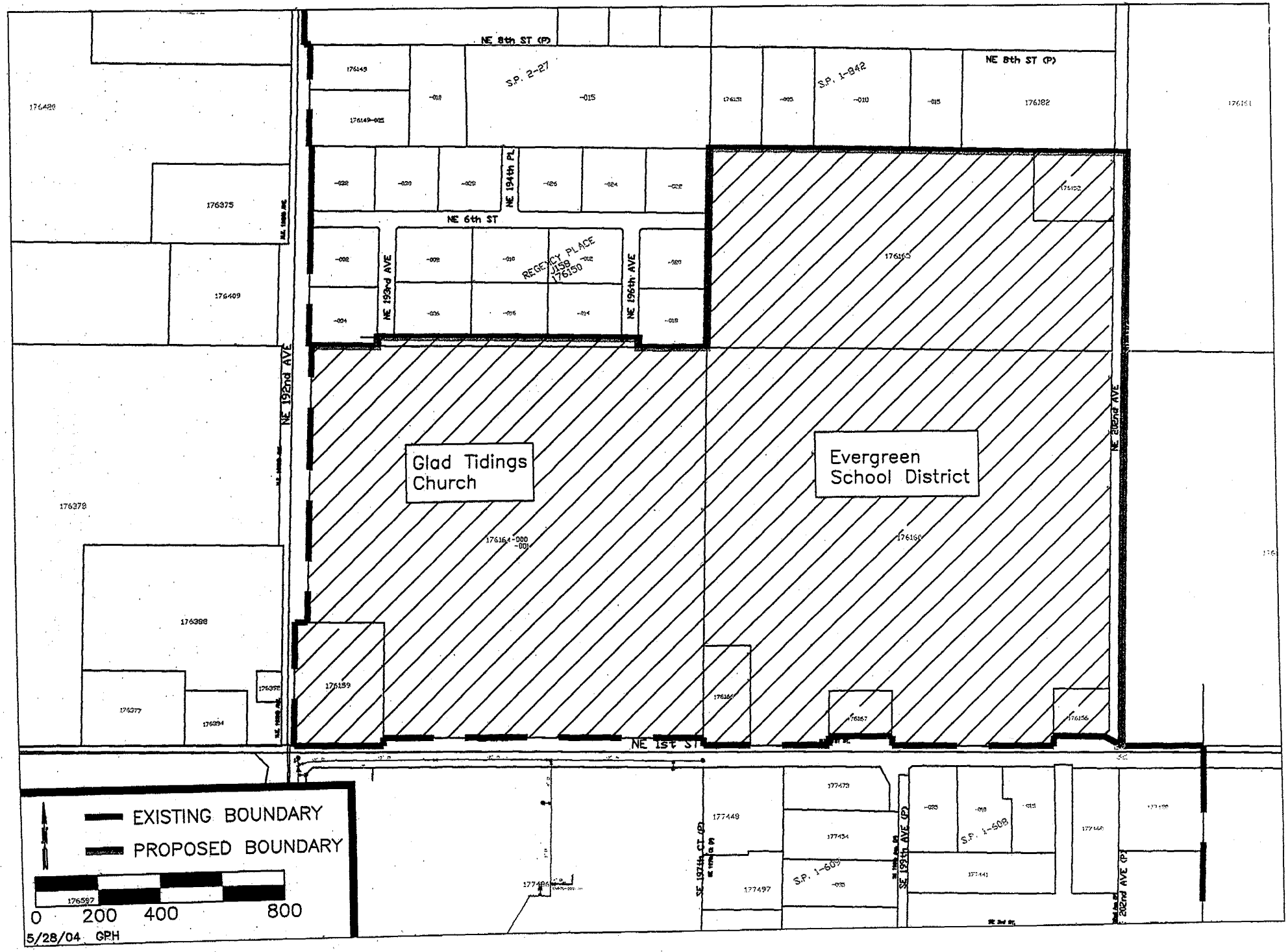
Elaine Spray

Elaine Spray, P. E.
Water System Planning and Design
City of Vancouver

Cc: Brian Carlson, Public Works Director
Victor Ehrlich, City Engineer
Thomas D. Boyer, Assistant City Engineer
File

ENCL

Water Engineering Services
Phone (360) 696-8008 Fax (360) 696-8460


NE 8th ST (P)
S.P. 2-27
S.P. 1-842
NE 8th ST (P)
NE 6th ST
NE 194th PL
NE 193rd AVE
NE 196th AVE
REGENCY PLACE
J158
176150
NE 192nd AVE
NE 200th AVE
Glad Tidings Church
Evergreen School District
NE 1st ST
SE 197th CT (P)
SE 199th AVE (P)
S.P. 1-609
NE 2nd PL
200th AVE (P)
EXISTING BOUNDARY
PROPOSED BOUNDARY
0 200 400 800
5/28/04 GPH

FINANCE

INTERLOCAL AGREEMENT FOR ESTABLISHING WATER UTILITY SERVICE BOUNDARIES

BETWEEN

City of Vancouver and City of Camas

THIS AGREEMENT, entered into by and between City of Vancouver and City of Camas, (hereinafter referred to as the WATER PURVEYORS), WITNESS THAT:

WHEREAS, Clark County and the WATER PURVEYORS conduct capital facilities and land use planning under the Growth Management Act as adopted by the State of Washington and subsequently amended; and

WHEREAS, RCW 70.116 Public Water System Coordination Act, and WAC 246-293-250 require development of a Coordinated Water System Plan, including establishment of service area boundaries; and

WHEREAS, the designation of service area boundaries will help facilitate efficient planning and delivery of water services within Clark County, will help ensure that unnecessary duplication of service is avoided, and will provide predictability to the WATER PURVEYORS, Clark County, and to citizens using water services; and

WHEREAS, the designation of service area boundaries will help assure that water reserved for public water supply proposed within the CWSSA will be utilized in the future in an efficient planned manner;

NOW THEREFORE, in consideration of covenants, conditions, performances, and promises hereinafter contained, the undersigned parties hereto agree as follows:

1. Service Area Boundaries. The undersigned acknowledges that the maps identifying their service area boundaries, dated May 28, 2004 and attached to this agreement, accurately identifies the water system's future service area. This signed Interlocal Agreement verifies that there are no service area conflicts with adjacent water utilities.

2. Boundary Streets. Where streets or portions of streets serve as a service area boundary, both WATER PURVEYORS may extend service within the street itself. The utility which is located to the north and/or east of the portion of the street serving as a boundary will also be entitled to extend service across the boundary to abutting streetside lots. Any other service extensions into adjacent service area boundaries shall require agreement of the WATER PURVEYORS involved.

3. Boundary Adjustments. If, at some time in the future, it is in the best interests of the undersigned parties to make service area boundary adjustments, such modifications must have the written concurrence of all involved parties and the proper legislative authority(ies), and must be noted and filed with Clark County and Washington State Department of Health.

As specified in WAC 246-293-250, Service Area Agreements-Requirements, this Agreement shall become effective once this document is approved by the Clark County Board of Commissioners.

This Interlocal agreement for establishing water utility service boundaries is hereby approved.

Utility Representative Brian K. Carlson	Title Public Works Director City of Vancouver	Date 5/28/04
Utility Representative Paul Dennis	Title ~~Mayor~~ Mayor City of Camas	Date 10-12-04

APPROVED BY CLARK COUNTY BOARD OF COMMISSIONEERS

_____

Chair

Resolution No._____

Date:_____

NE 6th ST
NE 194th PL
NE 193rd AVE
NE 196th AVE
REGENCY PLACE
NE 192nd AVE
Glad Tidings Church
Evergreen School District
NE 1st ST
EXISTING BOUNDARY
PROPOSED BOUNDARY
0 100 200 400
5/28/04 GPH

INTERLOCAL AGREEMENT BETWEEN
the
CITY OF WASHOUGAL and the CITY OF CAMAS

The corporate limits of the cities of Camas and Washougal are irregular along their common boundary. In particular, an area within the Camas corporate limits (herein referred to as "subject area", as described in attached Exhibit "A") located north of the intersection of Shepherd Road and 3rd Avenue is currently surrounded on approximately eighty-four (84) percent of its perimeter by Washougal's corporate limits.

Further, the cities have mutually entered into an Interlocal Agreement which designates the City of Washougal as the utility service (water and sewer) provider to the land located within the subject area.

The City of Washougal is in the process of preparing a Comprehensive Subarea Plan for an area lying north of the subject area, including the land surrounding the subject area. The Subarea Plan will address land uses, environmental protection, storm water drainage and infrastructure impacts for the area. Including the subject area would assure the orderly and logical progression of land development under the jurisdiction of the City of Washougal.

The purpose of this agreement is to establish the City of Washougal as the presiding jurisdiction with respect to land use planning and implementation, including, but not limited to the following:

1. Implementation of land division regulations.
2. Imposition and implementation of zoning regulations
3. Implementation of development standards, including streets, storm and sanitary sewer, water and other utility provision.

Pursuant to this, the City of Washougal and the City of Camas hereby agree to the following:

1. Presiding Jurisdiction. The City of Washougal shall be the presiding jurisdiction in all planning programs, land use designations and land use application processing for land within the subject area.

2. Land Use Planning and Implementation. All land use actions shall be processed under the rules and regulations of the City of Washougal, including but not limited to Titles 15 (Building), 16 (Environmental), 17 (Land Divisions) and 18 (Zoning) of the Washougal Municipal Code, the City of Washougal Engineering Standards for Public Works Construction and any and all provisions of the Woodburn Hill Comprehensive Subarea Plan. No provision of this agreement shall preclude future revisions, amendments or addenda to these regulations from being implemented by the City of Washougal within the subject area without prior written consent of the City of Camas.

3. Annexation. Both the City of Camas and the City of Washougal agree to pursue the necessary routes to transfer true corporate jurisdiction for the subject area from the City of Camas to the City of Washougal.

4. Effective Date and Duration. This agreement shall be effective upon signature by the presiding officer of both the City of Camas and the City of Washougal, and shall be in effect until terminated by one of the following methods:

   a. Ninety (90) day written notice of termination by either party subject to the agreement.
   b. Termination of agreement upon formal annexation of the subject area by the City of Washougal, said termination being effective concurrent with the effective date of the annexation.

5. Application Processing Upon Termination. Upon termination of this agreement, the city of Washougal shall complete processing of any technically complete land use application filed with the City of Washougal pursuant to the provisions of this agreement.

APPROVED this 4th day of August, 1997 by:

City of Washougal

Mayor Charles Crumpacker

City of Camas

Mayor Dean Dossett

Approved as to form:

City of Washougal

Don English, City Attorney

City of Camas

Roger Knapp, City Attorney

f:\eric\woodburn\intrlocl

CITY OF CAMAS
616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607

October 8, 1997

Mike Conway, Director
Department of Public Works
City of Washougal
1701 C Street
Washougal WA 98671

Gentlemen/Mike

Enclosed please find an executed copy of the *INTERLOCAL AGREEMENT BETWEEN the CITY OF WASHOUGAL and the CITY OF CAMAS.* Said agreement designates the City of Washougal as the utility service (water and sewer) provider to the land located north of the intersection of Shepherd Road and 3rd Avenue.

Any questions pertaining to this agreement may be directed to Eric Levison, our Assistant City Engineer, at 834-3451.

Sincerely,

Douglas A. Quinn, P.E.
Director

enclosure

Emergency Water Supply

INTER-LOCAL COOPERATION AGREEMENT

THIS AGREEMENT made this day by and between the CITY OF CAMAS, a municipal corporation organized under the laws of the State of Washington, hereinafter referred to as "Camas", and the CITY OF WASHOUGAL, a municipal corporation organized under the laws of the State of Washington, hereinafter referred to as "Washougal",

In accordance with the Inter-Local Cooperation Act (RCW Chapter 39.34), Camas and Washougal, in consideration of the payments, covenants and agreements hereinafter mentioned, to be made and performed by the parties, do covenant and agree as follows:

Section 1. **PURPOSE:** The purpose of this agreement is to allow Camas and Washougal to sell water to the other due to the occurrence of an emergency situation where either city is unable to meet their service demands within internal water sources. The designation of an emergency shall be made by the respective Public Works Directors of each city and shall include, but not be limited to, drought conditions or a break in a water main. The delivery of water upon the designation of an emergency shall be through Inter-Ties between the respective water systems of Camas and Washougal at locations approved by the Public Works Directors of each city.

Section 2. **DURATION:** This agreement shall be for an indefinite duration.

Section 3. **ADMINISTRATION:** No new or separate legal or administrative entity is created to administer the provisions of this agreement. This agreement shall be administered jointly by Camas and Washougal by and through the Public Works Directors of both cities, who shall jointly administer this undertaking in accordance with the terms and conditions of this agreement.

Section 4. **FINANCING:** In the event either Camas or Washougal receives water

pursuant the provisions of this agreement then the receiving city shall remit payment in full for the water received at a rate equivalent to the receiving city's residential, inside city, water volume rate at the time of provision of the water. Invoicing shall be on a monthly basis.

Section 5. **WATER QUALITY:** The water supplied by either Camas or Washougal, in accordance with the terms of this agreement, shall be deemed "finished and treated" drinking water at the point of delivery. The city providing water shall have no responsibility to maintain drinking water quality standards once the water has been provided to the receiving city's distribution system. The receiving city shall be solely responsible to maintain drinking water quality standards upon receipt.

Section 6. **INDEMNIFICATION:** Camas and Washougal shall indemnify and hold harmless the other, its officers, agents, and employees, or any of them, from any and all claims, actions, suits, liability, loss, costs, expenses and damage of any nature whatsoever, by reason of or arising out of any action or omission of the respective employees, officers and agents, in the execution and administration of this agreement.

Section 7. **INSURANCE:** Each city shall obtain and keep in full force and effect liability insurance protecting itself and its employees, officers and agents, and the party, its employees, officers and agents, for claims of any persons for injuries to life, person or property by reason of anything done or permitted to be done or suffered or admitted to be done by the parties in the administration of the project. If either party withdraws from the Washington Cities Insurance Authority, that party shall deliver a certificate of insurance showing compliance with this section.

Section 8. **TERMINATION:** Each party shall have the right to terminate this entire agreement, with or without cause, upon 180 days written notice to the other party. Such notice shall be sufficient if it is in writing and deposited in the United States mail, certified mail, return receipt requested, with postage fully prepaid and addressed to the parties at their last known addresses as follows:

City of Camas
P.O. Box 1055
Camas, WA 98607

City of Washougal
1701 "C" Street
Washougal, WA 98671

Section 9. **FILING:** This agreement shall be filed with the city clerks of Camas and Washougal and with the Clark County Auditor and the Washington Secretary of State.

Section 10. **EFFECTIVE DATE:** This agreement shall be effective upon signing by the respective parties hereto.

DATED this 7 day of August, 2006.

CITY OF CAMAS

By: _____
Mayor

Attest: _____
Clerk

Approved as to form:

_____
City Attorney

CITY OF WASHOUGAL

By: _____
Mayor

Attest: _____
Clerk

Approved as to form:

_____
City Attorney

INTER-LOCAL COOPERATION AGREEMENT

THIS AGREEMENT made this day by and between the CITY OF CAMAS, a municipal corporation organized under the laws of the State of Washington, hereinafter referred to as "Camas", and the CITY OF WASHOUGAL, a municipal corporation organized under the laws of the State of Washington, hereinafter referred to as "Washougal",

In accordance with the Inter-Local Cooperation Act (RCW Chapter 39.34), Camas and Washougal, in consideration of the payments, covenants and agreements hereinafter mentioned, to be made and performed by the parties, do covenant and agree as follows:

Section 1. **PURPOSE:** The purpose of this agreement is to provide for the drilling, testing and evaluation of drinking water wells in the Steigerwald Lake area east of the Port of Camas-Washougal Industrial Park, more particularly described, and subject to that certain Option to Purchase Exclusive Easement for Well Site attached hereto as Exhibit "A", and to allocate the costs and responsibilities associated for such projects.

Section 2. **DURATION:** This agreement shall be for an indefinite duration.

Section 3. **ADMINISTRATION:** No new or separate legal or administrative entity is created to administer the provisions of this agreement. This agreement shall be administered jointly by Camas and Washougal and there is hereby created a board comprised of the Public Works Directors of both cities, which shall jointly administer this undertaking in accordance with the terms and conditions of this agreement.

Section 4. **FINANCING:** Camas and Washougal shall each be responsible for fifty percent (50%) of the total actual costs incurred on this project, including any project costs associated with the discovery of an available and useable source of water within the property,

more particularly described in Exhibit "A", or within a ½ mile radius thereof. The initial costs for calendar year 2006 shall be allocated with Washougal to be responsible for paying $65,000.00 and Camas to be responsible for paying the remaining costs, but no more than $155,000.00. Camas shall not incur additional costs above $155,000.00, of which Washougal is to share, without the prior approval of Washougal.

Camas shall bill Washougal for its share of the expenses herein described in accordance with Camas' normal billing procedures for public works projects. Washougal shall remit payment in full for each such billing invoice no later than five (5) days after the first meeting of the Washougal City Council immediately following submission of such invoices by Camas.

Section 5. **PROJECT ADMINISTRATION:**

A) Camas shall be designated as the lead agency in reference to negotiating and obtaining of any contract for work on the project. Camas engineering staff shall provide staff oversight of all consultants and contractors working upon the drilling project.

B) In the event either Camas or Washougal, or both jointly, develop a source of water on the property as herein described, then the parties hereto agree to negotiate in good faith for the execution of a revised Inter-Local Agreement for allocation of costs and distribution of water resources.

Section 6. **INDEMNIFICATION:** Camas and Washougal shall indemnify and hold harmless the other, its officers, agents, and employees, or any of them, from any and all claims, actions, suits, liability, loss, costs, expenses and damage of any nature whatsoever, by reason of or arising out of any action or omission of the respective employees, officers and agents, in the

execution and administration of this agreement.

Section 7. **INSURANCE:** Each city shall obtain and keep in full force and effect liability insurance protecting itself and its employees, officers and agents, and the party, its employees, officers and agents, for claims of any persons for injuries to life, person or property by reason of anything done or permitted to be done or suffered or admitted to be done by the parties in the administration of the project. If either party withdraws from the Washington Cities Insurance Authority, that party shall deliver a certificate of insurance showing compliance with this section.

Section 8. **TERMINATION:** Each party shall have the right to terminate this entire agreement, with or without cause, upon 180 days written notice to the other party. Such notice shall be sufficient if it is in writing and deposited in the United States mail, certified mail, return receipt requested, with postage fully prepaid and addressed to the parties at their last known addresses as follows:

City of Camas
P.O. Box 1055
Camas, WA 98607

City of Washougal
1701 "C" Street
Washougal, WA 98671

Section 9. **FILING:** This agreement shall be filed with the city clerks of Camas and Washougal and with the Clark County Auditor and the Washington Secretary of State.

Section 10. **EFFECTIVE DATE:** This agreement shall be effective upon signing by the respective parties hereto.

///

DATED this 7 day of August, 2006.

CITY OF CAMAS

By: _____
Mayor

Attest: _____
Clerk

Approved as to form:

_____
City Attorney

CITY OF WASHOUGAL

By: _____
Mayor

Attest: _____
Clerk

Approved as to form:

_____
City Attorney

OPTION TO PURCHASE EXCLUSIVE EASEMENT FOR WELL SITE

In consideration of the recognition by the parties hereto of the need for enhanced water capacity benefiting the respective Cities and the Port's Industrial Park and the sum of One Thousand and no/100 dollars ($1,000.00), in hand paid, receipt of which is hereby acknowledged, the undersigned Optionor(s) hereby grant(s) to the CITY OF CAMAS, WASHINGTON, a municipal corporation of the State of Washington, and the CITY OF WASHOUGAL, WASHINGTON, a municipal corporation of the State of Washington, and their respective successors, assigns, lessees and agents (herein collectively called "Optionees") an option to purchase an Exclusive Right-of-Way and Easement as described in the document marked "Exhibit A" and entitled **"Grant of Right of Way Easement and Agreement"** as said document is attached hereto and made a part hereof. The Easement shall be for approximately 2 acres of land, generally described in "Exhibit B".

In addition to said approximate 2 acre parcel, Optionor(s) agree to grant to Optionees a 20' wide easement for ingress and egress and utilities to the proposed well site. Said access easement may be joint use with the Optionor(s) until such time as the remainder property is developed.

This option shall be subject to all terms and conditions of said attached document and shall continue in force from the date hereof until midnight Dec. 31, 2006, and at any time within said period Optionees shall have the right to exercise said option by giving Optionor(s) notice thereof, either in person or by letter mailed to the address given below. At any time within said period, Optionees or their contractors may enter upon said land for the purpose of making surveys and performing other work for the purpose of obtaining information to be used in exercising the rights above described without being deemed to have exercised the option.

If the Optionees exercise this option, Optionees agree to pay to Optionor(s) an amount equal to the fair market value of the perpetual easement provided for herein, to be determined by an appraiser mutually acceptable to both parties. In the alternative to payment of fair market value, in whole or part, the parties agree to negotiate in good faith for an exchange in value based upon the assumption of financing by Optionees of improvements to water capacity at the Grove Field Airport. The costs for said appraisal shall be shared by the parties hereto. Optionor(s) agree that at such time as Optionees may elect to exercise this option, Optionor(s) will execute and deliver to Optionees, a properly executed instrument of conveyance, in the form of said document marked "Exhibit A", attached hereto and made a part hereof, whereby the above described rights of way and easements are conveyed to Optionees.

It is understood and agreed that this option may be renewed for an additional 6 month period, upon payment by the Optionees to the Optionor(s) of an additional One-Thousand and no/100 dollars ($1,000.00).

It is understood and agreed that the exercising of this option is subject to acceptance by the Optionees, of an adequate public water supply, based upon the results of a test well, completed by the Optionees, which will determine whether the site is acceptable for municipal well(s).

If the Optionees do not exercise this option, the consideration paid for this option shall be retained by Optionor(s) with no further obligation to Optionees.

The terms, conditions, and provisions herein shall extend to and be binding upon the heirs, executors, administrators, personal representatives, successors, assigns, lessees and agents of the parties hereto.

EXECUTED this 17 day of July, 2006, at _____.

OPTIONEES:

City of Camas
By: _____
Title: Mayor

City of Washougal
By: _____
Title: Mayor

OPTIONOR(S):

Port of Camas-Washougal
By: _____
Title: Executor Director

Notice address of Optionor(s):

24 South A Street
Washougal, WA 98671

STATE OF WASHINGTON)
) ss.
COUNTY OF CLARK)

On this 18th day of July, 2006, before me personally appeared Paul Dennis, known to me to be the Mayor, of the CITY OF CAMAS, a municipal corporation, that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

JAMES M HODGES
STATE OF WASHINGTON
NOTARY — • — PUBLIC
My Commission Expires Dec. 15, 2009

James M. Hodges
Notary Public in and for the State of Washington, residing at Vancouver
My commission expires 12/15/09.

STATE OF WASHINGTON)
) ss.
COUNTY OF CLARK)

On this 26 day of July, 2006, before me personally appeared Scott P. Sawyer, known to me to be the Public Works Director, of the CITY OF WASHOUGAL, a municipal corporation, that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

TOMMYE J. BRATTON
NOTARY PUBLIC
STATE OF WASHINGTON
My Commission Expires
NOVEMBER 18, 2007

T Bratton
Notary Public in and for the State of Washington, residing at Washington
My commission expires 11/18/07

STATE OF WASHINGTON)
) ss.
COUNTY OF CLARK)

On this 13 day of June, 2006, before me the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared SHELDON TYLER, to me known to be the Executor Director of the Port of Camas-Washougal, the municipal corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they were authorized to execute said instrument.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

NOTARY PUBLIC in and for the State of Washington, Residing at Camas.
My appointment expires: 12-1-07.

RETURN ADDRESS:

City of Camas
616 NE 4th Avenue
Camas, WA 98607

GRANT OF RIGHT OF WAY EASEMENT AND AGREEMENT

Grantor: Port of Camas-Washougal, a municipal corporation
Grantees: City of Camas, Washington and City of Washougal, Washington
Legal Desc. (abbrev.):
Tax Parcel ID No.:

THE GRANTOR, PORT OF CAMAS-WASHOUGAL, a municipal corporation, in consideration of Ten and no/100 dollars ($10.00), in hand paid, hereby acknowledged, does grant and conveys to the CITY OF CAMAS, WASHINGTON, a municipal corporation of the State of Washington and to the CITY OF WASHOUGAL, WASHINGTON, a municipal corporation of the State of Washington, its successors and assigns, including joint users, an exclusive and perpetual easement and right of way together with the right of ingress and egress for the purpose of installing, constructing, erecting, altering, repairing, maintaining and operating thereon and therein a municipal water supply system, including all appurtenances necessary thereto, in, on, over, under and across the lands in Clark County, Washington, described as follows:

TO BE SUPPLIED BY SURVEYORS

Together with a 20 foot wide easement for ingress, egress and underground utilities to said well site.

This easement is subject to the following conditions:

1. The subject 2 acre (approximate) parcel will be surveyed and a legal description provided for recording purposes by the Grantees.

2. The ingress, egress and utility easement may be relocated in the future to accommodate development of the parcel. Any relocation shall be agreed upon by both the Grantors and Grantees.

3. Upon development of the remainder property of Grantors, Grantors agree to identify this easement area as "Tract A" (or similar) on the face of the plat, and dedicate said "Tract A" to the City of Camas, by recital and recording on the face of the plat.

EXHIBIT A
PAGE 1 OF 2

4. The Grantees herein agree to conduct their well drilling and operations in a safe and prudent manner so as not to cause any harm to the Grantor

5. Upon completion of any well drilling operations, and when weather is suitable, the Grantees shall restore any disturbed surrounding property as nearly as possible to its condition prior to the well drilling operations and to the reasonable satisfaction of the Grantor.

6. The Grantees shall indemnify and hold the Grantor harmless from all claims for damages or injuries alleged to arise or to accrue to any person or entity as a result of any activity or conduct assumed or performed by the Grantees.

7. Upon completion of the test well, if said test well proves to be inadequate for a public water supply, the Grantees agree to properly abandon the well so as to prevent any injuries and to restore the property as specified above. Or, at the discretion of the Grantors, the Grantees may abandon said facilities "in place".

The Grantor covenants for itself, successors and assigns, that it will not build or place, or allow to be built or placed, any structure of any kind over the easement granted herein.

The Grantor also covenants to and with the Grantees that Grantor has the right and power to convey an Easement for the purposes mentioned over the tract of land described herein.

PORT OF CAMAS-WASHOUGAL

By: _____

Title: EXEC DIR

EXHIBIT A

PAGE 1 OF 2

Exhibit "A"
Legal Description
For
Proposed Well Field and Transmission Line

A tract of land for a future water well area together with an easement for a transmission main located in portions of Sections 17, 20 and 21, Township 1 North, Range 4 East, Willamette Meridian, Clark County, Washington; said tract is a portion of that particular parcel shown on the official record of survey recorded in Book 43 at Page 9, Records of Clark County, Washington, being more particularly described as follows:

Beginning at the Northwest corner of said Section 21 per said record of survey in Book 43 at Page 9; Thence South 62°02'18" East a distance of 3,104.73 feet to the northerly right of way line of the dike road as shown in said survey and the point of beginning of this description; Thence along the following described courses:

North 10°34'45" East a distance of 461.58 feet;
South 88°36'01" East a distance of 347.39 feet;
South 68°07'52" East a distance of 343.29 feet;
South 73°19'26" East a distance of 198.86 feet;
South 73°26'56" East a distance of 160.51 feet;
North 17°28'45" East a distance of 102.65 feet;
South 65°33'04" East a distance of 376.31 feet;
North 63°42'19" East a distance of 112.43 feet;
South 01°23'59" West a distance of 292.78 feet to a point here and after referred to as Point "A", said point also being located on the northerly dike road right of way line; Thence following along said northerly line the following described courses:

North 88°35'14" West a distance of 850.42 feet to the beginning of a curve concave to the north having a radius of 2,782.47 feet;
Thence northwesterly 113.96 feet along said curve through a central angle of 2°20'10";

Thence North 86°15'03" West a distance of 141.48 feet;
Thence North 03°44'56" East a distance of 30.00 feet;
Thence North 86°15'03" West a distance of 516.09 feet to the TRUE POINT OF BEGINNING.

Together with an easement beginning at said Point "A"; Thence South a distance of 35.00 feet to the centerline of said dike road and the beginning of this easement description being 20 feet in width and lying 10 feet on each side of the following described centerline: Following westerly and northwesterly on and along the centerline of said dike road to a point due South of said Northwest corner of Section 21; Thence North 38°03'10" West leaving said dike road centerline a distance of 432.82 feet to a concrete monument with brass cap located in the centerline of Index Street as shown on Record of Survey recorded in Book 14 at Page 50, Records of Clark County, Washington, and the terminus of this easement description.

TW-1
TW-2
25
30
35
Parcel Boundary
Elevation Contours
31 Foot Contour
Other Contours (1 foot)
N
W
E
S
0
Feet
200
1:2,400
Columbia River
Index St
Figure 1
Proposed Location for Test Wells
PgG
K:\DANUM\970208\gis\Proposed_Development_topo.mxd - 5/2006

INTERIM INTERTIE AGREEMENT

City of Camas and City of Washougal

Currently, no formal agreement between the Cities of Camas and Washougal exist concerning the emergency interties between the two water systems. Camas and Washougal are working to develop an intertie agreement that satisfies both parties involved. Upon approval by both the City of Camas and City of Washougal, the Department of Health will be forwarded a copy of said agreement.

In the interim, the City of Camas and City of Washougal have an understanding that allows the City of Camas to provide supply to the City of Washougal. This understanding exists under the conditions that the two cities share operation and maintenance expenses for the interties, and that the City of Washougal pay the existing Camas water rate. The emergency interties exist at the following locations:

Intertie Location	Type
SE Shepherd Street	Normally closed one-way PRV station
Intersection of SE 3rd Street and Whitney Street	Normally closed one-way PRV station

Appendix H

Coliform Monitoring Plan

APPENDIX H

TABLE H-1

City of Camas Water System Coliform Monitoring Plan Sample Stations

No.	Address	Description/ Pressure Zone	Sample Point	Upstream Repeat	Downstream Repeat
1	NW 24th Avenue and NW Elgin Street	Hydrant/852	Sample Station (Hydrant Leg)	2424 NW Elgin Garage Wash Sink	636 NW 24th Laundry Room Wash Sink
2	NW 24th Avenue and NW Maryland Street	Distribution Piping 852	Sample Station	3555 NW 24th Circle Kitchen or Bathroom Sink	2427 NW Maryland Hose Bibb Left Side of House
3	600 NW 18th Loop	Lower Prune Hill Booster Station/697	Sample Station	1815 NW Fargo Hose Bibb	461 NW 17th 440 NW 17th Hose Bibbs
4	2822 NW 18th Avenue	Upper Prune Hill Booster Station/852	Sample Station	LDS Church Hose Bibb on West side by Step Tank Box	2612 NW 18th Back of House Hose Bibb
5	NW 9th Avenue and NW Hoquiam Court	Distribution Piping/ 852	Sample Station	1034 Hoquiam Upstairs Laundry Rm Wash Sink	3323 NW 9th Garage Wash Sink
6	418 NW 6th Avenue	Forest Home Booster Station/455	Sample Station	None Available	None Available
7	200 NE 23rd Avenue	Angelo Booster Station/455	Sample Station	Well 13 or Washougal Wellfield	Lower Prune Hill Booster
8	1707 NE Ione Street	Camas School District Bus Shop/343	Wash Sink Paint Room	1617 Ione Loop Rd Hose Bibb	1608 Ione Loop Hose Bibb
9	616 NE 4th Avenue	Fire Station 41/343	Wash Sink Fire Bay	Lutz Hardware Storeroom Wash Sink Library Janitor Closet Sink	713 NE 4th Camas Family Doctor Hand Wash Sink

TABLE H-1 – (continued)

City of Camas Water System Coliform Monitoring Plan Sample Stations

No.	Address	Description/ Pressure Zone	Sample Point	Upstream Repeat	Downstream Repeat
10	NE 2nd Avenue and SE Yale Street	Distribution System/ 343	Sample Station	2815 E 1st Garage Sink	2709 NW Lake Road Wash Sink (833-0775)
11	26306 SE 15th Street	Butler Booster Station/ 542	Sample Station	Gregg Booster (Old or New)	535 NE 43rd Garage Hose Bibb
12	27200 SE Robinson Road	Residence/542	Sample Station	27224 SE Robinson Rd Hose Bibb	27117 SE Robinson Rd Hose Bibb
13	26306 SE 15th Street	Gregg Booster Station (Old or New)/542	Sample Station	945 NE 43rd Hose Bibb	Butler Booster
14	2600 NW Lake Road	Underwriters Laboratory/544	Loading Dock Entry Wash Sink	3008 NW Lake Rd Bathroom Sink	2709 NW Lake Rd (833-0775)
15	4302 NW Dahlia Drive	Residence/544	Sample Station (Meter Box)	2630 NW 44th Laundry Room Wash Sink	4069 NW Dahlia Loop Jim Schubert (210-7563
16	4620 NW Sierra Street	Lacamas Booster Station/544	Hose Bibb (Inside Back Wall)	1826 NW 45th Wash Sink	Heritage Park Restroom Janitor's Wash Sink
17	SE 46th Way and SE Grand Ridge Drive	Grand Ridge Phase 4/ 852	Sample Station	None Available	None Available
18	SE 11th Avenue and SE Polk Street	Distribution System/ 343	Sample Station	Wastewater Treatment Plant Lab Room Sink	1718 SE 11th River Place Apts Hose Bibb by Garbage Bins
19	3263 NW 45th Avenue	Residence/544	Sample Station	None Available	None Available
20	4231 NW Parker Street	Fire Station 42/544	Wash Sink	Grass Valley Park Utility Rm Wash Sink	Skyridge School Janitor Rm Wash Sink

TABLE H-1 – (continued)

City of Camas Water System Coliform Monitoring Plan Sample Stations

No.	Address	Description/ Pressure Zone	Sample Point	Upstream Repeat	Downstream Repeat
21	NE Everett Street & NE 15th Avenue	Crown Park / 455	Sample Station	None Available	None Available
22	2702 SW 6th Avenue	West End / 455	Sample Station	None Available	None Available
23	NE Adams Street & SE Leadbetter Road	Deerhaven / 455	Sample Station	None Available	None Available

ROUTINE COLIFORM MONITORING PROCEDURES

As shown in Table H-1 as well as the Figure at the end of this Appendix, the City of Camas has 24 sampling locations in its distribution system for its total coliform monitoring program.

The City is required to collect 20 samples per month in its distribution system. Sample sites are rotated seasonally within each pressure zone. See rotation schedules below.

TABLE H-2

Coliform Sampling Station Rotations by Zone

No.	Address or Facility	Rotation
Butler Zone (343)		
8	1707 NE Ione	Spare
9	616 NE 4th	Winter
10	NE 2nd and Yale	Summer
11	Butler Booster Station	Winter
18	SE 11th and Polk	Summer
Lower Prune Hill Zone (455)		
6	Forest Home Booster Station	Spare
7	Angelo Booster Station	Summer and Winter
21	Crown Park	Spare
22	SW 6th West End	DOH Compliance Samples (non-coliform water quality testing)
23	Deerhaven	Not in Use(1)
Gregg Zone (542)		
12	27200 SE Robinson Road	Summer and Winter
13	Gregg Booster	Winter
Lacamas Zone (544)		
14	Underwriters Lab	Winter
15	4302 NW Dahlia	Summer
16	Lacamas Booster Station	Winter
19	3263 NW 45th Court	Not in Use(1)
20	Station 42 (Parker Street)	Summer and Winter
Upper Prune Hill Zone (852)		
1	NW 24th and Elgin	Summer
2	NW 24th and Maryland	Summer
3	Lower Prune Hill Booster Station	Winter
4	Upper Prune Hill Booster Station	Winter
5	NW 9th and Hoquiam	Summer
17	SE Grandridge	Not in Use(1)

(1) Normally not used because of low water use.

FOLLOW-UP COLIFORM SAMPLING FOR UNSATISFACTORY SAMPLE

If a routine total coliform sample is positive, follow-up sampling is required within 24 hours for each source per Ground Water Rule as well as distribution system samples upstream, downstream and at the sampling location that tests positive for total coliform.

Below is a list of sources and the zones served for those sources:

BOULDER AND JONES CREEKS (S01 AND S02)

These sources run from November 1 to May 15. Water from these sources can go to all zones.

WELL NO. 5 (S06)

This source feeds the 343 Zone. With Forrest Home Booster Station in operation, it will also feed the 455 Zone. If the Lower Prune Hill Booster Station is in operation with the Forrest Home Booster Station is in operation, it will feed the 852 Zone.

WASHOUGAL WELLFIELD

Well No. 6 (S07), Well No. 7 (S08), Well No. 8 (S09), Well No. 10 (S15), Well No. 11 (S13), Well No. 12 (S14) and Well No. 13 (S16) feed the entire distribution system.

WELL NO. 9

Well No. 9 (S11) feeds Zone 544.

For distribution system samples that test positive, three upstream and three downstream samples must be collected along with three samples from the location that tested positive. Also a sample is taken before treatment at each source that was running during this time.

In addition to taking the samples described above, a thorough inspection of the distribution system is required to determine the potential source of contamination, including “openings” in the system and/or treatment equipment failure.

Review of sampling procedures is also required to verify samples are taken correctly to avoid the possibility of cross contamination.

EMERGENCY NOTIFICATIONS

The list on the following page shall be used as needed to contact business that may be impacted by a water outage or contamination incident.

MEDICAL FACILITIES

Camas Hearing Clinic
605 NE 5th Avenue, Camas, WA, 98607
(360) 833-0609

Community Pregnancy Clinic of Camas Washougal
1542 NE 3rd Avenue, Camas, WA, 98607
(360) 834-2829

Columbia Medical Group
3400 SE 196th Avenue, Suite 101, Camas, WA, 98607
(360) 834-6700

Pacific Dermatology PC
3400 SE 196th Avenue, Camas, WA, 98607
(360) 834-2000

Elite Laser Spa
3400 SE 196th Avenue, Camas, WA, 98607
(360) 834-6740

Camas Vision Centre
225 NE 4th Avenue, Camas, WA, 98607
(360) 834-2063

Vancouver Vision Clinic
405 NE 6th Avenue, Camas, WA, 98607
(360) 834-4802

Beri Eye Care Associates, PC
19301 SE 34th Street, Suite 104, Camas, WA, 98607
(360) 817-2700

Lacamas Medical Group PC
3240 NE 3rd Avenue, Camas, WA, 98607
(360) 838-2440

Adventist Health/Medical Clinics
411 NE 6th Avenue, Camas, WA, 98607
(360) 834-2863

Supplement Clinic
30201 NE Stauffer Road, Camas, WA, 98607
(360) 210-7117

Blossom Natural Health & Wellness
417 NE Birch Street, Camas, WA, 98607
(360) 834-2732

Allen, Trevor W DMD PC
736 NE 6th Avenue, Camas, WA, 98607
(360) 859-9115

Design Dentistry
531 NE Everett Street, Camas, WA, 98607
(360) 834-4990

Align Orthodontics
19301 SE 34th Street, #101, Camas, WA, 98607
(360) 817-2747

Harris, Bryan D
316 NE Cedar Street, Camas, WA, 98607
(360) 834-2682

Messinger Eric P DDS PS
4400 NW Pacific Rim Boulevard, Camas, WA, 98607
(360) 834-3533

Gessford Orlan J
506 NE Everett Street, Camas, WA, 98607
(360) 834-3963

Nevin Robert B Dntst
2462 SE 11th Avenue, Camas, WA, 98607
(360) 834-7653.

Nevin H R DDS Jr
1636 NE Ione Loop, Camas, WA, 98607
(360) 834-3546

Nevin Robert B Dntst
403 NE 6th Avenue, Camas, WA, 98607
(360) 834-2182

Premier Dental
19221 SE 34th Street, Suite 106, Camas, WA, 98607
(360) 882-9595

RESTAURANTS

Angelo's Pizza
3136 NE 3rd Avenue, Camas, WA, 98607
(360) 835-1205

Big Lou's Texas BBQ
1924 NE 3rd Avenue, Camas, WA, 98607
(360) 834-4114

KFC
3545 NE 3rd, Camas, WA, 98607
(360) 835-2434

Pizza Palace Inc
3136 NE 3rd Avenue, Camas, WA, 98607
(360) 835-3313

Kop Chai
325 NE Cedar Street, Camas, WA, 98607
(360) 834-5287

Burgerville No 24
518 NE 3rd Avenue, Camas, WA, 98607
(360) 834-3289

Papa Murphy's Take 'N' Bake Pizza
2406 SE 8th Avenue North, Camas, WA, 98607
(360) 834-6907

Domino's Pizza
3512 NE 3rd Avenue, Camas, WA, 98607
(360) 835-1500

Subway Restaurant
602 NE 3rd Avenue, Suite B, Camas, WA, 98607
(360) 834-0210

Old Fashion Maid Drive-In
3414 NE 3rd Avenue, Camas, WA, 98607
(360) 835-3434

Mill Corner
204 NE 4th Avenue, Camas, WA, 98607
(360) 833-0474

Smittys
1816 NE 3rd Avenue, Camas, WA, 98607
(360) 834-4257

Camas Thai Cuisine
308 NE 5th Avenue, Camas, WA, 98607
(360) 833-1175

Taco Bell
3405 NE 3rd Avenue, Camas, WA, 98607
(360) 835-9201

Roots Restaurant and Bar
19215 SE 34th Street, Camas, WA, 98607
(360) 260-3001

Top Burger Restaurant
1436 NE Everett Street, Camas, WA, 98607
(360) 834-3867

Lakeside Chalet
3533 NE Everett Street, Camas, WA, 98607
(360) 834-3430

Mill Corner
204 NE 4th Avenue, Camas, WA, 98607
(360) 833-0474

El Rancho Viejo
231 NE 3rd Avenue, Camas, WA, 98607
(360) 834-5856

Jorcody Restaurants Vncvr
2013 NW Lacamas Drive, Camas, WA, 98607
(360) 833-2927

Rice Time
412 NE 4th Avenue, Camas, WA, 98607
(360) 833-9111

McDonald's
3354 NE 3rd Avenue, Camas, WA, 98607
(360) 835-8958

Prune Hill Cafe
228 NE 4th Avenue, Camas, WA, 98607
(360) 907-7899

Piccolo Paradiso
309 NE Birch Street, Camas, WA, 98607
(360) 834-7044

ELDER CARE FACILITIES

Mountainview House
2647 NW Kent Street, Camas, WA, 98607
(360) 834-3988

Prune Hill Adult Family Home
2247 NW Cascade Street, Camas, WA, 98607
(360) 834-5556

Heart Two Heart Care LLC
1745 Division Street, Camas, WA, 98607
(360) 210-7883

Lacamas Adult Family Home LLC
2746 NW 20th Avenue, Camas, WA, 98607
(360) 210-5761

Assisted Living Concepts
2647 NW Kent Street, Camas, WA, 98607
(360) 834-3988

Highland Terrace Nursing Center
640 NE Everett Street, Camas, WA, 98607
(360) 834-5055

CHILD CARE FACILITIES

Camas School District 117 - School Districts, Camas Childcare
1919 NE Ione Street, Camas, WA, 98607
(360) 817-4400

Parkside Christian Preschool and Day Care
1243 E 1st Avenue, Camas, WA, 98607
(360) 834-4002

Children's Villiage At
3500 SE 196th Avenue, Camas, WA, 98607
(360) 833-1230

Surface Water Chlorination Facility

Lacamas BPS

Butler BPS

Butler Reservoir

Gregg Reservoir

Gregg BPS (Old & New)

Well #9

Lacamas Reservoir

Surface Water Filtration Plant

Angelo BPS

Lower Prune Hill Reservoir & BPS

Upper Prune Hill Reservoir & BPS

Francis Rd BPS

Forest Home BPS

Operations Center

Well #15

Well #10, 11, & 12

Well #13

Well #7 & 8

Well #14

Well #6

Well #5

LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON

OREGON

0 4,000 8,000 Feet

LEGEND:

20 monthly samples are required
- 1 from the Surface Water Filtration Plant, when in operation
- 19 from the other 19 sites

If repeat samples are required, they are taken within 5 services upstream and 5 services downstream of the positive location.

- Booster Pump Station
- Reservoir
- Water Treatment
- Well
- In Use
- Future
- Urban Growth Boundary
- City Limits
- Water Service Boundary
- WaterLines
- Parcels
- Sample Station
- Existing Facilites
- Future Facilities

SOURCE: CITY OF CAMAS

CITY OF CAMAS WASHINGTON

WATER SYSTEM O&M MANUAL

COLIFORM MONITORING STATIONS

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Appendix I

Volatile Organic Chemical Test Results

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	AddyLab, LLC	**Service Request:**	K0708094
Project:	Camas/108002/07AL0803	**Date Collected:**	09/05/2007
Sample Matrix:	Drinking water	**Date Received:**	09/08/2007

Volatile Organic Compounds

Sample Name:	Well 9	**Units:**	ug/L
Lab Code:	K0708094-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	524.2		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Chloromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Vinyl Chloride	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Bromomethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Chloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Trichlorofluoromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1-Dichloroethene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Methylene Chloride	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
trans-1,2-Dichloroethene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
2,2-Dichloropropane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
cis-1,2-Dichloroethene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Methyl tert-Butyl Ether	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1-Dichloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Chloroform	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Bromochloromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1,1-Trichloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1-Dichloropropene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Carbon Tetrachloride	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Benzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2-Dichloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Trichloroethene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2-Dichloropropane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Bromodichloromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Dibromomethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
cis-1,3-Dichloropropene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Toluene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
trans-1,3-Dichloropropene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1,2-Trichloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Tetrachloroethene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,3-Dichloropropane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2,3-Trichlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Dibromochloromethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	

Comments:

Client: AddyLab, LLC
Project: Camas/108002/07AL0803
Sample Matrix: Drinking water

Service Request: K0708094
Date Collected: 09/05/2007
Date Received: 09/08/2007

Volatile Organic Compounds

Sample Name: Well 9
Lab Code: K0708094-001

Units: ug/L
Basis: NA

Extraction Method: METHOD
Analysis Method: 524.2

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Chlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Ethylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Styrene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
m,p-Xylenes	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
o-Xylene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Bromoform	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Isopropylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2,3-Trichloropropane	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Bromobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
n-Propylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,3,5-Trimethylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
2-Chlorotoluene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
4-Chlorotoluene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
tert-Butylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2,4-Trimethylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
sec-Butylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
p-Isopropyltoluene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,3-Dichlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,4-Dichlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
n-Butylbenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2-Dichlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2-Dibromo-3-chloropropane (DBCP	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
1,2,4-Trichlorobenzene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Hexachlorobutadiene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	
Naphthalene	ND	U	0.50	1	09/12/07	09/12/07	KWG0709880	

Comments:

0012

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: AddyLab, LLC
Project: Camas/108002
Sample Matrix: Drinking water

Service Request: K0705532
Date Collected: 06/26/2007
Date Received: 06/27/2007

Volatile Organic Compounds

Sample Name: Well Field-11 & 12
Lab Code: K0705532-001

Units: ug/L
Basis: NA

Extraction Method: METHOD
Analysis Method: 524.2

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Chloromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Vinyl Chloride	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Bromomethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Chloroethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Trichlorofluoromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,1-Dichloroethene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Methylene Chloride	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
trans-1,2-Dichloroethene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
2,2-Dichloropropane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
cis-1,2-Dichloroethene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Methyl tert-Butyl Ether	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,1-Dichloroethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Chloroform	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Bromochloromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,1,1-Trichloroethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,1-Dichloropropene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Carbon Tetrachloride	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Benzene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,2-Dichloroethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Trichloroethene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,2-Dichloropropane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Bromodichloromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Dibromomethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
cis-1,3-Dichloropropene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Toluene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
trans-1,3-Dichloropropene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,1,2-Trichloroethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Tetrachloroethene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,3-Dichloropropane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,2,3-Trichlorobenzene	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
Dibromochloromethane	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	07/02/07	07/02/07	KWG0707328	

Comments:

Client: AddyLab, LLC
Project: Camas/108002
Sample Matrix: Drinking water

Service Request: K0703045
Date Collected: 04/11/2007
Date Received: 04/12/2007

Volatile Organic Compounds

Sample Name: Boulder - Jones Creek
Lab Code: K0703045-001

Units: ug/L
Basis: NA

Extraction Method: METHOD
Analysis Method: 524.2

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Chloromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Vinyl Chloride	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Bromomethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Chloroethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Trichlorofluoromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,1-Dichloroethene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Methylene Chloride	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
trans-1,2-Dichloroethene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
2,2-Dichloropropane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
cis-1,2-Dichloroethene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Methyl tert-Butyl Ether	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,1-Dichloroethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Chloroform	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Bromochloromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,1,1-Trichloroethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,1-Dichloropropene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Carbon Tetrachloride	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Benzene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,2-Dichloroethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Trichloroethene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,2-Dichloropropane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Bromodichloromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Dibromomethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
cis-1,3-Dichloropropene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Toluene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
trans-1,3-Dichloropropene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,1,2-Trichloroethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Tetrachloroethene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,3-Dichloropropane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,2,3-Trichlorobenzene	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
Dibromochloromethane	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	04/18/07	04/18/07	KWG0704727	

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: AddyLab, LLC
Project: Drinking Water
Sample Matrix: Drinking water

Service Request: K0702509
Date Collected: 03/28/2007
Date Received: 03/28/2007

Volatile Organic Compounds

Sample Name: City Camas
Lab Code: K0702509-001

Extraction Method: METHOD
Analysis Method: 524.2

Units: ug/L
Basis: NA

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Chloromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Vinyl Chloride	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Bromomethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Chloroethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Trichlorofluoromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,1-Dichloroethene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Methylene Chloride	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
trans-1,2-Dichloroethene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
2,2-Dichloropropane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
cis-1,2-Dichloroethene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Methyl tert-Butyl Ether	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,1-Dichloroethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Chloroform	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Bromochloromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,1,1-Trichloroethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,1-Dichloropropene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Carbon Tetrachloride	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Benzene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,2-Dichloroethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Trichloroethene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,2-Dichloropropane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Bromodichloromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Dibromomethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
cis-1,3-Dichloropropene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Toluene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
trans-1,3-Dichloropropene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,1,2-Trichloroethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Tetrachloroethene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,3-Dichloropropane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,2,3-Trichlorobenzene	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
Dibromochloromethane	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	03/29/07	03/29/07	KWG0704139	

Comments:

00012

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: AddyLab, LLC
Project: Hunter Ridge-Camas
Sample Matrix: Drinking water

Service Request: K0701023
Date Collected: 02/07/2007
Date Received: 02/08/2007

Volatile Organic Compounds

Sample Name: West 17th, Lot 23
Lab Code: K0701023-001

Extraction Method: METHOD
Analysis Method: 524.2

Units: ug/L
Basis: NA

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Chloromethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Vinyl Chloride	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Bromomethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Chloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Trichlorofluoromethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1-Dichloroethene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Methylene Chloride	**1.2**		0.50	1	02/15/07	02/15/07	KWG0702461	
trans-1,2-Dichloroethene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
2,2-Dichloropropane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
cis-1,2-Dichloroethene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Methyl tert-Butyl Ether	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1-Dichloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Chloroform	**130**	D	2.5	5	02/15/07	02/15/07	KWG0702461	
Bromochloromethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1,1-Trichloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1-Dichloropropene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Carbon Tetrachloride	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Benzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2-Dichloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Trichloroethene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2-Dichloropropane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Bromodichloromethane	**2.8**		0.50	1	02/15/07	02/15/07	KWG0702461	
Dibromomethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
cis-1,3-Dichloropropene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Toluene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
trans-1,3-Dichloropropene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1,2-Trichloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Tetrachloroethene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,3-Dichloropropane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2,3-Trichlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Dibromochloromethane	**0.86**		0.50	1	02/15/07	02/15/07	KWG0702461	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	

Comments:

Client: AddyLab, LLC
Project: Hunter Ridge-Camas
Sample Matrix: Drinking water

Service Request: K0701023
Date Collected: 02/07/2007
Date Received: 02/08/2007

Volatile Organic Compounds

Sample Name: West 17th, Lot 23
Lab Code: K0701023-001

Units: ug/L
Basis: NA

Extraction Method: METHOD
Analysis Method: 524.2

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Chlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Ethylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Styrene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
m,p-Xylenes	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
o-Xylene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Bromoform	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Isopropylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2,3-Trichloropropane	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Bromobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
n-Propylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,3,5-Trimethylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
2-Chlorotoluene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
4-Chlorotoluene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
tert-Butylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2,4-Trimethylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
sec-Butylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
p-Isopropyltoluene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,3-Dichlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,4-Dichlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
n-Butylbenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2-Dichlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2-Dibromo-3-chloropropane (DBCP	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
1,2,4-Trichlorobenzene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Hexachlorobutadiene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	
Naphthalene	ND	U	0.50	1	02/15/07	02/15/07	KWG0702461	

Comments:

00010

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: AddyLab, LLC
Project: City of Camas/10802
Sample Matrix: Drinking water

Service Request: K0605566
Date Collected: 07/06/2006
Date Received: 07/07/2006

Volatile Organic Compounds

Sample Name: Filter Plant
Lab Code: K0605566-001

Extraction Method: METHOD
Analysis Method: 524.2

Units: ug/L
Basis: NA
Level: Low

State Regulatory Limit

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Chloromethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Vinyl Chloride	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Bromomethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Chloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Trichlorofluoromethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1-Dichloroethene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Methylene Chloride	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
trans-1,2-Dichloroethene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
2,2-Dichloropropane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
cis-1,2-Dichloroethene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Methyl tert-Butyl Ether	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1-Dichloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Chloroform	7.6 micrograms per liter		0.50	1	07/11/06	07/11/06	KWG0611226	
Bromochloromethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1,1-Trichloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1-Dichloropropene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Carbon Tetrachloride	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Benzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2-Dichloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Trichloroethene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2-Dichloropropane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Bromodichloromethane	0.75		0.50	1	07/11/06	07/11/06	KWG0611226	
Dibromomethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
cis-1,3-Dichloropropene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Toluene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
trans-1,3-Dichloropropene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1,2-Trichloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Tetrachloroethene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,3-Dichloropropane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2,3-Trichlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Dibromochloromethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Chlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	

Comments:

nnnn8

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client: AddyLab, LLC
Project: City of Camas/10802
Sample Matrix: Drinking water

Service Request: K0605566
Date Collected: 07/06/2006
Date Received: 07/07/2006

Volatile Organic Compounds

Sample Name: Filter Plant
Lab Code: K0605566-001

Units: ug/L
Basis: NA

Extraction Method: METHOD
Analysis Method: 524.2

Level: Low

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Ethylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Styrene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
m,p-Xylenes	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
o-Xylene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Bromoform	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Isopropylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2,3-Trichloropropane	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Bromobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
n-Propylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,3,5-Trimethylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
2-Chlorotoluene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
4-Chlorotoluene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
tert-Butylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2,4-Trimethylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
sec-Butylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
p-Isopropyltoluene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,3-Dichlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,4-Dichlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
n-Butylbenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2-Dichlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2-Dibromo-3-chloropropane (DBCP	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
1,2,4-Trichlorobenzene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Hexachlorobutadiene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	
Naphthalene	ND	U	0.50	1	07/11/06	07/11/06	KWG0611226	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
4-Bromofluorobenzene	99	82-110	07/11/06	Acceptable
Dibromofluoromethane	106	83-121	07/11/06	Acceptable
Toluene-d8	115	89-117	07/11/06	Acceptable

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	AddyLab, LLC	**Service Request:**	K0611093
Project:	City of Camas	**Date Collected:**	12/19/2006
Sample Matrix:	Drinking water	**Date Received:**	12/20/2006

Volatile Organic Compounds

Sample Name:	Well Field-Well 10	**Units:**	ug/L
Lab Code:	K0611093-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	524.2		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Dichlorodifluoromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Chloromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Vinyl Chloride	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Bromomethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Chloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Trichlorofluoromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1-Dichloroethene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Methylene Chloride	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
trans-1,2-Dichloroethene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
2,2-Dichloropropane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
cis-1,2-Dichloroethene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Methyl tert-Butyl Ether	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1-Dichloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Chloroform	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Bromochloromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1,1-Trichloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1-Dichloropropene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Carbon Tetrachloride	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Benzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2-Dichloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Trichloroethene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2-Dichloropropane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Bromodichloromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Dibromomethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
cis-1,3-Dichloropropene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Toluene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
trans-1,3-Dichloropropene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1,2-Trichloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Tetrachloroethene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,3-Dichloropropane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2,3-Trichlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Dibromochloromethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2-Dibromoethane (EDB)	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Chlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	

Comments:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	AddyLab, LLC	**Service Request:**	K0611093
Project:	City of Camas	**Date Collected:**	12/19/2006
Sample Matrix:	Drinking water	**Date Received:**	12/20/2006

Volatile Organic Compounds

Sample Name:	Well Field-Well 10	**Units:**	ug/L
Lab Code:	K0611093-001	**Basis:**	NA
Extraction Method:	METHOD	**Level:**	Low
Analysis Method:	524.2		

Analyte Name	Result	Q	MRL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Ethylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1,1,2-Tetrachloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Styrene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
m,p-Xylenes	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
o-Xylene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Bromoform	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Isopropylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,1,2,2-Tetrachloroethane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2,3-Trichloropropane	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Bromobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
n-Propylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,3,5-Trimethylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
2-Chlorotoluene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
4-Chlorotoluene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
tert-Butylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2,4-Trimethylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
sec-Butylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
p-Isopropyltoluene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,3-Dichlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,4-Dichlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
n-Butylbenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2-Dichlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2-Dibromo-3-chloropropane (DBCP	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
1,2,4-Trichlorobenzene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Hexachlorobutadiene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	
Naphthalene	ND	U	0.50	1	12/27/06	12/27/06	KWG0622068	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
4-Bromofluorobenzene	99	82-110	12/27/06	Acceptable
Dibromofluoromethane	99	83-121	12/27/06	Acceptable
Toluene-d8	95	89-117	12/27/06	Acceptable

Comments:

00014

Columbia Analytical Services, Inc.
1317 South 13th Avenue
Kelso, WA 98626

State of Washington

VOLATILE ORGANIC CHEMICALS (VOCS) REPORT

EPA TEST METHOD - 524.2

System ID No.:	**10800Z**	DOH Source No:	Lab Sample No.: **01746951**
System Name:	**Camas Municipal Water-Sewer System**		Date Collected: **6/7/2006**
Multiple Source Nos:	**S-09, S-15**		Date Received: **6/8/2006**
Sample Type: **A**	Purpose: **C**	Date Analyzed:	**6/9/06** Analyst: **N. Hyde**
County: **Clark**		Date Reported:	**6/12/06** Supervisor: **Jeff Grindstaff**
Specific Collection Location:	**Well #8 and Well #10**		
Sent Report To:			
Bill To:			

DOH #	ANALYTES	LAB MDL	RESULTS	UNITS	SRL	TRIGGER	MCL	ANALYST/METHOD
EPA REGULATED								
45	Vinyl Chloride	0.5	ND	ug/l	0.5	0.5	2	N. Hyde / 524.2
46	1,1 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	7	N. Hyde / 524.2
47	1,1,1 - Trichloroethane	0.5	ND	ug/l	0.5	0.5	200	N. Hyde / 524.2
48	Carbon Tetrachloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
49	Benzene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
50	1,2 - Dichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
51	Trichloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
52	P - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	75	N. Hyde / 524.2
56	Methylene Chloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
57	T - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
60	CIS - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
63	1,2-Dichloropropane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
66	Toluene	0.5	ND	ug/l	0.5	0.5	1000	N. Hyde / 524.2
67	1,1,2-Trichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
68	Tetrachloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
71	Chlorobenzene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
73	Ethylbenzene	0.5	ND	ug/l	0.5	0.5	700	N. Hyde / 524.2
76	Styrene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
84	1,2 - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	600	N. Hyde / 524.2
95	1,2,4-Trichlorobenzene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
160	Total Xylenes	0.5	ND	ug/l	0.5	0.5	10000	N. Hyde / 524.2
EPA UNREGULATED								
27	Chloroform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
28	Bromodichloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
29	Dibromochloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
30	Bromoform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
53	Chloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
54	Bromomethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
55	Chloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
58	1,1-Dichloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
59	2,2 Dichloropropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2

00011

DOH #	ANALYTES	LAB MDL	RESULTS	UNITS	SRL	TRIGGER	MCL	ANALYST/METHOD
			EPA UNREGULATED					
62	1,1 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
70	1,3 - Dichloropropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
71	Chlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
72	1,1,1,2 - Tetrachloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
78	Bromobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
80	1,1,2,2-Tetrachloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
81	O - Chlorotoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
82	P - Chlorotoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
83	M - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
97	Hexachlorobutadiene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
98	1,2,3 - Trichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
154	1,3-Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
158	Dichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
162	Dichlorodifluoromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
75	O - Xylene (MCL for Total)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
			STATE REGULATED					
102	EDB (Scan Confirm By 504.1)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
103	DBCP (Scan Confirm By 504.1)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
64	Dibromomethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
65	CIS - 1,3 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
69	TRANS - 1,3 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
74	M/P Xylenes (MCL for Total)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
79	1,2,3 - Trichloropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
85	Trichlorofluoromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
86	Bromochloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
87	Isopropylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
88	N - Propylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
89	1,3,5 Trimethylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
90	Tert - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
91	1,2,4 - Trimethylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
92	Sec - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
93	P - Isopropyltoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
94	N - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
96	Naphthalene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
	MTBE	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water Response Level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): in the amount column indicates this compound was not included in the current analysis.

ND (Not Detected): in the amount column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

<0.001: indicates the compound was not detected in the sample. It also indicates that the laboratory used a method detection level (lab mdl) lower than the SRL.

Comments:

00012

Columbia Analytical Services, Inc.
1317 South 13th Avenue
Kelso, WA 98626

State of Washington

VOLATILE ORGANIC CHEMICALS (VOCS) REPORT
EPA TEST METHOD - 524.2

n ID No.:	10800Z	DOH Source No:	Lab Sample No.: 01746952
m Name:	Camas Municipal Water-Sewer System		Date Collected: 6/7/2006
iple Source Nos:	S-08, S-13		Date Received: 6/8/2006
ple Type: A	Purpose: C	Date Analyzed: 6/9/06	Analyst: N. Hyde
nty: Clark		Date Reported: 6/12/06	Supervisor: Jeff Grindstaff
ecific Collection Location:	Well #7 and Well #11		
nt Report To:			
ill To:			

DOH #	ANALYTES	LAB MDL	RESULTS	UNITS	SRL	TRIGGER	MCL	ANALYST/METHOD
	EPA REGULATED							
45	Vinyl Chloride	0.5	ND	ug/l	0.5	0.5	2	N. Hyde / 524.2
46	1,1 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	7	N. Hyde / 524.2
47	1,1,1 - Trichloroethane	0.5	ND	ug/l	0.5	0.5	200	N. Hyde / 524.2
48	Carbon Tetrachloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
49	Benzene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
50	1,2 - Dichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
51	Trichloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
52	P - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	75	N. Hyde / 524.2
56	Methylene Chloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
57	T - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
60	CIS - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
63	1,2-Dichloropropane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
66	Toluene	0.5	ND	ug/l	0.5	0.5	1000	N. Hyde / 524.2
67	1,1,2-Trichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
68	Tetrachloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
71	Chlorobenzene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
73	Ethylbenzene	0.5	ND	ug/l	0.5	0.5	700	N. Hyde / 524.2
76	Styrene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
84	1,2 - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	600	N. Hyde / 524.2
95	1,2,4-Trichlorobenzene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
160	Total Xylenes	0.5	ND	ug/l	0.5	0.5	10000	N. Hyde / 524.2
	EPA UNREGULATED							
27	Chloroform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
28	Bromodichloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
29	Dibromochloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
30	Bromoform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
53	Chloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
54	Bromomethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
55	Chloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
58	1,1-Dichloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
59	2,2 Dichloropropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2

00013

Columbia Analytical Services, Inc.
1317 South 13th Avenue
Kelso, WA 98626

State of Washington

VOLATILE ORGANIC CHEMICALS (VOCS) REPORT

EPA TEST METHOD - 524.2

System ID No.:	**10800Z**	DOH Source No:	**S07**	Lab Sample No.:	**01746953**
System Name:	**Camas Municipal Water-Sewer System**			Date Collected:	**6/7/2006**
Multiple Source Nos:				Date Received:	**6/8/2006**
Sample Type: **A**	Purpose: **C**			Date Analyzed:	**6/9/06** Analyst: **N. Hyde**
County: **Clark**				Date Reported:	**6/12/06** Supervisor: **Jeff Grindstaff**
Specific Collection Location:	**Well #6**				
Sent Report To:					
Bill To:					

DOH #	ANALYTES	LAB MDL	RESULTS	UNITS	SRL	TRIGGER	MCL	ANALYST/METHOD
	EPA REGULATED							
45	Vinyl Chloride	0.5	ND	ug/l	0.5	0.5	2	N. Hyde / 524.2
46	1,1 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	7	N. Hyde / 524.2
47	1,1,1 - Trichloroethane	0.5	ND	ug/l	0.5	0.5	200	N. Hyde / 524.2
48	Carbon Tetrachloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
49	Benzene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
50	1,2 - Dichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
51	Trichloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
52	P - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	75	N. Hyde / 524.2
56	Methylene Chloride	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
57	T - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
60	CIS - 1,2 - Dichloroethylene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
63	1,2-Dichloropropane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
66	Toluene	0.5	ND	ug/l	0.5	0.5	1000	N. Hyde / 524.2
67	1,1,2-Trichloroethane	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
68	Tetrachloroethylene	0.5	ND	ug/l	0.5	0.5	5	N. Hyde / 524.2
71	Chlorobenzene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
73	Ethylbenzene	0.5	ND	ug/l	0.5	0.5	700	N. Hyde / 524.2
76	Styrene	0.5	ND	ug/l	0.5	0.5	100	N. Hyde / 524.2
84	1,2 - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5	600	N. Hyde / 524.2
95	1,2,4-Trichlorobenzene	0.5	ND	ug/l	0.5	0.5	70	N. Hyde / 524.2
160	Total Xylenes	0.5	ND	ug/l	0.5	0.5	10000	N. Hyde / 524.2
	EPA UNREGULATED							
27	Chloroform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
28	Bromodichloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
29	Dibromochloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
30	Bromoform	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
53	Chloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
54	Bromomethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
55	Chloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
58	1,1-Dichloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
59	2,2 Dichloropropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2

00015

DOH #	ANALYTES	LAB MDL	RESULTS	UNITS	SRL	TRIGGER	MCL	ANALYST/METHOD
			EPA UNREGULATED					
62	1,1 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
70	1,3 - Dichloropropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
71	Chlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
72	1,1,1,2 - Tetrachloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
78	Bromobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
80	1,1,2,2-Tetrachloroethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
81	O - Chlorotoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
82	P - Chlorotoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
83	M - Dichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
97	Hexachlorobutadiene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
98	1,2,3 - Trichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
154	1,3-Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
158	Dichlorobenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
162	Dichlorodifluoromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
75	O - Xylene (MCL for Total)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
			STATE REGULATED					
102	EDB (Scan Confirm By 504.1)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
103	DBCP (Scan Confirm By 504.1)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
64	Dibromomethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
65	CIS - 1,3 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
69	TRANS - 1,3 - Dichloropropene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
74	M/P Xylenes (MCL for Total)	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
79	1,2,3 - Trichloropane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
85	Trichlorofluoromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
86	Bromochloromethane	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
87	Isopropylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
88	N - Propylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
89	1,3,5 Trimethylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
90	Tert - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
91	1,2,4 - Trimethylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
92	Sec - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
93	P - Isopropyltoluene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
94	N - Butylbenzene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
96	Naphthalene	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2
	MTBE	0.5	ND	ug/l	0.5	0.5		N. Hyde / 524.2

NOTES:

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MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): in the amount column indicates this compound was not included in the current analysis.

ND (Not Detected): in the amount column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

<0.001: indicates the compound was not detected in the sample. It also indicates that the laboratory used a method detection level (lab mdl) lower than the SRL.

Comments:

00016

Appendix J

Lead and Copper Test Results

EDGE ANALYTICAL
The lab you can trust!

Burlington WA | 1620 S Walnut St - 98233
Corporate Office | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT FOR LEAD & COPPER

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 06-15702
Project: City of Camas Lead & Copper

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: B
County:

Analyst mvp
Date Received: 12/5/2006
Report Date: 12/11/2006

Supervisor:

	DOH#	23 (Copper)	9 (Lead)
	SRL	0.02 mg/L	0.002 mg/L
	AL	1.3 mg/L	0.015 mg/L

Lab Number	Date Collected	Site / Location	Copper mg/L	Lead mg/L	METHOD
04633867	11/30/06	638 SE Polk	0.312	ND	200.8
04633868	11/30/06	777 SE Polk St	0.266	ND	200.8
04633869	11/30/06	623 SE Tampa St	0.216	ND	200.8
04633870	11/30/06	1234 NE 6th Ave	0.172	0.002	200.8
04633871	12/1/06	2232 NE 3rd Lp	0.048	0.002	200.8
04633872	12/1/06	103 NE 14th Ave	ND	ND	200.8
04633873	12/1/06	5220 NW 16th	0.140	ND	200.8
04633874	11/29/06	2538 NW Ivy St	0.099	ND	200.8
04633875	11/30/06	2621 NW Walden	0.025	ND	200.8
04633876	12/1/06	2826 NW LaCamas	0.040	ND	200.8
04633877	11/30/06	2549 NW LaCamas	0.176	ND	200.8
04633878	11/30/06	1811 NW Hood St	0.168	ND	200.8
04633879	11/30/06	850 NW Viewridge	0.056	ND	200.8
04633880	11/30/06	429 NW Viewridge	0.142	ND	200.8
04633881	11/30/06	2127 NW Couch	0.110	ND	200.8
04633882	11/30/06	1429 NW Ash St	0.040	ND	200.8
04633883	11/30/06	2535 NW Ivy St	0.347	ND	200.8
04633884	12/1/06	2708 NW Ivy St	0.043	ND	200.8
04633885	11/30/06	544 NW View Rd	0.307	ND	200.8
04633886	11/29/06	635 NW Viewridge	0.264	ND	200.8

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

AL (Federal Action Level): 0.015mg/L for Lead and 1.3 mg/L for Copper. If the compounds detected at concentration in excess of this level, contact your regional DOH office for further information.

ND (Not Detected): indicates that the compound was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this compound was not analyzed.

Comments:

FORM: Pb&Cu

EDGE ANALYTICAL
The lab you can trust!

Burlington WA | 1620 S Walnut St - 98233
Corporate Office | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT FOR LEAD & COPPER

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 06-15702
Project: City of Camas Lead & Copper

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: B
County:

Analyst mvp
Date Received: 12/5/2006
Report Date: 12/11/2006

DOH#	23 (Copper)	9 (Lead)
SRL	0.02 mg/L	0.002 mg/L
AL	1.3 mg/L	0.015 mg/L

Lab Number	Date Collected	Site / Location	Copper mg/L	Lead mg/L	METHOD
04633887	11/30/06	2209 NW Douglas	0.098	ND	200.8
04633888	12/1/06	2816 NW 11th Ave	0.209	ND	200.8
04633889	11/30/06	2606 NW 15th Cir	0.057	ND	200.8
04633890	11/30/06	1635 NW Deerfern	0.106	ND	200.8
04633891	11/29/06	223 NE 22nd Ave	ND	ND	200.8
04633892	11/3/06	355 NE Oak St	0.273	ND	200.8
04633893	11/30/06	1921 NW 40th Ave	0.282	ND	200.8
04633894	11/30/06	2450 NW 15th Cir	0.362	0.002	200.8
04633895	11/30/06	2822 NW 9th Ave	0.023	ND	200.8
04633896	11/30/06	1925 NW 30th Cir	0.591	ND	200.8
04633897	12/1/06	5005 NW Sierra	0.283	ND	200.8

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

AL (Federal Action Level): 0.015mg/L for Lead and 1.3 mg/L for Copper. If the compounds detected at concentration in excess of this level, contact your regional DOH office for further information.

ND (Not Detected): Indicates that the compound was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): Indicates that this compound was not analyzed.

Comments:

FORM: Pb&Cu

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab@wa-net.co

06-15702
33867 - 33897

CHAIN OF CUSTODY REPORT 06AL0954

CLIENT:

INVOICE TO: ADDY LAB

REPORT TO:
ADDRESS: ADDY LAB

PHONE: FAX:

P.O. NUMBER:

PROJECT NAME: CITY of COMOS
PROJECT NUMBER:
SAMPLED BY:

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: 10 | 7 | 5 | 4 | 3 | 2 | 1 | <1 (STD. 5)
Petroleum Hydrocarbon Analyses: 5 | 4 | 3 | 2 | 1 | <1 (STD. 5)
OTHER — Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

REQUESTED ANALYSES: Pb/Cd

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Pb/Cd	MATRIX (W, S, O)	# OF CONT.	COMMENTS
1	1. 638 SE POLK	8:45 / 11.30.06	X	W		
2	2. 777 SE POLK ST	10:15 / 11-30-06	X			
3	3. 623 SE TAMPA ST	4:30 / 11-30-06	X			
4	4. 1234 NE 10TH AVE	9:00 / "	X			
5	5. 2232 NE 3RD LP	10:00 / "	X			
6	6. 103 NE 14TH AVE	5:30 / 12/1/06	X			
7	7. 5220 NW 11TH CIR	7:00 / "	X			
8	8. 2538 NW IVY ST	14:30 / 11-29-06	X			
9	9. 2021 NW WALDEN	7:20 / 11-30-06	X			
10	10. 2826 NW LOCUST	10:30 / 11-30-06	X			
11	11. 2540 NW LOCUST	8:30 / 11-30-06	X			
12	12. 1811 NW HILL ST	10:20 / "	X			
13	13. 850 NW VIEW DR	18:00 / "	X			
14						

RELINQUISHED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: E Newman DATE: 12/1/06
PRINT NAME: E NEWMAN FIRM: TIME: 1100

TEMP: 14°C

RELINQUISHED BY: E Newman DATE: 12/1/06
PRINT NAME: E NEWMAN FIRM: TIME: 1700

RECEIVED BY: DATE: 12/5/06
PRINT NAME: C DeVeiteo FIRM: Edge TIME: 1200

PAGE 1 OF 3

REV 06/04

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab@wa-net.com

06-15702
33867 - 33897

CHAIN OF CUSTODY REPORT 06AL0954

CLIENT:

REPORT TO: ADDY LAB
ADDRESS:

PHONE: FAX:

INVOICE TO: ADDY LAB

P.O. NUMBER:

PROJECT NAME: City of Camas
PROJECT NUMBER:
SAMPLED BY:

TURNAROUND REQUEST in Business Days*
Organic & Inorganic Analyses: 10 | 7 | 5 | 4 | 3 | 2 | 1 | <1
STD.
Petroleum Hydrocarbon Analyses: 5 | 4 | 3 | 2 | 1 | <1
STD.
OTHER Please Specify
*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Pb/Cu	MATRIX (W, S, O)	# OF CONT.	COMMENTS
15	1. 429 NW VIEW RIDGE	11.30.06 6:00	X	W		
16	2. 2127 NW COUCH	" 9:30	X			
17	3. 1429 NW ASH ST	" 9:05	X			
18	4. 2534 NW IVY ST	" 7:30	X			
19	5. 2708 NW IVY ST	12.1.06 5:00	X			
20	6. 544 NW VIEW RD	11.30.06 7:55	X			
21	7. 1035 NW VIEW RIDGE	11.29.06 8:15	X			
23	8. 2209 NW DOUGLAS	11.30.06 8:17	X			
25	9. 2816 NW 11TH AVE	12.1.06 7:00	X			
26	10. 2606 NW 15TH CIR	11.30.06 6:00	X			
27	11. 1035 NW DEER FERN	" 11:35	X			
29	12. 223 NE 22ND AVE	11.29.06 6:05	X			
33	13. 335 NE OAK ST	11.30.06 8:00	X			

RELINQUISHED BY: Ed Senecal DATE: 12-1-06
PRINT NAME: ED Senecal FIRM: City of Camas TIME: 10:53 AM

RECEIVED BY: Melissa Newman DATE: 12/1/06 TEMP: 14°C 10°C
PRINT NAME: E NEWMAN FIRM: TIME: 1120

RELINQUISHED BY: Melissa Newman DATE: 12/1/06
PRINT NAME: E NEWMAN FIRM: TIME: 1700

RECEIVED BY: DATE: 12/6/06 PAGE 2 OF 3
PRINT NAME: C DeVeiteo FIRM: Edge TIME: 1200

REV 06/04

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab@wa-net.com

06-15702
33867 - 33897

CHAIN OF CUSTODY REPORT 06AL0954

CLIENT:

REPORT TO:

ADDRESS: ADDY LAB

PHONE: FAX:

INVOICE TO: ADDY LAB

P.O. NUMBER:

PROJECT NAME: City of Camas

PROJECT NUMBER:

SAMPLED BY:

TURNAROUND REQUEST in Business Days*

Organic & Inorganic Analyses: 10 | 7 | 5 | 4 | 3 | 2 | 1 | <1 (STD.)

Petroleum Hydrocarbon Analyses: 5 | 4 | 3 | 2 | 1 | <1 (STD.)

OTHER Please Specify

*Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	REQUESTED ANALYSES: Ph/Cal	MATRIX (W, S, O)	# OF CONT.	COMMENTS
31	1. 1921 NW 40TH AVE	11.30.06 6:00	X	W		
32	2. 2450 NW 15TH Cir	" 11:30	X			
33	3. 2822 NW 9TH AVE	" 5:15	X			
34	4. 1925 NW 34TH Cir.	" 7:00	X			
35	5. 2205 NW Sierra	12/1/06 7:00	X			
	6.					
	7.					
	8.					
	9.					
	10.					
	11.					
	12.					
	13.					

RELINQUISHED BY: DATE:

PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE: 12/1/06

PRINT NAME: E NEWMAN FIRM: TIME: 1100

TEMP: 14°C 10°C

RELINQUISHED BY: DATE: 12/1/06

PRINT NAME: E NEWMAN FIRM: TIME: 1700

RECEIVED BY: DATE: 12/5/06

PRINT NAME: CDeVeiteo FIRM: Edge TIME: 1200

PAGE 3 OF 3

REV 06/04

Appendix K

Inorganic Compound Test Results

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 4/18/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **108002**	System Name: **City of Camas - Wells 10,11,12**
Lab Number **14490244**	County: Clark
Sample Location Hose Bib	Source Numbers: S-13 S-14 S-15 ____ ____
	Date Received: (MM/DD/YY) 4/18/07
	Date Analyzed: (MM/DD/YY) 4/18/07; 4/19/07; 4/20/07
	Date Reported: (MM/DD/YY) 4/23/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☒ Post-treatment/Raw ☐ Unknown
Sample Composition: Check appropriate box ☐ S - Single Source ☒ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) ____ Phone: ____ Comments: 07AL0309; 14470075
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: invoice

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**1.06**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.01**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.91**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.31**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**5.14**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**3.70**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**< 5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**144**	uS/cm	10	700	700	not exceeded	EPA 120.1	DKD

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: All analytes are within acceptable EPA limits.

Reviewed by: TAN Date: 4/24/07

State County (Customer) File

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Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-04688
Project: 108002 Camas

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number: 96 - Blended Sample
Multiple Sources: 131415
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: Hose bib
County: Clark

Sample Number: Wells 10-11-12
Lab Number: 04610702
Collect Date: 4/18/2007
Date Received: 4/19/2007
Report Date: 4/25/2007
Sampled By: Nelson
Sampler Phone: 360-817-1563
Supervisor: JH

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	0.00049	mg/L	0.0002	0.002	0.002	so	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	bj	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bj	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	15.6	mg/L	5.0			bj	200.7	
15	HARDNESS	35.6	mg/L	10			bj	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 4/18/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **108002**	System Name: **City of Camas - Wells 7-8**
Lab Number **14490245**	County: Clark
Sample Location Hose Bib	Source Numbers: S-08 S-09 ____ ____ ____
	Date Received: (MM/DD/YY) 4/18/07
	Date Analyzed: (MM/DD/YY) 4/18/07; 4/19/07; 4/20/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Date Reported: (MM/DD/YY) 4/23/07 Sample Type: (Check one) ☐ Pre-treatment/Raw ☒ Post-treatment/Raw ☐ Unknown
Sample Composition: Check appropriate box ☐ S - Single Source ☒ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) _____ Phone: _____ Comments: 07AL0309; 14470076
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: invoice

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**1.05**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.01**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.44**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.36**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**3.36**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**2.26**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**< 5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**108**	uS/cm	10	700	700	not exceeded	EPA 120.1	DKD

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: All analytes are within acceptable EPA limits.

Reviewed by: TRW Date: 4/24/07

State County (Customer) File

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-04688
Project: 108002 Camas

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number: 96 - Blended Sample
Multiple Sources: 0809
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: Hose bib
County: Clark

Sample Number: Wells 7-8
Lab Number: 04610703
Collect Date: 4/18/2007
Date Received: 4/19/2007
Report Date: 4/25/2007
Sampled By: Nelson
Sampler Phone: 360-817-1563
Supervisor: JA

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	0.00099	mg/L	0.0002	0.002	0.002	so	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	bi	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bi	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	11.8	mg/L	5.0			bi	200.7	
15	HARDNESS	25.0	mg/L	10			bi	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 3/28/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **10800**	System Name: **City of Camas - 10 Well**
Lab Number **14490184**	County: Clark
Sample Location	Source Numbers: S-15
	Date Received: (MM/DD/YY) 3/28/07
	Date Analyzed: (MM/DD/YY) 3/28/07
	Date Reported: (MM/DD/YY) 3/29/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☒ Post-treatment/Raw ☐ Unknown
Sample Composition: Check appropriate box ☒ S - Single Source ☐ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0237; 14470060
Send Report to: Mike Nelson 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**1.08**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.58**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.50**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**4.32**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**2.49**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**< 5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**105.0**	uS/cm	10	700	700	not exceeded	EPA 120.1	DKD

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant levels in drinking water for all analytes.

Reviewed by: Carl L Addy Date: 3/29/07

State County (Customer) File

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Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-03767
Project: City of Camas IOCTOT

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number: 15
Multiple Sources:
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: Well Field #10 Running
County: Clark

Sample Number: 108002 S15
Lab Number: 04608575
Collect Date: 3/28/2007
Date Received: 3/30/2007
Report Date: 4/9/2007
Sampled By: Mike Nelson
Sampler Phone: 360-817-1563
Supervisor:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	so	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	bi	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bi	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	13.2	mg/L	5.0			bi	200.7	
15	HARDNESS	25.2	mg/L	10			bi	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): Indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): Indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 3/28/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **10800**	System Name: **City of Camas - Cl2 Plant**
Lab Number **14490182**	County: Clark
Sample Location	Source Numbers: SO1 SO2 96
	Date Received: (MM/DD/YY) 3/28/07
	Date Analyzed: (MM/DD/YY) 3/28/07
	Date Reported: (MM/DD/YY) 3/29/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☒ Pre-treatment/Raw ☐ Post-treatment/Raw ☐ Unknown
Sample Composition: Check appropriate box ☐ S - Single Source ☒ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0237; 14470058
Send Report to: Mike Nelson 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**ND, <0.10**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.28**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.88**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**1.42**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**0.56**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**23.4**	uS/cm	10	700	700	not exceeded	EPA 120.1	DKD

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant levels in drinking water for all analytes.

Reviewed by: Carl K. Addy Date: 3-29-07

State County (Customer) File

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Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-03767
Project: City of Camas IOCTOT

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number: 96 - Blended Sample
Multiple Sources: 0102
Sample Type: B - Before treatment
Sample Purpose: C - Compliance
Sample Location: CL2 Plant
County: Clark

Sample Number: 108002 S01/S02
Lab Number: 04608573
Collect Date: 3/28/2007
Date Received: 3/30/2007
Report Date: 4/9/2007
Sampled By: Mike Nelson
Sampler Phone: 360-817-1563
Supervisor: [illegible]

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	so	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	bj	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bj	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	ND	mg/L	5.0			bj	200.7	
15	HARDNESS	ND	mg/L	10			bj	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 3/28/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **10800**	System Name **City of Camas - Well Field Lot 11**
Lab Number **14490183**	County: Clark
Sample Location	Source Numbers: ~~S-2~~ 96 S13 S16
	Date Received: (MM/DD/YY) 3/28/07
	Date Analyzed: (MM/DD/YY) 3/28/07
	Date Reported: (MM/DD/YY) 3/29/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☒ Post-treatment/Raw ☐ Unknown
Sample Composition: Check appropriate box ☐ S - Single Source ☒ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0237; 14470059
Send Report to: Mike Nelson 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**1.01**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.73**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.38**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**4.62**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**2.81**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**< 5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**110.8**	uS/cm	10	700	700	not exceeded	EPA 120.1	DKD

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant levels in drinking water for all analytes.

Reviewed by: Carl L Cuddy Date: 3-29-07

State County (Customer) File

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Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-03767
Project: City of Camas IOCTOT

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number: 96 - Blended Sample
Multiple Sources: 1315
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: Well Field #10 & 11 Running
County: Clark

Sample Number: 108002 S13, S15
Lab Number: 04608574
Collect Date: 3/28/2007
Date Received: 3/30/2007
Report Date: 4/9/2007
Sampled By: Mike Nelson
Sampler Phone: 360-817-1563
Supervisor: JM

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	so	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	bl	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bl	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	14.0	mg/L	5.0			bl	200.7	
15	HARDNESS	28.4	mg/L	10			bl	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 4/11/07	System Group Type (Circle one) (A) B Other: Specify
Water System ID No. **00504P**	System Name: **City of Camas - Boulder - Jones Crk.**
Lab Number **14490225**	County: Clark
Sample Location Boulder - Jones Creek	Source Numbers: SO1 SO2 ____ ____ ____
	Date Received: (MM/DD/YY) 4/11/07
	Date Analyzed: (MM/DD/YY) 4/11/07; 4/12/07; 4/13/07
	Date Reported: (MM/DD/YY) 4/16/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☐ Post-treatment/Raw ☒ Unknown
Sample Composition: Check appropriate box ☐ S - Single Source ☒ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) ____ Phone: ____ Comments: 07AL0290; 14470066
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: invoice

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**ND**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.25**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.87**	NTU	0.1	1.0	1.0	not exceeded	EPA 180.1	DKD

EPA Regulated (Secondary)

0021	Chloride	**1.44**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**0.55**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**< 5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016								EPA 120.1	

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: All analytes are within acceptable EPA limits.

Reviewed by: TAN Date: 4/16/07

State County (Customer) File

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 6/06/07	System Group Type (Circle one) A B Other: Specify
Water System ID No. **108002**	System Name: **City of Camas - Well #9**
Lab Number **14490405**	County: Clark
Sample Location Well #9	Source Numbers: S11
	Date Received: (MM/DD/YY) 6/06/07
	Date Analyzed: (MM/DD/YY) 6/06/07; 6/07/07; 6/08/07
	Date Reported: (MM/DD/YY) 6/11/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☐ Post-treatment/Raw ☒ Unknown
Sample Composition: Check appropriate box ☒ S - Single Source ☐ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0468; 14470126
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**0.71**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.44**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.20**	NTU	0.1	0.1	1.0	exceeded	EPA 180.1	CLA

EPA Regulated (Secondary)

0021	Chloride	**2.57**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**1.06**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**<5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**242**	uS/cm	10	700	700	not exceeded	EPA 120.1	CLA

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant level for all analytes in drinking water.

Reviewed by: DA Nelson Date: 6/11/07

State County Customer File

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-07180
Project: 108002 Camas

System Name: CITY OF CAMAS
System ID Number: 108002
DOH Source Number: 11
Multiple Sources:
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: #9 well sample tap
County: Clark

Sample Number:
Lab Number: 04616610
Collect Date: 6/6/2007
Date Received: 6/7/2007
Report Date: 6/20/2007
Sampled By: Mike Nelson
Sampler Phone: 817-1563
Supervisor:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	lih	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	kjv	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bj	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	9.45	mg/L	5.0			bj	200.7	
15	HARDNESS	107	mg/L	10			bj	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

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INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-07180
Project: 108002 Camas

System Name: CITY OF CAMAS
System ID Number: 108002
DOH Source Number: 06
Multiple Sources:
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: #5 well
County: Clark

Sample Number:
Lab Number: 04616608
Collect Date: 6/6/2007
Date Received: 6/7/2007
Report Date: 6/20/2007
Sampled By: Mike Nelson
Sampler Phone: 817-1563
Supervisor:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	ljh	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	klv	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bj	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	29.5	mg/L	5.0			bj	200.7	
15	HARDNESS	54.9	mg/L	10			bj	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	—
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 6/06/07	System Group Type (Circle one) A B Other: Specify
Water System ID No. **108002**	System Name: **City of Camas - Well #5**
Lab Number **14490403**	County: Clark
Sample Location Well #5	Source Numbers: SO6
	Date Received: (MM/DD/YY) 6/06/07
	Date Analyzed: (MM/DD/YY) 6/06/07; 6/07/07; 6/08/07
	Date Reported: (MM/DD/YY) 6/11/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Sample Type: (Check one) ☐ Pre-treatment/Raw ☐ Post-treatment/Raw ☒ Unknown
Sample Composition: Check appropriate box ☒ S - Single Source ☐ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0468; 14470124
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**0.76**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**1.68**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.31**	NTU	0.1	0.1	1.0	exceeded	EPA 180.1	CLA

EPA Regulated (Secondary)

0021	Chloride	**4.16**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**5.91**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**<5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**239**	uS/cm	10	700	700	not exceeded	EPA 120.1	CLA

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant level for all analytes in drinking water.

Reviewed by: [signature] Date: 6/11/07

State County Customer File

2517 E. Evergreen Blvd.
Vancouver, WA. 98661

AddyLab

Phone: 360-750-0055
Fax: 360-750-0057
Email: addylab.wa-net.com

INORGANIC CHEMICALS (IOC) REPORT

Date Collected (MM/DD/YY) 6/06/07	System Group Type (Circle one) A B Other: Specify
Water System ID No. **108002**	System Name: **City of Camas - Well #6**
Lab Number **14490404**	County: Clark
Sample Location Well #6	Source Numbers: S07
	Date Received: (MM/DD/YY) 6/06/07
	Date Analyzed: (MM/DD/YY) 6/06/07; 6/07/07; 6/08/07
Sample Purpose: Check appropriate box ☒ RC - Routine Compliance ☐ C - Confirmation ☐ I - Investigative ☐ O - Other (specify)	Date Reported: (MM/DD/YY) 6/11/07 Sample Type: (Check one) ☐ Pre-treatment/Raw ☐ Post-treatment/Raw ☒ Unknown
Sample Composition: Check appropriate box ☒ S - Single Source ☐ B - Blended (List Multiple Source Numbers in Source #s field) ☐ C - Composite (Specify in Comments field) ☐ D - Distribution sample	Sample Collected by: (Name) Phone: Comments: 07AL0468; 14470125
Send Report to: City of Camas 1620 SE 8th Ave. Camas, WA 98607	Bill to: Bill

EPA/State Regulated

DOH #	ANALYTE	RESULTS	UNITS	SRL	TRIGGER	MCL	MCL Exceeded?	Method	Analyst's Initials
0019	Fluoride	**0.68**	mg/L	0.2	2.0	4.0	not exceeded	EPA 300.0	DKD
0114	Nitrite	**ND, <0.10**	mg/L	0.5	0.5	1.0	not exceeded	EPA 300.0	DKD
0020	Nitrate	**0.71**	mg/L	0.5	5.0	10.0	not exceeded	EPA 300.0	DKD
0017	Turbidity	**0.28**	NTU	0.1	0.1	1.0	exceeded	EPA 180.1	CLA

EPA Regulated (Secondary)

0021	Chloride	**2.30**	mg/L	20	250	250	not exceeded	EPA 300.0	DKD
0022	Sulfate	**5.62**	mg/L	10	250	250	not exceeded	EPA 300.0	DKD
0018	Color	**<5**	std color units	5	15	15	not exceeded	EPA 110.2	DKD
0016	Conductivity	**163**	uS/cm	10	700	700	not exceeded	EPA 120.1	CLA

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.
SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).
MCL (maximum contaminant level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.
NA (Not Analyzed): in the results column indicates this compound was not included in the current analysis.
ND (Not Detected): in the results column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.
< (0.001) : indicates the compound was not detected in the sample at or above the concentration indicated.
J The result is an estimate as it is greater than the method detection limit but less than the practical reporting limit.

Comments: Your test results are below the EPA maximum contaminant level for all analytes in drinking water.

Reviewed by: DN Date: 7-6/a/07

State County (Customer) File

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Bellingham WA — *Microbiology* | 805 Orchard Dr Suite 4 - 98225
360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-07180
Project: 108002 Camas

System Name: CITY OF CAMAS
System ID Number: 108002
DOH Source Number: 07
Multiple Sources:
Sample Type: A - After treatment
Sample Purpose: C - Compliance
Sample Location: #6 well sample tap
County: Clark

Sample Number:
Lab Number: 04616609
Collect Date: 6/6/2007
Date Received: 6/7/2007
Report Date: 6/20/2007
Sampled By: Mike Nelson
Sampler Phone: 817-1563
Supervisor:

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	EPA Regulated								
4	ARSENIC	ND	mg/L	0.002	0.010	0.010	mvp	200.8	
5	BARIUM	ND	mg/L	0.100	2	2	mvp	200.8	
6	CADMIUM	ND	mg/L	0.002	0.005	0.005	mvp	200.8	
7	CHROMIUM	ND	mg/L	0.010	0.1	0.1	mvp	200.8	
11	MERCURY	ND	mg/L	0.0002	0.002	0.002	ljh	245.1	
12	SELENIUM	ND	mg/L	0.005	0.05	0.05	mvp	200.8	
110	BERYLLIUM	ND	mg/L	0.003	0.004	0.004	mvp	200.8	
111	NICKEL	ND	mg/L	0.040	0.1	0.1	mvp	200.8	
112	ANTIMONY	ND	mg/L	0.005	0.006	0.006	mvp	200.8	
113	THALLIUM	ND	mg/L	0.002	0.002	0.002	mvp	200.8	
116	CYANIDE, FREE	ND	mg/L	0.050	0.2	0.2	klv	SM4500-CN F	
	EPA Regulated (Secondary)								
8	IRON	ND	mg/L	0.100	0.3	0.3	bj	200.7	
10	MANGANESE	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
13	SILVER	ND	mg/L	0.010	0.05	0.05	mvp	200.8	
24	ZINC	ND	mg/L	0.200	5	5	mvp	200.8	
	State Regulated								
14	SODIUM	16.3	mg/L	5.0			bj	200.7	
15	HARDNESS	42.8	mg/L	10			bj	200.7	
	State Unregulated								
9	LEAD	ND	mg/L	0.002		0.015	mvp	200.8	
23	COPPER	ND	mg/L	0.020		1.3	mvp	200.8	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

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Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

INORGANIC COMPOUNDS (IOC) REPORT

Client Name: Addy Lab
2517 E Evergreen Blvd
Vancouver, WA 98661

Reference Number: 07-01943
Project: City of Camas

System Name: CAMAS MUNICIPAL WATER-SEWER SYSTEM
System ID Number: 108002
DOH Source Number:
Multiple Sources:
Sample Type: A - After treatment
Sample Purpose: Investigative or Other
Sample Location: Well field
County: Clark

Sample Number: City of Camas
Lab Number: 04604331
Collect Date: 2/14/2007
Date Received: 2/16/2007
Report Date: 2/21/2007
Sampled By:
Sampler Phone:
Supervisor: JM

DOH#	ANALYTES	RESULTS	UNITS	SRL	Trigger	MCL	Analyst	METHOD	COMMENT
	State Regulated								
15	HARDNESS	33.4	mg/L	3.30			bj	200.7	

NOTES:

SRL (State Reporting Level): indicates the minimum reporting level required by the Washington Department of Health (DOH).

MCL (Maximum Contaminant Level) maximum permissible level of a contaminant in water established by EPA; Federal Action Levels are 0.015 mg/L for Lead and 1.3 mg/L for Copper. Sodium has a recommended limit of 20 mg/L. A blank MCL value indicates a level is not currently established.

Trigger Level: DOH Drinking Water Response level. Systems with compounds detected in excess of this level are required to take additional samples. Contact your regional DOH office.

ND (Not Detected): indicates that the parameter was not detected above the Specified Reporting Limit (SRL).

NA (Not Analyzed): indicates that this parameter was not analyzed.

Comments:

FORM: IOC_ST

Appendix L

Water Modeling Results

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J-5115	9.13	617	674.7	25
J3-570	9.13	448	505.7	25
J2-206	6.05	389	446.81	25.05
J2-205	6.05	385	445.28	26.12
J3-929	9.13	752	816.63	28
J3-930	9.13	746	816.53	30.56
J3-928	9.13	746	816.81	30.68
J3-932	9.13	746	817.25	30.87
J-5116	6.05	445	517.31	31.33
J-517	10.48	350	422.72	31.51
J3-533	7.2	744	817.83	31.99
J3-373	9.13	750	824.33	32.21
J3-372	9.13	750	824.66	32.35
J3-370	9.13	751	826.44	32.69
J3-853	7.2	742	818.33	33.07
J2-555	6.05	370	446.37	33.09
J2-207	6.05	369	445.61	33.19
J4-424	6.05	344	422.73	34.11
J3-1020	0	745	824.2	34.32
J3-855	7.2	742	821.32	34.37
J3-606	7.2	740	820.42	34.85
J3-367	9.13	749	829.85	35.03
J3-377	9.13	740	821.09	35.14
J3-366	9.13	749	830.12	35.15
J3-776	9.13	610	692.41	35.71
J3-775	9.13	610	692.41	35.71
J4-690	11.45	441	525.01	36.4
J3-376	9.13	736	820.11	36.45
J2-669	6.05	338	422.65	36.68
J1-157	7.29	220	305.16	36.9
J3-354	9.13	738	823.92	37.23
J3-355	9.13	738	823.95	37.24
J1-159	7.29	219	305.09	37.3
J1-158	22.91	219	305.1	37.31
J3-371	9.13	739	825.11	37.31
J2-659	6.05	336	422.52	37.49
J3-787	9.13	419	505.57	37.51
J3-933	9.13	732	818.58	37.51
J3-564	9.13	605	691.91	37.66
J3-369	9.13	740	827.64	37.97
J3-368	9.13	740	827.64	37.98
J3-360	9.13	737	824.66	37.98
J3-935	9.13	736	824.34	38.28
J1-160	7.29	215	305.09	39.03
J1-794	7.29	215	305.1	39.04
J3-374	9.13	733	823.71	39.31
J4-691	11.45	434	525.01	39.43
J3-358	9.13	732	824.17	39.94
J1-153	7.29	213	305.2	39.95
J1-811	7.29	213	305.31	40
J1-155	10.09	213	305.31	40
J1-154	10.09	213	305.31	40
J3-774	9.13	600	692.36	40.02
J3-931	9.13	724	816.41	40.04
J3-356	9.13	731	823.7	40.17
J4-425	6.05	330	422.84	40.23
J3-936	9.13	731	824.18	40.38
J3-562	9.13	730	823.45	40.49
J3-938	9.13	730	824.18	40.81
J3-352	9.13	729	823.45	40.93
J3-777	9.13	598	692.47	40.94
J3-402	9.13	559	653.71	41.04
J5-842	7.36	440	534.82	41.08
J3-362	9.13	732	826.93	41.13
J1-163	7.29	210	305.09	41.2
J1-152	22.91	210	305.11	41.21
J1-145	7.29	210	305.19	41.25
J3-397	9.13	662	758.85	41.96
J1-151	7.29	208	305.14	42.09
J1-793	7.29	207	305.12	42.51
J3-927	9.13	718	816.31	42.6
J3-353	9.13	725	823.79	42.81
J-529	407.2	723	821.87	42.84
J3-375	9.13	724	823.15	42.96
J4-756	11.45	428	527.61	43.16
J3-357	9.13	724	823.75	43.22
J3-778	9.13	592	692.47	43.53
J2-654	6.05	290	390.74	43.65
J3-347	9.13	722	822.89	43.72
J3-345	9.13	721	822.55	44
J1-123	7.29	201	302.86	44.14
J3-348	9.13	721	822.91	44.16
J1-164	7.29	203	305.08	44.23
J3-940	9.13	722	824.41	44.37
J2-833	6.05	320	422.7	44.5
J5-832	6.05	320	422.7	44.5
J2-208	6.05	343	446.26	44.74
J3-709	9.13	655	758.85	45
J-5123	9.13	554	657.85	45
J-5131	9.13	576	679.85	45
J1-162	7.29	201	305.1	45.11
J1-150	7.29	201	305.17	45.14
J5-638	7.36	430	534.59	45.32
J-5109	6.05	412	517.31	45.63
J4-700	9.13	400	505.66	45.78
J3-571	9.13	400	505.67	45.78
J1-148	7.29	199	305.13	45.99
J2-190	6.05	340	446.89	46.31
J1-149	22.91	198	305.12	46.42
J2-204	6.05	337	445	46.8
J3-941	9.13	716	824.41	46.97
J5-639	7.36	426	534.6	47.06
J3-378	9.13	715	823.66	47.08
J3-351	9.13	713	823.15	47.73
J5-841	7.36	424	534.63	47.94
J3-297	9.13	633	745.08	48.57
J3-506	7.2	541	653.72	48.84
J3-383	9.13	710	823.67	49.25
J3-939	9.13	710	823.8	49.31
J5-640	7.36	420	534.6	49.66
J3-343	9.13	706	820.87	49.77
J1-147	7.29	190	305.16	49.9
J3-708	9.13	634	749.39	50
J3-580	9.13	588	703.39	50
J2-183	6.05	331	446.47	50.03
J3-346	9.13	707	822.55	50.07
J3-334	9.13	705	820.83	50.19
J-532	7.2	705	820.85	50.2
J3-329	9.13	705	820.94	50.24
J2-670	6.05	306	422.47	50.47
J3-344	9.13	705	821.76	50.59
J3-917	9.13	575	692.52	50.92
J-5118	9.13	575	692.7	51
J-5117	9.13	575	692.72	51.01
J3-333	9.13	702	820.4	51.3
J3-937	9.13	705	823.8	51.48
J3-385	9.13	702	821.24	51.67
J3-332	9.13	701	820.4	51.74
J3-324	9.13	701	820.46	51.76
J3-934	9.13	704	823.71	51.87
J-5129	9.13	560	679.84	51.93
J3-387	9.13	701	820.85	51.93
J2-554	6.05	325	445.34	52.14
J3-712	9.13	650	772.32	53
J2-660	6.05	300	422.48	53.07
J2-662	6.05	300	422.49	53.08
J3-994	9.13	383	505.57	53.11
J3-995	9.13	383	505.57	53.11
J5-637	7.36	411	534.68	53.59
J1-146	7.29	181	305.19	53.81
J3-790	9.13	700	824.64	54.01
J3-381	9.13	699	823.67	54.02
J4-843	6.05	298	422.8	54.07
J-5126	9.13	555	679.83	54.09
J3-325	9.13	695	820.46	54.36
J3-905	9.13	566	691.8	54.51
J3-300	9.13	621	746.95	54.57
J3-330	9.13	694	820.27	54.71
J3-380	9.13	697	823.66	54.88
J3-401	9.13	527	653.72	54.91
J4-622	11.45	400	526.74	54.92
J-5110	6.05	390	517.31	55.16

J3-942	9.13	696	823.67	55.32	J3-748	11.45	450	598.44	64.32
J4-414	11.45	401	528.84	55.39	J3-951	9.13	675	823.66	64.42
J3-331	9.13	692	820.14	55.52	J4-410	11.45	380	528.88	64.51
J3-323	9.13	692	820.21	55.56	J3-906	9.13	542	691.8	64.91
J2-671	6.05	294	422.47	55.66	J-518	6.05	273	423.01	65
J4-619	11.45	398	526.62	55.73	J-5087	9.13	564	714.92	65.39
J2-191	6.05	317	445.67	55.75	J3-599	9.13	664	815	65.43
J-5125	9.13	550	679.83	56.26	J2-838	6.05	295	446.4	65.6
J3-335	9.13	690	820.4	56.5	J1-106	7.29	153	304.64	65.71
J3-755	11.45	468	598.45	56.52	J1-858	7.29	153	304.65	65.71
J3-386	9.13	690	820.85	56.7	J3-876	9.13	540	691.81	65.78
J4-740	322.24	395	526.08	56.8	J3-392	9.13	669	820.81	65.78
J2-181	6.05	315	446.28	56.88	J4-409	11.45	377	528.91	65.82
J4-694	11.45	393	525.01	57.2	J3-920	9.13	540	692.31	66
J3-326	9.13	688	820.21	57.29	J3-919	9.13	540	692.31	66
J-5095	6.05	290	422.46	57.4	J1-85	7.29	152	304.58	66.11
J3-759	11.45	395	527.6	57.46	J3-361	9.13	672	824.63	66.14
J5-633	7.36	402	534.78	57.53	J1-105	7.29	152	304.64	66.14
J3-713	9.13	639	771.96	57.61	J-5086	9.13	562	714.92	66.26
J3-359	9.13	690	823.46	57.83	J3-314	9.13	667	820.3	66.42
J-5085	9.13	535	668.86	58	J3-382	9.13	670	823.64	66.57
J3-781	9.13	560	694.54	58.3	J3-598	9.13	660	813.75	66.62
J3-591	9.13	562	696.73	58.38	J3-785	9.13	537	691.06	66.75
J4-620	11.45	392	526.75	58.39	J3-780	9.13	540	694.54	66.96
J1-108	7.29	170	304.77	58.4	J3-561	9.13	665	819.55	66.97
J1-107	7.29	170	304.77	58.4	J4-796	11.45	372	526.76	67.06
J5-634	7.36	400	535.05	58.52	J4-615	11.45	372	526.84	67.09
J-5089	9.13	580	715.08	58.53	J4-411	11.45	374	528.86	67.1
J1-161	7.29	170	305.14	58.56	J4-696	11.45	370	525.04	67.18
J3-316	9.13	685	820.74	58.81	J3-789	9.13	670	825.47	67.37
J3-779	9.13	557	692.9	58.89	J3-715	9.13	616	771.6	67.42
J4-738	11.45	390	526.02	58.94	J-513	9.13	603	758.84	67.52
J3-388	9.13	684	820.73	59.24	J2-182	6.05	290	446.15	67.66
J3-865	11.45	390	526.74	59.25	J2-230	6.05	290	446.36	67.75
J3-587	9.13	560	696.87	59.3	J3-960	9.13	615	771.54	67.83
J3-954	9.13	686	823.61	59.63	J3-959	9.13	615	771.54	67.83
J-853	0	685	822.86	59.74	J4-419	11.45	372	528.55	67.83
J-516	9.13	527	665.47	60	J-5046	9.13	540	696.94	68
J3-703	11.45	460	598.47	60	J3-973	6.05	265	422.72	68.34
J3-384	9.13	685	823.59	60.05	J3-339	9.13	661	819.54	68.7
J4-618	11.45	388	526.75	60.12	J4-418	11.45	370	528.59	68.72
J3-391	9.13	682	820.83	60.16	J4-417	11.45	370	528.66	68.75
J3-327	9.13	681	820.21	60.32	J3-786	9.13	532	691.05	68.92
J3-328	9.13	681	820.46	60.43	J3-600	9.13	655	814.19	68.98
J2-664	6.05	283	422.7	60.53	J3-753	11.45	439	598.45	69.09
J2-184	6.05	306	446.25	60.77	J2-702	6.05	263	422.47	69.1
J3-315	9.13	680	820.3	60.79	J3-318	9.13	660	819.61	69.16
J3-918	9.13	552	692.37	60.82	J1-109	7.29	145	304.64	69.17
J3-915	9.13	674	815.56	61.34	J4-616	11.45	367	526.84	69.26
J4-750	11.45	386	527.61	61.36	J3-272	9.13	505	665.47	69.53
J3-322	9.13	678	819.69	61.39	J2-656	6.05	262	422.47	69.53
J3-904	9.13	550	691.8	61.44	J2-657	6.05	262	422.48	69.54
J3-527	12.96	679	820.82	61.45	J4-752	11.45	367	527.61	69.59
J3-299	9.13	603	744.93	61.5	J1-111	7.29	144	304.64	69.61
J4-408	11.45	386	528.31	61.66	J3-568	9.13	530	691	69.76
J3-349	9.13	680	822.4	61.7	J4-420	11.45	367	528.38	69.93
J3-389	9.13	677	820.68	62.26	J3-956	9.13	610	771.44	69.95
J3-714	9.13	628	771.7	62.27	J2-661	6.05	261	422.49	69.97
J4-844	6.05	279	422.79	62.31	J3-916	9.13	654	815.58	70.01
J4-617	11.45	383	526.8	62.31	J3-597	9.13	651	812.61	70.03
J3-338	9.13	675	819.66	62.68	J3-871	9.13	530	691.75	70.09
J4-434	11.45	383	527.83	62.76	J3-907	9.13	530	691.8	70.11
J3-336	9.13	675	820.05	62.85	J3-390	9.13	659	820.83	70.12
J2-189	6.05	301	446.15	62.9	J3-1005	7.36	380	541.9	70.15
J3-993	9.13	570	715.4	63	J3-393	9.13	658	820.67	70.49
J3-826	7.2	670	815.61	63.09	J4-621	11.45	364	526.79	70.54
J3-784	9.13	545	691.13	63.32	J4-695	11.45	362	525.04	70.64
J3-716	9.13	625	771.57	63.51	J3-321	9.13	656	819.49	70.84
J3-379	9.13	677	823.66	63.55	J3-1007	7.36	378	541.9	71.02
J3-589	9.13	553	700.03	63.71	J3-567	9.13	527	691.29	71.19
J-5088	9.13	568	715.08	63.73	J3-394	9.13	656	820.67	71.35
J3-758	11.45	451	598.46	63.89	J4-625	11.45	360	524.99	71.49
J4-749	11.45	380	527.61	63.96	J2-180	6.05	281	446.26	71.61
J3-953	9.13	676	823.62	63.96	J3-596	9.13	647	812.61	71.76
J4-412	11.45	381	528.85	64.06	J3-311	9.13	655	820.71	71.8
J1-527	12.96	220	368.14	64.19	J4-436	11.45	362	527.81	71.85
J4-610	11.45	361	526.87	71.87	J4-762	11.45	349	527.6	77.39

J2-197	6.05	279	445.03	71.94	J-5083	9.13	490	668.75	77.45
J4-773	11.45	361	527.64	72.2	J3-902	9.13	512	690.95	77.54
J1-110	7.29	138	304.64	72.21	J4-746	11.45	450	629.3	77.69
J4-439	11.45	361	527.68	72.22	J-5120	9.13	535	714.68	77.86
J3-273	9.13	527	693.69	72.23	J2-188	6.05	266	445.7	77.87
J4-416	11.45	362	528.74	72.25	J3-996	7.36	362	541.83	77.92
J3-566	9.13	525	691.79	72.27	J3-966	11.45	350	530.25	78.1
J3-565	9.13	525	691.79	72.27	J5-797	7.36	362	542.4	78.17
J4-428	11.45	358	524.99	72.36	J3-302	9.13	640	820.71	78.3
J4-693	11.45	358	525	72.36	J2-231	6.05	265	446.36	78.58
J4-430	260.64	358	525.03	72.37	J2-840	6.05	265	446.4	78.6
J5-815	7.36	375	542.4	72.53	J3-955	9.13	590	771.45	78.62
J4-421	11.45	361	528.52	72.59	J3-957	9.13	590	771.47	78.63
J2-203	6.05	277	444.61	72.62	J3-317	9.13	638	819.65	78.71
J4-415	11.45	362	529.7	72.66	J3-584	9.13	518	699.66	78.71
J1-122	7.29	135	302.87	72.74	J3-870	9.13	510	691.78	78.77
J3-289	9.13	575	743.02	72.8	J4-427	11.45	343	525	78.86
J2-178	6.05	278	446.24	72.9	J2-658	6.05	240	422.53	79.09
J3-559	11.45	430	598.45	72.99	J1-104	7.29	122	304.65	79.14
J3-717	9.13	603	771.59	73.05	J3-967	11.45	350	532.75	79.18
J4-429	260.64	356	524.97	73.21	J4-614	11.45	344	526.92	79.26
J3-604	9.13	522	691.18	73.31	J-5067	11.45	342	524.95	79.27
J3-726	9.13	650	819.61	73.49	J-5084	9.13	485	668.75	79.62
J4-413	11.45	359	528.84	73.59	J4-609	11.45	343	526.86	79.67
J5-636	7.36	365	534.97	73.65	J3-290	9.13	560	744.17	79.8
J-514	9.13	573	743.01	73.67	J3-341	9.13	635	819.54	79.96
J3-727	9.13	649	819.04	73.68	J1-447	7.29	120	304.63	80
J3-575	9.13	521	691.18	73.74	J-5128	9.13	495	679.84	80.09
J4-426	11.45	355	525.23	73.76	J3-280	9.13	557	741.86	80.1
J3-782	9.13	524	694.54	73.89	J1-119	7.29	118	302.87	80.11
J3-590	9.13	526	696.55	73.9	J3-1006	7.36	357	541.95	80.14
J4-770	11.45	357	527.55	73.9	J1-844	7.29	120	305.14	80.22
J4-435	11.45	357	527.6	73.92	J-5080	9.13	483	668.58	80.41
J4-757	11.45	357	527.61	73.93	J3-894	9.13	320	505.58	80.41
J4-771	11.45	357	527.7	73.96	J2-187	6.05	260	445.71	80.47
J4-441	11.45	354	524.91	74.06	J2-179	6.05	260	446.15	80.66
J3-574	9.13	520	691.24	74.2	J3-921	9.13	506	692.18	80.67
J3-337	9.13	648	819.59	74.35	J3-303	9.13	634	820.29	80.72
J3-909	9.13	520	691.78	74.43	J1-114	7.29	118	304.63	80.87
J5-799	7.36	370	542.22	74.62	J3-396	9.13	634	820.67	80.88
J4-765	11.45	355	527.57	74.78	J3-301	9.13	634	820.73	80.91
J4-438	11.45	355	527.65	74.81	J3-281	9.13	507	694.03	81.04
J3-971	6.05	250	422.72	74.84	J2-650	7.36	357	544.19	81.11
J2-665	6.05	250	422.75	74.85	J4-772	11.45	340	527.56	81.27
J3-601	9.13	641	813.76	74.86	J3-970	6.05	235	422.72	81.34
J4-422	11.45	356	528.76	74.86	J4-528	12.96	337	524.99	81.46
J3-277	9.13	521	694.09	75	J4-692	11.45	337	524.99	81.46
J3-296	9.13	571	744.61	75.22	J3-751	11.45	410	598.45	81.65
J3-557	9.13	569	743	75.4	J-5079	9.13	480	668.58	81.71
J3-922	9.13	518	692.24	75.5	J3-903	9.13	502	690.95	81.87
J4-624	11.45	355	529.84	75.76	J5-644	7.36	355	544.29	82.02
J-5091	11.45	350	524.97	75.82	J4-769	11.45	338	527.53	82.12
J3-313	9.13	645	820.01	75.83	J3-585	9.13	510	699.7	82.2
J2-651	7.36	369	544.27	75.95	J3-1003	7.36	352	541.93	82.3
J2-192	6.05	270	445.27	75.95	J3-312	9.13	630	820.19	82.41
J4-764	11.45	352	527.63	76.1	J3-891	9.13	500	690.95	82.74
J-5010	9.13	640	816.08	76.3	J3-320	9.13	628	819.22	82.85
J3-979	9.13	568	744.34	76.41	J3-579	9.13	500	691.23	82.86
J2-839	6.05	270	446.36	76.42	J4-768	11.45	336	527.55	83
J3-958	9.13	595	771.5	76.48	J2-252	6.05	255	446.84	83.12
J3-908	9.13	515	691.8	76.61	J4-698	11.45	333	525.07	83.22
J3-291	9.13	567	744.26	76.81	J3-754	11.45	406	598.45	83.39
J2-556	6.05	340	517.31	76.83	J-5113	9.13	620	812.47	83.4
J2-196	6.05	268	445.37	76.86	J3-593	9.13	620	812.5	83.41
J3-364	11.45	360	537.46	76.89	J4-766	11.45	335	527.56	83.44
J3-560	9.13	642	819.48	76.9	J1-83	7.29	112	304.6	83.45
J2-193	6.05	268	445.57	76.94	J2-663	6.05	230	422.65	83.47
J4-437	11.45	350	527.61	76.96	J3-969	11.45	340	532.75	83.52
J3-962	11.45	350	527.61	76.96	J3-276	9.13	501	694.01	83.63
J4-527	12.96	351	528.69	76.99	J4-697	11.45	332	525.06	83.65
J-5090	9.13	643	820.71	77	J2-175	6.05	253	446.07	83.66
J-5124	9.13	480	657.85	77.06	J2-185	6.05	252	445.86	84
J4-423	11.45	350	528	77.13	J2-449	6.05	252	446	84.06
J3-342	9.13	641	819.51	77.35	J3-558	9.13	549	743.15	84.12
J3-913	9.13	637	815.56	77.37	J2-652	7.36	350	544.17	84.13
J3-743	9.13	577	771.35	84.21	J4-2017	11.45	320	527.44	89.88
J3-582	9.13	505	699.45	84.25	J4-2016	11.45	320	527.44	89.88

J1-5104	7.29	110	304.69	84.36	J4-2015	11.45	320	527.44	89.88
J-527	12.96	347	541.75	84.39	J4-2014	11.45	320	527.45	89.89
J1-5105	7.29	110	304.81	84.41	J4-2018	11.45	320	527.45	89.89
J1-5106	7.29	110	304.82	84.42	J4-2013	11.45	320	527.45	89.89
J1-5108	7.29	110	304.84	84.42	J4-2012	11.45	320	527.46	89.89
J1-5107	7.29	110	304.84	84.42	J4-2010	11.45	320	527.46	89.89
J1-115	7.29	109	304.24	84.6	J4-2000	11.45	320	527.47	89.89
J-5114	9.13	617	812.47	84.7	J-5073	11.45	320	527.49	89.91
J4-767	11.45	332	527.55	84.73	J3-963	11.45	320	527.61	89.96
J3-952	9.13	628	823.66	84.78	J2-198	6.05	236	443.74	90.01
J-5037	9.13	500	695.68	84.79	J4-530	12.96	317	524.99	90.12
J3-977	9.13	548	744.32	85.07	J1-120	7.29	94	302.48	90.33
J3-975	9.13	548	744.32	85.07	J1-102	7.29	96	304.65	90.41
J3-288	9.13	546	742.45	85.12	J3-988	9.13	610	818.71	90.43
J3-890	9.13	494	690.95	85.34	J3-294	9.13	533	741.87	90.5
J4-611	11.45	330	527.01	85.36	J3-856	9.13	615	823.9	90.52
J3-602	9.13	494	691.03	85.37	J3-857	9.13	615	823.91	90.52
J3-926	9.13	495	692.15	85.42	J3-888	9.13	482	690.95	90.54
J4-741	11.45	328	525.16	85.43	J2-450	6.05	237	446	90.56
J4-2011	11.45	330	527.49	85.57	J4-612	11.45	318	527.14	90.62
J3-594	9.13	615	812.59	85.61	J3-744	9.13	562	771.34	90.71
J4-763	11.45	330	527.6	85.62	J1-101	7.29	95	304.61	90.82
J2-553	6.05	247	444.72	85.67	J3-998	7.36	332	541.63	90.83
J2-666	6.05	225	422.74	85.68	J4-608	11.45	317	526.98	90.98
J2-738	6.05	207	404.93	85.76	J2-653	6.05	195	405.48	91.2
J3-968	11.45	332	530.25	85.9	J3-987	9.13	608	818.73	91.31
J3-976	9.13	546	744.32	85.93	J3-363	9.13	610	820.92	91.39
J3-974	9.13	546	744.32	85.93	J3-901	9.13	480	690.95	91.4
J3-783	9.13	496	694.53	86.02	J2-202	6.05	232	443.24	91.53
J2-667	6.05	224	422.73	86.11	J1-736	7.29	92	303.59	91.68
J3-398	9.13	620	819.01	86.23	J3-946	9.13	480	692.11	91.91
J3-893	9.13	306	505.58	86.48	J3-923	9.13	480	692.13	91.92
J-531	7.2	223	422.59	86.48	J2-551	6.05	231	443.55	92.1
J-5127	9.13	480	679.83	86.59	J3-886	9.13	478	690.94	92.27
J3-282	9.13	494	694.01	86.66	J-5082	9.13	455	668.48	92.5
J4-742	11.45	325	525.1	86.7	J-5077	9.13	455	668.48	92.5
J3-573	9.13	491	691.15	86.72	J-5076	9.13	455	668.5	92.51
J2-649	7.36	344	544.28	86.78	J2-212	6.05	233	446.92	92.69
J4-739	11.45	325	525.82	87.02	J2-552	6.05	230	444.56	92.97
J1-112	7.29	103	304.64	87.37	J1-82	7.29	90	304.6	92.99
J1-103	7.29	103	304.65	87.38	J2-226	6.05	232	446.61	92.99
J3-878	9.13	490	691.76	87.42	J2-195	6.05	230	444.72	93.04
J3-1002	7.36	340	541.86	87.46	J2-668	6.05	208	422.73	93.04
J1-400	7.29	182	384.02	87.54	J4-2002	11.45	312	527.41	93.34
J3-925	9.13	490	692.14	87.59	J3-912	9.13	600	815.55	93.4
J3-307	9.13	618	820.17	87.6	J5-856	3.78	310	525.57	93.41
J5-643	7.36	342	544.29	87.65	J3-586	9.13	482	697.76	93.49
J4-747	11.45	426	629.3	88.09	J2-194	6.05	229	444.93	93.56
J3-892	9.13	302	505.59	88.21	J3-595	9.13	594	810	93.59
J3-964	11.45	324	527.61	88.22	J3-718	9.13	555	771.59	93.85
J3-911	9.13	490	694.53	88.62	J2-222	6.05	230	446.64	93.87
J3-997	7.36	337	541.66	88.68	J3-309	9.13	603	819.86	93.96
J3-985	9.13	614	818.7	88.7	J1-729	6.05	185	401.97	94.01
J3-319	9.13	614	819.22	88.92	J3-947	9.13	475	692.11	94.08
J3-914	9.13	610	815.55	89.07	J2-730	6.05	185	402.15	94.09
J3-961	11.45	322	527.61	89.09	J1-84	7.29	87	304.59	94.28
J2-186	6.05	240	445.96	89.24	J3-701	9.13	590	807.71	94.33
J3-603	9.13	485	691.19	89.34	J1-118	7.29	85	303.14	94.52
J2-234	6.05	240	446.27	89.38	J3-1008	7.36	324	542.21	94.55
J3-279	9.13	535	741.54	89.49	J3-983	9.13	600	818.7	94.76
J3-395	9.13	614	820.67	89.55	J3-984	9.13	600	818.75	94.79
J3-910	9.13	485	691.8	89.61	J3-278	9.13	522	741.55	95.13
J3-887	9.13	484	690.94	89.67	J4-613	11.45	308	527.62	95.16
J3-924	9.13	485	692.13	89.75	J-5021	9.13	605	824.69	95.19
J3-578	9.13	484	691.18	89.77	J3-879	9.13	472	691.75	95.22
J4-2009	11.45	320	527.38	89.86	J4-607	11.45	307	526.8	95.24
J-5072	11.45	320	527.38	89.86	J3-581	9.13	480	699.93	95.3
J4-2008	11.45	320	527.38	89.86	J2-172	6.05	226	445.97	95.31
J4-2007	11.45	320	527.38	89.86	J3-305	9.13	600	820.01	95.33
J4-2005	11.45	320	527.38	89.86	J1-100	7.29	84	304.67	95.62
J4-2006	11.45	320	527.38	89.86	J3-877	9.13	471	691.76	95.66
J4-2004	11.45	320	527.38	89.86	J3-872	9.13	471	691.77	95.66
J4-2003	11.45	320	527.39	89.86	J3-1009	7.36	321	541.93	95.73
J4-2001	11.45	320	527.41	89.87	J3-900	9.13	470	690.94	95.73
J3-896	9.13	470	690.95	95.74	J1-137	7.29	64	304.68	104.29
J2-170	6.05	225	445.97	95.75	J3-898	9.13	450	690.94	104.4
J3-719	9.13	550	771.44	95.95	J3-899	9.13	450	690.94	104.4
J2-221	6.05	225	446.64	96.04	J2-237	6.05	205	446.29	104.55

J4-606	11.45	305	526.7	96.06	J-5024	9.13	580	821.41	104.6
J3-875	9.13	470	691.77	96.09	J1-139	7.29	67	308.65	104.71
J3-873	9.13	470	691.78	96.1	J4-433	11.45	285	526.72	104.74
J3-950	9.13	470	692.07	96.22	J2-174	6.05	204	446.07	104.89
J3-944	9.13	470	692.12	96.24	J1-135	7.29	62	304.19	104.94
J1-116	7.29	81	303.32	96.33	J1-136	7.29	62	304.19	104.94
J2-199	6.05	221	443.46	96.39	J1-132	7.29	62	304.48	105.07
J-5023	9.13	600	822.51	96.41	J1-90	7.29	62	305.26	105.4
J3-965	11.45	305	527.61	96.46	J2-233	6.05	203	446.26	105.41
J2-250	6.05	224	446.85	96.56	J-5078	9.13	425	668.48	105.5
J3-889	9.13	468	690.95	96.6	J-5075	9.13	425	668.49	105.5
J3-1001	7.36	318	541.61	96.89	J1-93	7.29	62	305.57	105.54
J3-999	7.36	318	541.61	96.89	J3-569	9.13	448	691.83	105.65
J1-99	7.29	81	304.68	96.92	J-5044	9.13	450	694.69	106.03
J3-990	9.13	595	818.87	97	J-5130	9.13	576	821.24	106.26
J1-86	7.29	80	304.65	97.34	J3-583	9.13	454	699.61	106.42
J1-113	7.29	80	304.65	97.34	J1-125	65.41	57	302.79	106.5
J3-588	9.13	473	697.76	97.39	J2-268	6.05	200	445.98	106.58
J-5068	11.45	300	524.88	97.44	J2-167	6.05	200	446	106.59
J2-647	7.36	319	544.22	97.59	J2-232	6.05	198	446.26	107.57
J3-1000	7.36	316	541.6	97.75	J1-138	7.29	60	308.64	107.74
J3-897	9.13	465	690.94	97.9	J1-88	7.29	56	304.65	107.74
J2-238	6.05	220	446.29	98.05	J-5119	9.13	570	818.85	107.83
J3-724	9.13	545	771.34	98.07	J1-128	7.29	55	303.92	107.86
J3-723	9.13	545	771.35	98.08	J1-131	7.29	55	303.98	107.88
J2-254	6.05	220	446.41	98.1	J2-448	6.05	197	445.98	107.88
J2-251	6.05	220	446.84	98.29	J1-89	7.29	56	305.23	107.99
J3-885	9.13	465	692.18	98.44	J2-224	6.05	197	446.71	108.2
J2-169	6.05	218	445.97	98.78	J1-126	65.41	54	303.81	108.24
J1-737	65.41	72	300.49	99.01	J1-127	65.41	54	303.96	108.31
J3-304	9.13	591	820.01	99.23	J2-166	6.05	196	445.97	108.31
J2-729	7.36	315	544.28	99.35	J2-168	6.05	195	445.97	108.74
J5-845	7.36	315	544.29	99.35	J1-69	7.29	53	304.65	109.04
J3-978	9.13	515	744.31	99.36	J-519	11.45	273	524.92	109.16
J1-94	7.29	75	304.89	99.61	J1-27	7.29	54	306.58	109.44
J2-173	6.05	216	445.97	99.64	J3-274	9.13	441	693.75	109.51
J3-948	9.13	462	692.11	99.71	J3-100	11.45	272	524.86	109.57
J1-445	7.29	74	304.66	99.94	J-5069	11.45	272	524.87	109.57
J3-986	9.13	588	818.73	99.97	J3-869	9.13	440	693.12	109.68
J1-446	7.29	73	304.82	100.45	J3-884	9.13	440	693.23	109.72
J3-991	9.13	587	818.87	100.47	J2-646	7.36	291	544.27	109.74
J4-830	11.45	295	527.44	100.72	J3-722	9.13	518	771.41	109.8
J1-97	7.29	72	304.87	100.9	J1-28	7.29	53	306.59	109.88
J3-576	9.13	457	691.02	101.4	J1-29	7.29	53	306.59	109.88
J1-98	7.29	70	304.86	101.77	J1-30	7.29	53	306.59	109.88
J1-91	7.29	70	305.03	101.84	J1-444	65.41	50	304.07	110.09
J1-92	7.29	70	305.03	101.84	J3-592	9.13	558	812.48	110.27
J3-943	9.13	457	692.05	101.85	J1-31	7.29	52	306.59	110.31
J1-95	7.29	70	305.08	101.86	J2-264	6.05	191	446.07	110.52
J2-176	6.05	211	446.15	101.89	J1-26	7.29	51	306.58	110.74
J1-121	7.29	67	302.33	101.97	J1-23	7.29	51	306.58	110.74
J1-130	7.29	69	304.35	101.98	J1-24	7.29	51	306.59	110.75
J1-129	7.29	69	304.35	101.98	J1-34	7.29	51	306.59	110.75
J-5121	9.13	433	668.46	102.03	J3-881	9.13	436	691.8	110.84
J3-572	9.13	270	505.64	102.1	J3-310	9.13	564	819.85	110.86
J-5122	9.13	433	668.86	102.2	J3-292	9.13	566	821.92	110.89
J3-895	9.13	455	690.94	102.23	J1-25	7.29	50	306.59	111.18
J2-177	6.05	210	446.25	102.37	J1-35	7.29	50	306.62	111.19
J2-235	6.05	210	446.26	102.37	J1-140	7.29	52	308.77	111.26
J2-451	6.05	210	446.32	102.4	J1-981	7.29	48	304.84	111.29
J1-117	7.29	67	303.78	102.6	J3-992	9.13	562	819	111.36
J4-858	11.45	290	526.99	102.69	J1-22	7.29	49	306.74	111.68
J1-143	7.29	68	305.07	102.72	J1-21	7.29	49	306.75	111.68
J1-142	7.29	68	305.13	102.75	J1-141	7.29	51	308.78	111.69
J3-350	9.13	585	822.4	102.86	J2-253	6.05	189	446.93	111.76
J3-874	9.13	454	691.78	103.03	J3-745	9.13	513	771.35	111.94
J1-982	7.29	66	304.84	103.49	J2-219	6.05	188	446.82	112.15
J1-96	7.29	66	305.04	103.58	J1-20	7.29	48	307.04	112.24
J3-577	9.13	452	691.14	103.62	J1-1	7.29	48	307.08	112.26
J1-124	7.29	62	301.36	103.71	J1-2	7.29	48	307.08	112.26
J1-134	7.29	65	304.67	103.85	J1-3	7.29	48	307.09	112.26
J1-133	7.29	65	304.67	103.85	J1-791	7.29	48	307.11	112.27
J-5074	11.45	287	527.49	104.21					
J1-795	7.29	47	307.02	112.67					
J1-10	7.29	47	307.08	112.69	J1-5102	7.29	110	384.6	118.98
J-5026	9.13	560	820.25	112.77	J1-40	7.29	39	313.62	118.99
J1-9	7.29	46	307.13	113.15	J1-42	7.29	39	313.62	118.99
J-5031	9.13	560	821.37	113.25	J1-5101	7.29	110	384.65	119

J-5030	9.13	560	821.37	113.25
J3-880	9.13	430	691.81	113.44
J4-431	260.64	263	524.88	113.47
J1-11	7.29	45	307.12	113.58
J2-648	7.36	282	544.21	113.62
J4-2022	9.13	562	824.29	113.65
J1-17	7.29	44	306.6	113.79
J1-16	7.29	44	306.8	113.87
J3-862	9.13	430	693.12	114.01
J3-883	9.13	430	693.23	114.06
J1-76	7.29	41	304.71	114.27
J1-15	7.29	43	306.85	114.33
J1-19	7.29	42	305.86	114.33
J1-14	7.29	43	307.07	114.42
J1-4	7.29	43	307.25	114.5
J1-81	7.29	40	304.63	114.66
J1-75	7.29	40	304.69	114.69
J1-63	7.29	46	310.71	114.7
J1-441	7.29	46	310.73	114.71
J1-980	7.29	40	304.85	114.76
J3-972	11.45	260	524.86	114.76
J1-6	7.29	42	307.25	114.93
J1-5	7.29	42	307.25	114.93
J1-57	7.29	49	314.79	115.17
J3-306	9.13	554	819.89	115.21
J2-236	6.05	180	446.25	115.37
J1-7	7.29	41	307.3	115.39
J3-860	9.13	426	692.34	115.4
J2-248	6.05	180	446.61	115.52
J2-223	6.05	180	446.71	115.56
J1-18	7.29	39	305.86	115.63
J-5070	11.45	258	524.87	115.63
J3-275	9.13	427	693.87	115.63
J1-12	7.29	40	307.14	115.75
J-5013	7.36	274	541.55	115.93
J2-225	6.05	179	446.6	115.95
J-5081	9.13	400	668.47	116.33
J1-80	7.29	36	304.83	116.48
J-5040	9.13	425	693.91	116.52
J-5043	9.13	425	693.91	116.52
J-5039	9.13	425	693.91	116.52
J1-847	7.29	42	311.26	116.67
J1-56	7.29	45	314.79	116.9
J3-308	9.13	550	819.87	116.93
J3-861	9.13	423	692.92	116.96
J1-852	7.29	48	318.56	117.23
J1-733	6.05	175	445.99	117.42
J1-854	7.29	46	317.23	117.52
J2-837	6.05	175	446.51	117.65
J1-39	7.29	49	320.6	117.68
J2-249	6.05	175	446.76	117.75
J1-49	7.29	43	314.8	117.77
J1-1015	7.29	40	311.8	117.77
J1-51	7.29	43	314.84	117.79
J3-788	9.13	419	690.94	117.83
J2-165	6.05	174	445.98	117.85
J1-13	7.29	35	307.11	117.91
J1-848	7.29	45	317.16	117.93
J1-440	7.29	35	307.16	117.93
J1-54	7.29	45	317.16	117.93
J1-59	7.29	39	311.53	118.09
J1-1014	7.29	40	312.54	118.09
J1-850	7.29	46	318.56	118.1
J1-1013	7.29	40	312.58	118.11
J1-1012	7.29	40	312.58	118.11
J1-1011	7.29	40	312.74	118.18
J1-50	7.29	42	314.81	118.21
J1-44	7.29	40	313.01	118.29
J1-58	7.29	38	311.73	118.61
J1-172	0	110	384.02	118.73
J1-5103	7.29	110	384.47	118.93
J1-442	7.29	39	313.55	118.96
J4-432	11.45	227	524.5	128.9
J2-243	6.05	146	447.32	130.56
J3-868	9.13	390	693.11	131.34
J-5016	7.36	238	541.55	131.53
J-5011	9.13	512	816.08	131.76
J-5060	11.45	220	524.5	131.94
J1-5100	7.29	110	384.78	119.06
J2-220	6.05	172	446.86	119.1
J1-5099	7.29	110	384.87	119.1
J1-5098	7.29	110	384.92	119.12
J1-5097	7.29	110	384.93	119.13
J4-699	50.81	250	525.07	119.19
J3-293	9.13	547	822.35	119.31
J3-295	7.08	547	822.43	119.34
J1-47	7.29	37	312.78	119.49
J1-48	7.29	37	313.08	119.63
J-5064	11.45	248	524.54	119.82
J3-1010	7.36	265	541.86	119.96
J-5071	11.45	248	524.86	119.97
J2-211	6.05	170	446.93	119.99
J2-209	6.05	170	446.94	120
J2-210	6.05	170	446.95	120
J2-214	6.05	170	447	120.03
J1-41	7.29	40	317.22	120.12
J-5014	7.36	264	541.55	120.26
J-5065	11.45	247	524.55	120.26
J4-847	11.45	247	524.57	120.27
J-530	7.2	52	330.32	120.59
J-5028	9.13	540	818.59	120.71
J-5062	11.45	245	524.56	121.13
J1-77	7.29	25	304.71	121.2
J2-246	6.05	167	446.77	121.22
J2-239	6.05	166	446.32	121.46
J3-725	9.13	491	771.34	121.47
J-5041	9.13	540	821.36	121.91
J3-882	9.13	412	693.77	122.09
J3-864	9.13	410	692.34	122.34
J-523	6.05	110	392.59	122.45
J3-866	9.13	410	693.11	122.67
J2-247	6.05	163	446.77	122.96
J3-858	9.13	408	692.34	123.21
J-5063	11.45	240	524.55	123.29
J1-71	7.29	20	304.64	123.33
J-5066	11.45	240	524.65	123.34
J1-72	7.29	20	304.65	123.34
J1-79	7.29	20	304.76	123.39
J1-70	7.29	20	305.23	123.59
J-5015	7.36	256	541.55	123.73
J-5019	7.36	256	541.55	123.73
J-5020	7.36	256	541.56	123.73
J1-78	7.29	19	304.71	123.8
J3-283	9.13	408	694	123.92
J2-263	6.05	160	446.08	123.96
J2-241	6.05	160	446.23	124.02
JF-102	11.45	238	524.64	124.2
J1-165	0	25	311.8	124.27
J2-255	6.05	159	446.21	124.45
J3-867	9.13	405	693.12	124.84
J2-258	6.05	158	446.15	124.86
J3-101	11.45	235	524.86	125.6
J2-240	6.05	155	446.23	126.19
J1-443	7.29	20	311.8	126.44
J3-863	9.13	400	691.85	126.46
J2-245	6.05	155	446.93	126.49
J2-260	6.05	154	446.13	126.58
J2-256	6.05	154	446.16	126.59
J3-859	9.13	400	692.34	126.67
J4-440	11.45	232	524.56	126.77
J2-257	6.05	153	446.15	127.02
J3-815	9.13	400	693.77	127.29
J4-501	7.36	250	544.21	127.48
J-5061	11.45	230	524.49	127.6
J-5009	11.45	230	524.5	127.61
JF-101	11.45	230	524.6	127.65
J2-244	6.05	152	446.94	127.8
JF-100	0	228	524.6	128.52
J2-266	6.05	149	446.03	128.7
J2-218	6.05	150	447.26	128.8

J2-836	6.05	140	446.17	132.66
J2-259	6.05	137	446.13	133.95
J2-215	6.05	135	448.13	135.68
J2-213	6.05	130	447.6	137.62
J2-262	6.05	128	446.08	137.82
J2-265	6.05	127	446	138.22
J3-405	9.13	499	818.52	138.45
J-5033	9.13	500	821.36	139.24
J2-267	6.05	124	445.98	139.52
J-5050	11.45	200	524.49	140.6
J-5051	11.45	200	524.49	140.6
J-5052	11.45	200	524.49	140.6
J-5059	11.45	200	524.49	140.6
J-5058	11.45	200	524.49	140.6
J-5049	11.45	200	524.49	140.6
J-5057	11.45	200	524.49	140.6
J-5056	11.45	200	524.49	140.6
J-5055	11.45	200	524.49	140.6
J-5048	11.45	200	524.49	140.6
J-5054	11.45	200	524.5	140.61
J-5047	11.45	200	524.51	140.61
J-5042	9.13	495	821.36	141.41
J1-812	7.29	54	383.76	142.89
J2-217	6.05	122	453.99	143.85
J-5017	7.36	209	541.55	144.09
J2-271	0	110	443.31	144.42
J2-216	6.05	121	454.68	144.58
J1-686	7.29	50	385	145.15
J1-808	7.29	50	385.33	145.3
J2-270	6.05	110	445.96	145.57
J-526	6.05	110	445.96	145.57
J-525	6.05	110	446.07	145.62
J1-810	7.29	48	385.33	146.17
J-5035	9.13	484	821.35	146.17
J1-1019	7.29	46	384.95	146.87
J1-1020	7.29	46	384.98	146.88
J1-87	7.29	45	384.26	147
J1-851	7.29	46	385.33	147.03
J1-1022	7.29	46	385.33	147.03
J1-64	7.29	46	385.33	147.03
J1-688	7.29	45	385	147.32
J1-806	7.29	44	384.92	147.72
J1-1021	7.29	44	385.33	147.9
J1-1016	7.29	44	387.34	148.77
J3-404	9.13	470	818.52	151.02
J1-60	7.29	35	385.33	151.8
J2-269	6.05	90	445.96	154.24
J-5018	7.36	185	541.54	154.49
J1-700	0	20	384.02	157.73
J-528	12.96	454	824.44	160.51
J1-815	7.29	0	383.81	166.3
J1-816	7.29	0	384.06	166.41
J1-900	7.29	0	384.23	166.49
J1-401	7.29	0	384.46	166.59
J2-261	6.05	50	446.13	171.64
J-5053	11.45	110	524.49	179.6
J-5096	7.36	110	535.06	184.18
J-5093	7.36	110	544.22	188.15
J-5092	7.36	110	544.27	188.17
J-524	9.13	110	741.83	273.77
J-515	9.13	110	742.99	274.28
J-5025	9.13	110	821.41	308.25
J-5045	9.13	110	824.62	309.64
J-854	407.2	110	825.33	309.95

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow (gpm)
J1-107	2,003.52	J1-108	-134.09	-139.47	730.28	729.28	J1-108	20.07	730.30	730.28
J1-160	2,003.52	J1-160	-18.69	171.87	812.30	808.39	J1-160	20.08	812.32	812.30
J1-146	2,003.52	J1-146	-50.96	63.39	949.12	947.08	J1-146	20.09	949.12	949.12
J1-85	2,003.52	J1-85	-135	-159.57	1,014.12	1,013.24	J1-85	20.1	1,014.12	1,014.12
J1-145	2,003.52	J1-145	-8.13	191.24	1,015.63	1,010.69	J1-145	20.1	1,015.64	1,015.63
J1-123	2,003.52	J1-123	-43.31	101.05	1,177.18	1,175.26	J1-123	20.12	1,177.15	1,177.15
J1-794	2,003.52	J1-794	7.63	232.6	1,252.84	1,243.47	J1-794	20.12	1,252.86	1,252.84
J1-84	2,003.52	J1-85	-60.42	12.55	1,266.49	1,554.04	J1-85	-8.01	1,266.48	1,266.48
J1-159	2,003.52	J1-159	12.98	248.95	1,385.07	1,370.83	J1-159	20.14	1,385.12	1,385.07
J1-70	2,003.52	J1-70	-84.97	-176.11	1,421.34	1,420.42	J1-70	20.14	1,421.34	1,421.34
J1-149	2,012.73	J1-149	5.44	210.56	1,426.99	1,420.35	J1-149	20.14	1,426.99	1,426.99
J1-122	2,003.52	J1-123	-4.77	190	1,513.18	2,067.96	J1-123	-8.39	1,513.16	1,513.16
J1-22	2,003.52	J1-22	-27.06	-13.45	1,552.53	1,550.86	J1-22	20.15	1,552.53	1,552.53
J1-158	2,012.73	J1-158	15.69	255.21	1,562.42	1,544.47	J1-158	20.15	1,562.44	1,562.42
J1-81	2,003.52	J1-81	-39.09	-50.21	1,583.01	1,581.80	J1-81	20.16	1,583.06	1,583.01
J1-793	2,003.52	J1-793	14.27	239.92	1,631.40	1,619.89	J1-793	20.16	1,631.41	1,631.40
J1-443	2,003.52	J1-443	-40.11	-72.58	1,643.55	1,642.51	J1-443	20.16	1,643.60	1,643.55
J1-23	2,003.52	J1-23	-13.15	20.64	1,654.37	1,652.48	J1-23	20.16	1,654.37	1,654.37
J1-157	2,003.52	J1-157	17.67	260.77	1,708.55	1,685.66	J1-157	20.17	1,708.56	1,708.55
J1-109	2,003.52	J1-109	2.53	150.83	1,754.42	1,751.87	J1-109	20.17	1,754.52	1,754.42
J1-164	2,003.52	J1-159	18.21	261.03	1,775.64	1,983.72	J1-159	18.38	1,775.65	1,775.64
J1-57	2,003.52	J1-57	-5.32	36.73	1,794.63	1,793.07	J1-57	20.18	1,794.63	1,794.63
J1-89	2,003.52	J1-89	-1.88	51.66	1,804.23	1,802.53	J1-89	20.18	1,804.25	1,804.23
J1-152	2,012.73	J1-152	17.66	250.77	1,815.66	1,799.85	J2-206	20.17	1,980.19	1,815.66
J1-163	2,003.52	J1-163	18.06	251.67	1,835.51	1,819.16	J2-206	20.15	1,973.13	1,835.51
J1-83	2,003.52	J1-83	8.45	131.5	1,856.73	1,854.32	J1-83	20.19	1,856.77	1,856.73
J1-82	2,003.52	J1-85	11.81	179.26	1,867.74	2,286.67	J1-85	-6.64	1,867.78	1,867.74
J1-151	2,003.52	J1-151	18.75	251.27	1,898.71	1,882.55	J2-206	20.08	1,970.56	1,898.71
J1-56	2,003.52	J1-57	8.45	68.5	1,900.06	1,914.14	J1-57	18.46	1,900.05	1,900.05
J1-26	2,003.52	J1-26	12.7	80.31	1,908.88	1,906.32	J1-26	20.19	1,908.85	1,908.85
J1-1013	2,003.52	J1-1013	12.96	69.9	1,946.85	1,945.26	J1-1013	20.19	1,946.85	1,946.85
J1-162	2,003.52	J2-206	19.96	435.06	1,973.74	2,285.04	J1-163	17.27	2,027.76	1,973.74
J1-119	2,003.52	J1-123	19.01	244.88	1,974.09	3,001.24	J1-123	-15.67	1,974.09	1,974.09
J1-148	2,003.52	J2-206	19.96	435.06	1,975.34	2,547.46	J2-206	19.34	1,975.34	1,975.34
J1-161	2,003.52	J2-206	19.96	435.07	1,975.84	5,049.05	J1-163	6.42	3,264.48	1,975.84
J1-147	2,003.52	J2-206	19.96	435.07	1,976.43	4,884.80	J1-159	11.79	3,219.58	1,976.43
J1-150	2,003.52	J2-206	19.96	435.07	1,977.14	4,573.04	J1-159	15.2	3,456.32	1,977.14
J1-153	2,003.52	J2-206	19.96	435.07	1,978.73	4,089.60	J2-206	17.11	1,978.73	1,978.73
J1-138	2,003.52	J2-206	21.2	437.93	6,346.97	2,129.40	J1-138	20.21	2,131.76	2,131.76
J1-49	2,003.52	J2-206	21.2	437.94	6,535.82	2,292.20	J1-57	17.63	2,266.39	2,266.39
J1-120	2,003.52	J2-228	20.72	438.82	3,508.99	3,218.86	J1-123	0.2	2,355.21	2,355.21
J1-1015	2,003.52	J2-206	21.2	437.94	6,535.83	2,451.04	J1-1015	20.24	2,453.52	2,453.52
J1-41	2,003.52	J2-206	21.2	437.94	6,535.83	2,465.71	J1-41	20.25	2,468.08	2,468.08
J1-78	2,003.52	J2-206	21.2	437.94	6,200.29	2,477.77	J1-78	20.25	2,480.90	2,480.90
J1-118	2,003.52	J2-228	20.77	438.94	3,768.72	4,735.67	J1-123	-26.38	2,507.95	2,507.95
J1-1012	2,003.52	J2-206	21.2	437.94	6,535.83	2,505.85	J1-1013	20.25	2,508.42	2,508.42
J1-1014	2,003.52	J2-206	21.2	437.94	6,535.83	2,537.44	J1-1014	20.25	2,540.08	2,540.08
J1-1011	2,003.52	J2-206	21.2	437.94	6,535.83	2,565.40	J1-1011	20.26	2,568.08	2,568.08
J1-110	2,003.52	J2-228	20.99	439.45	4,652.57	2,581.93	J1-110	20.26	2,589.48	2,589.48
J1-44	2,003.52	J2-206	21.2	437.94	6,535.83	2,604.48	J1-44	20.26	2,607.23	2,607.23
J1-116	2,003.52	J2-228	20.79	438.98	3,850.19	5,001.55	J1-123	-25.98	2,611.68	2,611.68
J1-121	2,003.52	J2-228	20.69	438.74	3,397.01	4,513.01	J1-123	-13.93	2,644.79	2,644.79
J1-40	2,003.52	J2-206	21.2	437.94	6,535.83	2,671.78	J1-40	20.27	2,674.64	2,674.64
J1-42	2,003.52	J2-206	21.2	437.94	6,535.83	2,697.66	J1-40	20.27	2,700.58	2,700.58
J1-27	2,003.52	J2-206	21.21	437.95	6,493.46	2,700.60	J1-27	20.27	2,705.65	2,705.65
J1-442	2,003.52	J2-206	21.2	437.94	6,535.83	2,703.05	J1-442	20.27	2,705.98	2,705.98
J1-48	2,003.52	J2-206	21.2	437.94	6,535.83	2,758.49	J1-48	20.28	2,761.54	2,761.54
J1-737	2,036.34	J2-228	20.45	438.19	2,799.98	4,801.45	J1-123	4.11	3,727.71	2,799.98
J1-47	2,003.52	J2-206	21.2	437.94	6,535.83	2,799.63	J1-47	20.28	2,802.78	2,802.78
J1-50	2,003.52	J2-206	21.2	437.94	6,535.82	2,878.64	J1-57	17.25	2,841.02	2,841.02
J1-111	2,003.52	J2-228	20.99	439.45	4,652.84	2,856.08	J1-111	20.29	2,865.20	2,865.20
J1-124	2,003.52	J2-228	20.56	438.44	2,950.59	5,371.11	J1-123	-8.24	3,694.89	2,950.59

J1-14	2,003.52	J2-206	21.21	437.95	6,507.03	2,952.59	J1-14	20.29	2,958.45	2,958.45
J1-736	2,003.52	J2-228	20.84	439.09	4,067.29	3,807.49	J1-123	9.93	3,021.08	3,021.08
J1-11	2,003.52	J2-206	21.21	437.95	6,507.57	3,028.49	J1-11	20.3	3,034.76	3,034.76
J1-79	2,003.52	J2-206	21.2	437.94	6,215.57	3,058.24	J1-79	20.31	3,062.97	3,062.97
J1-58	2,003.52	J2-206	21.2	437.94	6,535.83	3,067.87	J1-58	20.31	3,071.62	3,071.62
J1-13	2,003.52	J2-206	21.21	437.95	6,507.53	3,069.93	J1-13	20.31	3,073.92	3,073.92
J1-12	2,003.52	J2-206	21.21	437.95	6,507.68	3,166.42	J1-12	20.32	3,170.73	3,170.73
J1-19	2,003.52	J2-206	21.21	437.95	6,414.97	3,238.66	J1-19	20.32	3,244.85	3,244.85
J1-5	2,003.52	J2-206	21.21	437.95	6,507.67	3,254.61	J1-5	20.33	3,259.19	3,259.19
J1-848	2,003.52	J2-206	21.2	437.94	6,535.82	3,344.06	J1-848	20.33	3,349.26	3,349.26
J1-112	2,003.52	J2-228	20.99	439.45	4,656.64	3,545.83	J1-111	15.36	3,372.85	3,372.85
J1-21	2,003.52	J2-206	21.21	437.95	6,499.86	3,408.19	J1-22	20.34	3,413.37	3,413.37
J1-77	2,003.52	J2-206	21.2	437.94	6,200.29	3,472.79	J1-77	20.35	3,479.65	3,479.65
J1-125	2,036.34	J2-228	20.75	438.89	3,489.93	6,339.64	J1-123	-18.72	4,200.12	3,489.93
J1-35	2,003.52	J2-206	21.21	437.95	6,496.44	3,517.55	J1-35	20.35	3,523.11	3,523.11
J1-31	2,003.52	J2-206	21.21	437.95	6,493.71	3,626.93	J1-31	20.36	3,632.92	3,632.92
J1-28	2,003.52	J2-206	21.21	437.95	6,493.46	3,653.41	J1-27	19.93	3,652.32	3,652.32
J1-71	2,003.52	J2-228	20.99	439.45	4,741.35	5,680.17	J1-85	-36.63	3,662.07	3,662.07
J1-34	2,003.52	J2-206	21.21	437.95	6,493.98	3,680.84	J1-34	20.37	3,686.99	3,686.99
J1-80	2,003.52	J2-206	21.21	437.94	6,252.46	4,475.26	J1-5108	-5.62	3,693.74	3,693.74
J1-29	2,003.52	J2-206	21.21	437.95	6,493.52	3,697.90	J1-29	20.37	3,704.16	3,704.16
J1-440	2,003.52	J2-206	21.21	437.95	6,507.82	3,701.19	J1-440	20.37	3,706.99	3,706.99
J1-117	2,003.52	J2-228	20.87	439.16	4,123.80	6,093.93	J1-123	-17.65	3,722.04	3,722.04
J1-24	2,003.52	J2-206	21.21	437.95	6,492.68	3,724.13	J1-23	20.37	3,730.43	3,730.43
J1-30	2,003.52	J2-206	21.21	437.95	6,493.48	3,731.00	J1-30	20.37	3,737.37	3,737.37
J1-9	2,003.52	J2-206	21.21	437.95	6,507.24	3,799.64	J1-9	20.38	3,806.81	3,806.81
J1-400	2,003.52	J2-206	21.21	437.95	6,757.41	3,859.42	J1-400	20.39	3,872.95	3,872.95
J1-25	2,003.52	J2-206	21.21	437.95	6,492.54	3,970.92	J1-23	20.16	3,974.29	3,974.29
J1-51	2,003.52	J2-206	21.2	437.94	6,535.82	4,151.39	J1-57	17.81	4,102.62	4,102.62
J1-126	2,036.34	J2-228	20.9	439.24	4,104.45	7,215.61	J1-123	-27.7	4,544.67	4,104.45
J1-128	2,003.52	J2-228	20.92	439.28	4,137.88	7,252.59	J1-123	-28.2	4,501.41	4,137.88
J1-10	2,003.52	J2-206	21.21	437.95	6,505.71	4,173.75	J1-10	20.42	4,182.60	4,182.60
J1-131	2,003.52	J2-228	20.93	439.31	4,200.13	7,082.93	J1-123	-22.51	4,539.12	4,200.13
J1-127	2,036.34	J2-228	20.93	439.31	4,223.15	7,065.24	J1-123	-21.47	4,573.44	4,223.15
J1-18	2,003.52	J2-206	21.21	437.95	6,414.97	4,274.40	J1-19	19.13	4,255.67	4,255.67
J1-136	2,003.52	J2-228	20.95	439.35	4,299.29	7,260.65	J1-123	-27.39	4,442.53	4,299.29
J1-135	2,003.52	J2-228	20.95	439.35	4,299.48	7,262.70	J1-123	-27.45	4,441.71	4,299.48
J1-444	2,036.34	J2-228	20.97	439.4	4,367.91	5,041.66	J1-123	17.53	4,706.76	4,367.91
J1-115	2,003.52	J2-228	20.91	439.26	4,383.82	3,798.62	J2-228	20.2	4,384.08	4,383.82
J1-76	2,003.52	J2-206	21.2	437.93	6,185.51	5,110.85	J1-5105	-0.12	4,389.49	4,389.49
J1-130	2,003.52	J2-228	20.97	439.39	4,411.72	7,266.35	J1-123	-25.4	4,472.68	4,411.72
J1-129	2,003.52	J2-228	20.97	439.39	4,416.00	7,506.29	J1-123	-30.93	4,467.16	4,416.00
J1-132	2,003.52	J2-228	20.98	439.41	4,426.12	6,825.81	J1-123	-13.16	4,608.57	4,426.12
J1-75	2,003.52	J2-228	21.19	439.91	5,003.42	5,463.48	J1-5104	-9.79	4,442.77	4,442.77
J1-134	2,003.52	J2-228	21	439.46	4,524.74	7,353.55	J1-123	-22.52	4,651.98	4,524.74
J1-133	2,003.52	J2-228	21	439.47	4,526.51	7,397.06	J1-123	-23.47	4,650.91	4,526.51
J1-137	2,003.52	J2-228	21.01	439.48	4,548.82	5,535.11	J1-123	11.35	4,678.13	4,548.82
J1-101	2,003.52	J2-228	20.98	439.43	4,576.08	6,130.85	J1-123	1.88	4,658.89	4,576.08
J1-99	2,003.52	J2-228	21	439.47	4,586.33	7,700.19	J1-123	-28.62	4,690.96	4,586.33
J1-100	2,003.52	J2-228	21	439.46	4,608.37	7,624.39	J1-123	-26.06	4,723.97	4,608.37
J1-98	2,003.52	J2-228	21.02	439.52	4,611.23	7,928.40	J1-123	-32.94	4,723.48	4,611.23
J1-114	2,003.52	J2-228	20.98	439.42	4,631.45	6,760.19	J1-123	-6.75	4,771.49	4,631.45
J1-447	2,003.52	J2-228	20.98	439.42	4,635.16	6,753.72	J1-123	-6.42	4,781.91	4,635.16
J1-104	2,003.52	J2-228	20.99	439.44	4,638.88	6,859.28	J1-123	-8.65	4,779.83	4,638.88
J1-143	2,003.52	J2-228	21.04	439.56	4,639.46	7,993.64	J1-123	-33.24	4,757.42	4,639.46
J1-105	2,003.52	J2-228	20.99	439.43	4,639.84	6,130.58	J1-123	4.39	4,788.13	4,639.84
J1-103	2,003.52	J2-228	20.99	439.44	4,640.44	7,271.32	J1-123	-17.11	4,776.47	4,640.44
J1-102	2,003.52	J2-228	20.99	439.45	4,644.07	7,387.75	J1-123	-19.44	4,780.37	4,644.07
J1-142	2,003.52	J2-228	21.04	439.57	4,647.79	8,003.86	J1-123	-33.1	4,767.21	4,647.79
J1-445	2,003.52	J2-228	20.99	439.45	4,655.38	7,737.98	J1-123	-26.66	4,791.92	4,655.38
J1-97	2,003.52	J2-228	21.03	439.52	4,655.77	6,850.35	J1-123	-8.53	4,781.29	4,655.77
J1-96	2,003.52	J2-228	21.04	439.55	4,678.31	6,402.82	J1-123	0.07	4,808.17	4,678.31
J1-446	2,003.52	J2-228	21.02	439.5	4,681.18	6,619.47	J1-123	-3.26	4,809.79	4,681.18
J1-113	2,003.52	J2-228	20.99	439.45	4,684.19	7,385.61	J1-123	-18.47	4,824.23	4,684.19

J1-94	2,003.52	J2-228	21.03	439.53	4,689.43	6,056.14	J1-123	6.15	4,819.86	4,689.43
J1-86	2,003.52	J2-228	20.99	439.45	4,695.68	7,287.41	J1-123	-16.19	4,837.15	4,695.68
J1-88	2,003.52	J2-228	20.99	439.45	4,695.68	6,958.73	J1-123	-9.66	4,837.15	4,695.68
J1-69	2,003.52	J2-228	20.99	439.45	4,726.01	7,481.92	J1-85	-21.95	5,625.48	4,726.01
J1-91	2,003.52	J2-228	21.04	439.56	4,731.28	5,740.81	J1-123	11.82	4,867.49	4,731.28
J1-92	2,003.52	J2-228	21.04	439.56	4,732.37	6,276.48	J1-123	3.71	4,870.74	4,732.37
J1-95	2,003.52	J2-228	21.05	439.57	4,736.49	6,284.11	J1-123	3.65	4,875.55	4,736.49
J1-72	2,003.52	J2-228	20.99	439.45	4,741.35	7,802.75	J1-85	-36.42	5,471.43	4,741.35
J1-90	2,003.52	J2-228	21.06	439.6	4,783.75	4,677.16	J2-228	20.03	4,783.75	4,783.75
J1-93	2,003.52	J2-228	21.08	439.66	4,850.98	5,726.51	J1-123	14.27	5,011.43	4,850.98
J1-17	2,003.52	J2-206	21.21	437.95	6,486.31	4,880.30	J1-27	19.36	4,864.73	4,864.73
J1-54	2,003.52	J2-206	21.2	437.94	6,535.82	5,136.88	J1-854	20.08	5,139.17	5,139.17
J1-4	2,003.52	J2-206	21.21	437.95	6,507.67	5,375.28	J1-791	19.63	5,365.96	5,365.96
J1-139	2,003.52	J2-206	21.2	437.93	6,346.97	8,741.95	J1-123	-31.3	5,378.85	5,378.85
J1-140	2,003.52	J2-206	21.2	437.93	6,358.45	9,067.67	J1-123	-37.21	5,400.09	5,400.09
J1-141	2,003.52	J2-206	21.2	437.93	6,359.31	9,095.23	J1-123	-37.71	5,401.39	5,401.39
J1-87	2,003.52	J2-206	21.21	437.95	6,760.63	10,921.54	J1-527	-43.58	5,533.35	5,533.35
J1-16	2,003.52	J2-206	21.21	437.95	6,495.85	4,977.87	J2-228	20.22	5,534.22	5,534.22
J1-15	2,003.52	J2-206	21.21	437.95	6,499.73	4,690.36	J2-228	20.35	5,541.30	5,541.30
J1-795	2,003.52	J2-206	21.21	437.95	6,503.82	4,728.67	J2-228	20.34	5,549.89	5,549.89
J1-20	2,003.52	J2-206	21.21	437.95	6,504.04	5,089.52	J2-228	20.18	5,550.52	5,550.52
J1-2	2,003.52	J2-206	21.21	437.95	6,504.86	5,125.58	J2-228	20.16	5,552.96	5,552.96
J1-1	2,003.52	J2-206	21.21	437.95	6,504.86	4,990.58	J2-228	20.22	5,552.96	5,552.96
J1-3	2,003.52	J2-206	21.21	437.95	6,505.23	5,205.24	J2-228	20.13	5,554.06	5,554.06
J1-791	2,003.52	J2-206	21.21	437.95	6,505.54	5,217.42	J2-228	20.12	5,554.98	5,554.98
J1-6	2,003.52	J2-206	21.21	437.95	6,507.95	4,512.06	J2-228	20.43	5,562.31	5,562.31
J1-7	2,003.52	J2-206	21.21	437.95	6,508.58	4,854.56	J2-228	20.29	5,564.23	5,564.23
J1-806	2,003.52	J2-206	21.21	437.95	6,743.65	11,378.90	J1-527	-47.4	5,589.71	5,589.71
J1-688	2,003.52	J2-206	21.21	437.95	6,738.88	9,658.43	J1-527	-27.36	5,606.30	5,606.30
J1-686	2,003.52	J2-206	21.21	437.95	6,738.88	9,833.22	J1-527	-29.74	5,606.30	5,606.30
J1-64	2,003.52	J2-206	21.21	437.95	6,717.42	11,161.34	J1-527	-45.15	5,675.05	5,675.05
J1-60	2,003.52	J2-206	21.21	437.95	6,679.79	9,827.97	J1-527	-27.76	5,788.28	5,788.28
J1-847	2,003.52	J2-206	21.2	437.94	6,535.82	7,941.86	J1-123	-6.27	5,824.82	5,824.82
J1-63	2,003.52	J2-206	21.2	437.94	6,535.82	9,741.40	J1-123	-38.21	5,824.82	5,824.82
J1-441	2,003.52	J2-206	21.2	437.94	6,535.82	9,725.10	J1-123	-37.9	5,824.82	5,824.82
J1-59	2,003.52	J2-206	21.2	437.94	6,535.82	6,102.52	J1-123	17.72	5,824.82	5,824.82
J1-39	2,003.52	J2-206	21.21	437.96	6,544.28	7,554.58	J1-123	0.92	5,981.24	5,981.24
J1-806	2,003.52	J1-157	36.95	305.28	0.00	12,401.32	J1-123	-30.42	8,029.19	8,029.19
J1-87	2,003.52	J1-157	36.95	305.28	0.00	12,016.46	J1-123	-22.6	8,118.58	8,118.58

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant	Critical Node 2 ID	Critical Node 2	Adjusted Available Flow	Design Flow (gpm)
J2-659	2,003.36	J2-659	-77.37	157.45	705.45	703.89	J2-659	20.07	705.45	705.45
J2-670	2,003.36	J2-670	-56.43	175.77	992.09	990.32	J2-670	20.1	992.09	992.09
J-5095	2,003.36	J-5095	-74.08	119.04	995.45	994.00	J-5095	20.1	995.45	995.45
J2-230	2,003.36	J2-555	-4.39	359.87	1,034.15	2,008.13	J2-555	-4.55	1,034.18	1,034.15
J2-231	2,003.36	J2-231	-19.83	219.23	1,501.49	1,499.16	J2-555	10.28	1,034.18	1,034.18
J2-669	2,003.36	J2-669	-15.88	301.35	1,039.24	1,035.69	J2-669	20.1	1,039.24	1,039.24
J2-838	2,003.36	J2-555	-3.54	361.84	1,050.42	2,239.66	J2-555	-11.57	1,050.41	1,050.41
J2-671	2,003.36	J2-671	-54.73	167.68	1,063.72	1,061.98	J2-671	20.11	1,063.72	1,063.72
J2-660	2,003.36	J2-660	-47.38	190.66	1,073.13	1,071.21	J2-660	20.11	1,073.13	1,073.13
J2-839	2,003.36	J2-555	-1.4	366.78	1,092.39	2,476.61	J2-555	-17.26	1,092.35	1,092.35
J2-658	2,003.36	J2-659	-11.87	308.61	1,094.58	2,218.36	J2-659	-21.38	1,094.58	1,094.58
J2-662	2,003.36	J2-662	-43.18	200.35	1,098.32	1,096.31	J2-659	19.95	1,094.58	1,094.58
J2-661	2,003.36	J2-659	-11.87	308.61	1,094.58	1,760.77	J2-659	-2.55	1,094.58	1,094.58
J2-840	2,003.36	J2-555	-1.18	367.29	1,097.54	2,653.06	J2-555	-23.58	1,097.50	1,097.50
J2-204	2,003.36	J2-206	17.78	430.03	1,112.24	4,441.21	J2-206	7.09	1,112.24	1,112.24
J2-270	2,003.36	J2-270	-217.72	-392.47	1,116.65	1,116.00	J2-270	20.11	1,116.61	1,116.61
J2-702	2,003.36	J2-670	-27.01	243.67	1,175.33	1,528.03	J2-670	1.52	1,175.33	1,175.33
J2-656	2,003.36	J2-671	-30.23	224.24	1,214.51	1,453.82	J2-670	5.74	1,175.33	1,175.33
J2-234	2,003.36	J2-555	3.28	377.57	1,200.65	2,521.06	J2-555	-11.77	1,200.64	1,200.64
J2-268	2,003.36	J2-268	-107.44	-47.95	1,212.55	1,211.46	J2-268	20.12	1,212.50	1,212.50
J2-252	2,003.36	J2-252	-73.59	85.16	1,212.81	1,211.36	J2-252	20.12	1,212.78	1,212.78
J2-235	2,003.36	J2-555	3.86	378.91	1,215.85	2,460.95	J2-555	-9.02	1,215.84	1,215.84
J2-233	2,003.36	J2-555	3.86	378.91	1,215.85	2,784.98	J2-555	-19.56	1,215.84	1,215.84
J2-232	2,003.36	J2-555	4.14	379.56	1,223.52	2,894.91	J2-555	-22.85	1,223.52	1,223.52
J2-657	2,003.36	J2-670	-19.22	261.65	1,243.17	1,623.97	J2-670	1.1	1,243.17	1,243.17
J2-236	2,003.36	J2-555	5.56	382.82	1,263.44	3,187.13	J2-555	-30.28	1,263.43	1,263.43
J2-238	2,003.36	J2-238	-7.27	203.21	1,697.67	1,695.49	J2-555	12.97	1,287.87	1,287.87
J2-237	2,003.36	J2-555	6.36	384.68	1,287.88	2,752.81	J2-555	-14	1,287.87	1,287.87
J2-269	2,003.36	J2-270	-133.75	-198.67	1,289.80	1,337.81	J2-270	11.47	1,289.78	1,289.78
J2-241	2,003.36	J2-555	6.47	384.93	1,291.23	3,345.90	J2-555	-33.86	1,291.23	1,291.23
J2-239	2,003.36	J2-555	6.51	385.03	1,292.69	3,521.19	J2-555	-40.32	1,292.69	1,292.69
J2-240	2,003.36	J2-555	6.65	385.34	1,296.83	3,420.99	J2-555	-36.17	1,296.83	1,296.83
J2-837	2,003.36	J2-555	6.78	385.66	1,300.76	4,058.23	J2-555	-61.16	1,300.76	1,300.76
J2-263	2,003.36	J2-555	6.77	385.64	1,301.00	2,306.56	J2-555	-0.64	1,301.00	1,301.00
J2-264	2,003.36	J2-264	4.08	200.41	1,831.27	1,829.09	J2-555	10.59	1,301.00	1,301.00
J2-266	2,003.36	J2-266	-0.06	148.86	1,824.36	1,822.56	J2-555	10.76	1,302.41	1,302.41
J2-262	2,003.36	J2-555	6.87	385.86	1,304.20	2,546.42	J2-555	-7.03	1,304.19	1,304.19
J2-257	2,003.36	J2-555	7.08	386.35	1,311.02	2,881.93	J2-555	-16.7	1,311.02	1,311.02
J2-260	2,003.36	J2-260	-34.78	73.74	1,594.19	1,592.77	J2-555	15.43	1,311.75	1,311.75
J2-259	2,003.36	J2-555	7.11	386.4	1,311.75	1,973.20	J2-555	7.78	1,311.75	1,311.75
J2-258	2,003.36	J2-555	7.11	386.4	1,311.75	2,828.80	J2-555	-15	1,311.75	1,311.75
J2-261	2,003.36	J2-555	7.11	386.4	1,311.75	2,050.00	J2-260	4.67	1,903.64	1,311.75
J2-256	2,003.36	J2-555	7.11	386.41	1,311.92	2,949.79	J2-555	-18.8	1,311.91	1,311.91
J2-255	2,003.36	J2-555	7.19	386.6	1,314.65	3,138.01	J2-555	-24.82	1,314.65	1,314.65
J2-225	2,003.36	J2-555	8.91	390.57	1,374.72	4,220.48	J2-555	-60.17	1,374.72	1,374.72
J2-226	2,003.36	J2-555	9.22	391.28	1,383.63	3,108.18	J2-555	-19.35	1,383.63	1,383.63
J2-267	2,003.36	J2-268	-60.17	61.13	1,391.82	1,665.33	J2-268	-12.76	1,391.79	1,391.79
J2-248	2,003.36	J2-555	9.57	392.09	1,400.07	4,068.09	J2-555	-51.81	1,400.07	1,400.07
J2-254	2,003.36	J2-555	9.77	392.55	1,406.15	2,072.41	J2-555	8.36	1,406.14	1,406.14
J2-221	2,003.36	J2-555	10.41	394.02	1,428.40	3,096.32	J2-555	-16.36	1,428.40	1,428.40
J2-222	2,003.36	J2-555	10.41	394.02	1,428.40	2,177.63	J2-555	6.86	1,428.40	1,428.40
J2-223	2,003.36	J2-555	10.87	395.1	1,450.11	4,288.92	J2-555	-55.15	1,450.11	1,450.11
J2-224	2,003.36	J2-555	10.87	395.1	1,450.11	2,512.61	J2-555	-0.07	1,450.11	1,450.11
J3-973	2,003.36	J3-973	-12.19	236.87	1,535.73	1,533.08	J3-855	20.06	13,259.03	1,535.73
J2-265	2,003.36	J2-268	-31.12	128.19	1,547.94	1,839.76	J2-268	-11.45	1,547.93	1,547.93
J2-220	2,003.36	J2-555	13.47	401.08	1,568.88	4,643.04	J2-555	-57.45	1,568.89	1,568.88
J2-249	2,003.36	J2-555	13.53	401.24	1,572.07	3,271.53	J2-555	-14.13	1,572.08	1,572.07
J2-247	2,003.36	J2-555	13.59	401.37	1,575.52	3,735.39	J2-555	-27.07	1,575.55	1,575.52
J2-246	2,003.36	J2-555	13.76	401.75	1,583.82	3,675.52	J2-555	-24.81	1,583.86	1,583.82
J2-663	2,003.36	J2-669	14.58	371.66	1,611.42	3,574.83	J2-669	-26.44	1,611.42	1,611.42
J2-219	2,003.36	J2-555	14.67	403.86	1,624.97	3,932.07	J2-555	-29	1,624.86	1,624.86
J2-212	2,003.36	J2-212	-13.29	202.34	1,626.00	1,623.84	J2-212	20.16	1,626.01	1,626.00
J3-971	2,003.36	J3-973	-3.84	256.13	1,627.16	1,700.71	J3-973	13.67	1,627.16	1,627.16
J2-250	2,003.36	J2-555	14.69	403.91	1,634.19	2,709.14	J2-555	1.57	1,634.30	1,634.19
J2-251	2,003.36	J2-252	-8.03	236.46	1,636.28	1,840.55	J2-252	5.02	1,636.29	1,636.28
J2-245	2,003.36	J2-555	14.94	404.48	1,647.90	3,818.45	J2-555	-25.42	1,648.03	1,647.90
J2-253	2,003.36	J2-555	15.1	404.85	1,657.25	3,306.91	J2-555	-11.38	1,657.39	1,657.25
J2-244	2,003.36	J2-555	15.12	404.9	1,658.42	3,891.79	J2-555	-26.96	1,658.56	1,658.42
J2-207	2,003.36	J2-206	19.57	434.16	1,686.80	5,181.54	J2-206	12.68	1,686.80	1,686.80

J3-970	2,003.36	J3-973	4.84	276.17	1,702.53	1,960.15	J3-973	7.2	1,702.52	1,702.52
J2-554	2,003.36	J2-206	19.65	434.34	1,734.80	9,533.78	J2-206	-1.68	1,734.80	1,734.80
J2-203	2,003.36	J2-206	19.67	434.4	1,744.95	12,637.56	J2-206	-11.3	1,744.95	1,744.95
J2-243	2,003.36	J2-555	17	409.24	1,776.88	4,625.20	J2-555	-41.96	1,776.88	1,776.88
J2-197	2,003.36	J2-206	19.78	434.65	1,825.11	14,243.39	J2-206	-15.78	1,825.11	1,825.11
J2-218	2,003.36	J2-555	17.77	411.01	1,828.85	5,475.92	J2-555	-65.02	1,829.00	1,828.85
J2-551	2,003.36	J2-206	19.81	434.73	1,845.54	13,767.78	J2-206	-11.33	1,845.54	1,845.54
J2-202	2,003.36	J2-206	19.84	434.79	1,866.96	13,178.98	J2-206	-7.8	1,866.96	1,866.96
J2-198	2,003.36	J2-206	19.85	434.81	1,877.05	9,790.54	J2-206	2.39	1,877.05	1,877.05
J2-213	2,003.36	J2-555	18.75	413.28	1,903.79	5,969.35	J2-555	-76.92	1,903.92	1,903.79
J2-553	2,003.36	J2-553	16.88	285.97	1,951.72	1,948.08	J2-553	20.19	1,951.54	1,951.54
J2-192	2,003.36	J2-206	19.98	435.12	1,997.17	13,872.31	J2-206	-9.56	1,997.17	1,997.17
J2-199	2,003.36	J2-206	19.98	435.12	1,998.35	5,315.67	J2-206	15.05	1,998.18	1,998.18
J2-211	2,003.36	J2-555	20.24	416.71	2,026.83	4,859.08	J2-555	-31.61	2,026.86	2,026.83
J2-215	2,003.36	J2-555	20.52	417.35	2,048.84	6,154.93	J2-555	-71.07	2,048.98	2,048.84
J2-196	2,003.36	J2-206	20.07	435.32	2,085.46	13,728.81	J2-206	-6.99	2,085.46	2,085.46
J2-552	2,003.36	J2-206	20.08	435.33	2,091.94	4,976.19	J2-206	15.94	2,091.94	2,091.94
J2-208	2,003.36	J2-206	20.09	435.37	2,111.14	8,767.77	J2-206	7.23	2,111.14	2,111.14
J2-210	2,003.36	J2-206	20.85	437.13	3,895.18	5,315.17	J2-555	-38.16	2,111.82	2,111.82
J2-217	2,003.36	J2-206	20.9	437.23	4,324.83	4,874.91	J2-555	-24.02	2,166.04	2,166.04
J2-195	2,003.36	J2-206	20.15	435.5	2,172.11	3,972.34	J2-553	13.03	3,750.86	2,172.11
J2-216	2,003.36	J2-206	20.9	437.24	4,359.47	4,798.46	J2-555	-21.46	2,180.27	2,180.27
J2-668	2,003.36	J3-855	19.58	787.18		2,603.78	J3-973	2.48	2,192.54	2,192.54
J2-664	2,003.36	J3-855	19.6	787.23	13,266.10	3,524.72	J2-669	-3.49	2,201.06	2,201.06
J2-193	2,003.36	J2-206	20.19	435.61	2,232.46	13,502.97	J2-206	-3.6	2,232.46	2,232.46
J2-194	2,003.36	J2-206	20.21	435.63	2,244.20	3,696.45	J2-206	18.34	2,244.20	2,244.20
J2-188	2,003.36	J2-206	20.27	435.77	2,329.27	13,810.53	J2-206	-2.93	2,329.27	2,329.27
J2-833	2,003.36	J3-855	19.6	787.24	13,258.75	2,836.46	J2-669	13.37	2,366.25	2,366.25
J5-832	2,003.36	J3-855	19.6	787.24	13,261.41	2,842.61	J2-669	13.41	2,374.01	2,374.01
J2-667	2,003.36	J3-855	19.58	787.18		2,800.36	J3-973	3.06	2,375.45	2,375.45
J2-191	2,003.36	J2-206	20.3	435.86	2,377.98	2,739.48	J2-206	19.65	2,377.98	2,377.98
J2-665	2,003.36	J3-855	19.58	787.18		4,076.45	J2-669	-3.91	2,567.14	2,567.14
J4-425	2,003.36	J3-855	19.57	787.16	13,258.55	2,944.30	J4-424	16.68	2,603.55	2,603.55
J2-187	2,003.36	J2-206	20.44	436.18	2,626.10	6,982.46	J2-206	14.91	2,626.10	2,626.10
J4-844	2,003.36	J3-855	19.57	787.17	13,268.96	3,779.46	J2-669	4.08	2,667.57	2,667.57
J4-843	2,003.36	J3-855	19.57	787.17	13,267.65	3,419.50	J2-669	10.14	2,676.68	2,676.68
J2-189	2,003.36	J2-206	20.48	436.26	2,694.34	11,980.49	J2-206	6.49	2,694.34	2,694.34
J2-666	2,003.36	J3-855	19.58	787.18	13,264.34	3,214.27	J3-973	2.99	2,735.95	2,735.95
J2-653	2,003.36	J2-206	20.65	436.66	2,820.01	8,053.55	J2-654	-20.36	5,885.59	2,820.01
J2-214	2,003.36	J2-206	20.85	437.12	3,841.63	7,803.16	J2-555	-46.96	2,903.00	2,903.00
J2-185	2,003.36	J2-206	20.59	436.51	2,949.76	6,157.11	J2-206	16.89	2,949.73	2,949.73
J2-209	2,003.36	J2-206	20.85	437.11	3,826.82	8,750.29	J2-555	-61.55	3,021.10	3,021.10
J2-186	2,003.36	J2-206	20.71	436.8	3,294.33	5,039.38	J2-206	18.61	3,294.33	3,294.33
J2-184	2,003.36	J2-206	20.73	436.85	3,352.97	2,873.70	J2-206	20.28	3,353.14	3,352.97
J2-172	2,003.36	J2-206	20.73	436.85	3,354.41	4,791.79	J2-206	18.91	3,354.52	3,354.41
J2-170	2,003.36	J2-206	20.73	436.85	3,357.65	4,465.65	J2-206	19.18	3,357.78	3,357.65
J2-449	2,003.36	J2-206	20.73	436.85	3,357.98	4,391.11	J2-206	19.24	3,358.11	3,357.98
J2-169	2,003.36	J2-206	20.73	436.85	3,360.41	3,639.60	J2-206	19.8	3,360.55	3,360.41
J2-173	2,003.36	J2-206	20.73	436.85	3,360.71	2,951.44	J2-206	20.24	3,360.85	3,360.71
J2-168	2,003.36	J2-206	20.73	436.85	3,361.58	3,888.06	J2-206	19.62	3,361.72	3,361.58
J2-166	2,003.36	J2-206	20.74	436.86	3,366.40	4,784.89	J2-206	18.92	3,366.56	3,366.40
J2-448	2,003.36	J2-206	20.74	436.86	3,367.70	4,771.10	J2-206	18.94	3,367.86	3,367.70
J2-450	2,003.36	J2-206	20.74	436.86	3,371.74	4,780.30	J2-206	18.93	3,371.92	3,371.74
J2-165	2,003.36	J2-206	20.74	436.86	3,372.28	4,076.66	J2-206	19.49	3,372.45	3,372.28
J1-733	2,003.36	J2-206	20.74	436.86	3,374.32	4,082.93	J2-206	19.49	3,374.51	3,374.32
J2-167	2,003.36	J2-206	20.74	436.87	3,379.62	4,870.86	J2-206	18.87	3,379.81	3,379.62
J2-175	2,003.36	J2-206	20.75	436.88	3,406.34	4,254.80	J2-206	19.39	3,406.56	3,406.34
J2-174	2,003.36	J2-206	20.75	436.89	3,410.20	4,816.84	J2-206	18.95	3,410.42	3,410.20
J2-182	2,003.36	J2-206	20.75	436.9	3,421.54	3,827.98	J2-206	19.71	3,421.74	3,421.54
J2-179	2,003.36	J2-206	20.76	436.9	3,430.61	4,725.36	J2-181	18.88	4,643.11	3,430.61
J2-176	2,003.36	J2-206	20.76	436.91	3,444.81	4,963.08	J2-181	16.99	4,738.27	3,444.81
J2-181	2,003.36	J2-206	20.76	436.91	3,445.77	3,790.00	J2-206	19.76	3,445.94	3,445.77
J2-178	2,003.36	J2-206	20.76	436.92	3,453.94	4,180.72	J2-206	19.48	3,454.13	3,453.94
J2-180	2,003.36	J2-206	20.76	436.92	3,455.70	4,202.21	J2-206	19.47	3,455.88	3,455.70
J2-177	2,003.36	J2-206	20.77	436.93	3,481.57	5,414.39	J2-181	11.93	4,816.56	3,481.57
J2-451	2,003.36	J2-206	20.78	436.96	3,521.17	5,610.44	J2-181	12.91	5,055.93	3,521.17
J2-183	2,003.36	J2-206	20.79	436.97	3,534.40	4,238.58	J2-206	19.51	3,534.41	3,534.40
J2-190	2,003.36	J2-206	20.88	437.18	3,940.07	12,389.83	J2-555	12.13	9,307.59	3,940.07
J4-424	2,003.36	J3-855	19.61	787.26	13,264.07	2,416.13	J3-855	19.23	13,264.06	13,264.06
J2-185	2,003.36	J2-206	21.65	438.96	5,491.22	6,258.31	J2-206	19.36	5,491.22	5,491.22
J2-214	2,003.36	J2-206	21.79	439.3	7,239.09	7,845.49	J2-838	-14.38	5,807.15	5,807.15

J2-209	2,003.36	J2-206	21.79	439.29	7,210.68	8,805.19	J2-838	-29.18	5,956.52	5,956.52
J2-190	2,003.36	J2-206	21.83	439.39	7,423.60	12,987.69	J2-206	15.56	7,423.71	7,423.60
J2-186	2,003.36	J2-206	21.71	439.09	6,075.84	5,091.55	J2-186	20.51	5,113.86	5,113.86
J2-451	2,003.36	J2-206	21.73	439.14	6,337.90	5,653.58	J2-181	13.6	5,151.92	5,151.92
J2-189	2,003.36	J2-206	21.64	438.94	5,228.21	12,675.96	J2-206	11.14	5,228.21	5,228.21
J2-185	2,003.36	J2-206	21.66	438.99	5,544.79	6,257.92	J2-206	19.42	5,545.02	5,544.79
J1-8	2,005.67	J2-206	22.15	440.13	9,922.41	6,112.30	J1-8	20.61	6,125.98	6,125.98
J2-190	2,003.36	J2-206	21.85	439.42	7,491.36	12,991.27	J2-555	12.14	9,933.13	7,491.36
J1-855	2,000.00	J2-206	22.11	440.03	9,860.82	8,644.12	J2-206	20.72	9,860.85	9,860.82

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow (gpm)
J5-638	2,004.09	J5-638	-437.78	-580.34	399.68	399.34	J5-638	20.04	399.68	399.68
J5-640	2,004.09	J5-640	-309.43	-294.12	509.07	508.59	J5-638	19.1	498.94	498.94
J5-639	2,004.09	J5-638	-270.83	-195.04	498.94	516.93	J5-638	18.32	498.94	498.94
J5-841	2,004.09	J5-638	-215.32	-66.93	553.11	583.17	J5-638	17.45	553.11	553.11
J5-637	2,004.09	J5-638	-168.32	41.55	615.53	718.70	J5-638	11.83	615.53	615.53
J2-652	2,004.09	J2-652	-354.36	-467.82	697.46	697.05	J2-652	20.07	697.46	697.46
J5-842	2,004.09	J5-842	-70.31	277.73	788.94	787.30	J5-842	20.08	788.94	788.94
J2-650	2,004.09	J2-650	-100.01	126.20	1,087.55	1,086.47	J2-650	20.11	1,087.55	1,087.55
J5-636	2,004.09	J5-842	6.71	455.48	1,504.40	2,562.78	J5-842	-12.26	1,504.40	1,504.40
J5-644	2,004.09	J5-644	2.89	361.67	1,736.98	1,734.13	J5-644	20.17	1,736.98	1,736.98
J4-501	2,004.09	J4-501	14.76	284.06	1,950.38	1,948.35	J4-501	20.19	1,950.37	1,950.37
J3-1001	2,004.09	J3-1001	19.12	362.13	1,990.79	1,987.79	J3-1001	20.2	1,990.79	1,990.79
J2-648	2,004.09	J2-206	21.21	437.94	12,066.71	2,108.38	J2-648	20.21	2,111.10	2,111.10
J-5013	2,004.09	J2-206	21.21	437.95	12,481.21	2,148.02	J-5013	20.21	2,150.77	2,150.77
J-5014	2,004.09	J2-206	21.21	437.95	12,481.21	2,252.13	J-5013	15.89	2,198.90	2,198.90
J-5017	2,004.09	J2-206	21.21	437.95	12,481.20	2,468.87	J-5013	3.95	2,261.87	2,261.87
J-5016	2,004.09	J2-206	21.21	437.95	12,481.21	2,415.75	J-5013	8.19	2,261.87	2,261.87
J-5015	2,004.09	J2-206	21.21	437.95	12,481.21	2,361.51	J-5013	12.44	2,261.87	2,261.87
J3-999	2,004.09	J2-206	21.21	437.95	12,481.22	2,278.41	J3-1001	20.23	2,282.30	2,282.30
J3-1000	2,004.09	J2-206	21.21	437.95	12,481.22	2,278.69	J3-1000	20.23	2,282.54	2,282.54
J-5020	2,004.09	J2-206	21.21	437.95	12,481.21	2,421.34	J3-1000	11.55	2,282.54	2,282.54
J-5019	2,004.09	J2-206	21.21	437.95	12,481.21	2,390.00	J-5013	12.44	2,289.30	2,289.30
J3-998	2,004.09	J2-206	21.21	437.95	12,481.22	2,290.48	J3-998	20.23	2,294.77	2,294.77
J3-997	2,004.09	J2-206	21.21	437.95	12,481.22	2,372.60	J3-997	20.24	2,377.32	2,377.32
J2-651	2,004.09	J2-206	21.21	437.94	12,066.71	2,553.90	J2-651	20.25	2,560.55	2,560.55
J-5092	2,004.09	J2-206	21.21	437.94	12,066.71	4,108.40	J2-651	-56.85	2,560.55	2,560.55
J3-1007	2,004.09	J2-206	21.21	437.95	12,481.23	2,614.16	J3-1007	20.26	2,621.84	2,621.84
J-527	2,007.20	J2-206	21.21	437.95	12,484.34	2,644.70	J-527	20.26	2,650.86	2,650.86
J2-647	2,004.09	J2-206	21.21	437.94	12,066.71	3,103.66	J2-650	3.84	2,723.93	2,723.93
J3-1005	2,004.09	J2-206	21.21	437.95	12,481.23	2,782.35	J3-1005	20.28	2,791.13	2,791.13
J3-1010	2,004.09	J2-206	21.21	437.95	12,481.23	2,797.02	J3-1010	20.28	2,801.36	2,801.36
J3-996	2,004.09	J2-206	21.21	437.95	12,481.23	2,835.47	J3-996	20.28	2,843.31	2,843.31
J5-815	2,004.09	J2-206	21.21	437.95	12,481.24	2,866.29	J5-815	20.29	2,874.94	2,874.94
J3-1002	2,004.09	J2-206	21.21	437.95	12,481.23	3,128.01	J3-996	14.58	2,975.96	2,975.96
J3-1003	2,004.09	J2-206	21.21	437.95	12,481.23	3,340.09	J3-1005	12.97	3,106.75	3,106.75
J3-1009	2,004.09	J2-206	21.21	437.95	12,481.23	3,104.42	J3-1005	20.07	3,106.75	3,106.75
J3-1006	2,004.09	J2-206	21.21	437.95	12,481.23	3,460.81	J3-1005	10.37	3,142.46	3,142.46
J3-1008	2,004.09	J2-206	21.21	437.95	12,481.24	3,609.09	J3-1008	20.36	3,618.49	3,618.49
J2-649	2,004.09	J2-206	21.21	437.94	12,066.71	3,973.53	J2-651	9.56	3,626.25	3,626.25
J2-646	2,004.09	J2-206	21.21	437.94	12,066.71	5,659.39	J2-650	-8.04	4,644.25	4,644.25
J5-799	2,004.09	J2-206	21.21	437.95	12,481.24	4,937.53	J3-1005	16.11	4,750.60	4,750.60
J5-634	2,004.09	J2-206	21.22	437.97	18,308.44	8,653.54	J5-842	3.5	6,563.83	6,563.83
J5-633	2,004.09	J2-206	21.22	437.98	19,751.76	6,532.16	J5-633	20.65	6,590.07	6,590.07
J2-729	2,004.09	J2-206	21.21	437.94	12,066.71	7,658.41	J2-650	2.55	6,720.59	6,720.59
J5-797	2,004.09	J2-206	21.21	437.95	12,481.24	7,828.51	J3-1005	12.91	7,319.01	7,319.01
J5-643	2,004.09	J2-206	21.21	437.94	12,066.71	8,245.34	J3-1005	8.43	7,405.96	7,405.96
J5-634	2,004.09	J5-842	41.04	534.72	12,598.01	10,954.48	J5-634	21.1	11,123.76	11,123.76

2009 FF 542 Zone
After Improvements

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow	Available Flow at	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow
J5-638	2,004.09	J5-638	-207.89	-49.78	562.08	561.36	J5-638	20.06	562.08	562.08
J2-652	2,004.09	J2-652	-356.11	-471.85	677.65	677.25	J2-652	20.07	677.68	677.65
J5-640	2,004.09	J5-640	-79.54	236.44	882.92	881.48	J5-640	20.09	882.99	882.92
J5-639	2,004.09	J5-638	-40.94	335.52	1,006.22	1,043.19	J5-638	18.37	1,006.13	1,006.13
J2-650	2,004.09	J2-650	-101.75	122.16	1,069.42	1,068.29	J2-650	20.11	1,069.42	1,069.42
J5-842	2,004.09	J5-842	-1.76	435.94	1,342.40	1,337.36	J5-842	20.13	1,342.33	1,342.33
J5-644	2,004.09	J5-644	0.92	357.12	1,716.66	1,713.85	J5-644	20.17	1,716.66	1,716.66
J5-637	2,004.09	J5-637	11.82	438.27	1,773.57	1,768.25	J5-637	20.18	1,773.55	1,773.55
J5-841	2,004.09	J5-638	14.57	463.63	1,796.27	1,891.36	J5-638	17.58	1,796.24	1,796.24
J4-501	2,004.09	J4-501	13.01	280.03	1,934.08	1,932.08	J4-501	20.19	1,934.07	1,934.07
J3-1001	2,004.09	J3-1001	15.91	354.72	1,944.99	1,942.10	J3-1001	20.19	1,944.99	1,944.99
J-5092	2,004.09	J5-638	19.91	475.96	2,000.49	5,412.69	J5-638	-111.6	2,000.37	2,000.37
J2-648	2,004.09	J2-648	26.35	342.81	2,086.00	2,083.32	J2-648	20.21	2,086.00	2,086.00
J-5013	2,004.09	J-5013	27.84	338.26	2,104.63	2,101.96	J-5013	20.21	2,104.63	2,104.63
J-5014	2,004.09	J4-690	28	505.63		2,201.97	J-5013	15.89	2,149.81	2,149.81
J-5017	2,004.09	J4-690	28	505.63		2,418.04	J-5013	3.5	2,208.88	2,208.88
J-5016	2,004.09	J4-690	28	505.63		2,361.97	J-5013	8.04	2,208.88	2,208.88
J-5015	2,004.09	J4-690	28	505.63		2,306.75	J-5013	12.43	2,208.88	2,208.88
J3-999	2,004.09	J4-690	28	505.63		2,210.67	J3-1001	20.22	2,214.40	2,214.40
J3-1000	2,004.09	J4-690	28	505.63		2,211.66	J3-1000	20.22	2,215.35	2,215.35
J-5020	2,004.09	J4-690	28	505.63		2,363.00	J3-1000	10.79	2,215.35	2,215.35
J3-998	2,004.09	J4-690	28	505.63		2,215.80	J3-998	20.22	2,219.90	2,219.90
J2-651	2,004.09	J5-638	24.24	485.94	2,221.07	3,159.10	J5-638	-2.78	2,221.04	2,221.04
J-5019	2,004.09	J4-690	28	505.63		2,333.53	J-5013	12.43	2,234.61	2,234.61
J5-636	2,004.09	J5-842	24.06	495.54	2,262.80	3,249.79	J5-842	0.55	2,262.80	2,262.80
J3-997	2,004.09	J4-690	28	505.63		2,288.43	J3-997	20.23	2,292.94	2,292.94
J3-1007	2,004.09	J4-690	28	505.63		2,472.64	J3-1007	20.25	2,479.83	2,479.83
J-527	2,007.20	J4-690	28	505.63		2,529.46	J-527	20.25	2,535.32	2,535.32
J3-1005	2,004.09	J4-690	28	505.63		2,617.58	J3-1005	20.26	2,625.78	2,625.78
J2-647	2,004.09	J4-690	28	505.63		3,036.60	J2-650	3.83	2,652.97	2,652.97
J3-996	2,004.09	J4-690	28	505.63		2,686.63	J3-996	20.27	2,694.03	2,694.03
J3-1010	2,004.09	J4-690	28	505.63		2,713.52	J3-1010	20.27	2,717.74	2,717.74
J5-815	2,004.09	J4-690	28	505.63		2,739.87	J5-815	20.27	2,748.23	2,748.23
J3-1002	2,004.09	J4-690	28	505.63		2,972.29	J3-996	14.21	2,812.08	2,812.08
J3-1003	2,004.09	J4-690	28	505.63		3,149.48	J3-1005	12.46	2,901.83	2,901.83
J3-1009	2,004.09	J4-690	28	505.63		2,968.05	J3-1005	18.03	2,901.83	2,901.83
J3-1006	2,004.09	J4-690	28	505.63		3,250.20	J3-1005	10.35	2,933.23	2,933.23
J2-649	2,004.09	J4-690	28	505.63		4,503.73	J5-638	-10.47	2,937.50	2,937.50
J3-1008	2,004.09	J4-690	28	505.63		3,426.68	J3-1008	20.34	3,435.72	3,435.72
J5-799	2,004.09	J4-690	28	505.63		4,517.23	J3-1005	16.07	4,325.85	4,325.85
J2-646	2,004.09	J4-690	28	505.63		5,648.80	J2-650	-8.05	4,561.37	4,561.37
J2-729	2,004.09	J4-690	28	505.63		7,874.00	J5-638	-16.63	4,898.09	4,898.09
J5-643	2,004.09	J4-690	28	505.63		8,342.74	J5-638	-12.03	5,420.91	5,420.91
J5-797	2,004.09	J4-690	28	505.63		7,880.33	J5-638	-2.25	5,657.26	5,657.26
J5-633	2,004.09	J4-690	28	505.63		6,285.72	J5-633	20.63	6,344.07	6,344.07
J5-634	2,004.09	J4-690	28	505.63		8,387.49	J5-842	5.63	6,350.27	6,350.27

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow
J4-690	2,006.36	J4-690	-13.12	410.71	423.45	419.52	J4-690	20.04	423.44	423.44
J4-691	2,006.36	J4-690	-12.5	412.16	426.92	650.88	J4-690	17.31	426.92	426.92
J4-692	2,006.36	J4-690	-12.14	412.98	428.92	2,042.87	J4-690	-13.23	428.91	428.91
J4-528	2,007.20	J4-690	-12.19	412.87	429.5	2,024.99	J4-690	-12.72	429.49	429.49
J4-530	2,007.20	J4-690	-12.19	412.87	429.50	1,935.94	J4-690	-10.1	429.49	429.49
J4-693	2,006.36	J4-690	-11.98	413.35	429.86	1,908.72	J4-690	-9.14	429.85	429.85
J4-694	2,006.36	J4-690	-11.82	413.71	430.8	1,503.61	J4-690	1.54	430.79	430.79
J4-695	2,006.36	J4-690	-10.56	416.63	439.29	2,082.38	J4-690	-12.74	439.28	439.28
J4-696	2,006.36	J4-690	-10.66	416.39	439.53	2,002.71	J4-690	-10.56	439.53	439.53
J4-697	2,006.36	J4-690	-9.44	419.2	447.26	2,484.05	J4-690	-23.65	447.25	447.25
J4-698	4,006.36	J4-690	-76.72	263.95	451.61	2,592.05	J4-690	-26.55	451.61	451.61
J4-742	2,006.36	J4-690	-7.92	422.73	460.71	2,752.96	J4-690	-30	460.7	460.7
J4-741	4,006.36	J4-690	-67.38	285.5	475.6	2,800.78	J4-690	-28.7	475.6	475.6
J4-699	2,028.23	J4-690	-7.92	422.73	482.57	3,016.88	J4-690	-37.68	482.57	482.57
J4-739	2,006.36	J4-690	9.05	461.89	736.97	5,022.80	J4-690	-29.88	736.97	736.97
J4-738	2,006.36	J4-690	13.24	471.55	908.66	4,168.83	J4-690	-1.83	908.66	908.66
J4-414	2,006.36	J4-414	-34.11	322.28	1,013.14	1,010.55	J4-414	20.1	1,013.14	1,013.14
J4-756	2,006.36	J4-756	-0.34	427.23	1,039.62	1,032.98	J4-756	20.1	1,039.62	1,039.62
J4-747	2,006.36	J4-747	-0.18	425.59	1,074.41	1,067.87	J4-747	20.11	1,074.41	1,074.41
J4-746	2,006.36	J4-747	-0.18	425.59	1,074.41	-86.16	J2-229	21.16	65,399.08	1,074.41
J4-740	2,179.02	J4-690	14.43	474.29	1,154.40	4,733.61	J4-690	0.37	1,154.29	1,154.29
J4-619	2,006.36	J4-690	17.33	481	1,286.89	9,376.18	J4-690	2.07	1,286.89	1,286.89
J4-618	2,006.36	J4-690	17.58	481.58	1,322.78	7,721.55	J4-690	7.15	1,322.78	1,322.78
J4-620	2,006.36	J4-690	17.61	481.63	1,326.11	3,582.04	J4-690	13.12	1,326.11	1,326.11
J4-622	2,006.36	J4-622	17.29	439.9	1,872.47	1,863.01	J4-690	18.15	1,326.11	1,326.11
J3-865	2,006.36	J3-865	13.95	422.2	1,778.90	1,771.92	J4-690	18.49	1,326.11	1,326.11
J4-796	2,006.36	J4-690	17.62	481.66	1,327.87	4,498.65	J4-690	12.37	1,327.87	1,327.87
J4-621	2,006.36	J4-690	17.66	481.75	1,333.82	8,861.05	J4-690	4.84	1,333.81	1,333.81
J4-617	2,006.36	J4-690	17.71	481.88	1,343.92	5,333.51	J4-690	11.43	1,343.92	1,343.92
J4-616	2,006.36	J4-690	17.73	481.92	1,347.20	6,031.89	J4-690	10.46	1,347.19	1,347.19
J4-615	2,006.36	J4-690	17.76	481.98	1,351.60	5,804.24	J4-690	10.82	1,351.60	1,351.60
J4-614	2,006.36	J4-690	17.77	482	1,352.18	10,105.80	J4-690	2.28	1,352.18	1,352.18
J4-610	2,006.36	J4-690	17.81	482.1	1,360.86	6,639.34	J4-690	9.54	1,360.86	1,360.86
J3-748	2,006.36	J3-748	-1.17	481.3	1,362.59	1,357.49	J3-748	20.14	1,362.59	1,362.59
J4-611	2,006.36	J4-690	17.84	482.18	1,364.92	10,863.84	J4-690	-0.11	1,364.92	1,364.92
J4-609	2,006.36	J4-690	17.86	482.21	1,369.52	7,471.45	J4-690	8	1,369.52	1,369.52
J4-608	2,006.36	J4-690	17.88	482.27	1,373.65	8,618.62	J4-690	5.79	1,373.65	1,373.65
J4-607	2,006.36	J4-690	17.89	482.3	1,378.59	10,467.36	J4-690	0.36	1,378.59	1,378.59
J4-612	2,006.36	J4-690	17.93	482.37	1,379.76	11,329.96	J4-690	-1.69	1,379.76	1,379.76
J4-606	2,006.36	J4-690	17.91	482.33	1,384.51	15,865.90	J4-690	-31.57	1,384.51	1,384.51
J3-759	2,006.36	J3-759	-1.04	392.6	1,406.85	1,402.22	J3-759	20.14	1,406.90	1,406.85
J3-965	2,006.36	J4-690	18.1	482.78	1,412.31	3,708.66	J4-690	13.19	1,412.31	1,412.31
J3-967	2,006.36	J4-690	18.1	482.78	1,412.31	2,510.46	J4-690	16.24	1,412.31	1,412.31
J3-364	2,006.36	J4-690	18.1	482.78	1,412.31	2,119.26	J4-690	17.71	1,412.31	1,412.31
J3-966	2,006.36	J4-690	18.1	482.78	1,412.31	2,730.72	J4-690	15.36	1,412.31	1,412.31
J3-968	2,006.36	J4-690	18.1	482.78	1,412.31	4,315.16	J3-364	8.29	3,617.13	1,412.31
J4-613	2,006.36	J4-690	18.1	482.78	1,412.31	10,754.10	J3-364	-1.48	8,097.83	1,412.31
J3-969	2,006.36	J4-690	18.1	482.78	1,412.31	3,101.51	J3-364	11.64	2,773.40	1,412.31
J3-961	2,006.36	J4-690	18.2	483	1,431.44	9,713.16	J4-690	4.54	1,431.44	1,431.44
J3-963	2,006.36	J4-690	18.2	483	1,431.44	2,761.53	J4-690	15.39	1,431.44	1,431.44
J4-433	2,006.36	J4-690	18.28	483.2	1,458.72	17,319.34	J4-690	-35.43	1,458.60	1,458.60
J3-964	2,006.36	J4-690	18.34	483.32	1,460.72	3,167.76	J4-690	13.96	1,460.72	1,460.72
J3-962	2,006.36	J4-690	18.34	483.32	1,460.72	8,081.04	J4-690	7.97	1,460.72	1,460.72
J4-858	2,006.36	J4-690	18.48	483.66	1,508.15	17,134.34	J4-690	-30.46	1,508.08	1,508.08
J4-749	2,006.36	J4-690	18.64	484.01	1,533.04	6,577.18	J4-690	10.71	1,532.95	1,532.95
J5-856	2,002.10	J4-690	18.66	484.06	1,542.49	11,125.48	J4-430	1.59	8,541.32	1,542.49
JF-102	2,006.36	J4-690	18.81	484.41	1,586.13	7,212.70	J4-690	10.16	1,586.08	1,586.08
JF-101	2,006.36	J4-690	18.81	484.41	1,586.10	11,137.96	J4-441	-16.69	7,320.91	1,586.10
J-5064	2,006.36	J-5064	1.62	251.75	1,805.14	1,803.08	J4-690	19.4	1,586.11	1,586.11
J4-847	2,006.36	J4-690	18.81	484.41	1,586.16	7,249.61	J4-690	10.11	1,586.11	1,586.11
J-5063	2,006.36	J4-690	18.81	484.41	1,586.16	3,380.15	J4-690	13.92	1,586.11	1,586.11
J-5065	2,006.36	J4-690	18.81	484.41	1,586.16	2,428.83	J4-690	17.47	1,586.11	1,586.11
J-5062	2,006.36	J4-690	18.81	484.41	1,586.16	4,794.89	J4-690	12.75	1,586.11	1,586.11
J4-440	2,006.36	J4-690	18.81	484.41	1,586.18	7,869.87	J4-690	9.22	1,586.14	1,586.14
J-5061	2,006.36	J4-690	18.81	484.41	1,586.28	2,310.74	J4-690	17.86	1,586.23	1,586.23
J-5060	2,006.36	J4-690	18.81	484.41	1,586.28	3,399.43	J4-690	13.84	1,586.23	1,586.23
J4-432	2,006.36	J4-690	18.81	484.41	1,586.28	3,339.47	J4-690	14.08	1,586.23	1,586.23
J-5009	2,006.36	J4-690	18.81	484.41	1,586.28	5,007.11	J4-690	12.59	1,586.23	1,586.23
J-5047	2,006.36	J4-690	18.81	484.41	1,586.28	7,248.72	J-5061	7.72	6,743.44	1,586.28
J-5048	2,006.36	J4-690	18.81	484.41	1,586.43	6,391.32	J4-690	11.2	1,586.39	1,586.39
J-5049	2,006.36	J4-690	18.81	484.41	1,586.52	6,258.80	J4-690	11.36	1,586.47	1,586.47

J-5051	2,006.36	J4-690	18.81	484.41	1,586.59	6,298.98	J4-690	11.31	1,586.54	1,586.54
J-5050	2,006.36	J4-690	18.81	484.41	1,586.61	6,162.83	J4-690	11.47	1,586.56	1,586.56
J-5052	2,006.36	J4-690	18.81	484.41	1,586.61	6,196.75	J4-690	11.43	1,586.56	1,586.56
J-5059	2,006.36	J4-690	18.81	484.41	1,586.62	5,973.36	J4-690	11.68	1,586.57	1,586.57
J-5058	2,006.36	J4-690	18.81	484.41	1,586.62	6,246.21	J4-690	11.37	1,586.57	1,586.57
J-5057	2,006.36	J4-690	18.81	484.41	1,586.63	6,028.83	J4-690	11.62	1,586.59	1,586.59
J-5056	2,006.36	J4-690	18.81	484.41	1,586.63	6,346.12	J4-690	11.26	1,586.59	1,586.59
J-5055	2,006.36	J4-690	18.81	484.41	1,586.64	5,724.10	J4-690	11.94	1,586.60	1,586.60
J-5053	2,006.36	J4-690	18.81	484.41	1,586.61	7,297.52	J-5059	-8.89	6,351.80	1,586.61
J-5054	2,006.36	J4-690	18.81	484.41	1,586.65	6,455.26	J4-690	11.13	1,586.61	1,586.61
J-5066	2,006.36	J4-690	18.81	484.42	1,586.99	8,421.87	J4-690	8.46	1,586.94	1,586.94
J4-441	2,006.36	J4-690	18.82	484.42	1,587.74	7,099.98	J4-690	10.32	1,587.69	1,587.69
J-5068	2,006.36	J4-690	18.83	484.45	1,591.24	3,733.86	J4-690	13.28	1,591.19	1,591.19
J-5071	2,006.36	J4-690	18.83	484.45	1,591.24	3,043.82	J4-690	15.29	1,591.19	1,591.19
J3-100	2,006.36	J4-690	18.83	484.45	1,591.23	3,186.83	J4-690	14.74	1,591.19	1,591.19
J3-101	2,006.36	J4-690	18.83	484.45	1,591.23	2,873.39	J4-690	15.93	1,591.19	1,591.19
J-5069	2,006.36	J4-690	18.83	484.45	1,591.24	3,306.57	J4-690	14.26	1,591.19	1,591.19
J3-972	2,006.36	J4-690	18.83	484.45	1,591.23	2,881.61	J4-690	15.9	1,591.19	1,591.19
J-5067	2,006.36	J4-690	18.83	484.45	1,591.23	6,026.56	J4-690	11.64	1,591.19	1,591.19
J-5070	2,006.36	J4-690	18.83	484.45	1,591.23	3,111.08	J4-690	15.03	1,591.19	1,591.19
J-5091	2,006.36	J4-690	18.83	484.47	1,592.68	7,649.19	J4-690	9.6	1,592.63	1,592.63
J4-427	2,006.36	J4-690	18.86	484.54	1,600.25	7,827.17	J4-690	9.41	1,600.21	1,600.21
J4-428	2,006.36	J4-690	18.86	484.54	1,600.25	3,474.06	J4-690	13.67	1,600.21	1,600.21
J4-625	2,006.36	J4-690	18.86	484.54	1,600.25	2,797.54	J4-690	16.27	1,600.21	1,600.21
J4-830	2,006.36	J4-690	18.87	484.54	1,609.63	17,295.67	J4-690	-27.04	1,609.60	1,609.60
J-5073	2,006.36	J4-690	19.03	484.92	1,657.22	7,012.56	J4-690	10.25	1,657.20	1,657.20
J-5074	2,006.36	J4-690	19.03	484.92	1,657.22	17,878.89	J4-690	-29.94	1,657.20	1,657.20
J4-426	2,006.36	J4-690	19.08	485.03	1,657.72	6,465.55	J4-690	11.5	1,657.69	1,657.69
J4-412	2,006.36	J4-414	12.09	428.9	1,690.60	2,026.97	J4-414	11.53	1,690.60	1,690.60
J4-413	2,006.36	J4-414	12.09	428.9	1,690.60	1,939.73	J4-414	13.85	1,690.60	1,690.60
J4-750	2,006.36	J4-747	16.7	464.54	1,698.25	3,018.07	J4-747	2.97	1,698.41	1,698.25
J4-752	2,006.36	J4-690	19.18	485.27	1,699.41	10,938.40	J4-756	-5.34	3,303.49	1,699.41
J4-430	2,144.80	J4-690	18.79	484.37	1,720.24	7,598.46	J4-690	9.79	1,720.22	1,720.22
J4-431	2,144.80	J4-690	18.81	484.41	1,724.40	10,679.22	J4-441	-9.96	7,469.42	1,724.40
J4-429	2,144.80	J4-690	18.82	484.44	1,728.64	7,526.72	J4-690	9.94	1,728.62	1,728.62
J4-2016	2,006.36	J4-690	19.37	485.71	1,757.04	4,623.79	J4-690	13.07	1,757.04	1,757.04
J4-2017	2,006.36	J4-690	19.47	485.94	1,791.42	3,525.90	J4-690	14.87	1,791.42	1,791.42
J4-2015	2,006.36	J4-690	19.47	485.94	1,791.42	4,964.28	J4-690	12.92	1,791.42	1,791.42
J4-757	2,006.36	J4-690	19.46	485.91	1,793.60	14,854.85	J4-756	-8.89	3,692.10	1,793.60
J4-762	2,006.36	J4-690	19.57	486.16	1,829.70	10,726.81	J4-690	6.06	1,829.70	1,829.70
J4-2014	2,006.36	J4-690	19.58	486.19	1,830.66	5,923.56	J4-690	12.23	1,830.66	1,830.66
J4-763	2,006.36	J4-690	19.59	486.22	1,838.56	4,840.29	J4-690	13.02	1,838.56	1,838.56
J4-2013	2,006.36	J4-690	19.61	486.27	1,843.41	6,413.56	J4-690	11.78	1,843.41	1,843.41
J4-2018	2,006.36	J4-690	19.61	486.27	1,843.41	3,662.45	J4-690	14.74	1,843.41	1,843.41
J4-2012	2,006.36	J4-690	19.64	486.33	1,853.96	6,907.47	J4-690	11.28	1,853.96	1,853.96
J4-435	2,006.36	J4-690	19.64	486.33	1,856.16	9,418.28	J4-690	8.2	1,856.16	1,856.16
J4-2010	2,006.36	J4-690	19.66	486.37	1,860.37	7,254.27	J4-690	10.91	1,860.37	1,860.37
J4-2006	2,006.36	J4-690	19.67	486.4	1,865.44	3,805.15	J4-690	14.39	1,865.44	1,865.44
J4-2001	2,006.36	J4-690	19.67	486.4	1,865.44	5,083.04	J4-690	12.96	1,865.44	1,865.44
J4-2002	2,006.36	J4-690	19.67	486.4	1,865.44	3,725.17	J4-690	14.66	1,865.44	1,865.44
J4-2004	2,006.36	J4-690	19.67	486.4	1,865.44	3,823.87	J4-690	14.32	1,865.44	1,865.44
J4-2007	2,006.36	J4-690	19.67	486.4	1,865.44	3,601.25	J4-690	15.09	1,865.44	1,865.44
J4-2008	2,006.36	J4-690	19.67	486.4	1,865.44	3,686.11	J4-690	14.8	1,865.44	1,865.44
J4-2009	2,006.36	J4-690	19.67	486.4	1,865.44	3,577.45	J4-690	15.16	1,865.44	1,865.44
J4-2000	2,006.36	J4-690	19.67	486.4	1,865.44	7,558.55	J4-690	10.57	1,865.44	1,865.44
J4-2003	2,006.36	J4-690	19.67	486.4	1,865.44	4,209.09	J4-690	13.3	1,865.44	1,865.44
J4-2005	2,006.36	J4-690	19.67	486.4	1,865.44	3,622.82	J4-690	15.01	1,865.44	1,865.44
J-5072	2,006.36	J4-690	19.67	486.4	1,865.44	3,635.33	J4-690	14.97	1,865.44	1,865.44
J4-2011	2,006.36	J4-690	19.69	486.44	1,872.37	7,614.64	J4-690	10.54	1,872.37	1,872.37
J4-765	2,006.36	J4-690	19.7	486.47	1,878.89	8,235.96	J4-690	9.86	1,878.89	1,878.89
J4-772	2,006.36	J4-690	19.7	486.48	1,879.20	4,458.20	J4-690	13.26	1,879.20	1,879.20
J4-766	2,006.36	J4-690	19.7	486.48	1,879.20	3,546.52	J4-690	15.33	1,879.20	1,879.20
J4-767	2,006.36	J4-690	19.71	486.48	1,879.74	3,477.18	J4-690	15.57	1,879.74	1,879.74
J4-769	2,006.36	J4-690	19.71	486.49	1,881.12	7,875.15	J4-690	10.29	1,881.11	1,881.11
J4-768	2,006.36	J4-690	19.71	486.49	1,881.17	8,552.36	J4-690	9.53	1,881.17	1,881.17
J4-770	2,006.36	J4-690	19.74	486.55	1,891.97	6,352.46	J4-690	11.98	1,891.97	1,891.97
J4-764	2,006.36	J4-690	19.77	486.63	1,906.87	2,166.48	J4-690	19.39	1,907.02	1,906.87
J4-773	2,006.36	J4-690	19.77	486.63	1,906.87	5,507.74	J4-690	12.66	1,907.02	1,906.87
J4-437	2,006.36	J4-690	19.82	486.73	1,924.14	6,217.96	J4-690	12.2	1,924.24	1,924.14
J4-438	2,006.36	J4-690	19.87	486.85	1,947.06	5,960.44	J4-690	12.47	1,947.08	1,947.06
J4-439	2,006.36	J4-690	19.9	486.93	1,961.38	4,402.88	J4-690	13.3	1,961.36	1,961.36
J3-751	2,006.36	J3-748	19.56	529.14	1,997.81	2,625.45	J3-748	-16.57	1,997.76	1,997.76
J4-771	2,006.36	J4-690	20.01	487.19	2,013.00	6,793.48	J4-690	12.11	2,012.94	2,012.94

J4-436	2,006.36	J4-690	20.04	487.26	2,027.74	5,637.61	J4-690	12.87	2,027.69	2,027.69
J4-434	2,006.36	J4-690	20.09	487.36	2,046.03	12,513.13	J4-690	4.22	2,046.01	2,046.01
J3-755	2,006.36	J2-229	21.16	443.82		2,053.26	J3-755	20.2	2,056.92	2,056.92
J4-411	2,006.36	J2-229	21.13	443.77	50,750.93	2,671.04	J4-414	8.56	2,114.82	2,114.82
J4-420	2,006.36	J4-690	20.51	488.34	2,280.59	5,817.60	J4-690	13.04	2,280.59	2,280.59
J3-753	2,006.36	J2-229	21.16	443.82		2,652.39	J3-748	0.76	2,283.98	2,283.98
J3-754	2,006.36	J2-229	21.16	443.82		2,631.45	J3-755	3.77	2,329.53	2,329.53
J3-559	2,006.36	J2-229	21.16	443.82		2,631.24	J3-755	3.8	2,329.53	2,329.53
J4-421	2,006.36	J4-690	20.66	488.69	2,371.23	4,912.70	J4-690	13.55	2,371.24	2,371.23
J4-422	2,006.36	J4-690	20.75	488.88	2,374.31	9,931.26	J4-690	10.62	2,374.31	2,374.31
J4-419	2,006.36	J4-690	20.69	488.76	2,391.83	5,733.22	J4-690	13.15	2,391.84	2,391.83
J4-418	2,006.36	J4-690	20.72	488.82	2,403.21	6,298.21	J4-690	12.9	2,403.22	2,403.21
J4-417	2,006.36	J4-690	20.77	488.93	2,427.27	6,992.50	J4-690	12.6	2,427.27	2,427.27
J3-758	2,006.36	J2-229	21.16	443.82		2,684.67	J3-748	5.97	2,439.35	2,439.35
J4-527	2,007.20	J4-690	20.86	489.15	2,494.72	5,764.26	J4-690	13.18	2,494.73	2,494.72
J4-416	2,006.36	J4-690	20.97	489.4	2,576.29	7,741.59	J4-690	12.46	2,576.31	2,576.29
J4-624	2,006.36	J2-229	21.13	443.76	43,440.28	12,659.38	J4-690	8.52	2,838.98	2,838.98
J4-410	2,006.36	J2-229	21.13	443.77	50,750.90	3,427.40	J4-414	11.24	2,840.14	2,840.14
J4-415	2,006.36	J2-229	21.13	443.76	44,302.91	12,250.35	J4-690	8.99	2,855.57	2,855.57
J4-409	2,006.36	J2-229	21.13	443.77	50,750.88	12,518.31	J4-690	8.59	2,915.79	2,915.79
J4-408	2,006.36	J2-229	21.14	443.78	65,365.75	16,283.55	J4-690	3.81	3,134.71	3,134.71
J4-408	2,006.36	J4-690	21.6	490.85	3,135.52	16,277.34	J4-690	3.81	3,135.54	3,135.52
J1-8	2,005.67	J4-690	23.12	494.35	42,151,177.91	5,308.79	J1-8	20.53	5,322.02	5,322.02

2009 FF 544 Zone
After Improvements

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow (gpm)
J4-414	2,006.36	J4-414	-31.82	327.57	1,062.07	1,059.46	J4-414	20.11	1,062.07	1,062.07
J4-756	2,006.36	J4-756	4.33	438	1,253.17	1,245.70	J4-756	20.12	1,253.17	1,253.17
J3-748	2,006.36	J3-748	-1.17	481.3	1,362.59	1,357.49	J3-748	20.14	1,362.59	1,362.59
J3-759	2,006.36	J3-759	3.77	403.69	1,537.56	1,532.59	J3-759	20.15	1,537.58	1,537.56
J4-746	2,006.36	J4-746	-42.2	352.62	1,604.48	1,643.73	J4-746	20.16	1,604.47	1,604.47
J4-412	2,006.36	J4-414	14.38	434.2	1,779.10	2,114.07	J4-414	11.54	1,779.18	1,779.10
J4-413	2,006.36	J4-414	14.38	434.2	1,779.10	1,999.93	J4-414	14.55	1,779.18	1,779.10
J4-747	2,006.36	J4-746	-1.11	447.43	1,811.68	1,931.84	J4-746	9.79	1,811.68	1,811.68
J-5064	2,006.36	J-5064	3.64	256.41	1,829.51	1,827.46	J-5064	20.18	1,829.51	1,829.51
J3-751	2,006.36	J3-748	19.56	529.14	1,997.81	2,560.12	J3-748	-16.58	1,997.76	1,997.76
J3-865	2,006.36	J3-865	20.09	436.37	2,009.91	2,002.19	J3-865	20.2	2,010.06	2,009.91
J3-755	2,006.36	J2-229	20.55	442.43		2,053.26	J3-755	20.2	2,056.92	2,056.92
J4-622	2,006.36	J2-229	20.54	442.4	38,907.73	2,175.49	J4-622	20.22	2,186.56	2,186.56
J4-411	2,006.36	J2-229	20.53	442.38	27,792.58	2,819.97	J4-414	8.58	2,250.02	2,250.02
J3-753	2,006.36	J2-229	20.55	442.43		2,578.43	J3-748	0.76	2,283.98	2,283.98
J4-764	2,006.36	J2-229	20.54	442.39	36,159.03	2,285.16	J4-764	20.23	2,291.63	2,291.63
J-5061	2,006.36	J2-229	20.53	442.39	35,286.18	2,324.17	J-5061	20.23	2,327.25	2,327.25
J3-559	2,006.36	J2-229	20.55	442.43		2,559.97	J3-755	3.79	2,328.15	2,328.15
J3-754	2,006.36	J2-229	20.55	442.43		2,564.68	J3-755	3.29	2,328.15	2,328.15
J3-758	2,006.36	J2-229	20.55	442.43		2,606.74	J3-748	5.96	2,377.60	2,377.60
J-5065	2,006.36	J2-229	20.53	442.39	35,288.49	2,454.89	J-5065	20.24	2,458.61	2,458.61
J3-101	2,006.36	J2-229	20.53	442.39	35,218.89	2,985.04	J3-101	20.3	2,990.24	2,990.24
J3-972	2,006.36	J2-229	20.53	442.39	35,218.89	3,009.80	J3-972	20.3	3,015.80	3,015.80
J3-963	2,006.36	J2-229	20.54	442.4	38,585.78	3,026.95	J3-963	20.3	3,035.50	3,035.50
J4-625	2,006.36	J2-229	20.53	442.39	35,003.70	3,066.31	J4-625	20.31	3,079.46	3,079.46
J4-410	2,006.36	J2-229	20.53	442.38	27,792.57	3,729.60	J4-414	11.27	3,118.46	3,118.46
J-5071	2,006.36	J2-229	20.53	442.39	35,218.90	3,178.89	J-5071	20.32	3,185.19	3,185.19
J4-530	2,007.20	J2-229	20.55	442.43	48,275.39	3,178.01	J4-530	20.32	3,186.25	3,186.25
J4-750	2,006.36	J2-229	20.54	442.4	37,149.32	3,505.94	J3-759	16.45	3,262.30	3,262.30
J-5070	2,006.36	J2-229	20.53	442.39	35,218.90	3,260.81	J-5070	20.33	3,267.80	3,267.80
J-5060	2,006.36	J2-229	20.53	442.39	35,286.18	3,387.80	J-5061	16	3,312.40	3,312.40
J4-432	2,006.36	J2-229	20.53	442.39	35,286.18	3,329.60	J-5061	19.1	3,312.40	3,312.40
J-5063	2,006.36	J2-229	20.53	442.39	35,288.49	3,400.14	J-5064	16.87	3,335.39	3,335.39
J3-100	2,006.36	J2-229	20.53	442.39	35,218.89	3,358.45	J3-100	20.34	3,366.46	3,366.46
J-5069	2,006.36	J2-229	20.53	442.39	35,218.90	3,492.88	J-5069	20.35	3,501.54	3,501.54
J3-964	2,006.36	J2-229	20.54	442.4	38,290.91	3,514.28	J3-964	20.35	3,526.19	3,526.19
J4-691	2,006.36	J2-229	20.55	442.43	48,401.40	3,498.47	J4-691	20.35	3,533.04	3,533.04
J4-528	2,007.20	J2-229	20.55	442.43	48,275.40	4,033.45	J4-691	15.83	3,689.22	3,689.22
J4-692	2,006.36	J2-229	20.55	442.43	48,252.88	4,116.76	J4-691	15.06	3,718.73	3,718.73
J4-767	2,006.36	J2-229	20.54	442.39	35,413.47	3,744.08	J4-767	20.37	3,758.68	3,758.68
J3-966	2,006.36	J2-229	20.54	442.4	41,468.09	3,761.31	J3-966	20.38	3,769.47	3,769.47
J4-2017	2,006.36	J2-229	20.54	442.39	35,894.63	3,790.87	J4-2017	20.38	3,804.49	3,804.49
J4-693	2,006.36	J2-229	20.55	442.43	48,191.29	4,354.91	J4-691	12.86	3,810.57	3,810.57
J4-766	2,006.36	J2-229	20.54	442.39	35,430.83	3,833.82	J4-766	20.38	3,849.52	3,849.52
J4-2009	2,006.36	J2-229	20.54	442.39	35,404.05	3,837.63	J4-2009	20.38	3,851.71	3,851.71
J4-428	2,006.36	J2-229	20.53	442.39	35,003.70	3,904.75	J4-625	19.52	3,879.11	3,879.11
J4-2007	2,006.36	J2-229	20.54	442.39	35,404.05	3,865.28	J4-2007	20.39	3,879.55	3,879.55
J4-694	2,006.36	J2-229	20.55	442.42	48,145.96	4,334.92	J4-691	14.21	3,888.32	3,888.32
J4-2005	2,006.36	J2-229	20.54	442.39	35,404.05	3,890.31	J4-2005	20.39	3,904.77	3,904.77
J-5072	2,006.36	J2-229	20.54	442.39	35,404.05	3,904.99	J-5072	20.39	3,919.56	3,919.56
J4-2018	2,006.36	J2-229	20.54	442.39	35,545.48	3,938.94	J4-2018	20.39	3,953.65	3,953.65
J3-967	2,006.36	J2-229	20.54	442.4	43,074.67	3,957.20	J3-967	20.4	3,961.59	3,961.59
J4-2008	2,006.36	J2-229	20.54	442.39	35,404.05	3,964.25	J4-2008	20.4	3,979.27	3,979.27
J4-2002	2,006.36	J2-229	20.54	442.39	35,404.05	3,990.77	J4-2002	20.4	4,005.05	4,005.05
J-5068	2,006.36	J2-229	20.53	442.39	35,218.90	4,002.92	J-5068	20.4	4,016.43	4,016.43
J4-690	2,006.36	J2-229	20.55	442.43	48,807.38	4,003.19	J4-690	20.4	4,043.79	4,043.79
J4-2006	2,006.36	J2-229	20.54	442.39	35,404.05	4,103.69	J4-2006	20.41	4,119.77	4,119.77
J4-620	2,006.36	J2-229	20.54	442.4	38,907.73	4,409.42	J4-622	16.97	4,125.88	4,125.88
J3-965	2,006.36	J2-229	20.54	442.4	38,834.04	4,120.85	J3-965	20.41	4,134.97	4,134.97
J4-2004	2,006.36	J2-229	20.54	442.39	35,404.05	4,125.52	J4-2004	20.41	4,141.76	4,141.76
J3-364	2,006.36	J2-229	20.54	442.4	45,317.14	4,360.11	J3-364	20.44	4,358.43	4,358.43
J4-695	2,006.36	J2-229	20.55	442.42	47,734.91	5,724.77	J4-690	1.94	4,437.32	4,437.32
J4-696	2,006.36	J2-229	20.55	442.42	47,701.64	5,991.34	J4-690	-1.92	4,483.26	4,483.26
J4-2003	2,006.36	J2-229	20.54	442.39	35,404.05	4,568.13	J4-2009	20.45	4,587.93	4,587.93
J4-697	2,006.36	J2-229	20.54	442.41	47,296.20	5,974.68	J4-690	0.32	4,613.17	4,613.17
J-5062	2,006.36	J2-229	20.53	442.39	35,288.49	4,643.41	J-5064	19.16	4,619.25	4,619.25
J4-698	4,006.36	J2-229	20.54	442.4	46,985.02	6,816.24	J4-690	-12.26	4,738.88	4,738.88
J-5009	2,006.36	J2-229	20.53	442.39	35,286.18	4,748.15	J-5061	20.47	4,761.05	4,761.05
J4-742	2,006.36	J2-229	20.54	442.41	46,502.01	6,983.79	J4-690	-12.1	4,906.05	4,906.05
J4-772	2,006.36	J2-229	20.54	442.39	35,430.83	4,900.43	J4-772	20.49	4,927.09	4,927.09
J4-699	2,028.23	J2-229	20.54	442.41	46,523.92	5,142.14	J4-690	17.28	4,927.92	4,927.92
J4-439	2,006.36	J2-229	20.53	442.39	34,375.39	4,957.58	J4-439	20.5	4,991.07	4,991.07
J4-2016	2,006.36	J2-229	20.54	442.39	36,141.63	4,990.53	J4-2016	20.5	5,013.99	5,013.99
J4-741	4,006.36	J2-229	20.54	442.4	45,821.91	6,943.10	J4-690	-6.85	5,139.70	5,139.70
J4-796	2,006.36	J2-229	20.54	442.4	38,894.42	5,130.16	J4-622	20.25	5,160.69	5,160.69
J3-969	2,006.36	J2-229	20.54	442.4	43,074.67	5,411.25	J3-967	16.21	5,223.83	5,223.83

J-5053	2,006.36	J2-229	20.53	442.39	35,284.27	6,604.29	J-5059	-10.54	5,763.17	5,763.17
J-5047	2,006.36	J2-229	20.53	442.39	35,286.18	6,414.85	J-5061	7.64	5,999.40	5,999.40
J4-752	2,006.36	J2-229	20.54	442.4	37,149.83	12,667.62	J4-756	-5.17	6,067.95	6,067.95
J3-968	2,006.36	J2-229	20.54	442.4	41,468.09	6,568.50	J3-966	12.86	6,153.19	6,153.19
J4-847	2,006.36	J2-229	20.53	442.39	35,288.49	6,453.20	J-5064	20.21	6,461.60	6,461.60
J4-440	2,006.36	J2-229	20.53	442.39	35,287.30	6,699.42	J-5064	20.03	6,700.71	6,700.71
J4-749	2,006.36	J2-229	20.54	442.4	37,843.70	7,793.63	J4-756	16.64	6,807.65	6,807.65
J3-962	2,006.36	J2-229	20.54	442.4	38,290.91	9,735.12	J4-756	15.44	7,234.88	7,234.88
J4-757	2,006.36	J2-229	20.54	442.4	36,845.81	18,157.87	J4-756	-7.9	7,405.62	7,405.62
J3-961	2,006.36	J2-229	20.54	442.4	38,585.78	11,798.26	J4-756	12.65	7,443.82	7,443.82
J4-427	2,006.36	J2-229	20.53	442.39	35,003.70	8,381.56	J4-625	13.47	7,644.15	7,644.15
J4-739	2,006.36	J2-229	20.54	442.4	42,279.93	8,478.67	J4-738	14.82	7,675.48	7,675.48
J-5074	2,006.36	J2-229	20.54	442.4	37,160.67	21,147.97	J4-756	-22.07	7,679.76	7,679.76
J4-762	2,006.36	J2-229	20.54	442.39	36,262.14	11,685.72	J4-756	12.44	7,843.43	7,843.43
J-5091	2,006.36	J2-229	20.53	442.39	35,174.00	8,221.58	J4-625	17.11	7,861.66	7,861.66
J4-769	2,006.36	J2-229	20.54	442.39	35,311.63	8,409.13	J4-770	15.22	7,933.19	7,933.19
J4-830	2,006.36	J2-229	20.54	442.4	37,233.25	20,483.55	J4-756	-16.49	7,946.04	7,946.04
J4-431	2,144.80	J2-229	20.53	442.39	35,449.18	11,165.58	J4-441	-8.3	8,027.50	8,027.50
J4-435	2,006.36	J2-229	20.54	442.39	35,922.42	10,217.67	J4-756	15.76	8,056.77	8,056.77
J4-2011	2,006.36	J2-229	20.54	442.39	35,362.65	8,114.33	J4-770	19.52	8,064.63	8,064.63
J4-429	2,144.80	J2-229	20.53	442.39	35,373.10	8,093.68	J4-625	19.82	8,074.28	8,074.28
J4-434	2,006.36	J2-229	20.54	442.4	36,390.36	14,813.94	J4-756	7.46	8,247.65	8,247.65
J4-765	2,006.36	J2-229	20.54	442.39	35,444.51	8,854.69	J4-756	18.39	8,267.48	8,267.48
J4-621	2,006.36	J2-229	20.54	442.4	38,861.71	10,616.05	J4-622	11.15	8,475.72	8,475.72
J4-618	2,006.36	J2-229	20.54	442.4	38,925.62	9,679.53	J4-622	16.33	8,706.58	8,706.58
J4-768	2,006.36	J2-229	20.54	442.39	35,355.85	9,053.39	J4-770	16.94	8,715.91	8,715.91
J4-858	2,006.36	J2-229	20.54	442.39	37,408.36	20,302.53	J4-756	-13.4	9,056.23	9,056.23
J5-856	2,002.10	J2-229	20.53	442.39	35,940.38	11,994.53	J4-430	1.85	9,429.36	9,429.36
J4-614	2,006.36	J2-229	20.54	442.4	38,787.22	12,096.10	J4-622	10.24	9,540.91	9,540.91
J4-433	2,006.36	J2-229	20.54	442.39	37,593.60	20,610.88	J4-756	-13.87	9,612.58	9,612.58
J4-608	2,006.36	J2-229	20.54	442.4	38,660.77	9,640.08	J4-756	20.3	9,835.88	9,835.88
J4-611	2,006.36	J2-229	20.54	442.4	38,759.27	13,156.89	J4-622	8.8	10,132.41	10,132.41
J4-607	2,006.36	J2-229	20.54	442.4	38,605.88	11,683.67	J4-756	18.31	10,499.28	10,499.28
J4-612	2,006.36	J2-229	20.54	442.4	38,751.91	13,912.02	J4-622	8.74	10,726.35	10,726.35
J4-422	2,006.36	J2-229	20.53	442.38	26,939.68	10,949.92	J4-756	20.13	11,043.24	11,043.24
J4-613	2,006.36	J2-229	20.54	442.4	38,834.04	13,287.61	J3-966	10.3	12,045.43	12,045.43
J4-409	2,006.36	J2-229	20.53	442.38	27,792.56	14,912.85	J4-414	11.08	12,336.00	12,336.00
J4-408	2,006.36	J2-229	20.54	442.4	37,194.07	19,328.26	J4-756	9.81	12,346.61	12,346.61
J4-619	2,006.36	J2-229	20.54	442.4	39,334.57	12,741.11	J4-756	19.23	12,376.90	12,376.90
J4-415	2,006.36	J2-229	20.53	442.37	23,689.40	14,611.94	J4-414	15.65	13,086.12	13,086.12
J4-624	2,006.36	J2-229	20.53	442.37	23,002.55	15,113.87	J4-414	14.59	13,210.62	13,210.62
J4-606	2,006.36	J2-229	20.54	442.4	38,305.15	19,147.52	J4-622	-8.08	14,237.74	14,237.74
J4-416	2,006.36	J2-229	20.53	442.38	28,177.17	8,609.78	J2-229	20.47	28,177.08	28,177.08
J4-527	2,007.20	J2-229	20.53	442.38	28,741.71	6,396.85	J2-229	20.5	28,741.58	28,741.58
J4-417	2,006.36	J2-229	20.53	442.38	28,788.36	7,882.45	J2-229	20.49	28,788.26	28,788.26
J4-418	2,006.36	J2-229	20.53	442.38	29,333.32	7,133.37	J2-229	20.5	29,333.20	29,333.20
J4-771	2,006.36	J2-229	20.53	442.38	29,610.88	7,521.98	J2-229	20.5	29,610.99	29,610.88
J4-419	2,006.36	J2-229	20.53	442.38	29,759.20	6,546.39	J2-229	20.51	29,759.08	29,759.08
J4-421	2,006.36	J2-229	20.53	442.38	29,821.49	5,529.33	J2-229	20.52	29,821.38	29,821.38
J4-420	2,006.36	J2-229	20.53	442.38	30,978.68	6,576.67	J2-229	20.51	30,978.67	30,978.67
J4-436	2,006.36	J2-229	20.53	442.39	33,839.86	6,289.44	J2-229	20.51	33,838.69	33,838.69
J4-426	2,006.36	J2-229	20.53	442.39	33,946.41	7,060.85	J2-229	20.51	33,948.00	33,946.41
J4-438	2,006.36	J2-229	20.53	442.39	34,593.11	6,561.79	J2-229	20.51	34,593.00	34,593.00
J4-437	2,006.36	J2-229	20.53	442.39	34,746.05	6,795.93	J2-229	20.51	34,746.09	34,746.05
J4-770	2,006.36	J2-229	20.53	442.39	35,150.34	6,979.02	J2-229	20.51	35,150.77	35,150.33
J-5067	2,006.36	J2-229	20.53	442.39	35,218.91	6,506.31	J2-229	20.51	35,222.39	35,218.91
J4-441	2,006.36	J2-229	20.53	442.39	35,275.67	7,653.51	J2-229	20.5	35,275.68	35,275.67
J-5066	2,006.36	J2-229	20.53	442.39	35,283.03	7,118.27	J2-229	20.51	35,283.04	35,283.03
J-5054	2,006.36	J2-229	20.53	442.39	35,284.20	5,837.44	J2-229	20.52	35,284.20	35,284.20
J-5055	2,006.36	J2-229	20.53	442.39	35,284.21	5,309.38	J2-229	20.52	35,284.21	35,284.21
J-5056	2,006.36	J2-229	20.53	442.39	35,284.21	5,759.18	J2-229	20.52	35,284.23	35,284.21
J-5057	2,006.36	J2-229	20.53	442.39	35,284.22	5,532.70	J2-229	20.52	35,284.23	35,284.22
J-5058	2,006.36	J2-229	20.53	442.39	35,284.24	5,687.77	J2-229	20.52	35,284.25	35,284.24
J-5059	2,006.36	J2-229	20.53	442.39	35,284.25	5,491.77	J2-229	20.52	35,284.25	35,284.25
J-5052	2,006.36	J2-229	20.53	442.39	35,284.26	5,652.29	J2-229	20.52	35,284.27	35,284.26
J-5050	2,006.36	J2-229	20.53	442.39	35,284.27	5,628.02	J2-229	20.52	35,284.28	35,284.27
J-5051	2,006.36	J2-229	20.53	442.39	35,284.31	5,724.56	J2-229	20.52	35,284.32	35,284.31
J-5049	2,006.36	J2-229	20.53	442.39	35,284.57	5,700.40	J2-229	20.52	35,284.57	35,284.57
JF-101	2,006.36	J2-229	20.53	442.39	35,284.61	6,004.14	J2-229	20.52	35,284.61	35,284.61
J-5048	2,006.36	J2-229	20.53	442.39	35,285.00	5,804.92	J2-229	20.52	35,285.01	35,285.00
JF-102	2,006.36	J2-229	20.53	442.39	35,291.36	6,786.13	J2-229	20.51	35,291.36	35,291.36
J4-2000	2,006.36	J2-229	20.54	442.39	35,404.05	8,017.59	J2-229	20.5	35,404.79	35,404.05
J4-2001	2,006.36	J2-229	20.54	442.39	35,404.05	5,476.57	J2-229	20.52	35,404.79	35,404.05
J4-2010	2,006.36	J2-229	20.54	442.39	35,436.38	7,708.49	J2-229	20.5	35,437.17	35,436.38
J4-2012	2,006.36	J2-229	20.54	442.39	35,477.51	7,353.41	J2-229	20.51	35,478.36	35,477.51
J4-430	2,144.80	J2-229	20.53	442.39	35,521.84	8,200.19	J2-229	20.5	35,521.86	35,521.84
J4-2013	2,006.36	J2-229	20.54	442.39	35,545.48	6,845.85	J2-229	20.51	35,546.42	35,545.48
J4-2014	2,006.36	J2-229	20.54	442.39	35,628.57	6,340.93	J2-229	20.52	35,629.62	35,628.57

J4-2015	2,006.36	J2-229	20.54	442.39	35,894.63	5,347.06	J2-229	20.52	35,896.09	35,894.63
J4-763	2,006.36	J2-229	20.54	442.39	36,149.64	5,255.57	J2-229	20.52	36,151.70	36,149.64
J4-773	2,006.36	J2-229	20.54	442.39	36,173.44	6,119.49	J2-229	20.52	36,174.50	36,173.44
J-5073	2,006.36	J2-229	20.54	442.4	37,145.65	7,408.25	J2-229	20.51	37,145.68	37,145.65
J4-609	2,006.36	J2-229	20.54	442.4	38,644.26	8,334.97	J2-229	20.52	38,644.34	38,644.26
J4-610	2,006.36	J2-229	20.54	442.4	38,709.76	7,493.50	J2-229	20.52	38,709.85	38,709.76
J4-615	2,006.36	J2-229	20.54	442.4	38,768.38	6,547.49	J2-229	20.52	38,768.46	38,768.38
J4-616	2,006.36	J2-229	20.54	442.4	38,794.96	6,722.37	J2-229	20.52	38,795.05	38,794.96
J4-617	2,006.36	J2-229	20.54	442.4	38,817.16	6,169.41	J2-229	20.52	38,817.25	38,817.16
J4-740	2,179.02	J2-229	20.54	442.4	40,927.50	7,161.03	J2-229	20.52	40,927.52	40,927.50
J4-738	2,006.36	J2-229	20.54	442.4	41,198.29	6,713.62	J2-229	20.52	41,198.36	41,198.28

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow
J3-912	2,005.07	J3-916	-11.77	592.83	0	1,283.20	J3-916	11.46	0	853.61
J3-565	2,005.07	J3-916	27.1	682.53	0	7,105.39	J3-916	7.43	0	3,792.11
J3-915	2,005.07	J3-915	-30.52	549.57	0	808.29	J3-915	20.08	0	889.22
J3-876	2,005.07	J3-916	27.17	682.72	0	7,103.19	J3-916	6.71	0	808.87
J3-272	2,005.07	J3-272	-802.56	-1,347.21	614.46	613.78	J3-272	20.06	614.45	614.45
J3-273	2,005.07	J3-273	-709.9	-1,111.35	621.73	621.72	J3-273	20.06	621.72	621.72
J3-274	2,005.07	J3-273	-642.34	-955.43	664.19	801.67	J3-273	-17.19	664.19	664.19
J3-275	2,005.07	J3-273	-554.18	-751.97	710.26	877.48	J3-273	-23.27	710.21	710.21
J3-871	2,005.07	J3-871	-248.74	-44.06	730.41	729.85	J3-871	20.07	730.41	730.41
J-5082	2,005.07	J-5082	-117.87	182.97	733.7	731.51	J-5082	20.07	733.7	733.7
J3-276	2,005.07	J3-273	-486.09	-594.83	752.96	814.42	J3-273	8.77	752.94	752.94
J3-283	2,005.07	J3-283	-494.09	-732.29	896.88	911.23	J3-273	-16.38	756.73	756.73
J3-282	2,005.07	J3-273	-480.41	-581.72	756.75	823.02	J3-273	7.61	756.73	756.73
J3-281	2,005.07	J3-281	-478.53	-597.38	787.13	803.84	J3-273	13.46	760.03	760.03
J3-377	2,005.07	J3-377	-36.09	656.71	761.64	834.98	J3-377	20.08	761.64	761.64
J3-557	2,005.07	J3-557	-365.7	-274.98	768.47	789.9	J3-557	20.08	768.44	768.44
J-515	2,005.07	J3-557	-365.7	-274.98	768.47	1,377.30	J3-557	-131.17	768.44	768.44
J3-916	2,005.07	J3-916	-35.22	538.72	781.92	779.3	J3-916	20.08	781.91	781.91
J3-289	2,005.07	J3-289	-333.2	-193.98	786.78	809.64	J3-289	20.08	786.74	786.74
J3-297	2,005.07	J3-297	-217.25	131.63	799.92	833.18	J3-297	20.08	799.91	799.91
J3-299	2,005.07	J3-297	-215.79	134.98	801.76	910.64	J3-297	9.84	801.75	801.75
J3-296	2,005.07	J3-297	-211.63	144.59	808.42	1,008.85	J3-297	-3.25	808.42	808.42
J3-927	2,005.07	J3-927	-57.48	532.33	812.18	845.25	J3-927	20.08	812.19	812.18
J3-280	2,005.07	J3-280	-339.11	-225.62	813.58	835.47	J3-280	20.08	813.56	813.56
J3-279	2,005.07	J3-279	-355.93	-286.43	833.13	853.62	J3-297	19.68	816.26	816.26
J3-288	2,005.07	J3-280	-249.99	-19.95	914.66	965.21	J3-297	4.54	816.26	816.26
J3-294	2,005.07	J3-280	-265.03	-54.66	894.63	976.05	J3-297	2.99	816.26	816.26
J3-290	2,005.07	J3-297	-206.49	156.45	816.26	1,030.59	J3-297	-5.01	816.26	816.26
J3-558	2,005.07	J3-289	-236.49	29.21	899.93	994.4	J3-297	0.34	816.26	816.26
J-5076	2,005.07	J-5076	-102.64	218.12	816.61	813.9	J-5076	20.08	816.62	816.61
J3-291	2,005.07	J3-297	-203.89	162.46	820.21	1,012.09	J3-297	-1.52	820.21	820.21
J3-402	2,005.07	J3-402	-93.95	342.18	822.47	820.74	J3-402	20.08	822.47	822.47
J3-979	2,005.07	J3-297	-202.11	166.55	822.98	1,010.56	J3-297	-0.79	822.97	822.97
J3-978	2,005.07	J3-978	-242.91	-45.6	1,006.10	1,030.28	J3-297	-3.68	822.97	822.97
J3-976	2,005.07	J3-297	-202.11	166.55	822.98	1,049.46	J3-297	-6.53	822.97	822.97
J3-977	2,005.07	J3-977	-204.85	75.24	1,007.90	1,035.95	J3-297	-4.52	822.97	822.97
J3-975	2,005.07	J3-297	-202.11	166.55	822.98	1,042.07	J3-297	-5.42	822.97	822.97
J3-974	2,005.07	J3-297	-202.11	166.55	822.98	1,053.57	J3-297	-7.15	822.97	822.97
J-5075	2,005.07	J-5076	-100.73	222.53	828.97	1,186.04	J-5076	7.69	828.97	828.97
J3-932	2,005.07	J3-927	-48.7	552.61	835.53	917.87	J3-927	16.59	835.54	835.53
J3-928	2,005.07	J3-927	-48.7	552.61	835.53	870.05	J3-927	20.09	835.54	835.53
J3-933	2,005.07	J3-933	-57.98	521.18	856.62	888.17	J3-927	18.77	835.54	835.54
J-5077	2,005.07	J-5082	-99.2	226.07	839.46	836.59	J-5082	20.08	839.46	839.46
J3-598	2,005.07	J3-598	-46.34	553.05	851.22	885.11	J3-598	20.09	851.22	851.22
J3-929	2,005.07	J3-927	-37.15	579.26	870.38	938.53	J3-927	17.92	870.39	870.38
J-5078	2,005.07	J-5082	-94.96	235.84	870.53	1,260.43	J-5082	7.13	870.53	870.53
J3-913	2,005.07	J3-916	-21.94	569.38	873.8	870.49	J3-916	20.09	873.77	873.77
J3-300	2,005.07	J3-297	-175.04	229.03	876.48	957.96	J3-297	14.62	876.48	876.48
J3-930	2,005.07	J3-927	-29.94	595.9	894.72	965.63	J3-927	17.92	894.73	894.72
J3-931	2,005.07	J3-927	-19.5	620	934.27	1,087.90	J3-927	15.77	934.27	934.27
J3-914	2,005.07	J3-914	-27.27	547.07	945.71	942.84	J3-914	20.09	945.71	945.71
J3-599	2,005.07	J3-927	-7.62	647.41	1,025.55	1,306.94	J3-927	15.35	1,025.48	1,025.48
J3-601	2,005.07	J3-598	-10.54	635.66	1,054.41	1,523.74	J3-598	11.92	1,054.35	1,054.35
J3-596	2,005.07	J3-596	-24.48	590.5	1,070.41	1,096.34	J3-596	20.11	1,070.41	1,070.41
J-513	2,005.07	J-513	-91.89	390.93	1,108.64	1,107.25	J-513	20.11	1,108.64	1,108.64
J3-600	2,005.07	J3-600	-13.16	624.63	1,116.33	1,151.33	J3-600	20.11	1,116.32	1,116.32
J3-376	2,005.07	J3-377	3.19	747.36	1,122.70	1,343.26	J3-377	18.4	1,122.65	1,122.65
J3-593	2,005.07	J3-598	-9.67	637.69	1,142.19	1,529.73	J3-598	13.68	1,142.18	1,142.18
J3-594	2,005.07	J3-598	-9.67	637.69	1,142.19	1,808.19	J3-598	4.18	1,142.18	1,142.18
J3-592	2,005.07	J3-592	-11.43	531.61	1,686.06	1,708.77	J3-598	10.27	1,142.18	1,142.18
J3-597	2,005.07	J3-597	-13.95	618.81	1,171.33	1,204.65	J3-597	20.12	1,171.33	1,171.33
J3-909	2,005.07	J3-909	-50.6	403.23	1,233.00	1,231.41	J3-909	20.12	1,232.91	1,232.91
J3-781	2,005.07	J3-916	8.77	640.24	1,282.25	2,743.71	J3-916	-5.73	1,282.25	1,282.25
J3-776	2,005.07	J3-776	8.58	629.8	1,311.48	1,305.76	J3-776	20.13	1,311.56	1,311.48
J3-401	2,005.07	J3-402	-30.8	487.93	1,311.57	1,715.63	J3-402	6.3	1,311.65	1,311.57
J3-956	2,005.07	J3-956	-53.5	486.54	1,327.66	1,378.64	J3-956	20.14	1,327.64	1,327.64
J3-392	2,005.07	J3-392	-23.35	615.11	1,345.82	1,427.06	J3-392	20.14	1,345.81	1,345.81
J-5081	2,005.07	J-5082	-61.05	314.1	1,353.30	1,709.37	J-5082	-3.67	1,353.30	1,353.30
J3-743	2,005.07	J3-743	-63.18	431.18	1,353.41	1,397.12	J3-743	20.14	1,353.40	1,353.40
J3-595	2,005.07	J3-597	-9.56	628.93	1,364.74	1,875.27	J3-597	0.12	1,364.74	1,364.74
J3-994	2,005.07	J3-994	-8.39	363.65	1,430.73	1,427.38	J3-994	20.14	1,430.73	1,430.73

J3-315	2,005.07	J3-315	-7.02	663.79	1,448.53	1,550.82	J3-315	20.15	1,448.52	1,448.52
J3-744	2,005.07	J3-744	-46.72	454.18	1,454.44	1,499.64	J3-744	20.15	1,454.43	1,454.43
J3-960	2,005.07	J3-960	-21.95	564.33	1,497.92	1,560.89	J3-960	20.16	1,497.89	1,497.89
J3-995	2,005.07	J3-994	-0.55	381.72	1,540.60	1,536.71	J3-994	20.15	1,540.60	1,540.60
J3-879	2,005.07	J3-879	-19.07	428	1,569.33	1,567.35	J3-879	20.16	1,569.30	1,569.30
J-5080	2,005.07	J-5080	-42.71	384.43	1,579.28	1,577.53	J-5080	20.16	1,579.20	1,579.20
J3-724	2,005.07	J3-744	-20.61	514.42	1,597.71	1,718.42	J3-743	12.08	1,582.97	1,582.97
J3-745	2,005.07	J3-745	-20.69	465.24	1,656.93	1,701.43	J3-743	13.83	1,582.97	1,582.97
J3-723	2,005.07	J3-743	-19.44	532.14	1,582.98	1,773.81	J3-743	6.31	1,582.97	1,582.97
J3-725	2,005.07	J3-744	-20.61	514.42	1,597.71	1,838.85	J3-744	-0.71	1,597.70	1,597.70
J-5079	2,005.07	J-5080	-36.53	398.69	1,609.50	1,635.45	J-5080	18.86	1,609.50	1,609.50
J3-309	2,005.07	J3-309	-9.79	580.41	1,613.32	1,680.43	J3-309	20.17	1,613.32	1,613.32
J3-716	2,005.07	J3-716	-4.5	614.62	1,617.24	1,692.83	J3-716	20.17	1,617.21	1,617.21
J3-717	2,005.07	J3-716	-2.76	618.63	1,633.62	1,812.28	J3-716	12.59	1,633.58	1,633.58
J3-955	2,005.07	J3-956	-5.66	596.93	1,633.77	1,809.25	J3-956	11.51	1,633.75	1,633.75
J3-718	2,005.07	J3-718	-16.52	516.87	1,635.25	1,687.12	J3-718	20.17	1,635.24	1,635.24
J3-957	2,005.07	J3-956	-2.92	603.26	1,658.11	1,813.35	J3-716	12.78	1,636.81	1,636.81
J3-958	2,005.07	J3-716	-2.27	619.77	1,638.45	1,798.86	J3-716	14.01	1,638.41	1,638.41
J3-959	2,005.07	J3-960	-2.92	608.25	1,650.08	1,723.06	J3-716	19.72	1,639.61	1,639.61
J3-325	2,005.07	J3-325	11.16	720.75	1,641.91	1,786.86	J3-325	20.18	1,641.87	1,641.87
J3-715	2,005.07	J3-716	-1.67	621.14	1,644.20	1,767.34	J3-716	16.84	1,644.17	1,644.17
J3-875	2,005.07	J3-875	-10.6	445.53	1,644.57	1,642.43	J3-875	20.16	1,644.54	1,644.54
J3-783	2,005.07	J3-916	17.35	660.04	1,653.79	3,189.08	J3-916	3.07	1,653.80	1,653.79
J3-782	2,005.07	J3-916	17.35	660.04	1,653.79	3,281.53	J3-916	1.59	1,653.80	1,653.79
J3-911	2,005.07	J3-916	17.35	660.04	1,653.80	2,699.85	J3-916	10.09	1,653.80	1,653.80
J3-780	2,005.07	J3-916	17.35	660.04	1,653.80	4,141.40	J3-916	-14.26	1,653.80	1,653.80
J3-719	2,005.07	J3-956	-3.09	602.86	1,656.51	2,015.09	J3-956	-3.99	1,656.49	1,656.49
J3-722	2,005.07	J3-956	-3.09	602.86	1,656.51	2,058.52	J3-956	-7.91	1,656.49	1,656.49
J3-714	2,005.07	J3-714	0.53	629.23	1,661.31	1,741.51	J3-714	20.17	1,661.27	1,661.27
J3-713	2,005.07	J3-713	3.58	647.26	1,674.65	1,762.15	J3-713	20.18	1,674.60	1,674.60
J3-405	2,005.07	J3-405	-13.55	467.72	1,710.42	1,755.31	J3-405	20.18	1,710.42	1,710.42
J-5084	2,005.07	J-5084	-14.7	451.08	1,718.90	1,761.48	J-5084	20.18	1,718.90	1,718.90
J3-397	2,005.07	J3-397	10.7	686.7	1,728.03	1,839.12	J3-397	20.18	1,728.01	1,728.01
J-5083	2,005.07	J-5083	-12.02	462.26	1,730.22	1,773.98	J-5083	20.18	1,730.22	1,730.22
J3-588	2,005.07	J3-588	4.29	482.9	1,802.11	1,803.77	J3-588	20.18	1,802.11	1,802.11
J3-389	2,005.07	J3-389	17.56	717.53	1,803.59	1,944.92	J3-389	20.19	1,803.54	1,803.54
J3-394	2,005.07	J3-389	17.56	717.53	1,803.59	2,048.95	J3-389	15.6	1,803.54	1,803.54
J3-395	2,005.07	J3-389	17.56	717.53	1,803.59	2,174.17	J3-389	9.82	1,803.54	1,803.54
J3-396	2,005.07	J3-389	17.56	717.53	1,803.59	2,075.55	J3-389	14.4	1,803.54	1,803.54
J3-393	2,005.07	J3-389	17.56	717.53	1,803.59	2,028.16	J3-389	16.53	1,803.54	1,803.54
J-5089	2,005.07	J-5089	17.72	620.9	1,900.27	1,974.87	J-5089	20.2	1,900.23	1,900.23
J-5087	2,005.07	J-5087	18.65	607.03	1,917.28	1,987.31	J-5087	20.2	1,917.24	1,917.24
J3-327	2,005.07	J3-327	23.27	734.7	1,926.31	2,085.39	J3-327	20.21	1,926.31	1,926.31
J3-590	2,005.07	J3-916	19.92	665.98	1,964.04	4,277.21	J3-916	-7.88	1,964.03	1,964.03
J-5086	2,005.07	J-5087	22.97	617.01	1,965.04	2,048.01	J-5087	19.34	1,965.04	1,965.04
J3-305	2,005.07	J3-305	24.63	656.84	1,977.58	2,068.89	J3-305	20.21	1,977.58	1,977.58
J3-591	2,005.07	J3-916	20.05	666.28	1,982.90	2,556.02	J3-916	15.57	1,982.79	1,982.79
J3-587	2,005.07	J3-916	20.11	666.41	1,990.77	2,311.79	J3-916	17.82	1,990.76	1,990.76
J-5088	2,005.07	J-5089	25.41	638.63	1,992.66	2,139.05	J-5089	15.01	1,992.66	1,992.66
J-5035	2,005.07	J-5035	22.3	535.48	2,008.17	2,022.74	J-5035	20.2	2,008.18	2,008.17
J3-586	2,005.07	J3-916	20.28	666.81	2,016.89	2,574.57	J3-916	15.78	2,016.89	2,016.89
J3-589	2,005.07	J3-916	20.37	667.01	2,030.71	3,372.34	J3-916	7.64	2,030.71	2,030.71
J3-582	2,005.07	J3-916	20.42	667.13	2,037.09	2,543.23	J3-916	16.25	2,037.09	2,037.09
J3-584	2,005.07	J3-916	20.43	667.14	2,038.11	2,474.80	J3-916	16.89	2,038.11	2,038.11
J3-585	2,005.07	J3-916	20.43	667.15	2,039.08	2,461.99	J3-916	17	2,038.89	2,038.89
J3-583	2,005.07	J3-916	20.44	667.16	2,039.53	2,350.54	J3-916	17.94	2,039.53	2,039.53
J3-581	2,005.07	J3-916	20.47	667.23	2,044.48	2,646.51	J3-916	15.41	2,044.48	2,044.48
J3-576	2,005.07	J3-576	24.33	513.15	2,071.61	2,068.48	J3-576	20.21	2,071.61	2,071.61
J3-892	2,005.07	J3-994	22.5	434.92	2,092.84	3,096.65	J3-994	-14.79	2,092.84	2,092.84
J3-893	2,005.07	J3-994	22.5	434.92	2,092.84	2,399.51	J3-994	10.58	2,092.84	2,092.84
J3-894	2,005.07	J3-994	22.5	434.92	2,092.84	2,127.46	J3-994	18.99	2,092.84	2,092.84
J3-578	2,005.07	J3-578	25.06	541.84	2,098.86	2,095.06	J3-578	20.21	2,098.86	2,098.86
J3-346	2,005.07	J3-346	28.03	771.69	2,120.01	2,316.20	J3-346	20.23	2,120.02	2,120.01
J-5124	2,005.07	J3-372	31.2	822.01	3,287.89	2,183.77	J-5124	20.22	2,125.34	2,125.34
J3-786	2,005.07	J3-786	25.05	589.81	2,151.18	2,145.16	J3-786	20.21	2,151.19	2,151.18
J3-404	2,005.07	J3-372	31.2	822.01	3,287.15	2,347.08	J3-405	7.67	2,159.22	2,159.22
J-5125	2,005.07	J-5125	26.25	610.58	2,197.53	2,214.11	J-5125	20.22	2,197.53	2,197.53
J3-577	2,005.07	J3-916	27.09	682.53	6,213.23	2,254.70	J3-577	20.22	2,258.31	2,258.31
J3-775	2,005.07	J3-776	22.3	661.46	2,299.35	2,286.20	J3-776	20.23	2,299.28	2,299.28
J3-903	2,005.07	J3-916	27.09	682.53	6,194.47	2,294.70	J3-903	20.23	2,299.96	2,299.96
J-5128	2,005.07	J3-372	31.21	822.02	3,288.71	2,379.03	J-5128	20.24	2,305.11	2,305.11
J3-779	2,005.07	J3-916	22.15	671.13	2,310.85	4,448.65	J3-916	0.19	2,310.75	2,310.75
J-5127	2,005.07	J3-372	31.21	822.02	3,288.71	2,403.14	J-5127	20.24	2,331.64	2,331.64

J3-989	2,005.07	J3-372	31.2	822.01	3,287.15	2,483.50	J3-989	20.25	2,356.04	2,356.04
J3-886	2,005.07	J3-916	27.09	682.53	6,197.70	2,361.16	J3-886	20.24	2,365.82	2,365.82
J-5126	2,005.07	J3-372	31.21	822.02	3,288.71	2,477.72	J-5126	20.25	2,378.95	2,378.95
J3-987	2,005.07	J3-372	31.2	822.01	3,287.15	2,508.96	J3-987	20.25	2,381.04	2,381.04
J3-884	2,005.07	J3-916	23.14	673.41	2,712.81	2,385.18	J3-884	20.24	2,386.49	2,386.49
J3-936	2,005.07	J3-936	30.04	800.33	2,405.59	2,689.55	J3-936	20.27	2,405.69	2,405.59
J3-860	2,005.07	J3-916	27.17	682.71	0.00	2,404.88	J3-860	20.24	2,408.36	2,408.36
J3-378	2,005.07	J3-377	27.36	803.14	2,424.84	3,884.12	J3-377	8.54	2,424.84	2,424.84
J3-373	2,005.07	J3-373	27.56	813.61	2,447.66	2,822.83	J3-373	20.28	2,447.66	2,447.66
J3-941	2,005.07	J3-377	28.46	805.68	2,605.10	2,652.65	J3-941	20.26	2,474.20	2,474.20
J3-390	2,005.07	J3-372	31.2	822.01	3,287.98	2,673.28	J3-390	20.27	2,475.09	2,475.09
J3-887	2,005.07	J3-916	27.09	682.53	6,197.70	2,473.46	J3-887	20.25	2,478.70	2,478.70
J3-988	2,005.07	J3-372	31.2	822.01	3,287.15	2,622.01	J3-988	20.26	2,482.90	2,482.90
J3-985	2,005.07	J3-372	31.2	822.01	3,287.15	2,628.22	J3-985	20.26	2,485.08	2,485.08
J-5117	2,005.07	J3-916	23.02	673.12	2,498.76	3,381.61	J3-916	13.85	2,498.76	2,498.76
J3-898	2,005.07	J3-916	27.09	682.53	6,183.10	2,495.16	J3-898	20.25	2,499.44	2,499.44
J3-372	2,005.07	J3-372	27.91	814.4	2,500.28	2,894.51	J3-372	20.29	2,500.29	2,500.28
J-5118	2,005.07	J3-916	23.06	673.23	2,511.10	3,367.74	J3-916	14.1	2,511.11	2,511.10
J3-388	2,005.07	J3-372	31.2	822.01	3,287.99	2,782.44	J3-388	20.28	2,515.00	2,515.00
J3-328	2,005.07	J3-372	31.2	822.01	3,287.16	3,081.91	J3-325	14.24	2,532.51	2,532.51
J3-308	2,005.07	J3-372	31.2	822.01	3,287.85	3,089.22	J3-309	-2.66	2,537.84	2,537.84
J3-331	2,005.07	J3-372	31.2	822	3,286.55	2,833.08	J3-331	20.28	2,542.96	2,542.96
J3-314	2,005.07	J3-372	31.2	822.01	3,287.82	3,057.51	J3-315	14.67	2,590.47	2,590.47
J3-815	2,005.07	J3-916	22.7	672.39	2,590.47	3,392.46	J3-916	14.92	2,590.48	2,590.47
J3-882	2,005.07	J3-916	22.7	672.39	2,590.47	3,857.46	J3-916	10.87	2,590.48	2,590.47
J-5129	2,005.07	J3-372	31.21	822.02	3,288.71	2,711.37	J-5129	20.27	2,595.54	2,595.54
J3-345	2,005.07	J3-372	31.17	821.93	3,275.65	2,947.64	J3-345	20.29	2,597.37	2,597.37
J3-352	2,005.07	J3-373	31.08	821.74	3,243.58	2,945.77	J3-352	20.29	2,599.86	2,599.86
J3-383	2,005.07	J3-377	30.8	811.08	3,116.96	2,854.34	J3-383	20.28	2,601.46	2,601.46
J3-940	2,005.07	J3-377	28.46	805.68	2,605.10	3,669.05	J3-377	14.08	2,605.11	2,605.10
J3-917	2,005.07	J3-916	23.42	674.05	2,610.44	4,065.30	J3-916	8.98	2,610.44	2,610.44
J3-777	2,005.07	J3-916	23.83	675	2,708.58	3,031.25	J3-776	17.03	2,626.48	2,626.48
J3-986	2,005.07	J3-372	31.2	822.01	3,287.15	2,955.87	J3-987	11.63	2,629.16	2,629.16
J3-983	2,005.07	J3-372	31.2	822.01	3,287.15	2,884.03	J3-985	15.97	2,633.69	2,633.69
J3-391	2,005.07	J3-372	31.2	822.01	3,287.98	2,926.59	J3-391	20.29	2,644.07	2,644.07
J3-937	2,005.07	J3-377	31.01	811.58	3,191.50	2,907.03	J3-937	20.29	2,678.39	2,678.39
J3-380	2,005.07	J3-377	30.09	809.45	2,965.03	2,895.03	J3-380	20.29	2,691.49	2,691.49
J3-304	2,005.07	J3-372	31.2	822.01	3,287.94	2,936.51	J3-305	16.39	2,705.95	2,705.95
J3-568	2,005.07	J3-916	27.09	682.53	6,202.08	2,699.78	J3-568	20.27	2,708.68	2,708.68
J3-883	2,005.07	J3-916	23.14	673.41	2,712.81	3,814.67	J3-916	12.93	2,712.82	2,712.81
J3-778	2,005.07	J3-916	23.91	675.18	2,716.05	3,482.93	J3-776	14.99	2,804.62	2,716.05
J3-351	2,005.07	J3-373	31.12	821.83	3,258.70	3,024.44	J3-351	20.3	2,729.51	2,729.51
J3-785	2,005.07	J3-916	27.09	682.53	6,207.70	2,727.25	J3-785	20.27	2,736.97	2,736.97
J3-784	2,005.07	J3-916	27.09	682.53	6,213.32	2,774.94	J3-784	20.28	2,785.87	2,785.87
J3-984	2,005.07	J3-372	31.2	822.01	3,287.15	3,104.31	J3-985	14.24	2,792.38	2,792.38
J3-332	2,005.07	J3-372	31.2	822	3,286.35	3,186.10	J3-332	20.32	2,797.26	2,797.26
J3-774	2,005.07	J3-916	24.7	677.01	2,974.78	3,252.95	J3-776	16.87	2,804.98	2,804.98
J3-918	2,005.07	J3-916	24.17	675.78	2,805.77	4,006.58	J3-916	11.4	2,805.77	2,805.77
J3-890	2,005.07	J3-916	27.09	682.53	6,197.70	3,118.84	J3-568	11.89	2,833.91	2,833.91
J3-888	2,005.07	J3-916	27.09	682.53	6,197.70	3,066.82	J3-568	13.43	2,833.91	2,833.91
J3-889	2,005.07	J3-916	27.09	682.53	6,197.70	2,967.71	J3-568	16.29	2,833.91	2,833.91
J3-326	2,005.07	J3-372	31.2	822	3,286.93	3,175.05	J3-326	20.32	2,836.49	2,836.49
J3-952	2,005.07	J3-377	30.39	810.14	3,036.87	2,957.84	J3-952	20.3	2,837.38	2,837.38
J3-575	2,005.07	J3-916	27.09	682.53	6,219.60	2,841.61	J3-575	20.28	2,850.36	2,850.36
J3-991	2,005.07	J3-372	31.2	822.01	3,287.15	3,007.46	J3-991	20.3	2,855.21	2,855.21
J3-902	2,005.07	J3-916	27.09	682.53	6,194.47	2,855.30	J3-902	20.29	2,863.53	2,863.53
J3-942	2,005.07	J3-377	29.71	808.58	2,873.01	4,446.50	J3-377	10.94	2,873.03	2,873.01
J3-338	2,005.07	J3-372	31.2	822	3,286.89	3,172.11	J3-338	20.32	2,873.26	2,873.26
J3-920	2,005.07	J3-916	24.37	676.25	2,873.73	3,186.11	J3-916	18.4	2,873.73	2,873.73
J3-919	2,005.07	J3-916	24.37	676.25	2,873.73	4,141.19	J3-916	10.95	2,873.73	2,873.73
J3-354	2,005.07	J3-373	29.82	818.82	2,877.51	3,636.05	J3-373	18.11	2,877.52	2,877.51
J3-891	2,005.07	J3-916	27.09	682.53	6,196.13	3,023.56	J3-568	16.25	2,886.00	2,886.00
J3-878	2,005.07	J3-916	27.14	682.64	0.00	2,906.97	J3-878	20.29	2,914.02	2,914.02
J3-333	2,005.07	J3-372	31.2	822	3,286.39	3,387.74	J3-333	20.34	2,950.87	2,950.87
J-5042	2,005.07	J-5082	33.44	532.19	0.00	2,985.33	J-5042	20.3	2,958.20	2,958.20
J3-379	2,005.07	J3-377	30.09	809.45	2,965.03	4,341.37	J3-380	11.77	3,534.64	2,965.03
J3-562	2,005.07	J3-373	31.08	821.74	3,243.58	3,419.99	J3-562	20.34	2,971.49	2,971.49
J3-347	2,005.07	J3-372	31.16	821.92	3,274.42	3,426.09	J3-347	20.34	2,983.63	2,983.63
J3-922	2,005.07	J3-916	24.65	676.89	2,984.73	4,457.01	J3-916	9.45	2,984.73	2,984.73
J3-324	2,005.07	J3-372	31.2	822.01	3,287.16	3,436.11	J3-324	20.34	2,986.58	2,986.58
J3-375	2,005.07	J3-373	31.12	821.83	3,258.70	3,432.03	J3-375	20.34	3,003.64	3,003.64
J3-951	2,005.07	J3-377	30.39	810.14	3,036.87	4,217.92	J3-377	15.36	3,036.91	3,036.87
J3-348	2,005.07	J3-373	31.15	821.88	3,267.72	3,508.82	J3-348	20.35	3,066.35	3,066.35

J-5090	2,005.07	J3-372	31.2	822.01	3,288.35	3,332.86	J-5090	20.33	3,070.20	3,070.20
J3-334	2,005.07	J3-372	31.2	822	3,286.15	3,563.79	J3-334	20.36	3,074.94	3,074.94
J3-901	2,005.07	J3-916	27.09	682.53	6,186.68	3,291.99	J3-902	13.77	3,086.93	3,086.93
J3-330	2,005.07	J3-372	31.2	822	3,286.61	3,578.62	J3-333	20.15	3,089.61	3,089.61
J3-343	2,005.07	J3-372	31.19	821.99	3,285.05	3,579.95	J3-343	20.36	3,093.96	3,093.96
J3-921	2,005.07	J3-916	24.87	677.39	3,096.55	4,650.77	J3-916	9.17	3,096.55	3,096.55
J3-900	2,005.07	J3-916	27.09	682.53	6,185.20	3,109.45	J3-902	20.04	3,109.84	3,109.84
J3-353	2,005.07	J3-373	30.68	820.8	3,111.21	3,752.58	J3-373	19.7	3,111.24	3,111.21
J3-899	2,005.07	J3-916	27.09	682.53	6,183.98	3,267.69	J3-902	15.45	3,115.07	3,115.07
J3-897	2,005.07	J3-916	27.09	682.53	6,183.10	3,146.77	J3-902	19.11	3,115.77	3,115.77
J3-381	2,005.07	J3-377	30.8	811.08	3,116.96	4,337.23	J3-377	15.54	3,117.01	3,116.96
J-5028	2,005.07	J-5082	33.44	532.19	0.00	3,153.04	J-5028	20.31	3,119.05	3,119.05
J3-895	2,005.07	J3-916	27.09	682.53	6,180.73	3,411.45	J3-902	11.18	3,121.19	3,121.19
J3-938	2,005.07	J3-372	31.16	821.9	3,272.81	3,608.18	J3-936	19.93	3,121.89	3,121.89
J3-896	2,005.07	J3-916	27.09	682.53	6,185.80	3,430.19	J3-902	11.01	3,133.36	3,133.36
J3-934	2,005.07	J3-377	30.81	811.11	3,134.22	4,730.54	J3-377	12.62	3,134.28	3,134.22
J-5033	2,005.07	J-5082	33.44	532.19	0.00	3,200.22	J-5041	18.34	3,136.92	3,136.92
J-5041	2,005.07	J-5082	33.44	532.19	0.00	3,150.35	J-5041	20.31	3,136.92	3,136.92
J3-386	2,005.07	J3-372	31.2	822.01	3,287.98	3,584.70	J3-386	20.36	3,154.17	3,154.17
J3-374	2,005.07	J3-373	31.02	821.6	3,222.29	3,662.51	J3-374	20.37	3,157.89	3,157.89
J3-990	2,005.07	J3-372	31.2	822.01	3,287.15	3,585.58	J3-985	12.1	3,157.91	3,157.91
J3-323	2,005.07	J3-372	31.2	822	3,286.93	3,707.71	J3-324	19.56	3,158.45	3,158.45
J3-926	2,005.07	J3-916	24.97	677.62	3,162.59	4,319.99	J3-916	12.73	3,162.30	3,162.30
J-5031	2,005.07	J-5082	33.44	532.19	0.00	3,178.07	J-5031	20.32	3,162.74	3,162.74
J3-925	2,005.07	J3-916	24.97	677.64	3,169.02	4,385.81	J3-916	12.29	3,168.75	3,168.75
J3-382	2,005.07	J3-377	31.03	811.6	3,178.40	4,183.74	J3-377	17.46	3,178.47	3,178.40
J3-344	2,005.07	J3-372	31.18	821.96	3,280.13	3,614.64	J3-344	20.36	3,180.35	3,180.35
J3-924	2,005.07	J3-916	24.99	677.68	3,182.40	4,612.91	J3-916	10.6	3,182.25	3,182.25
J3-726	2,005.07	J3-372	31.2	822	3,286.63	4,178.59	J3-333	12.34	3,190.49	3,190.49
J3-866	2,005.07	J3-916	27.24	682.86	6,759.49	3,185.39	J3-866	20.32	3,190.75	3,190.75
J3-939	2,005.07	J3-377	31.01	811.58	3,191.50	4,132.49	J3-377	17.95	3,191.57	3,191.50
J3-337	2,005.07	J3-372	31.2	822	3,286.73	4,215.69	J3-333	11.84	3,196.92	3,196.92
J3-355	2,005.07	J3-372	31.13	821.84	3,259.89	3,825.84	J3-355	20.38	3,206.60	3,206.60
J3-371	2,005.07	J3-372	30.92	821.37	3,207.24	4,389.17	J3-372	16.4	3,207.29	3,207.24
J3-341	2,005.07	J3-372	31.2	822	3,286.85	4,337.40	J3-333	10.02	3,210.04	3,210.04
J3-953	2,005.07	J3-377	31.16	811.9	3,210.52	4,124.81	J3-377	18.3	3,210.59	3,210.52
J3-342	2,005.07	J3-372	31.2	822	3,286.87	4,064.24	J3-333	14.84	3,213.32	3,213.32
J3-560	2,005.07	J3-372	31.2	822	3,286.89	3,914.51	J3-333	17.42	3,216.58	3,216.58
J3-313	2,005.07	J3-372	31.2	822.01	3,287.58	3,750.86	J3-315	17.5	3,218.99	3,218.99
J3-322	2,005.07	J3-372	31.2	822	3,286.93	3,828.99	J3-333	18.94	3,221.91	3,221.91
J3-561	2,005.07	J3-372	31.2	822	3,286.94	3,958.31	J3-333	16.91	3,225.58	3,225.58
J3-923	2,005.07	J3-916	25.05	677.82	3,231.31	5,231.02	J3-916	5.91	3,231.54	3,231.31
J3-321	2,005.07	J3-372	31.2	822.01	3,286.99	4,135.96	J3-333	14.15	3,234.42	3,234.42
J3-318	2,005.07	J3-372	31.2	822.01	3,287.00	3,879.52	J3-333	18.45	3,236.62	3,236.62
J3-329	2,005.07	J3-372	31.2	822.01	3,287.77	3,803.47	J3-329	20.38	3,241.59	3,241.59
J3-336	2,005.07	J3-372	31.2	822	3,286.44	3,876.64	J3-331	17.11	3,244.99	3,244.99
J3-387	2,005.07	J3-372	31.2	822.01	3,287.91	3,792.04	J3-387	20.38	3,253.37	3,253.37
J3-935	2,005.07	J3-372	31.1	821.77	3,253.79	4,121.61	J3-372	18.69	3,253.83	3,253.79
J3-320	2,005.07	J3-372	31.2	822.01	3,287.12	4,122.09	J3-333	15.03	3,260.19	3,260.19
J3-335	2,005.07	J3-372	31.2	822	3,286.13	3,703.20	J3-335	20.37	3,264.11	3,264.11
J3-398	2,005.07	J3-372	31.2	822.01	3,287.15	3,849.01	J3-333	19.57	3,265.36	3,265.36
J3-992	2,005.07	J3-372	31.2	822.01	3,287.18	4,499.67	J3-333	8.91	3,271.93	3,271.93
J3-349	2,005.07	J3-372	31.16	821.92	3,274.45	3,779.40	J3-348	20.12	3,272.48	3,272.48
J3-350	2,005.07	J3-372	31.16	821.92	3,274.45	3,574.67	J3-350	20.36	3,424.27	3,274.45
J3-885	2,005.07	J3-916	24.86	677.38	3,275.41	5,193.31	J3-916	7.62	3,275.41	3,275.41
J3-319	2,005.07	J3-372	31.2	822.01	3,287.21	4,234.12	J3-333	13.64	3,278.94	3,278.94
J3-356	2,005.07	J3-372	31.19	821.98	3,281.40	3,934.03	J3-372	20.19	3,281.45	3,281.40
J3-385	2,005.07	J3-372	31.2	822.01	3,288.13	3,913.45	J3-329	19.56	3,282.44	3,282.44
J3-339	2,005.07	J3-372	31.2	822	3,286.91	3,625.98	J3-339	20.36	3,294.70	3,286.91
J3-317	2,005.07	J3-372	31.2	822.01	3,287.33	3,867.48	J3-333	20.18	3,305.99	3,287.33
J3-310	2,005.07	J3-372	31.2	822.01	3,287.74	3,842.06	J3-309	19.39	3,564.04	3,287.74
J3-312	2,005.07	J3-372	31.2	822.01	3,287.88	3,878.19	J3-312	20.39	3,575.41	3,287.88
J3-307	2,005.07	J3-372	31.2	822.01	3,287.91	3,889.06	J3-307	20.39	3,606.55	3,287.91
J3-295	2,003.94	J3-372	31.21	822.02	3,288.02	6,760.10	J3-387	-17.18	3,469.86	3,288.02
J3-303	2,005.07	J3-372	31.2	822.01	3,288.06	3,764.73	J3-303	20.38	3,465.79	3,288.06
J3-316	2,005.07	J3-372	31.2	822.01	3,288.06	4,110.98	J3-387	16.34	3,304.96	3,288.06
J3-877	2,005.07	J3-916	27.14	682.64	0.00	3,514.38	J3-878	12.12	3,288.30	3,288.30
J3-302	2,005.07	J3-372	31.2	822.01	3,288.35	4,964.62	J3-387	3.13	3,360.95	3,288.35
J3-292	2,005.07	J3-372	31.21	822.02	3,288.97	6,380.41	J3-387	-12.71	3,446.34	3,288.97
J3-293	2,005.07	J3-372	31.21	822.02	3,289.13	6,753.40	J3-387	-17.29	3,467.31	3,289.13
J4-2022	2,005.07	J3-372	31.21	822.03	3,289.99	7,586.23	J3-329	-24.63	3,500.22	3,289.99
J3-857	2,005.07	J3-372	31.21	822.03	3,290.14	6,579.97	J3-329	-10.5	3,513.45	3,290.14
J3-856	2,005.07	J3-372	31.21	822.03	3,290.14	6,592.12	J3-329	-10.72	3,513.90	3,290.14

J3-384	2,005.07	J3-372	31.21	822.03	3,290.32	4,746.23	J3-329	12.28	3,526.57	3,290.32
J3-954	2,005.07	J3-372	31.21	822.04	3,291.24	4,835.46	J3-356	12	3,384.32	3,291.24
J3-948	2,005.07	J3-916	25.16	678.06	3,345.80	5,763.07	J3-916	2.95	3,345.80	3,345.80
J3-602	2,005.07	J3-916	27.09	682.53	6,197.61	3,350.61	J3-602	20.33	3,360.41	3,360.41
J3-944	2,005.07	J3-916	25.06	677.83	3,364.38	5,540.73	J3-916	5.64	3,364.39	3,364.38
J-5030	2,005.07	J-5082	33.44	532.19	0.00	3,411.11	J-5031	20.34	3,369.21	3,369.21
J3-947	2,005.07	J3-916	25.12	677.98	3,385.81	4,574.44	J3-916	13.29	3,385.81	3,385.81
J3-946	2,005.07	J3-916	25.12	677.98	3,385.81	5,130.89	J3-916	9.16	3,385.81	3,385.81
J3-357	2,005.07	J3-373	31.49	822.69	3,414.54	3,984.34	J3-357	20.4	3,705.87	3,414.54
J3-604	2,005.07	J3-916	27.09	682.53	6,219.60	3,402.44	J3-604	20.34	3,415.18	3,415.18
J3-950	2,005.07	J3-916	25.22	678.22	3,439.80	5,316.49	J3-916	8.24	3,439.81	3,439.80
J3-360	2,005.07	J3-373	32.39	824.75	3,832.77	3,723.78	J3-360	20.37	3,453.22	3,453.22
J3-358	2,005.07	J3-373	32.07	824.01	3,670.85	3,728.65	J3-358	20.37	3,467.98	3,467.98
J3-943	2,005.07	J3-916	25.31	678.42	3,531.95	6,116.86	J3-916	2.83	3,531.96	3,531.95
J-5026	2,005.07	J-5082	33.44	532.19	0.00	3,604.74	J-5026	20.36	3,559.23	3,559.23
J3-359	2,005.07	J3-373	31.83	823.47	3,560.80	4,841.43	J3-358	11.75	3,771.59	3,560.80
J3-370	2,005.07	J3-370	31.64	824.02	3,621.70	4,225.28	J3-370	20.42	3,621.78	3,621.70
J3-573	2,005.07	J3-916	27.09	682.53	6,213.23	3,998.62	J3-784	14	3,674.71	3,674.71
J3-572	2,005.07	J3-916	25.81	679.56	4,261.43	4,714.21	J3-994	-28.5	3,682.73	3,682.73
J3-363	2,005.07	J3-373	32.11	824.1	3,687.91	5,219.71	J3-360	9.07	3,802.25	3,687.91
J3-790	2,005.07	J3-373	32.43	824.84	3,852.90	4,263.73	J3-360	18.16	3,720.87	3,720.87
J3-603	2,005.07	J3-916	27.09	682.53	6,219.85	4,125.56	J3-784	13	3,743.06	3,743.06
J3-908	2,005.07	J3-916	26.81	681.87	6,133.17	5,378.34	J3-377	17.04	3,760.29	3,760.29
J3-907	2,005.07	J3-916	26.92	682.13	6,170.40	5,090.52	J3-377	18.28	3,770.97	3,770.97
J3-905	2,005.07	J3-916	27.06	682.44	0.00	3,745.27	J3-905	20.37	3,771.12	3,771.12
J3-566	2,005.07	J3-916	27.09	682.53	0.00	7,088.22	J3-377	7.66	3,792.11	3,792.11
J3-881	2,005.07	J3-916	27.12	682.6	0.00	7,005.62	J3-377	8.26	3,794.03	3,794.03
J3-874	2,005.07	J3-916	27.14	682.63	0.00	6,345.30	J3-377	12.97	3,795.19	3,795.19
J3-579	2,005.07	J3-916	27.09	682.53	6,224.79	4,306.88	J3-784	10.64	3,795.64	3,795.64
J3-873	2,005.07	J3-916	27.14	682.64	0.00	6,107.33	J3-377	14.34	3,795.70	3,795.70
J3-574	2,005.07	J3-916	27.09	682.53	6,225.63	4,101.22	J3-784	14.72	3,805.52	3,805.52
J3-858	2,005.07	J3-916	27.17	682.71	0.00	7,272.57	J3-377	7.24	3,807.02	3,807.02
J3-861	2,005.07	J3-916	27.22	682.83	0.00	6,506.02	J3-377	12.73	3,816.19	3,816.19
J3-862	2,005.07	J3-916	27.24	682.86	0.00	6,238.56	J3-377	13.88	3,818.94	3,818.94
J3-869	2,005.07	J3-916	27.24	682.86	6,759.49	4,970.44	J3-377	18.93	3,818.94	3,818.94
J-5043	2,005.07	J3-916	27.29	682.98	0.00	5,130.01	J3-377	18.35	3,823.90	3,823.90
J-5039	2,005.07	J3-916	27.29	682.98	6,896.93	5,975.45	J3-377	15	3,823.90	3,823.90
J-5037	2,005.07	J3-916	29.76	688.68	7,133.05	4,888.64	J3-377	19.3	3,833.33	3,833.33
J3-567	2,005.07	J3-916	27.09	682.53	6,230.37	4,281.21	J3-784	12.6	3,866.54	3,866.54
J3-361	2,005.07	J3-373	32.59	825.21	3,939.85	5,184.81	J3-360	11.8	3,939.46	3,939.46
J-5024	2,005.07	J-5082	33.44	532.19	0.00	4,048.61	J-5024	20.4	3,989.22	3,989.22
J-5025	2,005.07	J-5082	33.44	532.19	0.00	6,427.62	J-5024	-98.83	3,989.22	3,989.22
J4-700	2,005.07	J3-916	25.81	679.56	4,261.43	4,110.73	J4-700	20.41	4,116.37	4,116.37
J3-789	2,005.07	J3-373	32.9	825.92	4,121.41	5,101.01	J3-360	16.64	4,261.11	4,121.41
J3-571	2,005.07	J3-916	25.81	679.56	4,261.43	4,122.45	J4-700	20.41	4,128.11	4,128.11
J3-868	2,005.07	J3-916	27.24	682.86	0.00	4,413.93	J3-866	11.77	4,231.43	4,231.43
J-5040	2,005.07	J3-916	27.29	682.98	0.00	4,287.10	J-5040	20.43	4,274.38	4,274.38
J3-872	2,005.07	J3-916	27.14	682.64	0.00	4,630.33	J3-878	12.23	4,336.10	4,336.10
J3-859	2,005.07	J3-916	27.17	682.71	0.00	4,350.77	J3-859	20.43	4,360.42	4,360.42
J-5023	2,005.07	J-5082	33.44	532.19	0.00	4,510.26	J-5023	20.45	4,434.01	4,434.01
J3-362	2,005.07	J3-373	33.42	827.14	4,445.87	5,376.58	J3-360	19.69	4,836.62	4,445.87
J3-368	2,005.07	J-5082	33.44	532.19	0.00	5,979.03	J3-373	18.8	4,861.52	4,861.52
J3-369	2,005.07	J-5082	33.44	532.19	0.00	5,972.71	J3-373	18.86	4,869.26	4,869.26
J3-906	2,005.07	J3-916	27.03	682.37	0.00	5,319.15	J3-905	15.22	4,876.81	4,876.81
J3-867	2,005.07	J3-916	27.24	682.86	0.00	5,013.68	J3-866	18.33	4,949.78	4,949.78
J3-904	2,005.07	J3-916	27.07	682.47	0.00	5,525.57	J3-905	14.32	4,991.51	4,991.51
J3-367	2,005.07	J-5082	33.44	532.19	0.00	6,228.39	J3-370	19.1	5,216.58	5,216.58
J3-864	2,005.07	J3-916	27.17	682.71	0.00	5,490.41	J3-860	13.62	5,290.42	5,290.42
J3-366	2,005.07	J-5082	33.44	532.19	0.00	6,348.32	J3-370	19.06	5,317.40	5,317.40
J-5044	2,005.07	J3-916	27.69	683.91	7,006.67	5,540.62	J-5037	14.98	5,320.39	5,320.39
J1-8	2,005.67	J-5082	33.44	532.19	0.00	5,308.79	J1-8	20.53	5,322.02	5,322.02
J3-870	2,005.07	J3-916	27.14	682.64	0.00	5,843.89	J3-871	11.91	5,323.21	5,323.21
J-5021	2,005.07	J-5082	33.44	532.19	0.00	8,189.90	J3-369	5.95	5,514.90	5,514.90
J3-910	2,005.07	J3-916	26.53	681.23	5,970.05	6,832.63	J3-916	7.41	5,970.05	5,970.05
J3-880	2,005.07	J3-916	27.1	682.55	0.00	8,459.67	J3-784	-23.95	6,702.57	6,702.57
J3-863	2,005.07	J3-916	27.11	682.56	0.00	8,702.06	J3-784	-29.54	6,737.20	6,737.20
J-5045	2,005.07	J-5082	33.44	532.19	0.00	16,579.47	J-5023	-190.67	7,845.78	7,845.78

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow	Available Flow at	Critical Node 2 ID	Critical Node 2	Adjusted Available	Design Flow
J3-274	2,005.07	J-516	-240.87	-28.9	898.33	1,144.10	J-516	-17.16	898.35	898.33
J3-506	2,007.20	J3-402	-59.06	422.69	1,020.04	1,208.46	J3-402	12.32	1,020.08	1,020.04
J3-929	2,005.07	J3-929	2.93	758.77	1,023.53	1,172.13	J3-929	20.12	1,023.49	1,023.49
J-515	2,005.07	J3-557	-137.12	252.55	1,030.15	1,827.62	J3-557	-98.37	1,030.15	1,030.15
J3-557	2,005.07	J3-557	-137.12	252.55	1,030.15	1,029.05	J3-557	20.10	1,030.15	1,030.15
J3-930	2,005.07	J3-929	4.66	762.75	1,056.76	1,319.77	J3-929	18.29	1,056.72	1,056.72
J3-995	2,005.07	J3-787	-16.15	381.72	1,087.01	1,536.71	J3-787	4.55	1,087.04	1,087.01
J3-994	2,005.07	J3-787	-16.15	381.72	1,087.01	1,427.38	J3-787	8.72	1,087.04	1,087.01
J3-928	2,005.07	J3-929	6.28	766.5	1,087.69	1,375.97	J3-929	18.10	1,087.64	1,087.64
J3-275	2,005.07	J-516	-152.71	174.57	1,096.30	1,411.78	J-516	-23.22	1,096.29	1,096.29
J3-927	2,005.07	J3-929	6.72	767.5	1,100.08	1,814.02	J3-929	10.51	1,100.02	1,100.02
J3-932	2,005.07	J3-929	7.10	768.39	1,107.05	1,390.80	J3-929	18.29	1,106.99	1,106.99
J-513	2,005.07	J-513	-92.46	389.62	1,108.64	1,107.25	J-513	20.11	1,108.64	1,108.64
J3-915	2,005.07	J3-915	-9.62	651.79	1,450.02	1,502.62	J3-929	16.42	1,108.82	1,108.82
J3-914	2,005.07	J3-914	-3.26	602.48	1,675.38	1,713.69	J3-929	12.68	1,108.82	1,108.82
J3-916	2,005.07	J3-929	7.08	768.33	1,108.88	2,024.77	J3-929	6.68	1,108.82	1,108.82
J3-931	2,005.07	J3-929	7.27	768.79	1,112.19	1,874.98	J3-929	9.81	1,112.14	1,112.14
J3-600	2,005.07	J3-929	7.79	769.98	1,125.77	2,724.26	J3-929	-5.93	1,125.71	1,125.71
J3-289	2,005.07	J3-289	-104.62	333.56	1,128.89	1,127.52	J3-289	20.11	1,128.91	1,128.89
J3-596	2,005.07	J3-929	7.90	770.23	1,129.24	2,105.11	J3-929	5.93	1,129.17	1,129.17
J3-597	2,005.07	J3-929	7.90	770.23	1,129.24	2,535.70	J3-929	-1.14	1,129.17	1,129.17
J3-595	2,005.07	J3-929	8.01	770.48	1,132.27	3,360.41	J3-929	-11.21	1,132.20	1,132.20
J3-594	2,005.07	J3-929	8.11	770.72	1,135.30	3,352.35	J3-929	-10.80	1,135.24	1,135.24
J3-593	2,005.07	J3-929	8.11	770.72	1,135.30	2,368.44	J3-929	0.76	1,135.24	1,135.24
J3-592	2,005.07	J3-929	8.11	770.72	1,135.30	2,207.45	J3-929	4.11	1,135.24	1,135.24
J3-601	2,005.07	J3-929	8.15	770.81	1,136.69	3,012.95	J3-929	-8.40	1,136.63	1,136.63
J3-598	2,005.07	J3-598	0.51	661.19	1,604.93	1,659.14	J3-929	14.46	1,136.63	1,136.63
J3-599	2,005.07	J3-929	8.19	770.91	1,137.63	2,822.42	J3-929	-8.91	1,137.57	1,137.57
J3-279	2,005.07	J3-279	-127.35	241.1	1,157.29	1,156.21	J3-279	20.12	1,157.31	1,157.29
J3-280	2,005.07	J3-280	-110.53	301.91	1,161.97	1,160.71	J3-280	20.12	1,161.99	1,161.97
J3-933	2,005.07	J3-929	9.49	773.91	1,173.62	1,794.07	J3-929	13.19	1,173.53	1,173.53
J3-909	2,005.07	J3-909	-50.59	403.26	1,235.19	1,233.69	J3-909	20.12	1,235.19	1,235.19
J3-401	2,005.07	J3-402	-32.31	484.43	1,304.39	1,704.37	J3-402	6.30	1,304.39	1,304.39
J3-956	2,005.07	J3-956	-55.40	482.14	1,313.02	1,364.15	J3-956	20.14	1,312.99	1,312.99
J3-776	2,005.07	J3-776	8.83	630.38	1,321.42	1,315.56	J3-776	20.13	1,321.41	1,321.41
J3-276	2,005.07	J-516	-84.62	331.71	1,334.48	1,444.17	J-516	8.83	1,334.49	1,334.48
J3-392	2,005.07	J3-392	-23.92	613.8	1,338.01	1,419.70	J3-392	20.14	1,338.01	1,338.01
J3-743	2,005.07	J3-743	-65.12	426.71	1,340.60	1,384.46	J3-743	20.14	1,340.59	1,340.59
J3-282	2,005.07	J-516	-78.94	344.82	1,359.17	1,450.58	J-516	11.19	1,359.17	1,359.17
J3-283	2,005.07	J3-283	-92.62	194.25	1,469.56	1,492.63	J-516	6.32	1,359.17	1,359.17
J3-281	2,005.07	J3-281	-77.06	329.15	1,402.93	1,417.19	J-516	17.50	1,381.07	1,381.07
J3-581	2,005.07	J3-929	18.31	794.25	1,400.41	2,803.47	J3-929	14.81	1,400.30	1,400.30
J3-585	2,005.07	J3-929	18.41	794.48	1,420.35	2,617.81	J3-929	15.84	1,420.33	1,420.33
J3-583	2,005.07	J3-929	18.40	794.48	1,421.62	2,446.95	J3-929	16.60	1,421.60	1,421.60
J3-584	2,005.07	J3-929	18.42	794.52	1,423.60	2,642.99	J3-929	15.75	1,423.58	1,423.58
J3-582	2,005.07	J3-929	18.49	794.66	1,435.81	2,703.71	J3-929	15.49	1,435.81	1,435.81
J3-589	2,005.07	J3-929	18.71	795.19	1,437.00	3,908.44	J3-929	8.34	1,437.00	1,437.00
J3-315	2,005.07	J3-315	-7.60	662.45	1,438.66	1,541.33	J3-315	20.15	1,438.65	1,438.65
J3-744	2,005.07	J3-744	-48.66	449.71	1,440.99	1,486.27	J3-744	20.15	1,440.98	1,440.98
J3-376	2,005.07	J3-929	15.91	788.72	1,450.05	2,153.49	J3-929	13.83	1,449.99	1,449.99
J3-894	2,005.07	J3-787	6.90	434.92	1,476.45	2,127.46	J3-787	3.39	1,476.46	1,476.45
J3-892	2,005.07	J3-787	6.90	434.92	1,476.45	3,096.65	J3-787	-30.39	1,476.46	1,476.45
J3-893	2,005.07	J3-787	6.90	434.92	1,476.45	2,399.51	J3-787	-5.02	1,476.46	1,476.45
J3-960	2,005.07	J3-960	-23.78	560.12	1,480.12	1,543.09	J3-960	20.15	1,480.09	1,480.09
J3-377	2,005.07	J3-929	16.85	790.89	1,494.90	1,890.79	J3-929	18.30	1,494.76	1,494.76
J3-294	2,005.07	J3-280	-36.45	472.87	1,501.94	1,644.40	J3-280	9.76	1,501.94	1,501.94
J3-586	2,005.07	J3-929	19.09	796.05	1,531.20	2,714.43	J3-929	16.03	1,531.19	1,531.19
J3-588	2,005.07	J3-588	9.04	493.87	1,865.75	1,873.81	J3-929	19.76	1,531.19	1,531.19
J-5082	2,005.07	J-5082	-29.67	386.54	1,533.96	1,529.19	J-5082	20.15	1,533.96	1,533.96
J3-912	2,005.07	J3-915	-1.04	671.6	1,549.71	2,015.58	J3-915	-1.65	1,549.69	1,549.69
J3-913	2,005.07	J3-915	-1.04	671.6	1,549.71	1,913.30	J3-915	4.16	1,549.69	1,549.69
J3-297	2,005.07	J3-297	-8.01	614.51	1,561.04	1,644.60	J3-297	20.16	1,561.04	1,561.04
J3-723	2,005.07	J3-743	-21.37	527.67	1,566.24	1,757.15	J3-743	6.31	1,566.22	1,566.22
J3-724	2,005.07	J3-744	-22.55	509.95	1,581.91	1,702.66	J3-743	11.99	1,566.22	1,566.22
J3-725	2,005.07	J3-744	-22.55	509.95	1,581.91	1,824.41	J3-743	-0.90	1,566.22	1,566.22
J3-745	2,005.07	J3-745	-22.63	460.77	1,643.31	1,687.80	J3-743	13.51	1,566.22	1,566.22
J-5080	2,005.07	J-5080	-22.34	431.44	1,567.88	1,566.22	J-5080	20.16	1,567.88	1,567.88
J3-879	2,005.07	J3-879	-19.06	428.02	1,569.42	1,567.44	J3-879	20.16	1,569.39	1,569.39
J3-299	2,005.07	J3-297	-4.82	621.87	1,577.74	1,743.48	J3-297	15.36	1,577.83	1,577.74
J3-288	2,005.07	J3-280	-21.41	507.59	1,588.29	1,677.76	J3-280	16.65	1,588.26	1,588.26
J3-716	2,005.07	J3-716	-6.32	610.42	1,595.64	1,671.08	J3-716	20.17	1,595.60	1,595.60
J3-309	2,005.07	J3-309	-10.37	579.07	1,606.93	1,674.19	J3-309	20.17	1,606.92	1,606.92
J3-587	2,005.07	J3-929	19.64	797.32	1,607.63	2,509.43	J3-929	17.65	1,607.68	1,607.63
J3-717	2,005.07	J3-716	-4.58	614.44	1,611.66	1,791.07	J3-716	12.52	1,611.62	1,611.62
J3-955	2,005.07	J3-956	-7.57	592.53	1,612.87	1,788.31	J3-956	11.51	1,612.84	1,612.84
J3-957	2,005.07	J3-956	-4.82	598.87	1,636.72	1,792.67	J3-716	12.68	1,614.89	1,614.89

J3-958	2,005.07	J3-716	-4.07	615.6	1,616.54	1,778.16	J3-716	13.92	1,616.50	1,616.50
J3-959	2,005.07	J3-960	-4.75	604.03	1,629.06	1,701.90	J3-716	19.65	1,617.72	1,617.72
J3-718	2,005.07	J3-718	-18.32	512.72	1,620.53	1,672.39	J3-718	20.17	1,620.53	1,620.53
J3-715	2,005.07	J3-716	-3.48	616.98	1,622.17	1,745.48	J3-716	16.82	1,622.13	1,622.13
J3-591	2,005.07	J3-929	19.78	797.65	1,627.08	2,804.43	J3-929	16.48	1,627.12	1,627.08
J3-325	2,005.07	J3-325	10.57	719.39	1,627.68	1,772.80	J3-325	20.18	1,627.64	1,627.64
J3-719	2,005.07	J3-956	-5.00	598.46	1,635.07	1,993.85	J3-956	-4.00	1,635.05	1,635.05
J3-722	2,005.07	J3-956	-5.00	598.46	1,635.07	2,039.13	J3-956	-8.08	1,635.05	1,635.05
J-5079	2,005.07	J-5085	-20.03	488.78	1,635.88	1,706.75	J-5085	17.84	1,635.76	1,635.76
J3-296	2,005.07	J3-297	-0.17	632.6	1,635.95	2,022.18	J3-297	-1.50	1,635.81	1,635.81
J-5076	2,005.07	J-5085	-20.03	488.78	1,636.37	1,815.93	J-5085	4.59	1,636.32	1,636.32
J-5075	2,005.07	J-5085	-20.03	488.78	1,636.38	1,889.28	J-5085	-4.70	1,636.33	1,636.33
J-5077	2,005.07	J-5085	-20.03	488.78	1,636.43	1,800.26	J-5085	6.54	1,636.39	1,636.39
J-5078	2,005.07	J-5085	-20.03	488.78	1,636.43	1,899.22	J-5085	-5.99	1,636.40	1,636.40
J-5081	2,005.07	J-5085	-20.03	488.78	1,636.51	1,968.96	J-5085	-15.16	1,636.48	1,636.48
J-5083	2,005.07	J-5085	-20.03	488.78	1,638.57	1,766.67	J-5085	10.66	1,638.57	1,638.57
J-5084	2,005.07	J-5085	-20.03	488.78	1,638.57	1,754.37	J-5085	12.15	1,638.57	1,638.57
J3-714	2,005.07	J3-714	-1.21	625.21	1,639.28	1,719.29	J3-714	20.17	1,639.23	1,639.23
J3-875	2,005.07	J3-875	-10.59	445.55	1,644.67	1,642.52	J3-875	20.16	1,644.63	1,644.63
J3-713	2,005.07	J3-713	1.95	643.51	1,652.14	1,739.42	J3-713	20.17	1,652.08	1,652.08
J3-558	2,005.07	J3-289	-7.91	556.74	1,657.41	1,840.61	J3-289	8.90	1,657.37	1,657.37
J3-590	2,005.07	J3-929	20.35	798.96	1,666.94	4,790.53	J3-929	5.11	1,666.94	1,666.94
J3-978	2,005.07	J3-978	-12.08	487.11	1,702.71	1,753.90	J3-978	20.17	1,702.71	1,702.71
J3-405	2,005.07	J3-405	-14.51	465.52	1,703.48	1,748.43	J3-405	20.17	1,703.48	1,703.48
J3-397	2,005.07	J3-397	10.13	685.39	1,718.06	1,829.23	J3-397	20.18	1,718.02	1,718.02
J3-290	2,005.07	J3-297	8.50	652.63	1,732.09	2,177.96	J3-297	-3.93	1,731.96	1,731.96
J3-395	2,005.07	J3-389	16.99	716.22	1,790.73	2,164.59	J3-389	9.68	1,790.69	1,790.69
J3-393	2,005.07	J3-389	16.99	716.22	1,790.73	2,016.49	J3-389	16.48	1,790.69	1,790.69
J3-394	2,005.07	J3-389	16.99	716.22	1,790.73	2,037.29	J3-389	15.55	1,790.69	1,790.69
J3-389	2,005.07	J3-389	16.99	716.22	1,790.73	1,932.01	J3-389	20.19	1,790.69	1,790.69
J3-396	2,005.07	J3-389	16.99	716.22	1,790.73	2,065.42	J3-389	14.28	1,790.69	1,790.69
J3-291	2,005.07	J3-297	14.46	666.36	1,809.12	2,254.52	J3-297	-2.38	1,809.02	1,809.02
J3-977	2,005.07	J3-297	14.67	666.85	1,812.05	2,070.22	J3-297	10.44	1,811.95	1,811.95
J3-974	2,005.07	J3-297	14.67	666.85	1,812.05	2,167.73	J3-297	3.90	1,811.95	1,811.95
J3-975	2,005.07	J3-297	14.67	666.85	1,812.05	2,112.53	J3-297	7.64	1,811.95	1,811.95
J3-979	2,005.07	J3-297	14.67	666.85	1,812.05	2,171.76	J3-297	3.63	1,811.95	1,811.95
J3-976	2,005.07	J3-297	14.67	666.85	1,812.05	2,137.87	J3-297	5.93	1,811.95	1,811.95
J3-300	2,005.07	J3-300	14.50	654.47	1,824.72	1,921.48	J3-300	20.19	1,824.67	1,824.67
J-5089	2,005.07	J-5089	17.07	619.4	1,892.41	1,967.00	J-5089	20.20	1,892.36	1,892.36
J-5087	2,005.07	J-5087	18.00	605.54	1,909.90	1,979.93	J-5087	20.20	1,909.87	1,909.87
J3-327	2,005.07	J2-206	20.83	437.07		2,069.56	J3-327	20.21	1,910.70	1,910.70
J3-882	2,005.07	J2-206	20.83	437.07		3,948.28	J3-929	13.66	1,924.70	1,924.70
J3-815	2,005.07	J2-206	20.83	437.07		3,453.01	J3-929	15.78	1,924.70	1,924.70
J3-911	2,005.07	J2-206	20.83	437.07		2,779.64	J3-929	18.09	1,925.16	1,925.16
J3-781	2,005.07	J2-206	20.83	437.07		2,924.30	J3-929	17.58	1,925.16	1,925.16
J3-782	2,005.07	J2-206	20.83	437.07		3,467.99	J3-929	15.26	1,925.16	1,925.16
J3-783	2,005.07	J2-206	20.83	437.07		3,328.14	J3-929	15.90	1,925.16	1,925.16
J3-780	2,005.07	J2-206	20.83	437.07		4,514.93	J3-929	9.67	1,925.16	1,925.16
J-5086	2,005.07	J2-206	20.83	437.07		2,040.35	J-5087	19.34	1,957.41	1,957.41
J3-305	2,005.07	J2-206	20.83	437.07		2,060.50	J3-305	20.21	1,969.30	1,969.30
J-5088	2,005.07	J2-206	20.83	437.07		2,130.67	J-5089	15.01	1,984.25	1,984.25
J-5035	2,005.07	J2-206	20.83	437.07		2,018.00	J-5035	20.20	2,003.02	2,003.02
J3-883	2,005.07	J2-206	20.83	437.07		3,894.01	J3-929	14.16	2,011.45	2,011.45
J3-576	2,005.07	J2-206	20.83	437.07		2,068.61	J3-576	20.21	2,071.74	2,071.74
J3-346	2,005.07	J2-206	20.83	437.07		2,293.74	J3-346	20.23	2,097.66	2,097.66
J3-578	2,005.07	J2-206	20.83	437.07		2,095.22	J3-578	20.21	2,099.02	2,099.02
J-5124	2,005.07	J2-206	20.83	437.07		2,178.40	J-5124	20.22	2,120.06	2,120.06
J3-404	2,005.07	J2-206	20.83	437.07		2,337.00	J3-405	7.67	2,149.21	2,149.21
J3-786	2,005.07	J2-206	20.83	437.07		2,145.42	J3-786	20.21	2,151.44	2,151.44
J-5125	2,005.07	J2-206	20.83	437.07		2,214.11	J-5125	20.22	2,190.64	2,190.64
J3-378	2,005.07	J2-206	20.83	437.07		4,144.09	J3-929	7.05	2,230.40	2,230.40
J3-577	2,005.07	J2-206	20.83	437.07		2,254.85	J3-577	20.22	2,258.45	2,258.45
J-5128	2,005.07	J2-206	20.83	437.07		2,372.89	J-5128	20.24	2,299.20	2,299.20
J3-903	2,005.07	J2-206	20.83	437.07		2,294.91	J3-903	20.23	2,300.17	2,300.17
J-5127	2,005.07	J2-206	20.83	437.07		2,397.21	J-5127	20.24	2,325.95	2,325.95
J3-373	2,005.07	J2-206	20.83	437.07		2,698.43	J3-373	20.27	2,326.93	2,326.93
J-5117	2,005.07	J2-206	20.83	437.07		3,577.96	J3-929	16.13	2,339.91	2,339.91
J3-989	2,005.07	J2-206	20.83	437.07		2,467.07	J3-989	20.25	2,340.18	2,340.18
J-5118	2,005.07	J2-206	20.83	437.07		3,558.08	J3-929	16.32	2,344.45	2,344.45
J3-940	2,005.07	J2-206	20.83	437.07		3,824.86	J3-929	12.47	2,355.96	2,355.96
J3-987	2,005.07	J2-206	20.83	437.07		2,492.86	J3-987	20.25	2,365.52	2,365.52
J3-886	2,005.07	J2-206	20.83	437.07		2,361.35	J3-886	20.24	2,366.03	2,366.03
J3-936	2,005.07	J2-206	20.83	437.07		2,653.15	J3-936	20.26	2,370.00	2,370.00
J-5126	2,005.07	J2-206	20.83	437.07		2,469.55	J-5126	20.25	2,371.14	2,371.14
J3-775	2,005.07	J2-206	20.83	437.07		2,347.46	J3-776	20.23	2,379.34	2,379.34
J3-885	2,005.07	J2-206	20.83	437.07		5,321.63	J3-929	8.62	2,385.88	2,385.88
J3-372	2,005.07	J2-206	20.83	437.07		2,789.66	J3-372	20.28	2,397.67	2,397.67
J3-860	2,005.07	J2-206	20.83	437.07		2,404.99	J3-860	20.24	2,408.47	2,408.47

J3-884	2,005.07	J2-206	20.83	437.07	2,407.31	J3-884	20.24	2,411.05	2,411.05
J3-918	2,005.07	J2-206	20.83	437.07	4,203.13	J3-929	13.70	2,417.20	2,417.20
J3-920	2,005.07	J2-206	20.83	437.07	3,260.46	J3-929	18.79	2,429.09	2,429.09
J3-919	2,005.07	J2-206	20.83	437.07	4,321.85	J3-929	13.22	2,429.09	2,429.09
J3-944	2,005.07	J2-206	20.83	437.07	5,685.29	J3-929	6.95	2,431.53	2,431.53
J3-922	2,005.07	J2-206	20.83	437.07	4,621.29	J3-929	11.92	2,444.68	2,444.68
J3-946	2,005.07	J2-206	20.83	437.07	5,261.41	J3-929	9.19	2,447.90	2,447.90
J3-947	2,005.07	J2-206	20.83	437.07	4,673.91	J3-929	12.02	2,447.90	2,447.90
J3-921	2,005.07	J2-206	20.83	437.07	4,805.03	J3-929	11.15	2,456.00	2,456.00
J3-390	2,005.07	J2-206	20.83	437.07	2,655.39	J3-390	20.27	2,458.14	2,458.14
J3-926	2,005.07	J2-206	20.83	437.07	4,436.46	J3-929	12.96	2,460.72	2,460.72
J3-925	2,005.07	J2-206	20.83	437.07	4,501.52	J3-929	12.66	2,461.07	2,461.07
J3-924	2,005.07	J2-206	20.83	437.07	4,736.74	J3-929	11.57	2,461.92	2,461.92
J3-923	2,005.07	J2-206	20.83	437.07	5,383.02	J3-929	8.40	2,464.37	2,464.37
J3-988	2,005.07	J2-206	20.83	437.07	2,604.30	J3-988	20.26	2,465.93	2,465.93
J3-948	2,005.07	J2-206	20.83	437.07	5,917.26	J3-929	5.73	2,467.34	2,467.34
J3-985	2,005.07	J2-206	20.83	437.07	2,609.74	J3-985	20.26	2,467.37	2,467.37
J3-950	2,005.07	J2-206	20.83	437.07	5,444.23	J3-929	8.40	2,472.78	2,472.78
J3-887	2,005.07	J2-206	20.83	437.07	2,473.67	J3-887	20.25	2,479.03	2,479.03
J3-943	2,005.07	J2-206	20.83	437.07	6,265.51	J3-929	4.21	2,488.75	2,488.75
J3-388	2,005.07	J2-206	20.83	437.07	2,758.36	J3-388	20.28	2,492.48	2,492.48
J3-898	2,005.07	J2-206	20.83	437.07	2,495.33	J3-898	20.25	2,499.72	2,499.72
J3-328	2,005.07	J2-206	20.83	437.07	3,053.44	J3-325	14.24	2,505.36	2,505.36
J3-331	2,005.07	J2-206	20.83	437.07	2,803.69	J3-331	20.28	2,515.49	2,515.49
J3-308	2,005.07	J2-206	20.83	437.07	3,077.02	J3-309	-2.66	2,525.70	2,525.70
J3-941	2,005.07	J2-206	20.83	437.07	2,725.87	J3-941	20.27	2,545.11	2,545.11
J3-352	2,005.07	J2-206	20.83	437.07	2,893.56	J3-352	20.29	2,549.71	2,549.71
J3-942	2,005.07	J2-206	20.83	437.07	4,495.51	J3-929	9.91	2,556.60	2,556.60
J3-345	2,005.07	J2-206	20.83	437.07	2,907.48	J3-345	20.29	2,559.12	2,559.12
J3-314	2,005.07	J2-206	20.83	437.07	3,033.27	J3-315	14.67	2,567.44	2,567.44
J-5129	2,005.07	J2-206	20.83	437.07	2,701.87	J-5129	20.27	2,586.58	2,586.58
J3-383	2,005.07	J2-206	20.83	437.07	2,844.93	J3-383	20.28	2,591.84	2,591.84
J3-572	2,005.07	J2-206	20.83	437.07	4,738.94	J3-787	-44.10	2,602.29	2,602.29
J3-986	2,005.07	J2-206	20.83	437.07	2,937.07	J3-987	11.63	2,611.00	2,611.00
J3-983	2,005.07	J2-206	20.83	437.07	2,863.95	J3-985	15.95	2,614.15	2,614.15
J3-391	2,005.07	J2-206	20.83	437.07	2,901.16	J3-391	20.29	2,620.44	2,620.44
J3-951	2,005.07	J2-206	20.83	437.07	4,222.07	J3-929	13.50	2,656.50	2,656.50
J3-937	2,005.07	J2-206	20.83	437.07	2,890.03	J3-937	20.29	2,661.32	2,661.32
J3-351	2,005.07	J2-206	20.83	437.07	2,984.54	J3-351	20.30	2,691.14	2,691.14
J3-304	2,005.07	J2-206	20.83	437.07	2,922.86	J3-305	16.39	2,692.98	2,692.98
J3-380	2,005.07	J2-206	20.83	437.07	2,903.64	J3-380	20.29	2,698.95	2,698.95
J3-381	2,005.07	J2-206	20.83	437.07	4,325.12	J3-929	13.37	2,698.96	2,698.96
J3-568	2,005.07	J2-206	20.83	437.07	2,700.13	J3-568	20.27	2,709.55	2,709.55
J3-354	2,005.07	J2-206	20.83	437.07	3,440.25	J3-373	18.26	2,709.64	2,709.64
J3-934	2,005.07	J2-206	20.83	437.07	4,710.87	J3-929	10.76	2,714.18	2,714.18
J3-382	2,005.07	J2-206	20.83	437.07	4,164.05	J3-929	14.99	2,736.07	2,736.07
J3-785	2,005.07	J2-206	20.83	437.07	2,727.63	J3-785	20.27	2,737.96	2,737.96
J3-939	2,005.07	J2-206	20.83	437.07	4,102.82	J3-929	15.52	2,748.00	2,748.00
J3-953	2,005.07	J2-206	20.83	437.07	4,097.40	J3-929	15.69	2,757.15	2,757.15
J3-332	2,005.07	J2-206	20.83	437.07	3,147.65	J3-332	20.31	2,762.12	2,762.12
J3-984	2,005.07	J2-206	20.83	437.07	3,082.73	J3-985	14.23	2,771.72	2,771.72
J3-777	2,005.07	J2-206	20.83	437.07	3,196.38	J3-776	17.15	2,779.26	2,779.26
J3-910	2,005.07	J2-206	20.83	437.07	6,976.27	J3-929	2.00	2,779.45	2,779.45
J3-954	2,005.07	J2-206	20.83	437.07	4,783.58	J3-929	11.29	2,786.98	2,786.98
J3-784	2,005.07	J2-206	20.83	437.07	2,775.36	J3-784	20.28	2,787.07	2,787.07
J3-384	2,005.07	J2-206	20.83	437.07	4,694.59	J3-929	11.94	2,788.98	2,788.98
J3-385	2,005.07	J2-206	20.83	437.07	3,863.41	J3-929	17.57	2,793.58	2,793.58
J3-316	2,005.07	J2-206	20.83	437.07	4,074.83	J3-929	16.21	2,793.71	2,793.71
J3-303	2,005.07	J2-206	20.83	437.07	3,738.97	J3-929	18.35	2,793.75	2,793.75
J3-386	2,005.07	J2-206	20.83	437.07	3,546.55	J3-929	19.54	2,793.87	2,793.87
J3-387	2,005.07	J2-206	20.83	437.07	3,744.06	J3-929	18.32	2,794.00	2,794.00
J3-307	2,005.07	J2-206	20.83	437.07	3,864.38	J3-929	17.57	2,794.05	2,794.04
J3-312	2,005.07	J2-206	20.83	437.07	3,851.64	J3-929	17.65	2,794.10	2,794.10
J3-329	2,005.07	J2-206	20.83	437.07	3,752.93	J3-929	18.27	2,794.29	2,794.29
J3-310	2,005.07	J2-206	20.83	437.07	3,823.63	J3-929	17.83	2,794.38	2,794.38
J3-317	2,005.07	J2-206	20.83	437.07	3,837.69	J3-929	17.75	2,795.16	2,795.16
J3-398	2,005.07	J2-206	20.83	437.07	3,819.23	J3-929	17.87	2,795.53	2,795.53
J3-318	2,005.07	J2-206	20.83	437.07	3,842.81	J3-929	17.72	2,795.82	2,795.82
J3-322	2,005.07	J2-206	20.83	437.07	3,786.55	J3-929	18.08	2,795.96	2,795.96
J3-323	2,005.07	J2-206	20.83	437.07	3,663.05	J3-929	18.84	2,795.97	2,795.97
J3-339	2,005.07	J2-206	20.83	437.07	3,592.30	J3-929	19.28	2,796.00	2,796.00
J3-330	2,005.07	J2-206	20.83	437.07	3,535.71	J3-929	19.63	2,796.61	2,796.61
J3-335	2,005.07	J2-206	20.83	437.07	3,659.46	J3-929	18.88	2,797.57	2,797.57
J3-334	2,005.07	J2-206	20.83	437.07	3,516.93	J3-929	19.75	2,797.57	2,797.57
J3-343	2,005.07	J2-206	20.83	437.07	3,531.80	J3-929	19.68	2,799.74	2,799.74
J3-326	2,005.07	J2-206	20.83	437.07	3,141.95	J3-326	20.31	2,806.03	2,806.03
J3-356	2,005.07	J2-206	20.83	437.07	3,867.85	J3-929	17.63	2,807.86	2,807.86
J3-344	2,005.07	J2-206	20.83	437.07	3,568.72	J3-929	19.54	2,809.89	2,809.89

J3-350	2,005.07	J2-206	20.83	437.07	3,557.63	J3-929	19.70	2,822.02	2,822.02
J3-349	2,005.07	J2-206	20.83	437.07	3,743.12	J3-929	18.58	2,822.02	2,822.02
J3-938	2,005.07	J2-206	20.83	437.07	3,551.62	J3-929	19.74	2,824.07	2,824.07
J3-890	2,005.07	J2-206	20.83	437.07	3,119.39	J3-568	11.90	2,835.02	2,835.02
J3-888	2,005.07	J2-206	20.83	437.07	3,067.26	J3-568	13.43	2,835.02	2,835.02
J3-889	2,005.07	J2-206	20.83	437.07	2,968.00	J3-568	16.29	2,835.02	2,835.02
J3-952	2,005.07	J2-206	20.83	437.07	2,958.14	J3-952	20.30	2,837.50	2,837.50
J3-991	2,005.07	J2-206	20.83	437.07	2,989.77	J3-991	20.30	2,838.44	2,838.44
J3-338	2,005.07	J2-206	20.83	437.07	3,141.55	J3-338	20.31	2,844.96	2,844.96
J3-355	2,005.07	J2-206	20.83	437.07	3,744.14	J3-929	18.70	2,848.17	2,848.17
J3-575	2,005.07	J2-206	20.83	437.07	2,841.94	J3-575	20.28	2,851.40	2,851.40
J3-908	2,005.07	J2-206	20.83	437.07	5,395.62	J3-929	12.35	2,851.95	2,851.95
J3-935	2,005.07	J2-206	20.83	437.07	4,033.22	J3-929	17.01	2,861.12	2,861.12
J3-902	2,005.07	J2-206	20.83	437.07	2,855.62	J3-902	20.29	2,864.53	2,864.53
J3-907	2,005.07	J2-206	20.83	437.07	5,100.87	J3-929	14.04	2,884.20	2,884.20
J3-374	2,005.07	J2-206	20.83	437.07	3,576.36	J3-929	20.05	2,885.00	2,885.00
J3-891	2,005.07	J2-206	20.83	437.07	3,024.00	J3-568	16.25	2,887.22	2,887.22
J3-562	2,005.07	J2-206	20.83	437.07	3,351.89	J3-562	20.33	2,907.71	2,907.71
J3-333	2,005.07	J2-206	20.83	437.07	3,344.87	J3-333	20.33	2,912.13	2,912.13
J3-906	2,005.07	J2-206	20.83	437.07	5,328.97	J3-929	13.13	2,914.23	2,914.23
J3-878	2,005.07	J2-206	20.83	437.07	2,907.22	J3-878	20.29	2,914.80	2,914.80
J3-353	2,005.07	J2-206	20.83	437.07	3,645.09	J3-373	18.99	2,920.47	2,920.47
J3-905	2,005.07	J2-206	20.83	437.07	3,749.00	J3-929	20.11	2,923.45	2,923.44
J3-904	2,005.07	J2-206	20.83	437.07	5,536.70	J3-929	12.20	2,926.67	2,926.67
J3-347	2,005.07	J2-206	20.83	437.07	3,375.24	J3-347	20.34	2,936.19	2,936.19
J3-566	2,005.07	J2-206	20.83	437.07	7,241.57	J3-929	0.84	2,940.10	2,940.10
J3-565	2,005.07	J2-206	20.83	437.07	7,259.67	J3-929	0.70	2,940.87	2,940.87
J3-881	2,005.07	J2-206	20.83	437.07	7,113.56	J3-929	1.80	2,945.09	2,945.09
J3-324	2,005.07	J2-206	20.83	437.07	3,393.44	J3-324	20.34	2,948.18	2,948.18
J3-874	2,005.07	J2-206	20.83	437.07	6,411.36	J3-929	7.37	2,948.72	2,948.72
J-5042	2,005.07	J2-206	20.83	437.07	2,975.92	J-5042	20.30	2,948.95	2,948.95
J3-375	2,005.07	J2-206	20.83	437.07	3,373.83	J3-375	20.34	2,949.07	2,949.07
J3-873	2,005.07	J2-206	20.83	437.07	6,114.28	J3-929	9.45	2,950.04	2,950.04
J3-870	2,005.07	J2-206	20.83	437.07	5,850.63	J3-929	10.81	2,952.09	2,952.09
J3-876	2,005.07	J2-206	20.83	437.07	7,271.71	J3-929	0.50	2,958.28	2,958.28
J3-859	2,005.07	J2-206	20.83	437.07	4,351.85	J3-929	17.91	2,970.30	2,970.30
J3-858	2,005.07	J2-206	20.83	437.07	7,359.32	J3-929	0.91	2,970.31	2,970.31
J3-864	2,005.07	J2-206	20.83	437.07	5,490.35	J3-929	12.70	2,970.33	2,970.33
J3-774	2,005.07	J2-206	20.83	437.07	3,421.27	J3-776	17.08	2,970.48	2,970.48
J3-861	2,005.07	J2-206	20.83	437.07	6,511.63	J3-929	7.60	2,988.77	2,988.77
J3-869	2,005.07	J2-206	20.83	437.07	4,966.61	J3-929	15.30	2,994.44	2,994.44
J3-862	2,005.07	J2-206	20.83	437.07	6,241.37	J3-929	9.05	2,994.44	2,994.44
J3-867	2,005.07	J2-206	20.83	437.07	5,010.41	J3-929	15.10	2,994.44	2,994.44
J3-778	2,005.07	J2-206	20.83	437.07	3,736.05	J3-776	15.18	3,006.69	3,006.69
J-5039	2,005.07	J2-206	20.83	437.07	5,974.90	J3-929	10.52	3,011.84	3,011.84
J-5040	2,005.07	J2-206	20.83	437.07	4,281.61	J3-929	18.39	3,011.84	3,011.84
J-5043	2,005.07	J2-206	20.83	437.07	5,125.48	J3-929	14.65	3,011.84	3,011.84
J3-348	2,005.07	J2-206	20.83	437.07	3,453.63	J3-348	20.34	3,014.83	3,014.83
J-5044	2,005.07	J2-206	20.83	437.07	5,536.12	J3-929	12.77	3,027.94	3,027.94
J3-370	2,005.07	J2-206	20.83	437.07	4,101.94	J3-929	17.91	3,033.94	3,033.94
J-5037	2,005.07	J2-206	20.83	437.07	4,878.54	J3-929	15.92	3,039.14	3,039.14
J-5090	2,005.07	J2-206	20.83	437.07	3,310.71	J-5090	20.33	3,049.88	3,049.88
J-5046	2,005.07	J2-206	20.83	437.07	4,460.62	J3-929	17.84	3,052.43	3,052.43
J3-371	2,005.07	J2-206	20.83	437.07	4,272.88	J3-372	16.11	3,059.71	3,059.71
J3-901	2,005.07	J2-206	20.83	437.07	3,292.72	J3-902	13.77	3,088.34	3,088.34
J-5028	2,005.07	J2-206	20.83	437.07	3,134.93	J-5028	20.31	3,101.12	3,101.12
J3-900	2,005.07	J2-206	20.83	437.07	3,109.91	J3-902	20.04	3,111.29	3,111.29
J3-360	2,005.07	J2-206	20.83	437.07	3,379.44	J3-360	20.34	3,114.26	3,114.26
J3-899	2,005.07	J2-206	20.83	437.07	3,268.27	J3-902	15.45	3,116.53	3,116.53
J3-897	2,005.07	J2-206	20.83	437.07	3,147.25	J3-902	19.11	3,117.24	3,117.24
J3-358	2,005.07	J2-206	20.83	437.07	3,372.01	J3-358	20.34	3,117.63	3,117.63
J3-895	2,005.07	J2-206	20.83	437.07	3,412.22	J3-902	11.19	3,122.66	3,122.66
J-5033	2,005.07	J2-206	20.83	437.07	3,195.20	J-5041	18.30	3,130.90	3,130.90
J-5041	2,005.07	J2-206	20.83	437.07	3,143.74	J-5041	20.31	3,130.90	3,130.90
J3-990	2,005.07	J2-206	20.83	437.07	3,560.95	J3-985	12.10	3,134.50	3,134.50
J3-896	2,005.07	J2-206	20.83	437.07	3,431.06	J3-902	11.01	3,134.86	3,134.86
J3-726	2,005.07	J2-206	20.83	437.07	4,138.65	J3-333	12.20	3,146.37	3,146.37
J3-337	2,005.07	J2-206	20.83	437.07	4,179.30	J3-333	11.70	3,152.67	3,152.67
J-5031	2,005.07	J2-206	20.83	437.07	3,170.70	J-5031	20.32	3,155.87	3,155.87
J3-341	2,005.07	J2-206	20.83	437.07	4,304.59	J3-333	9.84	3,165.49	3,165.49
J3-342	2,005.07	J2-206	20.83	437.07	4,029.34	J3-333	14.59	3,168.69	3,168.69
J3-560	2,005.07	J2-206	20.83	437.07	3,881.51	J3-333	17.13	3,171.87	3,171.87
J3-561	2,005.07	J2-206	20.83	437.07	3,918.18	J3-333	16.73	3,180.76	3,180.76
J3-313	2,005.07	J2-206	20.83	437.07	3,722.07	J3-315	17.34	3,186.60	3,186.60
J3-321	2,005.07	J2-206	20.83	437.07	4,095.78	J3-333	13.98	3,189.43	3,189.43
J3-917	2,005.07	J2-206	20.83	437.07	4,342.28	J3-776	11.37	3,190.35	3,190.35
J3-866	2,005.07	J2-206	20.83	437.07	3,185.55	J3-866	20.32	3,191.10	3,191.10
J3-336	2,005.07	J2-206	20.83	437.07	3,834.36	J3-331	17.05	3,204.05	3,204.05

J3-320	2,005.07	J2-206	20.83	437.07	4,092.07	J3-333	14.78	3,214.83	3,214.83
J3-779	2,005.07	J2-206	20.83	437.07	4,738.52	J3-776	8.17	3,223.59	3,223.59
J3-992	2,005.07	J2-206	20.83	437.07	4,476.34	J3-333	8.53	3,226.37	3,226.37
J3-319	2,005.07	J2-206	20.83	437.07	4,206.92	J3-333	13.34	3,233.27	3,233.27
J3-877	2,005.07	J2-206	20.83	437.07	3,515.24	J3-878	12.12	3,289.66	3,289.66
J3-302	2,005.07	J2-206	20.83	437.07	4,935.94	J3-387	2.89	3,322.47	3,322.47
J3-790	2,005.07	J2-206	20.83	437.07	3,977.89	J3-360	16.90	3,325.32	3,325.32
J-5030	2,005.07	J2-206	20.83	437.07	3,388.38	J-5031	20.34	3,347.07	3,347.07
J3-357	2,005.07	J2-206	20.83	437.07	3,618.22	J3-357	20.36	3,349.07	3,349.07
J3-602	2,005.07	J2-206	20.83	437.07	3,351.51	J3-602	20.33	3,362.11	3,362.11
J3-359	2,005.07	J2-206	20.83	437.07	4,416.80	J3-358	11.73	3,362.58	3,362.58
J3-363	2,005.07	J2-206	20.83	437.07	4,707.08	J3-360	9.98	3,391.68	3,391.68
J3-292	2,005.07	J2-206	20.83	437.07	6,337.74	J3-387	-13.03	3,400.46	3,400.46
J3-604	2,005.07	J2-206	20.83	437.07	3,403.67	J3-604	20.34	3,417.43	3,417.43
J3-293	2,005.07	J2-206	20.83	437.07	6,712.28	J3-387	-17.63	3,421.13	3,421.13
J3-295	2,003.94	J2-206	20.83	437.07	6,718.99	J3-387	-17.52	3,423.63	3,423.63
J4-2022	2,005.07	J2-206	20.83	437.07	7,536.48	J3-329	-24.82	3,452.72	3,452.72
J3-857	2,005.07	J2-206	20.83	437.07	6,522.30	J3-329	-10.60	3,466.56	3,466.56
J3-856	2,005.07	J2-206	20.83	437.07	6,534.33	J3-329	-10.81	3,467.05	3,467.05
J3-361	2,005.07	J2-206	20.83	437.07	4,858.15	J3-360	10.38	3,503.61	3,503.61
J-5026	2,005.07	J2-206	20.83	437.07	3,579.73	J-5026	20.36	3,535.05	3,535.05
J3-379	2,005.07	J2-206	20.83	437.07	4,359.56	J3-380	11.77	3,550.74	3,550.74
J3-573	2,005.07	J2-206	20.83	437.07	4,000.56	J3-784	14.02	3,678.36	3,678.36
J3-603	2,005.07	J2-206	20.83	437.07	4,127.63	J3-784	13.02	3,746.91	3,746.91
J3-789	2,005.07	J2-206	20.83	437.07	4,856.97	J3-360	14.36	3,789.85	3,789.85
J3-579	2,005.07	J2-206	20.83	437.07	4,309.53	J3-784	10.65	3,799.63	3,799.63
J3-574	2,005.07	J2-206	20.83	437.07	4,103.91	J3-784	14.73	3,809.55	3,809.55
J4-700	2,005.07	J2-206	20.83	437.07	4,132.45	J3-787	12.17	3,812.37	3,812.37
J3-571	2,005.07	J2-206	20.83	437.07	4,144.43	J3-787	12.17	3,869.74	3,869.74
J3-567	2,005.07	J2-206	20.83	437.07	4,284.50	J3-784	12.60	3,870.73	3,870.73
J-5024	2,005.07	J2-206	20.83	437.07	4,014.99	J-5024	20.40	3,956.92	3,956.92
J-5025	2,005.07	J2-206	20.83	437.07	6,405.25	J-5024	-99.38	3,956.92	3,956.92
J3-368	2,005.07	J2-206	20.83	437.07	5,686.80	J3-929	17.13	4,174.76	4,174.76
J3-369	2,005.07	J2-206	20.83	437.07	5,683.58	J3-929	17.16	4,178.09	4,178.09
J-5021	2,005.07	J2-206	20.83	437.07	8,062.16	J3-929	4.15	4,178.09	4,178.09
J3-868	2,005.07	J2-206	20.83	437.07	4,410.10	J3-866	11.77	4,229.13	4,229.13
J3-367	2,005.07	J2-206	20.83	437.07	5,982.95	J3-929	16.48	4,308.97	4,308.97
J3-872	2,005.07	J2-206	20.83	437.07	4,632.82	J3-878	12.23	4,339.27	4,339.27
J-5023	2,005.07	J2-206	20.83	437.07	4,465.49	J-5023	20.45	4,390.26	4,390.26
J3-366	2,005.07	J2-206	20.83	437.07	6,101.72	J3-929	16.44	4,393.75	4,393.75
J3-362	2,005.07	J2-206	20.83	437.07	5,039.48	J3-360	18.91	4,434.81	4,434.81
J3-880	2,005.07	J2-206	20.83	437.07	8,641.60	J3-784	-23.70	6,845.20	6,845.20
J3-863	2,005.07	J2-206	20.83	437.07	8,883.08	J3-784	-28.82	6,881.46	6,881.46
J-5045	2,005.07	J2-206	20.83	437.07	16,466.96	J-5023	-190.69	7,725.24	7,725.24

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Critcal Node 2	Adjusted Available	Design Flow (gpm)
J1-108	2,004.43	J1-108	-126.99	-123.07	852.02	851.02	J1-108	20.08	216.35	852.04	852.02
J1-107	2,004.43	J1-108	-124.63	-117.63	857.92	856.9	J1-108	20.09	216.35	857.94	857.92
J1-123	2,004.43	J1-123	-63	55.61	919.49	918.06	J1-123	20.09	247.37	919.51	919.49
J1-400	2,004.43	J1-400	-77.26	3.69	990.99	989.79	J1-400	20.1	228.38	990.99	990.99
J1-85	2,004.43	J1-400	-77.11	4.04	991.6	1,167.52	J1-400	7.12	198.43	991.6	991.6
J1-737	2,036.34	J2-228	19.01	434.87	1,013.01	2,938.42	J1-123	-19.41	156.21	2,196.30	1,013.01
J1-124	2,004.43	J2-228	19.12	435.13	1,036.38	3,042.38	J1-123	-28.58	135.04	2,164.39	1,036.38
J1-146	2,004.43	J1-146	-41.11	86.12	1,146.57	1,144.48	J1-146	20.11	227.42	1,146.57	1,146.57
J1-122	2,004.43	J1-123	-24.42	144.63	1,153.77	1,723.07	J1-123	-8.43	181.55	1,153.73	1,153.73
J1-125	2,036.34	J2-228	19.23	435.38	1,155.57	3,212.19	J1-123	-35.21	119.74	2,083.61	1,155.57
J1-128	2,004.43	J2-228	19.3	435.54	1,188.85	3,276.31	J1-123	-39.28	110.34	2,020.72	1,188.85
J1-131	2,004.43	J2-228	19.3	435.55	1,191.85	3,259.80	J1-123	-37.73	113.93	2,020.78	1,191.85
J1-136	2,004.43	J2-228	19.32	435.58	1,202.89	3,249.78	J1-123	-37.02	115.56	2,006.76	1,202.89
J1-135	2,004.43	J2-228	19.32	435.58	1,202.90	3,249.97	J1-123	-37.04	115.52	2,006.64	1,202.90
J1-132	2,004.43	J2-228	19.33	435.6	1,209.70	3,210.31	J1-123	-33.2	124.39	2,016.53	1,209.70
J1-130	2,004.43	J2-228	19.33	435.6	1,212.35	3,220.30	J1-123	-34.36	121.7	2,000.36	1,212.35
J1-129	2,004.43	J2-228	19.33	435.61	1,213.39	3,238.93	J1-123	-35.7	118.61	1,998.58	1,213.39
J1-126	2,036.34	J2-228	19.29	435.52	1,214.88	3,306.44	J1-123	-39.4	110.07	2,055.73	1,214.88
J1-160	2,004.43	J1-160	-8.81	194.66	1,215.04	1,210.85	J1-160	20.12	261.44	1,215.04	1,215.04
J1-134	2,004.43	J2-228	19.33	435.62	1,219.87	3,242.13	J1-123	-34.95	120.34	2,015.53	1,219.87
J1-133	2,004.43	J2-228	19.34	435.62	1,220.49	3,245.58	J1-123	-35.19	119.79	2,015.33	1,220.49
J1-137	2,004.43	J2-228	19.34	435.63	1,221.25	3,057.31	J1-123	-22.11	149.97	2,016.83	1,221.25
J1-127	2,036.34	J2-228	19.3	435.55	1,222.65	3,290.70	J1-123	-37.7	114	2,053.03	1,222.65
J1-444	2,036.34	J2-228	19.31	435.57	1,228.16	3,037.82	J1-123	-19.79	155.34	2,053.46	1,228.16
J1-98	2,004.43	J2-228	19.34	435.65	1,233.58	3,259.12	J1-123	-35.56	118.94	2,020.13	1,233.58
J1-143	2,004.43	J2-228	19.34	435.65	1,233.66	3,266.69	J1-123	-36.07	117.76	2,020.45	1,233.66
J1-142	2,004.43	J2-228	19.34	435.65	1,233.74	3,265.87	J1-123	-35.99	117.93	2,020.60	1,233.74
J1-99	2,004.43	J2-228	19.34	435.65	1,234.08	3,197.89	J1-123	-31.18	129.03	2,019.05	1,234.08
J1-140	2,004.43	J2-228	19.35	435.65	1,235.33	3,321.79	J1-123	-39.87	108.98	2,023.84	1,235.33
J1-141	2,004.43	J2-228	19.35	435.65	1,235.34	3,327.48	J1-123	-40.29	108.01	2,023.84	1,235.34
J1-138	2,004.43	J1-138	-0.96	57.79	1,781.98	1,780.01	J2-228	19.52	436.04	1,235.35	1,235.35
J1-139	2,004.43	J2-228	19.35	435.65	1,235.43	3,237.62	J1-123	-33.77	123.06	2,023.82	1,235.43
J1-63	2,004.43	J2-228	19.35	435.65	1,235.55	3,336.41	J1-123	-40.9	106.6	2,024.13	1,235.55
J1-441	2,004.43	J2-228	19.35	435.65	1,235.55	3,336.23	J1-123	-40.89	106.64	2,024.13	1,235.55
J1-847	2,004.43	J2-228	19.35	435.65	1,235.92	3,329.57	J1-123	-40.3	107.98	2,024.65	1,235.92
J1-443	2,004.43	J1-443	-43.11	-79.49	1,584.87	1,583.78	J2-228	19.68	436.42	1,236.02	1,236.02
J1-1013	2,004.43	J1-1013	-18.6	-2.92	1,698.93	1,697.58	J2-228	19.58	436.2	1,236.02	1,236.02
J1-58	2,004.43	J2-228	19.35	435.65	1,236.07	2,493.52	J1-123	10.61	225.48	2,024.95	1,236.07
J1-1015	2,004.43	J2-228	19.35	435.65	1,236.07	2,146.17	J1-123	17.79	242.05	2,024.95	1,236.07
J1-59	2,004.43	J2-228	19.35	435.65	1,236.07	3,207.86	J1-123	-31.5	128.3	2,024.95	1,236.07
J1-41	2,004.43	J2-228	19.35	435.65	1,236.07	2,105.27	J1-123	18.5	243.69	2,024.95	1,236.07
J1-40	2,004.43	J2-228	19.35	435.65	1,236.07	2,259.66	J1-123	16.04	238.02	2,024.95	1,236.07
J1-42	2,004.43	J2-228	19.35	435.65	1,236.07	2,281.16	J1-123	15.76	237.37	2,024.95	1,236.07
J1-44	2,004.43	J2-228	19.35	435.65	1,236.07	2,218.68	J1-123	16.63	239.38	2,024.95	1,236.07
J1-442	2,004.43	J2-228	19.35	435.65	1,236.07	2,285.34	J1-123	15.71	237.25	2,024.95	1,236.07
J1-47	2,004.43	J2-228	19.35	435.65	1,236.07	2,344.81	J1-123	15.04	235.71	2,024.95	1,236.07
J1-48	2,004.43	J2-228	19.35	435.65	1,236.07	2,320.00	J1-123	15.29	236.3	2,024.95	1,236.07
J1-1014	2,004.43	J2-228	19.35	435.65	1,236.07	2,180.16	J1-123	17.23	240.76	2,024.95	1,236.07
J1-1012	2,004.43	J2-228	19.35	435.65	1,236.07	2,150.24	J1-123	17.72	241.89	2,024.95	1,236.07
J1-1011	2,004.43	J2-228	19.35	435.65	1,236.07	2,195.47	J1-123	16.99	240.2	2,024.95	1,236.07
J1-57	2,004.43	J1-57	-37.45	-37.44	1,546.19	1,544.82	J2-228	19.71	436.5	1,236.60	1,236.60
J1-50	2,004.43	J2-228	19.35	435.65	1,236.65	2,394.22	J1-123	14.65	234.82	2,025.55	1,236.65
J1-51	2,004.43	J2-228	19.35	435.65	1,236.65	2,923.94	J1-123	-12.84	171.36	2,025.55	1,236.65
J1-101	2,004.43	J2-228	19.35	435.66	1,236.69	3,026.75	J1-123	-18.55	158.19	2,023.97	1,236.69
J1-54	2,004.43	J2-228	19.35	435.65	1,236.81	3,310.71	J1-123	-38.85	111.34	2,025.59	1,236.81
J1-848	2,004.43	J2-228	19.35	435.65	1,236.81	2,748.73	J1-123	-2.58	195.05	2,025.59	1,236.81
J1-39	2,004.43	J2-228	19.35	435.65	1,237.24	3,295.65	J1-123	-37.59	114.25	2,026.33	1,237.24
J1-100	2,004.43	J2-228	19.35	435.66	1,238.20	3,186.36	J1-123	-29.8	132.23	2,025.59	1,238.20
J1-96	2,004.43	J2-228	19.35	435.66	1,238.59	3,154.76	J1-123	-27.64	137.21	2,026.99	1,238.59
J1-97	2,004.43	J2-228	19.35	435.66	1,238.87	3,174.76	J1-123	-28.98	134.13	2,027.40	1,238.87
J1-93	2,004.43	J2-228	19.35	435.66	1,240.34	3,074.02	J1-123	-22.02	150.19	2,029.78	1,240.34
J1-95	2,004.43	J2-228	19.35	435.67	1,240.87	3,120.21	J1-123	-25	143.3	2,030.40	1,240.87
J1-89	2,004.43	J1-89	-26.71	-5.64	1,595.72	1,594.21	J2-228	19.68	436.41	1,241.12	1,241.12
J1-92	2,004.43	J2-228	19.35	435.67	1,241.16	3,120.25	J1-123	-24.97	143.38	2,030.74	1,241.16
J1-90	2,004.43	J2-228	19.35	435.67	1,241.21	2,929.77	J1-123	-12.74	171.59	2,030.84	1,241.21
J1-7	2,004.43	J2-228	19.35	435.67	1,241.42	3,019.12	J1-123	-18.28	158.81	2,031.83	1,241.42
J1-440	2,004.43	J2-228	19.35	435.67	1,241.47	2,721.71	J1-123	-0.64	199.52	2,031.87	1,241.47
J1-6	2,004.43	J2-228	19.35	435.67	1,241.47	2,939.32	J1-123	-13.27	170.37	2,031.87	1,241.47
J1-12	2,004.43	J2-228	19.35	435.67	1,241.48	2,476.25	J1-123	11.82	228.27	2,031.87	1,241.48
J1-11	2,004.43	J2-228	19.35	435.67	1,241.49	2,390.19	J1-123	14.68	234.88	2,031.88	1,241.49
J1-13	2,004.43	J2-228	19.35	435.67	1,241.49	2,435.63	J1-123	13.69	232.6	2,031.89	1,241.49

J1-5	2,004.43 J2-228	19.35	435.67	1,241.50	2,516.79 J1-123	9.89	223.83	2,031.89	1,241.50
J1-4	2,004.43 J2-228	19.35	435.67	1,241.50	3,111.61 J1-123	-24.32	144.87	2,031.89	1,241.50
J1-9	2,004.43 J2-228	19.35	435.67	1,241.52	2,736.99 J1-123	-1.48	197.59	2,031.91	1,241.52
J1-14	2,004.43 J2-228	19.35	435.67	1,241.53	2,356.50 J1-123	14.96	235.52	2,031.91	1,241.53
J1-94	2,004.43 J2-228	19.35	435.67	1,241.54	3,082.90 J1-123	-22.42	149.25	2,031.19	1,241.54
J1-10	2,004.43 J2-228	19.35	435.67	1,241.59	2,839.75 J1-123	-7.3	184.15	2,031.97	1,241.59
J1-791	2,004.43 J2-228	19.35	435.67	1,241.61	3,066.57 J1-123	-21.33	151.77	2,031.98	1,241.61
J1-3	2,004.43 J2-228	19.35	435.67	1,241.63	3,064.22 J1-123	-21.18	152.13	2,031.99	1,241.63
J1-2	2,004.43 J2-228	19.35	435.67	1,241.64	3,049.54 J1-123	-20.22	154.34	2,032.00	1,241.64
J1-1	2,004.43 J2-228	19.35	435.67	1,241.64	3,023.96 J1-123	-18.57	158.14	2,032.00	1,241.64
J1-20	2,004.43 J2-228	19.35	435.67	1,241.66	3,042.36 J1-123	-19.75	155.42	2,032.02	1,241.66
J1-795	2,004.43 J2-228	19.35	435.67	1,241.67	2,972.76 J1-123	-15.33	165.63	2,032.03	1,241.67
J1-22	2,004.43 J1-22	-45.75	-56.59	1,503.82	1,502.55 J2-228	19.76	436.6	1,241.74	1,241.74
J1-21	2,004.43 J2-228	19.35	435.67	1,241.80	2,571.43 J1-123	7.23	217.69	2,032.10	1,241.80
J1-15	2,004.43 J2-228	19.35	435.67	1,241.83	2,975.01 J1-123	-15.45	165.34	2,032.12	1,241.83
J1-35	2,004.43 J2-228	19.35	435.67	1,241.89	2,615.16 J1-123	5.03	212.6	2,032.15	1,241.89
J1-26	2,004.43 J1-26	-6.25	36.58	1,746.84	1,745.04 J2-228	19.55	436.12	1,241.89	1,241.89
J1-16	2,004.43 J2-228	19.35	435.67	1,241.91	3,032.01 J1-123	-19.06	157.02	2,032.16	1,241.91
J1-23	2,004.43 J1-23	-32.12	-23.14	1,573.43	1,572.02 J2-228	19.7	436.46	1,241.92	1,241.92
J1-34	2,004.43 J2-228	19.35	435.67	1,241.94	2,677.80 J1-123	1.76	205.06	2,032.17	1,241.94
J1-91	2,004.43 J2-228	19.35	435.67	1,241.94	3,060.37 J1-123	-20.9	152.77	2,031.71	1,241.94
J1-31	2,004.43 J2-228	19.35	435.67	1,241.94	2,654.71 J1-123	2.98	207.88	2,032.18	1,241.94
J1-29	2,004.43 J2-228	19.35	435.67	1,241.95	2,679.79 J1-123	1.66	204.82	2,032.18	1,241.95
J1-30	2,004.43 J2-228	19.35	435.67	1,241.95	2,692.32 J1-123	0.99	203.27	2,032.18	1,241.95
J1-28	2,004.43 J2-228	19.35	435.67	1,241.95	2,662.76 J1-123	2.56	206.9	2,032.18	1,241.95
J1-27	2,004.43 J2-228	19.35	435.67	1,241.95	2,210.05 J1-123	16.87	239.93	2,032.18	1,241.95
J1-24	2,004.43 J2-228	19.35	435.67	1,241.98	2,694.71 J1-123	0.86	202.98	2,032.19	1,241.98
J1-25	2,004.43 J2-228	19.35	435.67	1,241.98	2,770.90 J1-123	-3.33	193.32	2,032.20	1,241.98
J1-17	2,004.43 J2-228	19.35	435.67	1,242.09	3,010.03 J1-123	-17.63	160.31	2,032.27	1,242.09
J1-18	2,004.43 J2-228	19.36	435.67	1,242.91	2,881.65 J1-123	-9.64	178.75	2,033.01	1,242.91
J1-19	2,004.43 J2-228	19.36	435.67	1,242.91	2,548.92 J1-123	8.42	220.44	2,033.01	1,242.91
J1-446	2,004.43 J2-228	19.36	435.67	1,243.32	3,152.77 J1-123	-26.87	138.98	2,033.08	1,243.32
J1-80	2,004.43 J2-228	19.36	435.67	1,244.15	2,943.60 J1-123	-13.3	170.31	2,033.86	1,244.15
J1-79	2,004.43 J2-228	19.36	435.67	1,244.38	2,552.98 J1-123	8.33	220.22	2,034.12	1,244.38
J1-77	2,004.43 J2-228	19.36	435.67	1,244.45	2,708.44 J1-123	0.32	201.74	2,034.23	1,244.45
J1-78	2,004.43 J2-228	19.36	435.67	1,244.45	2,175.07 J1-123	17.46	241.29	2,034.23	1,244.45
J1-76	2,004.43 J2-228	19.36	435.67	1,244.58	3,062.34 J1-123	-20.75	153.12	2,034.35	1,244.58
J1-75	2,004.43 J2-228	19.36	435.67	1,244.74	3,126.04 J1-123	-24.93	143.47	2,034.55	1,244.74
J1-81	2,004.43 J1-81	-57.04	-91.63	1,460.83	1,459.66 J2-228	19.8	436.7	1,245.23	1,245.23
J1-70	2,004.43 J2-228	19.36	435.68	1,245.31	3,273.10 J1-400	-43.2	82.3	2,103.17	1,245.31
J1-71	2,004.43 J2-228	19.36	435.68	1,245.31	3,305.75 J1-400	-42	85.06	2,176.06	1,245.31
J1-72	2,004.43 J2-228	19.36	435.68	1,245.31	3,490.92 J1-123	-51.28	82.65	2,035.32	1,245.31
J1-69	2,004.43 J2-228	19.36	435.68	1,245.34	3,323.22 J1-123	-38.6	111.92	2,035.35	1,245.34
J1-88	2,004.43 J2-228	19.36	435.68	1,245.38	3,270.15 J1-123	-34.75	120.8	2,035.42	1,245.38
J1-86	2,004.43 J2-228	19.36	435.68	1,245.38	3,188.40 J1-123	-29.02	134.03	2,035.42	1,245.38
J1-445	2,004.43 J2-228	19.36	435.68	1,245.39	3,253.92 J1-123	-33.59	123.49	2,035.44	1,245.39
J1-113	2,004.43 J2-228	19.36	435.68	1,245.40	3,197.06 J1-123	-29.61	132.66	2,035.44	1,245.40
J1-102	2,004.43 J2-228	19.36	435.68	1,245.67	3,123.62 J1-123	-24.57	144.3	2,035.76	1,245.67
J1-103	2,004.43 J2-228	19.36	435.68	1,245.75	3,080.37 J1-123	-21.69	150.93	2,035.88	1,245.75
J1-112	2,004.43 J2-228	19.36	435.68	1,245.88	2,585.06 J1-123	6.93	217	2,036.10	1,245.88
J1-111	2,004.43 J2-228	19.36	435.68	1,245.93	2,155.17 J1-123	17.83	242.14	2,036.17	1,245.93
J1-110	2,004.43 J2-228	19.36	435.68	1,246.02	2,041.68 J2-228	19.32	435.59	1,245.93	1,245.93
J1-109	2,004.43 J1-109	-18.64	101.98	1,477.11	1,474.86 J2-228	19.79	436.67	1,246.39	1,246.39
J1-104	2,004.43 J2-228	19.36	435.68	1,247.49	2,954.77 J1-123	-13.5	169.85	2,037.71	1,247.49
J1-105	2,004.43 J2-228	19.36	435.69	1,249.30	2,734.85 J1-123	-0.61	199.58	2,039.29	1,249.30
J1-114	2,004.43 J2-228	19.36	435.69	1,250.38	2,982.73 J1-123	-14.96	166.48	2,035.68	1,250.38
J1-447	2,004.43 J2-228	19.36	435.69	1,251.16	2,972.62 J1-123	-14.24	168.14	2,037.61	1,251.16
J1-119	2,004.43 J1-123	-0.6	199.61	1,426.89	2,380.41 J1-123	-15.73	164.7	1,426.89	1,426.89
J1-145	2,004.43 J1-145	1.77	214.08	1,432.19	1,426.98 J2-206	20.02	435.21	1,462.35	1,432.19
J1-157	2,004.43 J2-206	19.55	434.11	1,450.18	2,756.16 J2-206	18.79	432.37	1,450.18	1,450.18
J1-794	2,004.43 J1-794	17.55	255.5	1,876.31	1,866.29 J2-206	19.67	434.4	1,454.82	1,454.82
J1-159	2,004.43 J2-206	19.55	434.12	1,455.50	2,199.43 J2-206	19.37	433.71	1,455.50	1,455.50
J1-151	2,004.43 J2-206	19.55	434.13	1,456.03	2,616.00 J2-206	18.95	432.74	1,456.02	1,456.02
J1-164	2,004.43 J2-206	19.55	434.13	1,457.54	2,650.28 J2-206	18.92	432.66	1,457.54	1,457.54
J1-163	2,004.43 J2-206	19.56	434.13	1,458.02	2,576.74 J2-206	19	432.85	1,458.02	1,458.02
J1-793	2,004.43 J2-206	19.56	434.13	1,458.23	2,230.70 J2-206	19.35	433.65	1,458.23	1,458.23
J1-162	2,004.43 J2-206	19.56	434.13	1,458.50	3,011.57 J1-163	17.98	251.49	2,866.07	1,458.50
J1-148	2,004.43 J2-206	19.56	434.14	1,459.75	3,312.38 J2-206	18.16	430.91	1,459.74	1,459.74
J1-161	2,004.43 J2-206	19.56	434.14	1,460.15	4,902.57 J1-163	6.25	224.43	4,488.42	1,460.15
J1-147	2,004.43 J2-206	19.56	434.14	1,460.58	4,852.46 J1-159	11.92	246.52	4,587.19	1,460.58
J1-150	2,004.43 J2-206	19.56	434.14	1,461.12	4,789.59 J1-159	15.66	255.14	4,644.00	1,461.12
J1-153	2,004.43 J2-206	19.56	434.14	1,462.36	4,721.63 J2-206	16.11	426.18	1,462.35	1,462.35
J1-158	2,012.73 J2-206	19.55	434.12	1,462.39	2,474.36 J2-206	19.11	433.1	1,462.39	1,462.39

J1-152	2,012.73 J2-206	19.55	434.13	1,464.66	2,546.61 J2-206	19.04	432.93	1,464.66	1,464.66
J1-149	2,012.73 J1-149	15.38	233.49	1,844.22	1,837.30 J2-206	19.71	434.49	1,468.04	1,468.04
J1-84	2,004.43 J1-400	-2.17	177	1,534.80	2,404.52 J1-400	-20.93	133.7	1,534.77	1,534.77
J1-120	2,004.43 J1-123	9.47	222.86	1,625.51	2,501.56 J1-123	-9.82	178.35	1,625.50	1,625.50
J1-56	2,004.43 J1-57	-23.67	-5.64	1,627.29	1,641.89 J1-57	18.43	91.53	1,627.29	1,627.29
J1-118	2,004.43 J1-123	11.93	228.53	1,689.80	2,863.89 J1-123	-28.7	134.76	1,689.80	1,689.80
J1-116	2,004.43 J1-123	13.38	231.88	1,734.41	2,924.52 J1-123	-29.77	132.29	1,734.41	1,734.41
J1-121	2,004.43 J1-123	14.4	234.24	1,761.80	2,879.27 J1-123	-27.39	137.79	1,761.80	1,761.80
J1-736	2,004.43 J1-123	15.65	237.11	1,812.56	2,674.87 J1-123	-7.89	182.78	1,812.44	1,812.44
J1-82	2,004.43 J1-400	14.25	214.88	1,835.65	2,525.80 J1-400	-4.77	171	1,835.64	1,835.64
J1-83	2,004.43 J1-83	14.2	144.78	1,910.37	1,907.21 J1-400	17.56	222.52	1,835.64	1,835.64
J1-49	2,004.43 J1-57	10.79	73.9	1,902.65	1,929.62 J1-57	17.59	89.6	1,902.79	1,902.65
J1-117	2,004.43 J1-123	18.36	243.37	1,921.90	3,125.77 J1-123	-32.09	126.94	1,921.88	1,921.88
J1-115	2,004.43 J1-123	18.63	244.01	1,937.78	2,632.58 J1-123	0.84	202.94	1,937.77	1,937.77
J1-60	2,004.43 J2-206	20.6	436.54	4,919.23	9,071.75 J1-123	-37.2	115.15	5,712.99	4,919.23
J1-64	2,004.43 J2-206	20.6	436.55	5,424.57	11,065.98 J1-527	-44.88	116.41	5,652.56	5,424.57
J1-688	2,004.43 J2-206	20.6	436.55	5,445.93	10,011.91 J1-527	-33.54	142.59	5,613.79	5,445.93
J1-686	2,004.43 J2-206	20.6	436.55	5,445.93	10,240.09 J1-527	-36.41	135.96	5,613.79	5,445.93
J1-806	2,004.43 J2-206	20.6	436.55	5,452.11	11,380.06 J1-527	-47.24	110.97	5,602.78	5,452.11
J1-87	2,004.43 J2-206	20.6	436.55	5,471.14	10,881.14 J1-527	-43.81	118.89	5,569.05	5,471.14

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Critcal Node 2	Adjusted Available	Design Flow (gpm)
J2-659	2,003.60	J2-659	-78.46	154.92	703.94	702.39	J2-659	20.07	382.32	703.94	703.94
J2-204	2,003.60	J2-206	17.4	429.16	792.64	4,465.03	J2-206	7.13	405.47	792.64	792.64
J2-555	2,003.60	J2-555	-14.13	337.39	866.75	861.9	J2-555	20.09	416.36	866.77	866.75
J2-230	2,003.60	J2-555	-6.28	355.5	974.75	1,963.80	J2-555	-4.95	358.58	974.74	974.74
J2-231	2,003.60	J2-231	-21.74	214.82	1,479.83	1,477.64	J2-555	9.33	391.54	974.74	974.74
J2-838	2,003.60	J2-555	-5.42	357.48	989.56	2,183.96	J2-555	-11.61	343.21	989.55	989.55
J2-670	2,003.60	J2-670	-57.56	173.16	990.11	988.34	J2-670	20.1	352.38	990.11	990.11
J-5095	2,003.60	J-5095	-75.22	116.4	993.8	992.35	J-5095	20.1	336.39	993.8	993.8
J2-839	2,003.60	J2-555	-3.29	362.42	1,026.45	2,423.11	J2-555	-17.49	329.64	1,026.44	1,026.44
J2-840	2,003.60	J2-555	-3.06	362.93	1,031.20	2,595.37	J2-555	-23.66	315.4	1,031.20	1,031.20
J2-669	2,003.60	J2-669	-16.9	298.99	1,037.27	1,033.73	J2-669	20.1	384.4	1,037.27	1,037.27
J2-671	2,003.60	J2-671	-55.87	165.06	1,061.77	1,060.03	J2-671	20.11	340.4	1,061.77	1,061.77
J2-660	2,003.60	J2-660	-48.5	188.07	1,071.10	1,069.19	J2-660	20.11	346.4	1,071.10	1,071.10
J2-662	2,003.60	J2-662	-44.29	197.78	1,096.32	1,094.32	J2-659	19.91	381.95	1,091.23	1,091.23
J2-661	2,003.60	J2-659	-12.95	306.11	1,091.23	1,744.86	J2-659	-2.69	329.78	1,091.23	1,091.23
J2-658	2,003.60	J2-659	-12.95	306.11	1,091.23	2,190.80	J2-659	-21.38	286.66	1,091.23	1,091.23
J2-270	2,003.60	J2-270	-219.92	-397.56	1,110.29	1,109.71	J2-270	20.11	156.41	1,110.28	1,110.28
J2-234	2,003.60	J2-555	1.4	373.22	1,122.81	2,475.68	J2-555	-12.53	341.08	1,122.80	1,122.80
J2-235	2,003.60	J2-555	1.98	374.56	1,136.36	2,424.29	J2-555	-10.07	346.77	1,136.36	1,136.36
J2-233	2,003.60	J2-555	1.98	374.56	1,136.36	2,741.12	J2-555	-20.45	322.79	1,136.36	1,136.36
J2-232	2,003.60	J2-555	2.26	375.22	1,143.22	2,849.12	J2-555	-23.71	315.29	1,143.22	1,143.22
J2-656	2,003.60	J2-671	-31.36	221.63	1,212.02	1,450.07	J2-670	5.72	319.2	1,172.63	1,172.63
J2-702	2,003.60	J2-670	-28.13	241.07	1,172.63	1,504.67	J2-670	1.52	309.5	1,172.63	1,172.63
J2-236	2,003.60	J2-555	3.68	378.48	1,178.88	3,137.15	J2-555	-31.12	298.19	1,178.88	1,178.88
J2-252	2,003.60	J2-252	-75.53	80.7	1,199.19	1,197.87	J2-252	20.12	301.43	1,199.19	1,199.19
J2-237	2,003.60	J2-555	4.49	380.35	1,200.84	2,709.31	J2-555	-15.02	335.34	1,200.83	1,200.83
J2-238	2,003.60	J2-238	-9.21	198.74	1,677.33	1,675.23	J2-555	11.74	397.1	1,200.83	1,200.83
J2-268	2,003.60	J2-268	-109.58	-52.9	1,201.64	1,200.65	J2-268	20.12	246.43	1,201.62	1,201.62
J2-241	2,003.60	J2-555	4.59	380.59	1,203.75	3,295.56	J2-555	-34.77	289.77	1,203.75	1,203.75
J2-239	2,003.60	J2-555	4.64	380.7	1,205.23	3,465.65	J2-555	-41.06	275.25	1,205.22	1,205.22
J2-240	2,003.60	J2-555	4.77	381	1,208.80	3,369.73	J2-555	-37.07	284.44	1,208.79	1,208.79
J2-263	2,003.60	J2-555	4.9	381.3	1,212.52	2,279.13	J2-555	-1.99	365.4	1,212.52	1,212.52
J2-264	2,003.60	J2-264	2.03	195.69	1,810.11	1,808.00	J2-555	9.3	391.45	1,212.52	1,212.52
J2-837	2,003.60	J2-555	4.91	381.33	1,212.63	3,986.10	J2-555	-61.29	228.55	1,212.63	1,212.63
J2-266	2,003.60	J2-266	-2.14	144.07	1,806.66	1,804.91	J2-555	9.4	391.69	1,213.77	1,213.77
J2-262	2,003.60	J2-555	5	381.53	1,215.37	2,517.77	J2-555	-8.45	350.51	1,215.37	1,215.37
J2-257	2,003.60	J2-555	5.21	382.01	1,221.46	2,843.48	J2-555	-17.95	328.58	1,221.46	1,221.46
J2-260	2,003.60	J2-260	-36.81	69.04	1,580.33	1,578.98	J2-555	14.12	402.59	1,222.11	1,222.11
J2-259	2,003.60	J2-555	5.23	382.07	1,222.11	1,954.36	J2-555	6.36	384.68	1,222.11	1,222.11
J2-258	2,003.60	J2-555	5.23	382.07	1,222.11	2,790.84	J2-555	-16.25	332.5	1,222.11	1,222.11
J2-261	2,003.60	J2-555	5.23	382.07	1,222.11	2,034.92	J2-260	4.27	163.85	1,884.69	1,222.11
J2-256	2,003.60	J2-555	5.23	382.08	1,222.26	2,909.66	J2-555	-20.01	323.81	1,222.26	1,222.26
J2-207	2,003.60	J2-206	19.15	433.2	1,222.96	5,215.29	J2-206	12.78	418.49	1,222.96	1,222.96
J2-255	2,003.60	J2-555	5.32	382.27	1,224.71	3,092.80	J2-555	-25.91	310.19	1,224.71	1,224.71
J2-657	2,003.60	J2-670	-20.34	259.07	1,240.28	1,613.91	J2-670	1.09	308.53	1,240.28	1,240.28
J2-554	2,003.60	J2-206	19.24	433.39	1,263.75	9,887.48	J2-206	-1.41	385.74	1,263.75	1,263.75
J2-225	2,003.60	J2-555	7.05	386.28	1,280.02	4,142.64	J2-555	-60.29	230.85	1,280.02	1,280.02
J2-269	2,003.60	J2-270	-135.93	-203.71	1,281.33	1,329.39	J2-270	11.47	136.46	1,281.33	1,281.33
J2-203	2,003.60	J2-206	19.3	433.54	1,281.57	12,582.58	J2-206	-11.48	362.5	1,281.56	1,281.56
J2-226	2,003.60	J2-555	7.36	386.99	1,287.52	3,050.08	J2-555	-20.13	323.55	1,287.52	1,287.52
J2-248	2,003.60	J2-555	7.72	387.82	1,303.21	3,995.05	J2-555	-52.17	249.6	1,303.21	1,303.21
J2-254	2,003.60	J2-555	7.9	388.23	1,306.56	2,043.86	J2-555	7.05	386.27	1,306.56	1,306.56
J2-221	2,003.60	J2-555	8.56	389.75	1,327.93	3,041.66	J2-555	-17.32	330.02	1,327.93	1,327.93
J2-222	2,003.60	J2-555	8.56	389.75	1,327.93	2,147.00	J2-555	5.55	382.82	1,327.93	1,327.93
J2-197	2,003.60	J2-206	19.39	433.75	1,342.35	14,069.85	J2-206	-15.91	352.27	1,342.35	1,342.35
J2-224	2,003.60	J2-555	9.03	390.83	1,347.98	2,479.20	J2-555	-1.45	366.64	1,347.92	1,347.92
J2-223	2,003.60	J2-555	9.03	390.83	1,347.98	4,205.58	J2-555	-55.47	241.99	1,347.92	1,347.92
J2-551	2,003.60	J2-206	19.46	433.92	1,366.59	14,414.98	J2-206	-11.72	361.95	1,366.56	1,366.56
J2-267	2,003.60	J2-268	-62.31	56.21	1,377.67	1,651.35	J2-268	-12.77	170.54	1,377.65	1,377.65
J2-202	2,003.60	J2-206	19.5	433.99	1,384.78	13,962.39	J2-206	-8.35	369.74	1,384.74	1,384.74
J2-198	2,003.60	J2-206	19.47	433.93	1,387.16	10,039.71	J2-206	2.77	395.39	1,387.15	1,387.15
J2-249	2,003.60	J2-555	11.67	396.94	1,455.66	3,222.08	J2-555	-15.49	334.24	1,455.66	1,455.66
J2-220	2,003.60	J2-555	11.64	396.87	1,456.00	4,545.87	J2-555	-57.85	236.49	1,456.00	1,456.00
J2-247	2,003.60	J2-555	11.74	397.08	1,459.23	3,676.31	J2-555	-28.28	304.73	1,459.23	1,459.23
J2-246	2,003.60	J2-555	11.9	397.46	1,466.59	3,617.09	J2-555	-26.04	309.9	1,466.59	1,466.59
J2-199	2,003.60	J2-206	19.58	434.18	1,476.16	5,462.20	J2-206	15.02	423.66	1,476.29	1,476.16
J2-192	2,003.60	J2-206	19.58	434.18	1,483.83	13,973.25	J2-206	-9.22	367.72	1,483.83	1,483.83
J2-219	2,003.60	J2-555	12.91	399.8	1,508.34	3,867.78	J2-555	-30.07	300.61	1,508.40	1,508.34
J2-250	2,003.60	J2-555	12.83	399.61	1,511.87	2,663.71	J2-555	0.22	370.51	1,511.87	1,511.87
J2-245	2,003.60	J2-555	13.08	400.18	1,524.23	3,758.93	J2-555	-26.76	308.23	1,524.23	1,524.23
J2-265	2,003.60	J2-268	-33.22	123.32	1,530.96	1,823.04	J2-268	-11.45	173.57	1,530.95	1,530.95

J2-253	2,003.60	J2-555	13.24	400.56	1,532.67	3,253.39	J2-555	-12.76	340.56	1,532.67	1,532.67
J2-244	2,003.60	J2-555	13.26	400.61	1,533.75	3,830.99	J2-555	-28.3	304.69	1,533.75	1,533.75
J2-552	2,003.60	J2-206	19.65	434.34	1,544.69	5,001.72	J2-206	16.02	425.98	1,544.69	1,544.69
J2-208	2,003.60	J2-206	19.64	434.33	1,547.52	8,808.13	J2-206	7.67	406.7	1,547.52	1,547.52
J2-196	2,003.60	J2-206	19.66	434.37	1,556.35	13,886.67	J2-206	-6.27	374.53	1,556.35	1,556.35
J2-663	2,003.60	J2-669	13.57	369.32	1,567.59	3,510.88	J2-669	-26.45	276.97	1,567.58	1,567.58
J2-653	2,003.60	J2-206	19.73	434.54	1,592.73	13,616.09	J2-654	-19.81	244.29	8,297.67	1,592.73
J2-553	2,003.60	J2-553	16.45	284.96	1,944.23	1,940.81	J2-206	19.76	434.6	1,609.42	1,609.42
J2-195	2,003.60	J2-206	19.71	434.49	1,609.42	3,974.79	J2-553	13.03	277.07	3,751.07	1,609.42
J2-212	2,003.60	J2-212	-14.77	198.92	1,610.72	1,608.66	J2-212	20.16	279.53	1,610.73	1,610.72
J2-251	2,003.60	J2-252	-9.95	232.03	1,612.98	1,817.64	J2-252	5.02	266.57	1,612.99	1,612.98
J3-973	2,003.60	J3-973	-0.71	263.37	1,622.80	1,619.41	J3-973	20.16	311.53	1,622.80	1,622.80
J2-243	2,003.60	J2-555	15.14	404.94	1,641.12	4,537.28	J2-555	-43.14	270.43	1,641.12	1,641.12
J2-194	2,003.60	J2-206	19.76	434.6	1,666.85	3,692.80	J2-206	18.17	430.94	1,666.85	1,666.85
J2-193	2,003.60	J2-206	19.77	434.62	1,675.20	13,697.71	J2-206	-2.44	383.36	1,675.20	1,675.20
J2-218	2,003.60	J2-555	15.96	406.83	1,691.62	5,370.14	J2-555	-65.45	218.95	1,691.62	1,691.62
J2-188	2,003.60	J2-206	19.83	434.76	1,751.12	14,001.33	J2-206	-1.68	385.13	1,751.12	1,751.12
J3-971	2,003.60	J3-973	7.64	282.63	1,752.65	1,885.37	J3-973	13.69	296.59	1,752.65	1,752.65
J2-213	2,003.60	J2-555	16.91	409.02	1,759.57	5,856.53	J2-555	-77.09	192.09	1,759.57	1,759.57
J2-191	2,003.60	J2-206	19.85	434.8	1,780.09	2,720.22	J2-206	19.29	433.53	1,780.09	1,780.09
J2-211	2,003.60	J2-555	18.56	412.84	1,872.20	4,780.27	J2-555	-33.25	293.26	1,872.28	1,872.19
J2-215	2,003.60	J2-555	18.64	413.01	1,888.28	6,032.00	J2-555	-71.3	205.45	1,888.43	1,888.28
J3-970	2,003.60	J3-973	16.32	302.67	1,919.65	2,197.02	J3-973	7.22	281.66	1,919.61	1,919.61
J2-210	2,003.60	J2-555	19.46	414.9	1,951.35	5,221.09	J2-555	-39.81	278.13	1,951.40	1,951.35
J2-187	2,003.60	J2-206	19.98	435.11	1,983.91	6,979.19	J2-206	15.21	424.1	1,983.91	1,983.91
J2-217	2,003.60	J2-555	19.81	415.72	1,986.19	4,756.78	J2-555	-24.83	312.7	1,986.26	1,986.19
J2-216	2,003.60	J2-555	19.93	416.01	1,998.00	4,680.03	J2-555	-22.3	318.54	1,998.06	1,998.00
J2-189	2,003.60	J2-206	20.01	435.19	2,045.08	12,161.06	J2-206	8.16	407.84	2,045.08	2,045.08
J2-664	2,003.60	J2-206	20.62	436.59	19,385.88	3,431.40	J2-669	-3.5	329.93	2,105.60	2,105.60
J2-185	2,003.60	J2-206	20.1	435.4	2,238.38	6,140.20	J2-206	16.97	428.17	2,238.38	2,238.38
J2-833	2,003.60	J2-206	20.62	436.59	19,381.08	2,735.48	J2-669	13.27	368.63	2,256.73	2,256.73
J2-668	2,003.60	J2-206	20.62	436.59	19,400.44	2,614.18	J3-973	5.8	278.39	2,263.77	2,263.77
J5-832	2,003.60	J2-206	20.62	436.59	19,380.85	2,741.33	J2-669	13.3	368.7	2,263.87	2,263.87
J4-424	2,003.60	J2-206	20.62	436.59	19,366.41	2,288.46	J4-424	20.23	390.68	2,313.32	2,313.32
J2-667	2,003.60	J2-206	20.62	436.59	19,400.44	2,764.14	J3-973	2.76	271.37	2,333.58	2,333.58
J2-665	2,003.60	J2-206	20.62	436.59	19,400.43	3,947.21	J2-669	-4.64	327.28	2,448.08	2,448.08
J4-425	2,003.60	J2-206	20.62	436.59	19,422.80	2,810.46	J4-424	16.65	382.43	2,465.05	2,465.05
J2-186	2,003.60	J2-206	20.2	435.62	2,500.21	5,012.80	J2-206	18.42	431.51	2,500.21	2,500.21
J4-844	2,003.60	J2-206	20.62	436.59	19,407.71	3,674.57	J2-669	3.79	346.74	2,540.85	2,540.85
J4-843	2,003.60	J2-206	20.62	436.59	19,408.49	3,312.59	J2-669	9.87	360.78	2,549.29	2,549.29
J2-184	2,003.60	J2-206	20.22	435.66	2,549.49	2,848.94	J2-206	19.84	434.8	2,549.49	2,549.49
J2-172	2,003.60	J2-206	20.22	435.66	2,551.58	4,766.30	J2-206	18.66	432.07	2,551.58	2,551.58
J2-170	2,003.60	J2-206	20.22	435.66	2,554.18	4,441.78	J2-206	18.89	432.6	2,554.18	2,554.18
J2-449	2,003.60	J2-206	20.22	435.66	2,554.34	4,363.97	J2-206	18.95	432.72	2,554.34	2,554.34
J2-169	2,003.60	J2-206	20.22	435.66	2,556.41	3,620.87	J2-206	19.42	433.82	2,556.41	2,556.41
J2-173	2,003.60	J2-206	20.22	435.66	2,556.65	2,936.74	J2-206	19.8	434.7	2,556.65	2,556.65
J2-168	2,003.60	J2-206	20.22	435.66	2,557.34	3,870.30	J2-206	19.27	433.47	2,557.34	2,557.34
J2-166	2,003.60	J2-206	20.22	435.66	2,561.20	4,762.89	J2-206	18.68	432.1	2,561.20	2,561.20
J2-448	2,003.60	J2-206	20.22	435.67	2,562.24	4,749.08	J2-206	18.69	432.13	2,562.24	2,562.24
J2-450	2,003.60	J2-206	20.22	435.67	2,565.45	4,752.94	J2-206	18.69	432.13	2,565.45	2,565.45
J2-165	2,003.60	J2-206	20.22	435.67	2,565.89	4,059.81	J2-206	19.16	433.21	2,565.89	2,565.89
J1-733	2,003.60	J2-206	20.22	435.67	2,567.52	4,065.97	J2-206	19.15	433.21	2,567.52	2,567.52
J2-167	2,003.60	J2-206	20.22	435.67	2,571.71	4,847.92	J2-206	18.63	431.99	2,571.71	2,571.71
J2-175	2,003.60	J2-206	20.23	435.69	2,592.74	4,227.04	J2-206	19.07	433.02	2,592.74	2,592.74
J2-174	2,003.60	J2-206	20.23	435.69	2,595.75	4,793.37	J2-206	18.69	432.14	2,595.75	2,595.75
J2-182	2,003.60	J2-206	20.23	435.7	2,604.76	3,794.77	J2-206	19.35	433.67	2,604.76	2,604.76
J2-179	2,003.60	J2-206	20.24	435.7	2,611.68	4,692.45	J2-181	18.63	358	4,591.20	2,611.68
J2-176	2,003.60	J2-206	20.24	435.71	2,622.65	4,937.18	J2-181	16.64	353.4	4,684.45	2,622.65
J2-181	2,003.60	J2-206	20.24	435.71	2,623.43	3,748.19	J2-206	19.4	433.76	2,623.43	2,623.43
J2-178	2,003.60	J2-206	20.24	435.71	2,629.66	4,146.45	J2-206	19.16	433.21	2,629.66	2,629.66
J2-180	2,003.60	J2-206	20.24	435.71	2,631.01	4,167.14	J2-206	19.15	433.19	2,631.01	2,631.01
J2-177	2,003.60	J2-206	20.25	435.73	2,650.51	5,384.52	J2-181	11.67	341.93	4,762.86	2,650.51
J2-451	2,003.60	J2-206	20.26	435.75	2,680.13	5,576.77	J2-181	12.68	344.26	4,999.51	2,680.13
J2-666	2,003.60	J2-206	20.62	436.59	19,400.43	3,163.89	J3-973	2.98	271.88	2,688.55	2,688.55
J2-183	2,003.60	J2-206	20.26	435.76	2,691.14	4,188.46	J2-206	19.17	433.25	2,691.14	2,691.14
J2-214	2,003.60	J2-206	20.31	435.88	2,928.17	7,690.47	J2-555	-47.91	259.42	2,694.26	2,694.26
J2-209	2,003.60	J2-206	20.31	435.87	2,917.93	8,622.43	J2-555	-62.31	226.19	2,791.52	2,791.52
J2-190	2,003.60	J2-206	20.34	435.94	3,031.84	12,307.93	J2-555	11.36	396.22	8,841.77	3,031.84

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Critcal Node 2	Adjusted Available Flow (gpm)	Design Flow (gpm)
J5-638	2,004.38	J5-638	-439.51	-584.33	384.11	383.76	J5-638	20.04	476.24	384.11	384.11
J5-640	2,004.38	J5-640	-311.12	-298.03	493.52	493.04	J5-638	18.91	473.65	480.82	480.82
J5-639	2,004.38	J5-638	-272.52	-198.93	480.82	499.64	J5-638	18.31	472.27	480.82	480.82
J5-841	2,004.38	J5-638	-216.96	-70.72	534.03	565.49	J5-638	17.45	470.27	534.03	534.03
J5-637	2,004.38	J5-638	-169.91	37.88	595.7	703.3	J5-638	11.82	457.29	595.7	595.7
J2-652	2,004.38	J2-652	-356.97	-473.84	676.95	676.55	J2-652	20.07	396.31	676.98	676.95
J5-842	2,004.38	J5-842	-71.76	274.38	764.89	763.16	J5-842	20.08	486.33	764.85	764.85
J2-650	2,004.38	J2-650	-102.55	120.33	1,068.15	1,067.03	J2-650	20.11	403.4	1,068.15	1,068.15
J5-636	2,004.38	J5-842	5.37	452.4	1,478.54	2,510.45	J5-842	-12.27	411.68	1,478.51	1,478.51
J5-644	2,004.38	J5-644	0.46	356.06	1,711.76	1,708.98	J5-644	20.17	401.55	1,711.75	1,711.75
J4-501	2,004.38	J4-501	12.26	278.3	1,927.30	1,925.33	J4-501	20.19	296.6	1,927.30	1,927.30
J3-1001	2,004.38	J3-1001	15.33	353.38	1,937.20	1,934.35	J3-1001	20.19	364.6	1,937.20	1,937.20
J2-648	2,004.38	J2-206	20.59	436.51	6,166.28	2,073.51	J2-648	20.21	328.63	2,076.14	2,076.14
J-5013	2,004.38	J2-206	20.59	436.53	6,483.12	2,093.90	J-5013	20.21	320.64	2,096.54	2,096.54
J-5014	2,004.38	J2-206	20.59	436.53	6,483.12	2,193.30	J-5013	15.89	310.66	2,141.26	2,141.26
J-5016	2,004.38	J2-206	20.59	436.53	6,483.12	2,352.68	J-5013	8.02	292.5	2,199.72	2,199.72
J-5015	2,004.38	J2-206	20.59	436.53	6,483.12	2,297.34	J-5013	12.43	302.69	2,199.72	2,199.72
J-5017	2,004.38	J2-206	20.59	436.53	6,483.12	2,409.05	J-5013	3.42	281.89	2,199.72	2,199.72
J3-999	2,004.38	J2-206	20.59	436.53	6,483.13	2,199.72	J3-1001	20.22	364.66	2,203.39	2,203.39
J3-1000	2,004.38	J2-206	20.59	436.53	6,483.13	2,200.70	J3-1000	20.22	362.66	2,204.34	2,204.34
J-5020	2,004.38	J2-206	20.59	436.53	6,483.12	2,353.06	J3-1000	10.69	340.66	2,204.34	2,204.34
J3-998	2,004.38	J2-206	20.59	436.53	6,483.13	2,203.94	J3-998	20.22	378.67	2,207.96	2,207.96
J-5019	2,004.38	J2-206	20.59	436.53	6,483.12	2,323.86	J-5013	12.43	302.69	2,225.21	2,225.21
J3-997	2,004.38	J2-206	20.59	436.53	6,483.13	2,275.41	J3-997	20.23	383.68	2,279.84	2,279.84
J3-1007	2,004.38	J2-206	20.59	436.53	6,483.13	2,453.66	J3-1007	20.24	424.72	2,460.69	2,460.69
J2-651	2,004.38	J2-206	20.59	436.51	6,166.28	2,457.95	J2-651	20.25	415.72	2,464.31	2,464.31
J-5092	2,004.38	J2-206	20.59	436.51	6,166.28	4,039.05	J2-651	-57.94	235.28	2,464.31	2,464.31
J-527	2,007.20	J2-206	20.59	436.53	6,485.95	2,512.18	J-527	20.25	393.74	2,517.94	2,517.94
J3-1005	2,004.38	J2-206	20.59	436.53	6,483.13	2,595.08	J3-1005	20.26	426.76	2,603.09	2,603.09
J2-647	2,004.38	J2-206	20.59	436.51	6,166.28	3,001.78	J2-650	3.83	365.83	2,622.38	2,622.38
J3-996	2,004.38	J2-206	20.59	436.53	6,483.13	2,665.27	J3-996	20.27	408.77	2,672.52	2,672.52
J3-1010	2,004.38	J2-206	20.59	436.53	6,483.13	2,701.38	J3-1010	20.27	311.78	2,705.54	2,705.54
J5-815	2,004.38	J2-206	20.59	436.53	6,483.14	2,720.84	J5-815	20.27	421.78	2,729.02	2,729.02
J3-1002	2,004.38	J2-206	20.59	436.53	6,483.13	2,949.02	J3-996	14.15	394.66	2,788.08	2,788.08
J3-1003	2,004.38	J2-206	20.59	436.53	6,483.13	3,120.98	J3-1005	12.39	408.59	2,872.79	2,872.79
J3-1009	2,004.38	J2-206	20.59	436.53	6,483.13	2,948.18	J3-1005	17.74	420.95	2,872.79	2,872.79
J3-1006	2,004.38	J2-206	20.59	436.53	6,483.13	3,218.44	J3-1005	10.35	403.88	2,903.69	2,903.69
J3-1008	2,004.38	J2-206	20.59	436.53	6,483.13	3,400.43	J3-1008	20.34	370.94	3,409.28	3,409.28
J2-649	2,004.38	J2-206	20.59	436.51	6,166.28	3,806.36	J2-651	9.55	391.03	3,449.68	3,449.68
J5-799	2,004.38	J2-206	20.59	436.53	6,483.13	4,441.93	J3-1005	16.06	417.06	4,252.35	4,252.35
J2-646	2,004.38	J2-206	20.59	436.51	6,166.28	5,486.41	J2-650	-8.06	338.39	4,428.26	4,428.26
J5-634	2,004.38	J2-206	20.62	436.59	9,501.47	8,303.42	J5-842	3.46	447.98	6,043.58	6,043.58
J2-729	2,004.38	J2-206	20.59	436.51	6,166.28	7,428.30	J2-650	2.53	362.83	6,444.86	6,166.28
J5-643	2,004.38	J2-206	20.59	436.51	6,166.28	7,958.50	J2-651	9.09	389.99	7,197.23	6,166.28
J5-797	2,004.38	J2-206	20.59	436.53	6,483.14	7,589.97	J3-1005	12.88	409.72	7,041.84	6,483.14
J5-633	2,004.38	J2-206	20.62	436.59	10,255.95	6,243.24	J2-206	20.42	436.13	10,255.94	10,255.94

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Critcal Node 2	Adjusted Available Flow (gpm)	Design Flow (gpm)
J3-755	2,019.41	J3-853	16.99	781.21	970.49	1,990.51	J3-853	17.12	781.51	970.45	970.45
J3-753	2,019.41	J3-853	16.99	781.21	970.49	2,496.43	J3-853	14.74	776.02	970.45	970.45
J3-748	2,019.41	J3-748	9.07	470.93	1,863.38	1,860.63	J3-853	17.73	782.91	970.45	970.45
J3-758	2,019.41	J3-853	16.99	781.21	970.49	2,521.91	J3-755	12.87	497.7	2,407.74	970.49
J3-754	2,019.41	J3-853	16.99	781.21	970.49	2,489.73	J3-755	2.75	474.34	2,250.52	970.49
J3-559	2,019.41	J3-853	16.99	781.21	970.5	2,479.89	J3-755	3.78	476.72	2,250.52	970.5
J3-751	2,019.41	J3-853	16.99	781.21	970.5	2,444.22	J3-748	2.91	456.71	2,201.38	970.5
J4-414	2,019.41	J4-414	-35.03	320.15	1,004.50	1,001.97	J4-414	20.1	447.38	1,004.53	1,004.50
J4-756	2,019.41	J4-756	1.71	431.95	1,125.56	1,118.42	J4-756	20.11	474.41	1,125.56	1,125.56
J4-690	2,019.41	J3-853	19.5	787	1,201.70	3,608.71	J3-853	17.99	783.51	1,201.72	1,201.70
J4-691	2,019.41	J3-853	19.82	787.74	1,265.39	3,148.68	J3-853	18.28	784.18	1,265.40	1,265.39
J4-530	2,007.20	J3-853	19.92	787.96	1,275.42	3,090.84	J3-853	18.32	784.28	1,275.42	1,275.42
J4-528	2,007.20	J3-853	19.92	787.96	1,275.42	3,892.96	J4-691	13.71	465.65	3,343.09	1,275.42
J4-692	2,019.41	J3-853	19.94	788.01	1,292.32	3,983.12	J4-691	13.01	464.03	3,387.23	1,292.32
J4-693	2,019.41	J3-853	20	788.15	1,306.52	4,186.49	J4-691	11.25	459.95	3,481.47	1,306.52
J4-694	2,019.41	J3-853	20.05	788.27	1,318.43	4,113.60	J4-691	13.27	464.64	3,559.90	1,318.43
J4-696	2,019.41	J3-853	20.52	789.36	1,411.05	5,701.31	J4-690	-2.26	435.78	4,126.21	1,411.05
J4-695	2,019.41	J3-853	20.51	789.33	1,420.48	5,468.49	J4-690	1.05	443.43	4,076.40	1,420.48
J3-759	2,019.41	J3-759	0.85	396.97	1,465.04	1,460.20	J3-759	20.14	441.49	1,465.04	1,465.04
J4-747	2,019.41	J3-956	-16.27	572.46	1,544.05	1,892.17	J3-716	-5.23	612.92	1,512.80	1,512.80
J4-746	2,019.41	J4-746	-50.41	333.66	1,589.85	1,609.44	J3-716	16.39	662.83	1,512.80	1,512.80
J4-697	2,019.41	J3-853	20.96	790.36	1,547.72	5,743.41	J4-690	-1.16	438.32	4,257.55	1,547.72
J4-698	4,019.41	J3-853	18.13	783.85	1,615.55	6,515.67	J4-690	-12.8	411.46	4,377.08	1,615.55
J4-412	2,019.41	J4-414	11.72	428.05	1,685.38	2,026.66	J4-414	11.53	427.6	1,685.37	1,685.37
J4-413	2,019.41	J4-414	11.72	428.05	1,685.38	1,938.80	J4-414	13.83	432.93	1,685.37	1,685.37
J-5064	2,019.41	J-5064	-3.57	239.75	1,765.90	1,763.92	J-5064	20.17	294.56	1,765.91	1,765.90
J4-742	2,019.41	J3-853	21.53	791.7	1,901.71	6,679.49	J4-690	-12.84	411.37	4,535.66	1,901.71
J3-865	2,019.41	J3-865	17.07	429.4	1,904.19	1,896.61	J3-865	20.19	436.59	1,904.19	1,904.19
J4-699	2,028.23	J3-853	21.53	791.7	1,910.53	5,015.83	J4-690	14.04	473.41	4,544.48	1,910.53
J4-622	2,019.41	J4-622	20.5	447.31	2,045.73	2,035.16	J4-622	20.2	446.62	2,045.73	2,045.73
J4-411	2,019.41	J4-414	21.94	451.65	2,128.26	2,692.93	J4-414	8.55	420.72	2,128.26	2,128.26
J4-741	4,019.41	J3-853	18.48	784.66	2,150.95	6,633.40	J4-690	-7.84	422.91	4,753.18	2,150.95
J4-764	2,019.41	J3-853	24.48	798.51	6,591.96	2,214.87	J4-764	20.22	398.66	2,221.15	2,221.15
J-5065	2,019.41	J3-853	24.16	797.76	5,959.05	2,357.89	J-5065	20.23	293.7	2,361.46	2,361.46
J-5061	2,019.41	J3-853	24.16	797.76	5,959.55	2,544.08	J-5061	20.25	276.74	2,547.93	2,547.93
J3-101	2,019.41	J3-853	24.17	797.77	5,973.74	2,872.64	J3-101	20.29	281.82	2,877.63	2,877.63
J4-625	2,019.41	J3-853	24.17	797.78	6,016.09	2,865.99	J4-625	20.28	406.81	2,878.23	2,878.23
J3-972	2,019.41	J3-853	24.17	797.77	5,973.74	2,880.84	J3-972	20.29	306.82	2,886.56	2,886.56
J4-410	2,019.41	J3-570	25	505.7		3,506.46	J4-414	11.21	426.87	2,908.07	2,908.07
J3-963	2,019.41	J3-853	24	797.39	5,375.80	2,939.80	J3-963	20.29	366.83	2,948.06	2,948.06
J4-750	2,019.41	J3-853	24.16	797.76	5,954.43	3,273.17	J3-759	16.42	432.89	3,030.31	3,030.31
J-5071	2,019.41	J3-853	24.17	797.77	5,973.74	3,046.37	J-5071	20.3	294.86	3,052.37	3,052.37
J-5070	2,019.41	J3-853	24.17	797.77	5,973.74	3,114.76	J-5070	20.31	304.87	3,121.39	3,121.39
J-5063	2,019.41	J3-853	24.16	797.76	5,959.05	3,229.00	J-5064	16.84	286.87	3,163.67	3,163.67
J3-100	2,019.41	J3-853	24.17	797.77	5,973.74	3,190.39	J3-100	20.32	318.89	3,197.95	3,197.95
J-5069	2,019.41	J3-853	24.17	797.77	5,973.74	3,314.19	J-5069	20.33	318.92	3,322.36	3,322.36
J3-964	2,019.41	J3-853	24.04	797.47	5,507.46	3,394.83	J3-964	20.34	370.94	3,406.24	3,406.24
J4-739	2,019.41	J3-853	23.26	795.68	3,560.45	8,197.87	J3-853	11.94	769.55	3,560.45	3,560.45
J4-428	2,019.41	J3-853	24.17	797.78	6,016.08	3,600.91	J4-625	19.49	404.98	3,573.48	3,573.48
J4-767	2,019.41	J3-853	24.49	798.52	6,635.75	3,566.11	J4-767	20.35	378.98	3,579.91	3,579.91
J4-2009	2,019.41	J3-853	24.47	798.46	6,613.94	3,588.04	J4-2009	20.36	366.98	3,601.09	3,601.09
J3-966	2,019.41	J3-853	23.52	796.27	4,672.37	3,600.08	J3-966	20.36	396.98	3,609.75	3,609.75
J4-2017	2,019.41	J3-853	24.35	798.19	6,392.83	3,611.32	J4-2017	20.36	366.99	3,624.19	3,624.19
J4-2007	2,019.41	J3-853	24.47	798.46	6,613.94	3,613.15	J4-2007	20.36	366.99	3,626.39	3,626.39
J4-2005	2,019.41	J3-853	24.47	798.46	6,613.94	3,637.19	J4-2005	20.36	366.99	3,650.60	3,650.60
J4-766	2,019.41	J3-853	24.49	798.51	6,631.02	3,640.71	J4-766	20.36	381.99	3,655.50	3,655.50
J-5072	2,019.41	J3-853	24.47	798.46	6,613.94	3,647.55	J-5072	20.36	366.99	3,661.05	3,661.05
J4-620	2,019.41	J3-853	23.94	797.25	5,020.64	3,992.58	J4-622	16.93	439.07	3,705.50	3,705.50
J4-2008	2,019.41	J3-853	24.47	798.46	6,613.94	3,699.17	J4-2008	20.37	367.01	3,713.07	3,713.07
J4-2018	2,019.41	J3-853	24.43	798.39	6,553.84	3,738.21	J4-2018	20.37	367.02	3,752.07	3,752.07
J-5068	2,019.41	J3-853	24.17	797.77	5,973.74	3,745.52	J-5068	20.37	347.02	3,758.11	3,758.11
J4-2002	2,019.41	J3-853	24.47	798.46	6,613.94	3,766.88	J4-2002	20.37	359.02	3,780.27	3,780.27
J3-967	2,019.41	J3-853	23.15	795.42	4,317.30	3,795.26	J3-967	20.38	397.03	3,802.82	3,802.82
J4-2006	2,019.41	J3-853	24.47	798.46	6,613.94	3,823.66	J4-2006	20.38	367.04	3,838.54	3,838.54
J3-364	2,019.41	J3-853	23.02	795.13	3,852.72	4,192.01	J3-364	20.42	407.12	4,196.72	3,852.72
J4-2004	2,019.41	J3-853	24.47	798.46	6,613.94	3,847.58	J4-2004	20.38	367.04	3,862.62	3,862.62
J3-965	2,019.41	J3-853	23.96	797.31	5,262.77	3,981.80	J3-965	20.4	352.07	3,995.39	3,995.39
J4-738	2,019.41	J3-853	23.59	796.45	4,163.31	6,499.56	J3-853	17.12	781.5	4,163.33	4,163.31
J4-432	2,019.41	J3-853	24.16	797.76	5,959.55	4,196.63	J-5061	19.21	274.33	4,176.44	4,176.44
J-5060	2,019.41	J3-853	24.16	797.76	5,959.55	4,275.68	J-5061	16.09	267.12	4,176.44	4,176.44

J4-2003	2,019.41	J3-853	24.47	798.46	6,613.94	4,239.33	J4-2009	20.41	367.1	4,257.04	4,257.04
J3-969	2,019.41	J3-853	23.15	795.42	4,317.30	5,154.19	J3-967	16.18	387.34	4,970.69	4,317.30
J-5062	2,019.41	J3-853	24.16	797.76	5,959.05	4,347.03	J-5064	19.11	292.1	4,321.35	4,321.35
J-5009	2,019.41	J3-853	24.16	797.76	5,959.55	4,442.61	J-5061	20.43	277.16	4,454.47	4,454.47
J4-796	2,019.41	J3-853	23.94	797.26	5,029.49	4,722.46	J4-622	18.41	442.48	4,535.15	4,535.15
J4-740	2,179.02	J3-853	23.69	796.67	4,554.67	6,928.40	J3-853	16.51	780.09	4,554.67	4,554.67
J4-772	2,019.41	J3-853	24.49	798.51	6,631.02	4,584.78	J4-772	20.46	387.21	4,609.61	4,609.61
J4-752	2,019.41	J3-853	24.16	797.76	5,954.43	11,775.04	J4-756	-5.26	415.86	4,621.48	4,621.48
J4-439	2,019.41	J3-853	24.6	798.78	6,925.65	4,590.93	J4-439	20.46	408.21	4,621.74	4,621.74
J3-968	2,019.41	J3-853	23.52	796.27	4,672.37	6,265.90	J3-966	12.82	379.59	5,798.26	4,672.37
J4-2016	2,019.41	J3-853	24.28	798.04	6,274.21	4,710.90	J4-2016	20.47	367.24	4,732.97	4,732.97
J4-619	2,019.41	J3-853	23.65	796.59	4,801.79	10,916.31	J3-853	3.97	751.16	4,801.78	4,801.78
J-5055	2,019.41	J3-853	24.16	797.76	5,960.00	4,974.90	J-5055	20.5	247.3	4,988.27	4,988.27
J4-763	2,019.41	J3-853	24.38	798.27	6,405.85	4,974.92	J4-763	20.5	377.3	5,001.33	5,001.33
J4-618	2,019.41	J3-853	23.94	797.25	5,006.89	8,898.86	J3-853	12.8	771.55	5,006.47	5,006.47
J4-2015	2,019.41	J3-853	24.35	798.19	6,392.83	5,010.99	J4-2017	20.5	367.31	5,036.09	5,036.09
J4-621	2,019.41	J3-853	23.95	797.26	5,055.59	9,946.50	J3-853	10.04	765.17	5,055.58	5,055.58
J4-749	2,019.41	J3-853	24.09	797.6	5,711.72	7,383.20	J4-756	15.09	462.83	5,059.80	5,059.80
J4-2001	2,019.41	J3-853	24.47	798.46	6,613.94	5,055.37	J4-2009	20.46	367.22	5,079.18	5,079.18
J4-617	2,019.41	J3-853	23.95	797.28	5,093.19	5,769.89	J3-853	20.13	788.46	5,093.08	5,093.08
J4-616	2,019.41	J3-853	23.95	797.28	5,106.44	6,502.70	J3-853	18.51	784.71	5,106.17	5,106.17
J4-615	2,019.41	J3-853	23.96	797.29	5,120.40	6,269.22	J3-853	19.06	785.99	5,119.99	5,119.99
J4-607	2,019.41	J3-853	23.96	797.3	5,122.07	11,218.14	J3-853	4.7	752.86	5,122.00	5,122.00
J4-614	2,019.41	J3-853	23.96	797.29	5,131.94	11,354.79	J3-853	4.37	752.1	5,131.85	5,131.85
J4-610	2,019.41	J3-853	23.96	797.29	5,146.98	7,201.35	J3-853	17.03	781.29	5,146.97	5,146.97
J-5059	2,019.41	J3-853	24.16	797.76	5,959.99	5,133.81	J-5059	20.51	247.34	5,148.09	5,148.09
J4-609	2,019.41	J3-853	23.96	797.29	5,149.27	8,024.72	J3-853	15.16	776.98	5,148.77	5,148.77
J4-606	2,019.41	J3-853	23.98	797.34	5,151.42	17,096.14	J3-784	-19	501.16	10,563.82	5,151.42
J4-608	2,019.41	J3-853	23.97	797.31	5,182.16	9,292.45	J3-853	12.44	770.71	5,181.98	5,181.98
J4-611	2,019.41	J3-853	23.97	797.31	5,183.55	12,159.44	J3-853	-0.03	741.94	5,183.13	5,183.13
J-5057	2,019.41	J3-853	24.16	797.76	5,960.00	5,170.80	J-5057	20.52	247.35	5,185.29	5,185.29
J4-421	2,019.41	J3-570	25	505.7		5,158.73	J4-421	20.51	408.34	5,196.69	5,196.69
J4-612	2,019.41	J3-853	23.97	797.33	5,207.85	12,755.89	J3-853	-3.89	733.03	5,207.86	5,207.85
J4-613	2,019.41	J3-853	23.96	797.31	5,262.77	12,494.44	J3-853	-1.98	737.44	5,262.78	5,262.77
J-5050	2,019.41	J3-853	24.16	797.76	5,959.98	5,253.35	J-5050	20.52	247.37	5,268.33	5,268.33
J-5052	2,019.41	J3-853	24.16	797.76	5,959.99	5,274.76	J-5052	20.53	247.37	5,289.87	5,289.87
J-5058	2,019.41	J3-853	24.16	797.76	5,959.99	5,306.76	J-5058	20.53	247.38	5,322.06	5,322.06
J3-962	2,019.41	J3-853	24.04	797.47	5,507.46	9,238.23	J4-756	13.01	458.03	5,331.43	5,331.43
J-5049	2,019.41	J3-853	24.16	797.76	5,959.91	5,323.17	J-5049	20.53	247.38	5,338.55	5,338.55
J-5051	2,019.41	J3-853	24.16	797.76	5,959.97	5,338.89	J-5051	20.53	247.39	5,354.39	5,354.39
J-5053	2,019.41	J3-853	24.16	797.76	5,959.98	6,256.53	J-5059	-11.33	173.86	5,372.95	5,372.95
J3-961	2,019.41	J3-853	24	797.39	5,375.80	11,223.76	J3-853	6.64	757.31	5,375.81	5,375.80
J4-433	2,019.41	J3-853	24.02	797.44	5,385.04	18,499.17	J3-784	-19.3	500.45	11,062.64	5,385.04
J-5056	2,019.41	J3-853	24.16	797.76	5,960.00	5,371.47	J-5056	20.54	247.39	5,387.15	5,387.15
J4-757	2,019.41	J3-853	24.21	797.88	6,121.59	15,896.39	J4-756	-8.44	408.53	5,416.01	5,416.01
J-5048	2,019.41	J3-853	24.16	797.76	5,959.81	5,422.54	J-5048	20.54	247.4	5,438.49	5,438.49
J-5054	2,019.41	J3-853	24.16	797.76	5,960.01	5,443.62	J-5054	20.54	247.41	5,459.73	5,459.73
J4-858	2,019.41	J3-853	24.05	797.5	5,484.60	18,220.96	J3-784	-18.06	503.31	11,251.68	5,484.60
J-5047	2,019.41	J3-853	24.16	797.76	5,959.55	5,981.28	J-5061	7.57	247.47	5,554.96	5,554.96
J-5073	2,019.41	J3-853	24.12	797.68	5,793.30	7,161.63	J4-756	17.89	469.29	5,588.94	5,588.94
J-5074	2,019.41	J3-853	24.12	797.68	5,793.30	19,014.52	J4-756	-24.82	370.71	5,588.94	5,588.94
JF-101	2,019.41	J3-853	24.16	797.76	5,959.90	5,602.46	JF-101	20.56	277.45	5,621.80	5,621.80
J4-830	2,019.41	J3-853	24.1	797.62	5,684.85	18,371.35	J4-756	-19.54	382.9	5,745.21	5,684.85
J4-773	2,019.41	J3-853	24.48	798.51	6,591.96	5,646.08	J4-773	20.56	408.46	5,692.61	5,692.61
J5-856	2,006.41	J3-853	24.12	797.67	5,791.33	11,136.12	J4-430	1.15	360.65	8,484.37	5,791.33
J4-436	2,019.41	J3-853	24.69	798.98	7,125.96	5,745.21	J4-436	20.57	409.48	5,794.22	5,794.21
J4-435	2,019.41	J3-853	24.43	798.39	6,502.02	9,485.42	J4-756	13.97	460.24	5,830.30	5,830.30
J-5067	2,019.41	J3-853	24.17	797.77	5,973.74	5,837.74	J-5067	20.58	389.5	5,884.59	5,884.59
J4-2014	2,019.41	J3-853	24.41	798.34	6,516.62	5,868.80	J4-756	20.08	474.34	5,897.63	5,897.63
J4-2013	2,019.41	J3-853	24.43	798.39	6,553.84	6,298.98	J4-756	18.94	471.72	5,919.72	5,919.72
J4-2012	2,019.41	J3-853	24.45	798.42	6,583.32	6,759.66	J4-756	18.13	469.84	5,938.34	5,938.34
J4-2010	2,019.41	J3-853	24.46	798.45	6,600.61	7,103.33	J4-756	17.78	469.04	5,949.80	5,949.80
J4-765	2,019.41	J3-853	24.49	798.51	6,628.51	8,154.47	J4-756	16.44	465.93	5,958.34	5,958.34
JF-102	2,019.41	J3-853	24.16	797.76	5,958.44	6,330.25	JF-102	20.63	285.61	6,358.14	5,958.44
J4-2000	2,019.41	J3-853	24.47	798.46	6,613.94	7,404.03	J4-756	17.45	468.27	5,958.94	5,958.94
J4-847	2,019.41	J3-853	24.16	797.76	5,959.05	5,953.82	J-5064	20.12	294.43	5,958.99	5,958.99
J4-440	2,019.41	J3-853	24.16	797.76	5,959.31	6,214.06	J-5064	19.34	292.62	6,183.61	5,959.31
J-5066	2,019.41	J3-853	24.16	797.76	5,960.26	6,636.47	J3-853	20.41	789.11	5,960.31	5,960.26
J4-441	2,019.41	J3-853	24.16	797.77	5,961.84	6,888.68	J3-853	19.94	788.02	5,961.89	5,961.84
J4-2011	2,019.41	J3-853	24.48	798.49	6,631.45	7,465.06	J4-756	17.39	468.14	5,971.47	5,971.47
J-5091	2,019.41	J3-853	24.17	797.77	5,982.28	7,480.06	J4-625	16.96	399.13	7,078.61	5,982.28
J4-527	2,007.20	J3-570	25	505.7		5,966.89	J4-527	20.6	398.53	6,012.26	6,012.26

J4-427	2,019.41	J3-853	24.17	797.78	6,016.09	7,675.46	J4-625	13.39	390.91	6,852.65	6,016.09
J4-770	2,019.41	J3-853	24.51	798.56	6,696.57	6,271.18	J4-756	19.34	472.64	6,028.44	6,028.44
J4-419	2,019.41	J3-570	25	505.7		5,979.24	J4-419	20.6	419.53	6,037.67	6,037.67
J4-430	2,144.80	J3-853	24.16	797.75	6,062.44	7,429.45	J3-853	19.1	786.09	6,062.46	6,062.44
J4-420	2,019.41	J3-853	24.97	799.62	7,158.87	6,013.22	J4-420	20.6	414.54	6,069.33	6,069.33
J4-431	2,144.80	J3-853	24.16	797.76	6,079.46	10,464.87	J4-441	-9.34	332.45	7,265.93	6,079.46
J4-429	2,144.80	J3-853	24.17	797.77	6,096.51	7,331.02	J3-853	19.37	786.7	6,096.53	6,096.51
J4-437	2,019.41	J3-853	24.55	798.67	6,810.83	6,190.53	J4-756	19.86	473.84	6,137.89	6,137.89
J4-438	2,019.41	J3-853	24.59	798.74	6,865.43	5,988.63	J4-756	20.52	475.36	6,190.43	6,190.43
J4-426	2,019.41	J3-853	24.19	797.82	6,245.87	6,319.10	J4-426	20.63	402.61	6,401.23	6,245.87
J4-762	2,019.41	J3-853	24.37	798.25	6,371.99	10,941.54	J3-853	8.02	760.51	6,371.73	6,371.73
J4-418	2,019.41	J3-570	25	505.7		6,485.65	J4-418	20.65	417.65	6,552.74	6,552.74
J4-768	2,019.41	J3-853	24.49	798.52	6,648.45	8,448.85	J4-770	16	393.94	7,923.70	6,648.45
J4-769	2,019.41	J3-853	24.49	798.52	6,652.55	7,734.24	J4-770	14.88	391.33	7,135.09	6,652.55
J4-434	2,019.41	J3-853	24.53	798.61	6,661.82	13,317.13	J3-853	-0.02	741.94	6,662.00	6,661.82
J4-771	2,019.41	J3-853	24.66	798.91	7,199.25	6,828.15	J4-756	20.45	475.2	7,024.54	7,024.54
J4-408	2,019.41	J3-570	25	505.7		17,346.19	J3-853	-0.61	740.6	7,043.20	7,043.20
J4-409	2,019.41	J3-570	25	505.7		13,306.20	J3-853	6.68	757.41	7,141.02	7,141.02
J4-416	2,019.41	J3-570	25	505.7		7,887.24	J3-853	19.11	786.11	7,154.39	7,154.39
J4-422	2,019.41	J3-570	25	505.7		10,139.10	J3-853	11.03	767.46	7,181.85	7,181.85
J4-415	2,019.41	J3-570	25	505.7		13,153.71	J3-853	7.35	758.96	7,209.72	7,209.72
J4-624	2,019.41	J3-570	25	505.7		13,644.37	J3-853	6.67	757.4	7,245.35	7,245.35
J4-417	2,019.41	J3-570	25	505.7		7,125.64	J4-756	20.7	475.77	7,598.49	7,598.49

ID	Total Demand	Critical Node 1 ID	Critical Node 1	Critical Node 1	Adjusted Fire-Flow (gpm)	Available Flow at Hydrant (gpm)	Critical Node 2 ID	Critical Node 2	Critcal Node 2	Adjusted Available Flow (gpm)	Design Flow (gpm)
J3-992	1,006.67	J-5116	31.33	517.31		4,649.04	J-5089	12.41	580	0	3100.00
J3-274	1,006.67	J3-274	-6.52	425.95	888.77	888.31	J3-274	20.09	487.36	888.77	888.77
J3-281	1,006.67	J3-281	9.43	528.75	939.87	939.23	J3-281	20.09	553.37	939.83	939.83
J3-283	1,006.67	J3-281	11.25	532.97	950.48	1,085.92	J3-281	-1.83	502.78	950.49	950.48
J3-282	1,006.67	J3-281	11.25	532.97	950.48	969.87	J3-281	17.03	546.31	950.49	950.48
J3-276	1,006.67	J3-276	12.24	529.24	957.83	957.22	J3-276	20.1	547.38	957.83	957.83
J3-275	1,006.67	J3-276	12.24	529.24	957.83	1,029.79	J3-276	8.44	520.49	957.83	957.83
J3-557	1,006.67	J3-557	21.1	617.69	1,018.50	1,017.41	J3-557	20.1	615.39	1,018.50	1,018.50
J-515	1,006.67	J3-557	21.1	617.69	1,018.50	1,818.73	J3-557	-99.09	340.31	1,018.50	1,018.50
J-513	1,006.67	J-513	27.76	667.07	1,108.53	1,107.10	J-513	20.11	649.41	1,108.48	1,108.48
J3-289	1,006.67	J3-289	28.37	640.47	1,114.82	1,113.46	J3-289	20.11	621.41	1,114.84	1,114.82
J3-279	1,006.67	J-5116	31.33	517.31		1,140.22	J3-279	20.11	581.42	1,141.30	1,141.30
J3-280	1,006.67	J-5116	31.33	517.31		1,145.66	J3-280	20.11	603.42	1,146.92	1,146.92
J3-929	1,006.67	J3-929	23.69	806.66	1,166.37	1,246.39	J3-929	20.12	798.44	1,166.37	1,166.37
J3-506	1,007.20	J3-506	28.19	606.05	1,208.60	1,205.86	J3-506	20.12	587.43	1,208.60	1,208.60
J3-930	1,006.67	J3-929	24.21	807.87	1,213.40	1,410.78	J3-929	18.42	794.52	1,213.40	1,213.40
J3-909	1,006.67	J3-929	29.19	819.36	2,744.33	1,221.03	J3-909	20.12	566.44	1,222.73	1,222.73
J3-928	1,006.67	J3-929	24.63	808.83	1,258.73	1,485.19	J3-929	18.18	793.96	1,258.74	1,258.73
J3-927	1,006.67	J3-929	24.83	809.3	1,276.86	1,946.21	J3-929	11.29	778.06	1,276.86	1,276.86
J3-776	1,006.67	J3-776	24.78	667.19	1,286.84	1,276.68	J3-776	20.13	656.45	1,286.84	1,286.84
J3-932	1,006.67	J3-929	24.91	809.49	1,287.93	1,507.05	J3-929	18.38	794.42	1,287.94	1,287.93
J3-912	1,006.67	J3-929	24.95	809.59	1,289.73	2,064.03	J3-915	-1.17	671.3	1,620.67	1,289.73
J3-914	1,006.67	J3-929	24.95	809.59	1,289.73	1,743.82	J3-929	14.86	786.29	1,289.74	1,289.73
J3-915	1,006.67	J3-929	24.95	809.59	1,289.73	1,534.91	J3-929	17.98	793.51	1,289.74	1,289.73
J3-916	1,006.67	J3-929	24.95	809.59	1,289.73	2,100.14	J3-929	9.06	772.9	1,289.74	1,289.73
J3-913	1,006.67	J3-929	24.95	809.59	1,289.73	1,966.34	J3-915	4.16	683.61	1,620.67	1,289.73
J3-931	1,006.67	J3-929	24.96	809.61	1,294.20	2,043.61	J3-929	10.2	775.55	1,294.21	1,294.20
J3-956	1,006.67	J-5116	31.33	517.31		1,331.28	J3-956	20.13	656.46	1,307.31	1,307.31
J3-600	1,006.67	J3-929	25.17	810.09	1,314.80	2,910.03	J3-929	-3.43	744.08	1,314.80	1,314.80
J3-596	1,006.67	J3-929	25.22	810.2	1,319.93	2,175.79	J3-929	8.7	772.08	1,319.94	1,319.93
J3-597	1,006.67	J3-929	25.22	810.2	1,319.93	2,660.68	J3-929	1.72	755.96	1,319.94	1,319.93
J3-595	1,006.67	J3-929	25.26	810.3	1,324.42	3,533.64	J3-929	-7.34	735.07	1,324.42	1,324.42
J-5116	2,003.60	J-5116	2.86	451.61	1,872.96	1,882.66	J3-929	13.56	783.3	1,325.83	1,325.83
J-5110	2,003.60	J3-929	11.68	778.96	1,325.84	2,055.55	J-5116	7.84	463.1	1,954.68	1,325.84
J-5109	2,003.60	J3-929	11.68	778.96	1,325.84	2,038.49	J-5116	10.2	468.55	1,954.68	1,325.84
J3-593	1,006.67	J3-929	25.3	810.39	1,328.89	2,451.78	J3-929	4.23	761.76	1,328.90	1,328.89
J3-592	1,006.67	J3-929	25.3	810.39	1,328.89	2,251.61	J3-929	7.68	769.73	1,328.90	1,328.89
J3-594	1,006.67	J3-929	25.3	810.39	1,328.89	3,450.71	J3-929	-7.44	734.82	1,328.90	1,328.89
J3-598	1,006.67	J3-929	25.32	810.43	1,330.95	1,694.71	J3-929	16.44	789.94	1,330.95	1,330.95
J3-601	1,006.67	J3-929	25.32	810.43	1,330.95	3,167.70	J3-929	-5.54	739.22	1,330.95	1,330.95
J3-599	1,006.67	J3-929	25.33	810.47	1,332.36	3,094.19	J3-929	-7.09	735.64	1,332.36	1,332.36
J3-743	1,006.67	J-5116	31.33	517.31		1,354.50	J3-743	20.13	623.47	1,333.99	1,333.99
J3-933	1,006.67	J3-929	25.84	811.64	1,391.66	1,986.09	J3-929	13.48	783.11	1,391.67	1,391.66
J3-392	1,006.67	J-5116	31.33	517.31		1,429.93	J3-392	20.14	715.49	1,391.68	1,391.68
J3-994	1,006.67	J3-929	29.05	819.05	2,617.02	1,421.66	J3-994	20.14	429.48	1,425.00	1,425.00
J3-744	1,006.67	J-5116	31.33	517.31		1,455.13	J3-744	20.14	608.49	1,434.07	1,434.07
J3-960	1,006.67	J-5116	31.33	517.31		1,504.49	J3-960	20.15	661.5	1,475.21	1,475.21
J3-315	1,006.67	J-5116	31.33	517.31		1,554.04	J3-315	20.15	726.51	1,505.94	1,505.94
J3-294	1,006.67	J-5116	31.33	517.31		1,620.59	J3-280	9.76	579.53	1,506.41	1,506.41
J-5082	1,006.67	J-5116	31.33	517.31		1,520.40	J-5082	20.15	501.51	1,524.54	1,524.54
J3-995	1,006.67	J3-929	29.05	819.05	2,617.02	1,530.15	J3-994	20.15	429.51	1,534.03	1,534.03
J3-401	1,006.67	J-5116	31.33	517.31		1,701.39	J3-506	14.1	573.54	1,547.65	1,547.65
J-5080	1,006.67	J-5116	31.33	517.31		1,548.21	J-5080	20.15	529.51	1,549.85	1,549.85
J3-723	1,006.67	J-5116	31.33	517.31		1,720.50	J3-743	6.3	591.55	1,558.12	1,558.12
J3-724	1,006.67	J-5116	31.33	517.31		1,667.45	J3-743	11.79	604.2	1,558.12	1,558.12
J3-725	1,006.67	J-5116	31.33	517.31		1,792.89	J3-743	-1.4	573.78	1,558.12	1,558.12
J3-745	1,006.67	J-5116	31.33	517.31		1,657.42	J3-743	12.81	606.56	1,558.12	1,558.12
J3-879	1,006.67	J3-929	29.21	819.42	2,776.01	1,564.07	J3-879	20.16	518.52	1,566.01	1,566.01
J3-716	1,006.67	J-5116	31.33	517.31		1,625.47	J3-716	20.16	671.53	1,590.59	1,590.59
J3-297	1,006.67	J-5116	31.33	517.31		1,628.56	J3-297	20.16	679.53	1,591.73	1,591.73
J3-288	1,006.67	J-5116	31.33	517.31		1,654.36	J3-280	16.51	595.1	1,595.08	1,595.08
J3-955	1,006.67	J-5116	31.33	517.31		1,744.89	J3-956	11.51	636.56	1,605.75	1,605.75
J3-717	1,006.67	J-5116	31.33	517.31		1,747.91	J3-716	12.38	653.58	1,606.65	1,606.65
J3-957	1,006.67	J-5116	31.33	517.31		1,749.90	J3-716	12.53	653.91	1,610.25	1,610.25
J3-958	1,006.67	J-5116	31.33	517.31		1,735.28	J3-716	13.76	656.75	1,611.95	1,611.95
J3-959	1,006.67	J-5116	31.33	517.31		1,657.55	J3-716	19.55	670.11	1,613.36	1,613.36
J3-718	1,006.67	J-5116	31.33	517.31		1,641.59	J3-718	20.16	601.53	1,617.65	1,617.65
J3-715	1,006.67	J-5116	31.33	517.31		1,700.57	J3-716	16.77	663.69	1,617.66	1,617.66
J3-299	1,006.67	J-5116	31.33	517.31		1,729.66	J3-297	15.27	668.23	1,621.70	1,621.70
J3-719	1,006.67	J-5116	31.33	517.31		1,951.68	J3-956	-4.02	600.72	1,627.81	1,627.81
J3-722	1,006.67	J-5116	31.33	517.31		2,000.19	J3-956	-8.35	590.72	1,627.81	1,627.81

J3-714	1,006.67 J-5116	31.33	517.31		1,674.16 J3-714	20.17	674.54	1,637.22	1,637.22
J3-875	1,006.67 J3-929	29.22	819.43	2,774.93	1,639.61 J3-875	20.16	516.53	1,641.71	1,641.71
J-5079	1,006.67 J-5116	31.33	517.31		1,688.83 J-5080	18.87	526.55	1,645.48	1,645.48
J3-309	1,006.67 J-5116	31.33	517.31		1,681.61 J3-309	20.17	649.54	1,650.76	1,650.76
J3-713	1,006.67 J-5116	31.33	517.31		1,695.53 J3-713	20.17	685.55	1,655.19	1,655.19
J3-296	1,006.67 J-5116	31.33	517.31		2,010.41 J3-297	-1.48	629.59	1,670.04	1,670.04
J3-558	1,006.67 J-5116	31.33	517.31		1,818.75 J3-289	8.88	595.5	1,671.15	1,671.15
J3-581	1,006.67 J3-929	26.97	814.24	1,672.44	2,792.43 J3-929	15.63	788.08	1,672.45	1,672.44
J3-585	1,006.67 J3-929	27.06	814.44	1,683.64	2,606.34 J3-929	16.75	790.67	1,683.64	1,683.64
J3-583	1,006.67 J3-929	27.07	814.47	1,684.07	2,440.31 J3-929	17.61	792.64	1,684.07	1,684.07
J3-584	1,006.67 J3-929	27.07	814.48	1,685.34	2,630.46 J3-929	16.64	790.4	1,685.35	1,685.34
J3-582	1,006.67 J3-929	27.14	814.63	1,691.72	2,691.30 J3-929	16.34	789.7	1,691.73	1,691.72
J3-589	1,006.67 J3-929	26.95	814.19	1,700.17	3,877.62 J3-929	8.62	771.9	1,700.17	1,700.17
J-5084	1,006.67 J-5116	31.33	517.31		1,735.56 J-5084	20.17	531.56	1,716.11	1,716.11
J-5076	1,006.67 J-5116	31.33	517.31		1,797.91 J-5080	14.56	516.6	1,721.94	1,721.94
J3-978	1,006.67 J-5116	31.33	517.31		1,744.89 J3-978	20.17	561.56	1,722.75	1,722.75
J3-325	1,006.67 J-5116	31.33	517.31		1,793.62 J3-325	20.18	741.57	1,725.00	1,725.00
J3-405	1,006.67 J-5116	31.33	517.31		1,746.45 J3-405	20.17	545.56	1,725.81	1,725.81
J-5075	1,006.67 J-5116	31.33	517.31		1,872.02 J-5080	4.63	493.69	1,726.23	1,726.23
J-5083	1,006.67 J-5116	31.33	517.31		1,747.38 J-5083	20.17	536.56	1,727.40	1,727.40
J-5077	1,006.67 J-5116	31.33	517.31		1,782.39 J-5080	17.21	522.71	1,730.62	1,730.62
J-5078	1,006.67 J-5116	31.33	517.31		1,881.86 J-5080	3.9	492	1,736.16	1,736.16
J3-586	1,006.67 J3-929	27.57	815.64	1,744.36	2,703.48 J3-929	16.7	790.55	1,744.36	1,744.36
J3-588	1,006.67 J3-929	27.57	815.64	1,744.36	1,854.91 J3-588	20.18	519.58	1,855.35	1,744.36
J-5081	1,006.67 J-5116	31.33	517.31		1,952.41 J-5080	-2.13	478.08	1,768.49	1,768.49
J3-290	1,006.67 J-5116	31.33	517.31		2,166.06 J3-297	-3.81	624.2	1,770.96	1,770.96
J3-397	1,006.67 J-5116	31.33	517.31		1,852.56 J3-397	20.18	708.58	1,802.07	1,802.07
J3-587	1,006.67 J3-929	27.87	816.33	1,830.03	2,494.58 J3-929	18.3	794.23	1,829.92	1,829.92
J3-376	1,006.67 J3-929	28.56	817.9	1,835.21	2,521.01 J3-929	14.19	784.75	1,835.23	1,835.21
J3-591	1,006.67 J3-929	27.94	816.49	1,853.83	2,783.78 J3-929	16.89	790.98	1,853.71	1,853.71
J3-291	1,006.67 J-5116	31.33	517.31		2,246.82 J3-297	-2.37	627.52	1,854.29	1,854.29
J3-979	1,006.67 J-5116	31.33	517.31		2,163.06 J3-297	3.61	641.33	1,857.63	1,857.63
J3-974	1,006.67 J-5116	31.33	517.31		2,159.19 J3-297	3.87	641.93	1,857.63	1,857.63
J3-975	1,006.67 J-5116	31.33	517.31		2,103.37 J3-297	7.57	650.48	1,857.63	1,857.63
J3-976	1,006.67 J-5116	31.33	517.31		2,129.09 J3-297	5.88	646.56	1,857.63	1,857.63
J3-977	1,006.67 J-5116	31.33	517.31		2,060.79 J3-297	10.34	656.87	1,857.63	1,857.63
J3-300	1,006.67 J-5116	31.33	517.31		1,912.90 J3-297	19.87	678.86	1,862.00	1,862.00
J3-396	1,006.67 J-5116	31.33	517.31		2,091.19 J3-389	14.59	710.67	1,895.87	1,895.87
J3-389	1,006.67 J-5116	31.33	517.31		1,961.18 J3-389	20.2	723.61	1,895.87	1,895.87
J3-394	1,006.67 J-5116	31.33	517.31		2,066.27 J3-389	15.69	713.2	1,895.87	1,895.87
J3-395	1,006.67 J-5116	31.33	517.31		2,191.29 J3-389	10.09	700.28	1,895.87	1,895.87
J3-393	1,006.67 J-5116	31.33	517.31		2,044.88 J3-389	16.62	715.36	1,895.87	1,895.87
J-5089	1,006.67 J-5116	31.33	517.31		1,952.33 J-5089	20.19	626.61	1,918.39	1,918.39
J-5087	1,006.67 J-5116	31.33	517.31		1,963.99 J-5087	20.2	610.61	1,932.20	1,932.20
J3-590	1,006.67 J3-929	28.07	816.78	1,935.38	4,731.08 J3-929	4.09	761.43	1,935.38	1,935.38
J-5035	1,006.67 J-5116	31.33	517.31		1,964.02 J-5035	20.2	530.61	1,953.72	1,953.72
J3-377	1,006.67 J3-929	28.93	818.77	1,959.49	2,199.98 J3-929	19.35	796.65	1,959.53	1,959.49
J-5086	1,006.67 J-5116	31.33	517.31		2,024.43 J-5087	19.34	608.62	1,981.16	1,981.16
J-5088	1,006.67 J-5116	31.33	517.31		2,116.92 J-5089	15.01	614.64	2,013.49	2,013.49
J3-327	1,006.67 J-5116	31.33	517.31		2,097.29 J3-327	20.21	727.64	2,022.83	2,022.83
J3-305	1,006.67 J-5116	31.33	517.31		2,079.55 J3-305	20.21	646.64	2,038.53	2,038.53
J3-576	1,006.67 J3-929	29.22	819.43	2,770.43	2,054.63 J3-576	20.2	503.63	2,057.73	2,057.73
J3-893	1,006.67 J3-929	29.05	819.05	2,617.02	2,393.11 J3-994	10.49	407.21	2,083.65	2,083.65
J3-892	1,006.67 J3-929	29.05	819.05	2,617.02	3,087.55 J3-994	-14.79	348.86	2,083.65	2,083.65
J3-894	1,006.67 J3-929	29.05	819.05	2,617.02	2,121.81 J3-994	18.89	426.59	2,083.65	2,083.65
J3-578	1,006.67 J3-929	29.22	819.43	2,770.43	2,081.32 J3-578	20.21	530.64	2,085.09	2,085.09
J3-786	1,006.67 J3-929	29.22	819.43	2,770.43	2,119.44 J3-786	20.21	578.65	2,125.39	2,125.39
J-5124	1,006.67 J-5116	31.33	517.31		2,190.59 J-5124	20.22	526.66	2,164.77	2,164.77
J3-781	1,006.67 J3-929	28.61	818.03	2,172.78	2,901.36 J3-929	17.41	792.18	2,172.78	2,172.78
J3-783	1,006.67 J3-929	28.61	818.03	2,172.78	3,306.93 J3-929	15.27	787.23	2,172.78	2,172.78
J3-911	1,006.67 J3-929	28.61	818.03	2,172.78	2,768.19 J3-929	18.04	793.63	2,172.79	2,172.78
J3-782	1,006.67 J3-929	28.61	818.03	2,172.78	3,439.20 J3-929	14.51	785.48	2,172.79	2,172.78
J3-780	1,006.67 J3-929	28.61	818.03	2,172.78	4,451.45 J3-929	8.02	770.51	2,172.78	2,172.78
J3-404	1,006.67 J-5116	31.33	517.31		2,341.12 J3-405	7.67	516.69	2,187.39	2,187.39
J3-815	1,006.67 J3-929	28.62	818.04	2,195.12	3,438.09 J3-929	14.85	786.27	2,195.12	2,195.12
J3-882	1,006.67 J3-929	28.62	818.04	2,195.12	3,925.28 J3-929	12.11	779.95	2,195.12	2,195.12
J-5125	1,006.67 J-5116	31.33	517.31		2,211.75 J-5125	20.22	596.67	2,219.08	2,219.08
J3-577	1,006.67 J3-929	29.22	819.43	2,770.43	2,241.05 J3-577	20.22	498.67	2,244.63	2,244.63
J3-883	1,006.67 J3-929	28.7	818.24	2,256.41	3,870.41 J3-929	12.61	781.11	2,256.41	2,256.41
J3-884	1,006.67 J3-929	28.7	818.24	2,256.41	2,400.87 J3-884	20.24	486.71	2,404.61	2,256.41
J3-903	1,006.67 J3-929	29.22	819.43	2,770.43	2,269.43 J3-903	20.23	548.68	2,274.63	2,274.63
J3-346	1,006.67 J-5116	31.33	517.31		2,394.33 J3-346	20.24	753.71	2,283.14	2,283.14
J3-886	1,006.67 J3-929	29.22	819.43	2,770.43	2,338.27 J3-886	20.23	524.7	2,342.90	2,342.90

J3-775	1,006.67 J3-776	28.61	676.03	2,350.35	2,318.94 J3-776	20.23	656.69	2,350.45	2,350.35
J-5128	1,006.67 J-5116	31.33	517.31		2,399.90 J-5128	20.24	541.71	2,369.02	2,369.02
J-5127	1,006.67 J-5116	31.33	517.31		2,423.35 J-5127	20.24	526.72	2,393.55	2,393.55
J3-779	1,006.67 J3-929	28.9	818.71	2,402.95	4,662.40 J3-776	8.03	628.53	3,170.01	2,402.95
J3-860	1,006.67 J3-929	29.47	820.01	2,784.58	2,400.12 J3-860	20.24	472.71	2,403.58	2,403.58
J3-989	1,006.67 J-5116	31.33	517.31		2,482.29 J3-989	20.25	656.73	2,424.85	2,424.85
J-5117	1,006.67 J3-929	28.93	818.76	2,450.33	3,533.73 J3-929	14.89	786.37	2,450.33	2,450.33
J3-987	1,006.67 J-5116	31.33	517.31		2,509.37 J3-987	20.25	654.73	2,451.79	2,451.79
J3-887	1,006.67 J3-929	29.22	819.43	2,770.43	2,447.47 J3-887	20.24	530.72	2,452.76	2,452.76
J-5118	1,006.67 J3-929	28.93	818.77	2,453.18	3,517.71 J3-929	14.99	786.59	2,453.18	2,453.18
J-5126	1,006.67 J-5116	31.33	517.31		2,507.83 J-5126	20.25	601.73	2,466.44	2,466.44
J3-917	1,006.67 J3-929	28.96	818.84	2,469.33	4,265.86 J3-929	10.81	776.95	2,469.33	2,469.33
J3-898	1,006.67 J3-929	29.22	819.43	2,770.43	2,473.88 J3-898	20.25	496.73	2,478.23	2,478.23
J3-885	1,006.67 J3-929	28.94	818.79	2,483.55	5,261.97 J3-929	4.98	763.5	2,483.55	2,483.55
J3-918	1,006.67 J3-929	28.98	818.89	2,496.02	4,144.35 J3-929	11.63	778.84	2,496.02	2,496.02
J3-777	1,006.67 J3-929	28.98	818.87	2,498.39	3,162.09 J3-776	17.12	649.51	2,741.26	2,498.39
J3-778	1,006.67 J3-929	28.98	818.89	2,501.16	3,681.88 J3-929	14.28	784.97	2,501.16	2,501.16
J3-919	1,006.67 J3-929	28.98	818.89	2,503.12	4,264.28 J3-929	10.96	777.3	2,503.12	2,503.12
J3-920	1,006.67 J3-929	28.98	818.89	2,503.12	3,240.15 J3-929	17.13	791.54	2,503.12	2,503.12
J3-944	1,006.67 J3-929	28.96	818.83	2,509.87	5,613.77 J3-929	2.84	758.54	2,509.87	2,509.87
J3-922	1,006.67 J3-929	28.98	818.88	2,512.64	4,563.18 J3-929	9.23	773.31	2,512.64	2,512.64
J3-946	1,006.67 J3-929	28.97	818.85	2,519.00	5,198.15 J3-929	5.59	764.89	2,519.00	2,519.00
J3-947	1,006.67 J3-929	28.97	818.85	2,519.00	4,627.76 J3-929	9.11	773.02	2,519.00	2,519.00
J3-921	1,006.67 J3-929	28.98	818.87	2,519.92	4,745.04 J3-929	8.2	770.92	2,519.92	2,519.92
J3-926	1,006.67 J3-929	28.97	818.87	2,523.17	4,389.97 J3-929	10.41	776.02	2,523.17	2,523.17
J3-925	1,006.67 J3-929	28.97	818.87	2,523.42	4,454.83 J3-929	10.02	775.14	2,523.42	2,523.42
J3-924	1,006.67 J3-929	28.97	818.87	2,524.05	4,685.63 J3-929	8.64	771.93	2,524.05	2,524.05
J3-923	1,006.67 J3-929	28.97	818.87	2,525.96	5,315.92 J3-929	4.69	762.82	2,525.96	2,525.96
J3-948	1,006.67 J3-929	28.97	818.87	2,528.95	5,842.07 J3-929	1.31	755.02	2,528.95	2,528.95
J3-950	1,006.67 J3-929	28.98	818.87	2,533.10	5,380.53 J3-929	4.51	762.4	2,533.10	2,533.10
J3-373	1,006.67 J-5116	31.33	517.31		2,743.59 J3-373	20.27	796.79	2,541.48	2,541.48
J3-943	1,006.67 J3-929	28.98	818.89	2,542.75	6,083.28 J3-929	-0.31	751.29	2,542.75	2,542.75
J3-774	1,006.67 J3-929	29.01	818.96	2,552.63	3,385.37 J3-929	16.66	790.44	2,552.63	2,552.63
J3-988	1,006.67 J-5116	31.33	517.31		2,625.19 J3-988	20.26	656.76	2,562.75	2,562.75
J3-985	1,006.67 J-5116	31.33	517.31		2,631.10 J3-985	20.26	660.76	2,566.80	2,566.80
J3-936	1,006.67 J-5116	31.33	517.31		2,762.40 J3-936	20.28	777.79	2,609.71	2,609.71
J4-700	1,006.67 J3-929	29.05	819.05	2,617.02	4,107.21 J3-929	12.97	781.92	2,617.03	2,617.02
J3-572	1,006.67 J3-929	29.05	819.05	2,617.02	4,712.78 J3-994	-28.51	317.2	3,671.12	2,617.02
J3-571	1,006.67 J3-929	29.05	819.05	2,617.02	4,119.11 J3-929	12.89	781.74	2,617.03	2,617.02
J3-390	1,006.67 J-5116	31.33	517.31		2,737.59 J3-390	20.27	705.79	2,647.47	2,647.47
J3-308	1,006.67 J-5116	31.33	517.31		3,135.71 J3-309	-2.65	596.88	2,650.02	2,650.02
J3-372	1,006.67 J-5116	31.33	517.31		2,873.61 J3-372	20.29	796.82	2,656.94	2,656.94
J3-568	1,006.67 J3-929	29.22	819.43	2,770.43	2,658.61 J3-568	20.27	576.77	2,667.87	2,667.87
J3-785	1,006.67 J3-929	29.22	819.43	2,770.43	2,684.97 J3-785	20.27	583.78	2,695.13	2,695.13
J3-910	1,006.67 J3-929	29.14	819.26	2,695.90	6,584.80 J3-929	-2.8	745.55	2,695.91	2,695.90
J-5129	1,006.67 J-5116	31.33	517.31		2,754.81 J-5129	20.27	606.79	2,706.42	2,706.42
J3-986	1,006.67 J-5116	31.33	517.31		2,970.43 J3-987	11.63	634.84	2,721.83	2,721.83
J3-908	1,006.67 J3-929	29.18	819.33	2,729.35	5,359.73 J3-929	6.8	767.7	2,729.36	2,729.35
J3-983	1,006.67 J-5116	31.33	517.31		2,895.25 J3-985	15.98	650.89	2,729.50	2,729.50
J3-784	1,006.67 J3-929	29.22	819.43	2,770.43	2,730.63 J3-784	20.27	591.79	2,742.14	2,742.14
J3-907	1,006.67 J3-929	29.19	819.36	2,744.33	5,064.89 J3-929	8.88	772.5	2,744.34	2,744.33
J3-941	1,006.67 J-5116	31.33	517.31		2,837.32 J3-941	20.28	762.81	2,748.76	2,748.76
J3-388	1,006.67 J-5116	31.33	517.31		2,876.61 J3-388	20.29	730.82	2,753.05	2,753.05
J3-906	1,006.67 J3-929	29.19	819.37	2,758.30	5,286.94 J3-929	7.64	769.63	2,758.31	2,758.30
J3-331	1,006.67 J-5116	31.33	517.31		2,898.00 J3-331	20.29	738.82	2,760.87	2,760.87
J3-905	1,006.67 J3-929	29.19	819.37	2,762.57	3,718.19 J3-929	16.8	790.77	2,762.58	2,762.57
J3-904	1,006.67 J3-929	29.19	819.37	2,764.06	5,477.76 J3-929	6.47	766.94	2,764.07	2,764.06
J3-566	1,006.67 J3-929	29.22	819.43	2,770.43	6,751.96 J3-929	-3.62	743.64	2,770.44	2,770.43
J3-890	1,006.67 J3-929	29.22	819.43	2,770.43	3,077.78 J3-568	11.79	557.22	2,789.97	2,770.43
J3-900	1,006.67 J3-929	29.22	819.43	2,770.43	3,074.05 J3-902	19.68	557.41	3,063.04	2,770.43
J3-899	1,006.67 J3-929	29.22	819.43	2,770.43	3,233.22 J3-902	15.05	546.73	3,068.18	2,770.43
J3-603	1,006.67 J3-929	29.22	819.43	2,770.43	4,079.61 J3-784	12.65	574.19	3,679.29	2,770.43
J3-889	1,006.67 J3-929	29.22	819.43	2,770.43	2,935.76 J3-568	15.93	566.75	2,789.97	2,770.43
J3-575	1,006.67 J3-929	29.22	819.43	2,770.43	2,809.10 J3-575	20.28	567.8	2,818.45	2,770.43
J3-902	1,006.67 J3-929	29.22	819.43	2,770.43	2,814.21 J3-902	20.28	558.81	2,822.99	2,770.43
J3-891	1,006.67 J3-929	29.22	819.43	2,770.43	2,982.55 J3-568	16.11	567.18	2,840.64	2,770.43
J3-573	1,006.67 J3-929	29.22	819.43	2,770.43	3,950.30 J3-784	13.7	576.62	3,611.55	2,770.43
J3-574	1,006.67 J3-929	29.22	819.43	2,770.43	4,045.17 J3-784	14.58	578.66	3,742.64	2,770.43
J3-567	1,006.67 J3-929	29.22	819.43	2,770.43	4,221.39 J3-784	12.58	574.04	3,806.08	2,770.43
J3-602	1,006.67 J3-929	29.22	819.43	2,770.43	3,308.29 J3-929	19	795.86	2,770.44	2,770.43
J3-604	1,006.67 J3-929	29.22	819.43	2,770.43	3,357.71 J3-929	18.75	795.27	2,770.45	2,770.43
J3-897	1,006.67 J3-929	29.22	819.43	2,770.43	3,111.42 J3-902	18.74	555.26	3,068.88	2,770.43
J3-895	1,006.67 J3-929	29.22	819.43	2,770.43	3,373.51 J3-902	10.88	537.1	3,074.08	2,770.43

J3-901	1,006.67 J3-929	29.22	819.43	2,770.43	3,250.73 J3-902	13.6	543.38	3,040.66	2,770.43
J3-896	1,006.67 J3-929	29.22	819.43	2,770.43	3,388.92 J3-902	10.8	536.93	3,085.93	2,770.43
J3-579	1,006.67 J3-929	29.22	819.43	2,770.43	4,254.77 J3-784	10.41	569.03	3,732.34	2,770.43
J3-888	1,006.67 J3-929	29.22	819.43	2,770.43	3,029.71 J3-568	13.21	560.49	2,789.97	2,770.43
J3-565	1,006.67 J3-929	29.22	819.43	2,770.86	6,767.79 J3-929	-3.76	743.33	2,770.87	2,770.86
J3-880	1,006.67 J3-929	29.23	819.46	2,771.97	8,130.07 J3-905	-24.6	509.22	6,334.25	2,771.97
J3-881	1,006.67 J3-929	29.22	819.43	2,772.70	6,763.48 J3-929	-3.73	743.39	2,772.71	2,772.70
J3-863	1,006.67 J3-929	29.25	819.5	2,773.07	8,379.05 J3-905	-30.63	495.32	6,362.58	2,773.07
J3-874	1,006.67 J3-929	29.22	819.43	2,774.30	6,130.78 J3-929	1.55	755.58	2,774.31	2,774.30
J3-873	1,006.67 J3-929	29.22	819.43	2,774.93	5,936.69 J3-929	3.11	759.18	2,774.94	2,774.93
J3-877	1,006.67 J3-929	29.21	819.42	2,776.01	3,499.96 J3-878	12.12	517.96	3,274.27	2,776.01
J3-878	1,006.67 J3-929	29.21	819.42	2,776.01	2,894.92 J3-878	20.29	536.82	2,902.46	2,776.01
J3-872	1,006.67 J3-929	29.21	819.42	2,776.01	4,610.00 J3-929	11.89	779.45	2,776.02	2,776.01
J3-870	1,006.67 J3-929	29.21	819.42	2,776.01	5,769.84 J3-929	4.66	762.76	2,776.02	2,776.01
J3-876	1,006.67 J3-929	29.19	819.38	2,778.60	6,754.96 J3-929	-3.72	743.4	2,778.62	2,778.60
J3-328	1,006.67 J-5116	31.33	517.31		3,188.64 J3-325	14.25	727.89	2,782.06	2,782.06
J3-858	1,006.67 J3-929	29.47	820.01	2,784.55	7,011.55 J3-929	-5.19	740.03	2,784.56	2,784.55
J3-859	1,006.67 J3-929	29.47	820.01	2,784.55	4,327.22 J3-929	13.62	783.44	2,784.56	2,784.55
J3-864	1,006.67 J3-929	29.47	820.01	2,784.55	5,410.01 J3-929	7.08	768.33	2,784.57	2,784.55
J3-861	1,006.67 J3-929	29.69	820.52	2,793.15	6,316.91 J3-929	0.96	754.21	2,793.16	2,793.15
J3-869	1,006.67 J3-929	29.77	820.7	2,795.79	4,878.56 J3-929	10.46	776.13	2,795.80	2,795.79
J3-866	1,006.67 J3-929	29.77	820.7	2,795.79	3,177.91 J3-929	19.83	797.75	2,795.80	2,795.79
J3-867	1,006.67 J3-929	29.77	820.7	2,795.79	4,930.86 J3-929	10.14	775.4	2,795.80	2,795.79
J3-868	1,006.67 J3-929	29.77	820.7	2,795.79	4,353.56 J3-866	11.77	437.16	4,178.61	2,795.79
J3-862	1,006.67 J3-929	29.77	820.7	2,795.79	6,099.82 J3-929	2.67	758.16	2,795.80	2,795.79
J-5043	1,006.67 J3-929	30.04	821.32	2,803.92	5,028.35 J3-929	9.61	774.17	2,803.93	2,803.92
J-5040	1,006.67 J3-929	30.04	821.32	2,803.92	4,217.05 J3-929	14.36	785.15	2,803.93	2,803.92
J-5039	1,006.67 J3-929	30.04	821.32	2,803.92	5,838.76 J3-929	4.47	762.32	2,803.93	2,803.92
J-5044	1,006.67 J3-929	30.32	821.98	2,811.59	5,403.12 J3-929	7.33	768.92	2,811.60	2,811.59
J-5037	1,006.67 J3-929	30.78	823.04	2,817.62	4,746.71 J3-929	11.4	778.32	2,817.64	2,817.62
J-5046	1,006.67 J-5116	31.33	517.31		4,320.86 J3-929	13.93	784.14	2,824.37	2,824.37
J3-314	1,006.67 J-5116	31.33	517.31		3,164.62 J3-315	14.68	713.88	2,830.79	2,830.79
J3-304	1,006.67 J-5116	31.33	517.31		2,986.27 J3-305	16.4	637.84	2,839.47	2,839.47
J3-383	1,006.67 J-5116	31.33	517.31		2,968.37 J3-383	20.3	756.84	2,842.25	2,842.25
J-5042	1,006.67 J-5116	31.33	517.31		2,872.13 J-5042	20.29	541.82	2,865.13	2,865.13
J3-352	1,006.67 J-5116	31.33	517.31		3,056.28 J3-352	20.3	775.86	2,868.02	2,868.02
J3-937	1,006.67 J-5116	31.33	517.31		2,994.61 J3-937	20.3	751.85	2,878.25	2,878.25
J3-380	1,006.67 J-5116	31.33	517.31		3,006.87 J3-380	20.3	743.85	2,906.04	2,906.04
J3-984	1,006.67 J-5116	31.33	517.31		3,127.98 J3-985	14.23	646.85	2,907.37	2,907.37
J3-391	1,006.67 J-5116	31.33	517.31		3,039.43 J3-391	20.3	728.86	2,908.40	2,908.40
J3-952	1,006.67 J-5116	31.33	517.31		3,017.59 J3-952	20.3	674.85	2,959.71	2,959.71
J3-991	1,006.67 J-5116	31.33	517.31		3,029.28 J3-991	20.3	633.85	2,961.91	2,961.91
J3-345	1,006.67 J-5116	31.33	517.31		3,182.53 J3-345	20.32	767.89	2,969.87	2,969.87
J3-378	1,006.67 J3-929	31.22	824.05	2,987.59	4,683.08 J3-929	10.91	777.18	2,987.59	2,987.59
J3-351	1,006.67 J-5116	31.33	517.31		3,153.64 J3-351	20.31	759.88	2,993.35	2,993.35
J3-354	1,006.67 J-5116	31.33	517.31		3,489.60 J3-373	18.72	793.2	3,013.57	3,013.57
J-5028	1,006.67 J-5116	31.33	517.31		3,058.04 J-5028	20.31	586.86	3,036.55	3,036.55
J-5041	1,006.67 J-5116	31.33	517.31		3,055.46 J-5041	20.3	586.86	3,047.09	3,047.09
J-5033	1,006.67 J-5116	31.33	517.31		3,120.25 J-5041	17.66	580.76	3,047.09	3,047.09
J-5031	1,006.67 J-5116	31.33	517.31		3,068.81 J-5031	20.31	606.86	3,059.20	3,059.20
J3-360	1,006.67 J-5116	31.33	517.31		3,213.41 J3-360	20.32	783.9	3,067.37	3,067.37
J3-358	1,006.67 J-5116	31.33	517.31		3,218.42 J3-358	20.32	778.9	3,080.78	3,080.78
J3-338	1,006.67 J-5116	31.33	517.31		3,251.66 J3-338	20.32	721.91	3,112.82	3,112.82
J3-332	1,006.67 J-5116	31.33	517.31		3,315.86 J3-332	20.33	747.92	3,127.56	3,127.56
J3-326	1,006.67 J-5116	31.33	517.31		3,289.20 J3-326	20.33	734.91	3,129.10	3,129.10
J3-940	1,006.67 J-5116	31.33	517.31		4,180.31 J3-929	15.97	788.85	3,147.77	3,147.77
J-5024	1,006.67 J-5116	31.33	517.31		3,868.22 J3-929	18.38	794.43	3,176.13	3,176.13
J-5030	1,006.67 J-5116	31.33	517.31		3,289.13 J-5031	20.33	606.91	3,263.32	3,263.32
J3-790	1,006.67 J-5116	31.33	517.31		3,852.17 J3-360	16.44	774.95	3,286.59	3,286.59
J3-353	1,006.67 J-5116	31.33	517.31		3,813.00 J3-373	19.15	794.19	3,323.39	3,323.39
J3-359	1,006.67 J-5116	31.33	517.31		4,277.61 J3-358	11.6	758.76	3,324.00	3,324.00
J3-990	1,006.67 J-5116	31.33	517.31		3,645.28 J3-985	12.09	641.91	3,326.38	3,326.38
J3-363	1,006.67 J-5116	31.33	517.31		4,547.51 J3-360	10.01	760.1	3,344.76	3,344.76
J3-333	1,006.67 J-5116	31.33	517.31		3,560.20 J3-333	20.36	748.98	3,346.20	3,346.20
J3-357	1,006.67 J-5116	31.33	517.31		3,488.54 J3-357	20.35	770.96	3,346.91	3,346.91
J-5090	1,006.67 J-5116	31.33	517.31		3,481.00 J-5090	20.35	689.96	3,364.82	3,364.82
J3-562	1,006.67 J-5116	31.33	517.31		3,622.77 J3-562	20.36	776.99	3,372.35	3,372.35
J-5023	1,006.67 J-5116	31.33	517.31		4,270.28 J3-929	16.27	789.55	3,374.90	3,374.90
J3-942	1,006.67 J-5116	31.33	517.31		4,883.95 J3-929	13.92	784.13	3,392.79	3,392.79
J-5021	1,006.67 J-5116	31.33	517.31		7,409.07 J3-929	-3.58	743.74	3,421.74	3,421.74
J3-324	1,006.67 J-5116	31.33	517.31		3,650.18 J3-324	20.36	748	3,429.58	3,429.58
J3-375	1,006.67 J-5116	31.33	517.31		3,681.48 J3-375	20.37	771.01	3,437.69	3,437.69
J-5026	1,006.67 J-5116	31.33	517.31		3,472.19 J-5026	20.35	606.96	3,444.59	3,444.59

J3-361	1,006.67	J-5116	31.33	517.31	4,731.51	J3-360	9.99	760.07	3,465.44	3,465.44
J3-951	1,006.67	J-5116	31.33	517.31	4,472.95	J3-929	17.18	791.65	3,512.78	3,512.78
J3-938	1,006.67	J-5116	31.33	517.31	3,825.47	J3-936	19.95	777.04	3,535.22	3,535.22
J3-343	1,006.67	J-5116	31.33	517.31	3,784.82	J3-343	20.38	753.03	3,540.39	3,540.39
J3-334	1,006.67	J-5116	31.33	517.31	3,796.57	J3-334	20.38	752.03	3,552.30	3,552.30
J3-330	1,006.67	J-5116	31.33	517.31	3,773.65	J3-330	20.38	741.03	3,560.46	3,560.46
J3-344	1,006.67	J-5116	31.33	517.31	3,803.22	J3-344	20.38	752.03	3,570.92	3,570.92
J3-348	1,006.67	J-5116	31.33	517.31	3,842.68	J3-348	20.38	768.04	3,580.33	3,580.33
J3-934	1,006.67	J-5116	31.33	517.31	5,223.08	J3-929	13.72	783.66	3,581.58	3,581.58
J3-350	1,006.67	J-5116	31.33	517.31	3,660.14	J3-350	20.37	632	3,582.44	3,582.44
J3-339	1,006.67	J-5116	31.33	517.31	3,743.17	J3-339	20.37	708.02	3,590.53	3,590.53
J3-374	1,006.67	J-5116	31.33	517.31	3,873.62	J3-374	20.39	780.05	3,591.67	3,591.67
J3-939	1,006.67	J-5116	31.33	517.31	4,436.80	J3-929	18.07	793.7	3,613.05	3,613.05
J3-382	1,006.67	J-5116	31.33	517.31	4,461.18	J3-929	18.03	793.61	3,627.55	3,627.55
J3-371	1,006.67	J-5116	31.33	517.31	4,699.45	J3-372	16.04	787.02	3,628.91	3,628.91
J3-386	1,006.67	J-5116	31.33	517.31	3,850.08	J3-386	20.38	737.04	3,642.76	3,642.76
J3-313	1,006.67	J-5116	31.33	517.31	3,923.41	J3-315	18.9	723.62	3,658.51	3,658.51
J3-953	1,006.67	J-5116	31.33	517.31	4,489.50	J3-929	18.17	793.94	3,669.27	3,669.27
J3-323	1,006.67	J-5116	31.33	517.31	3,936.75	J3-324	20.32	747.9	3,682.67	3,682.67
J3-336	1,006.67	J-5116	31.33	517.31	4,067.25	J3-331	17.71	732.87	3,683.34	3,683.34
J3-335	1,006.67	J-5116	31.33	517.31	3,899.49	J3-335	20.39	737.06	3,686.46	3,686.46
J3-355	1,006.67	J-5116	31.33	517.31	4,186.62	J3-373	19.66	795.37	3,687.65	3,687.65
J3-935	1,006.67	J-5116	31.33	517.31	4,486.77	J3-373	17.9	791.3	3,694.61	3,694.61
J3-726	1,006.67	J-5116	31.33	517.31	4,365.34	J3-333	14.43	735.3	3,701.96	3,701.96
J3-337	1,006.67	J-5116	31.33	517.31	4,408.08	J3-333	13.97	734.23	3,712.12	3,712.12
J3-347	1,006.67	J-5116	31.33	517.31	4,143.89	J3-929	20.12	798.44	3,728.43	3,728.43
J3-356	1,006.67	J-5116	31.33	517.31	4,390.03	J3-373	18.74	793.24	3,731.67	3,731.67
J3-341	1,006.67	J-5116	31.33	517.31	4,526.48	J3-333	12.56	731	3,732.60	3,732.60
J3-370	1,006.67	J-5116	31.33	517.31	4,502.34	J3-929	18.47	794.62	3,732.77	3,732.77
J3-342	1,006.67	J-5116	31.33	517.31	4,207.08	J3-333	17.39	742.14	3,737.70	3,737.70
J3-560	1,006.67	J-5116	31.33	517.31	4,027.78	J3-333	20.03	748.23	3,742.73	3,742.73
J3-329	1,006.67	J-5116	31.33	517.31	4,201.47	J3-929	19.96	798.07	3,745.02	3,745.02
J3-387	1,006.67	J-5116	31.33	517.31	4,176.41	J3-929	20.09	798.35	3,745.91	3,745.91
J3-789	1,006.67	J-5116	31.33	517.31	4,750.53	J3-360	13.64	768.48	3,752.20	3,752.20
J3-322	1,006.67	J-5116	31.33	517.31	4,024.63	J3-333	20.23	748.68	3,752.55	3,752.55
J3-561	1,006.67	J-5116	31.33	517.31	4,145.59	J3-333	18.6	744.93	3,757.32	3,757.32
J3-385	1,006.67	J-5116	31.33	517.31	4,357.40	J3-373	19.2	794.31	3,771.07	3,771.07
J3-321	1,006.67	J-5116	31.33	517.31	4,341.13	J3-333	16.06	739.06	3,772.59	3,772.59
J3-318	1,006.67	J-5116	31.33	517.31	4,051.13	J3-333	20.26	748.75	3,777.85	3,777.85
J3-349	1,006.67	J-5116	31.33	517.31	3,991.68	J3-349	20.4	727.08	3,816.90	3,816.90
J3-303	1,006.67	J-5116	31.33	517.31	3,951.86	J3-303	20.39	681.07	3,818.85	3,818.85
J3-320	1,006.67	J-5116	31.33	517.31	4,280.91	J3-333	17.73	742.93	3,820.30	3,820.30
J3-398	1,006.67	J-5116	31.33	517.31	3,955.77	J3-398	20.39	667.07	3,832.26	3,832.26
J-5025	1,006.67	J-5116	31.33	517.31	6,288.22	J-5024	-102.2	344.14	3,833.24	3,833.24
J3-310	1,006.67	J-5116	31.33	517.31	3,955.79	J3-309	20.31	649.88	3,844.02	3,844.02
J3-319	1,006.67	J-5116	31.33	517.31	4,401.38	J3-333	16.62	740.36	3,854.64	3,854.64
J3-317	1,006.67	J-5116	31.33	517.31	4,030.21	J3-317	20.4	685.09	3,888.89	3,888.89
J3-312	1,006.67	J-5116	31.33	517.31	4,070.70	J3-312	20.41	677.1	3,935.86	3,935.86
J3-307	1,006.67	J-5116	31.33	517.31	4,066.89	J3-307	20.41	665.09	3,942.35	3,942.35
J3-379	1,006.67	J-5116	31.33	517.31	4,638.67	J3-380	11.8	724.23	3,958.47	3,958.47
J3-369	1,006.67	J-5116	31.33	517.31	5,596.37	J3-929	14.48	785.42	3,992.31	3,992.31
J3-316	1,006.67	J-5116	31.33	517.31	4,567.07	J3-387	16.74	739.63	3,997.76	3,997.76
J3-368	1,006.67	J-5116	31.33	517.31	5,593.81	J3-929	14.56	785.6	4,000.10	4,000.10
J3-362	1,006.67	J-5116	31.33	517.31	4,872.01	J3-929	18.12	793.82	4,006.06	4,006.06
J3-381	1,006.67	J-5116	31.33	517.31	4,706.25	J3-383	15.7	746.24	4,114.64	4,114.64
J3-302	1,006.67	J-5116	31.33	517.31	5,600.39	J3-387	4.11	710.5	4,126.41	4,126.40
J3-954	1,006.67	J-5116	31.33	517.31	5,871.02	J3-356	9.02	751.81	4,183.47	4,183.47
J3-384	1,006.67	J-5116	31.33	517.31	5,876.90	J3-347	8.6	741.85	4,285.68	4,285.68
J3-857	1,006.67	J-5116	31.33	517.31	7,641.51	J3-345	-11.71	693.97	4,311.70	4,311.70
J3-856	1,006.67	J-5116	31.33	517.31	7,654.71	J3-345	-11.89	693.57	4,311.92	4,311.92
J4-2022	1,006.67	J-5116	31.33	517.31	8,700.44	J3-345	-24.79	663.79	4,320.20	4,320.20
J3-292	1,006.67	J-5116	31.33	517.31	6,968.77	J3-387	-11.52	674.42	4,327.37	4,327.37
J3-293	1,006.67	J-5116	31.33	517.31	7,378.00	J3-387	-16.09	663.86	4,390.99	4,390.99
J3-295	1,006.67	J-5116	31.33	517.31	7,393.35	J3-387	-16	664.07	4,402.65	4,402.65
J3-367	1,006.67	J-5116	31.33	517.31	5,881.38	J3-929	16.67	790.47	4,574.30	4,574.30
J3-366	1,006.67	J-5116	31.33	517.31	6,002.34	J3-929	16.54	790.17	4,647.95	4,647.95
J-5045	1,006.67	J-5116	31.33	517.31	15,398.25	J-5023	-190.8	159.65	7,202.26	7,202.26

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J2-736	6.87	335	381.18	20.01
J3-271	7.08	405	452.01	20.37
J5-645	47.13	329	381	22.53
J2-229	7.44	395	449.67	23.69
J5-641	47.13	325	381.18	24.34
J-5115	17.8	617	674.7	25
J3-570	17.8	448	505.7	25
J3-704	7.08	600	657.7	25
J3-929	17.8	752	810.04	25.15
J2-228	7.44	391	449.66	25.42
J2-206	7.44	389	449.24	26.1
J5-632	47.13	470	530.29	26.13
J5-631	47.13	470	530.47	26.2
J3-930	17.8	746	809.93	27.7
J3-775	17.8	610	674.21	27.82
J3-776	17.8	610	674.2	27.82
J3-928	17.8	746	810.27	27.85
J3-932	17.8	746	811.3	28.3
J2-205	7.44	385	451.46	28.8
J3-564	17.8	605	674.24	30
J3-373	17.8	750	820.33	30.47
J3-533	0	744	814.84	30.7
J3-372	17.8	750	821.6	31.02
J-5116	7.44	445	517.31	31.33
J-517	10.48	350	422.63	31.47
J3-784	17.8	545	617.75	31.52
J4-756	58.48	428	500.73	31.52
J3-854	0	750	823.59	31.89
J3-774	17.8	600	674.2	32.15
J3-853	0	742	816.56	32.3
J3-777	17.8	598	674.24	33.03
J3-1020	0	745	821.32	33.07
J3-370	17.8	751	829.05	33.82
J4-424	7.44	344	422.64	34.07
J3-606	0	740	818.84	34.16
J3-855	0	742	820.94	34.2
J3-377	17.8	740	819.2	34.32
J3-785	17.8	537	616.38	34.39
J2-555	7.44	370	449.67	34.52
J3-355	17.8	738	818.18	34.74
J3-354	17.8	738	818.68	34.96
J3-707	7.08	573	653.78	35
J3-376	17.8	736	817.35	35.25
J3-365	7.08	753	835.15	35.6
J3-778	17.8	592	674.17	35.61
J3-933	17.8	732	814.44	35.72
J2-207	7.44	369	451.63	35.8
J3-367	17.8	749	832.03	35.98
J4-805	0	752	835.25	36.07
J3-935	17.8	736	820.04	36.42
J3-872	17.8	471	662.67	83.05
J3-875	17.8	470	661.8	83.11
J3-873	17.8	470	661.83	83.12
J3-974	17.8	546	737.85	83.13
J3-976	17.8	546	737.85	83.13
J3-754	58.48	406	597.99	83.19
J2-649	9.07	344	536.41	83.37
J2-663	7.44	230	422.54	83.43
J3-947	17.8	475	667.57	83.44
J2-738	7.44	207	399.76	83.52
J3-276	17.8	501	693.8	83.54
J3-788	17.8	419	611.93	83.6
J4-613	58.48	308	501.42	83.81
J3-279	17.8	535	728.48	83.83
J6-404	451	340	533.78	83.97
J4-607	58.48	307	500.99	84.06
J6-550	0	340	534.59	84.31
J1-161	9.47	170	364.76	84.39
J3-701	17.8	590	784.96	84.48
J2-252	7.44	255	450.27	84.61
J4-606	58.48	305	500.99	84.92
J5-643	9.07	342	538.22	85.02
J3-1002	9.07	340	536.36	85.08
J1-83	9.47	112	308.37	85.09
J3-965	58.48	305	501.37	85.09
J2-185	7.44	252	448.44	85.12
J-5023	17.8	600	796.53	85.16
J3-705	7.08	600	796.59	85.18
J3-294	17.8	533	729.62	85.2
J1-146	9.47	181	378.21	85.45
J3-950	17.8	470	667.22	85.46
J1-5107	9.47	110	307.51	85.58
J1-5108	9.47	110	307.5	85.58
J1-5106	9.47	110	307.53	85.59
J1-5105	9.47	110	307.55	85.6
J3-944	17.8	470	667.55	85.6
J3-595	17.8	594	791.57	85.61
J2-666	7.44	225	422.64	85.64
J3-983	17.8	600	797.79	85.7
J3-984	17.8	600	797.91	85.75
J1-5104	9.47	110	307.97	85.78
J-5068	58.48	300	498.05	85.81
J3-914	17.8	610	808.47	86
J2-667	7.44	224	422.63	86.07
J3-309	17.8	603	801.97	86.21
J3-997	9.07	337	536.08	86.26
J3-893	17.8	306	505.3	86.36
J-531	0	223	422.47	86.43
J-5127	17.8	480	679.77	86.56
J1-115	9.47	109	308.82	86.58

J3-366	17.8	749	833.08	36.43	J3-282	17.8	494	693.81	86.58
J4-407	45.56	419	503.17	36.47	J3-856	17.8	615	815.12	86.71
J3-360	17.8	737	821.23	36.5	J3-857	17.8	615	815.14	86.72
J3-374	17.8	733	817.23	36.5	J3-363	17.8	610	810.7	86.96
J3-786	17.8	532	616.37	36.56	J3-305	17.8	600	802.58	87.78
J3-371	17.8	739	823.4	36.57	J3-885	17.8	465	667.78	87.87
J2-669	7.44	338	422.53	36.63	J4-747	58.48	426	629.05	87.98
J3-568	17.8	530	614.93	36.8	J3-563	7.08	605	808.06	87.99
J3-931	17.8	724	809.8	37.18	J2-186	7.44	240	443.13	88.01
J3-356	17.8	731	816.89	37.22	J3-990	17.8	595	798.19	88.04
J3-562	17.8	730	815.9	37.22	J3-892	17.8	302	505.32	88.1
J3-787	17.8	419	505.25	37.37	J1-831	0	300	503.6	88.22
J2-659	7.44	336	422.37	37.42	J3-998	9.07	332	536.03	88.41
J3-352	17.8	729	815.9	37.65	J1-112	9.47	103	307.06	88.42
J3-358	17.8	732	819.71	38	J-5021	17.8	605	809.25	88.5
J3-936	17.8	731	819.52	38.36	J2-450	7.44	237	441.52	88.62
J3-938	17.8	730	819.53	38.79	J3-586	17.8	482	687.16	88.9
J1-802	10.21	227	316.77	38.9	J2-553	7.44	247	452.33	88.97
J1-804	10.21	227	316.77	38.9	J2-653	7.44	195	400.42	89.01
J1-805	10.21	227	316.81	38.91	J3-948	17.8	462	667.71	89.13
J3-368	17.8	740	830.11	39.04	J1-103	9.47	103	308.75	89.15
J3-369	17.8	740	830.12	39.05	J4-830	58.48	295	500.83	89.19
J3-375	17.8	724	814.32	39.13	J2-173	7.44	216	421.9	89.21
J3-604	17.8	522	612.32	39.14	J3-744	17.8	562	768.04	89.28
J3-345	17.8	721	811.48	39.2	J6-444	451	327	533.34	89.41
J3-347	17.8	722	812.61	39.26	J3-278	17.8	522	728.5	89.48
J3-927	17.8	718	808.78	39.33	J3-874	17.8	454	661.53	89.92
J3-575	17.8	521	612.32	39.57	J4-698	58.48	333	541.23	90.22
J3-348	17.8	721	813.04	39.88	J4-741	58.48	328	536.3	90.25
J-5111	7.44	425	517.31	40	J3-912	17.8	600	808.48	90.33
J3-721	7.08	537	629.31	40	J5-642	47.13	330	538.49	90.34
J2-654	7.44	290	382.42	40.04	J1-172	0	110	318.71	90.43
J2-227	7.44	357	449.68	40.16	J2-234	7.44	240	449.53	90.79
J3-353	17.8	725	817.78	40.2	J3-986	17.8	588	797.84	90.92
J4-425	7.44	330	422.79	40.21	J3-943	17.8	457	666.9	90.95
J3-574	17.8	520	613.54	40.53	J4-697	58.48	332	541.92	90.96
J3-567	17.8	527	620.67	40.59	J-5024	17.8	580	790.05	91.01
J3-357	17.8	724	818.35	40.88	J1-729	7.44	185	395.44	91.18
J5-842	9.07	440	534.45	40.93	J2-672	6.87	185	395.6	91.25
J3-402	17.8	559	653.67	41.02	J2-730	7.44	185	395.69	91.29
J3-362	17.8	732	827.98	41.59	J4-692	58.48	337	547.78	91.33
J3-397	17.8	662	758.84	41.96	J4-858	58.48	290	500.83	91.35
J3-905	17.8	566	663.72	42.34	J4-528	12.96	337	548.02	91.44
J-529	0	723	820.92	42.43	J3-991	17.8	587	798.19	91.51
J4-701	45.56	403	501.33	42.6	J3-304	17.8	591	802.59	91.68
J3-917	17.8	575	674.09	42.93	J-5077	17.8	455	667.56	92.1
J1-527	12.96	220	319.25	43.01	J-5082	17.8	455	667.55	92.1
J-5118	17.8	575	674.66	43.18	J-5076	17.8	455	667.61	92.12
J-5117	17.8	575	674.69	43.2	J1-102	9.47	96	308.74	92.18
J1-801	10.21	218	317.7	43.2	J3-1008	9.07	324	536.87	92.24
J3-343	17.8	706	805.81	43.25	J1-5103	9.47	110	323.22	92.39
J4-414	58.48	401	501.38	43.5	J3-581	17.8	480	693.34	92.44

J3-334	17.8	705	805.77	43.66	J2-170	7.44	225	438.6	92.55
J4-622	58.48	400	500.88	43.71	J1-5102	9.47	110	323.71	92.6
J3-902	17.8	512	612.96	43.74	J-5074	58.48	287	500.82	92.65
J-532	0	705	806.19	43.84	J1-101	9.47	95	308.85	92.66
J3-351	17.8	713	814.32	43.9	J2-172	7.44	226	439.85	92.66
J3-940	17.8	722	823.51	43.98	J1-5101	9.47	110	323.87	92.67
J3-329	17.8	705	806.62	44.03	J4-742	58.48	325	539.04	92.75
J3-333	17.8	702	803.87	44.14	J3-718	17.8	555	769.12	92.78
J2-833	7.44	320	422.61	44.46	J3-588	17.8	473	687.15	92.79
J5-832	7.44	320	422.61	44.46	J1-5100	9.47	110	324.34	92.88
J3-332	17.8	701	803.86	44.57	J1-120	9.47	94	308.49	92.94
J3-324	17.8	701	804.33	44.77	J2-169	7.44	218	432.51	92.95
J4-619	58.48	398	501.33	44.77	J2-668	7.44	208	422.63	93
J-5123	17.8	554	657.85	45	J1-5099	9.47	110	324.66	93.01
J-5131	17.8	576	679.85	45	J1-5098	9.47	110	324.85	93.09
J3-709	17.8	655	758.85	45	J1-5097	9.47	110	324.9	93.12
J3-344	17.8	705	808.9	45.02	J3-1009	9.07	321	536.47	93.36
J5-638	9.07	430	534.11	45.11	J4-433	58.48	285	500.83	93.52
J3-346	17.8	707	811.47	45.27	J2-198	7.44	236	451.89	93.55
J1-156	10.21	213	317.66	45.35	J3-569	17.8	448	664.27	93.71
J4-689	45.56	448	552.84	45.43	J1-736	9.47	92	308.82	93.95
J3-387	17.8	701	806.13	45.55	J2-647	9.07	319	536.55	94.27
J-5109	7.44	412	517.31	45.63	J2-212	7.44	233	450.74	94.35
J3-571	17.8	400	505.59	45.75	J3-1001	9.07	318	536	94.46
J4-700	17.8	400	505.59	45.75	J3-999	9.07	318	536.01	94.46
J3-759	58.48	395	500.61	45.76	J2-226	7.44	232	450.03	94.47
J3-385	17.8	702	808.15	46	J2-202	7.44	232	450.35	94.61
J3-297	17.8	633	739.27	46.05	J1-82	9.47	90	308.38	94.62
J3-378	17.8	715	821.48	46.14	J3-719	17.8	550	768.38	94.62
J3-941	17.8	716	823.5	46.58	J2-551	7.44	231	450.66	95.18
J3-383	17.8	710	817.8	46.71	J3-1000	9.07	316	535.99	95.32
J5-639	9.07	426	534.03	46.81	J2-222	7.44	230	450.08	95.36
J3-939	17.8	710	818.28	46.92	J1-84	9.47	87	308.35	95.91
J4-740	322.24	395	503.71	47.1	J2-195	7.44	230	452.33	96.34
J2-208	7.44	343	451.9	47.19	J2-729	9.07	315	537.46	96.39
J4-620	58.48	392	500.92	47.2	J5-845	9.07	315	537.51	96.41
J3-325	17.8	695	804.32	47.37	J-5026	17.8	560	782.67	96.48
J3-330	17.8	694	803.32	47.37	J2-194	7.44	229	451.81	96.54
J3-579	17.8	500	609.36	47.38	J3-978	17.8	515	737.82	96.55
J5-841	9.07	424	534.01	47.67	J2-552	7.44	230	452.92	96.59
J4-690	58.48	441	551.52	47.89	J3-723	17.8	545	768.07	96.65
J3-331	17.8	692	802.71	47.97	J3-724	17.8	545	768.05	96.65
J3-865	58.48	390	500.85	48.03	J1-856	0	227	450.72	96.94
J3-903	17.8	502	612.95	48.07	J1-118	9.47	85	308.84	96.99
J3-323	17.8	692	803.12	48.15	J3-881	17.8	436	660.94	97.47
J2-190	7.44	340	451.56	48.34	J1-100	9.47	84	309.05	97.51
J3-506	0	541	653.68	48.82	J2-221	7.44	225	450.09	97.53
J4-618	58.48	388	501.08	49	J3-100	58.48	272	497.76	97.82
J3-937	17.8	705	818.27	49.08	J-5069	58.48	272	497.81	97.84
J3-891	17.8	500	613.28	49.09	J3-350	17.8	585	811.18	98
J3-904	17.8	550	663.79	49.3	J2-250	7.44	224	450.29	98.05
J3-335	17.8	690	803.84	49.33	J-519	58.48	273	499.31	98.06

J3-934	17.8	704	817.97	49.38	J3-720	7.08	542	768.36	98.08
J5-640	9.07	420	534.03	49.41	J3-400	7.08	571	797.54	98.16
J2-204	7.44	337	451.36	49.55	J1-116	9.47	81	308.83	98.72
J4-750	58.48	386	500.71	49.7	J-5119	17.8	570	797.99	98.79
J3-326	17.8	688	803.11	49.88	J1-99	9.47	81	309.17	98.86
J6-557	451	418	533.29	49.96	J1-86	9.47	80	308.54	99.03
J4-738	58.48	390	505.37	49.99	J1-113	9.47	80	308.57	99.04
J3-580	17.8	588	703.39	50	J2-238	7.44	220	449.55	99.46
J3-708	17.8	634	749.39	50	J2-254	7.44	220	449.69	99.53
J6-405	451	418	533.68	50.12	J-5030	17.8	560	789.92	99.63
J4-691	58.48	434	549.75	50.15	J-5031	17.8	560	789.92	99.63
J3-386	17.8	690	806.14	50.32	J2-251	7.44	220	450.28	99.78
J2-670	7.44	306	422.29	50.39	J-5130	17.8	576	806.45	99.85
J4-408	58.48	386	502.67	50.55	J3-880	17.8	430	660.54	99.89
J3-602	17.8	494	611.61	50.96	J4-530	12.96	317	548.02	100.1
J2-183	7.44	331	448.91	51.09	J3-869	17.8	440	671.21	100.18
J4-617	58.48	383	501	51.13	J3-884	17.8	440	671.68	100.39
J3-779	17.8	557	675.06	51.15	J-5028	17.8	540	771.94	100.5
J4-434	58.48	383	501.26	51.24	J-5044	17.8	450	682.06	100.55
J3-381	17.8	699	817.8	51.48	J2-176	7.44	211	444.14	101.02
J3-781	17.8	560	678.92	51.53	J1-737	65.41	72	305.68	101.25
J3-890	17.8	494	613.64	51.84	J-5121	17.8	433	667.5	101.61
J-5129	17.8	560	679.82	51.92	J1-94	9.47	75	309.49	101.61
J3-918	17.8	552	672.16	52.07	J1-445	9.47	74	308.72	101.7
J3-573	17.8	491	611.41	52.17	J2-199	7.44	221	456.17	101.9
J3-316	17.8	685	805.52	52.22	J2-177	7.44	210	445.31	101.96
J4-412	58.48	381	501.53	52.23	J3-572	17.8	270	505.51	102.05
J4-749	58.48	380	500.94	52.4	J-5122	17.8	433	668.85	102.19
J3-790	17.8	700	821.2	52.51	J2-451	7.44	210	445.96	102.24
J3-380	17.8	697	818.41	52.61	J1-803	10.21	227	463.17	102.33
J3-388	17.8	684	805.52	52.65	J1-446	9.47	73	309.21	102.35
J3-906	17.8	542	663.66	52.71	J3-992	17.8	562	798.48	102.47
J3-327	17.8	681	803.11	52.91	J4-431	260.64	263	500	102.69
J4-410	58.48	380	502.12	52.92	J2-200	6.87	219	456.19	102.78
J3-994	17.8	383	505.25	52.97	J2-201	6.87	219	456.31	102.83
J3-995	17.8	383	505.25	52.97	J1-97	9.47	72	309.5	102.91
J2-660	7.44	300	422.3	52.99	J3-761	7.08	540	777.66	102.98
J2-662	7.44	300	422.32	53	J3-972	58.48	260	497.73	103.01
J3-591	17.8	562	684.32	53	J3-310	17.8	564	801.93	103.09
J3-712	17.8	650	772.32	53	J2-168	7.44	195	433.21	103.22
J3-322	17.8	678	800.66	53.15	J3-583	17.8	454	692.41	103.3
J3-300	17.8	621	743.7	53.16	J2-174	7.44	204	442.5	103.34
J3-942	17.8	696	818.74	53.19	J3-860	17.8	426	665.09	103.6
J5-637	9.07	411	534.15	53.36	J1-122	9.47	135	374.37	103.72
J3-328	17.8	681	804.33	53.44	J2-235	7.44	210	449.51	103.78
J3-315	17.8	680	803.66	53.58	J1-98	9.47	70	309.53	103.79
J3-391	17.8	682	806.11	53.78	J1-91	9.47	70	309.7	103.86
J3-876	17.8	540	664.12	53.78	J1-92	9.47	70	309.74	103.88
J3-587	17.8	560	684.7	54.03	J-5070	58.48	258	497.79	103.9
J4-843	7.44	298	422.72	54.04	J1-95	9.47	70	309.83	103.92
J-5126	17.8	555	679.78	54.07	J1-129	9.47	69	309.02	104
J3-603	17.8	485	610.15	54.23	J1-130	9.47	69	309.02	104

J3-338	17.8	675	800.49	54.37	J2-167	7.44	200	440.39	104.16
J4-409	58.48	377	502.73	54.48	J3-592	17.8	558	798.81	104.34
J3-578	17.8	484	610.14	54.66	J1-121	9.47	67	308.06	104.45
J2-554	7.44	325	451.52	54.82	J3-862	17.8	430	671.21	104.52
J3-401	17.8	527	653.69	54.9	J1-982	9.47	66	307.5	104.64
J-853	0	685	811.97	55.02	J3-883	17.8	430	671.69	104.72
J3-527	12.96	679	806.08	55.06	J1-117	9.47	67	308.82	104.78
J3-336	17.8	675	802.24	55.13	J1-143	9.47	68	309.92	104.82
J-5110	7.44	390	517.31	55.16	J1-142	9.47	68	310.01	104.86
J3-359	17.8	690	817.61	55.29	J3-292	17.8	566	808.03	104.87
J4-411	58.48	374	501.78	55.37	J2-448	7.44	197	439.09	104.9
J2-671	7.44	294	422.28	55.58	J-5078	17.8	425	667.56	105.1
J3-389	17.8	677	805.34	55.61	J-5075	17.8	425	667.59	105.11
J4-419	58.48	372	500.73	55.78	J2-166	7.44	196	438.57	105.11
J4-796	58.48	372	500.95	55.87	J1-96	9.47	66	309.8	105.64
J4-615	58.48	372	500.99	55.89	J1-133	9.47	65	309.41	105.9
J3-954	17.8	686	815.22	55.99	J1-134	9.47	65	309.41	105.9
J3-887	17.8	484	613.61	56.16	J1-124	9.47	62	306.56	105.97
J-5125	17.8	550	679.78	56.23	J2-237	7.44	205	449.55	105.97
J3-384	17.8	685	814.81	56.25	J1-844	9.47	120	364.76	106.05
J3-755	58.48	468	597.97	56.32	J1-137	9.47	64	309.42	106.34
J4-418	58.48	370	500.93	56.73	J2-646	9.07	291	537.24	106.7
J2-181	7.44	315	446.11	56.81	J2-233	7.44	203	449.51	106.81
J3-349	17.8	680	811.18	56.84	J3-861	17.8	423	669.68	106.89
J4-417	58.48	370	501.31	56.89	J1-135	9.47	62	308.91	106.99
J3-919	17.8	540	671.42	56.94	J1-136	9.47	62	308.91	106.99
J3-920	17.8	540	671.41	56.94	J1-132	9.47	62	309.24	107.13
J5-633	9.07	402	533.42	56.95	J3-306	17.8	554	802.11	107.5
J3-888	17.8	482	613.62	57.03	J1-90	9.47	62	310.12	107.51
J3-713	17.8	639	770.75	57.09	J1-93	9.47	62	310.68	107.76
J3-901	17.8	480	612.06	57.22	J2-268	7.44	200	449.1	107.93
J-5095	7.44	290	422.28	57.32	J1-139	9.47	67	316.13	107.95
J3-871	17.8	530	662.6	57.45	J-5112	17.8	425	674.64	108.17
J2-673	6.87	185	317.64	57.47	J-5071	58.48	248	497.78	108.23
J4-420	58.48	367	500.01	57.63	J-5041	17.8	540	789.89	108.28
J3-907	17.8	530	663.39	57.8	J3-722	17.8	518	768.26	108.44
J5-634	9.07	400	533.62	57.9	J3-760	7.08	540	790.61	108.59
J4-752	58.48	367	500.82	57.98	J1-125	65.41	57	307.79	108.67
J-5085	17.8	535	668.86	58	J2-232	7.44	198	449.51	108.98
J4-616	58.48	367	501	58.06	J-5039	17.8	425	676.76	109.09
J1-400	9.47	182	316.26	58.18	J-5040	17.8	425	676.76	109.09
J-5089	17.8	580	714.3	58.19	J-5043	17.8	425	676.76	109.09
J2-191	7.44	317	451.42	58.25	J3-274	17.8	441	692.9	109.15
J3-915	17.8	674	808.74	58.38	J3-308	17.8	550	801.99	109.19
J3-566	17.8	525	659.79	58.41	J1-88	9.47	56	308.54	109.43
J3-561	17.8	665	799.98	58.49	J1-27	9.47	54	307.09	109.66
J3-565	17.8	525	660.09	58.53	J2-224	7.44	197	450.18	109.7
J3-886	17.8	478	613.6	58.76	J4-2022	17.8	562	815.54	109.86
J3-299	17.8	603	738.91	58.89	J1-128	9.47	55	308.74	109.94
J4-436	58.48	362	497.96	58.91	J1-131	9.47	55	308.81	109.98
J4-439	58.48	361	497.36	59.08	J1-89	9.47	56	310.08	110.09
J3-314	17.8	667	803.68	59.22	J1-28	9.47	53	307.1	110.1

J1-109	9.47	145	281.73	59.24	J1-29	9.47	53	307.1	110.1
J3-392	17.8	669	806.06	59.39	J1-30	9.47	53	307.1	110.1
J4-621	58.48	364	501.06	59.39	J2-648	9.07	282	536.21	110.15
J3-826	0	670	808.07	59.83	J1-126	65.41	54	308.64	110.34
J4-773	58.48	361	499.2	59.88	J1-127	65.41	54	308.8	110.41
J-516	17.8	527	665.47	60	J-5064	58.48	248	502.98	110.48
J3-703	58.48	460	598.47	60	J3-745	17.8	513	768.06	110.52
J3-339	17.8	661	799.81	60.14	J1-31	9.47	52	307.1	110.53
J3-780	17.8	540	678.93	60.2	J3-864	17.8	410	665.11	110.54
J4-421	58.48	361	500.56	60.47	J1-69	9.47	53	308.49	110.7
J2-664	7.44	283	422.6	60.49	J1-26	9.47	51	307.08	110.96
J4-416	58.48	362	501.76	60.56	J1-23	9.47	51	307.11	110.97
J4-625	58.48	360	499.76	60.56	J1-34	9.47	51	307.1	110.97
J4-770	58.48	357	496.78	60.57	J1-138	9.47	60	316.13	110.98
J3-953	17.8	676	815.86	60.6	J1-24	9.47	51	307.12	110.98
J4-610	58.48	361	500.99	60.66	J-5065	58.48	247	503.26	111.04
J3-318	17.8	660	800.37	60.82	J4-847	58.48	247	503.76	111.25
J3-589	17.8	553	693.72	60.97	J1-35	9.47	50	307.1	111.4
J3-379	17.8	677	818.42	61.28	J1-25	9.47	50	307.12	111.41
J4-415	58.48	362	503.45	61.29	J3-858	17.8	408	665.12	111.41
J3-714	17.8	628	769.62	61.37	J3-605	7.08	403	660.86	111.73
J4-428	58.48	358	499.78	61.43	J1-22	9.47	49	307.12	111.84
J4-435	58.48	357	498.87	61.47	J1-21	9.47	49	307.13	111.85
J3-896	17.8	470	611.94	61.5	J2-264	7.44	191	449.23	111.89
J4-430	260.64	358	499.96	61.51	J-5062	58.48	245	503.4	111.96
J3-900	17.8	470	611.99	61.52	J1-444	65.41	50	309.03	112.24
J3-599	17.8	664	806.04	61.55	J4-832	0	300	559.24	112.33
J3-598	17.8	660	802.43	61.72	J1-20	9.47	48	307.27	112.34
J4-413	58.48	359	501.49	61.74	J1-1	9.47	48	307.28	112.35
J4-438	58.48	355	497.61	61.79	J1-2	9.47	48	307.28	112.35
J4-765	58.48	355	497.65	61.81	J1-3	9.47	48	307.28	112.35
J2-184	7.44	306	448.73	61.85	J1-791	9.47	48	307.29	112.35
J3-951	17.8	675	818.13	62.02	J1-981	9.47	48	307.5	112.44
J3-909	17.8	520	663.34	62.11	J1-10	9.47	47	307.27	112.77
J4-844	7.44	279	422.72	62.27	J1-795	9.47	47	307.27	112.77
J3-321	17.8	656	799.77	62.29	J3-863	17.8	400	660.86	113.03
J4-757	58.48	357	500.82	62.32	J3-866	17.8	410	671.17	113.17
J4-429	260.64	356	499.9	62.35	J1-9	9.47	46	307.28	113.21
J3-716	17.8	625	769.02	62.4	J-5066	58.48	240	501.34	113.24
J4-771	58.48	357	501.14	62.46	J2-253	7.44	189	450.39	113.26
J1-159	9.47	219	363.44	62.59	J3-882	17.8	412	673.68	113.39
J1-157	9.47	220	364.51	62.62	J-5013	9.07	274	535.91	113.49
J3-670	7.08	448	592.89	62.78	J1-11	9.47	45	307.26	113.64
J4-426	58.48	355	499.88	62.78	J3-293	17.8	547	809.28	113.65
J1-158	22.91	219	363.94	62.8	J2-219	7.44	188	450.41	113.7
J3-993	17.8	570	715.4	63	J3-295	7.08	547	809.51	113.75
J3-889	17.8	468	613.62	63.1	J3-101	58.48	235	497.71	113.83
J4-422	58.48	356	501.93	63.23	J-5063	58.48	240	503.21	114.05
J4-441	58.48	354	499.99	63.26	J1-16	9.47	44	307.24	114.06
J-5088	17.8	568	714.3	63.39	J1-17	9.47	44	307.23	114.06
J3-382	17.8	670	816.86	63.63	J1-14	9.47	43	307.25	114.5
J3-897	17.8	465	611.94	63.67	J1-15	9.47	43	307.24	114.5

J3-390	17.8	659	806.1	63.74	J1-140	9.47	52	316.34	114.54
J4-437	58.48	350	497.11	63.74	J1-4	9.47	43	307.34	114.54
J4-764	58.48	352	499.1	63.74	J6-450	0	270	534.59	114.64
J3-758	58.48	451	598.23	63.8	JF-102	58.48	238	502.67	114.68
J3-393	17.8	658	805.33	63.84	J1-733	7.44	175	439.77	114.73
J3-706	7.08	506	653.69	63.99	J2-165	7.44	174	439.1	114.87
J3-748	58.48	450	597.89	64.08	J3-859	17.8	400	665.11	114.87
J3-597	17.8	651	799.15	64.19	J1-19	9.47	42	307.29	114.95
J3-908	17.8	515	663.18	64.21	J1-5	9.47	42	307.34	114.97
J1-160	9.47	215	363.44	64.32	J1-6	9.47	42	307.33	114.97
J4-624	58.48	355	503.59	64.38	J1-141	9.47	51	316.35	114.98
J3-600	17.8	655	803.74	64.45	J1-8	10.21	42	307.41	115
J3-727	17.8	649	797.73	64.45	J3-867	17.8	405	671.19	115.34
J3-361	17.8	672	821.18	64.64	J3-275	17.8	427	693.32	115.4
J1-794	9.47	215	364.21	64.65	J1-7	9.47	41	307.35	115.41
J3-394	17.8	656	805.33	64.7	J1-76	9.47	41	307.84	115.62
J-5087	17.8	564	713.76	64.89	J1-12	9.47	40	307.26	115.8
J-5091	58.48	350	499.88	64.94	J-5081	17.8	400	667.51	115.91
J-518	7.44	273	423.01	65	J1-980	9.47	40	307.5	115.91
J3-726	17.8	650	800.16	65.06	J1-812	9.47	54	321.55	115.93
J3-311	17.8	655	805.31	65.13	J1-75	9.47	40	307.98	116.11
J2-189	7.44	301	451.46	65.19	J1-18	9.47	39	307.3	116.25
J4-527	12.96	351	501.49	65.21	J1-81	9.47	40	308.42	116.31
J4-762	58.48	349	499.59	65.25	J2-236	7.44	180	449.5	116.77
J3-962	58.48	350	501.1	65.47	J1-813	10.21	52	321.77	116.89
J4-423	58.48	350	501.34	65.57	J1-814	10.21	52	321.79	116.9
J-5086	17.8	562	713.76	65.76	J2-248	7.44	180	450.03	117
J3-337	17.8	648	800.06	65.89	J2-223	7.44	180	450.18	117.07
J1-811	9.47	213	365.14	65.92	J2-225	7.44	179	450.02	117.43
J3-596	17.8	647	799.15	65.92	J3-1010	9.07	265	536.36	117.58
J1-155	10.09	213	365.17	65.93	J1-80	9.47	36	307.52	117.65
J1-154	10.09	213	365.2	65.95	J-5014	9.07	264	535.92	117.82
J1-153	9.47	213	365.29	65.99	J-523	7.44	110	382.08	117.89
J3-922	17.8	518	670.3	65.99	J1-13	9.47	35	307.25	117.97
J3-870	17.8	510	662.71	66.17	J1-440	9.47	35	307.27	117.98
J1-163	9.47	210	363.13	66.35	J4-440	58.48	232	504.89	118.24
J3-715	17.8	616	769.14	66.36	JF-101	58.48	230	502.93	118.26
J3-789	17.8	670	823.66	66.58	J1-63	9.47	46	319.67	118.58
J3-959	17.8	615	768.9	66.68	J3-815	17.8	400	673.68	118.58
J3-960	17.8	615	768.89	66.68	J1-441	9.47	46	319.7	118.6
J3-916	17.8	654	808.28	66.85	J-526	7.44	110	383.74	118.61
J2-182	7.44	290	444.3	66.86	J2-837	7.44	175	449.89	119.11
J4-694	58.48	393	547.44	66.92	JF-100	0	228	502.93	119.13
J1-152	22.91	210	364.5	66.95	J2-249	7.44	175	450.17	119.23
J3-576	17.8	457	611.6	66.99	J1-808	9.47	50	326.83	119.95
J2-838	7.44	295	449.72	67.04	J3-725	17.8	491	768.04	120.04
J3-782	17.8	524	678.9	67.12	J1-87	9.47	45	322.08	120.06
J-513	17.8	603	758.79	67.5	J1-686	9.47	50	328.05	120.48
J1-106	9.47	153	308.81	67.51	FCV-7-OUT	0	50	328.1	120.5
J1-85	9.47	152	308.34	67.74	J2-220	7.44	172	450.41	120.64
J3-1005	9.07	380	536.43	67.78	J1-1019	9.47	46	324.96	120.87
J1-151	9.47	208	364.56	67.84	J1-1020	9.47	46	325.42	121.07

J1-105	9.47	152	308.81	67.95	J1-810	9.47	48	327.54	121.12
J4-427	58.48	343	499.87	67.97	J3-1018	0	46	325.63	121.17
J-5046	17.8	540	696.94	68	J3-1023	0	46	325.65	121.17
J3-895	17.8	455	611.93	68	J3-1024	0	46	325.67	121.18
J4-614	58.48	344	501.06	68.05	J-5015	9.07	256	535.92	121.29
J3-560	17.8	642	799.13	68.09	J-5019	9.07	256	535.92	121.29
J3-966	58.48	350	507.15	68.09	J-5020	9.07	256	535.93	121.29
J4-772	58.48	340	497.37	68.19	J1-64	9.47	46	326.71	121.63
J3-313	17.8	645	802.41	68.21	J2-211	7.44	170	450.75	121.65
J-5067	58.48	342	499.57	68.27	J2-210	7.44	170	450.79	121.67
J1-793	9.47	207	364.63	68.3	J1-1022	9.47	46	326.83	121.68
J3-973	7.44	265	422.62	68.3	J1-851	9.47	46	326.83	121.68
J3-590	17.8	526	683.85	68.4	J1-806	9.47	44	324.85	121.69
J1-144	10.21	119	276.92	68.43	J2-209	7.44	170	450.89	121.71
J4-609	58.48	343	500.99	68.46	J2-214	7.44	170	450.94	121.73
J3-289	17.8	575	733.39	68.63	J3-868	17.8	390	671.18	121.84
J3-956	17.8	610	768.42	68.64	J1-57	9.47	49	331.69	122.49
J3-1007	9.07	378	536.43	68.65	J1-77	9.47	25	307.72	122.5
J3-342	17.8	641	799.44	68.65	J1-1021	9.47	44	326.9	122.58
J4-769	58.48	338	496.7	68.76	J1-855	0	42	324.94	122.6
J3-753	58.48	439	598.11	68.94	J1-847	9.47	42	325.07	122.65
J2-702	7.44	263	422.29	69.02	J2-246	7.44	167	450.19	122.71
J3-577	17.8	452	611.39	69.07	J6-446	451	250	533.32	122.76
J1-164	9.47	203	362.66	69.18	J1-688	9.47	45	328.5	122.84
J2-230	7.44	290	449.66	69.18	FCV-8-OUT	0	45	328.59	122.88
J1-858	9.47	153	313	69.33	J2-239	7.44	166	449.59	122.88
JU-404	0	375	535.19	69.41	J1-1016	9.47	44	328.71	123.36
J2-656	7.44	262	422.28	69.45	J3-1017	0	44	328.9	123.45
J2-657	7.44	262	422.3	69.46	J1-852	9.47	48	333.36	123.65
J-514	17.8	573	733.37	69.49	J4-501	9.07	250	535.45	123.69
J3-272	17.8	505	665.45	69.52	J6-455	0	255	540.76	123.82
J4-768	58.48	336	497.24	69.87	J3-283	17.8	408	693.79	123.83
J2-661	7.44	261	422.32	69.9	J1-850	9.47	46	332.1	123.97
J3-601	17.8	641	802.45	69.95	J1-854	9.47	46	332.24	124.03
J3-898	17.8	450	611.93	70.16	J1-56	9.47	45	331.69	124.22
J3-899	17.8	450	611.95	70.17	J1-848	9.47	45	332.18	124.43
J5-815	9.07	375	537.14	70.26	J1-54	9.47	45	332.18	124.44
J-5090	17.8	643	805.3	70.33	J2-247	7.44	163	450.19	124.44
J4-766	58.48	335	497.35	70.35	J1-79	9.47	20	307.59	124.61
J1-162	9.47	201	363.57	70.44	J1-71	9.47	20	308.44	124.98
J3-317	17.8	638	800.76	70.52	J1-72	9.47	20	308.46	124.99
J1-111	9.47	144	306.9	70.59	J1-49	9.47	43	331.7	125.09
J3-921	17.8	506	669.27	70.74	J1-78	9.47	19	307.72	125.1
J6-447	451	370	533.29	70.75	J1-51	9.47	43	331.77	125.12
J3-967	58.48	350	513.39	70.8	J4-699	50.81	250	539.01	125.23
J1-150	9.47	201	365.06	71.09	J2-263	7.44	160	449.23	125.33
J3-557	17.8	569	733.34	71.21	J2-241	7.44	160	449.47	125.43
J1-107	9.47	170	334.63	71.33	J1-50	9.47	42	331.73	125.54
J1-108	9.47	170	334.63	71.33	J-5033	17.8	500	789.87	125.6
J2-180	7.44	281	445.68	71.36	J1-70	9.47	20	310.07	125.69
J3-341	17.8	635	799.7	71.37	J1-39	9.47	49	339.39	125.83
JU-402	0	370	535.01	71.5	J2-255	7.44	159	449.43	125.84

J4-767	58.48	332	497.24	71.6	J2-258	7.44	158	449.35	126.24
J3-302	17.8	640	805.31	71.63	FCV-4-OUT	0	30	322.1	126.57
J3-273	17.8	527	692.72	71.8	J1-59	9.47	39	331.51	126.74
J1-148	9.47	199	364.83	71.85	J3-403	7.08	504	797.48	127.16
J2-651	9.07	369	535.1	71.97	J3-711	7.08	363	656.72	127.27
J3-717	17.8	603	769.13	71.99	J2-240	7.44	155	449.47	127.59
J4-2011	58.48	330	496.32	72.07	J-5042	17.8	495	789.86	127.76
J3-364	58.48	360	526.6	72.19	J2-260	7.44	154	449.31	127.96
J1-149	22.91	198	364.81	72.28	J1-60	9.47	35	330.34	127.97
J5-799	9.07	370	536.88	72.31	J2-256	7.44	154	449.36	127.98
J3-296	17.8	571	738.19	72.44	J2-245	7.44	155	450.39	127.99
J2-178	7.44	278	445.26	72.47	J2-257	7.44	153	449.34	128.41
J1-110	9.47	138	305.75	72.69	J-5011	17.8	512	809.44	128.88
J1-715	0	110	277.79	72.7	J-5016	9.07	238	535.91	129.09
J3-559	58.48	430	598.01	72.8	J2-244	7.44	152	450.41	129.3
J1-145	9.47	210	378.22	72.89	J3-405	17.8	499	797.44	129.31
J4-763	58.48	330	499.31	73.36	J-5009	58.48	230	528.91	129.52
J-5010	17.8	640	809.44	73.42	J2-266	7.44	149	449.16	130.06
J3-303	17.8	634	803.66	73.51	J2-218	7.44	150	450.92	130.39
J5-636	9.07	365	534.74	73.55	J-5054	58.48	200	501.49	130.63
J3-979	17.8	568	737.91	73.62	J-5055	58.48	200	501.49	130.64
J3-291	17.8	567	737.78	74	J1-700	0	20	321.51	130.64
J4-611	58.48	330	501.08	74.13	J-5056	58.48	200	501.53	130.65
J3-320	17.8	628	799.13	74.15	J-5057	58.48	200	501.53	130.65
J3-396	17.8	634	805.33	74.24	J-5058	58.48	200	501.63	130.7
J3-301	17.8	634	805.35	74.25	J-5059	58.48	200	501.64	130.7
J3-913	17.8	637	808.49	74.31	J-5052	58.48	200	501.75	130.75
J2-197	7.44	279	451.41	74.71	J-5050	58.48	200	501.82	130.78
J3-280	17.8	557	729.6	74.79	J-5051	58.48	200	502.09	130.89
J3-971	7.44	250	422.62	74.79	J-5049	58.48	200	503.93	131.69
J3-878	17.8	490	662.64	74.81	J2-243	7.44	146	450.9	132.11
J2-665	7.44	250	422.67	74.82	J-5035	17.8	484	789.83	132.52
J3-277	17.8	521	694.09	75	J-5061	58.48	230	535.85	132.53
J3-312	17.8	630	803.23	75.06	J-5048	58.48	200	506.48	132.8
J3-969	58.48	340	513.42	75.14	J6-410	0	225	533.34	133.6
J3-958	17.8	595	768.68	75.26	J2-836	7.44	140	449.37	134.05
J3-926	17.8	495	668.79	75.3	J4-432	58.48	227	536.52	134.12
J-5072	58.48	320	494.18	75.47	J-5047	58.48	200	511.32	134.89
J4-2008	58.48	320	494.18	75.47	J2-259	7.44	137	449.31	135.32
J4-2009	58.48	320	494.18	75.47	J6-409	451	225	540.76	136.82
J2-203	7.44	277	451.19	75.48	J-5060	58.48	220	535.97	136.91
J4-2007	58.48	320	494.19	75.48	J2-215	7.44	135	451.86	137.3
J4-2005	58.48	320	494.21	75.49	J-530	0	52	369.83	137.72
J4-2006	58.48	320	494.23	75.49	J1-38	9.47	50	369.42	138.4
J4-2004	58.48	320	494.31	75.53	J3-1025	0	50	369.43	138.41
J3-996	9.07	362	536.33	75.54	FCV-6-OUT	0	50	369.54	138.45
J4-2003	58.48	320	494.44	75.58	FCV-6-IN	0	50	369.69	138.52
J3-584	17.8	518	692.56	75.64	FCV-14-IN	0	50	369.93	138.63
J4-696	58.48	370	544.74	75.71	FCV-14-OU	0	50	369.93	138.63
J1-147	9.47	190	364.93	75.8	J2-262	7.44	128	449.24	139.19
J4-2001	58.48	320	494.98	75.82	J2-213	7.44	130	451.26	139.2
J5-797	9.07	362	537.14	75.89	J1-815	9.47	0	321.56	139.33

J3-968	58.48	332	507.18	75.91	J1-816	9.47	0	321.64	139.37
J4-2018	58.48	320	495.98	76.25	J2-265	7.44	127	449.13	139.58
J4-2000	58.48	320	496.03	76.27	J1-58	9.47	38	360.19	139.6
J4-2010	58.48	320	496.02	76.27	J1-900	9.47	0	322.33	139.66
J4-2012	58.48	320	496.02	76.27	J1-401	9.47	0	323.25	140.06
J4-2013	58.48	320	496.02	76.27	J6-448	0	210	533.82	140.31
J4-2014	58.48	320	496.05	76.28	J6-449	0	210	534.59	140.64
J4-2017	58.48	320	496.28	76.38	J2-267	7.44	124	449.1	140.87
J4-2015	58.48	320	496.31	76.4	JU-401	0	215	540.55	141.06
J1-123	9.47	201	377.49	76.47	J-5017	9.07	209	535.91	141.65
J3-964	58.48	324	501.04	76.71	J3-404	17.8	470	797.46	141.89
J4-2016	58.48	320	497.05	76.72	J1-849	0	42	369.77	142.02
J3-290	17.8	560	737.24	76.8	J1-47	9.47	37	365.59	142.38
J2-556	7.44	340	517.31	76.83	J1-44	9.47	40	369.59	142.81
J-5124	17.8	480	657.84	77.06	J1-1011	9.47	40	369.69	142.86
J3-910	17.8	485	662.87	77.07	J1-1013	9.47	40	369.75	142.88
J-5120	17.8	535	712.94	77.1	J1-1012	9.47	40	369.76	142.89
J3-955	17.8	590	768.44	77.32	J1-1014	9.47	40	369.8	142.9
J-5083	17.8	490	668.48	77.34	J1-48	9.47	37	367.13	143.04
J3-398	17.8	620	798.54	77.36	J1-1015	9.47	40	370.42	143.17
J3-957	17.8	590	768.56	77.37	J1-442	9.47	39	369.41	143.17
J3-925	17.8	490	668.67	77.42	J1-40	9.47	39	369.48	143.2
J-5113	17.8	620	798.8	77.47	J1-42	9.47	39	369.48	143.2
J3-593	17.8	620	798.87	77.51	J6-445	0	202	533.34	143.57
J4-746	58.48	450	628.92	77.53	J1-41	9.47	40	373.04	144.31
J3-961	58.48	322	501.25	77.67	FCV-5-OUT	0	40	373.22	144.38
J2-650	9.07	357	536.5	77.78	J2-217	7.44	122	457.84	145.52
J3-1006	9.07	357	536.5	77.78	J2-216	7.44	121	458.54	146.26
J2-839	7.44	270	449.66	77.85	J2-270	7.44	110	449.06	146.92
J4-712	45.56	363	543.01	78	J-525	7.44	110	449.22	146.99
J-5073	58.48	320	500.81	78.34	J2-150	3.36	110	449.25	147
J3-963	58.48	320	501.17	78.5	FCV-5-IN	0	40	379.76	147.22
J2-192	7.44	270	451.41	78.61	FCV-7-IN	0	50	395.9	149.88
J-5114	17.8	617	798.78	78.76	J2-271	0	110	457.16	150.42
J2-658	7.44	240	422.37	79.02	J-521	5.2	46	396	151.65
J3-689	7.08	547	729.53	79.09	J-522	12.96	46	395.99	151.65
J3-585	17.8	510	692.66	79.15	FCV-8-IN	0	45	395.78	151.99
J4-695	58.48	362	544.72	79.17	J-5018	9.07	185	535.9	152.05
J3-783	17.8	496	678.89	79.25	J-520	12.96	44	395.99	152.52
J4-2002	58.48	312	494.95	79.27	J2-269	7.44	90	449.07	155.58
J4-612	58.48	318	501.14	79.35	J1-176	0	110	470.15	156.05
J5-644	9.07	355	538.21	79.38	J-528	12.96	454	815.71	156.73
J2-193	7.44	268	451.4	79.47	J1-165	0	25	389.81	158.07
J2-196	7.44	268	451.41	79.47	J1-166	0	25	389.95	158.13
J6-456	451	350	533.4	79.47	J1-167	0	25	389.95	158.13
J3-924	17.8	485	668.46	79.49	J3-406	7.08	430	797.46	159.22
J-5084	17.8	485	668.48	79.5	J1-443	9.47	20	389.81	160.24
J3-985	17.8	614	797.78	79.63	J-5053	58.48	110	501.83	169.78
J3-702	7.08	470	653.89	79.68	J2-261	7.44	50	449.31	173.02
J6-406	451	350	533.89	79.68	J4-2021	0	405	816	178.08
J4-608	58.48	317	501.03	79.74	J-5096	9.07	110	533.62	183.55
J3-594	17.8	615	799.09	79.77	J-5092	9.07	110	534.4	183.89

J2-179	7.44	260	444.18	79.8
J3-1003	9.07	352	536.47	79.93
J2-231	7.44	265	449.66	80.01
J2-840	7.44	265	449.72	80.04
J-5128	17.8	495	679.8	80.08
J3-558	17.8	549	733.84	80.09
J-5080	17.8	483	667.9	80.12
J6-407	451	350	535.12	80.21
J3-307	17.8	618	803.15	80.23
J3-319	17.8	614	799.21	80.25
J3-894	17.8	320	505.29	80.29
J2-188	7.44	266	451.39	80.33
J3-288	17.8	546	731.52	80.39
J2-652	9.07	350	536.47	80.8
J4-739	58.48	325	511.65	80.87
J1-104	9.47	122	308.75	80.92
J3-281	17.8	507	693.9	80.98
J3-582	17.8	505	691.94	81
J3-946	17.8	480	667.58	81.28
J3-970	7.44	235	422.62	81.3
J3-989	17.8	610	797.78	81.37
J3-988	17.8	610	797.8	81.38
J-5079	17.8	480	667.9	81.42
J3-751	58.48	410	597.96	81.44
J3-923	17.8	480	668.29	81.58
J-5037	17.8	500	688.69	81.76
J1-447	9.47	120	308.81	81.81
J3-911	17.8	490	678.89	81.84
J-527	12.96	347	536.21	81.99
J4-693	58.48	358	547.49	82.11
J2-175	7.44	253	442.61	82.16
J3-975	17.8	548	737.84	82.26
J3-977	17.8	548	737.84	82.26
J3-987	17.8	608	797.84	82.26
J3-952	17.8	628	818.12	82.38
J2-187	7.44	260	450.21	82.42
J5-856	19.3	310	500.23	82.43
J3-879	17.8	472	662.61	82.59
J1-114	9.47	118	308.81	82.68
J2-449	7.44	252	442.94	82.73
J3-743	17.8	577	768.05	82.78
J3-395	17.8	614	805.32	82.9
J1-119	9.47	118	309.55	83
J3-877	17.8	471	662.64	83.04
J-5093	9.07	110	536.55	184.82
J3-731	7.08	434	885.4	195.59
J-5004	0	434	885.63	195.69
J-5007	0	434	885.63	195.69
J-5006	0	434	889.1	197.19
J-5003	0	434	889.11	197.2
J-5005	0	434	890.29	197.71
J-5002	0	434	890.3	197.72
FCV-4-IN	0	30	494.97	201.47
J-524	17.8	110	729.53	268.44
J-515	17.8	110	733.31	270.08
J-5025	17.8	110	790.04	294.66
J-5045	17.8	110	808.83	302.8
J-854	407.2	110	819.67	307.5

Appendix M

Preventative Maintenance Schedule

SURFACE WATER FILTRATION PLANT

Standard Operating Procedures

The City of Camas Water Filter Plant is a group III facility. In accordance with WAC 246-292-040 a Water Treatment Plant Operator shall be certified at a level equal to or higher than the water system's classification rating by the department.

Any decisions concerning process control, or any adjustments that could impact water quality must be made by a WTPO 2 or greater.

After hours On-call personnel responding to an alarm at the filter plant may initiate shutdown procedures in accordance with the O&M plan when the plant is in automated by-pass mode. Notify supervisor of action

Weekend duty personnel shall maintain record requirements while doing rounds. If the filter plant alarms and goes into by-pass, follow the afterhours procedure above.

If there is an emergency or you need clarification, call Mike Stevens, Mike Nelson, or Monte Brachmann at the following phone numbers:

Mike Stevens	360-921-2872, or 360-835-9093
Mike Nelson	360-921-2751, or 360-687-5014
Monte Brachmann	360-921-3799, or 360-834-2749

It is the intent of this directive to have a WTPO 2 or greater make all operational decisions at the plant. Emergency actions may be taken by field personnel to protect the public health and safety. Before any action is taken by a field staff they must try to contact a person on the list above. The action taken must follow O&M procedures at the minimum level required to protect the public.

Surface Water Filtration Plant daily Operations

1. Record influent turbidity
2. Record influent pH, filter pH, and effluent pH.
3. Record influent water temperature.
4. Record the air temperature.
5. Record flow, headloss, influent pressure, and effluent turbidity.

6. Record alum pump stroke percent, and dose.

7. Record secondary floc pump stroke percent, and dose.

8. Record alum tank level from sight gauge and calculate pervious day's alum useage.

9. Record effluent chlorine residual with on-line analyzer.

10. Record effluent turbidity with on line analyzer.

11. Check the level of caustic tank.

12. Check the level of the secondary flocculent and fill if necessary.

13. Record fluoride meter reading and check fluoride level in saturator. Fill saturator if necessary.

14. Record fluoride concentration in the plant effluent.

15. Visually check all pumps, mechanical devices, and equipment for abnormalities.

16. Record weather conditions.

17. Record time of last backwash.

Surface Water Filtration Plant Shutdown Procedures – Routine Maintenance

1. At the blue S&B control panel by the entrance door, disable alarms by holding the red button down for 5 seconds. When the red light starts flashing, the alarms are disabled.

2. Shut off the following chemical feed pumps: alum, caustic, secondary floc, and fluoride.

3. Turn the Backwash on Headloss switch to **OFF.**

4. Turn the pressure gauge on at the southeast corner of the filter building to **ON.**

5. Turn the Influent Valve switch to **CLOSE.**

6. As the influent valve closes, the influent pressure will rise. Open the gate valve (described in the pressure regulation section above) to keep the pressure from going above 130. It will take approximately 3 minutes for the influent valve to fully close.

7. Turn the Effluent Waste (Filter to Waste) switch to **CLOSE.**

8. Open the 12 – inch bypass valve with the orange marker on the east side of the building to allow influent water to discharge to Lacamas Lake.

9. Push blue button to left of Sodium Thiosulfate Feed switch to initiate timed feed of sodium thiosulfate.

10. Turn sodium hypochlorite feed pump at Surface Water Chlorination Plant **OFF.**

11. If the effluent line is to be shut off, turn the chlorine analyzer on the south wall of the filter building to **OFF.**

12. If the 10- inch transmission main from the headworks is to be drained, unplug the streaming current monitor at the southeast corner of the filter plant building.

APPENDIX M

City of Camas Water System
Preventative Maintenance Schedule

Daily Maintenance Activities

Surface Water Chlorination Plant (in operation)

- Note liquid level in the sodium hypochlorite tank.
- Record the chlorine dosage.
- Record the weather conditions.
- Record the time.
- Record the chlorine residual results.
- If chlorine residual level is below 2.3 mg/L at the sample tap in the chlorination building, make appropriate adjustments at feed pump to bring the chlorine residual up to target level. Target level 1.8 – 2.3 mg/L (Depending on Weather)
- Check propane tank fuel level for generator
- Check pump performance with calibration cylinder

Surface Water Filtration Plant (in operation)

- Run sample and record influent turbidity.
- Run sample and record influent pH, filter pH, and effluent pH.
- Test and record influent water temperature.
- Record the air temperature.
- Record flow, headloss across filters, influent pressure, and effluent turbidity.
- Record alum pump stroke percentage, dosage, and whether in auto or manual position.
- Record effluent caustic pump stroke percentage, dosage, and whether in auto or manual position.
- Record secondary flocculent pump stroke percentage, dosage, and whether in auto or manual position.
- Record the alum tank level from the sight gauge and calculate the previous day's usage.
- Run sample and compare the effluent chlorine residual with the auto analyzer's results.
- Run sample and compare the effluent turbidity with the continuous analyzer's results.
- Check the level of the secondary flocculent and fill if necessary.
- Record the totalized fluoride meter reading and check the level of the fluoride in the saturator, filling if necessary.
- Test and record the fluoride concentration in the plant effluent. Fluoride concentration shall be between 0.8 and 1.2 mg/L at plant sample point and in the distribution system.

Daily Maintenance Activities
(continued)

Surface Water Filtration Plant (in operation)

- Visually check all pumps, mechanical devices, and equipment for abnormalities.
- Record weather conditions.
- Record time of last backwash.
- Record the chlorine residuals required on the Washington State DOH Disinfection Monthly Form.
- Record all required parameters on the Washington State DOH Water Treatment Plant Monthly Report.

Surface Water Filtration Plant (during extended shutdown)

- Check influent pressure gauge (this checks pressure in transmission pipeline).

Well No. 5, 6, 9, Washougal Wellfield (Wells 7, 8, 10, 11, 12), & Well No. 13

- Check motor oil level at each well
- Verify proper pumping operations.
  - Read upstream and down stream pressure gauges to see if pressures are in normal operating range.
  - Read flow meters for instantaneous and totalized flow to verify flow.
  - Observe well pump and motor while operating for abnormal vibrations.
  - Check for signs of loose fittings (water on floor).
- Record sodium hypochlorite level in drum (Well 5, and 9 only).
- Test chlorine residual and record. Chlorine residual should be between 0.7 and 1.0 mg/L at the sample point.
- Check fluoride level in the saturator and fill as necessary.
- Test fluoride concentration and record. Fluoride concentration shall be between 0.8 and 1.2 mg/L at well sample point and in the distribution system.
- Record totalized flow meter reading from fluoride saturator.
- Check for proper operation of surge valves at each well. Inspect blow off discharge points to check if standing water is accumulating anywhere in the surge discharge system.
- Check for proper operation of chlorinator for each well.
- Check for proper operation of the fluoride system for each well.

Diesel Powered Auxiliary Generators (Washougal Wellfield Facility, Well No. 13, New Gregg Booster Station, Angelo Booster Station, Lower Prune Hill Pump Station)

- Perform general inspection.
- Perform Coolant heater inspection.
- Check oil level.
- Check coolant level.
- Check fuel level.
- Record hour meter

Weekly Maintenance Activities

Jones and Boulder Creek Surface Water Sources

Twice per week (when in operation)

- Check impoundment structure for stability at both surface water intakes.
- Check for debris accumulation at intake screens at both sources.
- Read and record totalized flow on flowmeter.

Weekly

- Perform security check of facilities.

Surface Water Filtration Plant (during extended shut down)

Every TWO weeks:

- Backwash both filters.
- Check sodium hydroxide storage tank for signs of leakage.
- Check Alum storage tank for mixer operation and signs of leakage.

Reservoirs: Butler, Gregg, Upper & Lower Prune Hill, & Lacamas

- Perform full security check.
- Perform full structural check.

Booster Pump Stations: Butler, Old & New Gregg, Upper & Lower Prune Hill, Angelo Forest Home, Lacamas, & Francis Rd

- Perform full security check.
- Verify proper pumping operations.
    - Read upstream and down stream pressure gauges to see if pressures are in normal operating range.
    - Read flow meters for instantaneous and totalized flow to verify flow.
    - Observe well pump and motor while operating for abnormal vibrations.
    - Check for signs of loose fittings (water on floor).

Diesel Powered Auxiliary Generators (Washougal Wellfield Facility, Well No. 13, New Gregg Booster Station, Angelo Booster Station, Lower Prune Hill Pump Station)

- Air cleaner inspection.
- Air pipe inspection.
- Battery charger inspection.
- Drain fuel filters.
- Check block heater connections

Monthly Maintenance Activities

Surface Water Filtration Plant

- Enter all Plant reports for the month into the City's database.
- The reports are to be reviewed by the Operations Manager and/or Operations Supervisor and submitted to the Department of Health.
- Check oil in all pumps and compressors.

Well No. 5, 6, 9, Washougal Wellfield (7, 8, 10, 11, 12) and Well 13

- Inspect property for security purposes.
- Check fluoride pump gear oil.
- Inspect pump packing lubrication for proper operation.
- Inspect cooling screens on Vertical Turbine pumps for blockage.

On-Site Sodium Hypochlorite Generation System (Washougal Wellfield and Well 13)

- Clean blower inlet screen
- Check hardness of water from water softener – should be less than 10 mg/L.

Diesel Powered Auxiliary Generators (Washougal Wellfield Facility, Well No. 13, New Gregg Booster Station, Angelo Booster Station, Lower Prune Hill Pump Station)

- Drain exhaust condensate trap
- Check starting batteries
- Check antifreeze and DCA concentration
- Drive belt inspection
- Check block heater connections

Semi-Annual Maintenance Activities

On-Site Sodium Hypochlorite Generation System (Washougal Wellfield and Well 13)

- Level switch – remove and clean calcification
- Clean cells if needed

Annual Maintenance Activities

Jones and Boulder Creek Surface Water Sources

- Jones Creek - close inlet valve to screenhouse so that no water is diverted to surface water filtration plant from May 15th to November 1.

- Boulder Creek - close outlet valve from screenhouse so no water is diverted to surface water filtration plant from May 15th to November 1.

Surface Water Chlorination Plant

- Drain and clean hypochlorite tank when tank is taken off line from May 15th to November 1st.

Surface Water Filtration Plant

- Change motor oil in all pumps and compressors.
- Inspect roof and building for maintenance items.
- Clean fluoride vent fan filter bags.
- Check vent where exhaust from fluoride vent exists the building

Well No. 5, 6, 9, Washougal Wellfield (Wells 7, 8, 10, 11, 12) and Well 13

- Change oil on all oil lubricated equipment.
- Clean out fluoride saturator.
- Clean filter bags on ventilation fan.
- Infrared scan electrical panels.
- Exercise pump.
- Sample water.
- Inspect roof and building for maintenance requirements.
- Check control valves and piping for proper operation

Annual Maintenance Activities
(continued)

On-Site Sodium Hypochlorite Generation System (Washougal Wellfield and Well 13)

- Temperature switch – confirmation that the bi metal opens at 60º C when immersed in hot water
- Replace bellows and poppets on water pump.
- Inspect water heater and perform the following as needed:
  - Descale the heating element
  - Change anode rod
  - Change heating element
  - Change thermostat
  - Reset high limit switch

Reservoirs: Butler, Gregg, Upper & Lower Prune Hill, & Lacamas

- Visually inspect inside of reservoir using Liquivision and/or Tank Divers.
- Inspect and remove sediment.

Booster Pump Stations: Butler, Old & New Gregg, Upper & Lower Prune Hill, Angelo Forest Home, Lacamas, & Francis Rd

- Pump and motor maintained per manufacturer's instructions.
- Check control valves for proper operation
- Check Operations Center files for each of the booster stations for instructions concerning equipment at pump station.

Diesel Powered Auxiliary Generators (Washougal Wellfield Facility, Well No. 13, New Gregg Booster Station, Angelo Booster Station, Lower Prune Hill Pump Station)

- Inspect radiator hoses
- Change air cleaner element
- Change crankcase oil and filter
- Change coolant filter
- Change fuel filters
- Clean cooling system
- Check block heater connections

Distribution System

- Leak detection survey (as determined by maintenance staff)

Five Year Maintenance Activities

Pressure Reducing Valves

- Perform a comprehensive evaluation of the PRVs in the system. This is contracted through GC Systems.
- Quarterly inspect each station

Appendix N

Emergency Response Program

APPENDIX N

WATER SYSTEM EMERGENCY RESPONSE PLAN

FEDERAL AND STATE REQUIREMENTS

FEDERAL REQUIREMENTS

Under the Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act), Public Law 107-122 of June 12, 2002, drinking water systems serving more than 3,300 but less than 50,000 customers must complete a vulnerability assessment by June 30, 2004 and an emergency response plan (ERP) by December 30, 2004.

The U.S. Environmental Protection Agency (EPA) considers completion to mean the date on which the vulnerability assessment and certification were sent to EPA. The City submitted its vulnerability assessment on June 30, 2004, and the City completed its ERP certification by December 30, 2004.

The Bioterrorism Act requires the ERP to incorporate the results of the vulnerability assessment and include the following:

- Plans, procedures and equipment that can be implemented or utilized in the event of a terrorist or other intentional attack on the public water system.

- Actions, procedures and identification of equipment that can obviate or significantly lessen the impact of terrorist attacks or other intentional actions on the public health and the safety and supply of drinking water provided to communities and individuals.

STATE REQUIREMENTS

The operations and maintenance section of Chapter 246-290-415 (2)(b) WAC requires public water systems in Washington to have an emergency response plan as part of a water system plan. It also requires that systems employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump houses, and distribution systems from possible damage or intruders. The State requirements for emergency response must address all applicable hazards that could lead to abnormal operating conditions, such as flood, fire, unscheduled power outages, facility failure and system maintenance.

WATER SYSTEM EMERGENCY RESPONSE PLAN OUTLINE

Both the EPA and Washington State Department of Health (DOH) have prepared guides to develop emergency response plans that will comply with the Bioterrorism Act.

- *Emergency Response Guidance for Small and Medium Community Water Systems to Comply with the Public Health Security and Bioterrorism Preparedness and Response Act of 2002*, EPA 816-R-04-002, April 2004.

- *Emergency Response Planning Guide for Public Drinking Water Systems*, DOH Publication 331-211, May 2003.

The City's water system emergency response plan is based primarily upon the EPA guidance document, which establishes eight basic elements for an ERP:

1. System Specific Information
2. Community Water System Roles and Responsibilities
3. Water System Communication Procedures
4. Personal Safety
5. Identification of Alternative Water Sources
6. Replacement of Equipment and Chemicals
7. Property Protection
8. Water Sampling and Monitoring

The DOH planning guidance has been utilized to develop the eight elements of this ERP. Whenever possible, terminology used by the Department of Homeland Security and its sub-agency, the Federal Emergency Management Agency (FEMA) as well as the Occupational Safety and Health Administration (OSHA) and the National Fire Protection Association (NFPA) has been used relative to emergency management principles, hazardous materials response, mass casualty response and emergency medical response.

The following documents from EPA Water Security website were a technical resource for this ERP as well:

(Reference: http://cfpub.epa.gov/safewater/watersecurity/index.cfm)

Planning for and Responding to Drinking Water Contamination Threats and Incidents Response Protocol Toolbox (December 2003)

- Overview and Application
- Module 1: Water Utility Planning Guide
- Module 2: Contamination Threat Management Guide
- Module 3: Site Characterization and Sampling Guide
- Module 4: Analytical Guide

- Module 5: Public Health Response Guide
- Module 6: Remediation and Recovery Guide

EMERGENCY PLANNING AND OPERATION PRECEPTS

To be effective in a resource-constrained environment where multiple response agencies are involved, emergency planning for a water system must be considered in the context of the community's overall planning for emergency operations. The following sections identify and discuss the various plans that the City utilizes in its "all hazards" emergency management program.

CITY OF CAMAS DISASTER MANUAL

The City's Disaster Manual identifies the Emergency Response functions within the City based on a modified Incident Command System. The City Fire Chief is designated as the Incident Commander. The five functions coordinated by the incident commander are as follows:

- Police
- Public Information Officer
- Resource Officer (includes Public Works)
- Communications
- Disaster Control Officer

Emergency Operations Center (EOC)

The EOC is located at the City Police Department Headquarters building and provides overall direction, control and coordination of an incident. The EOC is primarily concerned with resource management and coordination between City Departments and other County/Regional, State and Federal emergency response and management agencies.

On-Scene Emergency Management

On scene management of emergencies is the responsibility of the Disaster Control Officer, who has a number of functions to coordinate, including:

- Suppression (includes rescue and control)
- Safety
- Triage

The City does not have its own hazardous materials response capability. This response capability is available from the City of Vancouver and the Georgia Pacific paper mill through a coordinated response plan that is under development by the County Regional Emergency Services Agency.

CLARK COUNTY REGIONAL EMERGENCY SERVICES AGENCY (CRESA)

The City utilizes the Clark County Regional Emergency Services Agency (CRESA) as its emergency management agency. CRESA also serves as the Local Emergency Planning Authority under the Superfund Amendments and Reauthorization Act (SARA) Title III (also known as the Emergency Planning and Community Right to Know Act – EPCRA) for communities in Clark County, including the City of Camas, the City of Washougal and the City of Vancouver. The CRESA website is:

http://www.cresa911.org/

RELATED COUNTY AND REGIONAL PLANS

In the event local capabilities to manage an incident are exceeded, the City will utilize mutual aid partners through the following plans and guidance documents:

- Clark County Regional Hazardous Materials Response Plan
- Washington State Department of Transportation Public Works Emergency Response Mutual Aid Agreement
- Interlocal Agreement between the City of Camas and the City of Washougal for Equipment Acquisition
- Reimbursable Services Agreement between Clark County Department of Public Works and the City of Camas

HAZARD IDENTIFICATION AND VULNERABILITY ANALYSIS

The City of Camas utilizes the Clark County Hazard Identification and Vulnerability Analysis as the primary means for identifying hazards and vulnerabilities. The Clark County HIVA was last updated in 2003.

To comply with the Bioterrorism Act, the City completed a water system vulnerability assessment (WSVA) in June 2004. The results of the WSVA are considered confidential and will not be addressed as to their specific finding and recommendations in the ERP. However, the ERP must incorporate the WSVA results in terms of providing response plans that address the general categories of vulnerabilities identified in the WSVA.

Table N-1 summarizes all hazards identified in the County HIVA and the City's WSVA that have been considered in the development of the City's ERP; the final column identifies those hazards considered significant enough to address in the City's water

system ERP. Clark County has assigned probability, vulnerability and risk levels to each hazard. Each of these parameters is discussed in greater detail below.

Probability

An adjective description (High, Moderate, or Low) of the probability of a hazard impacting Clark County within the next 25 years is assigned to each hazard. Probability is based on an assessment of a hazard's frequency using information provided by relevant sources, observations and trends.

- HIGH: There is great likelihood that a hazardous event will occur within the next 25 years.

- MODERATE: There is moderate likelihood that a hazardous event will occur within the next 25 years.

- LOW: There is little likelihood that a hazardous event will occur within the next 25 years.

Vulnerability

An adjective description (High, Moderate, or Low) of the potential impact a hazard could have on Clark County is assigned to each hazard. It is the ratio of population, property, commerce, infrastructure and services at risk relative to the entire County.

- HIGH: The total population, property, commerce, infrastructure and services of the county are uniformly exposed to the effects of a hazard of potentially great magnitude. In a worse case scenario there could be a disaster of major to catastrophic proportions.

- MODERATE**:** The total population, property, commerce, infrastructure and services of the county are exposed to the effects of a hazard of moderate influence;

  or

  The total population, property, commerce, infrastructure, and services of the county are exposed to the effects of a hazard, but not all to the same degree;

  or

  An important segment of population, property, commerce, infrastructure, or service is exposed to the effects of a hazard. In a worse case scenario

there could be a disaster of moderate to major, though not catastrophic proportions.

- LOW: A limited area or segment of population, property, commerce, infrastructure, or service is exposed to the effects of a hazard. In a worse case scenario there could be a disaster of minor or moderate proportions.

Risk Rating

An adjective description (High, Moderate, or Low) of the overall threat posed by a hazard over the next 25 years. It is a subjective estimate of the combination of probability of occurrence and vulnerability.

- HIGH: There is strong potential for a disaster of major proportions during the next 25 years;

  or

  History suggests the occurrence of multiple disasters of moderate proportions during the next 25 years. The threat is significant enough to warrant major program effort to prepare for, respond to, recover from, and mitigate against this hazard. This hazard should be a major focus of the emergency management training and exercise program.

- MODERATE: There is moderate potential for a disaster of less than major proportions during the next 25 years. The threat is great enough to warrant modest effort to prepare for, respond to, recover from, and mitigate against hazard. This hazard should be included in an emergency management training and exercise program.

- LOW: There is little potential for a disaster during the next 25 years. The threat is such as to warrant no special effort to prepare for, respond to, recover from, or mitigate against this hazard. This hazard need not be specifically addressed in the county's emergency management training and exercise program except as generally dealt with during hazard awareness training.

TABLE N-1

Hazard Identification and Vulnerability Assessment Summary City of Camas

Hazard Classification	Hazard	Probability	Vulnerability	Risk	Applies to City of Camas Water System
Drinking Water Unique	Bacteriological Contamination	MODERATE	MODERATE	MODERATE	X
Natural Disaster	Drought	HIGH	MODERATE	MODERATE	X
	Earthquake	HIGH	HIGH	HIGH	X
	Flood	HIGH	MODERATE	HIGH	X
	Forest/Wildland Fire	MODERATE	MODERATE	MODERATE	X
	Landslide	HIGH	LOW	MODERATE	X
	Severe Local Storm	HIGH	HIGH	HIGH	X
	Tornado	HIGH	LOW	LOW	X
	Volcano	LOW	MODERATE	LOW	X
Technological Hazards	Airplane Crash	MODERATE	LOW	MODERATE	X
	Dam Failure	LOW	LOW	LOW	X
	Hazardous Materials	HIGH	MODERATE	HIGH	X
	Energy Emergency	MODERATE	MODERATE	MODERATE	X
	Transportation Accident	MODERATE	LOW	MODERATE	X
	Urban Fire	MODERATE	MODERATE	MODERATE	X
Criminal Activity	Terrorist Use of Chemical, Biological, Radiological, Nuclear Agents and Explosives	LOW	MODERATE	MODERATE	X
	Cyber Attack	LOW	MODERATE	MODERATE	X
	Vandalism	LOW	MODERATE	MODERATE	X

SYSTEM SPECIFIC INFORMATION

Chapter 3 of this manual provides a complete description of the City's water system facilities.

Interties

The City currently has an emergency intertie agreement with the City of Washougal to the east. The City has two one-way PRV interties with Washougal, located on SE Shepherd Street and at the intersection of SE 3rd Street and Whitney Street. These interties provide water from the City of Camas to the City of Washougal under low pressure conditions. The City does not have any other intertie agreements at the present time.

Telemetry and Control System

The City's telemetry system monitors levels in the storage facilities and the status of the booster pump stations and groundwater wells. Installed in 1988 and upgraded in 2000, the system allows the City to record pump run times, filter plant metering information, and relays filter plant alarms to the office. The system also has the capability of reading instantaneous flow from individual pumps; however, the City does not have the source and pump meters in place that will allow this operation. The system allows the City to monitor and control the operation of these facilities from the office and over the Internet from home. The chemical feed system for the Washougal wellfield and can be remotely monitored in its operations in the same manner as the wells and reservoirs.

Supervisory Control and Data Acquisition (SCADA) System

The City has a SCADA system with master control located at the City Operations Center. The system uses programmable control software, which can be controlled by a personal computer at the operations center or remotely by a modem connected to a remote computer. The system monitors reservoir levels, well status, well flow rate, booster pump flow rate when metered, pump status, run time and alarm conditions. Reservoir levels are recorded on circular charts on a continual basis. The City also has the ability to monitor the drawdown level in the aquifer of Well No. 9.

WATER SYSTEM ROLES AND RESPONSIBILITIES

PUBLIC WORKS DIRECTOR

The City water system is operated by the Public Works Department. In the event of an emergency sufficient to activate the EOC, the City's Public Works Director or designated representative will locate to the EOC at the Police Department. The Public Works EOC representative is responsible for coordinating all public works functions with other

members of the EOC Operations Group. The Public Works Director also serves as the Public Information Officer for all Public Works matters.

OPERATIONS MANAGER

The water system is one of several utilities within the Public Works Department that is managed by the Operations Manager, who reports directly to the Public Works Director. In the event of an emergency involving the water system, the Operations Manager will serve as the on-scene Incident Commander until properly relieved by an appropriate Police or Fire Department representative The Operations Manager is responsible for all aspects of the water system during an emergency, including damage assessments, assessing customer impacts, coordinating with jurisdictional public health agencies and adjacent water utilities, keeping the public and media informed through the City's Public Information Officer, and working with the Public Works Engineering Manager for design and construction services required for repair and recovery operations.

OPERATIONS SUPERVISOR

The water utility has a supervisory operator reporting to the Operations Manager, who is responsible for operating the water system during an emergency. The Operations Supervisor assists the Operations Manager in damage assessments and coordinating repair and recovery operations.

WATER QUALITY MONITOR

Within the water division a water system operator is assigned responsibility for water quality monitoring. The responsibilities for water quality monitoring for routine compliance sampling and testing are outlined in the Operations and Maintenance manual. Positive coliform events of the water system require the water quality monitoring operator to follow procedures as outlined in the water sampling and monitoring section within this plan. Intentional contamination of the water system is covered in a separate incident specific plan at the end of this plan.

WATER SYSTEM COMMUNICATION PROCEDURES

The City Disaster Manual establishes communications procedures during an emergency. The City utilizes a 911 call service operated by CRESA, which provides dispatch services for fire police and emergency medical services.

The City maintains emergency phone number lists for use by City personnel. The list contains City staff home phone numbers, addresses and cell phone numbers. The second list includes the numbers for emergency services, generator rentals, adjacent utilities, fuel suppliers, parts supplies, safety equipment, pumper trucks, and contractors. The emergency phone numbers are updated frequently as phone numbers change.

The employee on-call will be the first person notified in the event of an emergency, disaster, or incident. The responding party shall report to the command center for a briefing and further instructions. The on-call employee shall be in charge of all Public Works functions until relieved by a higher ranking Public Works employee.

At the command center, the on-call employee will receive a "Public Works Department Duty Checklist." A copy of this form is provided in the Appendix H. The employee is to fill out the checklist. The employee is to determine if it is within the employee's capabilities to handle the incident requirements of the Public Works Department. If the employee is unable to fill the needs of the incident, the employee shall notify the Water/Sewer Supervisor. The Water/Sewer Supervisor shall notify the Public Works Operations Manager of the incident.

The City of Camas Disaster Manual provides additional procedures for Public Works response. A copy of this document can be found in the offices of the Public Works Director and the Public Works Operations Manager. It is an orange manual and all Public Works employees should be familiar with the contents and procedures.

In the event that public notification is required during a water system emergency, the Public Works Director provides information to the media for this purpose.

Liaison with the Washington State Department of Health (DOH) is normally the responsibility of the Public Works Director. An emergency contact list for DOH is presented in Table N-2.

TABLE N-2

Emergency Contact List for DOH

Agency/Contact	Contact Telephone Number	Purpose
DOH Hot Line DOH SWRO After Hours	(877) 481-4901 (360) 236-3030	After Hours Emergencies.
DOH/Regional Engineer	(360) 236-3033	Regulatory Assistance
DOH/Coliform Program Manager - SWRO	(360) 236-3044	Coliform Monitoring
DOH Public Information Coordinator	(360) 236-3162	Media Affairs and Public Notification Assistance
Security Manager (SWRO)	(360) 236-3159	Questions Regarding Water System Security

The City has entered into a mutual aid agreement with the City of Vancouver and several other public works organizations. The contact names and phone numbers for the responsible individuals for those purveyors are presented in Table N-3.

TABLE N-3

Mutual Aid Water Utility and Public Works Contacts

Utility	Contact Person	Contact Number	
		Phone	FAX
City of Vancouver	Terry McClure	(360) 735-8845	(360) 696-8002
City of Washougal	Trevor Evans	(360) 835-2662 (360) 835-8501	(360) 835-8808
Clark County	Peter Capel	(360) 397-2446 (360) 397-6118 (360) 901-7469(1)	(360) 397-6051
Clark Public Utilities	Doug Quinn	(360) 992-8022 (360) 992-3000(1)	(360) 992-8027
Washington State Department of Transportation	Bob Kofstad	(360) 905-2130 (360) 921-9119(1)	(360) 905-2075

(1) After hours

PERSONAL SAFETY

EVACUATION PLANS

The City's Disaster Manual provides limited guidance for evacuation operations. The Police Department has overall responsibility for evacuation operations. Each City Department and Division is responsible for developing emergency evacuation plans for its department/division.

The on-scene incident commander will normally direct evacuation operations. The Incident Commander at the scene will initially be the senior City employee at the scene; the on-scene incident commander duties will eventually be assumed by a Police or Fire Department representative depending upon the nature of the emergency.

The Occupational Safety and Health Administration (OSHA) provides guidance on developing evacuation plans for terrorist incidents:

http://www.osha.gov/dep/evacmatrix/index.html

Per the City's Disaster Manual, the Fire Department will be responsible for incident command during a hazardous materials (HAZMAT) release as this duty requires specific

training and certification under federal regulations. City and Regional Emergency Plans for terrorist incident response also require that HAZMAT protocols and procedures be followed for incidents involving the intentional release of chemical and biological agents.

EVACUATION ROUTES AND EXITS

Evacuation routes and exits for City facilities are to be posted at each facility. In the event of an evacuation from an area that encompasses more than one facility, the City Police or Fire Department will identify additional evacuation routes as needed. During an incident involving the release of hazardous materials, the Fire Department is responsible for identifying evacuation routes that mitigate hazards to evacuees. In the absence of direction from the Fire Department, the general rule for evacuation during a hazardous materials release is to travel uphill and upwind of the release.

ASSEMBLY AREAS AND ACCOUNTABILITY

Assembly areas for evacuation from City facilities are posted along with evacuation routes and exits at City facilities. In the event of an evacuation from an area that encompasses more than one facility, the City Police or Fire Department will identify additional assembly areas as needed. The senior water division employee is responsible for ensuring that all personnel are accounted for at the assembly area after an evacuation has been conducted.

SHELTER

Sheltering is not addressed in the City's Disaster Manual. The City defers to CRESA for emergency sheltering operations. The City is responsible for sheltering of City employees; this responsibility includes identifying City facilities that may be used for sheltering during a emergency.

TRAINING AND INFORMATION

All water utility employees are provided with the following training:

- Blood borne pathogens
- Cardiopulmonary resuscitation (CPR)
- Defensive driving
- Emergency first aid
- Emergency response awareness (including FEMA ICS - IS195)
- Equipment lock-out/tag-out procedures
- Fall protection
- Fire extinguishers/evacuation
- Hazard communication
- Hearing conservation and testing

- Protection from water borne pathogens

When appropriate for their duties, water utility employees are provided training in:

- Bucket truck
- Confined space (aerial platform)
- Forklift operation
- Respiratory protection and fit testing
- Trenching and shoring

Water utility employees are issued protective equipment appropriate to their job responsibilities including hard hats, safety goggles, work gloves and safety boots.

Recommended training: The water quality monitor should be trained in hazardous materials awareness (reference: 29 CFR 1910.120). This training is available from the City Fire Department.

Emergency Equipment

The water utility has a hoist, harness and gas detection equipment for confined space entry. All employees are issued hard hats and reflective safety vests. All trucks are equipped with emergency first aid kits.

FIRST AID

Water utility employees are trained in emergency first aid that includes the following:

- How to determine the safe response to an emergency situation.
- Recognizing and caring for life-threatening emergencies in adults, such as respiratory, choking, and cardiac problems.
- Caring for injuries including severe cuts and burns, sprains and strains.
- Caring for sudden illnesses such as poisonings, bites, and stings.
- Recognizing and caring for heat- and cold-related emergencies.
- Workplace emergency procedures, including notifications for medical emergencies.

The Fire Department provides emergency medical services for trauma victims whose injuries exceed emergency first aid treatment.

IDENTIFICATION OF ALTERNATIVE WATER SOURCES

INTERTIES

The City has interties with the City of Washougal that would normally be used to supply water to the City of Washougal. The City has no other interties and; therefore, must be self-sufficient in the event of a water shortage or water system failure.

REDUNDANCY IN CITY WATER SYSTEM

The City has several wells and a surface water source that provide some redundancy in the event certain elements of the water system fail. For example, if the Washougal Wellfield is flooded, the surface water source may serve as a backup, with water conservation measures in place to offset the loss of the wellfield.

Emergency Water Supplies

Under the County's CEMP, citizens are urged to keep a 72-hour supply of food and water in the event of an emergency. The City will endeavor to supply potable water to support emergency operations within its capabilities.

TRANSPORT OF POTABLE WATER DURING EMERGENCIES

If the City obtains potable water by transporting from another source, DOH has issued guidelines for water system utilities that deliver potable water to the public during emergencies. This guidance is found at the following website and are summarized below:

http://www.doh.wa.gov/ehp/dw/Publications/Truck_Transport.htm

General

- DOH recommends that someone with water treatment expertise be responsible for the operation and management of trucked potable water.

- The City should contact the regional office of the DOH Division of Drinking Water (DOH-DDW) or local health department to discuss current requirements and approve the proposed operation. [see WAC 246-290-415(2)(d) and 246-290-451(4)]. Southwest Regional Office – (360) 236-3030.

Truck Container

- The truck container must be contaminant-free and capable of being maintained so that water contamination is prevented.

- If a truck container has been previously used only for potable water and has been protected from possible contamination, it may be used without disinfection and testing for bacteria.

- Truck containers that cannot pass the initial testing criteria after disinfection (i.e. absence of coliforms) shall not be used.

- Trucks previously used for substances other than potable water will be evaluated on an individual basis. Consult with DOH before using trucks that may have previously carried toxic or other non-potable liquids.

- All truck containers must be filled or emptied through an air gap or approved double-check valve assembly, in accordance with WAC 246-290-490.

Initial Truck Disinfection

- The tank and all hoses, pumps, and other equipment used in handling water should disinfected by filling with water containing at least 50 to 60 parts per million (ppm) of chlorine and then held in the tank for at least 24 hours.

- One gallon of liquid bleach is required in every 1,000 gallons of water to produce 50 to 60 ppm. Bleach should be 5.25 to 6 percent hypochorite with no additives. Bleach should be added in proportion to the water as the tank is being filled, e.g., add approximately one-half gallon of bleach with each 500 gallons of water.

- The chlorine solution must be flushed from the tank after 24 hours.

- Once the tank is emptied, refill it with the water to be transported, and test for coliform bacteria. If coliforms are present, repeat the process. If the tank cannot be disinfected to eliminate coliforms, it must not be used.

- Water to be transported by tank trucks should contain a free chlorine residual of about one part per million (1 ppm or 1 mg/L) at the beginning of the haul.

Source of Water

- The source for emergency trucked water must come from an approved public water supply, unless otherwise approved by DOH.

- Every precaution should be taken to ensure that the water remains potable once it is collected and transported.

Receiving Tank

- The water system's receiving tanks must be inspected to assure that water quality issues will not occur during filling and later distribution to consumers.

- Receiving tanks must be cleaned and disinfected using the procedures for truck containers (see "Initial Truck Disinfection" guidelines).

- The receiving tanks must be kept secure and protected from contamination throughout the emergency response.

- The customer's receiving tank must be filled through an air gap or an approved double-check valve assembly in accordance with WAC 246-290-490.

Documentation and Record Keeping

- The receiving water system is responsible for documenting and keeping proper records of the emergency trucked water operation.

- Records should be retained for at least 6 months for review upon request by health agencies, haulers, or the supplying water system.

REPLACEMENT OF EQUIPMENT AND CHEMICALS

EQUIPMENT AND SUPPLIES

A list of equipment suppliers that the City has access to for emergencies is provided in Appendix I.

CHEMICALS

Table N-4 lists chemicals used by the City in its water treatment processes. Appendix J provides a list of chemical suppliers.

To assist the City in identifying chemicals with emergency planning implications, threshold quantities under EPCRA, the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and the Clean Air Act (CAA) are also shown in Table N-4, where applicable.

The applicability of each regulation is briefly discussed below.

Use and Storage – EPCRA governs reporting requirements for chemicals, either in use or in storage, that pose a significant environmental or health hazard.

Liquid Spill – In the event of a spill where the quantity exceeds the CERCLA threshold, certain reporting requirements will be in effect.

Risk of Air Release – Gaseous chemicals will require a risk management plan if they exceed threshold quantities.

Explanatory notes following Table N-4 provide greater detail regarding reporting requirements.

The City should coordinate all EPCRA, CERCLA and CAA planning and reporting requirements with CRESA.

Hazardous substance releases should be reported to the Washington State Department of Ecology (Ecology) and responses coordinated with CRESA through the City Fire Department.

CRESA Phone: (360) 737-1911

Ecology 24-Hour Spill Response Phone: (360) 753-2353.

TABLE N-4

Water Treatment Chemicals used by the City of Camas

Name[1]	Use[2]	CAS/EPCRA Section 313 Category Codes[3]	EPCRA Section 302 EHS TPQ[4] (pounds)	EPCRA Section 304 EHS RQ[5] (pounds)	CERCLA RQ[6] (pounds)	EPCRA Section 313[7]	CAA 112(r) TQ[8] (pounds)
Aluminum sulfate (alum)	CG	10043-01-3	N/A	N/A	**5,000**	N/A	N/A
Calcium hypochlorite	DI	7778-54-3	N/A	N/A	**10**	N/A	N/A
Hydrofluorosilicic acid	F	7732-18-5	N/A	N/A	N/A	N/A	N/A
Polymer	CG	12125-02-9	N/A	N/A	**5,000**	N/A	N/A
Sodium fluoride (> 99%)	F	7681-49-4	N/A	N/A	**1,000**	N/A	N/A
Sodium hydroxide (20 – 30%)	CO/pH	1310-73-2	N/A	N/A	**1,000**	N/A	N/A
Sodium hypochlorite (5-12.5%)	DI	7681-52-9	N/A	N/A	**100**	N/A	N/A

All reporting quantities noted in **bold** font n/a = not applicable.

(1) The chemicals listed above were taken from an extensive inventory of chemicals provided in a document titled *List of Lists, Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act (consolidated list), EPA,550-B-01-003, October 2001.* EPA put the list together to help chemical handling firms determine what reporting requirements apply under sections 302, 304, or 313 of EPCRA and if they are subject to the accident prevention regulations under CAA section 112(r). The chemical names are those that are generally used in the regulatory programs developed under EPCRA, CERCLA, and CAA section 112(r)

(2) Use Definitions: Coagulant (CG); Corrosion Control (CO); Disinfection (DI); Fluoridation (F); pH Adjustment (pH).

(3) The chemicals above are organized under the Chemical Abstracts Service (CAS) registry number and the EPCRA Section 313 category codes.

(4) EPCRA Section 302 includes a list of *Extremely Hazardous Substances* (EHSs). The presence of EHSs in quantities at or above the Threshold Planning Quantity (TPQ) require local emergency planning committees to develop emergency response plans and notify State emergency response committees. Facilities with a listed EHS are subject to the reporting requirements of EPCRA section 311. The facility must provide a material safety data sheet or a list of covered chemicals to State and local emergency response committees and the local fire department. The minimum TPQ for section 311 reporting is 500 pounds or the TPQ, whichever is less. EHS TPQ and RQ are represented in pounds.

(5) Under EPCRA Section 304, releases of reportable quantities (RQ) of EHSs are subject to State and local reporting.

(6) Under Section 304 of EPCRA, releases of hazardous substances listed in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) are to be reported to the National Response Center, as well as to the State and local emergency response committees. The CERCLA RQ column shows the reportable quantities (in pounds) for chemicals that are CERCLA hazardous substances as listed in 40 CFR Part 302, Table 302.4. Solid metals listed under CERCLA, with mean diameters greater than 100 micrometers, are not reported. The CERCLA RQs listed above apply to smaller particles.

(7) Under the column titled Section 313, the notation "313" means that the chemical is required to report under section 313 and 6607 of the Pollution Prevention Act. An "X" indicates that this chemical may have a second name or that the same chemical may have the same CAS number listed under a different name. The lower case "c" indicates that a chemical must report under one or more of the EPCRA section 313 chemical categories even though it has no CAS number.

(8) Under CAA section 112(r) EPA identified 77 toxic substances and 63 flammable substances, including their threshold quantities (TQs), which are subject to accident prevention provisions. The requirements for risk management programs for accidental release prevention are found in 40 CFR Part 68. CAA section 112(r) lists several substances in solution that are covered only in concentrations above a specific level. Most of these chemicals are listed above and include ammonia CAS #7664-41-7 (concentrations 20 percent or greater); hydrochloric acid CAS #7647-01-0 (concentrations 37 percent or greater); hydrogen fluoride/hydrofluoric acid CAS #7664-39-3 (concentrations 50 percent or greater); and nitric acid CAS #76997-37-2 (concentrations 80 percent or greater). CAA section 112(r) TQs are in pounds and apply to those quantities within a process and not at the facility as a whole.

PROPERTY PROTECTION

The City controls access to its water facilities using barriers and locks. Reservoirs are fenced, with access controlled by locked gates. Utility vaults are covered and locked. The City maintains strict control over its keys. The Operations Manager has the master key to all locks. Employees are issued keys only to those facilities they are required to access to perform their duties. The City has also partnered with residential customers to be vigilant of the areas around its chlorination plant, filter plant, well and reservoir sites to alert the City if they notice any suspicious activity.

WATER SAMPLING AND MONITORING

Water sampling for routine compliance is described in Chapter 2 of this manual.

Water sampling and monitoring for a coliform incident is described below under incident specific plans (bacteriological contamination).

Water sampling and testing for a suspected intentional contamination incident is described below under incident specific plans.

MAJOR WATER SUPPLY INTERRUPTIONS

WATER MAIN BREAKS

Depending on the location where the main break occurs, if susceptible populations are impacted, use contact list in Appendix B (Coliform Monitoring Plan) for notification. City will provide bottled water for lengthy outages. Depending on circumstances, portable toilets may be supplied as well. Trucked potable water may be provided. If the City uses trucked potable water, the guidelines in DOH Publication #331-063 will be followed.

The City maintains an inventory of piping and fittings to address most emergency repair requirements and has a list of vendor telephone numbers to obtain supplies when existing material stocks are inadequate for emergencies. When repairs are too large for City crews to manage, the City will contact contractors from its small works roster.

When water supply interruptions for a pressure zone are expected to be lengthy, the City will consider instituting measures to allow customers to come to a reservoir and obtain water directly from a reservoir. Any water dispensed in this manner will be done under the supervision of a City employee.

BOOSTER STATIONS

The City has developed detailed written procedures for operating the water system when booster stations are not in service and has figures showing locations of pumps, piping, meters, shut off valves and other key features of each facility, such as valve size/type, motor manufacturer/type/hp and pump capacity/type. Copies of these procedures, technical details and figures are kept at each facility.

A brief summary of the booster station emergency procedures follows.

Butler Booster Station

Auxiliary Power

The Butler Booster Station does not have an auxiliary power system.

HOA Setting

Emergency operation of the booster station may require the pump to be operated in the HAND mode to compensate for distribution system problems in other areas of the system during a power outage.

Backup Operations

Angelo Booster Station serves as a backup for feeding the Lower Prune Hill (455) Zone if the Butler Booster Station is out of service. The City has a standby pump for the 455 Zone at the Angelo Booster Station in the event that a pump is out of service. There is sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Gregg Booster Station

Auxiliary Power

The New Gregg Booster Station has a diesel powered 300-kW generator with automatic transfer switch capable of operating the New Gregg Booster Station pumps during a power outage.

HOA Setting

Emergency operation of the booster station may require the pump to be operated in HAND mode to compensate for distribution system problems in other areas.

Backup Operations

There is no back up in the event Gregg Booster Stations are out of service; however, there is sufficient pumping capacity at the Gregg Booster Stations to operate with the largest pump out of service under normal system demands, including fire flow.

Angelo Booster Station

Auxiliary Power

The Angelo Booster Station is equipped with a 200-kW diesel generator with an automatic transfer switch. This generator is capable of providing power to three of the pumps, the lighting, and the HVAC system.

Backup Operations

If Angelo Booster Station is out of service, Butler Booster Station and Forest Home Booster Station serve as back up to feed the upper zones (Lower Prune Hill, Lacamas, Upper Prune Hill) from the lower zone (Butler). The City has a standby pump at the Angelo Booster Station in the event that a pump is out of service. There is sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Lower Prune Hill Reservoir Out of Service

If the Lower Prune Hill Reservoir is out of service, one pump at the station will be placed into hand mode and operated with the reservoir isolated. The pressure relief valve at the station will bleed excess pressure to the inlet piping. This will allow the system to maintain a constant pressure in the zone. During this operation, the pump and pressure need to be monitored every two hours.

Forest Home Booster Station

Auxiliary Power

Auxiliary power is not available for the Forest Home Booster Station.

HOA Settings

During emergencies the booster station may need to be operated in the HAND mode to compensate for distribution system problems in other areas of the system.

Backup Operations

If the Forest Home Booster Station is out of service, Butler Booster Station and Angelo Booster Station serve as back up to feed the upper zones (Lower Prune Hill, Lacamas, Upper Prune Hill) from the lower zone (Butler). The City has a standby pump at the Angelo Booster Station in the event that a pump is out of service. There is sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Lacamas Booster Station

Auxiliary Power

The Lacamas Booster Station has an auxiliary generator with automatic transfer switch available to provide power. This generator is a 60 kW natural gas generator and is capable of running the two 500-gpm pumps, the building lights and ventilation system. This generator is able to provide the Lacamas Booster Station with power as long as natural gas service is not interrupted. If the generator fails during a power outage, water service can be maintained through the pressure reducing valve (PRV) stations that that connected to the system that feeds down from the Upper PruneHill Reservoir. Well No. 9 also serves the area supplied by Lacamas Booster Station, but since it does not have auxiliary power, it is more than likely unavailable during a power outage.

Lacamas Reservoir Out of Service

When the Lacamas Reservoir is out of service, pressure to the Lacamas (544) Zone can be maintained by operating one of the pumps in the Lacamas Booster Station. The pressure relief valve will return excess pressure to the inlet piping while maintaining the downstream pressure. Under this operating condition, the pump operation and pressure need to be checked every 2 hours. The 544 Zone can also be served from Upper Prune Hill through PRV stations.

Backup Operations

When the Lacamas Booster Station is out of service Well No. 9 and the Lower Prune Hill Booster Station can be used to feed the Lacamas (544) Zone.

Lower Prune Hill Booster Station

Auxiliary Power

This facility is equipped with a 300-kW diesel powered generator with an automatic transfer switch to operate the three pumps in the event of a power failure.

Temporary Pump

During high seasonal demands a mobile skid mounted pump is rented by the City to supplement the LPH Booster Station. This pump is installed via connections constructed for this purpose near the entrance to the pump station. It is operated in a manual mode and has a capacity between 600 and 700 gpm. This pump is not powered by the auxiliary power generator. The City also has pumping capacity available at the Upper Prune Hill Booster Station to serve the Upper Prune Hill area for temporary losses of service at the Lower Prune Hill Booster Station, but this is limited and cannot provide supply for extended interruptions in service or extended periods of high demands.

Upper Prune Hill Booster Station

Auxiliary Power

The Upper Prune Hill Booster Station is equipped with a manual transfer switch to allow the City to bring in a portable generator to supply power to the booster station. The portable generator used by the City can operate two of the 20-hp pumps.

RESERVOIR EMERGENCY PROCEDURES

General

The City has developed detailed written procedures for operating the water system when reservoirs are not in service. These procedures are kept at each facility. If a reservoir must be taken off line isolation valves are used to prevent water from being pumped into the reservoirs and the reservoirs are allowed to empty into the distribution system.

A brief summary of the reservoir emergency procedures follows.

Butler Reservoir

Water service is maintained to the system during cleaning / draining / disinfection of the reservoir with the following procedures.

- Connect 6-inch overflow piping to the 12-inch main in the Butler Yard.
- Open the 6-inch overflow valve.
- Open the 4-inch main connecting line valve between the 12-inch and 14-inch mains until water comes out of the 6-inch overflow.
- Close the two 12-inch valves in the reservoir valve pit to take the Butler Reservoir offline.

- Adjust the 4-inch connecting valve to maintain a small amount of water flow from the 6-inch overflow. As long as water flows from the overflow, water service will be maintained to the 343 Zone.

- Depending on the season and the demand, a well may need to be in operation to maintain system pressure in the 343 Zone.

- The pressure reducers on NE 22nd Avenue and NE Everett Street regulate pressure and keep the 343 Zone served.

Reverse the order to place the reservoir back online.

Gregg Reservoir

Water service can be maintained to the Gregg area by running a pump in the HAND position in the Gregg Booster Station. The pressure relief/bypass valve at the Gregg Booster Station will maintain pressure in the service area and also keep it from over pressurizing the zone. The Gregg Reservoir can be isolated after the pump in the Booster Station is placed into operation. Close attention will be paid to the system pressure and the pump to provide uninterrupted service.

Lacamas Reservoir

The Lacamas Reservoir is supplied from the Upper Prune Hill Zone via PRVs, from the Lower Prune Hill Zone via the Lacamas Booster Station, or from Well No. 9. As long as one of these facilities is in operation, the reservoir can be filled.

Water service can be maintained to the Lacamas area (544 Zone) by running a pump in the HAND position in the Lacamas Booster Station or Well No. 9. The pressure relief/bypass valve at the Lacamas Booster Station will maintain pressure in the service area and also keep it from over pressurizing the zone. The Lacamas Reservoir can be isolated after the pump in the Booster Station is placed into operation. Close attention must be paid to the system pressure and the pump to provide uninterrupted service.

Lower Prune Hill (LPH) Reservoirs

Emergency operation of the reservoir would be required if a problem were to occur with one of the reservoirs. If a reservoir were to experience a physical or water quality problem, one reservoir could be taken out of service and the remaining one could be used to supply water until the problem is solved. If the smaller of the two tanks was used alone, the start levels for the Butler, Forest Home, and the Angelo Booster will be raised to keep the reservoir full at all times.

Upper Prune Hill (UPH) Reservoirs

UPH 2.4-MG Reservoir

The 2.4-MG reservoir inlet has an altitude valve that closes to allow the UPH standpipe to fill when the reservoir is full (63-foot level). The UPH 2.4-MG reservoir outlet valve is normally opened, but is seismically controlled and will close in a seismic event. The UPH booster pumps will also be turned off in a seismic event.

If both the Lower Prune Hill and Upper Prune Hill Booster Stations are out of service and the Upper Prune Hill Standpipe level drops low enough, site valves can be opened to allow both the standpipe and the 2.4-MG Reservoir to float on the system.

Two of the booster pumps (No. 2 and No. 3) are equipped with modified pump control valves that employ two valves that are adjusted to drain the UPH 2.4-MG reservoir. Detailed procedures for using these pump control valves are provided at the UPH booster station.

UPH Standpipe

The UPH standpipe inlet valve is a spring-activated altitude valve that is designed to shut off when the standpipe is full. This valve is not controlled by the telemetry system. When the UPH standpipe altitude valve is closed, the UPH booster pumps operate based on the pump discharge pressure.

If the Upper Prune Hill Standpipe is out of service, the UPH area can be supplied by the UPH Booster Station and the LPH Booster Station. The LPH Booster Station operates based on reservoir level in the 2.4 MG UPH Reservoir. If the LPH Booster Station flows exceed system demands, the 2.4 MG UPH Reservoir will fill. If the 2.4 MG UPH Reservoir is full, the LPH Booster Station will shut off and the UPH Booster Station will be called in pressure mode and will supply the system. If system demands exceed the supply of the LPH Booster Station while it is in operation, the UPH Booster Station will be called in pressure mode to provide additional supply. Pressure mode for the UPH Booster Station is discussed below.

At the Upper Prune Hill Pump Control Panel Screen, the operator selects this setting at the pump control panel, which is a six step operating sequence (numbered 0 to 5) that is based satisfying a minimum pressure of the pump discharge. The operator sets the pressure at 40 psi, which simulates a full standpipe.

- Step 0 – no pumps on (40 psi is satisfied)
- Step 1 – pump 1 on and runs till 40 psi is satisfied
- Step 2 – pump 1 and 2 on if 40 psi is not satisfied after Step 1
- Step 3 – pump 1 and 3 on if 40 psi is not satisfied after Step 2

- Step 4 – pump 1, 2 and 3 on if 40 psi is not satisfied after Step 3
- Step 5 – all pumps on if 40 psi not satisfied after step 4

There is a 15 second delay built in between each step. Pumps turn off sequentially in 15 second intervals once 40 psi is satisfied.

WELLS

Detailed written operating instructions are maintained at each well. These instructions cover normal operations as well as response to pump and power failure. For wells with treatment facilities, written descriptions of shutdown and start up of treatment equipment is included with the written procedures. A brief summary of emergency operations at each well is provided below.

Well No. 5

There is neither a generator nor an angle drive to operate Well No. 5 during a power outage. Well No. 5 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Under these conditions, Well No. 5 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit.

Well No. 6

There is neither a generator nor an angle drive to operate Well No. 6 during a power outage. Well No. 6 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 6 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit.

Well No. 7

There is not a generator or an angle drive to operate Well No. 7 during a power outage. Well No. 7 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 7 has to be run from the HAND position from the well facility or the Operations Center master telemetry unit.

Well No. 8

During a power outage, Well No. 8 has an auxiliary engine and angle drive. Well No. 8 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 8 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit during a power outage. The backup chlorination system is also run by the generator.

Well No. 9

There is neither a generator nor angle drive to operate Well No. 9 during a power outage.

Well No. 10

There is neither a generator nor angle drive to operate Well No. 10 during a power outage.

Well Nos. 11 and 12

The Washougal Wellfield Facility has its own diesel powered auxiliary generator with an automatic transfer switch. This generator is 350 kW and is designed to serve the Washougal Wellfield Treatment Facility during a power outage, to include the two well pumps, chemical feed pumps, controls for the well pumps and chemical feed system, HVAC system and lighting.

Well No. 13

The Well No. 13 Facility has its own diesel powered auxiliary generator with an automatic transfer switch and acoustical enclosure. This generator is 250 kW and is designed to serve the Well 13 Facility during a power outage, to include the well pump, chemical feed pumps, controls for the well pump and chemical feed system, HVAC system and lighting.

SURFACE WATER FILTRATION PLANT

Detailed written operating instructions are maintained at the Surface Water Filtration Plant. These instructions cover normal operations as well as start up and shut down procedures. The plant is equipped with a 45 kW propane powered auxiliary generator in event of a power outage.

INCIDENT SPECIFIC RESPONSE PLANS

Per the hazard assessment summarized in Table N-1, the following incident specific response plans are outlined below:

- Drinking Water Unique: bacteriological contamination
- Natural Disasters: drought, earthquake, flood, landslide/mudflow/debris flow, severe snow storm, tsunami, volcano
- Technological Hazards: power failure, dam failure, hazardous materials, urban fire, transportation accident

- Criminal Acts: Terrorism, cyber attack, vandalism

BACTERIOLOGICAL CONTAMINATION

WAC 246-290-320 establishes specific procedures for water utilities to follow should bacteriological contamination be detected in the water system. These procedures are outlined in Figure N-1. If the chlorine disinfection residual in the distribution system is lost, it may be necessary to batch chlorinate the reservoirs and flush distribution piping.

For every 1.0 million gallons of storage, approximately 17 lbs. of 70 percent calcium hypochlorite (HTH) is necessary to provide a 1.0 mg/L chlorine residual. As an alternative, 18 gallons of 5.25 percent sodium hypochlorite, available as household bleach in the supermarket, can be added to 1.0 million gallons to provide a dose of 1.0 mg/L.

In the event of a suspected intentional contamination with a microbial agent, the protocols for intentional contamination shall be followed in addition to the procedures outlined here. Law enforcement authorities will need to be consulted prior to making public notifications as discussed further in the intentional contamination incident plan.

Boil Water Notification

Emergencies such as floods, earthquakes, and other disasters can result in damage to water system infrastructure, thereby warranting a boil water notice as a cautionary measure. A suggested boil water notification form is presented at the end of this Appendix. The City would issue the order through radio, television and newspapers serving the local area. Prior to the issuance of a boil water notice, the City should consider the experience gained by other communities in the past. A summary of pertinent information follows:

- An initial press conference should be held following issuance of the boil water notice to advise the public of the situation. All press releases will go the City's Public Information Officer.

- Consolidated press releases, announced on morning and evening television and radio news broadcasts, can also be used to keep the public informed.

- A 24-hour telephone hotline will be established to respond to public and media inquiries regarding the notice. The hotline should be staffed with knowledgeable representatives from the City and other governmental agencies. In order to maintain the consistency of information released, hotline operators should be provided with standard question and answer

sheets and briefed as new information becomes available. The hotline should remain available for 24 hours after the boil water notice has been rescinded to provide relevant information and reassurance for concerned customers. All media inquiries shall be directed to the Public Information Officer.

- Other State, County, and City agencies will be consulted prior to release of information to the public, including DOH and the Clark County Health Agency. A consensus will be reached among the jurisdictional agencies regarding information to be released and actions to be taken. It is important not to release conflicting information so as not to confuse the public.

- Agencies and hot line phone operators should be aware of difficult questions that could be asked by the public or the press. A few examples follow:

    1. What other utilities are affected?

    2. What should be done about coffee and ice machines that use water directly from the system?

    3. How did the system get contaminated and what is being done about it?

- Protocol should be developed for rescinding the boil water notice. One example includes two consecutive days of no detection of Cryptosporidium, Giardia, or coliform bacteria in the system.

- Once the boil water notice is rescinded, a notice should be developed to inform the public regarding appropriate measures for use of the water supply including flushing of pipes and fixtures as required.

A thorough investigation of the contamination source should be conducted and strategies developed to avoid similar future occurrences. The public should be informed and given updates regarding investigation findings in order to restore confidence in the quality of water provided by the water system.

DROUGHT

The Clark County Hazard Identification and Vulnerability Analysis states that nearly all areas of the county are vulnerable to drought.

History suggests a high probability of occurrence in Clark County. Although the entire population of the county is considered vulnerable to the effects of drought, severity has historically been low. Actual drought conditions have been limited to a few days, even during extended dry periods.

The hazard of a short-term drought will be addressed through water conservation measures outlined in the Water Conservation Chapter of the Water System Plan. The City will need to coordinate with adjacent water users in developing an effective drought response. This type of coordination will become essential with longer drought periods when more stringent water conservation measures may become necessary. Additionally, extended droughts may also increase fire hazards, particularly in the heavily wooded areas of the City.

EARTHQUAKE

The County's assessment indicates that of all potential disasters, the City is most vulnerable to a severe earthquake. However, the ability of the City's water system facilities to withstand a major earthquake has not been fully characterized.

The Northridge earthquake, which struck on January 17, 1994, left the Metropolitan Water District of Southern California (MWDSC) facing a major disaster. Fortunately, the MWDSC had established emergency planning procedures that proved to be essential to restoring water service to its customers. Two essential components were an Emergency Response Center and pre-established reconnaissance patrols that were able to quickly conduct damage inspections. The MWDSC had also stockpiled considerable repair parts and materials in order to be virtually self-sufficient in an emergency. Following the Northridge earthquake, however, the MWDSC found that most parts and equipment were readily available via overnight shipping from around the nation, indicating that stockpiling does not need to be wholly relied on for effecting repairs.

The Pacific Northwest is a very seismically active area. The Clark County HIVA states that potential earthquake sources in Clark County are not well characterized because of their infrequent occurrence compared to California. Estimations of possible earthquake sources are limited to studies of many small earthquakes, investigations of known faults, and other geological surveys.

CRESA indicates that earthquakes in Clark County are most likely to originate from three sources: (1) the Mt. St. Helens seismic Zone; (2) the Portland/Vancouver Seismic Zone; and (3) the Cascadia Subduction Zone. Descriptions of each of these seismic zones are summarized from the Clark County HIVA below.

1. Mt. St. Helens Seismic Zone – This seismic zone is most commonly a source of several small earthquakes (<4 M). The strongest earthquake associated with this zone was the Elk Lake earthquake of February 13, 1981. This was approximately 5.5 M magnitude earthquake. While this

was just a moderate earthquake it was felt over an area of about 104,000 km^2 that ran as far north as Ferndale, Washington and as far South as Salem, Oregon. Geologists suggest that the possibility exist for an earthquake as great as 6.5 M originating from this zone.

2. Portland/Vancouver – The Portland metropolitan area is the most seismically active region in Oregon in historic times. In the past 150 years there have been six earthquakes of magnitude 5 or greater. The Washington side of the seismic area is the second most seismically active area in Washington (the Puget Sound area is the most seismically active area in the state). The area between the Lacamas Creek Fault and the Portland Hills Fault borders this seismic region. The existence of the Portland Hills fault was only recently confirmed by the digging of the light rail tunnel through the West Hills of Portland. This discovery, matched with other geophysical studies suggest that earthquakes as large as 6 M or larger should occur in the Portland region every 300 to 350 years and an event of M 6.5 or larger about every 800 to 900 years. Earthquakes in this area present what may be the worst-case scenario for Clark County because the epicenters may be quite close. Geologists theorize there may be faults directly underneath the cities of Portland and Vancouver. Recent studies suggest that the epicenter for the 5.5 M earthquake in November 5, 1962, was located underneath the City of Vancouver.

3. Cascadia Subduction Zone – The Cascadia Subduction Zone lies about 50 miles offshore, extending from near Vancouver Island to northern California. The zone is where the oceanic Juan de Fuca plate dives beneath the continental North American plate. These plates are converging at a rate of 1 to 1.5 inches per year.

CRESA considers the entire county population, property, commerce, infrastructure and services as vulnerable to an earthquake. The scope of damage will be a function of earthquake magnitude and level of preparedness. Damage could range from minimal to extreme loss of life and destruction of property.

Most injury, death, and property damage in an earthquake result from seismic impacts on structural and non-structural materials. The vulnerability of certain areas partially depends on the types of structures in that area. A wood frame residential structure that is adequately secured to the foundation is relatively safe. An un-reinforced masonry building is at greatest risk from seismic impacts. Most injuries in earthquakes result from non-structural materials such as light fixtures, equipment, and furniture, falling on people and causing injury.

Another factor in earthquake vulnerability is soil type. Water-saturated loose sand and silt lose their ability to support structures in an earthquake. Areas in Clark County that

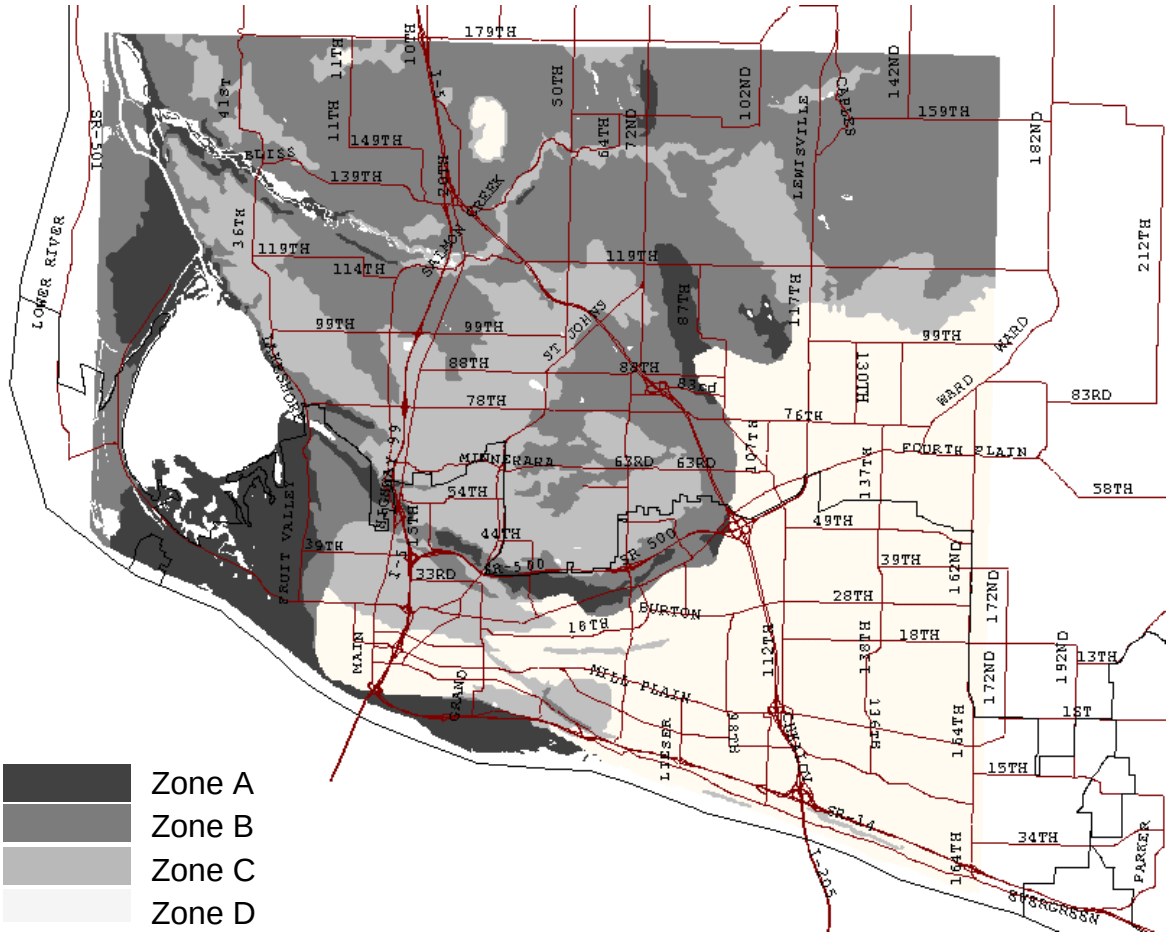
are near flood plains or areas with silt deposits are at the greatest risk during an earthquake.

Within the limits of predictability, CRESA assigns a high probability of occurrence for a damaging earthquake during the next 25 years. A large earthquake could have a catastrophic impact on Clark County suggesting high vulnerability. Accordingly, a high-risk rating is assigned.

Figure N-2 shows a map of Clark County with zones of relative hazards for earthquakes. Based on evaluation of soil liquifaction, ground amplification, and earthquake induced landsliding hazards. Zone A is area of greatest relative hazard. Zone D is area of least relative hazard. The City of Camas is primarily in Zone D.

FIGURE N-2

Relative Earthquake Hazard Map, Clark County, Washington



Earthquake response measures for the City's water system are shown in Table N-5.

TABLE N-5

Earthquake Response City of Camas Water System

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution system mains may be broken and the City's ability to monitor and respond to these incidents may be limited.	Isolate the major broken sections of piping throughout the system as they are located and repair as necessary and possible. Contact DOH.
Storage Facilities	Reservoirs may be leaking or structurally damaged	Inspect each reservoir for structural damage or cracks and leaks. Seal or drain these reservoirs as required. Contact DOH.
Booster Stations	Booster stations may be structurally damaged or mechanical damage to pumps and piping may have occurred.	Check booster stations and shut down pumps as required. If zones can be fed by alternate methods, implement those procedures. Contact DOH.
Wells	Unable to supply additional water to system. Well casings may be broken. Pumping capacity may be lost.	Investigate situation. Determine which wells can be utilized. Determine if surface water source still available. Contact DOH.
Treatment Facilities	Damage may have occurred to the treatment building, piping, or filters at the filter plant. May be unable to supply water from surface water source.	Shut down the equipment at the treatment facility. Attempt to repair. Check possibility of supplying City with groundwater sources. Contact DOH.

FLOOD

The Clark County HIVA states that floods are the most common disaster in Washington State and Clark County. The County's climate, topography, and geology are conducive to flooding. Normal annual precipitation ranges from 38 inches on the western floodplains to over 114 inches in the mountainous northeastern part of the county.

History of Flooding in Clark County and Adjacent Areas

- **December 1933** – The largest flood of record on the Lewis River.

- **May 30, 1948** – Columbia River crested at 34.4 ft. Flood stage at that time was 15 ft. This is the flood that destroyed the City of Vanport. Vanport, with a population at the time of the disaster of 18,500, was the second largest City in Oregon. The destruction of the town occurred when a 600-foot section of dike protecting the settlement from the rising Columbia River broke. Unfortunately, few people evacuated Vanport prior to the dam rupture. Evacuation was hampered by the fact that there were very few good evacuation routes. Fifteen people died in the flood.

- **June 1956** – Columbia River flooded due to snowmelt runoff.

- **January 1972** – A combination of intense rainfall and snowmelt caused major East Fork of the Lewis River floods.

- **December 1977** – Heavy rainfall and snowmelt caused flooding on the East Fork of the Lewis River. Salmon Creek had largest flood since gages were placed on Salmon Creek. The Washougal River also received its largest flood since gages were placed in 1944. This flood was an extremely rare event, greater than a 500-year flood.

- **February 8, 1996** – The Columbia River crested at 27.1 feet on February 9. This flood produced some of the worst flooding seen in the County since 1948. Approximately 1,500 people were evacuated, and 177 homes were destroyed. This flood occurred because of the confluence of several factors. The winter of 1995/96 was extremely rainy. Prior to the flooding period, the region experienced a cold snap with low elevation freezing, ice, and snow. This was followed by a strong warming trend with heavy precipitation.

In Clark County, the weather that produces the most serious flooding events are extensive wet conditions that follow a period of mid and high elevation ice and snow pack development. Many rivers in Clark County historically flood every few years. These include the East Fork of the Lewis River, Washougal River, Salmon Creek, and the Columbia River. Flooding on these rivers usually occurs between October and February. Long periods of heavy rainfall and mild temperatures coupled with snowmelt contribute to flooding.

There are three types of flood threats:

- Riverine

- Tidal
- Flash and Surface

The greatest threat of flooding in the City will be flash and surface flooding due to inundation of stormwater collection and conveyance systems. This may impact the water system operation through a number of mechanisms, including:

- Restricting access to water system facilities due to flooded streets
- Flooded valve and meter vaults
- Flooded City facilities
- Increasing groundwater levels that threaten contamination of leaking underground water lines

Actions the City will consider depending on the extent of flooding and the risks that might be mitigated include:

Pre-Flood

- Sandbagging around City facilities, such as the Public Works Operations Center
- Securing large pieces of equipment and materials that could be carried off by floodwaters
- Raising electronic equipment and computers off the floor
- Moving valuable records to locations expected to remain dry

Post-Flood

- Checking coliform levels in the water system for contamination (see incident specific plan for bacteriological contamination)
- Inspecting meters and PRV stations to ensure proper operation
- Cleaning debris from around reservoirs

Figure N-3 includes a flood map of the City of Camas. As the flood map indicates areas susceptible to flooding include the Washougal Wellfield (Well Nos. 5, 6, 7, 8, 10 and 12 as well as the new chemical feed building).

Historically, flooding occurs along one or more of the County's waterways every few years, suggesting a high probability of occurrence. Because of the relative land area and population affected, the County is exposed to moderate vulnerability. Although the vulnerability is moderate, the frequency of flooding, the potential for simultaneous flooding events, plus the historical record of recurrent flooding and cumulative costs, all suggest the assignment of a high risk rating.

Table N-6 lists flood response measures specific to the City's water system.

TABLE N-6

Flood Response City of Camas Water System

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution mains could be affected by landslides or high water levels. City staff transportation for monitoring the system and making repairs may be limited.	Monitor possible areas of concern for waterline conditions. Monitor waterline bridge crossings for possible damage. Prepare to valve off any washed out or damaged waterlines. Contact DOH.
Storage Facilities	Minimum physical/structural impact due to locations. Flooding could cause elevated coliform levels in water system.	Monitor coliform levels. Contact DOH to advise of acute of non-acute coliform violations.
Booster Stations	Minimal operational impact.	None.
Wells	Facilities could be overwhelmed by flood waters.	Prepare to disconnect any well affected by flood waters. Contact DOH.
Treatment Facilities	Heavy rainfall or snow melt may overwhelm the capacity of the water treatment facility. Flooding in the vicinity of the plant is a risk.	Allow the water to bypass the filtration plant by closing intake facilities. Use wells as source of water for City. Contact DOH.

LANDSLIDE/MUDFLOW/DEBRIS FLOW

The term landslide includes a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Landslides commonly occur on water-saturated slopes when the base of the slope can no longer support the weight of the soil above it, thus their frequency increases during or after periods of heavy rain and flooding. Though commonly associated with heavy rain and flooding conditions, landslides may also be associated with earthquakes (the 1994 Northridge Earthquake caused an estimated 11,000 landslides) and volcanic activity.

CRESA indicates that Clark County experienced the greatest number of landslides from 1996 to 1997. One of the largest landslides in the area occurred just outside of Clark County, two miles north of Woodland on February 8 and 9 when 32,000 yd^3 of earth fell across all lanes of I-5 and the adjacent railroad tracks, disrupting traffic until February 19. In the same flooding period there were also several landslides that disrupted railroad operations in the area adjacent to Vancouver Lake. The following year, which was marked by heavy rains but no significant flooding, there were several landslides. Clark County has several areas where landslides have taken place and several areas that are susceptible to landslides. The hills north of La Center and the slopes north of Camas and Washougal are particularly susceptible.

Slides in Clark County generally range in size from thin masses of soil of a few yards wide to deep-seated bedrock slides more than six miles across. Travel rate may range in velocity from a few inches per month to many feet per second, depending largely on slope, material, and water content. The recognition of ancient dormant slide masses is important as they can be reactivated by earthquakes or unusually wet winters. Also, because they consist of broken materials and disrupted ground water, they are more susceptible to construction-triggered sliding than adjacent undisturbed material.

CRESA states that typical effects of landslides include damage or destruction of portions of roads and railroads, sewer lines, pipelines, and water lines, electrical and communications distribution lines, and destroyed homes and public buildings, but the most significant effect of landslides is the disruption of transportation and the destruction of private and public property.

The Clark County HIVA indicates the County has a history of landslides and their numbers are increasing, suggesting a high probability of occurrence. Landslides tend to occur in isolated, sparsely developed areas threatening individual structures and remote sections of the transportation, energy and communications infrastructure suggesting low vulnerability. Because of the high probability of occurrence and the trend to more frequent landslides, a moderate risk rating is assigned.

The risk to the water system is considered low because of the lack of steep slopes in the Camas area. Flooding and Earthquakes will increase the risk of landslides. Refer to Tables 5-5 and 5-6 for response measures that may be appropriate for landslides induced by those event categories.

SEVERE SNOWSTORM

The most significant anticipated impact of a severe snowstorm is limiting access to the City's facilities. City personnel may not be able to access water mains, reservoirs or valves for maintenance and/or manual operation of system components. During a severe snowstorm the City will rely on the telemetry system for information on the major system components. Additional hazards to be considered with severe winter storms include:

- Freezing in City Reservoirs – Mitigated by ensuring continuous turnover.
- Water service line breaks – Mitigated by asking customers to be vigilant for flooding around homes and businesses.
- Roof Collapse on City buildings and reservoirs – Mitigated by observing snow levels and having City crews remove when snow load may be exceeded.

Table N-7 lists water system response measures associated with winter storms.

TABLE N-7

Severe Snowstorm Response City of Camas Water System

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	City staff transportation for monitoring system and making repairs will be limited.	Contact City street department to expedite plowing of critical water system component access. Maintain chains and other snow gear for maintenance equipment on hand. Be able to provide accurate locations of valving for maintenance purposes.
Storage Facilities	Snow may prevent access.	Clear snow from access roads. Three 4 x 4 vehicles are available for water department use to access critical sites.
Booster Stations	Snow may prevent access.	Clear snow from access roads. Three 4 x 4 vehicles are available for water department use to access critical sites.
Wells	Snow may prevent access.	Clear snow from access roads. Three 4 x 4 vehicles are available for water department use to access critical sites.
Treatment Facilities	Snow may prevent access.	Clear snow from access roads. Three 4 x 4 vehicles are available for water department use to access critical sites.

TORNADO

Tornadoes are characterized by funnel clouds of varying sizes that generate winds as fast as 500 miles per hour. They can affect an area of 1/4 to 3/4 of a mile and seldom more than 16 miles long. Tornadoes normally descend from the large cumulonimbus clouds

that characterize severe thunderstorms. They form when a strong crosswind (sheer) intersects with strong warm updrafts in these clouds causing a slowly spinning vortex to form within a cloud. Eventually, this vortex may develop intensity and then descend to form a funnel cloud. When this funnel cloud touches the ground or gets close enough to the ground to affect the surface it becomes a tornado. Tornadoes can come from lines of cumulonimbus clouds or from a single storm cloud. Tornado hazards are measured using the Fujita Scale ranging from F0 to F6.

A history of tornadoes in Clark County follows:

- October 1951 – Battle Ground (F0 on the Fujita Scale). 8-miles long and 25-yards wide, which uprooted trees and destroyed a two-story barn.

- August 26, 1953 – Ridgefield (F0 on the Fujita Scale). Lasted 3 minutes and severely damaged a farm.

- April 5, 1972 – Vancouver (F3 on the Fujita Scale). This was the most disaster to occur in Clark County and the most serious tornado in Washington State. Six people died and 300 were injured when a tornado cut a swath of destruction through East Vancouver. The tornado's path was 9-miles long, from the Columbia River, just east of Andresen Road up to Fourth Plain Blvd. Peter S. Ogden Elementary, a shopping center, and a bowling alley were severely damaged.

- December 1974 – Camas (F0 on the Fujita Scale). Windows were broken and walls collapsed but there was no serious damage.

- October 1984 – Woodland (F1 on the Fujita Scale). A funnel cloud touched down several times, snapping and overturning trees, and ripping up fence lines. A barn roof was torn off, corrals flattened and a pump house lifted and exploded.

- June 29, 1989 – La Center (F1 on the Fujita Scale). Uprooted several trees and tossed one car off the road causing minor injuries to the driver.

- May 31, 1997 – Vancouver (F0 on the Fujita Scale). Caused $10,000 in property damage.

- September 15, 1997 – Yacolt (F0 on the Fujita Scale). No reported damage.

- May 11, 2000 – Battleground (F0 on the Fujita Scale). Caused $10,000 in property damage.

- May 27, 2004 – La Center (F0 on the Fujita Scale). No reported damage.

- September 2004 – Ridgefield (F0 on the Fujita Scale). No reported damage.

- January 10, 2008 – Vancouver, (F1 on the Fujita Scale). Damage reports showed widespread downed power lines, malfunctioning traffic lights, and roofing that had been ripped off. Although the majority of damage was light in nature, in at least one case a home was completely demolished. At least 2,500 homes and businesses had lost power because of the storm. Property damage estimated to total $525,000.

Table N-8 provides definitions of tornado hazards.

TABLE N-8

Tornado Hazard Scale

F-Scale Number	Intensity Phase	Wind Speed	Type of Damage Done
F0	Gale Tornado	40-72 mph	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages sign boards.
F1	Moderate Tornado	73-112 mph	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	Significant Tornado	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	Severe Tornado	158-206 mph	Roof and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted.

Tornadoes are not normal occurrence in the Northwest as they require a confluence of warm surface temperatures and warm fronts coming from the south with cold fronts coming from the north. Northwest climates do not normally generate the temperature variations conducive to tornado formation. Washington is ranked 43 in the US for total number of tornadoes. Nonetheless, CRESA states that the tornado threat should be taken very seriously. The conditions conducive to tornado formation may develop in Southwest Washington and it is common for funnel clouds to be reported in this region. During severe thunderstorms it is possible for tornadoes to occur.

With the exception of the April 1972 disaster, tornadoes in Washington and Oregon tend to be light or moderate, with winds ranging from 40 to 112 mph. There are a notable minority of tornadoes that cause significant to severe damage with winds going as high as 200 mph. The peak season for tornadoes is April through July. However, in Washington tornadoes may occur in the late summer months and, in a few rare cases, may occur in the

winter months. While tornadoes are sometimes formed in association with large Pacific storms, most of them are caused by intense local thunderstorms. Tornadoes almost exclusively occur in the late afternoon and early evening.

It is possible for a tornado to occur anywhere in the lower elevations of Clark County. Normally, Pacific Northwest tornadoes are moderate but it is possible for serious tornadoes to develop, causing death and serious injury as well as property damage.

Water systems most vulnerable to tornadoes will be reservoirs, booster stations and treatment facilities. Reservoirs are not designed to withstand the high winds possible with tornadoes and buildings that house well pumps, booster pumps and treatment facilities may be damaged or destroyed by a severe tornado.

VOLCANO

According to the Clark County HIVA, the most likely scenarios for volcanic eruptions that will impact the County are as follows:

- Ashfall and *tephra* (the ash, rock and boulder-sized debris from an exploding volcano) from Mt. St. Helens.

- Ashfall and the generation of *lahars* (volcanic mud/debris flows) from the Sandy River in Oregon due to volcanic activity at Mt. Hood.

The most severe impacts in Southwest Washington from another major eruption from Mt. St. Helens eruption would be in Cowlitz County. In this event, Clark County emergency managers and responders may support Cowlitz County agencies and the Forest Service in assisting in evacuation, perimeter control, search and rescue and other operations. Drawing from these resources may leave the City of Camas potentially vulnerable to an inability to respond should emergencies arise that require local response assets.

The vulnerability to damage from lahars is greatest in southern Clark County, due to potential impacts from lahars in the Sandy River. Since the Sandy River empties into the Columbia across from Camas, lahar deposits could influence the flow of the Columbia River and possibly affect low lying areas of Camas near the Columbia. However, the potential exists for ashfall from volcanic activity to impact the entire county by creating a respiratory hazard and potentially adding weight to the roofs of City facilities (including the water reservoirs) that will increase significantly if it becomes wet. Wet ash also creates a slipping hazard and will create traffic problems and make water system maintenance hazardous.

URBAN FIRE

In the 2001 Water System Plan, a hydraulic analysis was conducted in several areas throughout the system to determine if the water system had adequate capacity to provide fire flow. Deficiencies were noted in the following areas:

- PRV Systems – Lacking pressure-sustaining features to prevent fire flows in lower pressure zones from causing unacceptable service pressures in upper pressure zones.
- NW 3rd Avenue – Fire flow limitations.
- Sierra Lane – Fire flow limitations.
- NW Ostenson Canyon Road – Fire flow limitations.

The modeling of the water system is generally based on single event structural fires. In addition to the areas with fire flow deficiencies noted above, multiple structural fires occurring simultaneously in the same pressure zone could conceivably overwhelm the water system's capacity. If mutual aid agreements are invoked, the City would need to consider the potential for a water shortage in a coordinated fire response.

However, in the event of a fire City personnel monitor reservoir levels and system performance with the telemetry system, which allows the Fire Department to understand the limitations of water supplies available for fire suppression and to operate accordingly.

Other issues to consider with fires include:

- Creating a vacuum on waterlines due to high fire demand; this may create a cross-contamination hazard.
- Water quality complaints from customers due to high pipe velocities scouring inner pipe surfaces.

Table N-9 lists water system response measures for urban fires.

TABLE N-9

Urban Fire Response City of Camas Water System

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Low pressure may result in the extremities of the system depending on the extent of the fire incident.	Monitor system and adjust pumps if applicable.
Storage Facilities	Draw down will occur in the reservoirs with increased demand.	Monitor reservoir levels.
Booster Stations	Additional pumps called on.	Monitor pump station to ensure proper operation.
Treatment Facilities	Fire in watershed could cause increased sediment in the surface water source. Turbidity levels may exceed acceptable levels.	Use groundwater sources until surface water sources available. Provide silt fences along areas that have lost vegetation due to fire. Contact DOH.

POWER FAILURE

Various types of severe weather can cause loss of electrical power. In order to alleviate the effects of a power outage, the City has installed auxiliary generators at the Chlorination Plant, the Filter Plant, Butler/Gregg Booster Stations, Angelo Booster Station, Lacamas Booster Station and the Lower Prune Hill Pump Station. Well Nos. 8, 11 and 12 also have an auxiliary power source to allow the wells to operate during an electrical outage. The Washougal Wellfield Treatment Facility obtains auxiliary power from the generator for Wells 11 and 12.

Table N-10 presents the potential effects of a lengthy power failure on the water system components.

TABLE N-10

Power Failure Response City of Camas Water System

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	No effect	None.
Storage Facilities	Telemetry system may be inoperable.	Manually check reservoir levels. Some reservoirs can provide water to lower areas.
Booster Stations	Booster stations inoperable without auxiliary power.	Operate booster station with auxiliary power.
Wells	Unable to supply additional water to system.	Well Nos. 8, 11 and 12 Auxiliary Power
Treatment Facilities		Auxiliary generator.

DAM FAILURE

Dam failures are the release of impounded water due to structural deficiencies, which can affect lives and property downstream. Dam failures are caused by flooding, earthquakes, lack of maintenance and repair, misoperation, poor construction, vandalism, or terrorism.

According to the Clark County HIVA, several dam failures have occurred in Washington State over the last 40 years, some of which been catastrophic, but none have occurred in or has impacted Clark County.

There are 36 dams in Clark County. These dams are used for hydroelectric power generation, irrigation, and recreation. Table N-11 shows dams that could potentially impact the City of Camas.

TABLE N-11

Clark County Dams Upstream of the City of Camas

Name of Dam	Year Built	Type	Nearest City Downstream	Distance in Miles	River	Downstream Hazard Category
Clark Reservoir Dam	1948	RE	Camas	4	Robinson Creek	3
Lacamas and Round Lakes, Lower Dam	1936	BU	Camas	1	Lacamas Creek	2
Lacamas and Round Lakes, Upper Dam	1936	BU	Camas	1	Lacamas Creek	2
Price Reservoir Dam	1950	RE	Camas	3	Tributary - Lacamas Creek	3

Dam Type: BU – Buttressed Dam, RE – Reinforced Earth Dam.
Hazard Category:
1 = High; 2 = Significant; 3 = Low
(reference: Washington State Department of Ecology Dam Safety Guidelines, July 1992, revised Sept 2004)
2 = 1 to 6 lives at risk, appreciable economic loss, limited or short term water quality degradation
3 = No lives at risk, minimal economic losses, no significant water quality impacts

Washington State uses a Downstream Hazard Classification system for dams, which assigns a Low, Significant or High rating for populations at risk of economic loss and environmental damage should the dam fail. In Clark County, most dams are rated low, three are significant and three high. (The three potential high hazard dams are the Merwin Dam on the Lewis River, Erickson on Rock Creek and Tsugawa Brothers Reservoir Dam on Mason Creek.) The three potential significant hazard dams are the Elmer Dam on Mason Creek and the Lacamas and Round Lakes, upper and lower dams on Lacamas Creek; these latter two dams pose a downstream hazard to the City of Camas.

In addition to the dams located in Clark County, the county can also be affected by dam failures of dams on the Columbia River upstream from Clark County. CRESA considers these dams to be well maintained, operated with 24-hour staffing and inspected on a regular basis.

CRESA states that Washington experiences a dam failure on a frequency of approximately once every two years. The majorities of failures were in whole or part the result of a failure to perform adequate maintenance and monitoring of the facilities. Dam failure can have many effects such as loss of life, damage to structures, roads, utilities, and crops. Economic losses can also result from a lowered tax base and lack of power profits.

History suggests a low probability of occurrence. The failure of a high hazard dam would threaten a small segment of the County suggesting low vulnerability. Because there has not been a major dam failure in Clark County, and the three high hazard dams are well maintained and operated providing no reason to suspect a compromise in

structural integrity baring a natural disaster or terrorist action, a low risk rating is assigned.

For response measures in the event of a dam failure, refer to Table N-7 (flood response).

TRANSPORTATION ACCIDENT (AIRPLANE CRASH)

Although there have been no major airplane crashes in Clark County, the scope of the impact of such an event and the potential complexities of the response require the City to consider how such an incident could impact the water system operation.

The City of Vancouver is across the river from Portland International Airport. The airspace over the Columbia River and Vancouver is heavily used by all types of aircraft flying into Pearson Airpark, Portland Air National Guard Base and Portland International Airport. Most airplane accidents occur during arrival and departure so the City of Vancouver is at a greater risk than any other area in the County. Considering the flight paths of aircraft into and out of Portland International Airport, Vancouver has the potential for a major airplane crash with mass casualties, hazardous materials incidents, and fires. Accordingly, response assets from the City of Camas may be drawn to a crash site and leave the City potentially vulnerable if another emergency arises that requires those assets. Additionally, an airplane crash could cause major transportation routes to be closed for significant periods of time, resulting in significant delays for contractors, equipment and chemical suppliers to access the City of Camas.

TRANSPORTATION ACCIDENT (HIGHWAY OR RAIL)

City water lines cross a number of well-trafficked thoroughfares through the City, including SR 14 and the railroad that runs parallel to SR14. It is conceivable that a major accident on one of these thoroughfares would damage a water line. The Public Works component of the response to a transportation incident includes the following:

- Coordinate damage assessments, emergency road clearing and road repair activities
- Provide contracts for repair and recover work, including damaged utilities
- Provide maps for transportation route planning

The water utility will need to be assessed rapidly in the event of a major transportation incident to determine if water lines have either been damaged or are at risk of being damaged due to the incident. It may become necessary to isolate damaged or at-risk water lines until the incident has been cleared and emergency repairs have been made to allow recovery efforts to proceed.

HAZARDOUS MATERIALS (HAZMAT) INCIDENT

According to the Clark County HIVA, as of 1998, Clark County had approximately 77 entities, at 117 facility locations, which filed an Emergency and Hazardous Chemical Inventory Form (known as a Tier Two Form) with Washington State Department of Ecology. Of these 117 facilities about 58 of them use chemicals on the Environmental Protection Agencies list of Extremely Hazardous Substances.

The City may obtain Clark County Tier Two Hazardous Chemical Inventories from CRESA:

Phone: (360) 737-1911 Email: cresa@clark.wa.gov

Statistics show that nearly half of all hazardous materials incidents occur during transit. Large quantities of HAZMAT are transported through and in the close vicinity of the City via the interstate highway and by rail. In the event of a HAZMAT spill, the Fire Department will be the City's lead department for incident response within the City limits. A large spill will trigger the need for mutual response under the Regional HAZMAT response agreement.

The City of Camas Fire Department has no HAZMAT response capability. A HAZMAT response capability permits offensive operations necessary to perform the following operations:

- Preliminary hazard characterization
- Safely enter the hazardous area
- Mitigate the effects of the release prior to recovery operations
- Exit the hazard area employing a deliberate and thorough decontamination process

The above capabilities can only be provided by HAZMAT teams that are equipped and trained to Occupational Safety and Health Agency regulations (29 CFR 1910.120) and National Fire Protection Association competency levels (NFPA 471 and 472). The City of Vancouver and the Georgia Pacific Mill have such response capabilities. The City Fire Department will coordinate all HAZMAT support with this units working with CRESA under the regional HAZMAT response plan. Telephone numbers for the City of Vancouver and Georgia Pacific HAZMAT teams leaders are as follows:

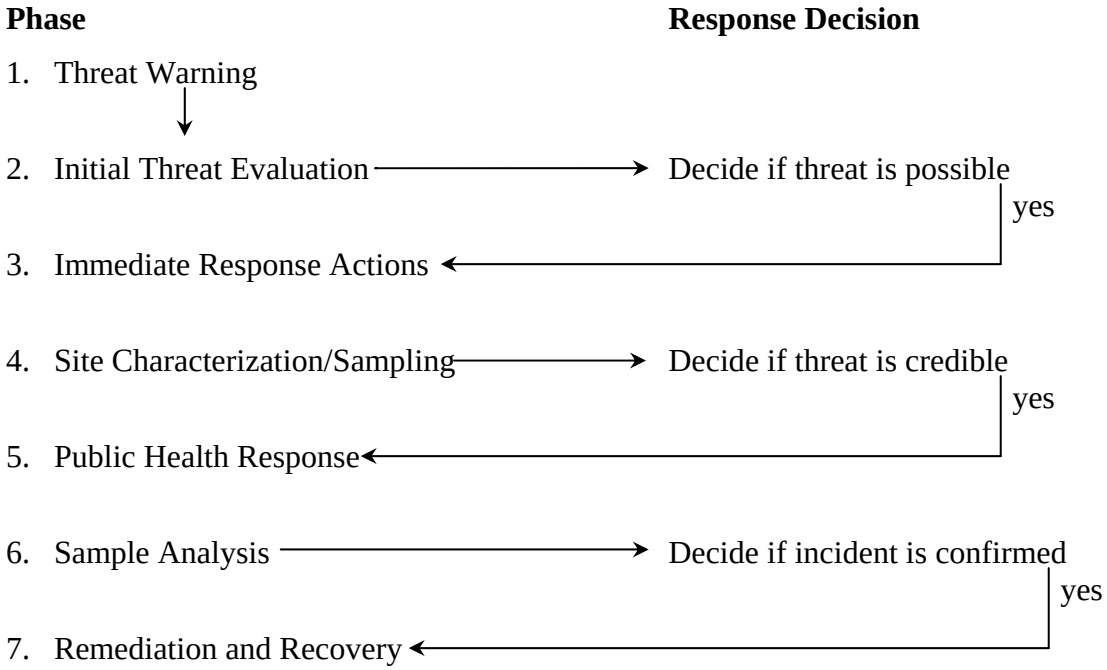
City of Vancouver (360) 619-4165
Georgia Pacific (360) 834-8465

The Public Works and Fire Departments will communicate during a HAZMAT spill to determine if the incident poses a hazard to water system personnel and facilities. It may become necessary to isolate water lines that are at risk of contamination due to a HAZMAT spill in order to prevent contamination of the water system.

INTENTIONAL CONTAMINATION

This type of incident could accompany a terrorist incident involving chemical, biological or radiological agents as well as vandalism. It is treated as a unique class of incident due to the complexities of the response from an operational, public health, law enforcement and physical recovery standpoint.

The EPA recommended protocols for managing a suspected intentional contamination incident are summarized in Figure N-4. The EPA protocol has seven phases with three response decision points:

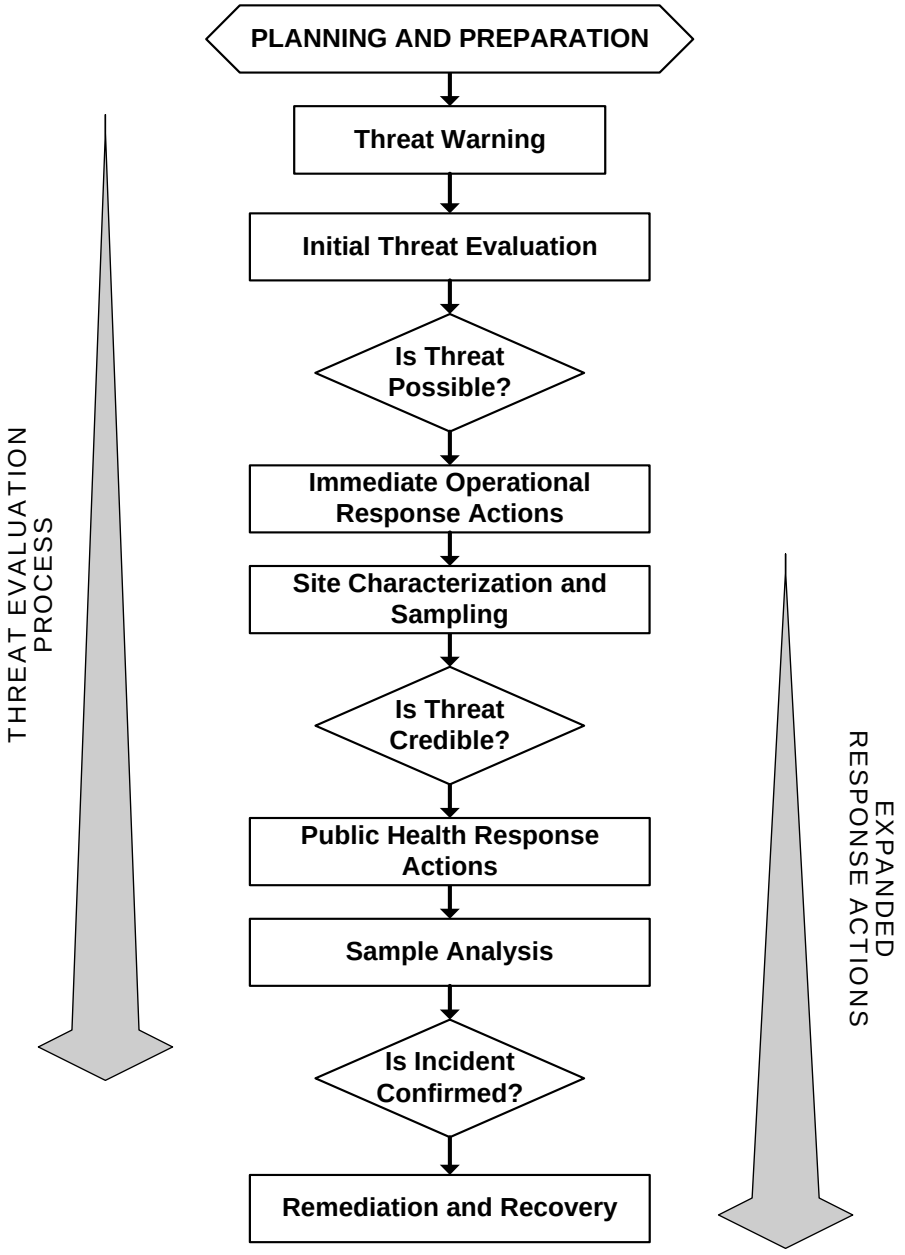


In no case should the utility pursue these actions unilaterally. Jurisdictional law enforcement agencies and public health agencies must be involved in each phase of the process. There are legal and practical requirements for this involvement, including rules of evidence for criminal investigations, balancing the need to protect law-enforcement sensitive information with public-right-to-know provisions in the Safe Drinking Water Act, obtaining specialized technical advice for sampling procedures and protecting the safety and health of water system personnel when taking water samples to test for suspected contamination.

Terrorism is a Federal crime and will require the involvement of federal law enforcement (Federal Bureau of Investigation).

FIGURE N-4

Protocol for Managing an Intentional Contamination Incident



Reference: Planning for and Responding to Drinking Water Contamination Threats and Incidents Response Protocol Toolbox, USEPA, December 12, 2003.

Additionally, it is always recommended that the water utility consult with the HAZMAT team leader during the characterization and sampling process since, depending on the exposure hazard, it may become necessary for HAZMAT technician trained personnel to perform the site assessment and collect samples wearing OSHA compliant personal protective equipment.

Threat Warning

This is any unusual occurrence, observation, or discovery that indicates a potential contamination incident and initiates actions to address this concern. Such a warning would typically come in the form of an apparent security breach in the water system. Evidence of a security breach could come in the form of a telephone call threatening contamination or stating that intentional contamination has occurred; statements by witnesses who have seen water facilities being tampered with or broken into; physical evidence at a water facility indicating water facilities have been intentionally damaged or tampered with; and reports of increased illnesses from local hospitals or the Clark County Health Department.

Initial Threat Evaluation

This is the part of the threat management process in which all available and relevant information about the threat is evaluated to determine if the threat is possible. This is an iterative process in which the threat evaluation is revised as additional information becomes available. The conclusions from the threat evaluation are considered when making *response decisions*.

Immediate Response Actions

These are actions taken in response to a possible contamination threat in an attempt to minimize the potential for exposure to the potentially contaminated water. Immediate operational response actions will generally have a negligible impact on consumers. These actions will include estimating the potential area(s) within the water system that may have been subject to contamination and isolating these areas from the system to contain the contamination. This process must be performed quickly and generally will not allow modeling tools to be used unless the scenarios have been developed and modeled prior to the suspected contamination event.

Immediate Characterization and Sampling

This is the process of collecting information from an *investigation site* in order to support the evaluation of a drinking water contamination threat. Site characterization activities include the site investigation, *field safety screening*, *rapid field testing* of the water, and sample collection.

Field Safety Screening

Screening performed to detect any environmental hazards (i.e., in the air and on surfaces) that might pose a threat to the *site characterization* team. Monitoring for radioactivity as the team approaches the site is an example of field safety screening.

Rapid Field Testing

Analysis of water during *site characterization* using rapid field water testing technology in an attempt to tentatively identify contaminants or unusual water quality.

Public Health Response

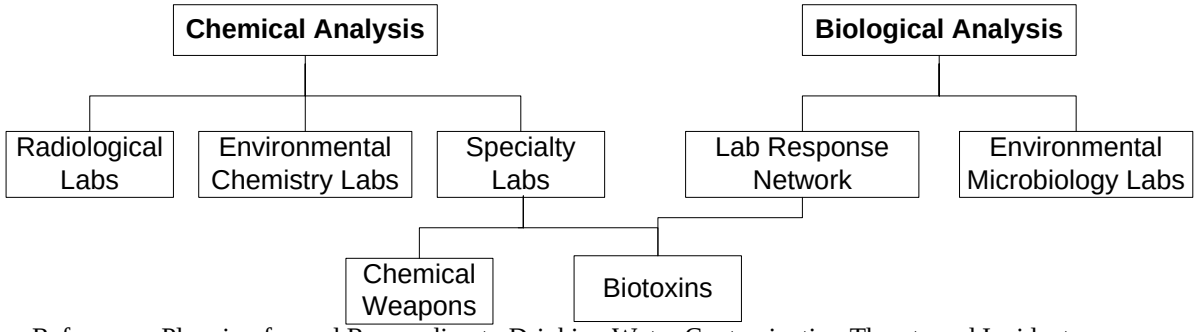
This encompasses all actions taken to mitigate consequences resulting from threats or incidents involving biological, chemical, or radiological contaminants. These actions include public notification, using an alternative water supply, boil water notices and chemical sterilization.

Sample Analysis

This step involves laboratory analysis that is undertaken to confirm the presence/absence of contamination such that specific decisions can be made by law enforcement and public health officials and allow the water utility to proceed with definitive response and recovery actions. It is important to keep in mind that not all labs can definitively confirm a potential contamination agent. Figure N-5 shows the types of laboratories and their general capabilities.

FIGURE N-5

Types of Laboratories by Contaminant Class



Reference: Planning for and Responding to Drinking Water Contamination Threats and Incidents Response Protocol Toolbox, Module 4: Analytical Guide, USEPA, December 12, 2003

Definitions for terms used in Figure N-5 are provided below. The EPA Environmental Laboratory Compendium provides a national listing of laboratories and their capabilities. The City may sign up for this list by going to the EPA's water security website:

http://cfpub.epa.gov/safewater/watersecurity/index.cfm

Environmental Chemistry Laboratory

This is any laboratory, either commercial or government-operated that is able to perform analysis of water samples for compliance with the Safe Drinking Water, Clean Water Acts, or other applicable environmental regulation, as well as other chemical parameters that are important to system operation and overall water quality. These laboratories have the instrumentation necessary to implement methods for chemical analysis of a water sample.

Environmental chemistry laboratories perform water analyses to support regulatory compliance and they are familiar with the need to treat samples with precautions necessary for legal defensibility. Analysis for regulatory compliance purposes, however, may proceed differently than analysis of emergency samples in response to a contamination threat, which has the dual role of both providing an emergency response to protect public health and also providing legally defensible evidence to support a criminal investigation. Additionally, no commercial environmental chemistry laboratories can analyze chemical warfare agents (e.g., nerve, mustard and blood/choking agents); this latter type of analysis can only be performed by a small number of government-operated laboratories in the United States whose access is restricted to law enforcement and military agencies.

Environmental Microbiological Labs

These labs include those of EPA, state environmental agencies, and the commercial sector, that typically perform analyses for waterborne pathogens. Most of these laboratories have the equipment and staff necessary to analyze for indicators of fecal contamination such as fecal and total coliforms and *E. coli*. Culture techniques are available for many of the more common waterborne pathogens such as *Vibrio cholerae*, *Salmonella enteriditis*, Typhi, and *Shigella* spp.; however, analyses for these pathogens are not routinely performed in most environmental microbiological laboratories. While some environmental microbiological laboratories have expanded capabilities to analyze for parasites such as *Cryptosporidium* and *Giardia* or to perform molecular assays for some organisms, these capabilities are not widespread.

Only laboratories registered for the analysis of select agents are legally permitted to analyze for those agents, and currently most registered labs reside in the LRN. Thus, even if environmental microbiological laboratories develop additional capabilities for pathogen analysis, they could not perform such analyses without registering for select agents.

Laboratory Response Network (LRN)

This is a network of laboratories developed by the Centers for Disease Control (CDC), Association of Public Health Laboratories (APHL), and the Federal Bureau of Investigation (FBI) for the express purpose of dealing with bioterrorism threats, including pathogens and some biotoxins.

Radiological Labs

These laboratories specialize in the analysis and handling of radiological materials. For radionuclides, analytical confirmation may be viewed differently than most chemicals because radionuclide analysis can take the form of screens for gross alpha, beta, or gamma radiation, and/or it can take the form of analysis for the specific radionuclides themselves, such as strontium-90. Thus, analytical confirmation may involve the process of confirming quantity of gross radiation or identifying the radionuclide. The type of analysis that is performed will be based on the analytical goals. For example, radionuclides in drinking water regulation are often characterized by their gross alpha and gross beta emissions.

For the purpose of emergency analysis of water contaminants, a tiered approach is suggested, with screening for gross radiation in the field or upon receipt by the laboratory followed by identification of the radionuclide, which may be important for a more complete understanding of risks to public health as well as potential criminal actions against perpetrators.

Specialty Labs

These are laboratories that are capable of analyzing samples for chemical, biological and radiological agents that cannot be analyzed by commercial laboratories. These labs require special safety certifications for operation and their access is controlled by law enforcement agencies and the military.

Remediation and Recovery

The remediation process involves: system characterization; selection of remedy options; provision of an alternate drinking water supply during remediation; and monitoring to demonstrate that the system has been remediated. This process will follow a process similar to the US EPA's Superfund program's approach to hazardous waste site cleanup to include *risk assessment, system characterization, feasibility study*, analysis of alternatives, *remedy* selection, *remedial design, remedial action*, and post-remedial monitoring and operations.

EXPLOSIVES INCIDENT

A bomb threat will be handled by the City Police Department. If the call is received at the CRESA 911 call center, the call center staff is trained regarding information to be obtained and questioning techniques. If the call is received by a City employee they will follow procedures as shown in Appendix L.

In the event of an attack on the water system with explosive devices, the response will, like a contamination incident, be complex and multidisciplinary (police, fire, public works, emergency medical services (EMS), public information, etc.). Important issues to be considered in the response include:

- Assignment of the Incident Commander (will depend on the situation/risks) – the incident commander is responsible for overall command and control at the incident scene and the health and safety of all response personnel.

- Presence of casualties and proper procedures for casualty extraction and emergency medical treatment at the incident site.

- The risk of fire/explosion presented by flammable materials in the vicinity of the explosion.

- Threat of a secondary device (a device that is placed at the scene to kill or injure emergency responders after their arrival).

- Physical hazards associated with collapsed structures.

- Evidence preservation requirements.

- Respiratory, ocular and skin hazards associated with vapors and fine particulate matter generated by the explosion and subsequent fires and what personal protective equipment (PPE) levels are appropriate for the hazards – note that "escape" respirators (e.g., Quickmask 2000), are <u>not</u> designed for prolonged exposures necessary for intentional entry into a hazardous area, they are designed solely to allow movement away from the incident site to a safer location. Additionally, as of late 2004, no escape masks have received federal certification (the approval agency is NIOSH – National Institute of Occupational Safety and Health) for an independently recognized and tested level of performance.

- The need to maintain communication between all response units (especially police, fire, public works and EMS) to ensure different response units all have the same hazard assessment and understand which

response units are being allowed at the incident site, their locations and basic tasks; this becomes even more critical as mutual aid from other agencies and jurisdictions arrive at the site.

- The need to isolate damaged elements of the water system to make emergency repairs and minimize impact to undamaged elements of the water system.

- The need to maintain a single spokesperson for the City to release information to the public and the news media.

CYBER ATTACK

The City maintains an IT network separate from the water system SCADA network. The network is used for intracity business and is password protected. Firewall protection is used and no outside access for third parties is allowed.

If a cyber attack is successful, the response will require the IT-System Administrator to assess the extent of impact and develop a plan to restore damaged or compromised files and attempt to recover lost files.

If the SCADA system is compromised it will become necessary to monitor the water facilities by periodic and direct visual contact until the system is restored to normal operations.

DOCUMENTATION PROCEDURES

During an emergency, precise documentation of actions taken and materials used will greatly increase the efficiency with which the City handles the situation. Detailed recording and reporting of events, such as shut downs, valve isolations, sampling events and reservoir operations, enables repairs to be made quickly keeping down time to a minimum. The detailed reports are invaluable in making certain that the system is quickly and efficiently returned to pre-emergency operating status. To aid employees, an Operating and Damage Report form is included in Appendix M.

The Federal Emergency Management Agency (FEMA) requires proper documentation of damage for the City to file claims in the event the City is covered by a Presidential Disaster Declaration. Photographic evidence of “before” and “after” an event as well as equipment purchase records will strengthen any justification for compensation from the Federal government.

The FEMA disaster assistance website for public agencies can be consulted for further information:

http://www.disasterassistance.gov/daip_en.portal

MAJOR WATER SUPPLY INTERRUPTIONS

WATER MAIN BREAKS

Depending on the location where the main break occurs, if susceptible populations are impacted, use contact list in Appendix B (Coliform Monitoring Plan) for notification. City will provide bottled water for lengthy outages. Depending on circumstances, portable toilets may be supplied as well. Trucked potable water may be provided. If the City uses trucked potable water, the guidelines in DOH Publication #331-063 will be followed.

The City maintains an inventory of piping and fittings to address most emergency repair requirements and has a list of vendor telephone numbers to obtain supplies when existing material stocks are inadequate for emergencies. When repairs are too large for City crews to manage, the City will contact contractors from its small works roster.

When water supply interruptions for a pressure zone are expected to be lengthy, the City will consider instituting measures to allow customers to come to a reservoir and obtain water directly from a reservoir. Any water dispensed in this manner will be done under the supervision of a City employee.

BOOSTER STATIONS

The City has developed detailed written procedures for operating the water system when booster stations are not in service and has figures showing locations of pumps, piping, meters, shut off valves and other key features of each facility, such as valve size/type, motor manufacturer/type/hp and pump capacity/type. Copies of these procedures, technical details and figures are kept at each facility.

A brief summary of the booster station emergency procedures follows.

Butler Booster Station

<u>Auxiliary Power</u>
The Butler Booster Station does not have an auxiliary power system.

<u>HOA Setting</u>
Emergency operation of the booster station may require the pump to be operated in the HAND mode to compensate for distribution system problems in other areas of the system during a power outage.

<u>Backup Operations</u>
Angelo Booster Station serves as a back up for feeding the Lower Prune Hill (455) Zone if the Butler Booster Station is out of service. The City has a standby pump for the 455 Zone at the Angelo Booster Station in the event that a pump is out of service. There is

sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Gregg Booster Station

Auxiliary Power
The New Gregg Booster Station has a diesel powered 300-kW generator with automatic transfer switch capable of operating the New Gregg Booster Station pumps during a power outage.

HOA Setting
Emergency operation of the booster station may require the pump to be operated in HAND mode to compensate for distribution system problems in other areas.

Backup Operations
There is no back up in the event Gregg Booster Stations are out of service, however, there is sufficient pumping capacity at the Gregg Booster Stations to operate with the largest pump out of service under normal system demands, including fire flow.

Angelo Booster Station

Auxiliary Power
The Angelo Booster Station is equipped with a 200-kW diesel generator with an automatic transfer switch. This generator is capable of providing power to three of the pumps, the lighting, and the HVAC system.

Backup Operations
If Angelo Booster Station is out of service, Butler Booster Station and Forest Home Booster Station serve as back up to feed the upper zones (Lower Prune Hill, Lacamas, Upper Prune Hill) from the lower zone (Butler). The City has a standby pump at the Angelo Booster Station in the event that a pump is out of service. There is sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Lower Prune Hill Reservoir Out of Service
If the Lower Prune Hill Reservoir is out of service, one pump at the station will be placed into hand mode and operated with the reservoir isolated. The pressure relief valve at the station will bleed excess pressure to the inlet piping. This will allow the system to maintain a constant pressure in the zone. During this operation, the pump and pressure need to be monitored every two hours.

Forest Home Booster Station

Auxiliary Power
Auxiliary power is not available for the Forest Home Booster Station.

HOA Settings
During emergencies the booster station may need to be operated in the HAND mode to compensate for distribution system problems in other areas of the system.

Backup Operations
If the Forest Home Booster Station is out of service, Butler Booster Station and Angelo Booster Station serve as back up to feed the upper zones (Lower Prune Hill, Lacamas, Upper Prune Hill) from the lower zone (Butler). The City has a standby pump at the Angelo Booster Station in the event that a pump is out of service. There is sufficient pumping capacity to the 455 Zone to operate with the largest pump out of service under normal system demands, including fire flow.

Lacamas Booster Station

Auxiliary Power
The Lacamas Booster Station has an auxiliary generator with automatic transfer switch available to provide power. This generator is a 60 kW natural gas generator and is capable of running the two 500-gpm pumps, the building lights and ventilation system. This generator is able to provide the Lacamas Booster Station with power as long as natural gas service is not interrupted. If the generator fails during a power outage, water service can be maintained through the pressure reducing valve (PRV) stations that that connected to the system that feeds down from the Upper PruneHill Reservoir. Well No. 9 also serves the area supplied by Lacamas Booster Station, but since it does not have auxiliary power, it is more than likely unavailable during a power outage.

Lacamas Reservoir Out of Service
When the Lacamas Reservoir is out of service, pressure to the Lacamas (544) Zone can be maintained by operating one of the pumps in the Lacamas Booster Station. The pressure relief valve will return excess pressure to the inlet piping while maintaining the downstream pressure. Under this operating condition, the pump operation and pressure need to be checked every 2 hours. The 544 Zone can also be served from Upper Prune Hill through PRV stations.

Backup Operations
When the Lacamas Booster Station is out of service Well No. 9 and the Lower Prune Hill Booster Station can be used to feed the Lacamas (544) Zone.

Lower Prune Hill Booster Station

Auxiliary Power
This facility is equipped with a 300-kW diesel powered generator with an automatic transfer switch to operate the three pumps in the event of a power failure.

Temporary Pump
During high seasonal demands a mobile skid mounted pump is rented by the City to supplement the LPH Booster Station. This pump is installed via connections constructed

for this purpose near the entrance to the pump station. It is operated in a manual mode and has a capacity between 600 and 700 gpm. This pump is not powered by the auxiliary power generator. The City also has pumping capacity available at the Upper Prune Hill Booster Station to serve the Upper Prune Hill area for temporary losses of service at the Lower Prune Hill Booster Station, but this is limited and cannot provide supply for extended interruptions in service or extended periods of high demands.

Upper Prune Hill Booster Station

Auxiliary Power

The Upper Prune Hill Booster Station is equipped with a manual transfer switch to allow the City to bring in a portable generator to supply power to the booster station. The portable generator used by the City can operate two of the 20-hp pumps.

RESERVOIR EMERGENCY PROCEDURES

General

The City has developed detailed written procedures for operating the water system when reservoirs are not in service. These procedures are kept at each facility. If a reservoir must be taken off line isolation valves are used to prevent water from being pumped into the reservoirs and the reservoirs are allowed to empty into the distribution system.

A brief summary of the reservoir emergency procedures follows.

Butler Reservoir

Water service is maintained to the system during cleaning / draining / disinfection of the reservoir with the following procedures.

- Connect 6-inch overflow piping to the 12-inch main in the Butler Yard.
- Open the 6-inch overflow valve.
- Open the 4-inch main connecting line valve between the 12-inch and 14-inch mains until water comes out of the 6-inch overflow.
- Close the two 12-inch valves in the reservoir valve pit to take the Butler Reservoir offline.
- Adjust the 4-inch connecting valve to maintain a small amount of water flow from the 6-inch overflow. As long as water flows from the overflow, water service will be maintained to the 343 Zone.
- Depending on the season and the demand, a well may need to be in operation to maintain system pressure in the 343 Zone.
- The pressure reducers on NE 22nd Avenue and NE Everett Street regulate pressure and keep the 343 Zone served.

Reverse the order to place the reservoir back online.

Gregg Reservoir

Water service can be maintained to the Gregg area by running a pump in the HAND position in the Gregg Booster Station. The pressure relief/bypass valve at the Gregg Booster Station will maintain pressure in the service area and also keep it from over pressurizing the zone. The Gregg Reservoir can be isolated after the pump in the Booster Station is placed into operation. Close attention will be paid to the system pressure and the pump to provide uninterrupted service.

Lacamas Reservoir

The Lacamas Reservoir is supplied from the Upper Prune Hill Zone via PRVs, from the Lower Prune Hill Zone via the Lacamas Booster Station, or from Well No. 9. As long as one of these facilities is in operation, the reservoir can be filled.

Water service can be maintained to the Lacamas area (544 Zone) by running a pump in the HAND position in the Lacamas Booster Station or Well No. 9. The pressure relief/by-pass valve at the Lacamas Booster Station will maintain pressure in the service area and also keep it from over pressurizing the zone. The Lacamas Reservoir can be isolated after the pump in the Booster Station is placed into operation. Close attention must be paid to the system pressure and the pump to provide uninterrupted service.

Lower Prune Hill (LPH) Reservoirs

Emergency operation of the reservoir would be required if a problem were to occur with one of the reservoirs. If a reservoir were to experience a physical or water quality problem, one reservoir could be taken out of service and the remaining one could be used to supply water until the problem is solved. If the smaller of the two tanks was used alone, the start levels for the Butler, Forest Home, and the Angelo Booster will be raised to keep the reservoir full at all times.

Upper Prune Hill (UPH) Reservoirs

<u>UPH 2.4-MG Reservoir</u>
The 2.4-MG reservoir inlet has an altitude valve that closes to allow the UPH standpipe to fill when the reservoir is full (63 foot level). The UPH 2.4-MG reservoir outlet valve is normally opened, but is seismically controlled and will close in a seismic event. The UPH booster pumps will also be turned off in a seismic event.

If both the Lower Prune Hill and Upper Prune Hill Booster Stations are out of service and the Upper Prune Hill Standpipe level drops low enough, site valves can be opened to allow both the standpipe and the 2.4-MG Reservoir to float on the system.

Two of the booster pumps (No. 2 and No. 3) are equipped with modified pump control valves that employ two valves that are adjusted to drain the UPH 2.4-MG reservoir.

Detailed procedures for using these pump control valves are provided at the UPH booster station.

UPH Standpipe

The UPH standpipe inlet valve is a spring-activated altitude valve that is designed to shut off when the standpipe is full. This valve is not controlled by the telemetry system. When the UPH standpipe altitude valve is closed, the UPH booster pumps operate based on the pump discharge pressure.

If the Upper Prune Hill Standpipe is out of service, the UPH area can be supplied by the UPH Booster Station and the LPH Booster Station. The LPH Booster Station operates based on reservoir level in the 2.4 MG UPH Reservoir. If the LPH Booster Station flows exceed system demands, the 2.4 MG UPH Reservoir will fill. If the 2.4 MG UPH Reservoir is full, the LPH Booster Station will shut off and the UPH Booster Station will be called in pressure mode and will supply the system. If system demands exceed the supply of the LPH Booster Station while it is in operation, the UPH Booster Station will be called in pressure mode to provide additional supply. Pressure mode for the UPH Booster Station is discussed below.

At the Upper Prune Hill Pump Control Panel Screen, the operator selects this setting at the pump control panel, which is a six step operating sequence (numbered 0 to 5) that is based satisfying a minimum pressure of the pump discharge. The operator sets the pressure at 40 psi, which simulates a full standpipe.

- Step 0 – no pumps on (40 psi is satisfied)
- Step 1 – pump 1 on and runs till 40 psi is satisfied
- Step 2 – pump 1 and 2 on if 40 psi is not satisfied after Step 1
- Step 3 – pump 1 and 3 on if 40 psi is not satisfied after Step 2
- Step 4 – pump 1, 2 and 3 on if 40 psi is not satisfied after Step 3
- Step 5 – all pumps on if 40 psi not satisfied after step 4

There is a 15 second delay built in between each step. Pumps turn off sequentially in 15 second intervals once 40 psi is satisfied.

WELLS

Detailed written operating instructions are maintained at each well. These instructions cover normal operations as well as response to pump and power failure. For wells with treatment facilities, written descriptions of shutdown and start up of treatment equipment is included with the written procedures. A brief summary of emergency operations at each well is provided below.

Well No. 5

There is neither a generator nor an angle drive to operate Well No. 5 during a power outage. Well No. 5 can be used to maintain pressure in the lower grid when the Butler

Reservoir is out of service. Under these conditions, Well No. 5 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit.

Well No. 6

There is neither a generator nor an angle drive to operate Well No. 6 during a power outage. Well No. 6 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 6 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit.

Well No. 7

There is not a generator or an angle drive to operate Well No. 7 during a power outage. Well No. 7 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 7 has to be run from the HAND position from the well facility or the Operations Center master telemetry unit.

Well No. 8

During a power outage, Well No. 8 has an auxiliary engine and angle drive. Well No. 8 can be used to maintain pressure in the lower grid when the Butler Reservoir is out of service. Well No. 8 has to be run from the HAND position from the pump house or the Operation Center master telemetry unit during a power outage. The backup chlorination system is also run by the generator.

Well No. 9

There is neither a generator nor angle drive to operate Well No. 9 during a power outage.

Well No 10

There is neither a generator nor angle drive to operate Well No. 10 during a power outage.

Well No. 11 & 12

The Washougal Wellfield Facility has its own diesel powered auxiliary generator with an automatic transfer switch. This generator is 350 kW and is designed to serve the Washougal Wellfield Treatment Facility during a power outage, to include the two well pumps, chemical feed pumps, controls for the well pumps and chemical feed system, HVAC system and lighting.

Well No. 13

The Well No. 13 Facility has its own diesel powered auxiliary generator with an automatic transfer switch and acoustical enclosure. This generator is 250 kW and is designed to serve the Well 13 Facility during a power outage, to include the well pump, chemical feed pumps, controls for the well pump and chemical feed system, HVAC system and lighting.

SURFACE WATER FILTRATION PLANT

Detailed written operating instructions are maintained at the Surface Water Filtration Plant. These instructions cover normal operations as well as start up and shut down procedures. The plant is equipped with a 45 kW propane powered auxiliary generator in event of a power outage.

DRINKING WATER WARNING

The _____ Water System, ID_____, located in _____County is contaminated with fecal coliform/ *E. coli* bacteria.

Fecal coliform/ *E. coli* bacteria were detected/confirmed in the water supply on _____. These bacteria can make you sick and are a particular concern for people with weakened immune systems.

DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST. Bring all water to a rolling boil for one minute. Let it cool before using. Boiled or purchased bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation until *further notice*. Boiling kills bacteria and other organisms in the water.

Fecal coliforms and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care provider.

What happened? What is the suspected or known source of contamination?

The following is being done to correct the problem:

We have consulted with the Washington State Department of Health about this incident. We will notify you when you no longer need to boil the water. We anticipate resolving the problem by _____.

For more information, please contact _____ at ( )___-_____ or at _____.
(owner or operator) (phone number) (address)

Please share this notice with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distribution copies by hand or mail.

This notice is sent to you by _____ Water System on ___/___/____

10/17/08

City of Camas Water System
Public Works Department Emergency Phone Numbers

Employee	Pager	Home	Cell
A. Blanchard	418-5474	835-5645	606-4275
J. Gant	418-5517	834-2410	518-4646
G. Emmert	418-5509	835-3758	606-1137
R. Crum	418-5490	335-8023	
P. Hargrave	418-5521	693-1005	901-4238
B. Walton	418-5621	699-4926	
E. Nickelsen	418-5585	834-6732	
L. Grimani	418-5519	835-9451	
J. Martell	418-5150	835-9476	772-3522
C. Hittle	418-5525	254-0124	772-0236
G. Reed	418-5588	834-3604	772-0232
K. Kunkel	418-5559	834-2896	772-0230
J. Carothers		891-4542	936-0292
J. Hodges		885-0953	909-8031
W. Heigh		254-1238	921-8209
K. Kakuk		834-6809	
A. Ashton		834-7104	904-7619
H. Hoyer		256-1962	
J. Englund		834-6546	
911 from Cell Phone			696-4461
M. Stevens	418-5616	835-9093	921-2872
M. Nelson	418-5578	687-5014	921-2751
M. Clapp	690-1446	834-1667	609-0889
K. Murray	418-5574	835-8919	921-5020
T. Reed	418-5590	834-1089	931-0327
B. Prather	418-5737	326-3718	
K. Lougheed	418-5733	901-1886	931-0326
J. Dickinson	418-5497	254-3431	606-4604
R. Shirley	418-5602	687-4750	
T. Holtcamp	418-5550	986-2138	
O. Helland	418-5524	837-8637	
S. Skinner	418-5603	834-6715	
S. Adlard	418-5446	687-5913	
C. Reed		834-7941	609-0885
E. Levison	418-5952	210-4302	609-0887
M. Brachmann	690-0584	834-2749	921-3799
Filter Plant		834-6190	
Sonitrol	696-0777	After Hours	737-0592
STP 834-3263	STP Cells	901-1579	606-7090

City of Camas Water System
Other Departments 24-Hour Emergency Phone Numbers

Department	Pager	Home	Cell
Larry Larimer, Fire Department	418-5474	835-5645	606-4275
Allen Wolk, Fire Marshal	418-5517	834-2410	518-4646
Police Chief	418-5509	835-3758	606-1137
Police Captain	418-5490	335-8023	
Patrol Sargeant	418-5521	693-1005	901-4238
Detective Sargeant	418-5621	699-4926	
Patrol Car 31	418-5585	834-6732	
Patrol Car 273	418-5519	835-9451	
Patrol Car 302	418-5150	835-9476	772-3522
Patrol Car 307	418-5525	254-0124	772-0236
Patrol Car 320	418-5588	834-3604	772-0232
Patrol Car 321	418-5559	834-2896	772-0230
Kit Kanekoa		891-4542	936-0292
Crime Prevention		885-0953	909-8031

City of Camas Water System
Other Agencies 24-Hour Emergency Phone Numbers

Agency	Pager	Home	Cell
AT&T/Comcast		834-7104	904-7619
Burlington Northern Railroad		256-1962	
City of Vancouver		834-6546	
City of Washougal			696-4461
Clark Public Utilities	418-5616	835-9093	921-2872
DOE Hazardous Spills	418-5578	687-5014	921-2751
Evergreen Adjustment	690-1446	834-1667	609-0889
Georgia-Pacific MERT	418-5574	835-8919	921-5020
NW Natural	418-5590	834-1089	931-0327
One Call Locates	418-5737	326-3718	
Verizon	418-5733	901-1886	931-0326
Wafertech	418-5497	254-3431	606-4604
Wast Connections - Bob Byrd	418-5602	687-4750	
WSDOT	418-5550	986-2138	

Appendix O

Cross Connection Control Ordinance

ORDINANCE NO. 1504

AN ORDINANCE amending Sub-section (2) of Section VIII of Ordinance No. 601, as last amended by Ordinance No. 1265 and Section 13.08.190 of the Camas City Code by revising regulations for connections to the City Water System.

THE COUNCIL OF THE CITY OF CAMAS DO ORDAIN AS FOLLOWS:

Section I

That Sub-section (2) of Section VIII of Ordinance No. 601 as last amended by Ordinance No. 1265 and Section 13.08.190 of the Camas City Code be and the same are hereby amended to read as follows:

Section 13.08.190 Unlawful connections - Cross Connections - Private water systems.

(1) It shall be unlawful for any person, except duly authorized city employees, to make connections with any water main or water pipe belonging to the municipal water supply system, without first obtaining written permission to do so from the Public Works Director or his designated representative.

(2) As used herein, the terms "cross connection" shall be construed to mean any physical arrangement whereby the public water supply is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, plumbing fixture or other device which contains or may contain contaminated water, sewage, or other wastes or liquids of unknown or unsafe quality or which may be capable of imparting contamination to the public water supply as a result of back-flow.

(3) The installation or maintaining of a cross connection with the public water supply system of the City is prohibited, except as provided in sub-section 5 hereof.

(4) The control or elimination of cross connections shall be in accordance with the rules and regulations of the Washington State Board of Health regarding public water supplies, Washington Administrative Code 248-54-285 as it now exists or as it may hereinafter be amended, and with any requirements set forth by the "U.S. Environmental Protection Agency" as authorized by the "Safe Drinking Water Act", PL 93-523, as it presently exists or as it may hereinafter be amended, and with any manual of standard practice pertaining to cross connection control approved by the Public Works Director or his designated representative.

(5) The owner or operator of any water system having a separate source of water supply may cross connect such water supply to the city water system only after first having installed, at the point of such cross connection, a back-flow preventative device approved in writing by the Public Works Director or his designated representative. Such approval shall not be given unless the back-flow device meets the existing requirements of the Washington State Board of Health.

(6) All automatic fire sprinkler systems connected to the City water supply system shall be required to have Washington State Board of Health approved type back-flow preventative devices installed at or near the service connection and ahead of any type of outlet or pumper connection.

(7) The Director of Public Works, or his designated representative, upon showing proper identification shall be allowed access to all portions of the premises, including buildings and structures, to which City water is supplied, at reasonable hours of the day and for the sole purpose of inspecting and determining compliance with all provisions of this section. Water service may be refused or discontinued to any premises for failure to allow such necessary access and inspection.

(8) Where a back-flow preventative device is in service, the device shall be inspected and tested at least annually by the Public Works Director or an authorized representative, and must be in a satisfactory operating condition. If the device is not found to be in a satisfactory operating condition, the connection between the City water supply and the system isolated by the device shall be severed immediately or City water service may be discontinued without notice.

Section II

This Ordinance shall be in full force and effect from and after five (5) days from the date of its passage and publication according to law.

PASSED by the Council and APPROVED by the Mayor this 13 day of February, 1984.

SIGNED: _____
MAYOR

ATTEST: _____
CLERK

APPROVED as to form:

_____
CITY ATTORNEY

Cross Connection Control

Actions taken to improve CCC program:

2003 Irrigation Permits from the Building Department
Compared previous three year's worth of irrigation permits to BPMS database. Addresses that were not in the database were placed on a non-compliance spreadsheet. Notices were sent to addresses that had not submitted a test report.

This exercise is performed annually using the previous year's data. And notices are sent out.

2004 Letters were sent to all local businesses informing them of the Cross Connection Control program and testing requirements. We asked that they contact us regarding any assemblies that they had on-site – irrigation, soda machines, medical equipment. Letters were sent to 15 businesses and 29 restaurants and gas stations.

2005 We created an informational brochure regarding backflow prevention. This brochure was mailed with notices to residential customers listed in the BPMS database. We also placed brochures in kiosks at multiple city facilities.

We had summer help note addresses with possible irrigation systems. We compared that list to addresses in our BPMS database. Addresses not in BPMS were compared to the non-compliance spreadsheet. Addresses not in the spreadsheet were added to the spreadsheet. Those addresses received notices regarding testing requirements. From that list we developed an AVB listing and were able to bring more citizens into compliance. An additional 1,080 letters were sent.

This is an on-going process. We continue to add to this list every year. We gather information from homeowners, meter readers, City of Camas Finance Department, BF testers, etc.

2007 Medical facilities and veterinaries were contacted asking what CCC they had on site and questioning if they use stand-alone bottled water at their patient stations.

Fall 2007, City of Camas meter readers were asked to identify all addresses with possible irrigation systems. This information was downloaded to an Excel spreadsheet and compared to the BPMS database. All addresses not in the database were then compared to the non-compliance spreadsheet. Any addresses not in either the database or spreadsheet were added to the spreadsheet. Non-compliance notices will be sent in spring 2008.

2008 We were able to increase the Water/Sewer staff to include a Cross Connection Control certified employee. This person has been performing surveys of our industrial customers and of sites shown to have an AVB on site. He has also offered assistance to support staff in managing calls from City of Camas water customers.

We were able to increase our support staff to assist in managing the CCC program with data management and answering questions from BF testers and citizens.

We created two informational brochures (line card format), which replaces the brochure created in 2005. They are titled: Backflow Prevention Requirements / Irrigation and LEAKS. These cards will be mailed to water customers with possible irrigation systems that are not listed in BPMS. Cards have also been placed in kiosks at multiple city facilities.

IMPORTANT INFORMATION FROM
THE CITY OF CAMAS – WATER DEPARTMENT
ANNUAL BACKFLOW DEVICE TESTING NOTICE

May 1, 2007

Dear Current Water Customer,

Our records indicate that you have one or more backflow prevention assemblies installed in your water supply plumbing that are due for testing (i.e., lawn irrigation system, soda machine, sterilization equipment, etc.).

It is imperative that each assembly is working properly to safeguard your health and the health of others. Washington State Law (WAC 246-290-490 Cross Connection Control) requires annual testing of backflow prevention assemblies. The testing is to be performed by a Washington State Certified Tester. Please have your assembly tested within 30 (thirty) days. A list of State Certified Backflow Testers has been copied on the reverse side of this letter. Backflow Testers are private contractors and their fees are not regulated by the City of Camas. The tester will notify the City that the test has been completed. To obtain additional information on the importance of backflow device testing, please review the backflow information on the City's website at:

http://www.ci.camas.wa.us/services/utilities/irrigation.htm

Thank you for helping us to preserve our water quality. If you have questions or need information on your location, please call the Backflow Hotline at (360) 817-1569 and leave a message or e-mail rsyverson@ci.camas.wa.us. You will receive a return call as soon as possible. If you have a test report and would like to fax it to the City of Camas, please send it to (360) 834-1535.

Sincerely,

Ronda L. Syverson
Sr. Administrative Support Assistant

Appendix P

Wellhead Protection Program

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
PH: 360-834-6864 • F: 360-834-1535
http://www.ci.camas.wa.us

May 28, 2010

Department of Ecology
Southwest Regional Office
PO Box 47775
Olympia, WA 98504-7775

Re: City of Camas Wellhead Protection Plan

Dear Department of Ecology:

The City of Camas has developed a Wellhead Protection Plan to help maintain the drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA).

The enclosed map depicts the WHPA boundary, source wells, and identified potential contaminant sources. Please review the map and use it as a reference when inspecting and permitting the storage, use, and disposal of hazardous material within our WHPA.

Thank you for your attention in this matter. If you have any questions or would like a copy of the wellhead protection plan, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
Director of Operations
City of Camas

James E. Carothers, P.E.
Engineering Manager
City of Camas

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
PH: 360-834-6864 • F: 360-834-1535
http://www.ci.camas.wa.us

May 28, 2010

Ron Mitchell, Police Chief
Washougal Police Department
1320 "A" Street
Washougal, WA 98671

Re: City of Camas Wellhead Protection Plan

Dear Chief Mitchell:

The City of Camas has developed a Wellhead Protection Plan to help maintain the drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA).

As part of this Plan, the city must provide wellhead protection information to agencies responsible for incident/spill response procedures. Since a portion of our WHPA extends into the City of Washougal's jurisdiction, it is important that you are aware of where potential contaminant releases could adversely impact the quality of our communities drinking water supply.

A map of the wellhead protection areas and adjacent transportation routes is enclosed for your review. An acknowledgement of receipt of this information or a response from your office as part of our wellhead protection plan documentation would be appreciated.

In the event of a spill or contaminant release, we would ask that you notify immediately us and the Department of Ecology, so that we can take appropriate measures to deal with the problem.

Thank you for your attention in this matter. If you have any questions or would like a copy of the wellhead protection plan, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
Director of Operations
City of Camas

James E. Carothers, P.E.
Engineering Manager
City of Camas

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
PH: 360-834-6864 • F: 360-834-1535
http://www.ci.camas.wa.us

May 28, 2010

Ron Schumacher, Fire Chief
Washougal Fire Department
1400 A street
Washougal, WA 98671

Re: City of Camas Wellhead Protection Plan

Dear Chief Schumacher:

The City of Camas has developed a Wellhead Protection Plan to help maintain the drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA).

As part of this Plan, the city must provide wellhead protection information to agencies responsible for incident/spill response procedures. Since a portion of our WHPA extends into the City of Washougal's jurisdiction, it is important that you are aware of where potential contaminant releases could adversely impact the quality of our communities drinking water supply.

A map of the wellhead protection areas and adjacent transportation routes is enclosed for your review. An acknowledgement of receipt of this information or a response from your office as part of our wellhead protection plan documentation would be appreciated.

In the event of a spill or contaminant release, we would ask that you notify immediately us and the Department of Ecology, so that we can take appropriate measures to deal with the problem.

Thank you for your attention in this matter. If you have any questions or would like a copy of the wellhead protection plan, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
Director of Operations
City of Camas

James E. Carothers, P.E.
Engineering Manager
City of Camas

CITY OF CAMAS

616 Northeast Fourth Avenue
P.O. Box 1055
Camas, Washington 98607
PH: 360-834-6864 • F: 360-834-1535
http://www.ci.camas.wa.us

May 28, 2010

Mitch Lackey, Police Chief
City of Camas Police Department
2100 NE 3rd Avenue
Camas, WA 98607

Re: City of Camas Wellhead Protection Plan

Dear Chief Lackey:

The City of Camas has developed a Wellhead Protection Plan to help maintain the drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA).

As part of this Plan, the city must provide wellhead protection information to agencies responsible for incident/spill response procedures. It is important that you are aware of where potential contaminant releases could adversely impact the quality of our communities drinking water supply.

A map of the wellhead protection areas and adjacent transportation routes is enclosed for your review. An acknowledgement of receipt of this information or a response from your office as part of our wellhead protection plan documentation would be appreciated.

In the event of a spill or contaminant release, we would ask that you notify immediately us and the Department of Ecology, so that we can take appropriate measures to deal with the problem.

Thank you for your attention in this matter. If you have any questions or would like a copy of the wellhead protection plan, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
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P.O. Box 1055
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May 28, 2010

Leo Leon, Fire Chief
City of Camas Fire Department
616 NE 4th Avenue
Camas, Washington 98607

Re: City of Camas Wellhead Protection Plan

Dear Chief Leon:

The City of Camas has developed a Wellhead Protection Plan to help maintain the drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA).

As part of this Plan, the city must provide wellhead protection information to agencies responsible for incident/spill response procedures. It is important that you are aware of where potential contaminant releases could adversely impact the quality of our communities drinking water supply.

A map of the wellhead protection areas and adjacent transportation routes is enclosed for your review. An acknowledgement of receipt of this information or a response from your office as part of our wellhead protection plan documentation would be appreciated.

In the event of a spill or contaminant release, we would ask that you notify immediately us and the Department of Ecology, so that we can take appropriate measures to deal with the problem.

Thank you for your attention in this matter. If you have any questions or would like a copy of the wellhead protection plan, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
Director of Operations
City of Camas

James E. Carothers, P.E.
Engineering Manager
City of Camas

Date

Address of local business (see Table 1)

Re: City of Camas Wellhead Protection Plan

To Whom It May Concern:

The City of Camas has developed a Wellhead Protection Plan to help maintain drinking water quality for our city residents. The Plan is based on Washington Department of Health WAC 246-290-135(3) regulations. As part of the Plan, maps were prepared that show the areas around each city drinking water well where a chemical spill on the ground may cause contamination of the well/aquifer. These areas are Wellhead Protection Areas (WHPA). The Plan also requires an inventory of potential sources of groundwater contamination within these wellhead protection areas.

The primary purpose of this letter is to notify you that your facility is located within our WHPA. Since your business or the activities conducted at your facility may involve the use of chemicals (e.g., gasoline, underground storage tanks, hazardous waste, etc.), and the potential exists that a chemical spill from your facility may adversely impact the city drinking water supply, please notify the City of Camas immediately if a chemical spill occurs at your facility. All spills should be reported by dialing 911 and requesting that the City of Camas Fire Department and Southwest Washington Health Department be contacted.

Please note that the groundwater aquifer that supplies City Camas' wells also supply the City of Washougal's wells. Therefore, immediate notification of City of Camas in the event of a spill also assists the City of Washougal by protecting the water supply for the entire community.

Thank you for assisting us in protecting our water supply and groundwater resources. If you have any questions, please contact me at (360) 834-2457 ext 4251.

Sincerely,

Eric Levison
Director of Operations
City of Camas

Table 1 - Mailing List for Wellhead Protection Area Notification

Facility/Site ID	Facility/Site Name	Address	City	State	Zip Code
18768638	All Seasons Auto Centers Inc Camas	3440 NE 3RD AVE	CAMAS	WA	98607
94778244	Asher Engine Service	1405 E ST	WASHOUGAL	WA	98671
64124152	Brass Lamp Motor Inn	544 6TH ST	WASHOUGAL	WA	98671
74959167	CAMAS STP	1129 SE POLK ST	CAMAS	WA	98607
92847997	CAMAS WASHOUGAL PORT	24 A ST	WASHOUGAL	WA	98671-2163
1043	CHEVRON BULK PLANT CAMAS	SE 6TH AVE & SE UNION AVE	CAMAS	WA	98607
95756539	CLARK COUNTY PUB WKS WASHOUGAL SITE	4624 SE WASHOUGAL	WASHOUGAL	WA	98671-9262
5352681	CLARK PUBLIC UTILITY DIST C ST	89 C ST	WASHOUGAL	WA	98671-2142
5016308	COLUMBIA ROCK CONCRETE PRODUCTS INC	1615 SE 6TH AVE	CAMAS	WA	98607
11338232	COLUMBIA STORAGE INC 2ND ST	365 2ND ST	WASHOUGAL	WA	98671-2111
37125488	COLUMBIA WAREHOUSE	361 C ST	WASHOUGAL	WA	98671
70983458	CONCRETE PRODUCTS OF OREGON LLC	1635 SE 6TH AVE	CAMAS	WA	98607-2260
4168647	GK Construction & Equipment Rentals	1840 SE 8TH AVE	CAMAS	WA	98607
85837922	GOODYEAR TIRE CAMAS	3440 3RD AVE	CAMAS	WA	98607
4399598	HAMBLETON BROS LOG YARD	335 S A ST	WASHOUGAL	WA	98671-2138
69936158	Helland Brothers SS	135 6TH ST	CAMAS	WA	98607
22538744	HI WAY FUEL	1250 E ST	WASHOUGAL	WA	98671
86429735	JIMBOS DELI MART 2	165 C ST	WASHOUGAL	WA	98671
79581825	Napa Washougal	1414 E ST	WASHOUGAL	WA	98671
14447751	Northwest Pipeline GP Washougal M/S	30 C ST	WASHOUGAL	WA	98671-2143
49392144	Overton Mfg Inc	1325 E ST	WASHOUGAL	WA	98671-1410
64113396	S & S FOOD MART	1641 E ST	WASHOUGAL	WA	98671-1430
52218486	Schucks Auto Supply Camus	3440 NE 3RD ST	CAMAS	WA	98607
3264254	TARR INC WASHOUGAL	361B C ST	WASHOUGAL	WA	98671
7282918	TIDLAND CORPORATION	2363 8TH AVE SE	CAMAS	WA	98607-2261
3153967	TRIANGLE RESOURCES	612 SE UNION ST	CAMAS	WA	98607
3811629	US DOE BPA Camas Substation	1ST ST 1 BLK N OF 8TH AVE	WASHOUGAL	WA	98671
16327542	WASHOUGAL ELECTRIC & SHEET METAL INC	594 C ST	WASHOUGAL	WA	98671-0005
48371594	WASHOUGAL SCHOOL DIST BUS GARAGE	995 E ST	WASHOUGAL	WA	98671-1317
57872946	WASHOUGAL SHELL	730 E ST	WASHOUGAL	WA	98671

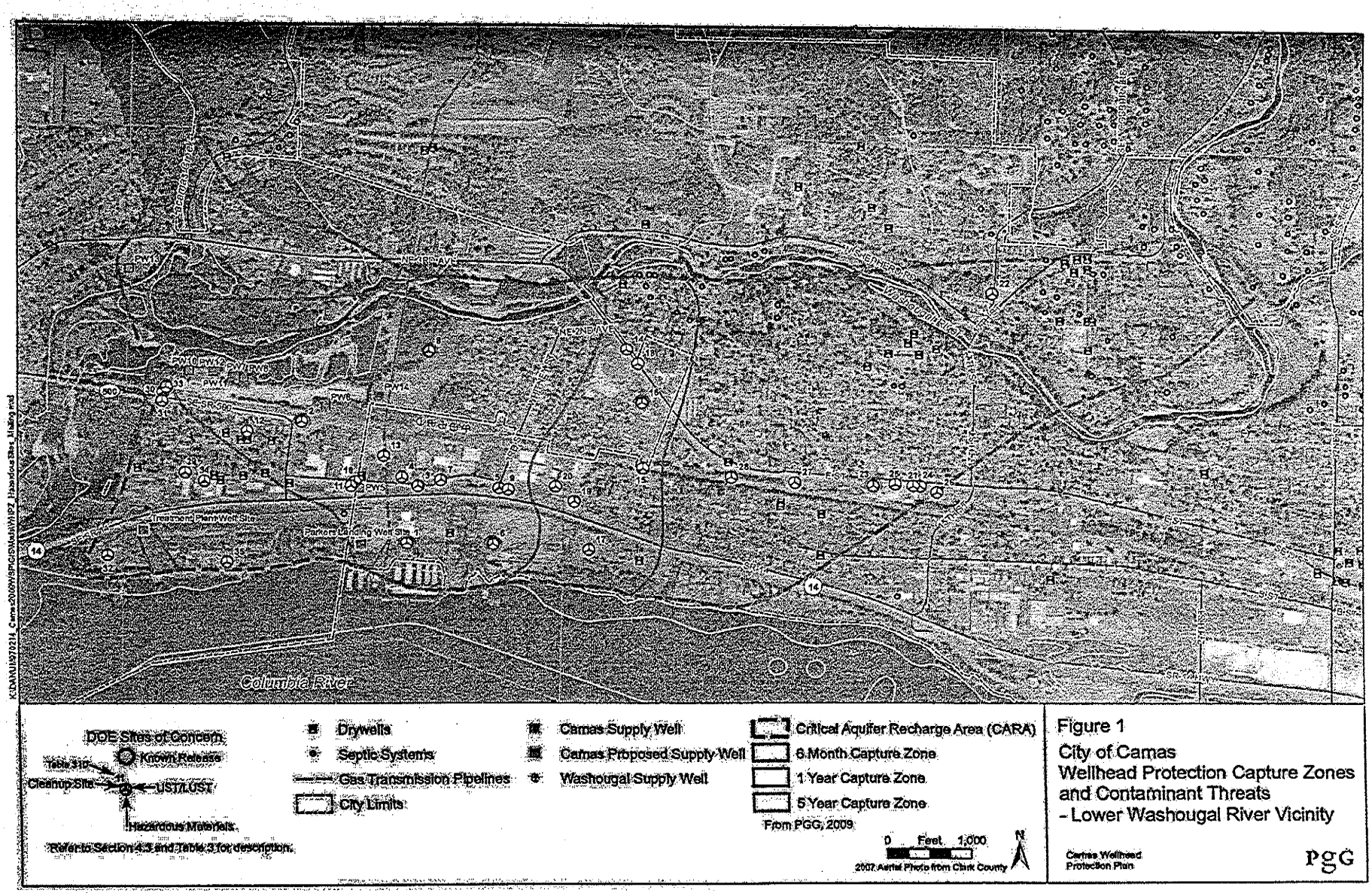
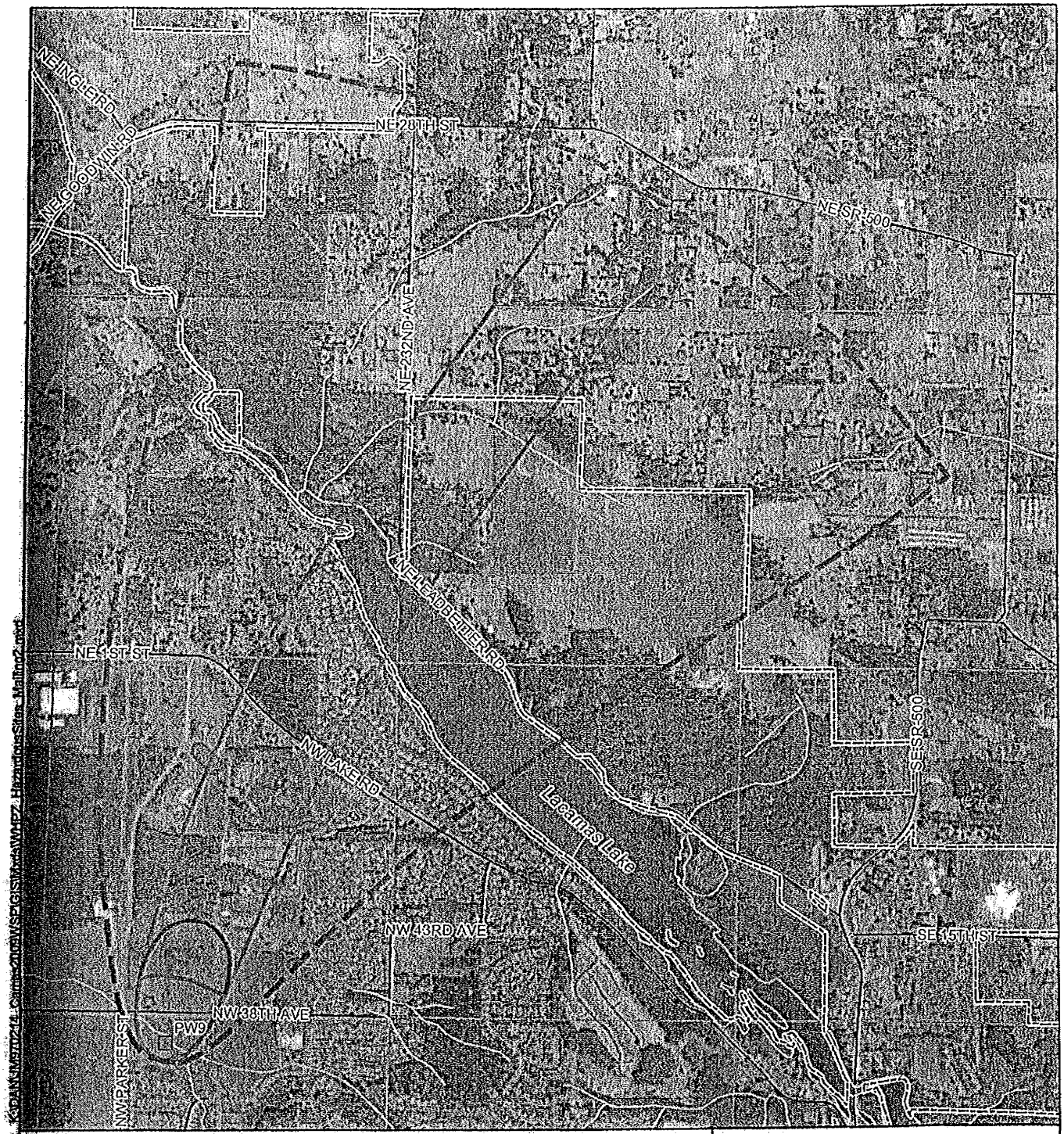


Figure 1
City of Camas
Wellhead Protection Capture Zones
and Contaminant Threats
- Lower Washougal River Vicinity

Camas Wellhead Protection Plan

PGG



Camas Well 9
City Limits
6 Month Capture Zone
1 Year Capture Zone
5 Year Capture Zone
10 Year Capture Zone
Critical Aquifer Recharge Area (CARA)

From PGG, 2002

0 Feet 2,000

N

2007 Aerial Photo from Clark County

Figure 2
City of Camas
Wellhead Protection
Capture Zones
and Contaminant Threats
- Well 9 Vicinity

Camas Wellhead
Protection Plan

PgG

City of Camas
Hydrogeologic Summary and
Wellhead Protection Assessment Report

September 16, 2009

Pacific Groundwater Group
Seattle, Washington

JM9702.14

City of Camas
Hydrogeologic Summary and
Wellhead Protection Assessment Report

Prepared for:

City of Camas
616 NE Fourth Avenue
Camas, WA 98607
(360) 834-3451

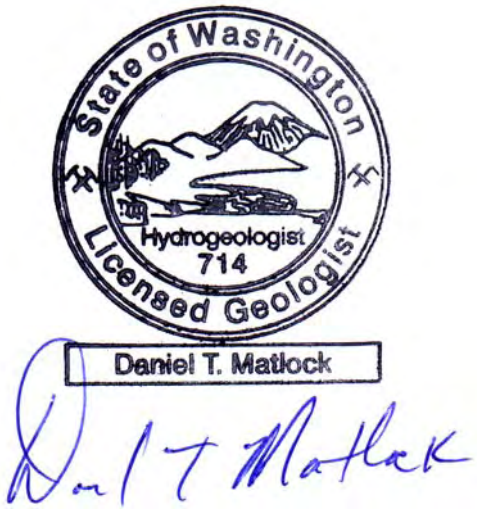
Prepared by:

Pacific Groundwater Group
2377 Eastlake Avenue East, #200
Seattle, WA 98102
(206) 329-0141
www.pgwg.com

September 16, 2009
JM9702.14

SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



Dan Matlock
Principal Hydrogeologist
Washington State Hydrogeologist No. 714

Table of Contents

1 INTRODUCTION 1
2 HYDROGEOLOGIC FRAMEWORK 1
2.1 GEOLOGY AND HYDROGEOLOGY 1
2.2 RECENT AND PLEISTOCENE ALLUVIAL DEPOSITS 2
2.2.1 Deposits Origin, Texture, Distribution 2
2.2.2 Aquifer Definition, Recharge, Production, Capture 3
2.2.3 Aquifer Susceptibility 4
3 WHPA DELINEATIONS 4
3.1 WHPA MODEL 4
3.2 CAPTURE ZONE ANALYSIS 5
4 RISK ASSESSMENT 6
4.1 DATA SOURCES 6
4.1.1 Land Use Database 6
4.2 CURRENT LAND USE AND ZONING 6
4.3 CONTAMINANT SOURCES 7
4.3.1 Known/Confirmed Sources 7
4.3.2 Potential Sources 9
4.4 WELLHEAD SUSCEPTIBILITY/VULNERABILITY ANALYSIS 16
4.4.1 Alluvial Aquifer – Lower Washougal Wellfield 16
5 REFERENCES 17

List of Tables

Table 1	Summary of Land Use Types of Concern
Table 2	Summary Data for Parcels of Concern within Wellhead Protection Capture Zones
Table 3	Summary of Environmental Sites within Wellhead Protection Capture Zones

List of Figures

Figure 1	Surficial Geologic Map and Cross Section Alignments
Figure 2	Hydrogeologic Cross Section A – A’
Figure 3	Wellhead Protection Capture Zones
Figure 4	Zoning and Parcels of Concern
Figure 5	Environmental Sites within Wellhead Protection Capture Zones

List of Appendices

Appendix A	Environmental Sites Information

List of Acronyms

BNSF	Burlington Northern Santa Fe
CARA	Critical Aquifer Recharge Area
EPA	Environmental Protection Agency
FSID	Facility Site Identification
GIS	Geographic Information System
GP	Georgia Pacific
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
ModFlow	Modular Three-Dimensional Finite-Difference Ground-Water Flow Model
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
PAA	Pleistocene Alluvial Aquifer
RA	Remedial Assessment
SGA	Sand and Gravel Aquifer
SHA	Site Hazardous Assessment
SSL	Site Screening Level
SWMP	Stormwater Management Plan
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Codes
WDOT	Washington Department of Transportation
WHPA	Wellhead Protection Area

1 Introduction

This report summarizes the hydrogeology, municipal wellhead protection area ("WHPA") delineations, and contaminant risks to groundwater supplies for the City of Camas ("the City"). Information presented in this report supports an update of the City's Water System Plan ("WSP") currently being prepared for the City by Gray & Osborne, Inc (Gray & Osborne, 2009). The purpose of this report is to help the City better manage its groundwater supply wells and to better understand the contaminant risks posed to these sources.

The study area for this investigation focuses on the City's eight shallow supply wells that lie in close proximity to low Washougal River (**Figure 1**). The City also operates one deeper supply well in the Lacamas Lake area (Well 9). This well is used primarily as a peaking supply. Well construction and land use conditions limit the susceptibility and vulnerability of this source; therefore, it was not reviewed as part of this investigation.

This report is organized in four sections:

- **Section 1: Introduction.** This section contains background information on the report.

- **Section 2: Hydrogeologic Framework.** This section presents the regional and local hydrogeologic features that are pertinent to the City's groundwater supplies. It describes the deposits that form aquifers and aquitards, and describes the movement of groundwater through these deposits.

- **Section 3: Wellhead Protection Area Delineations.** This section discusses the methods used to delineate the WHPAs and presents the results of the analysis. Time-related capture zones are presented for the Lower Washougal Wellfield area.

- **Section 4: Risk Assessment.** This section presents an inventory of confirmed and potential sources of contamination, particularly those that lie within the wellhead capture zones. An evaluation of risks associated with these sources is also presented.

This work was performed, and this report prepared, in accordance with generally accepted hydrogeologic practices at this time and in this area for the exclusive use of the City of Camas for specific application to the study area. No other warranty, expressed or implied, is made.

2 Hydrogeologic Framework

2.1 Geology and Hydrogeology

The geology of the greater Clark County region and the study area is commonly divided into older rocks and younger sediments, which are semi-consolidated or unconsolidated. The older rocks crop out in the foothills and mountains in the north and east portions of Clark County, and occur at depth in the central and western portions of the County.

Within the Camas study area, the older rocks crop out north and east of the Washougal River. The younger sediments crop out in all other areas, and contain all of the principal aquifers noted in the County. The sedimentary units, from youngest to oldest, consist of:

- Recent alluvial deposits
- Pleistocene alluvial deposits
- Troutdale formation

These units are described below and shown on hydrogeologic cross section A-A′ (**Figure 2)**. Surface outcrop patterns for these units are shown on **Figure 1**, along with the cross section location. The main focus of attention for the existing Camas groundwater sources is the Pleistocene alluvial deposits that occur in the Lower Washougal River lowland. All but one of the City's active supply wells (Wells 5 - 8 and Wells 10 - 13) are completed in these materials.

The Troutdale formation does not occur in the immediate vicinity of the City's wellfield but underlies the Pleistocene alluvial deposits further east of the wellfield and is an important source of water in other parts of the Clark County. Throughout most of the county, the Troutdale formation contains three coarse-grained units that are separated by finer-grained confining units. The coarse units are:

- The Upper Troutdale unit – variably cemented gravel in a matrix of sand and silt;
- The Lower Troutdale unit – relatively discontinuous occurrence of fine sand; and,
- The "SGA" - a deeper sand and gravel unit.

2.2 Recent and Pleistocene Alluvial Deposits

2.2.1 Deposits Origin, Texture, Distribution

Recent floodplain alluvium consisting of silt, sand, and gravel occurs along many of the rivers and streams in the study area, including Lacamas Creek and the Columbia, Washougal, and Little Washougal rivers. The recent floodplain alluvium generally occurs in narrow bands (less than 1,000 feet wide) along these rivers and streams, with thicknesses ranging from several feet to ten or twenty feet.

During the late Pleistocene time, the ancestral Columbia River deposited a great deltaic fan emanating to the west from the mouth of the Gorge during a series catastrophic flood events known as the "Missoula floods." Textures are similar to those of the recent alluvium, which overlies the Pleistocene alluvium along streams and rivers. Due to textural similarities between Recent and Pleistocene alluvium, hydrogeologic distinction is not necessary between the two units.

The combined Recent and Pleistocene alluvial deposits are approximately 100 feet thick in vicinity of the City's Lower Washougal Wellfield, and are underlain by clay and locally by bedrock. The City of Camas occurs near the eastern limit of the area scoured by catastrophic Columbia River flooding during late Pleistocene times. Therefore, the

sedimentary basin at Camas is small compared to portions of Clark County farther to the west. The older bedrock exposed to the north is relatively impermeable and functions as an adjacent no-flow boundary.

2.2.2 Aquifer Definition, Recharge, Production, Capture

The Pleistocene Alluvial Aquifer (PAA), defined as the combination of the Recent and Pleistocene alluvial deposits found along the Columbia and lower Washougal rivers, is the principal aquifer in the Lower Washougal lowland. The aquifer is recharged by incident precipitation, and induced recharge from the incised Columbia and Washougal rivers.

The productive zone of the aquifer is described on drillers' logs as a loose mixture of gravel, cobbles, boulders and little sand. Depending on the thickness of saturation, this aquifer can be very productive with well yields in excess of 1,000 gpm. Immediately north and east of the Washougal River, where this aquifer pinches out on top of bedrock or Troutdale deposits, wells yields are likely to be significantly lower. Eight of nine City production wells are completed in the PAA including Well 5 - 8, and Wells 10 – 13. The water supply sources are collectively referred to as the Lower Washougal wellfield as shown on **Figure 1**. Groundwater in the PAA in the vicinity of the Lower Washougal wellfield area occurs under unconfined conditions.

Three new supply wells are being installed in the Lower Washougal wellfield. These sources are intended to meet future city growth and will also serve as a replacement supply for Boulder and Jones Creeks during low-flow months when these sources will be shutdown to improve fish habitat. The new sources include Well 14 which was recently installed on the east side of the wellfield and the Parkers Landing and Treatment Plant wells which will be installed in the near future on the south side of SR 14. The three new wells are being installed under new water right permits that were issued by the Department of Ecology in 2008 after seven years of extensive study and negotiations.

Groundwater flow directions in the PAA are relatively dynamic because the hydraulic connection to the Washougal and Columbia rivers causes groundwater levels to move up and down with the tides and with seasonal changes in runoff. Pumping at industrial supply wells operated by Georgia Pacific also influences water levels in the PAA. Georgia Pacific owns and operates as many as 17 industrial supply wells that are completed at depths of approximately 50 to 120 feet in the PAA. Total production from the Georgia Pacific wellfield may exceed 25 mgd at times. This large scale pumping has a significant affect on water levels within City production wells with large declines occurring during peak industrial supply periods.

2.2.3 Aquifer Susceptibility

The sensitivity of the City's groundwater sources to potential contamination was evaluated by assessing the relative susceptibility and vulnerability of the City's primary production aquifer. Aquifer susceptibility refers to the estimated ease of contaminant transport from the land surface to the aquifer. Some of the primary factors influencing aquifer susceptibility are the thickness and permeability of the sediments overlying the aquifer. Shallow aquifers are typically more susceptible to surficial contaminants than deeper aquifers. Aquifers overlain by highly permeable sediments such as sand and gravel are also at higher risk than aquifers overlain by lower permeability sediments such as silt or clay. In the vicinity of the Lower Washougal wellfield, coarse grained soils typically extend from ground surface to the water table which lies at depths of 30 to 50 feet. Drillers' logs from wells in the area indicate no laterally extensive low permeability layers exist between land surface and the underlying PAA. The combination of a shallow depth to water and relatively high permeability of the overlying sediments indicate the PAA has relatively high susceptibility to contamination.

Aquifer vulnerability combines the aquifer susceptibility discussed above, with an evaluation of the availability of contaminants at land surface, and the likelihood of a contaminant release. In general, aquifer susceptibility is a function of stratigraphy and hydrogeology, and cannot be substantially modified. The potential for contaminant release on the other hand is controllable, and can be reduced in areas where susceptible aquifers are utilized as a major source of potable water. One of the primary purposes of a water system's wellhead protection plan is to evaluate the susceptibility of the systems aquifer(s), and the potential sources of contamination within the systems capture zones. Additional attention to potential contamination sources is recommended within the capture zones in high susceptibility aquifers areas, to reduce the likelihood of a contaminant release. This is especially true for potential contaminant sources within the shorter duration capture zones, such as the 1 year capture zone shown in **Figure 3**.

3 WHPA Delineations

3.1 WHPA Model

This section documents methods used to delineate the wellhead protection areas (WHPAs) and presents the results of the analysis. The "capture zone" for the Lower Washougal wellfield was estimated using a computer groundwater flow model (ModFlow) that was developed by the US Geologic Survey (McDonald and Harbaugh, 1988). A capture zone is the area that supplies groundwater recharge to a pumping well, or wellfield—in other words, its "zone of contribution." In natural systems, capture zones are not circular but elongated, with most of the capture occurring from areas that lie hydraulically up-gradient of the wellhead. Each capture zone has a stagnation point—the furthermost "point of capture" down-gradient of the wellhead. A time-related capture zone is the area that supplies groundwater recharge to a pumping well within a specified time period. The capture zone encompasses portions of the aquifer that surround the well. Time-related capture zones provide a basis for developing monitoring plans, land-use

inventories, and data collection plans. They are used in conjunction with the results of the aquifer vulnerability assessment.

The groundwater flow model developed for the Lower Washougal and Columbia River lowlands depicts the major aquifers in the study area (PAA and SGA), the occurrence of bedrock, the Columbia and Washougal rivers, recharge from precipitation, and groundwater inflow from areas outside the model domain (PGG, 2004 and 2007). The model simulates three-dimensional flow in its two layers (one for each aquifer), and includes cell sizes ranging from 100 feet square to 600 feet square. Model boundary conditions include cells that represent the rivers, pumping wells, specified inflows from outside the model domain, and incident recharge applied to the top of the uppermost aquifer. The model was calibrated to observed summer drawdowns in the City's Washougal Wellfield vicinity, summer seepage losses from the Washougal River, and groundwater level responses to tidal fluctuations and runoff events in the Columbia River.

The calibrated model was used to perform predictive simulations which included evaluation of capture zones for the Lower Washougal wellfield. The simulations assumed that the City would fully exercise all of their water rights which provides for a fairly conservative assessment of the capture zone extent. In addition, a high-end pumping was assumed for the Georgia Pacific wellfield (37.5 mgd).

3.2 Capture Zone Analysis

Estimated capture zones for 6-month, 1-year, and 5-year times-of-travel for the Lower Washougal wellfield area are shown on **Figure 3**. All groundwater in the recharge area is younger than 10 years, therefore there is no need for a 10-year time-of-travel delineation. The shape and extent of these capture zones are influenced by pumping at the Georgia Pacific wellfield, and aquifer boundaries including the Washougal and Columbia Rivers and older bedrock exposures to the north. Capture for Well 13 is primarily to the northeast, extending to the approximate boundary where the PAA is pinched out by older bedrock. Capture for the proposed Treatment Plant Well extends southeast toward the Columbia River. Capture for the remaining Lower Washougal wells extends to the east, between the Columbia and Washougal rivers. Evaluation of mass-balance calculations for the groundwater flow model indicate that the majority of water captured by the Lower Washougal welllfield originates as flow within the PAA, that otherwise would have discharged to the Columbia and Washougal rivers.

The estimated capture zones were generated using a steady state groundwater flow model, meaning that only the long term average rates of withdrawal were simulated. Variations in pumping, recharge and boundary conditions such as river stage are not simulated in a steady state model. As a result, **Figure 3** shows the average positions of the capture zones, not the temporal variations in the capture areas. Increased pumping during peak use months will result in variations of the predicted capture zones beyond the long term average estimates shown in **Figure 3**. In order to account for the uncertainties associated with temporal variations in capture zone, an additional capture zone labeled

Critical Aquifer Recharge Area (CARA) is shown. This zone includes areas that were not included in the steady state capture zone analysis, but likely will contribute recharge during certain times of the year given variations in pumping, river elevation, and natural recharge.

4 Risk Assessment

4.1 Data Sources

Contaminant sources that lie within the vicinity of Camas' Lower Washougal Wellfield were investigated and mapped using data from two sources. The first, a parcel database that contains information on land use and zoning, was provided by Clark County. The second contains data from the Washington State Department of Ecology's Facility / Site database[1], including state cleanup sites, federal superfund sites, hazardous waste generators, solid waste facilities and underground storage tanks. The information from these sources were classified and plotted on GIS coverages to assess whether existing and potential contaminant sources were located within the vicinity of Camas' production wells and WHPA delineations.

4.1.1 Land Use Database

Clark County's database contains a description of the land use within each parcel in the study area. A GIS analysis was used to identify land uses that could pose a risk to groundwater within the vicinity of the City's wellfield. Parcels where such land uses were identified were designated "parcels of concern." This approach provides a way to assess potential sources of contamination. The "parcels of concern" include those where potential activities could result in a release of contaminants to groundwater. **Table 1** summarizes the land use categories that are considered to be of concern.

Figure 4 shows the distribution of zoning throughout the study area. It also shows the parcels of concern that occur within the City's capture zone areas. Parcels of concern are shown as green cross-hatched areas. For the Lower Washougal wellfield, 31 parcels of concern occur in the 6-month capture zone, 11 parcels fall within the one-year capture zone, and 24 parcels fall within the 5 year capture zone. Two additional parcels fall outside of the capture zones, but within the defined CARA. Parcels of concern that fall within the various capture zones should be considered as potential contaminant sources, with the shorter time of travel zones being more critical for risk management.

4.2 Current Land Use and Zoning

Zoning information from the County's GIS was used to evaluate current and future land-use in the study area. The following zoning categories were mapped (**Figure 4**):

[1] http://www.ecy.wa.gov/fs/

- Agriculture
- Commercial
- Industrial
- Parks
- Residential

The most common allowed land use within the Lower Washougal wellhead protection capture zone is residential followed by industrial and commercial. Areas zoned as commercial and industrial are most likely to comprise threats to groundwater quality. Most of the allowed commercial and industrial use is concentrated along SR-14, the southern terminus of SR-500, the railroad corridors, SE 3rd and 6th Avenues, and E. Street.

4.3 Contaminant Sources

Table 3 summarizes the known contaminant sources that fall within the Lower Washougal Wellfield wellhead protection capture zones. Thirty-five confirmed or potential contaminant sources occur within the Lower Washougal wellfield capture zone. **Figure 5** displays the location of each of these sites, and indicates through the location symbols which types of activities or risk are associated with each site. Each site marker has three pie slices which indicate the type of activities associated with the site as follows:

Underground Storage Tanks (UST/LUST)

Cleanup Site (State Cleanup or Voluntary Cleanup)

Hazardous Material Generator or Handler

Any combination of the three indicators is possible. In addition to the pie slices, a red circle around the outside of the pie indicates that a release to either groundwater or soils has occurred at the site. Site markers without any pie slices filled in indicate the facility is tracked in Ecology's facilities database, and the facility type is considered to have risk to groundwater, but the facility is not a cleanup site, a hazardous materials handler, nor does it have registered underground storage tanks.

4.3.1 Known/Confirmed Sources

Table 3 indicates seven confirmed contaminant sources occur in the Lower Washougal wellfield capture area. Confirmed contaminated sites are shown on **Figure 5** by one of the following types of sites:

- State Cleanup Sites
- Leaking Underground Storage Tanks (LUST)

4.3.1.1 State Cleanup Sites

Of the seven contaminant release sites in the Lower Washougal wellfield capture area, three are included on the State Cleanup List. A brief discussion of each of these sites follows, with additional information provided in **Appendix A**.

State Cleanup Sites		
FS ID	**Facility Name**	**WHPZ**
1043	CHEVRON BULK PLANT CAMAS	6-Month
4399598	HAMBLETON BROS LOG YARD	6-Month
5016308	COLUMBIA ROCK CONCRETE PRODUCTS INC	CARA

The Chevron Bulk Plant site (FSID 1043) has contaminated soil and groundwater and is located at SE 6th Avenue and SE Union Avenue. A Site Hazardous Assessment (SHA) was completed for the site in 1994, and Ecology has assigned a ranking of "2" to this site, indicating that it poses a serious threat to human health and the environment. The site is on active status, indicating that the site is still managed by Ecology. The site is undergoing "monitored natural attenuation" with quarterly monitoring of groundwater quality. Affected media at the site include both soil and groundwater, with petroleum products (diesel, gasoline, and heavy range organics) being the most common contaminants. Other contaminants detected at the site include benzene, toluene, ethylbenzene, xylenes, dissolved and total lead. Two new monitoring wells (MW-15 and MW-16) have been installed between the contamination 'hot spot' and Camas Well #6 for the purpose of monitoring contaminant migration. No contaminants have been detected at MW-15, while MW-16 has had several diesel range organic detections, although the contamination levels have been well below the cleanup standards. There have been no contaminants detected in Well 6.

The Hambleton Bros. Log Yard (FSID 4399598) is located at 335 South A Street. The site has contaminated soil, sediment, surface water, and groundwater. The site has undergone Phase I and II Environmental Site Assessments (ESA) during which numerous borings and monitoring wells were installed. Analysis of reconnaissance groundwater samples indicate metals (arsenic, cadmium and lead) concentrations exceed the EPA Region VI Site Screening Levels (SSLs) and the MTCA Method A cleanup levels. Quarterly groundwater monitoring has been conducted for six onsite monitoring wells since January 2008. Barium, chromium, arsenic and lead were detected in the quarterly groundwater sampling, of these, only arsenic exceeded the EPA SSL. Arsenic did not exceed the MTCA Method A cleanup level.

The Columbia Rock Concrete Products site is located at 1615 SE 6th Avenue, and has both soil and groundwater contamination. A SHA has been completed by Clark County Public Health (2007), with the site receiving a ranking of "2" indicating that it poses a serious threat to human health and the environment. Affected media at the site include soil and groundwater. Contaminants of concern (above MTCA Level A Cleanup Levels) in soils include petroleum products (diesel, gasoline, and heavy range organics), while groundwater contaminants include arsenic, chromium, lead and barium. The site is awaiting a remedial assessment (RA).

4.3.1.2 LUST Sites

Figure 5 and **Table 3** show that three leaking underground storage (LUST) sites occur within the Lower Washougal Wellfield wellhead protection capture. A brief discussion of each of these sites follows, with some additional information provided in **Appendix A**.

The Camas Washougal Port site (FSID 92847997) is located at 24 South A Street, Washougal. Cleanup at the site began in 1990 and was completed (reported clean) in 1995.

The Goodyear Tire site (FSID 85837922) at 3440 3rd Avenue has been classified as no further action (NFA) after undergoing voluntary cleanup (VCP). This classification indicates that the site is considered clean, and no further action is required. Contaminants of concern for soils included petroleum hydrocarbons and halogenated organics.

The Hiway Fuel site (FSID 22538744) is located at 1250 E Street in Washougal. Cleanup at the site began in 1996, with cleanup still ongoing. Affected media are both soil and groundwater.

4.3.1.3 VCP Sites

Of the seven contaminant release sites in the Lower Washougal wellfield capture area, two are participating in the Voluntary Cleanup Program (VCP). A brief discussion of each of these sites follows, with additional information provided in **Appendix A**.

Voluntary Cleanup Program (VCP) Sites		
FS ID	**Facility Name**	**WHPZ**
14447751	Northwest Pipeline GP Washougal M/S	6-Month
85837922	GOODYEAR TIRE CAMAS	1 Year

The Northwest Pipeline GP Washougal M/S (FSID 14447751) is located at 30 C Street, Washougal. This site is participating in the VCP program, and the site is currently undergoing cleanup. Impacted media is soil, with contaminants of concern including arsenic, and metals / priority pollutants.

Leaking Underground Storage (LUST) Sites		
FS ID	**Facility Name**	**WHPZ**
92847997	CAMAS WASHOUGAL PORT	6-Month
85837922	GOODYEAR TIRE CAMAS	1 Year
22538744	HI WAY FUEL	5 Year

As discussed previously, the Goodyear Tire site has been classified as no further action (NFA) after undergoing voluntary cleanup (VCP).

4.3.2 Potential Sources

This section discusses potential sources of contamination within the wellhead protection capture zones based on Ecology's Facility database, and Clark County's parcel,

stormwater, and septic system databases. The following potential contamination sources have been identified within or near the capture zones for the Camas wells:

- Hazardous materials
- On-site septic systems
- Underground storage tanks
- Stormwater
- Unused and improperly constructed wells
- Agriculture, golf courses, and parks
- Transportation corridors

4.3.2.1 Hazardous Materials

The commercial use of chemicals poses a major threat to groundwater quality, since the chemicals can be accidentally spilled or disposed of improperly. The likelihood of such releases from spills can be reduced by proper methods of handling, spill prevention measures, and emergency response strategies. Risk reduction strategies should target on-site waste management practices. Improper disposal is likely the most common pathway for chemicals to be released into the environment. The following facility activity classifications were included as hazardous materials sites:

Activity Code	Definition
HWG	Facilities that generate any quantity of a dangerous waste. They may be classified as small, medium or large quantity generators (SQG, MQG, or LQG) depending on hazardous waste generated for a given month.
HWOTHER	Facilities that are required to have a RCRA Site ID# but who do not generate and/or manage hazardous waste (XQG generator status). This includes transporters, used oil recycler's, and dangerous waste fuel marketers and burners.
HWTRNSFR	Transfer facility is a site, owned, leased or operated by a transporter of regulated hazardous waste shipments where any of the following occurs: 1) receives wastes from another transporter, 2) transfers wastes from one transport vehicle to another, 3) transfers waste from one container to another, and 4) stores waste within a vehicle or on property for 10 days or less. Examples of transfer facilities include a parking lot, warehouse, truck terminal, barge or steamship loading and unloading facility, or railroad spur loading or unloading facility.
HWTSDF	Facilities that treat store or dispose hazardous waste.
TIER2	Businesses that store 10,000 pounds or more of a hazardous chemical or 500 pounds or less, depending on the chemical, of an extremely hazardous chemical on site at any one time must report annually. Reports are sent to the State Emergency Response Commission [represented by Ecology], Local Emergency Planning Committees, and local fire departments for emergency planning. [product, not waste]
TRI	Facilities in specific industries that manufacture, process or use more than the threshold amount of one or more of 600 listed toxic chemicals. Most threshold amounts are 10,000 or 25,000 pounds per year. Some chemicals have much lower thresholds.

The most significant threats to groundwater are related to the use and storage of solvents. Solvents are persistent, both soluble and insoluble in water, and highly mobile. A large plume of contamination can be created with a small quantity of solvent.

The Washington State Facility Site database indicates that there are twenty-one sites within the Lower Washougal wellfield that fall into one of the above hazardous waste classifications. Of these twenty-one sites, eight have active status, the rest are inactive. Inactive status indicates that the sites do not have current permitting, and therefore, are not actively overseen by Ecology.

Active Hazardous Materials Sites			
FS ID	**Facility Name**	**WHPZ**	**Activity Code**
11338232	COLUMBIA STORAGE INC 2ND ST	6-Month	TIER2
37125488	COLUMBIA WAREHOUSE	6-Month	TIER2
3264254	TARR INC WASHOUGAL	6-Month	TIER2
88277363	Tidland Corp	6-Month	HWG
39956434	West Coast Marine Cleaning Inc	1 Year	HWOTHER
38772238	Camas City Operations Center	CARA	TIER2, HWOTHER
994431	CAMAS CITY WELL 11 & 12	CARA	TIER2
83917959	HERAEUS SHIN ETSU AMERICA	CARA	TIER2

The facility site index database does not indicate whether sites listed are large or small hazardous waste generators.

4.3.2.2 On-Site Septic Systems

4.3.2.2.1 Potential Risks

On-site septic systems pose a risk to groundwater where they are relatively high in density and/or where hazardous wastes are discharged to them. Potential contaminants from septic systems include pathogenic organisms (bacteria and parasites), toxic substances, and nitrogen compounds.

The extent to which pathogens are transported in the subsurface away from a septic drain field depends on the type of pathogen and the chemical and physical conditions in the subsurface. In general, if a septic system is properly sited, constructed, and maintained, the transport of microorganisms will be limited. Household hazardous chemicals such as cleaners, polishes, waxes, and paints can be transported to groundwater can via a septic system. Some products contain toxic and persistent chemicals that can cause low-level contamination when coupled with a high density of septic systems. Homeowners can improperly apply or dispose of chemicals because they do not understand the threat they pose to groundwater quality. In some areas, business and commercial facilities still use on-site septic systems for sewage disposal. Business, commercial, and industrial operations that utilize on-site systems need to take special precautions to avoid contamination of their wastewater.

Ammonia and nitrate are highly soluble in water and can be expected in detectable quantities wherever portions of an aquifer are affected by septic system discharges. Septic systems are a source of nitrates in groundwater throughout Clark County. Nitrate is regulated, since ingestion can result in methemoglobinemia, or "blue baby" syndrome. Other sources of nitrate include fertilizers, feedlots, and natural mineral deposits. Background concentrations of nitrates in groundwater are typically less than 1 milligram of nitrogen per liter (mg-N/L). The maximum contaminant level (MCL) for nitrate is 10 mg-N/L.

Although significant portions of the urban areas are served by sewer systems, many residents still rely on septic systems. Clark County maintains a GIS coverage of on-site septic system locations, locations that are based on information provided by the South-west Washington Health Department. The locations of the septic systems are plotted on **Figure 5**. This figure indicates that the Lower Washougal wellfield capture zone has only one identified septic system within the six-month capture zone, 4 systems within the one-year capture zone, and 19 systems within the 5 year capture zone. Overall, 24 septic system fall within the Lower Washougal Critical Aquifer Recharge Area.

4.3.2.3 Underground Storage Tanks

Contamination in soil and groundwater caused by leaking USTs ("LUSTs") is a major environmental, legal, and regulatory issue. The most common causes of leaks are structural failure, corrosion, improper fittings, improper installation, and natural phenomena. Although USTs usually contain flammable motor fuels or heating oils, they may contain other compounds used by industry, government, or business.

Leakage from USTs and associated piping often occurs without detection. Even relatively small amounts of certain compounds can adversely impact groundwater quality. Once released from an UST, some VOCs and petroleum products can rapidly migrate to groundwater, a problem that is especially serious in areas with permeable soils such as the sand and gravel comprising the PAA.

Of the many materials stored in USTs, solvents are considered the most toxic. However, petroleum products may pose a greater total risk because of the prevalence of tanks containing petroleum products. In addition, petroleum products contain many potential contaminants, including three EPA priority pollutants: benzene, toluene, and ethylbenzene. Benzene is a known human carcinogen.

Figure 5 shows the locations of USTs in the WHPA. These sites were identified from the WDOE UST site data. Most of them lie along the railroad corridor and within areas zoned industrial and commercial.

A total of twelve USTs occur within the Lower Washougal wellfield capture zone. Based on status information from Ecology, four are active and eight are inactive. Inactive USTs do not currently store materials.

4.3.2.4 Storm Water

Storm water (i.e., urban runoff) is produced when rainfall or other precipitation accumulates faster than it can evaporate, be used by plants, or infiltrate to the subsurface. Urban areas produce more runoff than rural areas because they have more impermeable surfaces, such as rooftops, driveways, streets, and highways. These surfaces not only promote runoff but they also reduce the infiltration that recharges groundwater supplies. Even grass lawns can produce more runoff than forests and pasture.

Storm water typically contains pollutants, such as sediment, nutrients, bacteria, oils and grease, metals, and other toxicants. Many of these contaminants come from air pollution, motor vehicles, application of pesticides and fertilizers, soil erosion, and pet feces. Roofing materials have also been identified as a diffuse source of metals in runoff, particularly zinc (Good, 1993). In general, contaminant concentrations in storm water are similar for all land uses with slightly higher nitrate concentrations in residential areas, and higher zinc concentrations in commercial areas. Concentrated sources of storm water contamination may also occur if undiluted pollutants (e.g., fertilizer, gasoline) are accidentally spilled or intentionally released and enter storm drains.

Storm water contamination has primarily been a concern for surface water pollution because most urban runoff is directed to streams, lakes, and other water bodies with fish and other aquatic life that are highly sensitive to common storm water contaminants. However, where storm water is discharged to infiltration areas, there is also potential for groundwater contamination.

4.3.2.4.1 Potential Risks

Concern over potential groundwater contamination from storm water has been recognized by several governmental agencies in western Washington. Storm water-related impacts to water quality are of particular concern in industrial, commercial, and high-density residential development areas, where runoff volumes can be large. Consequently, storm water runoff from highways and roads can introduce contaminants such as heavy metals and organic priority pollutants, pesticides, and coliform bacteria into the groundwater system. Impervious surfaces in the commercial and industrial areas along SR-14, the southern terminus of SR-500, the railroad, and 3rd Avenue contribute substantial amounts of runoff in the Camas study area. Storm water runoff from lawns and agricultural areas can introduce nitrate, herbicides, pesticides, and bacterial contaminants.

4.3.2.4.2 Occurrence in the Camas Area

Jim Hodges of Camas Public Works provided information about Camas' storm water facilities for this section (e-mail comm, August 17, 2009). In addition, Clark County's GIS data was reviewed to assess the distribution of dry wells in the area.

All of the stormwater runoff in Camas flows to catchment basins, drainage ditches, biofiltration swales, exfiltration ponds or sedimentation ponds. Catchment basins and other surface storm water facilities filter out some pollutants before the water enters the subsurface or surface water environment. Near the Lower Washougal Wellfield area,

most storm water is captured via catchment basins and then routed to the Washougal River via outfall pipes. Commercial construction projects in the vicinity of Well 5 and SE 6th Avenue have required the construction of collection ponds that provide some filtration and allow infiltration of stormwater. The City's stormwater discharges are regulated under the Federal National Pollutant Discharge Elimination System (NPDES) Phase II permitting process. The permitting process requires that the City provided annual reports and develop a stormwater management plan (SWMP). The City has prepared a draft SWMP (2008) and is in compliance with the other NPDES permitting requirements.

There are no known drywells in the City of Camas stormwater system. Drywells previously used in the area of Oak Park and Goot Park in southeast Camas were abandoned and replaced with new storm water collection systems in the mid 1990's

By contrast to the City of Camas, Washougal has more than 100 dry wells. Most of the dry wells are in the older part of Washougal which includes the area bounded by 6th Street on the west, 32nd Street on the east, SR-14 on the south, and where Washougal River road crosses the Washougal River on the north. This area includes a portion of the 5-year capture zone for the City of Camas' Lower Washougal wellfield. Dry wells are the most common storm water facility in the older parts of Washougal, whereas surface storm water facilities are the most common in newer developments of Washougal. Similar to current engineering practices implemented by the City of Camas, all new construction of storm water facilities in Washougal include only surface storm water facilities such as biofiltration swales and retention ponds.

4.3.2.5 Unused, and Improperly Constructed Wells

Well casings can provide a conduit between the ground surface and underlying aquifers. Improperly constructed or abandoned wells pose several potential problems. In wells with no surface seal, contaminants introduced near the wellhead can move downward outside the casing to underlying aquifers. Many older wells that were constructed before the implementation of WAC 173-160 have no surface seal. Unused wells that have not been properly abandoned are left uncapped in many cases, posing a special risk because contaminants can be introduced directly into the aquifer. Unused wells also pose a risk when they are damaged during site redevelopment. Any of these situations can provide a conduit for contaminant movement.

Among the private wells in the Camas vicinity, a portion were constructed prior to adoption of Ecology's drilling standards and therefore have a higher likelihood of improper construction. In addition, since there has been no inventory of the number or location of these wells, some of these wells may have been abandoned properly. Public water supplies have served most of the Lower Washougal area since the 1930s and therefore few private wells occur in this area.

4.3.2.6 Agriculture, Golf Courses, Parks, and Lawns

Fertilizers, pesticides, and herbicides are applied to residential lawns, commercial landscaping, agricultural lands, and landscaped areas adjacent to roads. If optimally applied, these chemicals pose little threat to groundwater, however, applications are commonly not made correctly and groundwater contamination can result if fertilizers are applied in exceedance of the agronomic uptake rate. Excess nitrate from fertilizer will be recharged to the underlying groundwater system. Frimpter and others (1990) estimated that an average of 9 pounds of nitrate-N leached annually to groundwater from each 5,000-square-foot lawn. Landscaping activities can also be the source of pesticides and herbicides such as EDB, DBCP, and dicamba.

Agriculture and park turf is not a significant concern in the Lower Washougal Wellfield capture area (**Figure 4**). Most of the parks with managed turf in the study area are outside the wellfield capture zone, except for several parks in the eastern half of the 5 year capture zone.

Residential lawns and landscaping occur throughout the Lower Washougal wellfield. These are potential sources of nitrogen, pesticides and herbicides to the groundwater. The risk of groundwater contamination by these contaminants is high in the PAA because the aquifer is unconfined and groundwater is relatively shallow.

4.3.2.7 Transportation Spills

Vehicles transporting hazardous material can be a source of groundwater contamination through accidents and resultant chemical spills. Hazardous materials are transported through Camas on a daily basis. The major transportation routes in the Camas include:

- SR-14,
- SR-500,
- Burlington Northern Santa Fe railroad, and
- 3rd Avenue.

All of these transportation corridors go through the Lower Washougal wellfield capture zone and are very close to the individual supply wells. A major spill along any of these routes could adversely impact groundwater pumped from any well in the Camas supply wells.

The Washington State Department of Transportation (WDOT) is planning to install a stormwater infiltration facility along the north side of SE 11th Avenue, near the City's wastewater treatment plant. PGG and the City are working with DOT to help ensure that this facility does not adversely impact water quality in the Alluvial Aquifer.

About 32 to 45 Burlington Northern Santa Fe (BNSF) freight trains pass through the Washougal area on a daily basis (pers. comm. Read Fay, BNSF). Roughly 25% of the containers may contain hazardous materials (including petrochemicals). Maximum speed of these trains does not exceed 45 to 50 miles per hour. These low speeds and the durability of the tank cars minimize the possibility of a spill in the unlikely event of a

derailment. BNSF has their own spill response plan and contracts with local firms to take handle any hazardous material problems.

4.4 Wellhead Susceptibility/Vulnerability Analysis

The sensitivity of the City's groundwater sources to potential contamination was evaluated by assessing the relative susceptibility and vulnerability of the Lower Washougal wellfield. Susceptibility refers to the estimated ease of contaminant transport from the land surface to the aquifer. Vulnerability accounts for the potential of contaminant releases at the land surface.

4.4.1 Alluvial Aquifer – Lower Washougal Wellfield

As described in Section 2.2.1, the PAA occurs in the floodplains of the Columbia and Washougal rivers and is predominantly comprised of permeable sand, gravel and cobble deposits. Reported depth to groundwater in the aquifer is as little as 30 feet below land surface in supply wells completed at the Lower Washougal wellfield. While some fine-grained or cemented zones are noted above the shallow water table in drilling logs, in many cases they are absent in the logs of neighboring wells. Therefore, no laterally extensive low permeability layer exists between the land surface and the water table to protect the PAA from contaminants released at the land surface. The aquifer is therefore considered to exhibit relatively high susceptibility.

Several natural mechanisms exist for attenuation of pollutant loading to the alluvial aquifer. While these mechanisms are probably benefiting groundwater quality under current conditions, they do not reduce the aquifer's susceptibility rating. Percolation of recharge through the unsaturated zone (from the land surface to the water table) supports some reduction of selected contaminants via: (1) adsorption to particulates and oxides; (2) precipitation in aerated zones; and (3) biodegradation. However, the course texture of the sediments and general lack of organic matter suggests that the unsaturated zone offers minor contaminant attenuation relative to more silty, organic soils. Dilution via mixing with uncontaminated recharge in the unsaturated zone and the alluvial aquifer also serves to reduce contaminant concentrations. Because it is nearly certain that *some* contaminant loading occurs at the land surface (e.g., from known contaminated sites, urban runoff and septic systems), the fact that historic groundwater quality monitoring has detected minimal contamination supports the value of these two processes. However, lack of contaminant detection in the City's wells does not mean that contamination is not reaching the water table in adjacent areas. It is important to understand that these natural attenuation processes are not likely to offer sufficient protection against a significant contaminant spill or release at the land surface.

Aquifer vulnerability is typically expressed as a risk factor, calculated by multiplying ratings reflecting the ease of contaminant transport to the water table (susceptibility) by the potential for contaminant releases at the land surface. Thus, the risk of groundwater contamination depends both on the hydrogeologic framework and the activities conducted at the land surface. In the case of Camas, the PAA should be considered *highly*

vulnerable to potential contamination. While active, known/confirmed sources of groundwater contamination are limited, potential sources of contamination include:

- Known and unknown UST's and LUST's;
- Hazardous waste generators;
- Industrially or commercially zoned areas and related parcels of concern;
- Dry wells and septic tanks;
- Transportation spills; and,
- Other potential sources.

In addition to the risks associated with contaminant loading and the hydrogeologic framework, additional risk arises from the fact that most of the City's wells are clustered in close proximity to each other and may be susceptible to the same contamination events. Only Well 13 is located such that it's capture zone does not merge with the other Lower Washougal supply wells. Should groundwater contamination be detected at the main wellfield (e.g., Well No. 5-8 and 10-12), the City has few backup options for supply. In this event, the City would need to rely on its surface water sources, Wells 9 and 13, and the intertie with Washougal. These options would not supply the City's entire water demand on a sustained basis, particularly during the high demand summer months.

5 References

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Table 1. Summary of Land Use Types of Concern

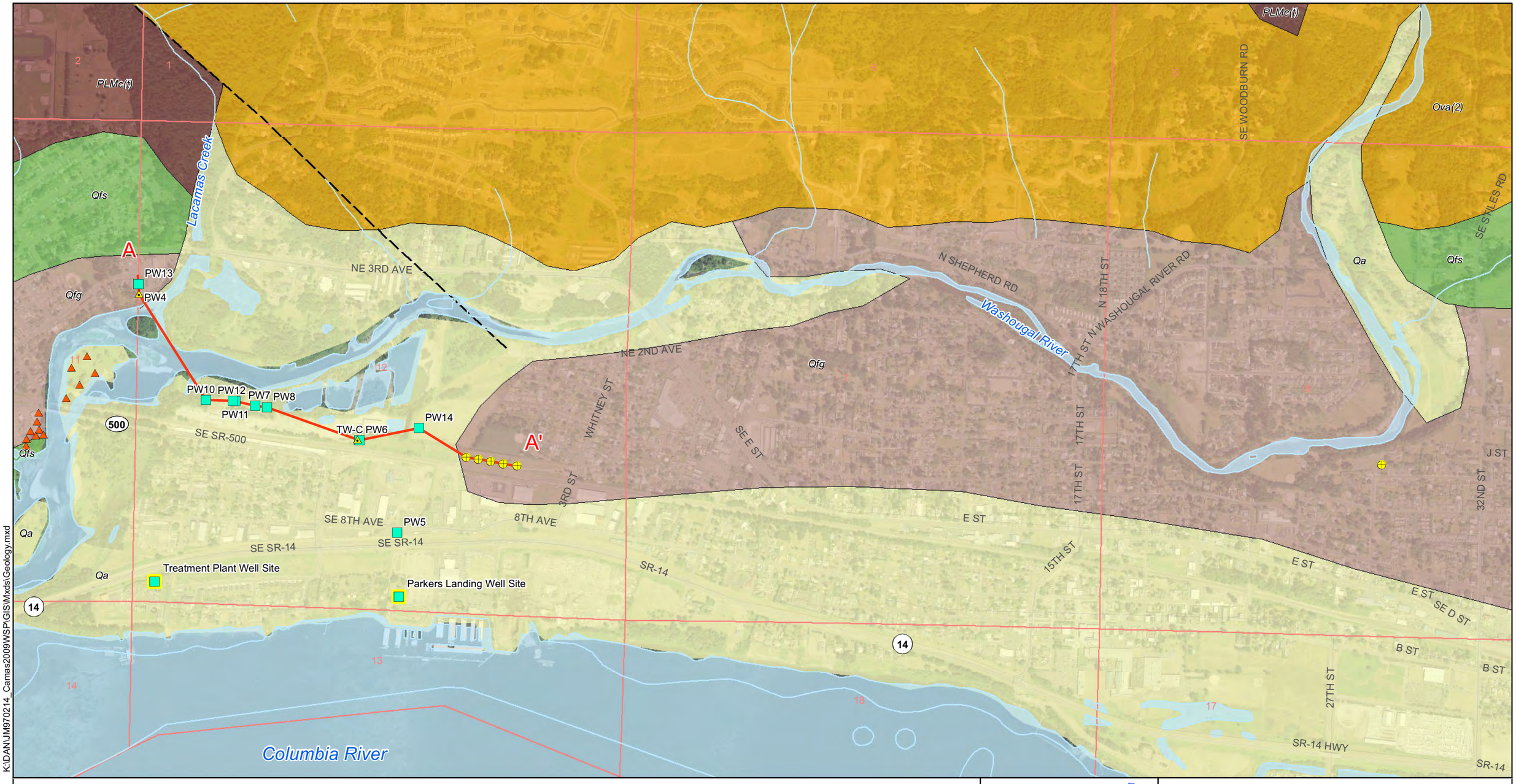
Parcel Land-Use Description	Number of Parcels Within CARA
Auto Body Shop	1
Bio-Filtration Swales/Ponds	1
Boats and marine accessories.	1
Drive Through Car Wash	7
Electric power boosters, transformers, sub-stations, right-of-ways.	1
Electric power operating, maintenance, and repair building.	2
Feedlots.	1
Fleet Operation Centers & Storage	4
Gas storage tanks, pumping, distribution, pipelines, production.	2
General repair & service garages	8
Health Clinics: Medical / Dental / Other	1
Medical & Dental Laboratories	1
Mfg - Lumber & Wood Products	1
Mfg - Machinery	4
Mfg - Miscellaneous	1
Motor vehicle dealers, new cars and small trucks,	3
Parking Lot: Gravel, for adjoining building	8
RETAIL AUTOMOTIVE AND ALLIED	1
Rock quarry, crushing, sand and gravel pits.	3
SERVICE REPAIR SHOP	8
Service Station w/ Tanks & Pumps or Card Lock Station	1
Sewage Related Bldg or Structure	4
Tires (includes retread tires), batteries, parts and accessories dealers	3
Veterinarians / Small Animal Hospitals.	1

Table 2. Summary Data for Parcels of Concern Within Camas Wellhead Protection Capture Zone

Parcel Serial Number	Owner Name	Owner Address	Site Address	Legal Description	Buisness Description	Zoning Abbreviation	WHPZ	
73134007	NORTHWEST PIPELINE	PO BOX 58900, SALT LAKE CITY, UT 84158	30 C ST, WASHOUGAL	#7 DAVID PARKER DLC .45A	Gas storage tanks, pumping, distribution, pipelines, product	LI	6-Month	1
73134153	HAMBLETON BROS LUMBER CO	PO BOX 285, WASHOUGAL, WA 98671	335 A ST, WASHOUGAL	#153, #154, #178 D. C. PARKER DLC 16.69 A	Mfg - Lumber & Wood Products	HI	6-Month	2
73134157	PORT OF CAMAS WASHOUGAL	24 A ST, WASHOUGAL, WA 98671	WASHOUGAL	#157 DAVID PARKER DLC 2.89A	Parking Lot: Gravel, for adjoining building	CH	6-Month	3
73134161	PORT OF CAMAS WASHOUGAL	24 S A ST, WASHOUGAL, WA 98671	115 S 1ST AV, WASHOUGAL	#161 DAVID C PARKER DLC 1.72A	Motor vehicle dealers, new cars and small trucks,	CH	6-Month	4
73134170	PORT OF CAMAS WASHOUGAL	24 S A ST, WASHOUGAL, WA 98671	WASHOUGAL	#170 DAVID C PARKER DLC	Electric power operating, maintenance, and repair building.	LI	6-Month	5
73139080	PORT OF CAMAS WASHOUGAL	24 S A ST, WASHOUGAL, WA 98671	115 S 1ST ST, WASHOUGAL	PARKERSVILLE LOTS 1, 2, 3, 4, 5 BLK 10	Boats and marine accessories.	CH	6-Month	6
73139085	PORT OF CAMAS WASHOUGAL	24 A ST, WASHOUGAL, WA 98671	WASHOUGAL	PARKERSVILLE LOTS 6 & 7 BLK 10	Parking Lot: Gravel, for adjoining building	CH	6-Month	7
73139087	PORT OF CAMAS WASHOUGAL	24 A ST, WASHOUGAL, WA 98671	WASHOUGAL	PARKERSVILLE LOTS 8 & 9 BLK 10	Parking Lot: Gravel, for adjoining building	CH	6-Month	8
73139089	PORT OF CAMAS WASHOUGAL	24 A ST, WASHOUGAL, WA 98671	WASHOUGAL	PARKERSVILLE LOT 10 BLK 10	Parking Lot: Gravel, for adjoining building	CH	6-Month	9
73139090	PORT OF CAMAS WASHOUGAL	24 A ST, WASHOUGAL, WA 98671	WASHOUGAL	PARKERSVILLE BLK 13	Parking Lot: Gravel, for adjoining building	CH	6-Month	10
87021000	GUNDERSON BEVERLY A TRUSTEE	2375 SE 8TH AVE, CAMAS, WA 98607	2456 SE 8TH AV, CAMAS	ORCHARD HOME WASHOUGAL #2 LOT 1 AKA #1 LOT 1 SP3-341 3.12A	RETAIL AUTOMOTIVE AND ALLIED	HI	6-Month	11
87053000	TIDLAND CORPORATION	2305 SE 8TH AVE, CAMAS, WA 98607	2305 SE 8TH AV, CAMAS	ORCHARD HOME WASHOUGAL #4 LOT 2 1.91A	Mfg - Machinery	HI	6-Month	12
87054000	TIDLAND CORPORATION	2305 SE 8TH AVE, CAMAS, WA 98607	CAMAS	ORCHARD HOME WASHOUGAL #5 LOT 2 .23A	Mfg - Machinery	HI	6-Month	13
87260000	C B I LLC	2305 SE 8TH AVE, CAMAS, WA 98607	2380 SE 8TH AV, CAMAS	ORCHARD HOME WASHOUGAL #2 LOT 9 .17A	Mfg - Miscellaneous	LI	6-Month	14
87360000	CITY OF CAMAS	616 NE 4TH AVE, CAMAS, WA 98607	1129 SE POLK ST, CAMAS	ORCHARD HOME WASHOUGAL #1 LOT 16 3.02A	Sewage Related Bldg or Structure	RC	6-Month	15
87365000	CITY OF CAMAS	616 NE 4TH AVE, CAMAS, WA 98607	CAMAS	ORCHARD HOME WASHOUGAL #2 LOT 16	Sewage Related Bldg or Structure	RC	6-Month	16
87451000	CORAL PROPERTIES LLC	14313 NE 20TH AVE A-104, VANCOUVER, WA 98686	1846 NE 3RD AV, CAMAS	RIVER VIEW ADDN TO CAMAS #3 LOT 8	Motor vehicle dealers, new cars and small trucks,	RC	6-Month	17
87452000	CORAL PROPERTIES LLC	14313 NE 20TH AVE A-104, VANCOUVER, WA 98686	CAMAS	RIVER VIEW ADDN TO CAMAS #4 LOT 8 & #3 LOT 9	Motor vehicle dealers, new cars and small trucks,	RC	6-Month	18
87460000	CORAL PROPERTIES LLC	14313 NE 20TH AVE A-104, VANCOUVER, WA 98686	1904 NE 3RD AV, CAMAS	RIVER VIEW ADDN TO CAMAS #1 LOT 9	General repair & service garages	RC	6-Month	19
87500000	EPJLM LLC	2845 NW LOGAN CIR, CAMAS, WA 98607	2016 NE 3RD AV, CAMAS	RIVER VIEW ADD TO CAMAS #1 #4 LOT 10 #2 LOT 11	Health Clinics: Medical / Dental / Other	RC	6-Month	20
88630000	TIDLAND CORPORATION	2305 SE 8TH AVE, CAMAS, WA 98607	754 SE UNION ST, CAMAS	OAK PARK ADDN WASHOUGAL LOT 6 BLK 8	Mfg - Machinery	HI	6-Month	21
88640000	TIDLAND CORPORATION	2305 SE 8TH AVE, CAMAS, WA 98607	2205 SE 8TH AV, CAMAS	OAK PARK ADDN WASHOUGAL LOTS 7 & 8 BLK 8	Mfg - Machinery	HI	6-Month	22
89861000	ENCON PACIFIC LLC	1660 LINCOLN ST STE 1800, DENVER, CO 80264	1635 SE 6TH AV, CAMAS	#32 OF DAVID C PARKER DLC 4.98A	Rock quarry, crushing, sand and gravel pits.	HI	6-Month	23
89882000	BRAMBLE ACRES LLC	4206 NE 261ST AVE, CAMAS, WA 98607	2459 NE 3RD LP, CAMAS	#64 OF DAVID C PARKER DLC .50A	Medical & Dental Laboratories	RC	6-Month	24
89908000	NORTHWEST PIPELINE	PO BOX 58900, SALT LAKE CITY, UT 84158	CAMAS	#135 DAVID C PARKER DLC 4.17A	Gas storage tanks, pumping, distribution, pipelines, product	MF-24	6-Month	25
89932000	CITY OF CAMAS	430 NE EVERETT ST, CAMAS, WA 98607	CAMAS	#192 DAVID PARK DLC 18.24A M/L	Rock quarry, crushing, sand and gravel pits.	HI	6-Month	26
91045163	CITY OF CAMAS	613 NE 4TH AVE, CAMAS, WA 98607	CAMAS	#163 DAVID PARKER DLC 4.39A	Electric power boosters, transformers, sub-stations, right-o	R1-7.5	6-Month	27
91045167	SONDEREN ENTERPRISES LLC	6590 SW LOMBARD AVE, BEAVERTON, OR 97008	3136 NE 3RD AV, CAMAS	#176-A D C PARKER DLC 2.13A	Tires (includes retread tires), batteries, parts and accesso	RC	6-Month	28
96158768	BUCK STEVEN E	PO BOX 324, WASHOUGAL, WA 98671	921 4TH ST, WASHOUGAL	RIVERSIDE ESTATES LOT 5 SUB 96	Auto Body Shop	CC	6-Month	29
127950000	CLARK PUBLIC UTILITIES	PO BOX 8900, VANCOUVER, WA 98668	WASHOUGAL	#115 DAVID C PARKER DLC .96A	Electric power operating, maintenance, and repair building.	LI	6-Month	30
700120000	COLUMBIA ROCK PRODUCTS INC	PO BOX 1067, CAMAS, WA 98607	1635 SE 6TH AV, CAMAS	BN RY LEASE 229,056	Rock quarry, crushing, sand and gravel pits.	HI	6-Month	**31**
71355005	TOWNSEND GREG & TOWNSEND MONICA	401 6TH ST, WASHOUGAL, WA 98671	401 C ST, WASHOUGAL	#26-A #453-A #624-A #619-A #640-A AKA LOT 2 SP2-554 1.04A	Veterinarians / Small Animal Hospitals.	CH	1 Year	1
73134116	MUYSKENS DIRK & HOMA DARLENE ETAL	PO BOX 926, RIDGEFIELD, WA 98642	453 C ST, WASHOUGAL	#116 OF D C PARKER DLC 1.11A	Parking Lot: Gravel, for adjoining building	LI	1 Year	2
73134155	MCGREW ROBERT W & MCGREW KATHARINA TRUSTEES	MCGREW FAMILY TRUST, WASHOUGAL, WA 98671	450 C ST, WASHOUGAL	#155 D C PARKER DLC .38A	SERVICE REPAIR SHOP	CH	1 Year	3
75357048	M & M CARWASH INC	PO BOX 812, BORING, OR 97009	WASHOUGAL	R B JOHNSTON TTS LOT 12 BLK 2	Drive Through Car Wash	CV	1 Year	4
75357049	M & M CARWASH INC	PO BOX 832, BORING, OR 97009	WASHOUGAL	R B JOHNSTON TT LOT 12 BLK 2 (SEE 075357-048-050 LAND AV)	Drive Through Car Wash	CV	1 Year	5
75357050	M & M CARWASH INC	PO BOX 832, BORING, OR 97009	WASHOUGAL	R B JOHNSTON TRACTS LOT 13 BLK 2	Drive Through Car Wash	CV	1 Year	6
75357051	M & M CARWASH INC	PO BOX 832, BORING, OR 97009	WASHOUGAL	R B JOHNSTON TRACTS LOT 14 BLK 2	Drive Through Car Wash	CV	1 Year	7
91045582	KITTERMAN LLC 45.6%	811 NE 112TH AVE SUITE 104, VANCOUVER, WA 98662	CAMAS	WEIR PARK #1 LOT 7 BLK 1	Parking Lot: Gravel, for adjoining building	RC	1 Year	8
91045584	KITTERMAN LLC 45.6%	811 NE 112TH AVE SUITE 104, VANCOUVER, WA 98662	CAMAS	WEIR PARK #1 LOT 8 BLK 1	Parking Lot: Gravel, for adjoining building	RC	1 Year	9
91045652	MANBER MIRIAM TRUST 1/3 INT	555 12TH ST STE 1400, OAKLAND, CA 94607	3440 NE 3RD AV, CAMAS	WEIR PARK LOTS 3 & 4 BLK 5	Tires (includes retread tires), batteries, parts and accesso	RC	1 Year	10
91045666	FOUNTAIN ROBERT & FOUNTAIN NANCY	114 SE WEIR ST, CAMAS, WA 98607	114 SE WEIR ST, CAMAS	WEIR PARK LOT 16 BLK 5	General repair & service garages	RC	1 Year	**11**
71360000	HIGGINSON BLAINE & HIGGINSON BRIAN	984 17TH ST, WASHOUGAL, WA 98671	984 17TH ST, WASHOUGAL	#19C OF OUGH DLC .50A	SERVICE REPAIR SHOP	R1-10	5 Year	1
71527002	R & T AUTO BODY INC	1434 E ST, WASHOUGAL, WA 98671	1434 E ST, WASHOUGAL	#275 OF RICH OUGH DLC	General repair & service garages	CC	5 Year	2
71528000	R & T AUTO BODY INC	1434 E ST, WASHOUGAL, WA 98671	1434 E ST, WASHOUGAL	#276 OF RICH OUGH DLC	General repair & service garages	CC	5 Year	3
71542000	BKS ENTERPRISES INC	1641 E ST, WASHOUGAL, WA 98671	1641 E ST, WASHOUGAL	#292 OF RICH OUGH DLC	Drive Through Car Wash	CV	5 Year	4
71543000	VAUGHN PATRICIA	462 LILLIAN LN, ROSEBURG, OR 97470	1423 E ST, WASHOUGAL	#293 OF RICH OUGH DLC	SERVICE REPAIR SHOP	CV	5 Year	5
71559000	MALFAIT RONALD & MALFAIT SHERYL	31914 SE 17TH ST, WASHOUGAL, WA 98671	1022 E ST, WASHOUGAL	#315 OF RICH OUGH DLC	Drive Through Car Wash	CC	5 Year	6
71592000	MALFAIT RONALD & MALFAIT SHERYL	31914 SE 17TH ST, WASHOUGAL, WA 98671	WASHOUGAL	#367 OF RICH OUGH DLC	Drive Through Car Wash	CC	5 Year	7
71622000	WASHOUGAL SCHOOL DIST #112	2349 B ST, WASHOUGAL, WA 98671	WASHOUGAL	#420 OF OUGH DLC	Fleet Operation Centers & Storage	R1-7.5	5 Year	8
71666000	MALFAIT RONALD & MALFAIT SHERYL	31914 SE 17TH ST, WASHOUGAL, WA 98671	1138 E ST, WASHOUGAL	#473 OF RICH OUGH DLC	General repair & service garages	CC	5 Year	9
71671002	GATEWAY COMMUNITY CHURCH WASHOUGAL	1235 E ST, WASHOUGAL, WA 98671	1325 E ST, WASHOUGAL	#479 OF OUGH DLC .11A	SERVICE REPAIR SHOP	CV	5 Year	10
71680000	MALFAIT RONALD S	31914 SE 17TH ST, WASHOUGAL, WA 98671	1250 E ST, WASHOUGAL	#489 OF RICH OUGH DLC .22A	Service Station w/ Tanks & Pumps or Card Lock Station	CC	5 Year	11
71683000	COLUMBIA ELECTRIC INC	PO BOX 473, WASHOUGAL, WA 98671	1338 E ST, WASHOUGAL	#496 OF RICH OUGH DLC .21A	SERVICE REPAIR SHOP	CC	5 Year	12
71706000	MALFAIT RONALD & MALFAIT SHERYL	31914 SE 17TH ST, WASHOUGAL, WA 98671	1204 E ST, WASHOUGAL	#530 OF OUGH DLC .25A	Tires (includes retread tires), batteries, parts and accesso	CC	5 Year	13
71717002	MAHRE DONALD A (C/S)	1403 SE 283RD AVE, CAMAS, WA 98607	1315 E ST, WASHOUGAL	#553 OF OUGH DLC .14A	SERVICE REPAIR SHOP	CV	5 Year	14
71741000	MAHON JENIFER & MAHON JOHN A	1005 I ST, WASHOUGAL, WA 98671	1005 I ST, WASHOUGAL	#589 OF OUGH DLC .35A	Feedlots.	R1-7.5	5 Year	15
71792000	HATTEN RANDALL & HATTEN BRENDA	PO BOX 141, WASHOUGAL, WA 98671	1320 E ST, WASHOUGAL	#662 OF RICHARD OUGH DLC .31A	SERVICE REPAIR SHOP	CC	5 Year	16
71832000	VAUGHN PATRICIA	462 LILLIAN LN, ROSEBURG, OR 97470	1405 E ST, WASHOUGAL	#714 RICHARD OUGH DLC .23A	General repair & service garages	CV	5 Year	17
71886000	JENSEN RONALD & JENSEN DONNA TRUSTEE	982 E ST, WASHOUGAL, WA 98671	1022 E ST, WASHOUGAL	#777 RICHARD OUGH DLC	SERVICE REPAIR SHOP	CC	5 Year	18
71910000	SAMPLE RONALD N & LILJA-SAMPLE NANCY	2100 NE 249TH AVE, CAMAS, WA 98607	WASHOUGAL	#803 RICHARD OUGH DLC	General repair & service garages	CC	5 Year	19
75358010	WASHOUGAL SCHOOL DIST #112	2349 B ST, WASHOUGAL, WA 98671	971 E ST, WASHOUGAL	ELLS SUB-DIV LOT 1	Fleet Operation Centers & Storage	R1-7.5	5 Year	20
75359586	RADFORD BRIAN J	3000 H ST, WASHOUGAL, WA 98671	730 E ST, WASHOUGAL	MIDLAND ACRE REPLT BLKS 1-5 & TTA #2 LTS 24 Z 26 BLK 1	General repair & service garages	CV	5 Year	21
75359644	WASHOUGAL SCHOOL DIST #112	2349 B ST, WASHOUGAL, WA 98671	995 E ST, WASHOUGAL	MIDLAND ACRES REPLAT BLKS 1-5 & TT A #1 LOT 2 BLK A	Fleet Operation Centers & Storage	R1-7.5	5 Year	22
75359646	WASHOUGAL SCHOOL DIST #112	2349 B ST, WASHOUGAL, WA 98671	WASHOUGAL	MIDLAND ACRE REPLAT BLKS 1-5 & TT A #2 LOT 2 BLK A	Fleet Operation Centers & Storage	R1-7.5	5 Year	23
131901042	CITY OF WASHOUGAL	1701 C ST, WASHOUGAL, WA 98671	WASHOUGAL	AUTUMN SLOPE TT A SUB 2004	Bio-Filtration Swales/Ponds	R1-10	5 Year	**24**
87124000	CITY OF CAMAS	616 NE 4TH AVE, CAMAS, WA 98607	CAMAS	ORCHARD HOME WASHOUGAL G,H,& I LOT 4 .17A	Sewage Related Bldg or Structure	LI	CARA	1
89924000	CITY OF CAMAS	616 NE 4TH AVE, CAMAS, WA 98607	CAMAS	#183A DAVID C PARKER DLC 1 A M/L	Sewage Related Bldg or Structure	RC	CARA	**2**

Table 3. Summary of Environmental Sites of Concern

ID	Facility Name	Facility ID	WHPZ	Release	Underground Storage Tank	Leaking Underground Storage Tank	Total Tank Volume	Hazardous Materials	Cleanup Site	Halogenated Organic Compounds	EPA Priority Pollutants	PCB	Petroleum Products	Non Halogenated Solvents	Arsenic
1	Camas Washougal Port	92847997	6-Month	Y	Y	Y	22500	N	N						
2	Chevron Bulk Plant Camas	1043	6-Month	Y	N	N		N	Y	C	C		C	C	
3	Clark Public Utility Dist C St	5352681	6-Month	N	Y	N		N	N						
4	Columbia Storage Inc 2nd St	11338232	6-Month	N	N	N		Y	N						
5	Columbia Warehouse	37125488	6-Month	N	Y	N	550	Y	N						
6	Hambleton Bros Log Yard	4399598	6-Month	Y	N	N		N	Y		C	C	C		
7	Jimbos Deli Mart 2	86429735	6-Month	N	Y	N	60000	N	N						
8	Northwest Pipeline Gp Washougal M/S	14447751	6-Month	Y	N	N		Y	Y		C				C
9	Tarr Inc Washougal	3264254	6-Month	N	N	N		Y	N						
10	Tidland Corp	88277363	6-Month	N	N	N		Y	N						
11	Tidland Corporation	7282918	6-Month	N	Y	N	550	N	N						
12	Triangle Resources	3153967	6-Month	N	N	N		N	N						
13	Us Doe Bpa Camas Substation	3811629	6-Month	N	N	N		Y	N						
14	All Seasons Auto Centers Inc Camas	18768638	1 Year	N	N	N		Y	N						
15	Brass Lamp Motor Inn	64124152	1 Year	N	N	N		Y	N						
16	Goodyear Tire Camas	85837922	1 Year	Y	Y	Y	3000	N	Y						
17	Helland Brothers Ss	69936158	1 Year	N	N	N		Y	N						
18	Schucks Auto Supply Camus	52218486	1 Year	N	N	N		Y	N						
19	Washougal Electric & Sheet Metal Inc	16327542	1 Year	N	Y	N	550	N	N						
20	West Coast Marine Cleaning Inc	39956434	1 Year	N	N	N		Y	N						
21	Asher Engine Service	94778244	5 Year	N	N	N		Y	N						
22	Clark County Pub Wks Washougal Site	95756539	5 Year	N	Y	N	16500	N	N						
23	Hi Way Fuel	22538744	5 Year	Y	Y	Y	103500	N	N						
24	Napa Washougal	79581825	5 Year	N	N	N		Y	N						
25	Overton Mfg Inc	49392144	5 Year	N	N	N		Y	N						
26	S & S Food Mart	64113396	5 Year	N	Y	N	45000	Y	N						
27	Washougal School Dist Bus Garage	48371594	5 Year	N	Y	N		N	N						
28	Washougal Shell	57872946	5 Year	N	Y	N		N	N						
29	Camas City Operations Center	38772238	CARA	N	N	N		Y	N						
30	Camas City Well 11 & 12	994431	CARA	N	N	N		Y	N						
31	Camas City Well 3	9810684	CARA	N	N	N		Y	N						
32	Camas Stp	74959167	CARA	N	N	N		Y	N						
33	Columbia Rock Concrete Products Inc	5016308	CARA	Y	N	N		N	Y		S		C		
34	Gk Construction & Equipment Rentals	4168647	CARA	N	N	N		Y	N						
35	Heraeus Shin Etsu America	83917959	CARA	N	N	N		Y	N						



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- Camas Supply Well
- Camas Proposed Supply Well
- Washougal Supply Well
- Georga Pacific Supply Well
- Cross Section Alignment
- Other Well in Cross Section

Geologic Units (DGER 100K)

- Qfs - outburst flood deposits, sand and silt, late Wisconsinan
- Qa - alluvium
- Qfg - outburst flood deposits, gravel
- Ova(2) - Andesite flows
- PLM(t) - continental sedimentary deposits or rocks (Troutdale Formation)
- Normal Fault

0 Feet 1,000

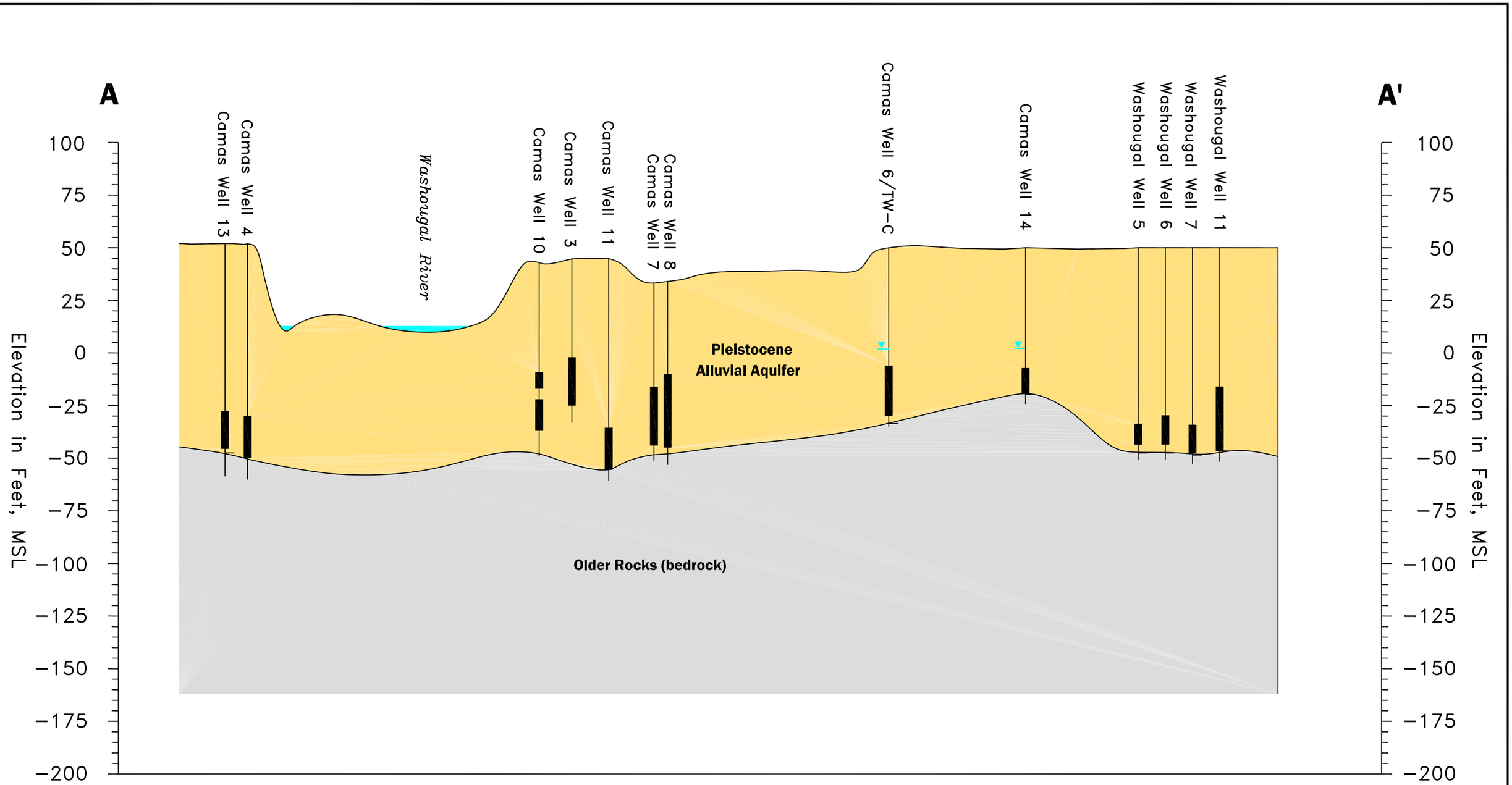
N

2007 Aerial Photo from Clark County

Figure 1
Surficial Geology, Cross Section & Wellfields

Camas Wellhead Protection Plan

PgG



LEGEND

- Well Water Level
- Well Completion Interval

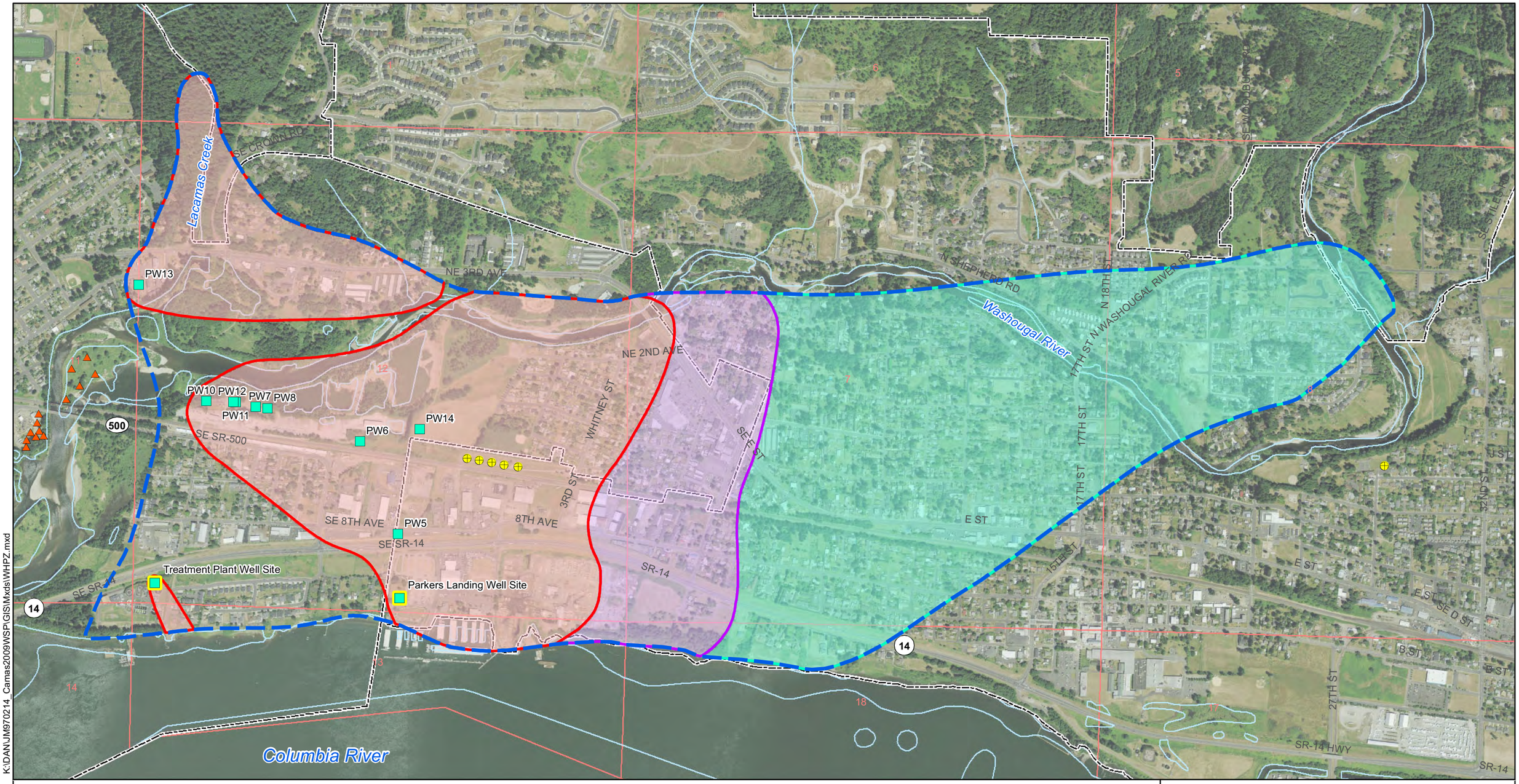
Horizontal Scale in Feet
0 250 500
0 25 50
Vertical Scale in Feet

FIGURE 2
Hydrogeologic Cross Section A-A'

City of Camas
Replacement Wells

JM9702.06, XSECA.DWG, May/2003

PgG



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- Camas Supply Well
- Camas Proposed Supply Well
- Washougal Supply Well
- Georga Pacific Supply Well

Wellhead Protection Capture Zones (WHPP-3 Scenario)
- 6 Month Capture Zone
- 1 Year Capture Zone
- 5 Year Capture Zone

- Critical Aquifer Recharge Area (CARA)
- City Limits

0 Feet 1,000

N

2007 Aerial Photo from Clark County

P-39

Figure 3
City of Camas Wellhead Protection Capture Zones

Camas Wellhead Protection Plan

PgG

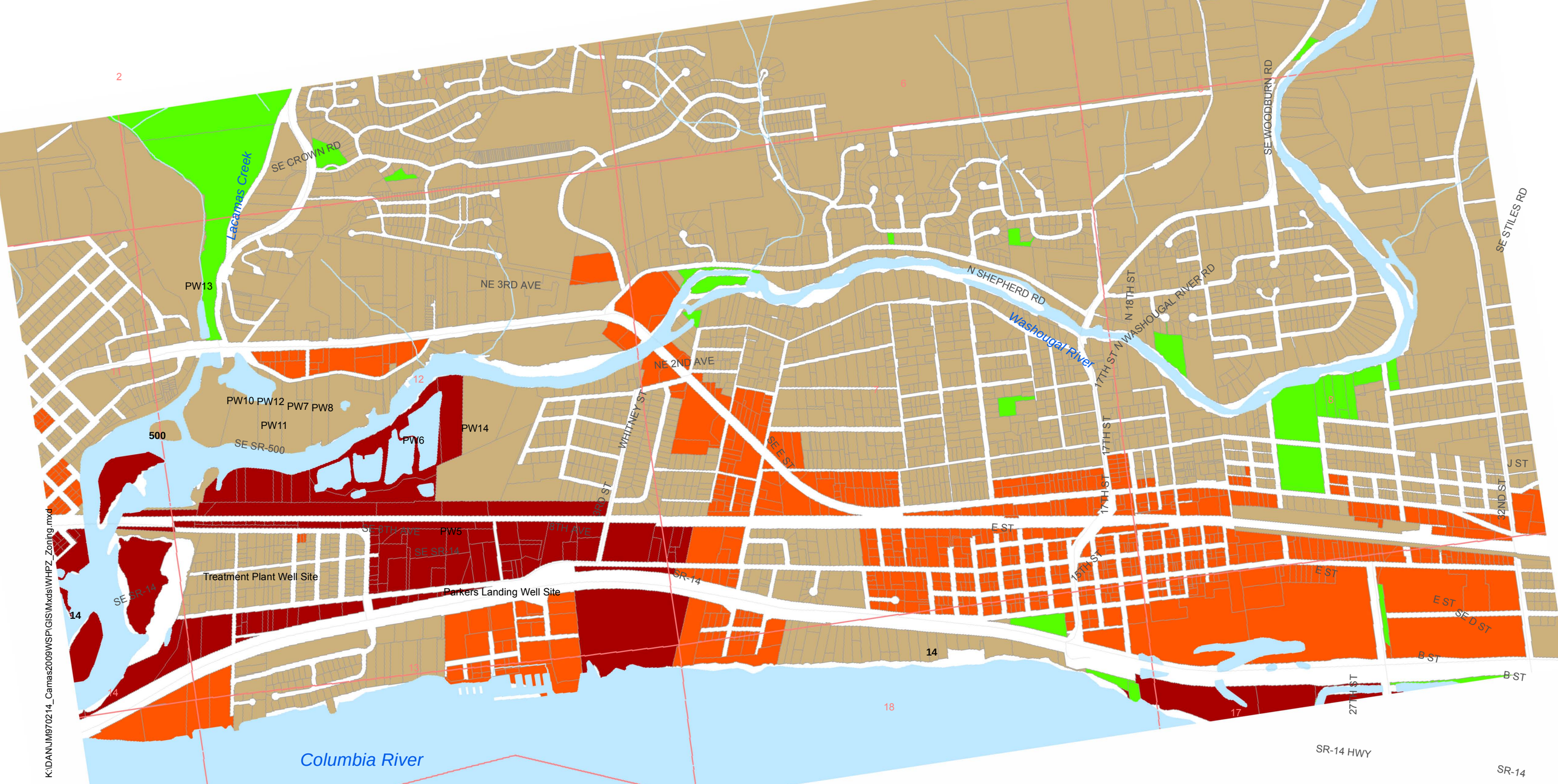

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Figure 4
Zoning Categories

Camas Wellhead
Protection Plan

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DOE Sites of Concern

Known Release

Table 3 ID → 11 ← Cleanup Site

UST/LUST

Hazardous Materials

Refer to Section 4.3 and Table 3 for description.

- Drywells
- Septic Systems
- WSDOT Infiltration Area
- City Limits
- Camas Supply Well
- Camas Proposed Supply Well
- Washougal Supply Well
- Georga Pacific Supply Well
- Critical Aquifer Recharge Area (CARA)
- 6 Month Capture Zone
- 1 Year Capture Zone
- 5 Year Capture Zone

0 Feet 1,000

2007 Aerial Photo from Clark County

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Figure 5
Hazardous Sites

Camas Wellhead Protection Plan

PgG

Appendix A

Environmental Sites Information

Facility/Site: 1043 CHEVRON BULK PLANT CAMAS

Also known as: CHEVRON BULK PLANT CAMAS, TRIANGLE RESOURCES

Larger Map

Larger Map

Address

SE 6TH AVE & SE UNION AVE

CAMAS WA 98607

Decimal Coordinates

Latitude: 45.58285

Longitude: -122.38523

Geographic Information

Ecology Region: SWRO

County: Clark

Legislative District: 18

Congressional District: 3

WRIA: 28

Tribal Land: No

Ecology Interactions

Interaction Description	Ecology Program	Ecology Program Phone	Program ID	Start Date	End Date
State Cleanup Site	TOXICS	(360) 407-7224		5/23/1990	

Industrial Codes (External Links Below)

Report generated on 08-05-2009

Clark COUNTY

Site ID: **1043** **CHEVRON BULK PLANT CAMAS**

LOCATION

Address: SE 6TH AVE & SE UNION AVE
CAMAS, 98607

Lat/Long: 45.582 -122.385

Township/Range/Section: 1N 3E 48

(View Map)

Legislative District: 18

Congressional District: 3

STATUS

Ecology Status: RA in Progress
Independent Status:
Site Type:
Statute: MTCA only
WARM BIN#: 2
Brownfield: ☐ **Restrictive Covenant:** ☐ **PSI:** ☐
No Further Action (NFA):

Responsible Unit: SOUTHWEST
Site Manager: SCHMALL, ROD
Entered Date: 5/23/1990
Last Update Date: 1/24/2008
LUST ID:
ERTS ID:
NFA Date:

(View Site Web Page)

SITE ACTIVITIES

Activity	Status	Start Date	End Date	Legal Mechanism	Project Manager
Site Hazard Assessment	Completed	2/10/1995	6/29/1995		SOUTHWEST REGION
Hazardous Sites Listing	Completed	8/22/1995	8/22/1995		SOUTHWEST REGION
Remedial Investigation/Feasibility Study	In Process	10/20/2003	7/1/2010	Agreed Order	SCHMALL, ROD

AFFECTED MEDIA & CONTAMINANTS DATA

Media \ Contaminants:	2	3	7	9
Soil- C		C	C	C
Groundwater- C	C		C	C

CONTAMINANT KEY

#1 = Base/Neutral Organics
#2 = Halogenated Organics
#3 = Metals-Priority Pollutants
#4 = Metals-Other
#5 = PCB
#6 = Pesticides
#7 = Petroleum Products
#8 = Phenolic Compounds
#9 = Non-Halogenated Solvents
#10 = Dioxins
#11 = PAH
#12 = Reactive Wastes
#13 = Corrosive Wastes
#14 = Radioactive Wastes
#15 = Conventional Contaminants, Organic
#16 = Conventional Contaminants, Inorganic
#17 = Asbestos
#18 = Arsenic
#19 = MTBE
#20 = Unexploded Ordnance (UXO)
(21-24 Sediment only)
#21 = Tributyl Tin
#22 = Bioassay/Benthic Failures
#23 = Wood Debris
#24 = Other

PCB = PolyChlorinated BiPhenyls PAH = Polynuclear Aromatic Hydrocarbons MTBE = Methyl Tertiary-Butyl Ether

B = Below MTCA Cleanup Levels; C = Confirmed; R = Remediated; S = Suspected

COUNTY - CLARK (1 sites)

Site Name: CHEVRON BULK PLANT CAMAS

FS ID: 1043

Address SE 6TH AVE & SE UNION AVE
CAMAS, WA 98607

(View Map) Lat: 45.58285 / Long: -122.38523

Rank 2
PSI ☐
VCP ☐
Brownfield ☐

Entered Date May 23, 1990
Last Update January 24, 2008
Resp. Unit Southwest
Ecology Status RA in Progress

ACTIVITY	STATUS	START	END	LEGAL
Site Hazard Assessment	C	2/10/1995	6/29/1995	
Hazardous Sites Listing	C	8/22/1995	8/22/1995	
Remedial Investigation/Feasibility Study	I	10/20/2003	7/1/2010	Agreed Order

Media	Contaminant 2	3	7	9
Soil- C		C	C	C
Groundwater- C	C		C	C

*hover over boxes above for details

Report Statistics

Number of Counties.	1	Number of Brownfield Sites	0
Total Number of Resp. Units	1	Number of VCP Sites	0
Number of Regions	1	Number of Puget Sound Initiative Sites	0
Total Number of Sites	1	Number of Ranked Sites	1

Continued from Page 1

warehouse, near a *sump* (pit which collects excess liquid) on the east side of the site, and beneath a sand trap near the former garage. Petroleum constituents, gasoline, and lead have been discovered in groundwater samples. In November 1994, more than 550 cubic yards (55 dump truck loads) of petroleum-contaminated soil were removed and disposed of. The property was sold in November 1994 to a wood recycling company, Triangle Resources.

What Is Being Done?

The agreed order requires Chevron to conduct a remedial investigation/feasibility study (RI/FS) and risk assessment of lead and petroleum-contaminated soil and groundwater. The remedial investigation will determine the nature, extent, and magnitude of site contamination. The risk assessment will measure the threats to human health and the environment. The feasibility study will evaluate site cleanup alternatives. Ecology will oversee implementation of the agreed order to ensure that all parts of the agreed order are fulfilled.

What Happens Next?

Public comment on the proposed agreed order will be considered and the order will be modified, if necessary, based on the comments received. The work for the remedial investigation/feasibility study and risk assessment should be completed by Summer 2004. Further formal public comment opportunities will occur after the remedial investigation/feasibility study and risk assessment are completed, and a draft cleanup action plan is prepared.

Ecology Wants Your Comments!

You are invited to review and comment on the proposed agreed order through **September 19, 2003**. The public comment period presents an opportunity to have your ideas and comments heard by Ecology. Information repositories, which include the agreed order, have been set up at the locations listed in the box on page one. To review more detailed site documents than those in the information repositories, contact Ecology's Southwest Regional Office records center at (360) 407-6365 to schedule an appointment.

Please submit your written comments to Marcel Szyszkowski, Site Manager, at the Ecology address listed in the box on page one. Ecology will review and respond to all comments received, and may revise the agreed order. Updates of site activities will be provided to those who submit comments or request to be placed on the site mailing list. (If you received this fact sheet directly from Ecology, you are already on the site mailing list.)

Ecology is an Equal Opportunity Employer.

CHEVRON BULK PLANT, CAMAS

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Agreed Order for RI/FS Proposed

The Washington Department of Ecology and Chevron have agreed to a Model Toxics Control Act (MTCA, Chapter 70.105D RCW) order to conduct a remedial investigation/feasibility study (RI/FS) of lead and petroleum-contaminated soil and groundwater at the Chevron Bulk Plant, Camas site. The agreed order is a legal document formalizing an agreement between Ecology and potentially liable persons (PLP's), to ensure that proposed site cleanup activities are conducted in a timely fashion, in accordance with MTCA and other applicable laws and regulations.

Your comments on the proposed agreed order are welcome through **September 19, 2003**. The box to the right provides information about where to review the agreed order, as well as where to submit comments.

Site Background

The 1.5-acre former Chevron Bulk Plant, Camas site is located at 612 SE Union Street. The site was a bulk fuel terminal which was decommissioned in 1983. Railroad spurs border the site to the north and east. A garage was formerly located in the northwest corner of the site and a warehouse building was in the south portion. An office building remains on-site. The site is about 800 feet southeast from the Washougal River. The Columbia River is about 1700 feet south of the site. Drinking water wells for the City of Camas are about 250 feet north and about 1000 feet southeast of the site. Area groundwater flows northwest, southwest, and south.

Five above-ground fuel tanks and pumps, associated piping, and some buildings were removed in 1984. A fuel oil underground storage tank was removed in 1990. Although site files do not indicate where lead and other gasoline additives were stored, they were likely on-site since there is lead contamination in soil and groundwater.

Ecology conducted a site initial investigation in November 1992. In August 1995, the site was ranked on the Hazardous Sites List as a 2 (1 being high priority, 5 being low). Chevron Bulk Plant, Camas received its score based on its impact to groundwater and human health.

Site investigations, including soil and groundwater sampling, occurred between October 1987 and November 1995. Petroleum constituents and lead above cleanup levels have been detected in soil underneath the former loading racks, pumps, and above-ground storage tanks as well as in the area of the former

Continued on Page 2

August 2003

FACT SHEET

Ecology Southwest Regional Office
Toxics Cleanup Program
300 Desmond Drive SE
P.O. Box 47775
Olympia, WA 98504-7775
(360) 407-6300 (voice)
(360) 407-6306 (TDD)
e-mail mszy461@ecy.wa.gov

PUBLIC COMMENT PERIOD ON AGREED ORDER:

August 18, 2003 to
September 19, 2003

Comments and requests for updates should be directed to Marcel Szyszkowski, Site Manager, at the Ecology address listed above or at (360) 407-6363.

INFORMATION REPOSITORIES

The agreed order can be reviewed at the following locations:

www.ecy.wa.gov/programs/tcp/sites/sites_information.html
then click on the appropriate county

www.ecy.wa.gov, then click on "Public Events Calendar page"

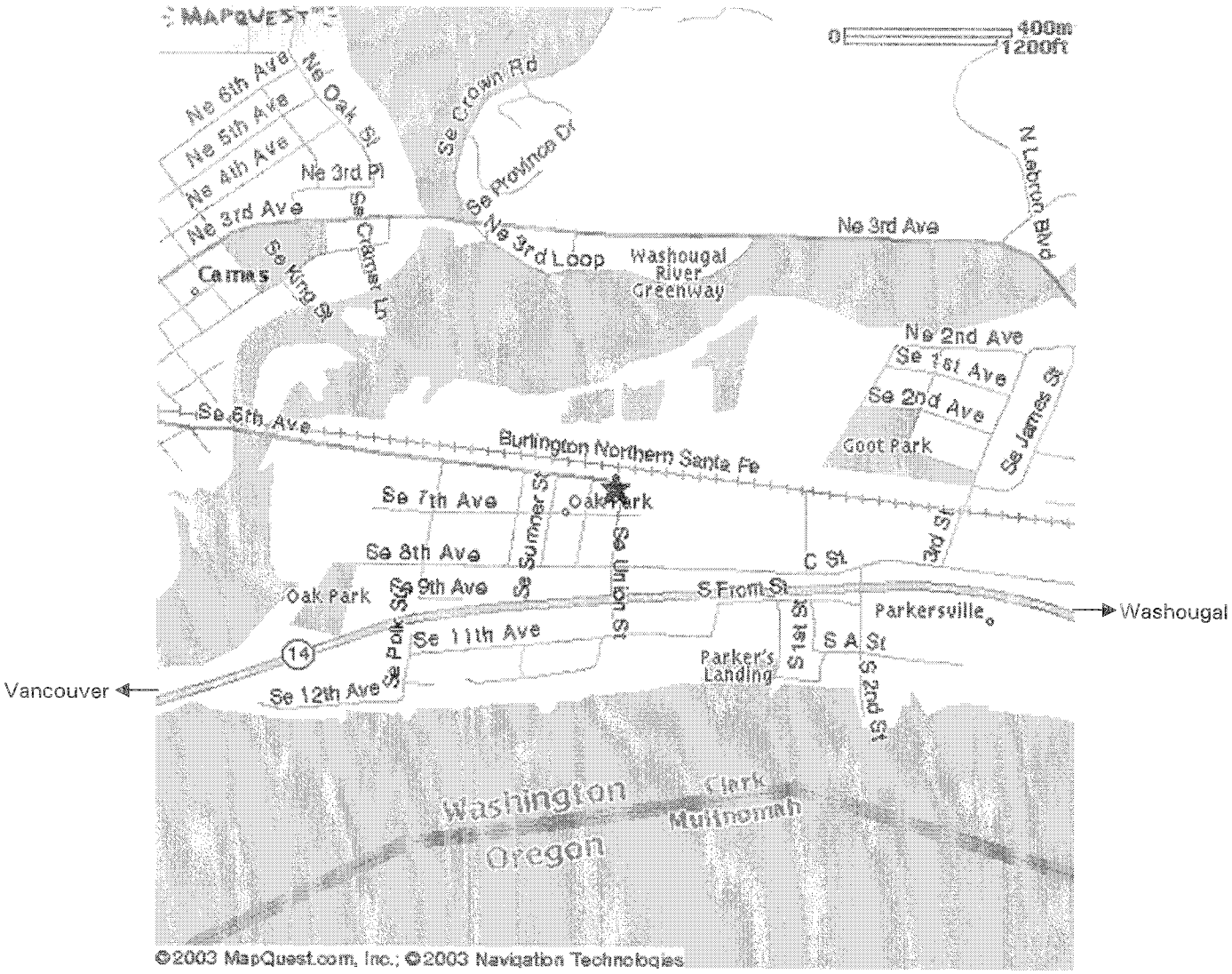
Ecology Southwest Regional Office address listed above

Camas Library
625 NE 4th Avenue
Camas, WA 98607-2109
(360) 834-4692

Printed on Recycled Paper

If you have special accommodation needs, please call (360) 407-6300, (360) 407-6306 (TDD), 711, or 1-800-833-6388 (TTY).

Continued from Page 2



No NAICS information is available for this facility site.

SIC Code	SIC Description
2999	PETROLEUM & COAL PRODUCTS

Report generated on 08-05-2009

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

In the Matter of Remedial Action by:	)	
	)	AGREED ORDER
Chevron U.S.A. Products Company	)	No. 02TCPSR-3991
Former Chevron Bulk Facility #207407	)	
(100-1840)	)	
SE 6th Avenue and SE Union Street	)	
Camas, WA	)	

TO: Chevron Products Company
A ChevronTexaco Company
Attn: Jon. N. Robbins, Senior Counsel
P.O. Box 6004
6001 Bollinger Canyon Rd. Room T4276
San Ramon, CA 94583-0904

I.
JURISDICTION

This Agreed Order ("Order") is issued pursuant to the authority of RCW 70.105D.050(1).

II.
FINDINGS OF FACT

Ecology makes the following Findings of Fact, without admission of such facts by the Chevron Products Company (Chevron).

SITE DESCRIPTION: The project site is a former Bulk Terminal located on the southeast corner of the intersection of SE Sixth Avenue and SE Union Street in Camas, Washington. Chevron no longer has any leasehold or other real or personal property interest in the Site.. The site was decommissioned in 1983, and the aboveground storage tanks (ASTs) pumps and associated piping were removed in 1984. Railroad spurs bordered the site to the north and east. A garage was formerly located in the northwest corner of the site, and a warehouse building formerly occupied the southern portion of the irregularly shaped property. According to the documents reviewed, an office building remains on the southern portion of the property. The documents reviewed did not state the year operations began at this site.

RECEPTORS: The site is approximately 800 feet southeast from the Washougal River. The Columbia River is located approximately 1,700 feet south of the site. There are also groundwater production wells for the city of Camas located approximately 250 feet north of the site (Municipal well #6), and approximately 1,000 feet southeast of the site (Municipal well #5).

SITE INVESTIGATIONS: Investigations have been performed at the site between October 1987 and November 1995. A total of nine soil borings have been drilled on the site. Seven of these borings were completed as groundwater monitoring wells (MW). Wells MW-1 through MW-4 were completed to 22 feet below grade (bg) and have never generated groundwater. Groundwater monitoring wells MW-5 through MW-7 were completed to approximately 44 feet bg. Depth to groundwater in these wells has ranged from approximately 31 to 44 feet bg. The last groundwater sampling event was performed on November 27, 1995.

Eighteen test pits were also completed to a maximum depth of 15 feet bg across the site in September 1994.

SOIL CONDITIONS: Soils observed on site consist of silty sand or gravelly silt to approximately five feet bg, overlying sandy or silty gravel. Boulders were encountered at 20 feet bg. Concentrations of petroleum hydrocarbons exceeding Washington State Model Toxics Control Act (MTCA) Method A cleanup levels have been detected in soil beneath the former loading racks, pumps and ASTs to 20 feet bg. Concentrations of TPH exceeding MTCA Method A cleanup levels were also detected in the area of the former warehouse, near a sump on the east side of the site, and beneath a sand trap near the former garage.

GROUNDWATER CONDITIONS: Groundwater gradient has been observed to the northwest, southwest, and south. Depth to groundwater has ranged from approximately 31 feet bg to 44 feet bg. Concentrations of TPH-gasoline, TPH-diesel, TPH-oil and BTEX compounds have never been detected in groundwater samples collected from monitoring wells MW-6 and MW-7 above laboratory reporting limits. Concentrations of TPH-gasoline up to 3,600 parts per billion (ppb) have been detected in Well MW-5. Concentrations of BTEX compounds have ranged from non-detectable levels to 120 ppb in Well MW-5. Groundwater has not been sampled since November 1995.

REMEDIATION ACTIVITIES: In November 1994, 830 cubic yards of soil was excavated from six areas of the facility. The soil was placed through a vibratory screen, and approximately 200 cubic yards of rock greater than 3" in diameter was segregated. Approximately 790 tons of soil was hauled off site for disposal. Wells MW-1 through MW-4 were properly abandoned during this project.

Following excavation activities, confirmation soil samples were collected from the bottom of the excavations. Laboratory analytical results indicate that soil above MTCA cleanup levels remains beneath the former loading rack at 11 feet, and beneath the former ASTs at approximately 15 feet bg.

III.
ECOLOGY DETERMINATIONS

1. Chevron was an "owner or operator" as defined at RCW 70.105D.020(11) of a "facility" as defined in RCW 70.105D.020(4).
2. The facility, which consists of approximately one acre of property known as the former Chevron Site (Site), is located at SE 6th Avenue and SE Union Street, Camas, Washington.
3. The substances found at the Site as described above are "hazardous substances" as defined at RCW 70.105D.020(7).
4. Based on the presence of these hazardous substances at the Site and all factors known to Ecology, there is a release or threatened release of hazardous substances from the Site, as defined at RCW 70.105D.020(19).
5. By a letter dated April 22, 2002, Ecology notified Chevron of its status as a "potentially liable person" under RCW 70.105D.040 after notice and opportunity for comment. By a letter of May 22, 2002 Chevron accepted Ecology's determination that Chevron is a "potentially liable person" under RCW 70.105D.040.
6. Pursuant to RCW 70.105D.030(1) and 70.105D.050, Ecology may require potentially liable persons to investigate or conduct other remedial actions with respect to the release or threatened release of hazardous substances, whenever it believes such action to be in the public interest.
   Based on the foregoing facts, Ecology believes the remedial actions required by this Order are in the public interest.

IV.
WORK TO BE PERFORMED

Based on the foregoing Facts and Determinations, it is hereby ordered that Chevron perform the following activities and that these activities be conducted in accordance with Chapter 173-340 WAC unless otherwise specifically provided for herein.

The activities in this Order are designed to remediate the potential risks posed to human health and the environment from the Site. Specifically, work to be performed includes, but is not limited to: 1) and reduce the risk of further contaminant migration to the groundwater beneath the site; 2) conduct and prepare a RI/RA/FS of the Site; 3) implement the recommendations of the RI/RA/FS.

Based on the foregoing Facts and Determinations, it is hereby ordered that Chevron conduct remedial activities at the Site according to the requirements of this Order. In order to carry out the remedial actions required under this Order, Chevron shall produce the reports and carry out the activities specified in this section. All activities shall be conducted in accordance with Chapter 173-340 WAC unless otherwise specifically provided for herein.

1. WORK PLAN WITH SAP/HASP

A work plan which includes a sampling and analysis plan (SAP) and a Site health and safety plan (HASP) will be prepared to comply with WAC 173-340-810 and 820. A single work plan will be prepared for the entire Site. The SAP will propose a scope of work to evaluate known environmental concerns at the site.

a) Chevron shall submit a draft work plan to Ecology for characterization of the extent of soil and groundwater contamination at the Site. The work plan shall contain a SAP which will identify but not be limited to the proposed number of soil test locations and groundwater monitoring locations; approximate depths of samples and borings (as appropriate); sampling and analysis scheme including a quality assurance/quality control (QA/QC) plan; and a HASP for field work. The draft work plan shall include a schedule for implementation. The draft work plan shall be submitted within ninety (90) calendar days of the effective date of this Order. Ecology shall review and provide written comments within thirty (30) calendar days of receipt of the draft work plan. Chevron shall submit a final work plan within thirty (30) calendar days of receipt of Ecology's comments.

2. REMEDIAL INVESTIGATION/RISK ASSESSMENT/FEASIBILITY STUDY (RI/RA/FS)

Chevron shall conduct a remedial investigation (RI), risk assessment (RA) and a feasibility study (FS) at the Site to address the substantive requirements of WAC 173-340-350 and 360. The RI will evaluate the distribution of contaminants in soil and groundwater at the Site. Based on these data, the RA and FS will be performed to evaluate a range of remedial technologies to mitigate Site conditions that pose an unacceptable risk to human health and/or the environment.

a) The approved work plan outlined in Subsection 1a of this Order will be implemented. The RI work plan will include a scope of work to characterize the nature and extent of soil and groundwater impacts at the Site. Should additional RI work be needed to characterize the distribution of contaminants in soil and groundwater, a supplemental RI work plan will be submitted for review by Ecology.
b) Once all RI work is complete, Chevron shall perform a RA and focused FS (in the event that Site media exceed cleanup standards that are appropriate for the use of the property). Chevron shall then submit to Ecology a report of the results of the RI/RA/FS. The report shall include, as appropriate, Site location maps and physical setting description; soil characterization; surface and subsurface soil sampling results (analytical data as well as field logs); soil, groundwater, and sediment characterization; description of monitoring well installation; well logs; drilling logs; results of soil, groundwater, and sediment sampling; hydraulic characterization; recommendations including estimates of volumes and areas of media requiring remediation; evaluation of realistic exposure pathways and exposed populations; evaluation of a range of proven and reliable remedial alternatives that mitigate risks; summary; and conclusions.
c) The draft RI/RA/FS report shall be submitted to Ecology for review and comment within ninety (90) calendar days of completion of field work and receipt of analytical results. Ecology shall provide written comments within forty-five (45) calendar days of receipt of the draft report. Chevron shall complete a final report within thirty (30) calendar days of receipt of Ecology's comments.

3. OTHER SITE WORK NOT INCLUDED IN WORK ITEMS 1 THROUGH 2

No investigative or remedial work shall be done at the Site unless the work is done under the MTCA process in conjunction with this Order. Ecology may amend the Order if the proposed additional work is considered significant.

4. SCHEDULE

1. Draft Work Plan	Within 90 days of the effective date of this Order.
2. Ecology's comments on Draft Work Plan	Within 30 days of the receipt of the Draft Work Plan.
3. Final Work Plan	Within 30 days of the receipt of Ecology's comments
4. RI/RA/FS Draft Report	Within 90 days of completion of field work and receipt of analytical results, but not later than 180 days of the effective date of this Order.
5. Ecology's comments on Draft RI/RA/FS Report	Within 45 days of the receipt of the RI/RA/FS Draft report.
6. RI/RA/FS Final Report	Within 30 days of the receipt of the Ecology's comments.

V.
TERMS AND CONDITIONS OF ORDER

1. **Definitions.**
Unless otherwise specified, the definitions set forth in ch. 70.105D RCW and ch. 173-340 WAC shall control the meanings of the terms used in this Order.

2. **Public Notices.**
RCW 70.105.D,030(2)(a) requires that, at a minimum, this Order be subject to concurrent public notice. Ecology shall be responsible for providing such public notice and reserves the right to modify or withdraw any provisions of this Order should public comment disclose facts or considerations which indicate to Ecology that the Order is inadequate or improper in any respect.

3. **Remedial Action Costs.**
Chevron U.S.A. Products Company (Chevron) shall pay to Ecology costs incurred by Ecology as defined in WAC 173-340-550(2). Chevron shall pay the required amount within 90 days of receiving from Ecology an itemized statement of costs that includes a summary of costs incurred, an identification of involved staff, the amount of time spent by involved staff members on the project and a general description of work performed if requested by Chevron. Itemized statements shall be prepared quarterly. Failure to pay Ecology's costs within 90 days of receipt of the general description will result in interest charges.

4. **Designated Project Coordinators.**
The project coordinator for Ecology is:
Name: Marcel Szyszkowski, P.E.
Address: Southwest Regional Office
PO Box 47775, Olympia, WA 98504-7775
Telephone: (360) 407-6363
E-mail: mszy461@ecy.wa.gov

The project coordinator for Chevron is:
Name: Brett Hunter
Address: P.O. Box 6004
6001 Bollinger Canyon Rd. Rm. L4064
San Ramon, CA 94583-0904

The project coordinator(s) shall be responsible for overseeing the implementation of this Order. To the maximum extent possible, communications between Ecology and Chevron, and all documents, including reports, approvals, and other correspondence concerning the activities performed pursuant to the terms and conditions of this Order, shall be directed through the project coordinator(s). Should Ecology or Chevron change project coordinator(s), written notification shall be provided to Ecology or Chevron at least ten (10) calendar days prior to the change.

5. **Performance.**
All work performed pursuant to this Order shall be under the direction and supervision, as necessary, of a professional engineer or professional hydrogeologist, or similar expert, with appropriate training, experience and expertise in hazardous waste site investigation and cleanup. Chevron shall notify Ecology as to the identity of such engineer(s) or hydrogeologist(s), and of any contractors and subcontractors to be used in carrying out the terms of this Order in advance of their involvement at the Site. Chevron shall provide a copy of this Order to all agents, contractors, and subcontractors retained to perform work required by this Order and shall ensure that all work undertaken by such agents, contractors and subcontractors will be in compliance with this Order.

Except where necessary to abate an emergency situation, Chevron shall not perform any remedial actions at the former Chevron Site outside that required by this Order unless Ecology concurs, in writing, with such additional remedial actions.

WAC 173-340-400(7)(b)(i) requires that "construction" performed on the Site must be under the supervision of a professional engineer registered in Washington.

6. Access.
Upon providing at least twenty four (24) hours notice to Chevron, Ecology or any Ecology authorized representative shall have the authority to enter and freely move about the Site at all reasonable times for the purposes of, inter alia: inspecting records, operation logs, and contracts related to the work being performed pursuant to this Order; reviewing the progress in carrying out the terms of this Order; conducting such tests or collecting samples as Ecology or the project coordinator may deem necessary; using a camera, sound recording, or other documentary type equipment to record work done pursuant to this Order; and verifying the data submitted to Ecology by Chevron. By signing this Order, Chevron agrees that this Order constitutes reasonable notice of access, and agrees to allow access to the Site at all reasonable times for purposes of overseeing work performed under this Order. Ecology shall allow split or replicate samples to be taken by Chevron during an inspection unless doing so interferes with Ecology's sampling. Ecology shall provide Chevron reasonable notice before any sampling event. Chevron shall allow split or replicate samples to be taken by Ecology and shall provide seven (7) days notice before any sampling activity.

7. Public Participation.
Chevron shall prepare and/or update a public participation plan for the Site. Ecology shall maintain the responsibility for public participation at the Site.

8. Retention of Records.
Chevron shall preserve in a readily retrievable fashion, during the pendency of this Order and for ten (10) years from the date of completion of the work performed pursuant to this Order, all records, reports, documents, and underlying data in its possession relevant to this Order. Should any portion of the work performed hereunder be undertaken through contractors or agents of Chevron, Chevron agrees to include in their contract with such contractors or agents a record retention requirement meeting the terms of this paragraph.

9. Dispute Resolution.
Chevron may request Ecology to resolve disputes which may arise during the implementation of this Order. Such request shall be in writing and directed to the signatory, or his/her successor(s), to this Order. Ecology resolution of the dispute shall be binding and final. Chevron is not relieved of any requirement of this Order during the pendency of the dispute and remains responsible for timely compliance with the terms of the Order unless otherwise provided by Ecology in writing.

10. Reservation of Rights/No Settlement.
This Order is not a settlement under ch. 70.105D RCW. Ecology's signature on this Order in no way constitutes a covenant not to sue or a compromise of any Ecology rights or authority. Ecology will not, however, bring an action against Chevron to recover remedial action costs paid to and received by Ecology under this Order. In addition, Ecology will not take additional enforcement actions against Chevron to require those remedial actions required by this Order, provided Chevron complies with this Order.

Ecology reserves the right, however, to require additional remedial actions at the Site should it deem such actions necessary.

Ecology also reserves all rights regarding the injury to, destruction of, or loss of natural resources resulting from the releases or threatened releases of hazardous substances from the former Chevron facility.

In the event Ecology determines that conditions at the Site are creating or have the potential to create a danger to the health or welfare of the people on the Site, or in the surrounding area, or to the environment, Ecology may order Chevron to stop further implementation of this Order for such period of time as needed to abate the danger.

11. Transference of Property.
No voluntary or involuntary conveyance or relinquishment or title, easement, leasehold, or other interest in any portion of the Site shall be consummated by Chevron without provision for continued implementation of all requirements of this Order and implementation of any remedial actions found to be necessary as a result of this Order.

Prior to transfer of any legal or equitable interest Chevron may have in the Site or any portions thereof, Chevron shall serve a copy of this Order upon any prospective purchaser, lessee, transferee, assignee, or other successor in

such interest. At least thirty (30) days prior to finalization of any transfer, Chevron shall notify Ecology of the contemplated transfer.

12. Compliance with Applicable Laws.

A. All actions carried out by Chevron pursuant to this Order shall be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in paragraph B of this section.

B. Pursuant to RCW 70.105D.090(1), the substantive requirements of chapters 70.94,70.95,70.105,75.20,90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals for the remedial action under this Order that are known to be applicable at the time of issuance of the Order have been included in Attachment A and are binding and enforceable requirements of the Order.

Chevron has a continuing obligation to determine whether additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order. In the event Chevron determines that additional permits or approvals addressed in RCW 70.105D.090(1) would otherwise be required for the remedial action under this Order, it shall promptly notify Ecology of this determination. Ecology shall determine whether Ecology or Chevron shall be responsible to contact the appropriate state and/or local agencies. If Ecology so requires, Chevron shall promptly consult with the appropriate state and/or local agencies and provide Ecology with written documentation from those agencies of the substantive requirements those agencies believe are applicable to the remedial action. Ecology shall make the final determination on the additional substantive requirements that must be met by Chevron and how Chevron must meet those requirements. Ecology shall inform Chevron in writing of these requirements. Once established by Ecology, the additional requirements shall be enforceable requirements of this Order. Chevron shall not begin or continue the remedial action potentially subject to the additional requirements until Ecology makes its final determination.

Ecology shall ensure that notice and opportunity for comment is provided to the public and appropriate agencies prior to establishing the substantive requirements under this section.

C. Pursuant to RCW 70.105D.090(2), in the event Ecology determines that the exemption from complying with the procedural requirements of the laws referenced in RCW 70.105D.090(1) would result in the loss of approval from a federal agency which is necessary for the state to administer any federal law, the exemption shall not apply and Chevron shall comply with both the procedural and substantive requirements of the laws referenced in RCW 70.105D.090(1), including any requirements to obtain permits.

VI.
SATISFACTION OF THIS ORDER

The provisions of this Order shall be deemed satisfied upon Chevron's receipt of written notification from Ecology that Chevron has completed the remedial activity required by this Order, as amended by any modifications, and that all other provisions of this Order have been complied with.

VII.
ENFORCEMENT

1. Pursuant to RCW 70.105D.050, this Order may be enforced as follows:

A. The Attorney General may bring an action to enforce this Order in a state or federal court.

B. The Attorney General may seek, by filing an action, if necessary, to recover amounts spent by Ecology for investigative and remedial actions and orders related to the Site.

C. In the event Chevron refuses, without sufficient cause, to comply with any term of this Order, Chevron will be liable for:

(1) up to three times the amount of any costs incurred by the state of Washington as a result of its refusal to comply; and

(2) Civil penalties of up to $25,000 per day for each day it refuses to comply.

D. This Order is not appealable to the Washington Pollution Control Hearings Board. This Order may be reviewed only as provided under Section 6 of ch. 70.105D RCW.

Effective date of this Order: _____

CHEVRON

By _____
David Wickland
Office Manager
Chevron Environmental Management Company
San Ramon, CA

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

By _____
Rebecca S. Lawson, P.E.
Regional Section Manager
Southwest Regional Office
Toxics Cleanup Program

ATTACHMENT A

The known permits and rules that are pertinent to this Order and their respective substantive requirements are listed below. A contact and phone number are provided for the state agency or local government that would typically administer each permit or applicable regulations. Ecology will make a final determination regarding which substantive requirements will apply in situations where requirements conflict.

Regulations pertinent to this action:

1. State of Washington, Hazardous Waste Management, Ecology (Contact: Dee Williams, 360-690-7120)

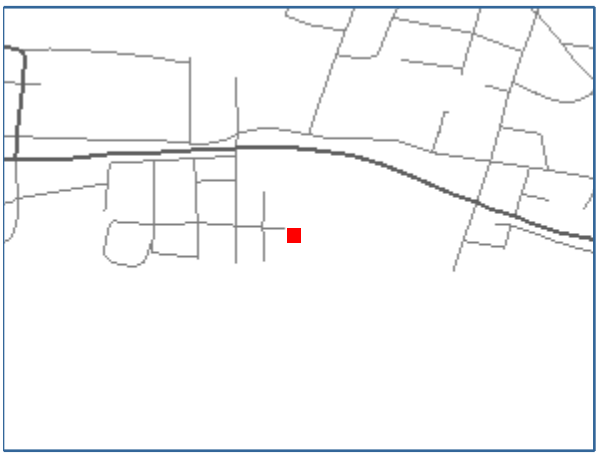
- The remedial action shall provide for management or disposal of dangerous wastes or hazardous wastes in a manner in compliance with regulations under Chapter 173-303-WAC. Wastes shall be designated and managed in compliance with the Site Work Plans. Hazardous waste manifests shall be used to track the transfer and disposal of hazardous wastes.

2. Local Health Department - Solid Waste Regulations (Contact: Gary Bickett, 360-397-8061)

- This project shall comply with Southwest Washington Health District provisions for acceptance of any soils to be disposed of at a landfill in the State of Washington, according to criteria developed for the specific Site.

Facility/Site: 4399598 HAMBLETON BROS LOG YARD

Also known as: HAMBLETON BROS LOG YARD, HAMBLETON LOG POND



Larger Map

Larger Map

Address

335 S A ST

WASHOUGAL WA 98671-2138

Decimal Coordinates

Latitude: 45.57889

Longitude: -122.37611

Geographic Information

Ecology Region: SWRO

County: Clark

Legislative District: 18

Congressional District: 3

WRIA: 28

Tribal Land: No

Ecology Interactions

Interaction Description	Ecology Program	Ecology Program Phone	Program ID	Start Date	End Date
State Cleanup Site	TOXICS	(360) 407-7224		10/15/2008	
General Permit Storm Water Ind	WATQUAL	(360) 407-6400	SO3002129	9/20/2002	

Report generated on 08-05-2009

Clark COUNTY

Site ID: 4399598 HAMBLETON BROS LOG YARD

LOCATION

Address: 335 S A ST
WASHOUGAL, 98671-2138

Lat/Long: 45.578 -122.376

Township/Range/Section: 1N 3E 13

(View Map)

Legislative District: 18

Congressional District: 3

STATUS

Ecology Status: Awaiting SHA

Independent Status:

Site Type:

Statute: MTCA only

WARM BIN#:

Brownfield: ☐ **Restrictive Covenant:** ☐ **PSI:** ☐

No Further Action (NFA):

Responsible Unit: SOUTHWEST

Site Manager: MATTHEWS, CRIS

Entered Date: 10/16/2008

Last Update Date: 10/16/2008

LUST ID:

ERTS ID:

NFA Date:

SITE ACTIVITIES

Activity	Status	Start Date	End Date	Legal Mechanism	Project Manager
Site Discovery/Report Received	Completed	10/15/2008	10/15/2008		MATTHEWS, CRIS
Early Notice Letter(s)	Completed	10/16/2008	10/16/2008		CROSS, KIM

AFFECTED MEDIA & CONTAMINANTS DATA

Media \ Contaminants:	3	5	7	8	11
Soil- C	C	C	C		
Groundwater- C	C				
Sediment- C	C			C	
Surface Water- C	C		C	C	C

CONTAMINANT KEY

#1 = Base/Neutral Organics
#2 = Halogenated Organics
#3 = Metals-Priority Pollutants
#4 = Metals-Other
#5 = PCB
#6 = Pesticides
#7 = Petroleum Products
#8 = Phenolic Compounds
#9 = Non-Halogenated Solvents
#10 = Dioxins
#11 = PAH
#12 = Reactive Wastes
#13 = Corrosive Wastes
#14 = Radioactive Wastes
#15 = Conventional Contaminants, Organic
#16 = Conventional Contaminants, Inorganic
#17 = Asbestos
#18 = Arsenic
#19 = MTBE
#20 = Unexploded Ordnance (UXO)
(21-24 Sediment only)
#21 = Tributyl Tin
#22 = Bioassay/Benthic Failures
#23 = Wood Debris
#24 = Other

PCB = PolyChlorinated BiPhenyls PAH = Polynuclear Aromatic Hydrocarbons MTBE = Methyl Tertiary-Butyl Ether

B = Below MTCA Cleanup Levels; C = Confirmed; R = Remediated; S = Suspected

Industrial Codes (External Links Below)

No NAICS information is available for this facility site.

SIC Code	SIC Description
2421	SAWMILLS & PLANNING MILLS, GEN
5031	LUMBER, PLYWOOD, AND MILLWORK

Report generated on 08-05-2009

COUNTY - CLARK (1 sites)

Site Name: HAMBLETON BROS LOG YARD

FS ID: 4399598

Address 335 S A ST
WASHOUGAL, WA 98671
(View Map) Lat: 45.57888 / Long: -122.37611

Rank ---
PSI ☐
VCP ☐
Brownfield ☐

Entered Date October 16, 2008
Last Update October 16, 2008
Resp. Unit Southwest
Ecology Status Awaiting SHA

ACTIVITY	STATUS	START	END	LEGAL
Site Discovery/Report Received	C	10/15/2008	10/15/2008	
Early Notice Letter(s)	C	10/16/2008	10/16/2008	

Media	Contaminant 3	5	7	8	11
Soil- C	C	C	C		
Groundwater- C	C				
Sediment- C	C			C	
Surface Water- C	C		C	C	C

*hover over boxes above for details

Report Statistics

Number of Counties.	1	Number of Brownfield Sites	0
Total Number of Resp. Units	1	Number of VCP Sites	0
Number of Regions	1	Number of Puget Sound Initiative Sites	0
Total Number of Sites	1	Number of Ranked Sites	0

COUNTY - CLARK (1 sites)

Site Name: COLUMBIA ROCK CONCRETE PRODUCTS INC

FS ID: 5016308

Address 1615 SE 6TH AVE
CAMAS, WA 98607

(View Map) Lat: 45.58388 / Long: -122.39166

Rank 2
PSI ☐
VCP ☐
Brownfield ☐

Entered Date April 26, 2004
Last Update February 7, 2008
Resp. Unit Southwest
Ecology Status Ranked, Awaiting RA

ACTIVITY	STATUS	START	END	LEGAL
Initial Investigation	C	9/11/2003	4/26/2004	
Early Notice Letter(s)	C	4/26/2004	4/26/2004	
Site Hazard Assessment	C	2/27/2006	1/4/2007	
Hazardous Sites Listing	C	1/4/2007	1/4/2007	

Media	Contaminant	
	3	7
Soil- C	S	C
Groundwater- C	C	S

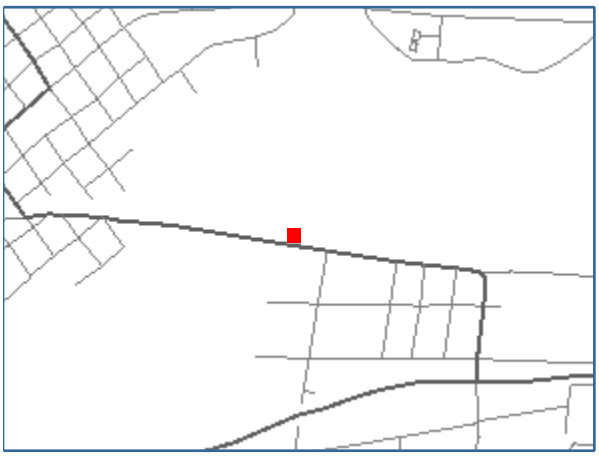
*hover over boxes above for details

Report Statistics

Number of Counties.	1	Number of Brownfield Sites	0
Total Number of Resp. Units	1	Number of VCP Sites	0
Number of Regions	1	Number of Puget Sound Initiative Sites	0
Total Number of Sites	1	Number of Ranked Sites	1

Facility/Site: 5016308 COLUMBIA ROCK CONCRETE PRODUCTS INC

Also known as: COLUMBIA ROCK CONCRETE PRODUCTS INC



Larger Map

Larger Map

Address

1615 SE 6TH AVE

CAMAS WA 98607

Decimal Coordinates

Latitude: 45.58389

Longitude: -122.39167

Geographic Information

Ecology Region: SWRO

County: Clark

Legislative District: 18

Congressional District: 3

WRIA: 28

Tribal Land: No

Ecology Interactions

Interaction Description	Ecology Program	Ecology Program Phone	Program ID	Start Date	End Date
State Cleanup Site	TOXICS	(360) 407-7224		9/11/2003	

Report generated on 08-05-2009

Clark COUNTY

Site ID: 5016308 COLUMBIA ROCK CONCRETE PRODUCTS INC

LOCATION

Address: 1615 SE 6TH AVE
CAMAS, 98607

Lat/Long: 45.583 -122.391
Township/Range/Section: 1N 3E 48
(View Map)

Legislative District: 18
Congressional District: 3

STATUS

Ecology Status: Ranked, Awaiting RA
Independent Status:
Site Type:
Statute: MTCA only
WARM BIN#: 2
Brownfield: ☐ **Restrictive Covenant:** ☐ **PSI:** ☐
No Further Action (NFA):

Responsible Unit: SOUTHWEST
Site Manager: SOUTHWEST REGION
Entered Date: 4/26/2004
Last Update Date: 2/7/2008
LUST ID:
ERTS ID:
NFA Date:

SITE ACTIVITIES

Activity	Status	Start Date	End Date	Legal Mechanism	Project Manager
Early Notice Letter(s)	Completed	4/26/2004	4/26/2004		CROSS, KIM
Initial Investigation	Completed	9/11/2003	4/26/2004		COUNTY HEALTH-SW
Site Hazard Assessment	Completed	2/27/2006	1/4/2007		LOCAL GOVERNMENT-SW
Hazardous Sites Listing	Completed	1/4/2007	1/4/2007		SOUTHWEST REGION

AFFECTED MEDIA & CONTAMINANTS DATA

Media \ Contaminants:	3	7
Soil- C	S	C
Groundwater- C	C	S

CONTAMINANT KEY

#1 = Base/Neutral Organics
#2 = Halogenated Organics
#3 = Metals-Priority Pollutants
#4 = Metals-Other
#5 = PCB
#6 = Pesticides
#7 = Petroleum Products
#8 = Phenolic Compounds
#9 = Non-Halogenated Solvents
#10 = Dioxins
#11 = PAH
#12 = Reactive Wastes
#13 = Corrosive Wastes
#14 = Radioactive Wastes
#15 = Conventional Contaminants, Organic
#16 = Conventional Contaminants, Inorganic
#17 = Asbestos
#18 = Arsenic
#19 = MTBE
#20 = Unexploded Ordnance (UXO)
(21-24 Sediment only)
#21 = Tributyl Tin
#22 = Bioassay/Benthic Failures
#23 = Wood Debris
#24 = Other

PCB = PolyChlorinated BiPhenyls PAH = Polynuclear Aromatic Hydrocarbons MTBE = Methyl Tertiary-Butyl Ether

B = Below MTCA Cleanup Levels; C = Confirmed; R = Remediated; S = Suspected

Industrial Codes (External Links Below)

No NAICS information is available for this facility site.

SIC Code	SIC Description
3272	CONCRETE PRODUCTS, NEC

Report generated on 08-05-2009

Facility/Site: HI WAY FUEL 22538744

Also known as:

Larger Map

Larger Map

Address

1250 E ST

WASHOUGAL WA 98671

Decimal Coordinates

Latitude: 45.58122

Longitude: -122.35839

Geographic Information

Ecology Region: SWRO

County: Clark

Legislative District: 18

Congressional District: 3

WRIA: 28

Tribal Land: No

Ecology Interactions

Interaction Description	Ecology Program	Ecology Program Phone	Program ID	Start Date	End Date
LUST Facility	TOXICS	(360) 407-7224	102163	8/21/1996	
Underground Storage Tank	TOXICS	(360) 407-7224	102163	6/1/1978	

Report generated on 08-05-2009

Southwest Region

Clark County, City of Washougal

	Facility Site ID:	UST ID:	Lat/Long:
HI-WAY FUEL 1250 E ST WASHOUGAL, 98671	22538744	102163	45.58122 -122.35839

Release ID: 377975

Media Affected:	Status:	Status Date:
Ground Water, Soil	Awaiting Cleanup	11/12/1996
	Cleanup Started	8/21/1996

About the Leaking Underground Storage Tanks Site List:

The Cleanup Status assigned by the Department of Ecology to a Leaking Underground Tank Site is based on an informal review of the information we have received regarding the cleanup. A formal review could determine that the site has not been cleaned up to Model Toxics Control Act standards. Formal reviews including potential No Further Action determinations are available under the fee-based Voluntary Cleanup Program.

Cleanup Status Definitions:

Awaiting Cleanup -- Discovered or reported release, yet no active cleanup measures taken; or,
Site check (identified the source) begun or completed, yet no active cleanup measures taken; or,
Site characterization begun or completed, yet no active cleanup measures taken.

Cleanup Started -- Responsible party has initiated physical, biological, or chemical management of release (e.g. soil excavated, groundwater pumped, vapors extracted, free product removed, oxygen added, etc.). Site investigations and emergency responses (e.g. venting explosive vapors, providing bottled water) do not qualify as activities under Cleanup Started.

Monitoring -- Groundwater monitoring is the only activity occurring at the site; or, Site has been characterized, only low levels of soil and/or groundwater contamination remain, and natural attenuation is the chosen cleanup method; or, Confirmational monitoring following active cleanup measures.

Reported Cleaned Up -- Owner or consultant reports that contamination has been cleaned up; and/or.
Some soil contamination may remain under existing structures or in otherwise inaccessible areas if groundwater is not threatened and there has been no migration of contamination into the structure; and,
Cleanup report has not been formally reviewed by Ecology. A formal review could determine that the site has not been cleaned up to MTCA standards.

No Further Action -- Cleanup report has been formally reviewed by Ecology under the fee-based Voluntary Cleanup Program and resulted in a No Further Action status; and, Institutional controls may have been required due to soil contamination that may remain under existing structures or in otherwise inaccessible areas.

TCP/TCP_web_reporting/LUSTList.rdl

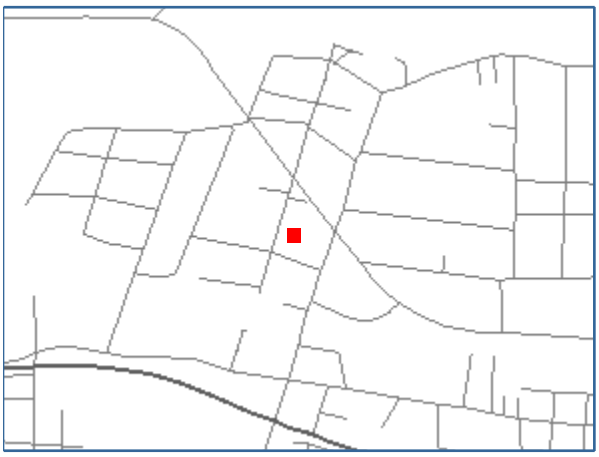
Industrial Codes (External Links Below)

No NAICS information is available for this facility site.	No SIC information is available for this facility site.

Report generated on 08-05-2009

Facility/Site: 85837922 GOODYEAR TIRE CAMAS

Also known as: GOODYEAR TIRE CAMAS, SCHUCKS AUTO SUPPLY



Larger Map

Larger Map

Address

3440 3RD AVE

CAMAS WA 98607

Decimal Coordinates

Latitude: 45.5838

Longitude: -122.36929

Geographic Information

Ecology Region: SWRO

County: Clark

Legislative District: 18

Congressional District: 3

WRIA: 28

Tribal Land: No

Ecology Interactions

Interaction Description	Ecology Program	Ecology Program Phone	Program ID	Start Date	End Date
Voluntary Cleanup Sites	TOXICS	(360) 407-7224		8/3/2001	9/6/2001
LUST Facility	TOXICS	(360) 407-7224	496977	5/27/1999	9/6/2001

Report generated on 08-05-2009

Clark COUNTY

Site ID: 85837922 GOODYEAR TIRE CAMAS

LOCATION

Address: 3440 3RD AVE
CAMAS, 98607

Lat/Long: 45.583 -122.369

Township/Range/Section: 1N 4E 53

(View Map)

Legislative District: 18

Congressional District: 3

STATUS

Ecology Status: RA and all other activities completed

Independent Status:

Site Type: VCP

Statute: MTCA only

WARM BIN#:

Brownfield: ☐ **Restrictive Covenant:** ☐ **PSI:** ☐

No Further Action (NFA): NFA after assessment, IRAP, or VCP

Responsible Unit: SOUTHWEST

Site Manager: SZYSZKOWSKI, MARCEL

Entered Date: 8/3/2001

Last Update Date: 3/7/2002

LUST ID: 496977

ERTS ID:

NFA Date: 9/4/2001

SITE ACTIVITIES

Activity	Status	Start Date	End Date	Legal Mechanism	Project Manager
Site Discovery/Report Received	Completed	5/1/1999	5/27/1999	Independent	SZYSZKOWSKI, MARCEL
Routine Cleanup	Completed	5/27/1999	9/13/1999	Independent	SZYSZKOWSKI, MARCEL
Voluntary Cleanup Program	Completed	8/3/2001	9/6/2001	Independent	SZYSZKOWSKI, MARCEL

AFFECTED MEDIA & CONTAMINANTS DATA

Media	Contaminants: 2	7
Soil- R	R	R

CONTAMINANT KEY

#1 = Base/Neutral Organics
#2 = Halogenated Organics
#3 = Metals-Priority Pollutants
#4 = Metals-Other
#5 = PCB
#6 = Pesticides
#7 = Petroleum Products
#8 = Phenolic Compounds
#9 = Non-Halogenated Solvents
#10 = Dioxins
#11 = PAH
#12 = Reactive Wastes
#13 = Corrosive Wastes
#14 = Radioactive Wastes
#15 = Conventional Contaminants, Organic
#16 = Conventional Contaminants, Inorganic
#17 = Asbestos
#18 = Arsenic
#19 = MTBE
#20 = Unexploded Ordnance (UXO)
(21-24 Sediment only)
#21 = Tributyl Tin
#22 = Bioassay/Benthic Failures
#23 = Wood Debris
#24 = Other

PCB = PolyChlorinated BiPhenyls PAH = Polynuclear Aromatic Hydrocarbons MTBE = Methyl Tertiary-Butyl Ether

B = Below MTCA Cleanup Levels; C = Confirmed; R = Remediated; S = Suspected

VOLUNTARY CLEANUP PROGRAM DETAILS

VCP#	Submitted	10-day PM	Project Status	Status Date
SW0350	8/3/2001	n/a	Project Completed	3/7/2002

Project Activity	Activity Status	Status Date	Decision Date	90-day PM
Final Cleanup Report	Completed Consultation	8/3/2001	9/4/2001	n/a

* PM = Performance Measure

Underground Storage Tank	TOXICS	(360) 407-7224	496977	5/10/1999	1/23/2007

Industrial Codes (External Links Below)

No NAICS information is available for this facility site.

SIC Code	SIC Description
5014	TIRES AND TUBES

Report generated on 08-05-2009

Appendix Q

Watershed Control Program

WATERSHED PROTECTION PROGRAM

The City of Camas Watershed consists of two watershed areas in the Washougal River Drainage System. Jones Creek and Boulder Creek have their own distinct watersheds that water is collected from for the City of Camas. Both watersheds are bordered by Department of Natural Resources property and Longview Fibre property. The City of Camas owns a total of 1,720 acres combined in these watersheds.

City personnel patrol a part of the watershed each time that they visit the screen chambers for cleaning. This occurs on Mondays and Fridays during most of the year. During the fall when the leaves are falling, daily visits are necessary. Patrolling of upstream areas of the watershed are done on an annual basis. If beaver dams are located, a trapper is notified to remove them from locations upstream from water intakes.

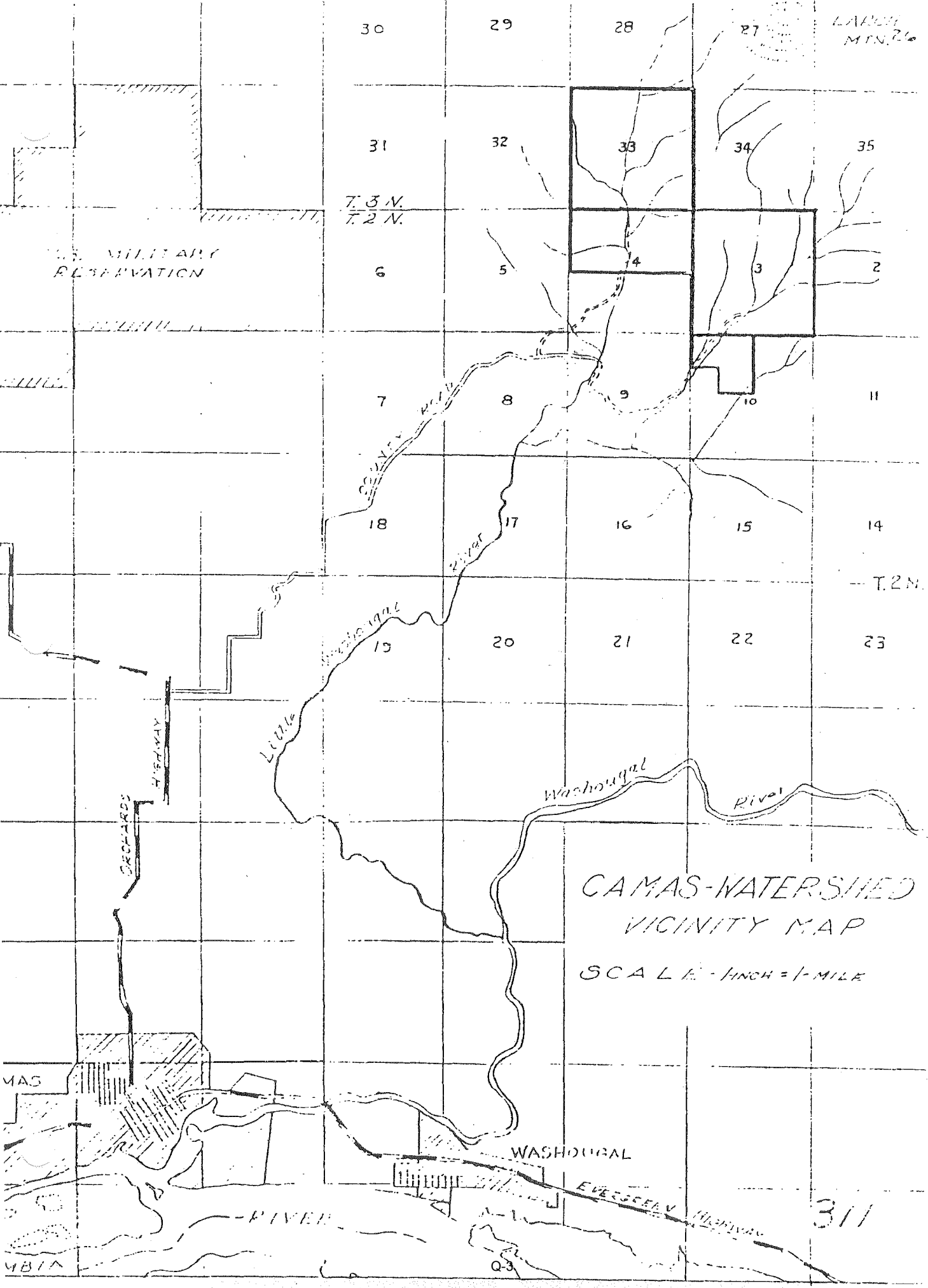
The City of Camas has agreements with all neighboring property to owners to notify city personnel of any activities anticipated in the watershed areas. Activities of concern include spraying, fertilizing, logging, road building, etc. We are fortunate that our neighboring property owners are interested in preserving the watershed and have thus far been very cooperative. In 1986, the DNR wanted to perform some fertilizing of a stand of timber in the watershed. With the help of the Department of Health, a sampling plan was established that would be required of them if they did the fertilizing. After a cost analysis was done, they determined that the gain would not equal the expense of the sampling program.

Near the Jones Creek Watershed is a recreational vehicle area that is patrolled by DNR personnel. The City of Camas and the DNR have cooperatively performed sign posting, gating and we are in the process of planning fencing of portions of the watershed to keep people and vehicles out. The City's service entrances are also gated and posted to keep people from entering. The City's goal is to prohibit all entrance into the watershed area. Chapter 13.56 of the Camas Municipal Code prohibits entry into the watershed and establishes a penalty for trespass.

The long term goal of the City of Camas is to purchase all of the property within the Jones and Boulder Creek watershed areas. This purchase was recently placed on the Capital Improvement Plan for the years 2010-2014.

The continued efforts to protect the water quality in the watershed can be summarized by the following:

-Review all activities in and around the watershed through SEPA checklist review process.
-Patrol watershed on regular basis.
-Coordinate efforts with DNR to maintain signs, gates, fences, etc.
-Maintain agreements with neighboring property owners.
-Purchase all property within the watersheds.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CAMAS MTN.
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T. 2 N.
U.S. MILITARY RESERVATION
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Little Washougal River
Washougal River
ORCHARDS
HIGHWAY
CAMAS-WATERSHED
VICINITY MAP
SCALE - INCH = 1-MILE
MAS
WASHOUGAL
RIVER
EVERGREEN HIGHWAY
Q-3
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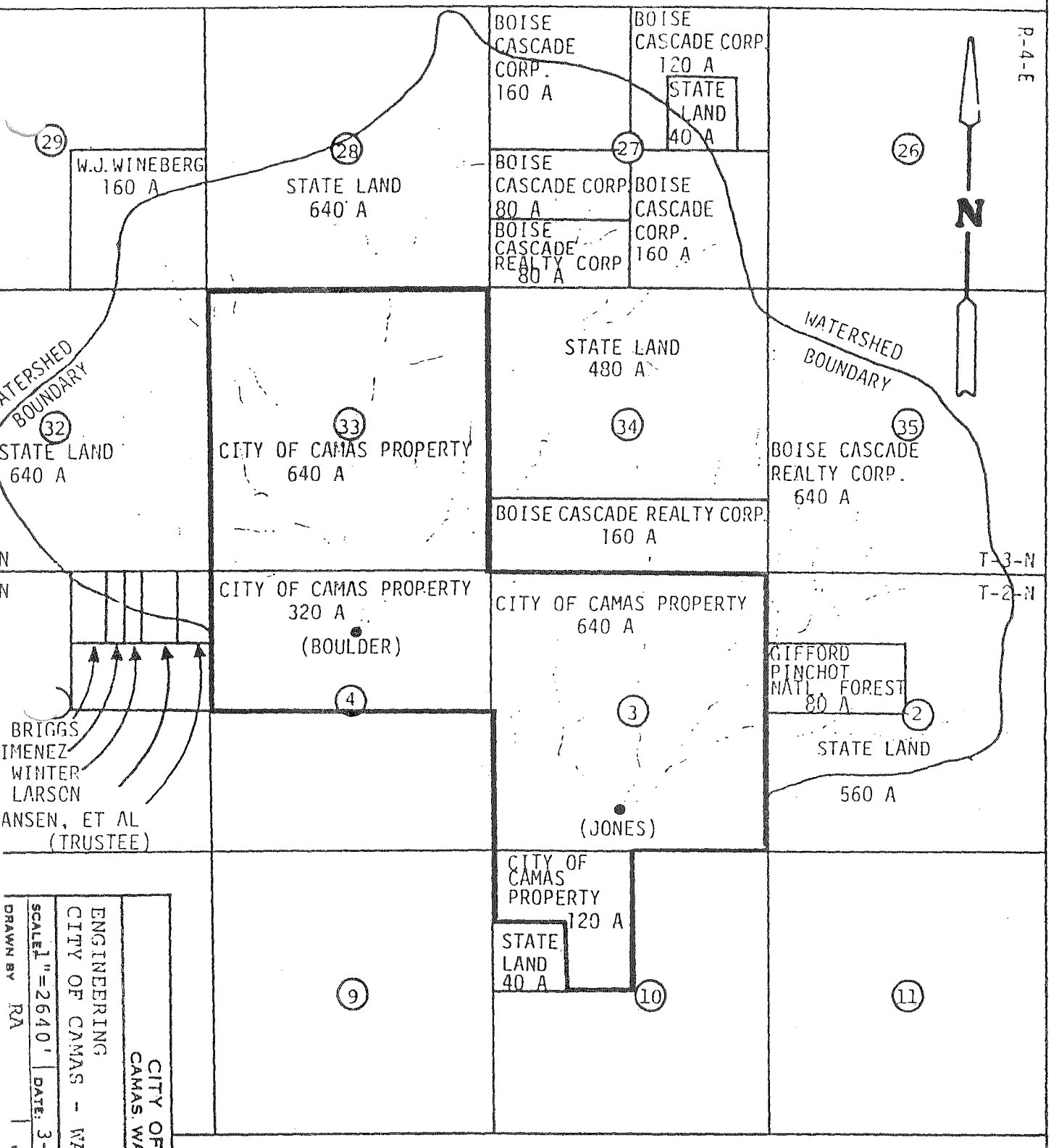


CITY OF CAMAS, WASHINGTON
BOULDER CREEK AND JONES CREEK WATERSHED

CITY OF CAMAS
IS A WATER PURVEYOR OF
A CLASS 1 SYSTEM

CITY OF CAMAS
CAMAS, WASHINGTON
DEPARTMENT
ENGINEERING
CITY OF CAMAS - WATERSHED
SCALE 1"=2640'
DATE: 3-11-83
SHEET 1
DRAWN BY RA
PROJECT NO

Appendix R

Consistency Statement

Washington State Department of Health

Local Government Consistency Review Checklist

A consistency review between DOH planning and engineering documents and adopted comprehensive plans and development regulations is required in certain situations. This checklist may be used to document the consistency review as required in WAC 246-290-108. A consistency review is required for each local government with jurisdiction over the applicable service area.

Water System Name: Camas Municipal Water & Sewer System PWS ID: 10800

Planning Document Title: Water System Plan Plan Date: June 2010

Local Government with Jurisdiction: City of Camas

Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
The applicable service area is consistent with the land use and zoning in the adopted comprehensive plan and adopted development regulations.	3-2, Figure 3-1	Yes
For Water System Plans: The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection was used, the alternative growth projection and methodology proposed is acceptable based on explanation given.	3-24, 3-25, 3-26	Yes
For Water System Plans: Provisions of water service for new service connections are consistent with the adopted comprehensive plan and adopted development regulations.	2-11	Yes
For city-owned systems only: All utility service extension ordinances regarding water service are included in the plan. These policies are consistent with the adopted comprehensive plan and adopted development regulations.		N/A
Other relevant elements related to water supply (as determined by DOH) is consistent with the adopted comprehensive plan and adopted development regulations.	Appendix P, Q Chapter 8	Yes
Where the local government with jurisdiction did not provide a Consistency Review: Provide documentation of efforts taken and amount of time provided. Include: name of contact, date, type of effort attempted, and response from local agency.		N/A

I certify that the above statements are true to the best of my knowledge and that these statements support the conclusion that the subject-planning document is consistent with adopted comprehensive plans, development regulations, and other policies.

Oliver Orjiako — 6-9-2010

Signature — Date

OLIVER ORJIAKO, DIRECTOR, CLARK COUNTY COMMUNITY PLANNING

Printed Name, Title, & Jurisdiction

****For any issues of inconsistency, please document the inconsistency, including the citation from the comprehensive plan or development regulation. Provide direction on how this inconsistency can be resolved.****

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: Camas Municipal Water & Sewer System PWS ID: 10800

Planning/Engineering Document Title: Draft Water System Plan Plan Date: January 2010

Local Government with Jurisdiction: City of Camas

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	Figures 3-1, 3-1A	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	3-10, 3-24 through 3-26	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	2-10, 2-11	Yes
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	2-11	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	Chapter 8, Appendices P, Q	Yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature 6-3-10
Date

Phillip Bourquin, Community Development Director, City of Camas
Printed Name, Title, & Jurisdiction

Consistency Review Guidance

For Use by Local Governments and Municipal Water Suppliers

This checklist may be used to meet the requirements of WAC 246-290-108. When using an alternative format, it must describe all of the elements; 1a), b), c), d), and e), when they apply.

For **water system plans (WSP)**, a consistency review is required for the retail service area and any additional areas where a municipal water supplier wants to expand its water right's place of use.

For **small water system management programs**, a consistency review is only required for areas where a municipal water supplier wants to expand its water right's place of use. If no water right place of use expansion is requested, a consistency review is not required.

For **engineering documents**, a consistency review is required for areas where a municipal water supplier wants to expand its water right's place of use (water system plan amendment is required). For non-community water systems, a consistency review is required when requesting a place of use expansion. All engineering documents must be submitted with a service area map per WAC 246-290-110(4)(b)(ii).

A) Documenting Consistency: Municipal water suppliers must document all of the elements in a consistency review per WAC 246-290-108.

1 a) Provide a copy of the adopted **land use/zoning** map corresponding to the service area. The uses provided in the WSP should be consistent with the adopted land use/zoning map. Include any other portions of comprehensive plans or development regulations that are related to water supply planning.

1 b) Include a copy of the **six-year growth projections** that corresponds to the service area. If the local population growth rate projections are not used, provide a detailed explanation on why the chosen projections more accurately describe the expected growth rate. Explain how it is consistent with the adopted land use.

1c) Include water service area policies and show that they are consistent with the **utility service extension ordinances** within the city or town boundaries. This applies to cities and towns only.

1 d) Include all **service area policies** for how new water service will be provided to new customers.

1 e) **Other relevant elements** related to water supply planning as determined by the department (DOH). See Local Government Consistency – Other Relevant Elements, Policy B.07, September 2009.

B) Documenting an Inconsistency: Please document the inconsistency, include the citation from the comprehensive plan or development regulation, and provide direction on how this inconsistency can be resolved.

C) Documenting Lack of Consistency Review by Local Government: Where the local government with jurisdiction did not provide a consistency review, document efforts made and the amount of time provided to the local government for their review. Please include: name of contact, date, and efforts made (letters, phone calls, and e-mails). In order to self-certify, please contact the DOH Planner.

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Appendix S

Detailed Cost Estimates

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-2
Forest Home Booster Station Upgrade

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 20,400	$ 20,400
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 20,000	$ 20,000
4	CMU Building	500 SF	$ 200	$ 100,000
5	Piping and Appurtanences	1 EA	$ 50,000	$ 50,000
6	Booster Pumps	2 EA	$ 15,000	$ 30,000
7	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 45,000	$ 45,000
8	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$ 274,900
Tax rate (8.2%)	22,542
Subtotal:	$ 297,442
Contingency (25%)	$ 74,358
Total Estimated Construction Cost:	**$ 371,800**
Engineering and AdministrativeCosts (25%):	$ 93,000
Total Estimated Project Cost:	**$ 464,800**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY

PROJECT TYPE: Transmission System Improvement

PROJECT NUMBER: T-2 **ESTIMATED COST:** $ 464,800

PRESSURE ZONE: 455 **YEAR TO BE COMPLETED:** 2012

PROJECT DESCRIPTION:

Forest Home Booster Station Upgrade

Upgrade from 1,000 gpm to 2,500 gpm. Includes a new building, 2 pumps, and auxillary generator

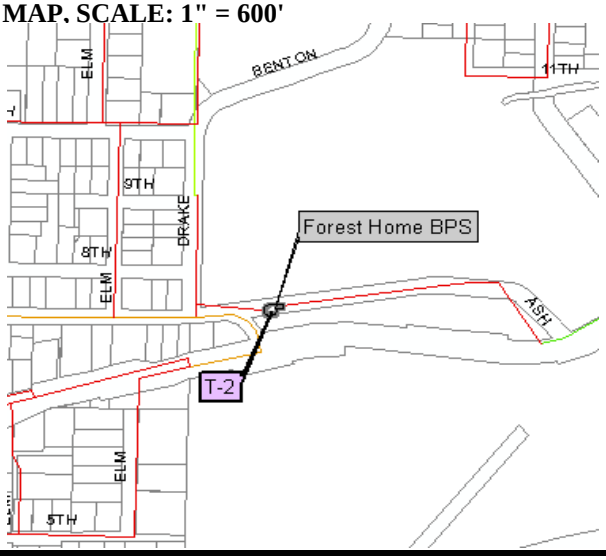
PROJECT BENEFIT:

To meet 6-year demands in the 455 Zone

COMMENTS:

Interium project as the Cemetery Reservoir and Booster Station are being constructed.

MAP, SCALE: 1" = 600'



SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering		93,000				
Construction		107,000	264,800			
Construction Management, Administration						
TOTAL	0	200,000	264,800	0	0	0

FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-3
Forest Home Transmission Upgrade

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 16,000	$ 16,000
2	12-inch D.I. Water Pipe, Including Fittings	1,400 LF	$ 75	$ 105,000
3	Locate Existing Utilities	LUMP SUM	$ 4,000	$ 4,000
4	Erosion Control	LUMP SUM	$ 4,000	$ 4,000
5	Additional Pipe Fittings	1,150 LB	$ 2.50	$ 2,900
6	Trench Safety Systems	LUMP SUM	$ 2,800	$ 2,800
7	12-inch Gate Valves	2 EA	$ 2,250	$ 5,300
8	Fire Hydrants	4 EA	$ 4,000	$ 14,000
9	Gravel Backfill	1,312 TN	$ 15	$ 19,700
10	Foundation Gravel	148 TN	$ 35	$ 5,200
11	Asphalt Concrete Pavement Repair	109 TN	$ 80	$ 8,800
12	Crushed Surfacing, Top Course	100 TN	$ 25	$ 2,600
13	Cold Mix Asphalt	74 TN	$ 150	$ 11,100
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 7,000	$ 7,000
	Subtotal			$ 211,400
	Tax rate (8.2%)			17,335
	Subtotal:			$ 228,735
	Contingency (25%)			$ 57,265
	Total Estimated Construction Cost			**$ 286,000**
	Engineering and Administrative Costs (25%):			$ 72,000
	Total Estimated Project Cost			**$ 358,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY

PROJECT TYPE: Transmission System Improvement

PROJECT NUMBER: T-3 **ESTIMATED COST:** $ 358,000

PRESSURE ZONE: 343 and 455 **YEAR TO BE COMPLETED:** 2012

PROJECT DESCRIPTION:

Forest Home Transmission Upgrade

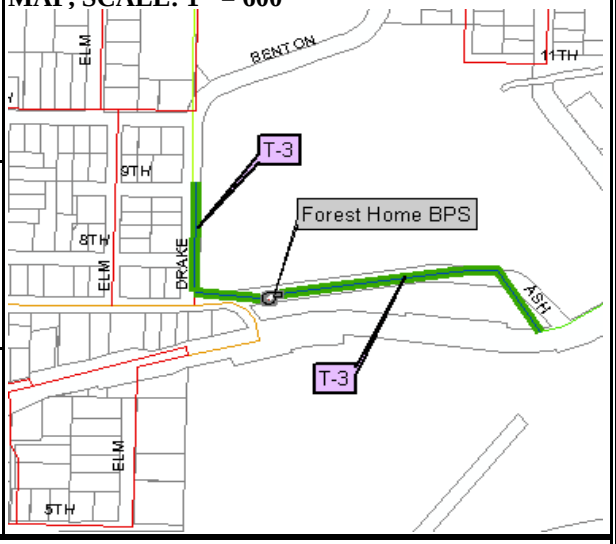
Replace approximately 1,400 LF of 6-inch pipe with 12-inch DI

PROJECT BENEFIT:

Increase transmission from the Washougal Wellfield to meet demands in the 455 Zone.

COMMENTS:

MAP, SCALE: 1" = 600'



SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering		72,000				
Construction		78,000	208,000			
Construction Management, Administration						
TOTAL	0	150,000	208,000	0	0	0

FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-4
Crown Road 24-inch Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 131,000	$ 131,000
2	24-inch D.I. Water Pipe, Including Fittings	7,800 LF	$ 110	$ 858,000
3	Locate Existing Utilities	LUMP SUM	$ 31,300	$ 31,300
4	Erosion Control	LUMP SUM	$ 31,300	$ 31,300
5	Additional Pipe Fittings	5,460 LB	$ 2.50	$ 13,650
6	Trench Safety Systems	LUMP SUM	$ 15,600	$ 15,600
7	24-inch Butterfly Valves	13 EA	$ 27,500	$ 357,500
8	Fire Hydrants	20 EA	$ 4,000	$ 78,000
9	Gravel Backfill	6,356 TN	$ 15	$ 95,400
10	Foundation Gravel	715 TN	$ 35	$ 25,100
11	Asphalt Concrete Pavement Repair	530 TN	$ 80	$ 42,400
12	Crushed Surfacing, Top Course	486 TN	$ 25	$ 12,200
13	Cold Mix Asphalt	358 TN	$ 150	$ 53,700
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 10,000	$ 10,000
	Subtotal			$ 1,758,150
	Tax rate (8.2%)			144,168
	Subtotal:			$ 1,902,318
	Contingency (25%)			$ 475,682
	Total Estimated Construction Cost:			**$ 2,378,000**
	Engineering and Administrative Costs (25%):			$ 595,000
	Total Estimated Project Cost:			**$ 2,973,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY

PROJECT TYPE: Transmission System Improvement

PROJECT NUMBER: T-4 **ESTIMATED COST:** $ 2,973,000

PRESSURE ZONE: 343 and 542 **YEAR TO BE COMPLETED:** 2012

PROJECT DESCRIPTION:

Crown Road 24-inch Transmission Main

Install approximately 7,800 LF of DI main on the suction and discharge of the Crown Rd Booster Station to connect the 343 Zone to the 542 Zone.

PROJECT BENEFIT:

Increase transmission from the Washougal Wellfield to supply growth in the 542 Zone and NUGA.

COMMENTS:

Dependant on the rate of growth in the NUGA and 542 Zone.

MAP, SCALE: 1" = 3000'

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering		595,000				
Construction		405,000	1,973,000			
Construction Management, Administration						
TOTAL	0	1,000,000	1,973,000	0	0	0

FUNDING SOURCE:

Developers: equivalent of an 8-inch main, approximately $1,465,000. Capital Fund: the remaining portion of the upgrade to 24-inch, approximately $1,508,000

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-5
Crown Road Booster Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 31,200	$ 31,200
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 25,000	$ 25,000
4	CMU Building	500 SF	$ 200	$ 100,000
5	Piping and Appurtanences	1 EA	$ 50,000	$ 50,000
6	Booster Pumps	4 EA	$ 15,000	$ 60,000
7	Auxilary Power Generator	LUMP SUM	$ 50,000	$ 50,000
8	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 95,000	$ 95,000
9	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$	420,700
Tax rate (8.2%)		34,497
Subtotal:	$	456,000
Contingency (25%)	$	114,000
Total Estimated Construction Cost:	**$**	**570,000**
Engineering and AdministrativeCosts (25%):	$	143,000
Total Estimated Project Cost:	**$**	**713,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY

PROJECT TYPE: Transmission System Improvement

PROJECT NUMBER: T-5 **ESTIMATED COST:** $ 713,000

PRESSURE ZONE: 542 **YEAR TO BE COMPLETED:** 2012

PROJECT DESCRIPTION:

Crown Road Booster Station

3,200 gpm booster station, includes new building, 4 pumps, and auxillary power generator

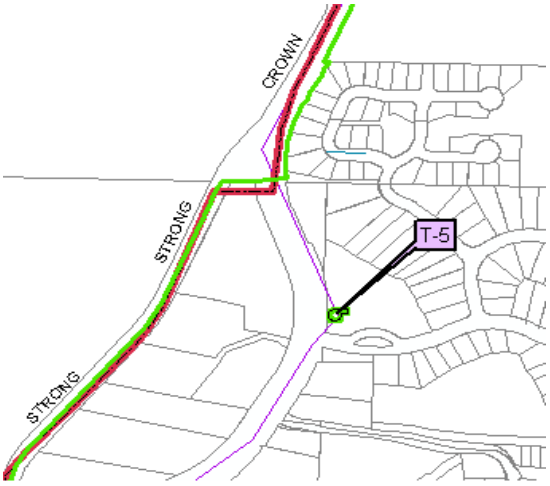
PROJECT BENEFIT:

Increase transmission from Washougal Wellfield to meet growth in the 542 Zone and NUGA.

COMMENTS:

Developers will pay for 70 percent of this project,

MAP, SCALE: 1" = 600'



SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering		143,000				
Construction		157,000	413,000			
Construction Management, Administration						
TOTAL	0	300,000	413,000	0	0	0

FUNDING SOURCE:

Developers: 70 percent, approximately $500,000. Capital Fund: remaining portion of project cost, approximately $213,000.

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-7
NUGA 544 Zone - 24 inch Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 150,000	$ 150,000
2	24-inch D.I. Water Pipe, Including Fittings	19,650 LF	$ 110	$ 2,161,500
3	Locate Existing Utilities	LUMP SUM	$ 20,000	$ 20,000
4	Erosion Control	LUMP SUM	$ 20,000	$ 20,000
5	Additional Pipe Fittings	13,760 LB	$ 3.50	$ 48,160
6	Trench Safety Systems	LUMP SUM	$ 39,300	$ 39,300
7	24-inch Butterfly Valves	33 EA	$ 27,500	$ 907,500
8	Fire Hydrants	50 EA	$ 4,000	$ 200,000
9	Gravel Backfill	16,011 TN	$ 15	$ 240,167
10	Foundation Gravel	1,801 TN	$ 35	$ 63,044
11	Asphalt Concrete Pavement Repair	1,334 TN	$ 80	$ 106,741
12	Crushed Surfacing, Top Course	1,225 TN	$ 25	$ 30,621
13	Cold Mix Asphalt	901 TN	$ 150	$ 135,094
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 4,165,126
	Tax rate (8.2%)			341,540
	Subtotal:			$ 4,506,667
	Contingency (25%)			$ 1,126,333
	Total Estimated Construction Cost			**$ 5,633,000**
	Engineering and Administrative Costs (25%):			$ 1,408,000
	Total Estimated Project Cost			**$ 7,041,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-8
Transmission from Cemetery Reservoir to 290 Zone

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 23,000	$ 23,000
2	12-inch D.I. Water Pipe, Including Fittings	2,300 LF	$ 75	$ 172,500
3	Locate Existing Utilities	LUMP SUM	$ 6,000	$ 6,000
4	Erosion Control	LUMP SUM	$ 6,000	$ 6,000
5	Additional Pipe Fittings	1,150 LB	$ 2.50	$ 2,900
6	Trench Safety Systems	LUMP SUM	$ 4,600	$ 4,600
7	12-inch Gate Valves	4 EA	$ 2,250	$ 8,700
8	Fire Hydrants	6 EA	$ 4,000	$ 23,000
9	Gravel Backfill	1,312 TN	$ 15	$ 19,700
10	Foundation Gravel	148 TN	$ 35	$ 5,200
11	Asphalt Concrete Pavement Repair	109 TN	$ 80	$ 8,800
12	Crushed Surfacing, Top Course	100 TN	$ 25	$ 2,600
13	Cold Mix Asphalt	74 TN	$ 150	$ 11,100
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 7,000	$ 7,000
	Subtotal			$ 304,100
	Tax rate (8.2%)			24,936
	Subtotal:			$ 329,036
	Contingency (25%)			$ 81,964
	Total Estimated Construction Cost:			**$ 411,000**
	Engineering and Administrative Costs (25%):			$ 103,000
	Total Estimated Project Cost:			**$ 514,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-9
Cemetery Booster Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 34,400	$ 34,400
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 25,000	$ 25,000
4	CMU Building	500 SF	$ 200	$ 100,000
5	Piping and Appurtanences	1 EA	$ 50,000	$ 50,000
6	Booster Pumps	4 EA	$ 25,000	$ 100,000
7	Auxilary Power Generator	LUMP SUM	$ 50,000	$ 50,000
8	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 95,000	$ 95,000
9	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$ 463,900
Tax rate (8.2%)	38,040
Subtotal:	$ 501,940
Contingency (25%)	$ 125,460
Total Estimated Construction Cost:	**$ 627,400**
Engineering and AdministrativeCosts (25%):	$ 156,850
Total Estimated Project Cost:	**$ 784,250**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-10
Transmission from Cemetery BS to 455 Zone

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 56,000	$ 56,000
2	16-inch D.I. Water Pipe, Including Fittings	4,200 LF	$ 100	$ 420,000
3	Locate Existing Utilities	LUMP SUM	$ 20,000	$ 20,000
4	Erosion Control	LUMP SUM	$ 20,000	$ 20,000
5	Additional Pipe Fittings	2,520 LB	$ 2.50	$ 6,300
6	Trench Safety Systems	LUMP SUM	$ 8,400	$ 8,400
7	16-inch Butterfly Valves	7 EA	$ 10,000	$ 70,000
8	Fire Hydrants	11 EA	$ 4,000	$ 42,000
9	Gravel Backfill	2,738 TN	$ 15	$ 41,067
10	Foundation Gravel	308 TN	$ 35	$ 10,780
11	Asphalt Concrete Pavement Repair	228 TN	$ 80	$ 18,252
12	Crushed Surfacing, Top Course	209 TN	$ 25	$ 5,236
13	Cold Mix Asphalt	154 TN	$ 150	$ 23,100
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 10,000	$ 10,000
	Subtotal			$ 754,135
	Tax rate (8.2%)			61,839
	Subtotal:			$ 815,974
	Contingency (25%)			$ 204,026
	Total Estimated Construction Cost:			**$ 1,020,000**
	Engineering and Administrative Costs (25%):			$ 255,000
	Total Estimated Project Cost:			**$ 1,275,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-12
Lower Prune Hill Booster Station Upgrade

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 21,200	$ 21,200
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 25,000	$ 25,000
4	CMU Building	500 SF	$ 200	$ 100,000
4	Piping and Appurtanences	1 EA	$ 50,000	$ 50,000
5	Booster Pump	2 EA	$ 15,000	$ 30,000
6	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 50,000	$ 50,000
7	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$	285,700
Tax rate (8.2%)		23,427
Subtotal:	$	309,127
Contingency (25%)	$	77,273
Total Estimated Construction Cost:	**$**	**386,400**
Engineering and AdministrativeCosts (25%):	$	96,600
Total Estimated Project Cost:	**$**	**483,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-13
Lacamas Booster Station Upgrade

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 7,700	$ 7,700
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 17,000	$ 17,000
4	Piping and Appurtanences	1 EA	$ 10,000	$ 10,000
5	Booster Pump	1 EA	$ 15,000	$ 15,000
6	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 45,000	$ 45,000
7	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$	104,200
Tax rate (8.2%)		8,544
Subtotal:	$	112,744
Contingency (25%)	$	28,156
Total Estimated Construction Cost	**$**	**140,900**
Engineering and AdministrativeCosts (25%):	$	35,225
Total Estimated Project Cost	**$**	**177,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-14
20-inch Suction Side Transmission to Lacamas Booster Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 76,000	$ 76,000
2	20-inch D.I. Water Pipe, Including Fittings	5,000 LF	$ 105	$ 525,000
3	Locate Existing Utilities	LUMP SUM	$ 20,000	$ 20,000
4	Erosion Control	LUMP SUM	$ 20,000	$ 20,000
5	Additional Pipe Fittings	3,250 LB	$ 3.50	$ 11,400
6	Trench Safety Systems	LUMP SUM	$ 10,000	$ 10,000
7	20-inch Butterfly Valves	8 EA	$ 20,000	$ 166,700
8	Fire Hydrants	13 EA	$ 4,000	$ 50,000
9	Gravel Backfill	3,667 TN	$ 15	$ 55,000
10	Foundation Gravel	413 TN	$ 35	$ 14,500
11	Asphalt Concrete Pavement Repair	306 TN	$ 80	$ 24,500
12	Crushed Surfacing, Top Course	281 TN	$ 25	$ 7,100
13	Cold Mix Asphalt	206 TN	$ 150	$ 31,000
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 10,000	$ 10,000
	Subtotal			$ 1,024,200
	Tax rate (8.2%)			83,984
	Subtotal:			$ 1,108,184
	Contingency (25%)			$ 276,816
	Total Estimated Construction Cost			**$ 1,385,000**
	Engineering and Administrative Costs (25%):			$ 346,000
	Total Estimated Project Cost			**$ 1,731,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-15
Replace 14-inch Steel Transmission from Butler Site to 455 Zone

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 69,000	$ 69,000
2	14-inch D.I. Water Pipe, Including Fittings	6,000 LF	$ 85	$ 510,000
3	Locate Existing Utilities	LUMP SUM	$ 16,500	$ 16,500
4	Erosion Control	LUMP SUM	$ 16,500	$ 16,500
5	Additional Pipe Fittings	3,300 LB	$ 3.50	$ 11,600
6	Trench Safety Systems	LUMP SUM	$ 12,000	$ 12,000
7	14-inch Butterfly Valves	10 EA	$ 6,500	$ 65,000
8	Fire Hydrants	15 EA	$ 4,000	$ 60,000
9	Gravel Backfill	3,911 TN	$ 15	$ 58,700
10	Foundation Gravel	440 TN	$ 35	$ 15,400
11	Asphalt Concrete Pavement Repair	326 TN	$ 80	$ 26,100
12	Crushed Surfacing, Top Course	299 TN	$ 25	$ 7,500
13	Cold Mix Asphalt	220 TN	$ 150	$ 33,000
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 20,000	$ 20,000
	Subtotal			$ 924,300
	Tax rate (8.2%)			75,793
	Subtotal:			$ 1,000,093
	Contingency (25%)			$ 249,907
	Total Estimated Construction Cost			**$ 1,250,000**
	Engineering and Administrative Costs (25%):			$ 313,000
	Total Estimated Project Cost			**$ 1,563,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-16
Crown Road Booster Station Upgrade

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 3,500	$ 3,500
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 2,000	$ 2,000
4	Piping and Appurtanences	1 EA	$ 5,000	$ 5,000
5	Booster Pump	2 EA	$ 15,000	$ 30,000
6	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 4,000	$ 4,000

Subtotal	$	47,500
Tax rate (8.2%)		3,895
Subtotal:	$	51,395
Contingency (25%)	$	12,805
Total Estimated Construction Cost:	**$**	**64,200**
Engineering and AdministrativeCosts (25%):	$	16,050
Total Estimated Project Cost:	**$**	**80,250**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-17
12-inch along Polk Street for Well 16 transmission

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 23,000	$ 23,000
2	12-inch D.I. Water Pipe, Including Fittings	2,300 LF	$ 75	$ 172,500
3	Locate Existing Utilities	LUMP SUM	$ 6,000	$ 6,000
4	Erosion Control	LUMP SUM	$ 6,000	$ 6,000
5	Additional Pipe Fittings	1,150 LB	$ 2.50	$ 2,900
6	Trench Safety Systems	LUMP SUM	$ 4,600	$ 4,600
7	12-inch Gate Valves	4 EA	$ 2,250	$ 8,700
8	Fire Hydrants	6 EA	$ 4,000	$ 23,000
9	Gravel Backfill	1,312 TN	$ 15	$ 19,700
10	Foundation Gravel	148 TN	$ 35	$ 5,200
11	Asphalt Concrete Pavement Repair	109 TN	$ 80	$ 8,800
12	Crushed Surfacing, Top Course	100 TN	$ 25	$ 2,600
13	Cold Mix Asphalt	74 TN	$ 150	$ 11,100
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 7,000	$ 7,000
	Subtotal			$ 304,100
	Tax rate (8.2%)			24,936
	Subtotal:			$ 329,036
	Contingency (25%)			$ 81,964
	Total Estimated Construction Cost			**$ 411,000**
	Engineering and Administrative Costs (25%):			$ 103,000
	Total Estimated Project Cost			**$ 514,000**

City of Camas
Preliminary Project Cost Estimate
Transmission and Booster Station Improvement T-18
Jones and Boulder Creek Transmisssion Improvements

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 306,000	$ 306,000
2	10-inch D.I. Water Pipe, Including Fittings	48,000 LF	$ 60	$ 2,880,000
3	Locate Existing Utilities	LUMP SUM	$ 74,000	$ 74,000
4	Erosion Control	LUMP SUM	$ 74,000	$ 74,000
5	Additional Pipe Fittings	22,560 LB	$ 2.50	$ 56,400
6	Trench Safety Systems	LUMP SUM	$ 96,000	$ 96,000
7	10-inch Gate Valves	80 EA	$ 1,800	$ 144,000
8	Gravel Backfill	23,467 TN	$ 15	$ 352,000
9	Foundation Gravel	2,640 TN	$ 35	$ 92,400
10	Crushed Surfacing, Top Course	1,795 TN	$ 25	$ 44,900
11	Connections to Existing System	2 EA	$ 1,500	$ 3,000
12	Traffic Control	LUMP SUM	$ 2,000	$ 2,000
	Subtotal			$ 4,124,700
	Tax rate (8.2%)			338,225
	Subtotal:			$ 4,462,925
	Contingency (25%)			$ 1,116,075
	Total Estimated Construction Cost:			**$ 5,579,000**
	Engineering and Administrative Costs (25%):			$ 1,395,000
	Total Estimated Project Cost:			**$ 6,974,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-1
15,600 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 151,000	$ 151,000
2	12-inch D.I. Water Pipe, Including Fittings	15,600 LF	$ 75	$ 1,170,000
3	Locate Existing Utilities	LUMP SUM	$ 37,000	$ 37,000
4	Erosion Control	LUMP SUM	$ 37,000	$ 37,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	26 EA	$ 2,250	$ 58,500
8	Fire Hydrants	39 EA	$ 4,000	$ 156,000
9	Gravel Backfill	8,898 TN	$ 15	$ 133,467
10	Foundation Gravel	1,001 TN	$ 35	$ 35,035
11	Asphalt Concrete Pavement Repair	741 TN	$ 80	$ 59,319
12	Crushed Surfacing, Top Course	681 TN	$ 25	$ 17,017
13	Cold Mix Asphalt	501 TN	$ 150	$ 75,075
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 2,030,912
	Tax rate (8.2%)			166,535
	Subtotal:			$ 2,197,447
	Contingency (25%)			$ 549,553
	Total Estimated Construction Cost			**$ 2,747,000**
	Engineering and Administrative Costs (25%):			$ 687,000
	Total Estimated Project Cost			**$ 3,434,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-2
5,300 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 57,000	$ 57,000
2	12-inch D.I. Water Pipe, Including Fittings	5,300 LF	$ 75	$ 397,500
3	Locate Existing Utilities	LUMP SUM	$ 14,000	$ 14,000
4	Erosion Control	LUMP SUM	$ 14,000	$ 14,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	9 EA	$ 2,250	$ 19,875
8	Fire Hydrants	13 EA	$ 4,000	$ 53,000
9	Gravel Backfill	3,023 TN	$ 15	$ 45,344
10	Foundation Gravel	340 TN	$ 35	$ 11,903
11	Asphalt Concrete Pavement Repair	252 TN	$ 80	$ 20,153
12	Crushed Surfacing, Top Course	231 TN	$ 25	$ 5,781
13	Cold Mix Asphalt	170 TN	$ 150	$ 25,506
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 765,563
	Tax rate (8.2%)			62,776
	Subtotal:			$ 828,339
	Contingency (25%)			$ 206,661
	Total Estimated Construction Cost			**$ 1,035,000**
	Engineering and Administrative Costs (25%):			$ 259,000
	Total Estimated Project Cost			**$ 1,294,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-3
1,900 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 26,000	$ 26,000
2	12-inch D.I. Water Pipe, Including Fittings	1,900 LF	$ 75	$ 142,500
3	Locate Existing Utilities	LUMP SUM	$ 7,000	$ 7,000
4	Erosion Control	LUMP SUM	$ 7,000	$ 7,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	3 EA	$ 2,250	$ 7,125
8	Fire Hydrants	5 EA	$ 4,000	$ 19,000
9	Gravel Backfill	1,084 TN	$ 15	$ 16,256
10	Foundation Gravel	122 TN	$ 35	$ 4,267
11	Asphalt Concrete Pavement Repair	90 TN	$ 80	$ 7,225
12	Crushed Surfacing, Top Course	83 TN	$ 25	$ 2,073
13	Cold Mix Asphalt	61 TN	$ 150	$ 9,144
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 349,089
	Tax rate (8.2%)			28,625
	Subtotal:			$ 377,714
	Contingency (25%)			$ 94,286
	Total Estimated Construction Cost			**$ 472,000**
	Engineering and Administrative Costs (25%):			$ 118,000
	Total Estimated Project Cost			**$ 590,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-4
11,200 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 111,000	$ 111,000
2	12-inch D.I. Water Pipe, Including Fittings	11,200 LF	$ 75	$ 840,000
3	Locate Existing Utilities	LUMP SUM	$ 27,000	$ 27,000
4	Erosion Control	LUMP SUM	$ 27,000	$ 27,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	19 EA	$ 2,250	$ 42,000
8	Fire Hydrants	28 EA	$ 4,000	$ 112,000
9	Gravel Backfill	6,388 TN	$ 15	$ 95,822
10	Foundation Gravel	719 TN	$ 35	$ 25,153
11	Asphalt Concrete Pavement Repair	532 TN	$ 80	$ 42,588
12	Crushed Surfacing, Top Course	489 TN	$ 25	$ 12,217
13	Cold Mix Asphalt	359 TN	$ 150	$ 53,900
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 1,490,181
	Tax rate (8.2%)			122,195
	Subtotal:			$ 1,612,375
	Contingency (25%)			$ 402,625
	Total Estimated Construction Cost			**$ 2,015,000**
	Engineering and Administrative Costs (25%):			$ 504,000
	Total Estimated Project Cost			**$ 2,519,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-5
2,600 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 33,000	$ 33,000
2	12-inch D.I. Water Pipe, Including Fittings	2,600 LF	$ 75	$ 195,000
3	Locate Existing Utilities	LUMP SUM	$ 8,000	$ 8,000
4	Erosion Control	LUMP SUM	$ 8,000	$ 8,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	4 EA	$ 2,250	$ 9,750
8	Fire Hydrants	7 EA	$ 4,000	$ 26,000
9	Gravel Backfill	1,483 TN	$ 15	$ 22,244
10	Foundation Gravel	167 TN	$ 35	$ 5,839
11	Asphalt Concrete Pavement Repair	124 TN	$ 80	$ 9,886
12	Crushed Surfacing, Top Course	113 TN	$ 25	$ 2,836
13	Cold Mix Asphalt	83 TN	$ 150	$ 12,513
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 434,569
	Tax rate (8.2%)			35,635
	Subtotal:			$ 470,203
	Contingency (25%)			$ 117,797
	Total Estimated Construction Cost			**$ 588,000**
	Engineering and Administrative Costs (25%):			$ 147,000
	Total Estimated Project Cost			**$ 735,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-6
7,900 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 81,000	$ 81,000
2	12-inch D.I. Water Pipe, Including Fittings	7,900 LF	$ 75	$ 592,500
3	Locate Existing Utilities	LUMP SUM	$ 20,000	$ 20,000
4	Erosion Control	LUMP SUM	$ 20,000	$ 20,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	13 EA	$ 2,250	$ 29,625
8	Fire Hydrants	20 EA	$ 4,000	$ 79,000
9	Gravel Backfill	4,506 TN	$ 15	$ 67,589
10	Foundation Gravel	507 TN	$ 35	$ 17,742
11	Asphalt Concrete Pavement Repair	375 TN	$ 80	$ 30,040
12	Crushed Surfacing, Top Course	345 TN	$ 25	$ 8,618
13	Cold Mix Asphalt	253 TN	$ 150	$ 38,019
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 1,085,632
	Tax rate (8.2%)			89,022
	Subtotal:			$ 1,174,654
	Contingency (25%)			$ 293,346
	Total Estimated Construction Cost			**$ 1,468,000**
	Engineering and Administrative Costs (25%):			$ 367,000
	Total Estimated Project Cost			**$ 1,835,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement N-7
5,700 LF of 12-inch NUGA Transmission Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 61,000	$ 61,000
2	12-inch D.I. Water Pipe, Including Fittings	5,700 LF	$ 75	$ 427,500
3	Locate Existing Utilities	LUMP SUM	$ 15,000	$ 15,000
4	Erosion Control	LUMP SUM	$ 15,000	$ 15,000
5	Additional Pipe Fittings	7,800 LB	$ 3.50	$ 27,300
6	Trench Safety Systems	LUMP SUM	$ 31,200	$ 31,200
7	12-inch Gate Valves	10 EA	$ 2,250	$ 21,375
8	Fire Hydrants	14 EA	$ 4,000	$ 57,000
9	Gravel Backfill	3,251 TN	$ 15	$ 48,767
10	Foundation Gravel	366 TN	$ 35	$ 12,801
11	Asphalt Concrete Pavement Repair	271 TN	$ 80	$ 21,674
12	Crushed Surfacing, Top Course	249 TN	$ 25	$ 6,218
13	Cold Mix Asphalt	183 TN	$ 150	$ 27,431
14	Connections to Existing System	2 EA	$ 1,500	$ 3,000
15	Traffic Control	LUMP SUM	$ 40,000	$ 40,000
	Subtotal			$ 815,266
	Tax rate (8.2%)			66,852
	Subtotal:			$ 882,118
	Contingency (25%)			$ 220,882
	Total Estimated Construction Cost			**$ 1,103,000**
	Engineering and Administrative Costs (25%):			$ 276,000
	Total Estimated Project Cost			**$ 1,379,000**

Refer to the 2010 Utility Rate Study by FCS Group for detail on eligible SDC credit amounts.

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement D-4
UPH PRV adjustments and looping around NW Astor

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 14,000	$ 14,000
2	8-inch D.I. Water Pipe, Including Fittings	1,600 LF	$ 50	$ 80,000
3	Locate Existing Utilities	LUMP SUM	$ 3,000	$ 3,000
4	Erosion Control	LUMP SUM	$ 3,000	$ 3,000
5	Additional Pipe Fittings	720 LB	$ 16.00	$ 11,520
6	Trench Safety Systems	LUMP SUM	$ 3,200	$ 3,200
7	8-inch Gate Valves	3 EA	$ 1,200	$ 3,200
8	Fire Hydrants	4 EA	$ 4,000	$ 16,000
9	Gravel Backfill	782 TN	$ 15	$ 11,733
10	Foundation Gravel	88 TN	$ 35	$ 3,080
11	Asphalt Concrete Class B	533 SQ YD	$ 5	$ 2,400
12	Sawcutting	3,200 LF	$ 5	$ 16,000
13	Crushed Surfacing, Top Course	60 TN	$ 25	$ 1,496
14	Cold Mix Asphalt	44 TN	$ 150	$ 6,600
15	Connections to Existing System	5 EA	$ 3,000	$ 15,000
16	Traffic Control	100 HRS	$ 5	$ 450
	Subtotal			$ 190,679
	Tax rate (8.2%)			15,636
	Subtotal:			$ 206,315
	Contingency (25%)			$ 51,685
	Total Estimated Construction Cost:			**$ 258,000**
	Engineering and Administrative Costs (25%):			$ 65,000
	Total Estimated Project Cost:			**$ 323,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: D-4	**ESTIMATED COST:** $ 323,000
PRESSURE ZONE: 852	**YEAR TO BE COMPLETED:** 2011
PROJECT DESCRIPTION: UPH PRV adjustments and looping around NW Astor	**MAP, SCALE: 1" = 2750'**
PROJECT BENEFIT: Improve fireflow deficiencies	
COMMENTS:	

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering		65,000				
Construction		258,000				
Construction Management, Administration						
TOTAL		323,000	0	0	0	0

FUNDING SOURCE:

Capital Fund

CIP Forms.XLS,D-2

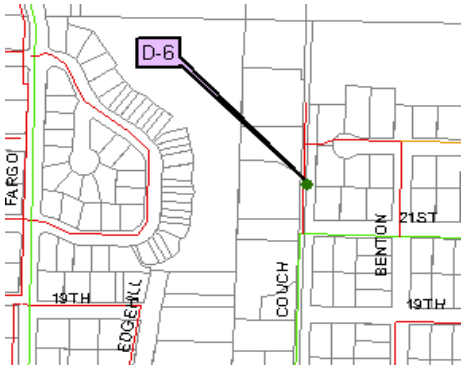
City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement D-5
Butler Site PRV, 8-inch

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 3,900	$ 3,900
2	PRV, 8-inch	LUMP SUM	$ 48,500	$ 48,500
	Subtotal			$ 52,400
	Tax rate (8.2%)			4,297
	Subtotal:			$ 56,697
	Contingency (25%)			$ 14,203
	Total Estimated Construction Cost			**$ 70,900**
	Engineering and AdministrativeCosts (25%):			$ 17,725
	Total Estimated Project Cost			**$ 89,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement D-6
Couch Street Booster Pump Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 5,200	$ 5,200
2	Booster Pump, 50 gpm	LUMP SUM	$ 65,500	$ 65,500
	Subtotal			$ 70,700
	Tax rate (8.2%)			5,797
	Subtotal:			$ 76,497
	Contingency (25%)			$ 19,103
	Total Estimated Construction Cost			**$ 95,600**
	Engineering and AdministrativeCosts (25%):			$ 23,900
	Total Estimated Project Cost			**$ 120,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: D-6	**ESTIMATED COST:** $ 120,000
PRESSURE ZONE: 455	**YEAR TO BE COMPLETED:** 2012
PROJECT DESCRIPTION: Couch Street Booster Pump Station	**MAP, SCALE: 1" = 600'** 
PROJECT BENEFIT: Eliminate peak hour demand deficiencies.	
COMMENTS:	

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering						
Construction			120,000			
Construction Management, Administration						
TOTAL	0	0	120,000	0	0	0

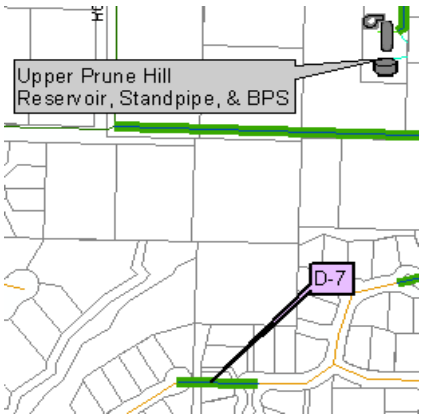
FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement D-7
UPH looping from NW 16th to NW 12th Avenue

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 3,000	$ 3,000
2	12-inch D.I. Water Pipe, Including Fittings	300 LF	$ 75	$ 22,500
3	Locate Existing Utilities	LUMP SUM	$ 1,000	$ 1,000
4	Erosion Control	LUMP SUM	$ 1,000	$ 1,000
5	Additional Pipe Fittings	150 LB	$ 16.00	$ 2,400
6	Trench Safety Systems	LUMP SUM	$ 600	$ 600
7	Gravel Backfill	171 TN	$ 15	$ 2,567
8	Foundation Gravel	19 TN	$ 35	$ 674
9	Asphalt Concrete Class B	117 SQ YD	$ 5	$ 525
10	Sawcutting	600 LF	$ 5	$ 3,000
11	Crushed Surfacing, Top Course	13 TN	$ 25	$ 327
12	Cold Mix Asphalt	10 TN	$ 150	$ 1,444
13	Connections to Existing System	2 EA	$ 3,000	$ 6,000
14	Traffic Control	100 HRS	$ 5	$ 450
	Subtotal			$ 45,486
	Tax rate (8.2%)			3,730
	Subtotal:			$ 49,216
	Contingency (25%)			$ 12,784
	Total Estimated Construction Cost:			**$ 62,000**
	Engineering and Administrative Costs (25%):			$ 16,000
	Total Estimated Project Cost:			**$ 78,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: D-7	**ESTIMATED COST:** $ 78,000
PRESSURE ZONE: 852	**YEAR TO BE COMPLETED:** 2012
PROJECT DESCRIPTION: UPH looping from NW 16th to NW 12th Ave Install 300 LF of DI water main	**MAP, SCALE: 1" = 600'** 
PROJECT BENEFIT: Eliminate peak hour deficiencies.	
COMMENTS:	

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR	2010	2011	2012	2013	2014	2015
Land and Right of Way Acquisition						
Design and Engineering			16,000			
Construction			62,000			
Construction Management, Administration						
TOTAL	0	0	78,000	0	0	0

FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement D-8
UPH Standpipe outlet piping upgrade, 24-inch

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 7,000	$ 7,000
2	24-inch D.I. Water Pipe, Including Fittings	320 LF	$ 110	$ 35,200
3	Locate Existing Utilities	LUMP SUM	$ 2,000	$ 2,000
4	Erosion Control	LUMP SUM	$ 2,000	$ 2,000
5	Additional Pipe Fittings	220 LB	$ 16.00	$ 3,520
6	Trench Safety Systems	LUMP SUM	$ 600	$ 600
7	24-inch Butterfly Valves	1 EA	$ 27,500	$ 27,500
8	Gravel Backfill	261 TN	$ 15	$ 3,911
9	Foundation Gravel	29 TN	$ 35	$ 1,027
10	Crushed Surfacing, Top Course	20 TN	$ 25	$ 499
11	Connections to Existing System	2 EA	$ 3,000	$ 6,000

Subtotal	$	89,256
Tax rate (8.2%)		7,319
Subtotal:	$	96,575
Contingency (25%)	$	24,425
Total Estimated Construction Cost:	**$**	**121,000**
Engineering and Administrative Costs (25%):	$	30,000
Total Estimated Project Cost:	**$**	**151,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY

PROJECT TYPE: Distribution System Improvement

PROJECT NUMBER: D-8 **ESTIMATED COST:** $ 151,000

PRESSURE ZONE: 852 **YEAR TO BE COMPLETED:** 2020

PROJECT DESCRIPTION:

UPH Standpipe Outlet Piping Upgrade, 24-inch

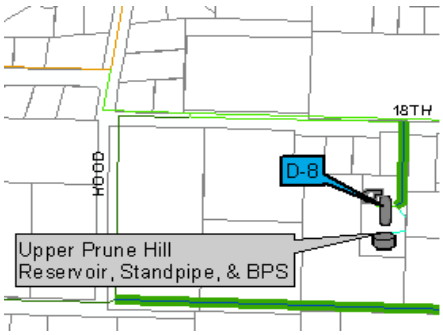
Replace approximately 320 LF of 12-inch outlet piping with 24-inch DI.

PROJECT BENEFIT:

Eliminate peak hour deficiencies.

COMMENTS:

MAP, SCALE: 1" = 600'



SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR ($1,000s)	2016	2017	2018	2019	2020	2021
Land and Right of Way Acquisition						
Design and Engineering					30,000	
Construction					121,000	
Construction Management, Administration						
TOTAL	0	0	0	0	151,000	0

FUNDING SOURCE:

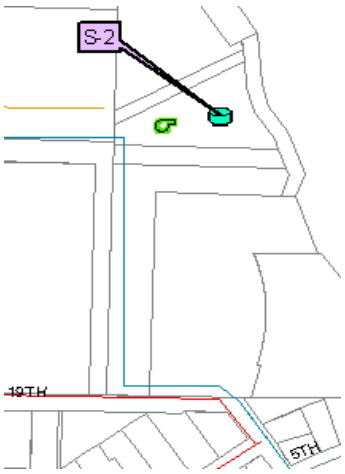
Capital Fund

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement S-2
2.0 MG Cemetery Reservoir

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 44,000	$ 44,000
2	2.0 MG Reservoir	LUMP SUM	$ 550,000	$ 550,000
3	Earthwork	LUMP SUM	$ 70,000	$ 70,000
4	Site Piping	LUMP SUM	$ 150,000	$ 150,000
5	Landscape and Irrigation	LUMP SUM	$ 50,000	$ 50,000
6	Painting	LUMP SUM	$ 80,000	$ 80,000
7	Electrical	LUMP SUM	$ 350,000	$ 350,000

Subtotal	$	1,294,000
Tax rate (8.2%)		106,108
Subtotal:	$	1,400,108
Contingency (25%)	$	349,892
Total Estimated Construction Cost	**$**	**1,750,000**
Engineering and Administrative Costs (25%):	$	438,000
Total Estimated Project Cost	**$**	**2,188,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: S-2	**ESTIMATED COST:** $ 2,188,000
PRESSURE ZONE: existing 343, new 290	**YEAR TO BE COMPLETED:** 2014
PROJECT DESCRIPTION: 2.0 MG Cemetary Reservoir	**MAP, SCALE: 1" = 600'** 
PROJECT BENEFIT:	
COMMENTS:	

SCHEDULE AND FUNDING PLAN						
PROJECT COST PER YEAR ($1,000s)	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Land and Right of Way Acquisition						
Design and Engineering					438,000	
Construction					1,750,000	
Construction Management, Administration						
TOTAL	0	0	0	0	2,188,000	0

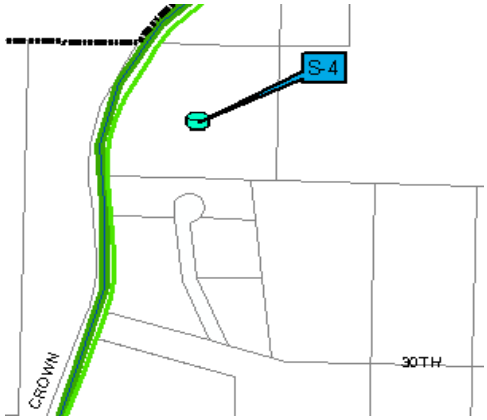
FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement S-4
2.0 MG Gregg Reservoir

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 44,000	$ 44,000
2	2.0 MG Reservoir	LUMP SUM	$ 550,000	$ 550,000
3	Earthwork	LUMP SUM	$ 70,000	$ 70,000
4	Site Piping	LUMP SUM	$ 150,000	$ 150,000
5	Landscape and Irrigation	LUMP SUM	$ 50,000	$ 50,000
6	Painting	LUMP SUM	$ 80,000	$ 80,000
7	Electrical	LUMP SUM	$ 350,000	$ 350,000
	Subtotal			$ 1,294,000
	Tax rate (8.2%)			106,108
	Subtotal:			$ 1,400,108
	Contingency (25%)			$ 349,892
	Total Estimated Construction Cost:			**$ 1,750,000**
	Engineering and Administrative Costs (25%):			$ 438,000
	Total Estimated Project Cost:			**$ 2,188,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: S-4	**ESTIMATED COST:** $ 2,188,000
PRESSURE ZONE:	**YEAR TO BE COMPLETED:** 2018
PROJECT DESCRIPTION: 2.0 MG Gregg Reservoir	**MAP, SCALE: 1" = 600'** 
PROJECT BENEFIT:	
COMMENTS:	

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR ($1,000s)	2016	2017	2018	2019	2020	2021
Land and Right of Way Acquisition						
Design and Engineering			438,000			
Construction			1,750,000			
Construction Management, Administration						
TOTAL	0	0	2,188,000	0	0	0

FUNDING SOURCE:

Capital Fund

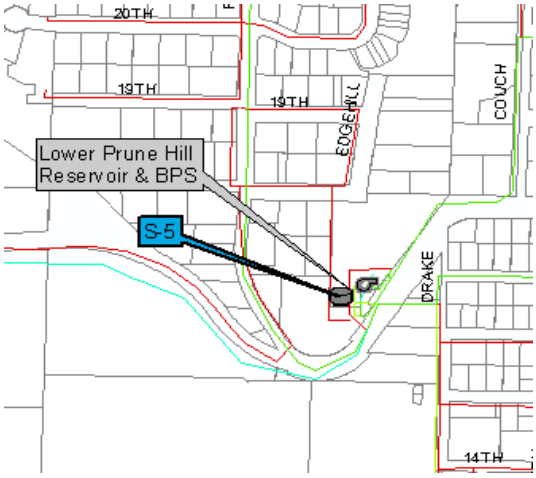
CIP Forms.XLS,S-4

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement S-5
Lower Prune Hill Reservoir Replacement

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 25,000	$ 25,000
2	Decommision and Demolition of Existing	LUMP SUM	$ 85,000	$ 85,000
3	0.5 MG Reservoir	LUMP SUM	$ 200,000	$ 200,000
4	Earthwork	LUMP SUM	$ 70,000	$ 70,000
5	Site Piping	LUMP SUM	$ 150,000	$ 150,000
6	Landscape and Irrigation	LUMP SUM	$ 50,000	$ 50,000
7	Painting	LUMP SUM	$ 80,000	$ 80,000
8	Electrical	LUMP SUM	$ 250,000	$ 250,000
	Subtotal			$ 910,000
	Tax rate (8.2%)			74,620
	Subtotal:			$ 984,620
	Contingency (25%)			$ 246,380
	Total Estimated Construction Cost:			**$ 1,231,000**
	Engineering and Administrative Costs (25%):			$ 308,000
	Total Estimated Project Cost:			**$ 1,539,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: S-5	**ESTIMATED COST:** $ 1,539,000
PRESSURE ZONE:	**YEAR TO BE COMPLETED:** 2020
PROJECT DESCRIPTION: Lower Prune Hill Reservoir Replacement	**MAP, SCALE: 1" = 600'**
PROJECT BENEFIT:	
COMMENTS:	



SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR ($1,000s)	2016	2017	2018	2019	2020	2021
Land and Right of Way Acquisition						
Design and Engineering					308,000	
Construction					1,231,000	
Construction Management, Administration						
TOTAL	0	0	0	0	1,539,000	0

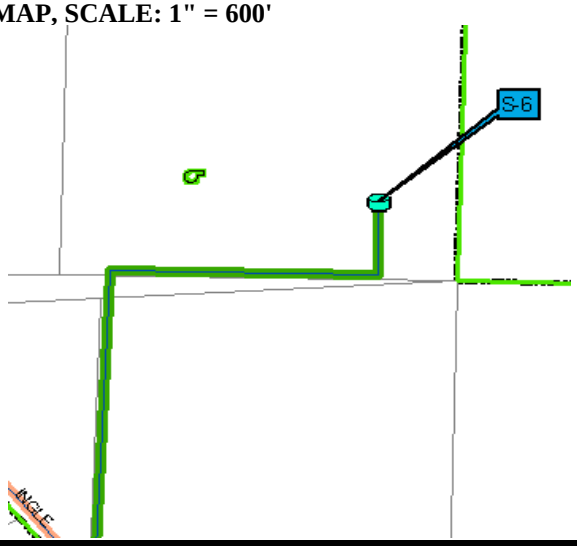
FUNDING SOURCE:

Capital Fund

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement S-6
2.0 MG Green Mountain Reservoir

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 44,000	$ 44,000
2	2.0 MG Reservoir	LUMP SUM	$ 550,000	$ 550,000
3	Earthwork	LUMP SUM	$ 70,000	$ 70,000
4	Site Piping	LUMP SUM	$ 150,000	$ 150,000
5	Landscape and Irrigation	LUMP SUM	$ 50,000	$ 50,000
6	Painting	LUMP SUM	$ 80,000	$ 80,000
7	Electrical	LUMP SUM	$ 350,000	$ 350,000
	Subtotal			$ 1,294,000
	Tax rate (8.2%)			106,108
	Subtotal:			$ 1,400,108
	Contingency (25%)			$ 349,892
	Total Estimated Construction Cost:			**$ 1,750,000**
	Engineering and Administrative Costs (25%):			$ 438,000
	Total Estimated Project Cost:			**$ 2,188,000**

CITY OF CAMAS
CAPITAL IMPROVEMENTS PROJECT DESCRIPTION

PROJECT SUMMARY	
PROJECT TYPE: Distribution System Improvement	
PROJECT NUMBER: S-6	**ESTIMATED COST:** $ 2,188,000
PRESSURE ZONE:	**YEAR TO BE COMPLETED:** 2024
PROJECT DESCRIPTION: 2.0 MG Green Mountain Reservoir	**MAP, SCALE: 1" = 600'** 
PROJECT BENEFIT:	
COMMENTS:	

SCHEDULE AND FUNDING PLAN

PROJECT COST PER YEAR ($1,000s)	2022	2023	2024	2025	2026	2027
Land and Right of Way Acquisition						
Design and Engineering			438,000			
Construction			1,750,000			
Construction Management, Administration						
TOTAL	0	0	2,188,000	0	0	0

FUNDING SOURCE:

Capital Fund

CIP Forms.XLS,S-6

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement DE-1
DI main between NW Camas Meadows Drive to SE 1st Street

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 43,000	$ 43,000
2	12-inch D.I. Water Pipe, Including Fittings	4,000 LF	$ 75	$ 300,000
3	Locate Existing Utilities	LUMP SUM	$ 10,000	$ 10,000
4	Erosion Control	LUMP SUM	$ 10,000	$ 10,000
5	Additional Pipe Fittings	2,000 LB	$ 16.00	$ 32,000
6	Trench Safety Systems	LUMP SUM	$ 8,000	$ 8,000
7	12-inch Gate Valves	7 EA	$ 2,250	$ 15,000
8	Fire Hydrants	10 EA	$ 4,000	$ 40,000
9	Gravel Backfill	2,281 TN	$ 15	$ 34,222
10	Foundation Gravel	257 TN	$ 35	$ 8,983
11	Asphalt Concrete Class B	1,556 SQ YD	$ 5	$ 7,000
12	Sawcutting	8,000 LF	$ 5	$ 40,000
13	Crushed Surfacing, Top Course	175 TN	$ 25	$ 4,363
14	Cold Mix Asphalt	128 TN	$ 150	$ 19,250
15	Connections to Existing System	2 EA	$ 3,000	$ 6,000
16	Traffic Control	LUMP SUM	$ 5,000	$ 5,000
	Subtotal			$ 582,819
	Tax rate (8.2%)			47,791
	Subtotal:			$ 630,610
	Contingency (25%)			$ 157,390
	Total Estimated Construction Cost:			**$ 788,000**
	Engineering and Administrative Costs (25%):			$ 197,000
	Total Estimated Project Cost:			**$ 985,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement DE-2
UPH looping along NW 16th Avenue

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 14,000	$ 14,000
2	12-inch D.I. Water Pipe, Including Fittings	1,300 LF	$ 75	$ 97,500
3	Locate Existing Utilities	LUMP SUM	$ 3,000	$ 3,000
4	Erosion Control	LUMP SUM	$ 3,000	$ 3,000
5	Additional Pipe Fittings	650 LB	$ 16.00	$ 10,400
6	Trench Safety Systems	LUMP SUM	$ 2,600	$ 2,600
7	12-inch Gate Valves	2 EA	$ 2,250	$ 4,500
8	Fire Hydrants	3 EA	$ 4,000	$ 12,000
9	Gravel Backfill	741 TN	$ 15	$ 11,122
10	Foundation Gravel	83 TN	$ 35	$ 2,920
11	Asphalt Concrete Class B	506 SQ YD	$ 5	$ 2,275
12	Sawcutting	2,600 LF	$ 5	$ 13,000
13	Crushed Surfacing, Top Course	57 TN	$ 25	$ 1,418
14	Cold Mix Asphalt	42 TN	$ 150	$ 6,256
15	Connections to Existing System	2 EA	$ 3,000	$ 6,000
16	Traffic Control	100 HRS	$ 5	$ 450
	Subtotal			$ 190,441
	Tax rate (8.2%)			15,616
	Subtotal:			$ 206,057
	Contingency (25%)			$ 51,943
	Total Estimated Construction Cost:			**$ 258,000**
	Engineering and Administrative Costs (25%):			$ 65,000
	Total Estimated Project Cost:			**$ 323,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement DE-3
542 Zone looping

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 22,000	$ 22,000
2	12-inch D.I. Water Pipe, Including Fittings	2,000 LF	$ 75	$ 150,000
3	Locate Existing Utilities	LUMP SUM	$ 5,000	$ 5,000
4	Erosion Control	LUMP SUM	$ 5,000	$ 5,000
5	Additional Pipe Fittings	1,000 LB	$ 16.00	$ 16,000
6	Trench Safety Systems	LUMP SUM	$ 4,000	$ 4,000
7	12-inch Gate Valves	3 EA	$ 2,250	$ 6,750
8	Fire Hydrants	5 EA	$ 4,000	$ 20,000
9	Gravel Backfill	1,141 TN	$ 15	$ 17,111
10	Foundation Gravel	128 TN	$ 35	$ 4,492
11	Asphalt Concrete Class B	778 SQ YD	$ 5	$ 3,500
12	Sawcutting	4,000 LF	$ 5	$ 20,000
13	Crushed Surfacing, Top Course	87 TN	$ 25	$ 2,182
14	Cold Mix Asphalt	64 TN	$ 150	$ 9,625
15	Connections to Existing System	2 EA	$ 3,000	$ 6,000
16	Traffic Control	100 HRS	$ 5	$ 450
	Subtotal			$ 292,109
	Tax rate (8.2%)			23,953
	Subtotal:			$ 316,062
	Contingency (25%)			$ 78,938
	Total Estimated Construction Cost:			**$ 395,000**
	Engineering and Administrative Costs (25%):			$ 99,000
	Total Estimated Project Cost:			**$ 494,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement DE-4
Decommission 10th Avenue/Francis Street Booster Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 21,000	$ 21,000
2	8-inch D.I. Water Pipe, Including Fittings	2,500 LF	$ 50	$ 125,000
3	Locate Existing Utilities	LUMP SUM	$ 5,000	$ 5,000
4	Erosion Control	LUMP SUM	$ 5,000	$ 5,000
5	Additional Pipe Fittings	1,130 LB	$ 16.00	$ 18,080
6	Trench Safety Systems	LUMP SUM	$ 5,000	$ 5,000
7	8-inch Gate Valves	4 EA	$ 1,200	$ 4,800
8	Fire Hydrants	6 EA	$ 4,000	$ 24,000
9	Gravel Backfill	1,222 TN	$ 15	$ 18,333
10	Foundation Gravel	138 TN	$ 35	$ 4,813
11	Asphalt Concrete Class B	833 SQ YD	$ 5	$ 3,750
12	Sawcutting	5,000 LF	$ 5	$ 25,000
13	Crushed Surfacing, Top Course	94 TN	$ 25	$ 2,338
14	Cold Mix Asphalt	69 TN	$ 150	$ 10,313
15	Connections to Existing System	2 EA	$ 3,000	$ 6,000
16	Traffic Control	100 HRS	$ 5	$ 450
	Subtotal			$ 278,876
	Tax rate (8.2%)			22,868
	Subtotal:			$ 301,744
	Contingency (25%)			$ 75,256
	Total Estimated Construction Cost:			**$ 377,000**
	Engineering and Administrative Costs (25%):			$ 94,000
	Total Estimated Project Cost:			**$ 471,000**

City of Camas
Preliminary Project Cost Estimate
Distribution System Improvement DE-5
Upper Green Mountain Booster Station

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 18,400	$ 18,400
2	Clearing and Grubbing	LUMP SUM	$ 3,000	$ 3,000
3	Site Work	LUMP SUM	$ 25,000	$ 25,000
4	CMU Building	250 SF	$ 200	$ 50,000
5	Piping and Appurtanences	1 EA	$ 40,000	$ 40,000
6	Booster Pumps	2 EA	$ 15,000	$ 30,000
7	Auxilary Power Generator	LUMP SUM	$ 25,000	$ 25,000
8	Electrical, Telemetry, and Instrumentation	LUMP SUM	$ 50,000	$ 50,000
9	Automatic Transfer Switch	LUMP SUM	$ 6,500	$ 6,500

Subtotal	$	247,900
Tax rate (8.2%)		20,328
Subtotal:	$	268,228
Contingency (25%)	$	67,072
Total Estimated Construction Cost:	**$**	**335,300**
Engineering and AdministrativeCosts (25%):	$	83,825
Total Estimated Project Cost:	**$**	**419,200**

Appendix T

FCS Group Financial Analysis - DRAFT

ity of Camas
Vater Utility Rate Study
ummary

evenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 2,765,100	$ 2,806,576	$ 2,848,675	$ 2,891,405	$ 2,934,776	$ 2,978,798
Non-Rate Revenues	330,300	216,088	232,008	247,410	257,712	273,029
Total Revenues	**$ 3,095,400**	**$ 3,022,664**	**$ 3,080,683**	**$ 3,138,815**	**$ 3,192,487**	**$ 3,251,826**
Expenses						
Cash Operating Expenses	$ 2,325,196	$ 2,607,902	$ 2,709,642	$ 2,815,625	$ 2,925,971	$ 3,041,027
Existing Debt Service	380,659	402,641	403,908	401,061	401,757	400,917
New Debt Service	-	201,605	272,261	272,261	559,428	650,395
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
Total Expenses	**$ 2,705,855**	**$ 3,212,148**	**$ 3,385,811**	**$ 3,688,947**	**$ 4,087,156**	**$ 4,292,338**
Net Surplus (Deficiency)	**$ 389,544**	**$ (189,484)**	**$ (305,128)**	**$ (550,132)**	**$ (894,668)**	**$ (1,040,511)**
% of Rate Revenue	0.00%	6.75%	10.71%	19.03%	30.49%	34.93%
Additions To Meet Coverage	$ (95,165)	$ (125,562)	$ (137,211)	$ -	$ (6,308)	$ (31,308)
Total Surplus (Deficiency)	**$ 294,379**	**$ (315,046)**	**$ (442,339)**	**$ (550,132)**	**$ (900,976)**	**$ (1,071,820)**
% of Rate Revenue	0.00%	11.23%	15.53%	19.03%	30.70%	35.98%
Annual Rate Adjustment	**0.00%**	**14.50%**	**5.00%**	**5.00%**	**5.00%**	**5.00%**
Rate Revenues After Rate Increase	$ 2,765,100	$ 3,145,704	$ 3,424,819	$ 3,650,001	$ 3,889,989	$ 4,145,755
Additional Taxes from Rate Increase	$ -	$ 17,055	$ 28,974	$ 38,150	$ 48,038	$ 58,686
Net Cash Flow After Rate Increase	**389,544**	**132,589**	**242,042**	**170,315**	**12,507**	**67,760**
Coverage After Rate Increases	2.02	1.26	1.41	1.61	1.26	1.29
Sample Monthly Bill (5/8" 11ccf)	$ 20.07	$ 22.98	$ 24.13	$ 25.34	$ 26.60	$ 27.93
Monthly Increase	$ -	$ 2.91	$ 1.15	$ 1.21	$ 1.27	$ 1.33

Notes:

If growth accelerates in NUGAE than need to revisit study. Current study assumes that NUGAE growth begins after 2013

2009 increase is in effect for 9 month (effective March)

City of Camas
Water Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	$ 479,154	$ 175,000	$ 307,589	$ 549,631	$ 694,264	$ 706,771
Net Cash Flow after Rate Increase	389,544	132,589	242,042	170,315	12,507	67,760
Transfer of Surplus to Capital Fund	(295,362)	-	-	(25,682)	-	(24,688)
Ending Balance	$ 573,336	$ 307,589	$ 549,631	$ 694,264	$ 706,771	$ 749,842
Minimum Target Balance	*$ 573,336*	*$ 643,044*	*$ 668,131*	*$ 694,264*	*$ 721,472*	*$ 749,842*
90 Day Target	90	43	74	90	88	90
Capital						
Beginning Balance	$ 181,256	$ (100,000)	$ 202,304	$ 206,537	$ 279,216	$ 204,313
plus: Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
plus: Grants / Developer Donations / Other Outside Sources	-	390,000	2,232,968	363,657	-	2,676,451
plus: Transfer from REET	500,000	-	-	-	-	-
plus: Existing Bond Proceeds	4,084,800	-	-	-	-	-
plus: Connection Charges	189,104	189,104	189,104	189,104	189,104	189,104
plus: Net Debt Proceeds Available for Projects	-	2,140,000	750,000	-	3,220,000	1,020,000
plus: Interest Earnings	5,673	-	6,331	6,464	8,739	6,394
plus: Transfer of Surplus from Operating Fund	295,362	-	-	25,682	-	24,688
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	5,256,194	2,619,104	3,380,707	991,443	3,897,058	4,320,951
less: Capital Expenditures (inflated)	(5,030,000)	(2,416,800)	(3,174,170)	(712,228)	(3,692,745)	(4,115,044)
Ending Balance	**226,194**	**202,304**	**206,537**	**279,216**	**204,313**	**205,907**
Minimum Capital Contingency Target	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost inflation assumptions)

No	Description	Current Cost	Year	Annual O&M Impact	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1								1	Enterprise Fund	$ -	$ -	$ -
2	SR-12 WELL 13 (WELL 4 GW))	1,200,000	2008		50	100%	0%	1	Enterprise Fund	1,200,000	-	1,200,000
3	SR-11 WATER RIGHT PURCHASE	165,000	2021		50	100%	0%	1	Enterprise Fund	165,000	-	274,737
4	"	300,000	2022		50	100%	0%	1	Enterprise Fund	300,000	-	519,503
5								1	Enterprise Fund	-	-	-
6	D-5 8" MAIN ON 8TH FOR FIRE FLOW	50,000	2014		50	0%	100%	1	Enterprise Fund	-	50,000	70,926
7	D-9 OSTENSON CANYON MAIN	800,000	2008		50	100%	0%	1	Enterprise Fund	800,000	-	800,000
8	D-10 FIRE FLOW ON SIERRA ST	50,000	2014		50	50%	50%	1	Enterprise Fund	25,000	25,000	70,926
9	S-1 WEST PRUNE HILL RES ACQUISITION (FEASIBI	50,000	2008		50	100%	0%	1	Enterprise Fund	50,000	-	53,000
10	T-7 WASHOUGAL RIVER TRANS CROSS	2,500,000	2008		50	100%	0%	1	Enterprise Fund	2,500,000	-	2,500,000
11	WATER FACILITY PLAN UPDATE	130,000	2008		6	50%	50%	1	Enterprise Fund	65,000	65,000	130,000
12	BOULDER CREEK FISH SCREEN PROJ	25,000	2009		50	0%	100%	1	Enterprise Fund	-	25,000	26,500
13	LOWER PRUNE HILL PUMP #4	70,000	2009		20	100%	0%	1	Enterprise Fund	70,000	-	74,200
14	Source Development	20,000	2009		50	100%	0%	1	Enterprise Fund	20,000	-	21,200
15	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	1,064,400	2010		50	100%	0%	2	Grants/Developer Donation	1,064,400	-	1,195,960
16	CROWN RD PS /MAIN LINE INSTALLATION 40% P	709,600	2010		50	100%	0%	2	Grants/Developer Donation	709,600	-	797,307
17	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	393,600	2010		50	100%	0%	1	Enterprise Fund	393,600	-	442,249
18	CROWN RD PS /MAIN LINE INSTALLATION 40% P	262,400	2010		50	100%	0%	1	Enterprise Fund			294,833
19	WELL 14	900,000	2008		50	100%	0%	1	Enterprise Fund	900,000	-	954,000
20	WELL 14	390,000	2008		50	100%	0%	1	Enterprise Fund	390,000	-	413,400
21	D-8 12" LINE FOR AIRPORT FIRE FLOW (2/3 Develo	305,333	2011		50	100%	0%	2	Grants/Developer Donation	305,333	-	383,657
22	D-8 12" LINE FOR AIRPORT FIRE FLOW (1/3 City)	152,667	2011		50	100%	0%	1	Enterprise Fund	152,667	-	181,828
23	D-7 BOOSTER STATION ON COUCH FIRE FL	53,800	2014		50	100%	0%	1	Enterprise Fund	53,800	-	76,316
24	T-2 SUCTION SIDE MAIN ON LAKE RD	1,260,000	2016		50	100%	0%	1	Enterprise Fund	1,260,000	-	1,894,574
25	T-3 ADDITIONAL PUMP ON LACAMAS BS	65,000	2011		50	100%	0%	1	Enterprise Fund	65,000	-	77,416
26	T-6 FOREST HOME BOOSTER UPGRADE	100,000	2014		50	100%	0%	1	Enterprise Fund	100,000	-	141,852
27	NW 35th AVENUE WATER LINE	750,000	2008		50	100%	0%	1	Enterprise Fund	750,000	-	795,000
28	PAC RM/35TH WATER INTERTIE (2/3) Developer	213,333	2010		50	100%	0%	2	Grants/Developer Donation	213,333	-	239,701
29	PAC RM/35TH WATER INTERTIE (1/3) City	106,667	2010		50	100%	0%	1	Enterprise Fund	106,667	-	119,851
30	D-8 8" MAIN ON KLICKITAT FIRE FLOW	62,000	2014		50	100%	0%	1	Enterprise Fund	62,000	-	87,948
31	S-2 WEST PRUNE HILL RES.	2,500,000	2012		50	100%	0%	1	Enterprise Fund	2,500,000	-	3,156,192
32	S-3 WEST PRUNE HILL 12" TRANS. LINE	350,000	2012		50	100%	0%	1	Enterprise Fund	350,000	-	441,867
33	UGA RESERVOIR	1,000,000	2015		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
34	"	1,600,000	2018		50	100%	0%	1	Enterprise Fund	1,600,000	-	2,368,391
35	UGA PRV (2/3) Developer	74,667	2014		50	100%	0%	2	Grants/Developer Donation	74,667	-	105,916
36	UGA PRV (1/3) City	37,333	2014		50	100%	0%	1	Enterprise Fund	37,333	-	52,958
37	UGA PRV (2/3) Developer	74,667	2015		50	100%	0%	2	Grants/Developer Donation	74,667	-	112,271
38	UGA PRV (1/3) City	37,333	2015		50	100%	0%	1	Enterprise Fund	37,333	-	56,136
39	UGA PRV (2/3) Developer	74,667	2016		50	100%	0%	2	Grants/Developer Donation	74,667	-	119,007
40	UGA PRV (1/3) City	37,333	2016		50	100%	0%	1	Enterprise Fund	37,333	-	59,504
41	UGA PRV (2/3) Developer	74,667	2017		50	100%	0%	2	Grants/Developer Donation	74,667	-	126,148
42	UGA PRV (1/3) City	37,333	2017		50	100%	0%	1	Enterprise Fund	37,333	-	63,074

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Annual O&M Impact	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
43	D-16 12" MAIN LAKE TO 38TH	515,000	2020		50	100%	0%	2	Grants/Developer Donation	815,000	-	1,304,841
44	T-4 TRANSMSN MAIN EVERETT SOUTH	1,130,000	2014		50	100%	0%	1	Enterprise Fund	1,130,000	-	1,602,927
45	T-5 TRANSMSN MAIN EVERETT NORTH	1,130,000	2015		50	100%	0%	1	Enterprise Fund	1,130,000	-	1,699,102
46	UGA BOOSTER STATION	400,000	2014		50	100%	0%	1	Enterprise Fund	400,000	-	567,408
47	WATER FACILITY PLAN UPDATE	150,000	2014		6	50%	50%	1	Enterprise Fund	75,000	75,000	212,778
48	"	150,000	2020		6	50%	50%	1	Enterprise Fund	75,000	75,000	240,155
49	"	150,000	2026		6	50%	50%	1	Enterprise Fund	75,000	75,000	303,872
50	STIEGERWALD SOURCE DEVELOPMENT	1,000,000	2020		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
51	MISC WATER MAIN REPLACEMENT	400,000	2009		50	30%	70%	1	Enterprise Fund	120,000	280,000	400,000
52	"	75,000	2009		50	30%	70%	1	Enterprise Fund	22,500	52,500	79,500
53	"	75,000	2010		50	30%	70%	1	Enterprise Fund	22,500	52,500	84,270
54	"	75,000	2011		50	30%	70%	1	Enterprise Fund	22,500	52,500	89,326
55	"	75,000	2012		50	30%	70%	1	Enterprise Fund	22,500	52,500	94,686
56	"	75,000	2013		50	30%	70%	1	Enterprise Fund	22,500	52,500	100,367
57	"	75,000	2014		50	30%	70%	1	Enterprise Fund	22,500	52,500	106,389
58	"	75,000	2015		50	30%	70%	1	Enterprise Fund	22,500	52,500	112,772
59	"	75,000	2016		50	30%	70%	1	Enterprise Fund	22,500	52,500	119,539
60	"	75,000	2017		50	30%	70%	1	Enterprise Fund	22,500	52,500	126,711
61	"	75,000	2018		50	30%	70%	1	Enterprise Fund	22,500	52,500	111,018
62	"	75,000	2019		50	30%	70%	1	Enterprise Fund	22,500	52,500	115,459
63	"	75,000	2020		50	30%	70%	1	Enterprise Fund	22,500	52,500	120,077
64	"	75,000	2021		50	30%	70%	1	Enterprise Fund	22,500	52,500	124,881
65	"	75,000	2022		50	30%	70%	1	Enterprise Fund	22,500	52,500	129,876
66	"	75,000	2023		50	30%	70%	1	Enterprise Fund	22,500	52,500	135,071
67	"	75,000	2024		50	30%	70%	1	Enterprise Fund	22,500	52,500	140,474
68	"	75,000	2025		50	30%	70%	1	Enterprise Fund	22,500	52,500	146,093
69	"	75,000	2026		50	30%	70%	1	Enterprise Fund	22,500	52,500	151,936
70	"	75,000	2027		50	30%	70%	1	Enterprise Fund	22,500	52,500	158,014
71	UGA MAIN LINE (2/3) Developer	2,000,000	2013		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,676,451
72	UGA MAIN LINE (1/3) City	1,000,000	2013		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,338,226
73	UGA MAIN LINE (2/3) Developer	2,000,000	2014		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,837,038
74	UGA MAIN LINE (1/3) City	1,000,000	2014		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
75	UGA MAIN LINE (2/3) Developer	2,000,000	2015		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,007,261
76	UGA MAIN LINE (1/3) City	1,000,000	2015		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,503,630
77	UGA MAIN LINE (2/3) Developer	2,000,000	2016		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,187,696
78	UGA MAIN LINE (1/3) City	1,000,000	2016		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,593,848
79	UGA MAIN LINE (2/3) Developer	2,000,000	2017		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,378,958
80	UGA MAIN LINE (1/3) City	1,000,000	2017		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,689,479
81	UGA MAIN LINE (2/3) Developer	2,000,000	2018		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,960,489
82	UGA MAIN LINE (1/3) City	1,000,000	2018		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,480,244
83	UGA MAIN LINE (2/3) Developer	2,000,000	2019		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,078,908
84	UGA MAIN LINE (1/3) City	1,000,000	2019		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,539,454
85	UGA MAIN LINE (2/3) Developer	2,000,000	2020		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,202,064
86	UGA MAIN LINE (1/3) City	1,000,000	2020		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
87	UGA MAIN LINE (2/3) Developer	2,000,000	2021		50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,330,147
88	UGA MAIN LINE (1/3) City	1,000,000	2021		50	100%	0%	1	Enterprise Fund	1,000,000	-	1,665,074

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Annual O&M Impact	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
89	UGA MAIN LINE (2/3) Developer	2,000,000	2022		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,463,353
90	UGA MAIN LINE (1/3) City	1,000,000	2022		50	100%	0%	1 Enterprise Fund	1,000,000	-	1,731,676
91	UGA MAIN LINE (2/3) Developer	2,000,000	2023		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,601,887
92	UGA MAIN LINE (1/3) City	1,000,000	2023		50	100%	0%	1 Enterprise Fund	1,000,000	-	1,800,944
93	UGA MAIN LINE (2/3) Developer	2,000,000	2024		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,745,962
94	UGA MAIN LINE (1/3) City	1,000,000	2024		50	100%	0%	1 Enterprise Fund	1,000,000	-	1,872,981
95	UGA MAIN LINE (2/3) Developer	2,000,000	2025		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,895,801
96	UGA MAIN LINE (1/3) City	1,000,000	2025		50	100%	0%	1 Enterprise Fund	1,000,000	-	1,947,900
97	UGA MAIN LINE (2/3) Developer	2,000,000	2026		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,051,633
98	UGA MAIN LINE (1/3) City	1,000,000	2026		50	100%	0%	1 Enterprise Fund	1,000,000	-	2,025,817
99	UGA MAIN LINE (2/3) Developer	2,000,000	2027		50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,213,698
100	UGA MAIN LINE (1/3) City	1,000,000	2027		50	100%	0%	1 Enterprise Fund	1,000,000	-	2,106,849
101						100%	0%	1 Enterprise Fund	-	-	-
102						100%	0%	1 Enterprise Fund	-	-	-
	Total Capital Projects	$ 69,796,800		$ -		98%	2%		$ 67,866,900	$ 1,657,500	$ 108,022,459
	Total Upgrade/Expansion Projects										105,593,648
	Total R&R Projects										2,428,812
	Projects by Grants / Developer Donations			-					33,406,333	-	54,996,155
	Projects by Enterprise Fund			-					34,460,567	1,667,500	53,026,304

Year	2008$	Inflated
2008	5,030,000	5,030,000
2009	2,280,000	2,416,800
2010	2,825,000	3,174,170
2011	598,000	712,228
2012	2,925,000	3,692,745
2013	3,075,000	4,115,044
Total	16,733,000	108,022,459

FCS GROUP

Consultant Memorandum

To: **Monte Brachmann, Public Works Director, City of Camas** Date: **June 15th, 2009**

From: **Sergey Tarasov, Angie Sanchez Virnoche; FCS GROUP**

CC:

RE **City of Camas Proposed Draft System Development Charges**

INTRODUCTION

As part of the utility rate studies for water, sewer, storm and solid waste utilities completed for the City of Camas, FCS GROUP was also asked to update the water and sewer system development charges (SDCs) and create a new SDC for the storm drainage utility. This memorandum will provide a general overview of SDCs, summarize the methodology used, outline key factors and present the recommended charges.

OVERVIEW

"System Development Charge (or connection) charge" is a generic term referring to charges imposed as a condition of connecting to the utility system. SDCs differ from installation fees in that they are intended as a means of ensuring that new customers bear their equitable share of the cost of the system assets that serve all customers, and are not direct reimbursement for out-of-pocket costs to connect the customer. It is assumed that SDCs are imposed in addition to meter charges, labor and material charges, tap fees, inspection fees, or other non-capital charges related to the immediate expense of connecting a new service.

METHODOLOGY

The purpose of the SDC is two-fold: 1) to provide a source for capital financing and 2) to equitably recover the proportionate share of utility plant-in-service from new customers. In the absence of SDCs, growth-related costs would be borne in large part by existing customers. The cost of the system to be recovered by SDCs can be defined in two parts: an existing cost basis portion, which recover existing costs, and a future cost basis portion, which recover future costs.
Revenues generated from the SDCs can be used to fund capital projects or to pay debt service incurred to finance capital projects, but cannot be used to pay operating and maintenance costs.

There are several documented approaches used in the industry to establish a SDC that is legally defensible if designed properly. Within the range of legally defensible approaches, the choice of the costs the City targets is a matter of policy. It is important that the City follow a methodical and rational approach to consistently determine and implement cost-based SDCs.

Since the calculated charges represent the maximum allowable charge, the City may choose to implement a charge at any level up to the calculated charge. Revenues generated from the charge will vary depending upon whether or not the full charge is implemented (e.g., phase-in strategies). The lower the charge and longer the phase-in period, the less revenue will be collected and available to help pay the cost of these facilities. This loss in revenue could result in delays in completing the

capital improvement program and/or result in increased costs to the City's existing ratepayers through rates for service.

EXISTING COST BASIS

The existing cost basis portion of the charge developed in this study is based on facilities of general benefit, such as storage reservoirs, transmission mains, interceptor trunk lines, etc. It is intended to recognize the current ratepayers' net investment in estimated original cost of the non-donated system assets and the accumulated interest on that investment. For Washington cities and towns, State statute (RCW 35.92.025) and subsequent legal interpretations provide a guideline for connection charges which suggest that such charges should reflect the actual original cost of the utility system, and can include interest on that cost at the rate applicable at the time of construction. Interest can be accumulate for a maximum of ten years from the date of construction, and cannot exceed the original cost of the asset. In addition, outstanding debt principal (less any cash available to buy down debt) is deducted from plant-in-service because new customers will pay their share of debt service through user rates. For this study, the existing cost basis for each utility is based on the City's record of system assets as of December 31, 2007, incorporating the adjustments noted above.

FUTURE COST BASIS

The statue enabling connection charges for cities and towns does not specifically address a charge based on planned future improvements. Common practice and legal opinion suggest that future facilities needed to serve growth, as well as to provide for regulatory system improvement, can be included in the connection charge. It is common practice for Cities and Towns to include up to twenty (20) years of future costs consistent with the planning period used in the City's comprehensive planning process. The future cost basis can include utility capital projects planned for construction and identified in comprehensive system planning documents.

It is important to note that current-year dollars are used when calculating the SDC and not inflated dollars. This approach assumes that the SDC will be updated annually to track construction cost inflation. Projects directly funded by developers, grants, or special property assessments are not included in the calculation. Replacement projects are most often excluded from the calculation unless they are needed to increase the size of the system. The capital improvement program has been allocated between existing and future customers based on engineering and planning criteria.

WATER SYSTEM DEVELOPMENT CHARGE

The City currently uses a cost of service allocation basis approach when calculating the SDC and establishes an individual charge for each customer class based on the results of the cost-of-service functional allocation which includes assignment of costs based on individual customer flow statistics, meter equivalents and number of accounts.

After assessing the current structure and individual class charges it seemed that most class specific SDCs resulted in similar charges with the exception of the industrial class, which demonstrated a significantly higher disproportionate demand on the system based on its size and usage.

From these observations a "general" approach is proposed, which changes the class specific SDC and instead calculates the value of one meter customer equivalent (MCE) and assesses all new system connections based on this equivalent unit buy-in value. This recommended approach is applicable to all customer classes with the exception of the industrial class due to the disproportionate demand placed on the system by these customers. A separate charge is recommended specifically for the industrial class.

DETERMINATION OF THE WATER SYSTEM DEVELOPMENT CHARGES

Existing Cost Basis

As of 2007, water utility total fixed assets equal $37.75 million. Of this amount, approximately $4.83 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million. The water utility's existing cash reserves were less than outstanding debt, and thus an adjustment of $5.72 million was made to account for principal outstanding. After adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $42.82 million.

Future Cost Basis

According to the 2008 Draft Water System Plan the City has planned for approximately $69.80 million of capital projects in the water utility between 2008 and 2027. Recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting engineer working on the Water System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $66.12 million. In addition, the projects were split between projects related to the North Urban Growth Area East (NUGAE), non-NUGAE related projects and projects which benefited both customer groups. The NUGAE portion of total future projects was $54.13 million, non-NUGAE portion was $7.62 million and the cumulative portion was $4.37 million.

From the $66.12 million $34.12 million are considered to be contributed / donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions / donations any project or portion of the project designated as repair and replacement (R&R) was also deducted. The resulting allocable future cost basis was $30.90 million, which was made up of $20.72 million project costs related to NUGAE, $6.10 million of project costs related to non-NUGAE and $4.08 million of project costs related to both customer bases.

Customer Base

Using the detailed customer statistics provided by the City, the water utility had approximately 9,446 meter customer equivalents (MCEs) – MCEs relate to flow factor assumptions that vary by meter size and are established by the American Water Works Association – in 2008, which related specifically to non-NUGAE customers. The consulting engineer working on the Water System Plan provided a growth forecast, by class, for the 20-year study period using flow based equivalent residential units (ERUs). Since a different unit of measure was used in estimating the future demand ERUs than in the calculation of the charge (MCEs), a growth rate was calculated from the demand projection ERUs (percentage growth from current ERU's to 20-year future ERU's) and applied to the MCEs to calculate the 20-year MCEs. With

this assumption in place the City will add 6,780 non-NUGAE MCEs over the next twenty-year period – reaching a total non-NUGAE customer base of 16,226 MCEs.

Since there were no NUGAE customers in place during the study process an alternative approach had to be used estimating the 20-year NUGAE customer base in MCEs. The flow based demand ERUs provided by class were used to develop a ratio between 20-year non-NUGAE ERUs and MCEs. These ratios were then applied to the NUGAE flow based demand ERUs and converted to MCEs for the 20-year period; 5,581 MCEs. The total customer base, NUGAE and non-NUGAE, for the 20-year period is calculated to be 21,807 MCEs.

Calculation of the General Water System Development Charge

The following table shows the calculation of the water system development charge by calculating the existing and the future cost bases.

Water System Development Charge Calculation			
	non-NUGAE	NUGAE	Notes
Existing Allocable Cost	$ 42,818,181	$ 42,818,181	
Allocable Customer Base	21,807	21,807	Total customer base (existing & future)
Existing Portion	**$ 1,964**	**$ 1,964**	
Future Cumulative Cost*	$ 4,082,100	$ 4,082,100	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	12,361	12,361	Total future customers
Future Cumulative Portion	**$ 330**	**$ 330**	
Future Cost	$ 6,095,575	$ 20,720,667	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	6,780	5,581	Total future customers
Future Portion	**$ 899**	**$ 3,713**	
TOTAL SDC	**$ 3,193**	**$ 6,007**	per MCE

Notes: Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each on an individual basis

The table below shows the proposed non-NUGAE and the NUGAE system development charges by meter size using the MCE's to differentiate the demands different meter sizes place on the system.

Meter	MCEs	Proposed	
		Non-NIGAE	NIGAE
5/8"	1	$ 3,193	$ 6,007
3/4"	1.5	4,790	9,011
1"	2.5	7,983	15,018
1.5"	5	15,965	30,035
2"	8	25,544	48,056
3"	16	51,088	96,112
4"	25	79,825	150,175
6"	50	159,650	300,350
8"	80	255,440	480,560

As previously mentioned the proposed charges are a calculated ceiling, the City can implement a charge of any level up to the indicated amount.

Separate Industrial Water System Development Charge Alternatives

As previously mentioned the industrial class exhibited high disproportionate demands on the system based on its size and usage compared to other classes. To avoid the remaining classes subsidizing the industrial class a separate industrial system development charge is proposed.

A charge based on MCEs represents the peaking (maximum instantaneous) requirements placed on the system by a customer. The increase in the charge from one meter to the next represents the maximum peaking requirement for that meter size and the relationship between each different size meter to the base 5/8" meter. If every customer class uses water on an equitable basis (usage per MCE) the peaking approach is appropriate. If there are customers who use disproportionate amounts of water on an average daily basis whereby the average usage exceeds the standard MCE factor the peaking methodology alone may not be appropriate. This is because the system is sized not only based on peak demand of the individual customer, but is sized based on the total system requirements of "all" individual customer demands. A large user places a disproportionate demand on other parts of the system such as storage requirements and source of supply and should be charged commensurate with these increased demands. The SDC options proposed address this issue.

Two options are proposed to the City for the Industrial SDC. The first option keeps the City's current methodology and simply updates the industrial charge based on the functional allocation of updated costs. The second approach uses a similar functional allocation approach as the existing methodology, but spreads the "base" costs by ERUs instead of MCEs.

Industrial Option 1

The water system costs were spread based on a functional allocation (base, peak, fire, etc.). The previous study was used since a cost-of-service analysis was not performed during the 2008 update. Similar to the general approach existing and future infrastructure costs were calculated, however instead of dividing through by the applicable total customer base, the costs were spread through by the industrial customer class statistics representing accounts, meter customer equivalents (MCEs) and meter service equivalents (MSEs – related to actual cost of the meter / hardware) depending on the function.

The following table summarizes the Industrial charge for the base 5/8" meter.

Industrial Option 1						
Industrial	Customer / Account	Meters & Services/MSE	Base / MCE	Peak / MCE	Fire / Account	SDC
non-NUGAE	$ -	$ 393	$ 14,725	$ 2,134	$ 2,567	$ 19,819
NUGAE	$ -	$ 393	$ 29,551	$ 4,326	$ 4,206	$ 38,476

The table below escalates the SDC based on each function and an appropriate factor by meter size.

Meter	MCEs	MSEs	Proposed	
			Non-NUGAE	NUGAE
5/8"	1	1	$ 19,819	$ 38,476
3/4"	1.5	1.1	28,288	55,454
1"	2.5	1.4	45,265	89,449
1.5"	5	1.8	87,569	174,298
2"	8	2.9	138,579	276,362
3"	16	11	276,634	550,561
4"	25	14	429,544	856,633
6"	50	21	853,770	1,706,309
8"	80	29	1,362,684	2,725,763

Industrial Option 2

Similar to the first option the costs were spread based on a functional allocation. In this scenario the costs were based on the customer statistics for the system as a whole to determine unit costs instead of allocating costs based on individual customer statistics first. This approach also spreads "base" costs or total average water flow based on the ERU for the system (283.6 gpd / ERU) instead of MCEs.

The following table summarizes the Industrial charge for the base 5/8" meter and one (1) ERU. When comparing the two options it is important to remember that each industrial class will be multiple ERUs.

Industrial Option 2						
Industrial	Customer / Account	Meters & Services/MSE	Base / ERU	Peak / MCE	Fire / Account	SDC
non-NUGAE	$ -	$ 393	$ 988	$ 1,147	$ 518	$ 3,045
NUGAE	$ -	$ 393	$ 2,704	$ 2,324	$ 845	$ 6,266

The calculation of system development charges by meter size will depend on the size of meter factors associated with that meters size (as with option 1), in addition the projected demand will be needed to estimate the number of ERUs.

As an example two existing accounts are used to calculate an SDC using both options and compare the outcomes. Two accounts from the existing customer Wafertech are used.

- ✓ The first account (6346) is on a two inch meter and its usage for 2008 was 2,076 ccf.
- ✓ The second account (6344) is on a six inch meter and its usage for 2008 was 296,967 ccf

Option 1 Calculation: two inch meter non-NUGAE customer

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $14,725 / MCE representing the "Base" portion is escalated by 8 to represent the meter size = [8 * $14,752 = $117,800]

Step 4: $2,134 / MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $2,134 = $17,072]

Step 5: $2,567/ account is added representing the Fire portion

Total charge = $138,579 [$0 + $1,139.70 + $117,800 + $17,072 + 2,567]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base ($14,725*50 = $736,250) + Peak ($2,134*50 = $106,700) + Fire ($2,567) for a combined charge of $853,770.

Option 2 Calculation: two inch meter non-NUGAE customer

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $988/ ERU (***this is the change between the options***). Determine the number of ERUs for the customer by dividing the projected annual use of 2,076 ccf by 283.6 gpd (represents 1 ERU). First you must convert ccf to gallons per day (2,076 ccf *748(g/ccf)/365(days/year) = 4,254 gpd. Calculate ERUs = 4,254 gpd / 283.6(gpd/ERU) = 15. Calculate base allocation $988 * 15 = $14,821

Step 4: $1,147 / MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $1,147 = $9,176]

Step 5: $518/ account is added representing the Fire portion

Total charge = $25,655 [$0 + $1,139.70 + $14,821 + $9,176 + 518]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base (296,967ccf*748(g/ccf)/365(days/year) = 608,579 gpd, 608,579 gpd/283.6(gpd/ERU) = 2,146 ERUs), 2,146 ERUs * $988 = $2,120,248) + Peak ($1,147*50 = $57,350) + Fire ($518), results in a charge of $2,186,369.

Comparing the resulting charges for the two and six inch meters side by side shows that option two results in lower charges if consumption is lower (two inch meter option one: $138,579; two inch meter option two: $25,655), while the opposite is true if the customers consumption is on the higher side (six inch meter option one: $853,770; six inch meter option two: $2,186,369).

You can find additional examples / comparisons in the technical appendix section.

SEWER

The sewer utility follows the same methodology currently in place where Residential and Commercial I customers are charged a fixed system development charge for the base meter size of 5/8" (Commercial I customers charge increases based on meter size by AWWA flow factors). Commercial II charge is calculated based on functionally allocated costs and established unit costs for flow and strength (Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS)).

DETERMINATION OF THE SEWER SYSTEM DEVELOPMENT CHARGES

Existing Cost Basis

As of 2007, sewer utility total fixed assets equal $43.60 million. Of this amount approximately $6.24 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million. The sewer utility's existing cash reserves were less than outstanding debt, and thus an adjustment of $16.48 million was made to account for principal outstanding. After adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $39.77 million.

Future Cost Basis

According to the 2008 Draft Sewer System Plan the City has planned for approximately $102.62 million of capital projects in the sewer utility between 2008 and 2027. Similar to the water utility, recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting Engineer working on the Sewer System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $79.31 million. In addition, the projects were split between projects related to the NUGAE and non-NUGAE related projects and projects which benefited both customer groups. The NUGAE portion of total projects was $39.26 million, non-NUGAE portion was $35.90 million and the cumulative portion was $4.15 million.

From the $79.31 million $13.70 million are considered to be contributed / donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions / donations any project or portion of the project designated as repair and replacement (R&R) was deducted as well; total R&R deduction was $24.37 million. The resulting allocable future cost basis was $41.27 million,

ORIGINAL SAVE

Presentation of the Sanitation, Water, Sewer & Storm Utility Rate Forecast

February 2nd, 2009

City Council Workshop

FCS GROUP | 7525 – 166th Ave. NE, Suite D-215, Redmond, WA 98052 ■ 425-867-1802

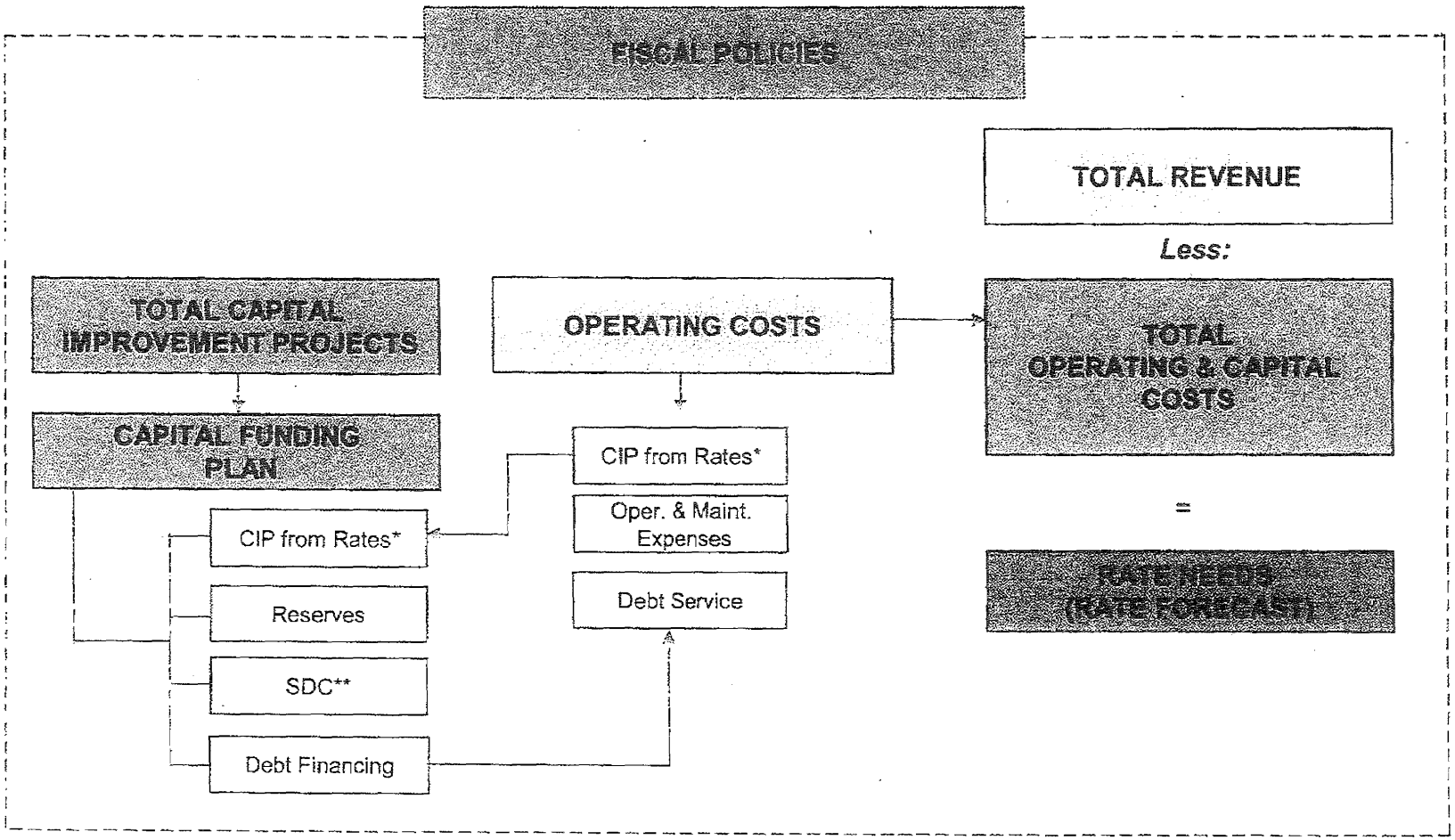
Discussion Outline

- Overview and Development of the Rate Forecast
  - ✓ Sanitation System
  - ✓ Water System
  - ✓ Sewer System
  - ✓ Storm System

Role of the Rate Forecast

- A multi-year forecast that allows for thoughtful planning and is consistent with capital planning
- Determines the amount of revenue necessary to meet all utility system financial obligations
  - ✓ Operating costs
  - ✓ Capital costs
  - ✓ Fund Balances
  - ✓ Financial policies
- Evaluates sufficiency of current rates on a stand-alone basis
- Develops rate implementation strategy
- "Living" forecast that should be checked annually during budget process

Development of the Rate Forecast



**CIP from rates = capital improvement funding supported by rate revenue*

*** SDC = System Development Charge Revenue*

RATE FORECAST

Establishing Overall Revenue Needs

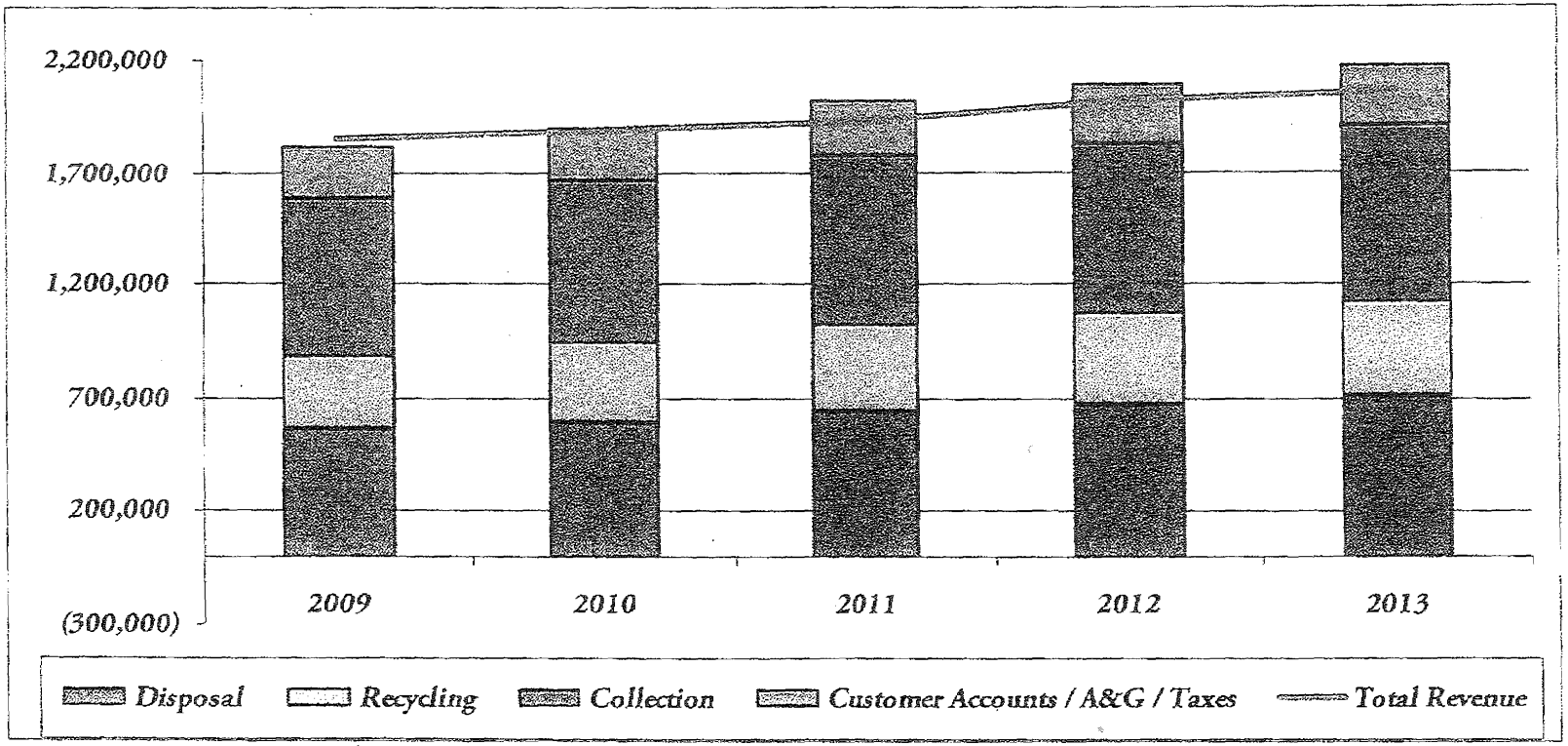
General Assumptions for Rate Forecast - All Utilities

- Time Period Reviewed = 2009-2013
- 2008 budget used as basis for revenue and expenses
- Forecast of revenue includes rate revenue + miscellaneous revenue
  - ✓ Rate revenue growth – utility specific
- Expenses assume the following annual escalation factors
  - ✓ 3.15% general inflation
  - ✓ 5.0% labor inflation
  - ✓ 6.0% Construction inflation
- Two tests completed
  - ✓ Cash flow (revenue less expenses)
  - ✓ Debt service coverage (bond coverage => 1.25)

Sanitation System Rate Forecast

- Fiscal policies
  - ✓ Target reserve levels – 30 days of O&M expenses
- Forecast of revenue (rate revenue + miscellaneous revenue)
  - ✓ 2.0% growth in rate revenue per year
  - ✓ Assumes new Lacamas Heights connections in 2012 (268 residential, 6 commercial) – approximately $50 thousand per year
- North Urban Growth Area (NUGA) expansion growth is assumed to start after the study period of (after 2013)
- 2009 includes $344 thousand for 6,500 new container

Sanitation Rate Forecast Current Rate Levels



Cashflow Surplus (Deficiency)	2009	2010	2011	2012	2013
	$ 67,356	$ 13,160	$ (66,003)	$ (42,185)	$ (84,114)
Rate Increase	0.00%	0.00%	3.43%	2.09%	4.09%
Rate Strategy*	0.00%	2.00%	2.00%	2.00%	2.00%

Annual increases also include meeting reserve targets

Key Considerations Sanitation

- No increase required in 2009
- Rate deficiency beginning in 2011
  - ✓ Rate proposal of 2% per year in 2010 – 2014 to smooth rate impacts
- Existing fund balance above 30 day target

Water System Rate Forecast

- Fiscal policies
  - ✓ Target cash operating reserve level – 90 days of O&M expenses
  - ✓ Capital contingency of $200,000
  - ✓ Rate Funded System Reinvestment - $200,000 starting in 2011
    - Ideally set at average annual capital or annual depreciation expense
    - City currently not specifically funding this cost component
  - ✓ Debt service coverage = >1.25
- Forecast of revenue (rate revenue + miscellaneous revenue)
  - ✓ 1.5% growth in rate revenue per year
  - ✓ NUGA growth assumed after 2013
- Existing debt service obligations
  - ✓ 3 loans = $402k/year

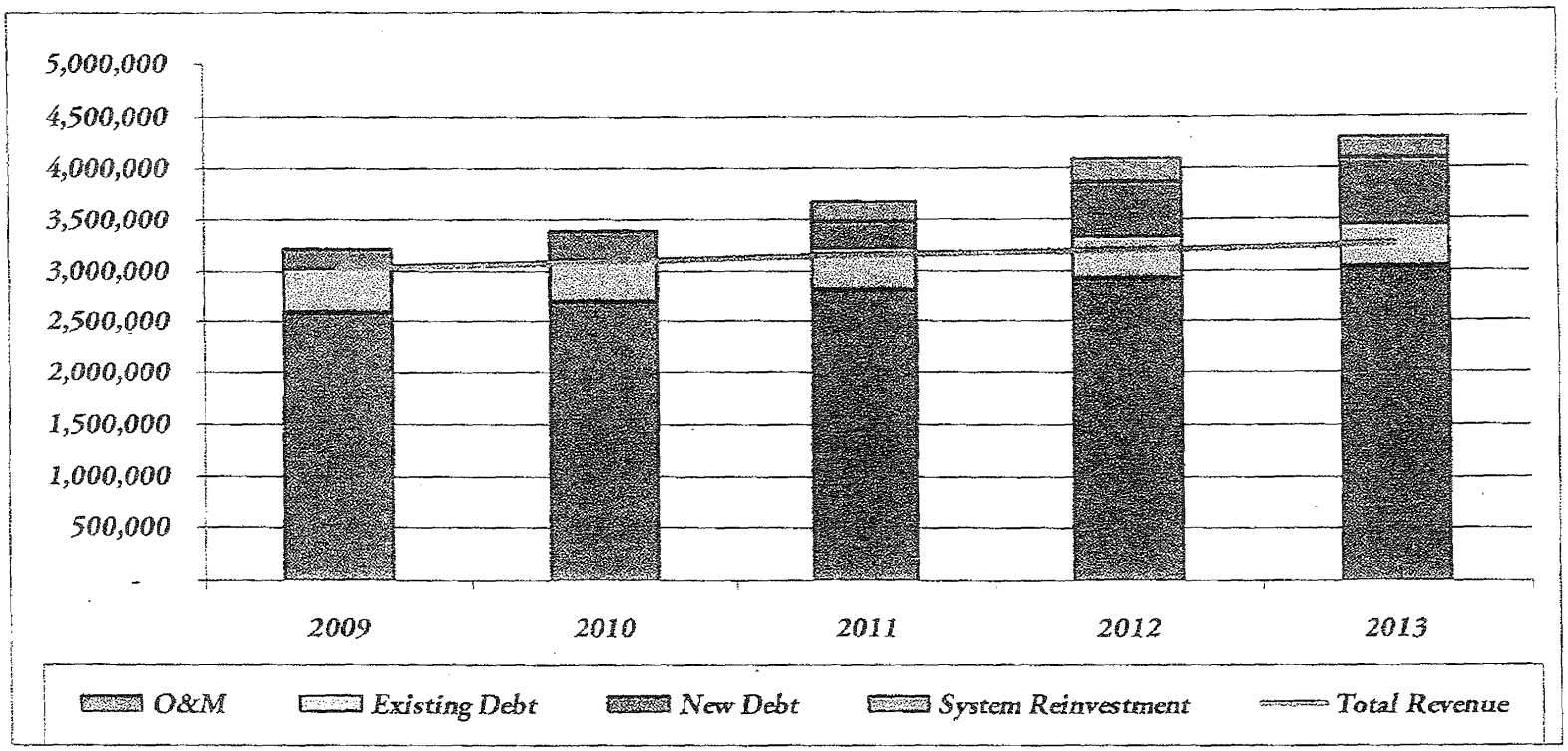
Water Capital Improvement Program

- Capital funding associated with program
  - ✓ $189,000/year SDC revenue (current charge)
  - ✓ $5.7 million developer donations identified
  - ✓ $7.1 million new debt service (total for time period)
  - ✓ $200,000/year rate funded capital beginning in 2011

- New debt service - $201,000 increasing to $650,000 by 2013

Year	Water CIP (2008$)	Water CIP (inflated)
2009	$ 2,280,000	$ 2,416,800
2010	2,825,000	3,174,170
2011	598,000	712,228
2012	2,925,000	3,692,745
2013	3,075,000	4,115,044
Total	**$ 11,703,000**	**$ 14,110,986**

Water Rate Forecast Current Rate Levels



Cashflow Surplus (Deficiency)	2009	2010	2011	2012	2013
	$ (315,046)	$ (442,339)	$ (550,132)	$ (900,976)	$ (1,071,820)
Rate Increase	11.23%	15.53%	19.03%	30.70%	35.98%
Rate Strategy*	14.50%	5.00%	5.00%	5.00%	5.00%

* 2009 Rate increase takes into account that the earliest date rates will go into effect is March 2009.

Annual increases also consider meeting reserve targets

Key Considerations Water

- Current rates not sufficient to meet financial obligations in 2009 - 2013
  - ✓ 14.5% increase in 2009 - $2.91 for average single family customer*
  - ✓ 5.0% per year increase 2010 – 2013 - $1.15 - $1.33 increase per month*
- Rate increase driven by:
  - ✓ Capital requirements causing the need for additional debt
  - ✓ New debt service begins 2009 - $200,000 additional expense
  - ✓ 2011 begins funding capital projects from rates
  - ✓ Debt coverage requirements of => 1.25
- Current operating fund balance is below target level of 90 days until 2011
  - ✓ Proposed rate increases are required to reach target levels
  - ✓ Strong fund balance is key factor when looking to securing outside funding
- Capital fund meeting minimum requirement of $200,000

**Assumes a 5/8" single family meter at 11 ccf per month*

City of Camas
Camas 2035
Camas, Washington

Appendix H
General Sewer Plan

CITY OF CAMAS

CLARK COUNTY, WASHINGTON

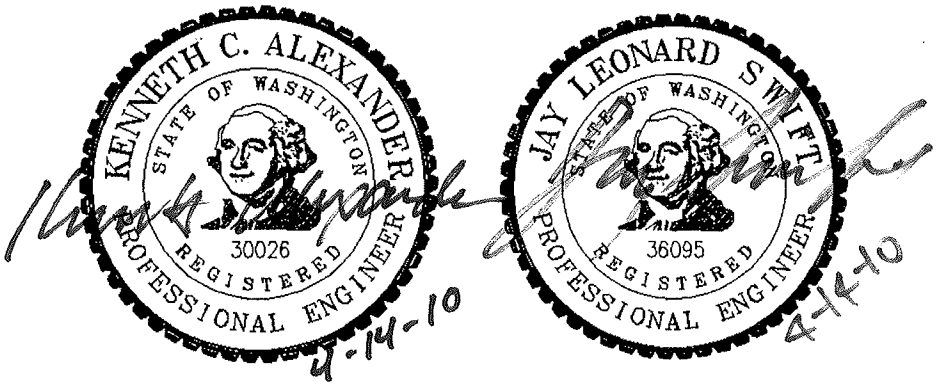
GENERAL SEWER PLAN AMENDMENT

G&O No. 05471.01
APRIL 2010

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT



April 2010

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TABLE OF CONTENTS

CHAPTER 1 – REVISED SEWER SERVICE AREA AND LAND USE

INTRODUCTION 1-1
NORTH URBAN GROWTH AREA EXPANSION 1-1
GRASS VALLEY COMMERCIAL DEVELOPMENT 1-2
CAMAS WATER SYSTEM AND NUGA WATER SERVICE 1-2

CHAPTER 2 – REVISED PLANNING DATA

INTRODUCTION 2-1
WATER SYSTEM DEMANDS AND EQUIVALENT RESIDENTIAL UNITS 2-1
WASTEWATER FLOWS, LOADINGS, AND EQUIVALENT RESIDENTIAL UNITS 2-5

CHAPTER 3 – REVISED COLLECTION SYSTEM ANALYSIS

NUGA BASINS 3-1
NUGA FLOWS AND PUMP STATION REQUIREMENTS 3-1
EXISTING COLLECTION SYSTEM MODEL RESULTS 3-3
Sewer System Infrastructure Cost Estimates 3-5
GRASS VALLEY 3-6

CHAPTER 4 - REVISED WASTEWATER TREATMENT FACILITY EVALUATION

DESIGN CRITERIA 4-1
PLANNED PHASE II WWTF IMPROVEMENTS 4-2
NPDES Waste Discharge Permit 4-3
LIQUID STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA 4-3
Headworks 4-6
Primary Clarifiers 4-6
Aeration Basins and Aeration System Capacity 4-6
Biological Selectors 4-9
Alkalinity Addition System 4-10
Secondary Clarifiers 4-11
Clarifier Overflow Rate 4-11
Solids Loading Rate 4-11
Effluent Filters 4-13
Plant Effluent Flow Meter 4-13
Ultraviolet Disinfection System 4-13
Effluent Pumps 4-14
Outfall 4-14
SOLIDS STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA 4-15
WAS Holding Tank 4-17
Centrate Holding Tank 4-18
Primary Sludge Pumps, Grit Classifier and Gravity Thickener 4-18
WAS Rotary Screen Thickener 4-18

Anaerobic Digesters and Sludge Holding Tank 4-18
Sludge Dryer 4-20
Odor Contorl Biofilter and Fan 4-20
Septage Storage Tank 4-20
Electrical and SCADA Systems 4-24
Recommended WWTF Plan 4-25
SOURCE CONTROL PROGRAM 4-27
Significant Industrial Users 4-27
Industrial Pretreatment Tracking Program 4-29

CHAPTER 5 – REVISED EVALUATION OF REUSE

INTRODUCTION 5-1
REGULATIONS CONCERNING REUSE 5-1
WATER RIGHTS 5-2
CURRENT WATER SYSTEM 5-4
POTENTIAL FOR REUSE 5-4
Industrial Process Water 5-4
Irrigation 5-6
Mitigation Wetlands Bank 5-7
Stream Flow Augmentation 5-8
EVALUATION OF ALTERNATIVES 5-9
Alternative No. 1 – Modify the Existing WWTF for a Reuse Application of Irrigation and Industrial Process Water 5-9
Conceptual Design and Cost Estimate 5-10
Alternative No. 2 – Construct a Satellite Water Reclamation Facility for a Reuse Application of Industrial Process and Irrigation 5-14
Conceptual Design and Cost Estimate 5-14
FEASIBILITY OF REUSE 5-20
Benefits of Reuse 5-20
Economic Feasibility 5-21

CHAPTER 6 – FINANCIAL ANALYSIS

LIST OF TABLES

No.	Table	Page
1-1	Land Use Summary City of Camas	1-4
2-1	Non-NUGA Demand Projections – Water	2-2
2-2	NUGA Demand Projections – Water	2-3
2-3	Total Demand Projections – Water	2-3
2-4	Non-NUGA ERU Projections – Water	2-4
2-5	NUGA ERU Projections – Water	2-4
2-6	Total ERU Projections – Water	2-5
2-7	Non-NUGA ERUs and Sewer Flows 2005 – 2025	2-6
2-8	Comparison of Water and Sewer ERUs for Non-NUGA Service Area	2-7
2-9	NUGA Flow and ERU Projections – Sewer	2-8
2-10	Projected Flows 2015 and 2025 – Sewer	2-10
2-11	Projected Loadings 2015 and 2025 – Sewer	2-11
2-12	Total ERUs – Sewer	2-11
2-13	Comparison of Water and Sewer ERUs for Full Service Area	2-12
3-1	Projected 2025 NUGA Basin Flows	3-2
3-2	Projected NUGA Basin Pump Station and Force Main Requirements	3-2
3-3	Summary of Model Results for Existing Sewer Collection System Downstream of NUGA	3-4
3-4	NUGA and Lacamas Creek Sewage Pump Station Preliminary Cost Estimates (2009 Dollars)	3-5
3-5	NUGA and Crown Road Sewer Transmission Main Preliminary Cost Estimates (2009 Dollars)	3-6
3-6	NUGA Sewer Infrastructure Preliminary Cost Estimate Summary (2009 Dollars)	3-6
4-1	Current and Projected Future Flows and Loadings	4-1
4-2	Projected NPDES Permit Effluent Limits	4-2
4-3	Comparison of Liquid Stream Treatment Component Design Criteria and Projected Flow Loadings	4-4
4-4	Activated Sludge Process Design Criteria	4-7
4-5	Evaluation of Oxygen Demand with Three Existing Blowers in Service	4-9
4-6	WWTF Design Criteria for Solids Treatment (Year 2025)	4-15
4-7	Comparison of Solids Treatment Component Design Criteria and Projected Flows and Loadings	4-16
4-8	Design Year 2025 WWTF Project Cost Estimate (2009 Dollars)	4-26
4-9	WWTF O&M Cost Estimate (Design Year 2025)	4-27
5-1	City of Camas Water Rights Summary	5-3
5-2	City of Camas Highest Water Users	5-5
5-3	Potential Reclaimed Water Usage Rates	5-7
5-4	Alternative No. 1 – Modify Existing WWTF for Production of Reclaimed Water Treatment Costs (2009 Dollars)	5-13

No.	Table	Page
5-5	Alternative No. 1 – Modify Existing WWTF for Reclaimed Water Distribution Costs (2009 Dollars)	5-13
5-6	Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water, Treatment Costs (2009 Dollars)	5-19
5-7	Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water, Distribution Costs (2009 Dollars)	5-20
5-8	Comparison of Reuse Alternatives (2009 Dollars)	5-22

LIST OF FIGURES

No.	Figure	Follows Page
1-1	Sewer Service Area Prior to December 2007	1-2
1-2	Current Sewer Service Area	1-2
1-3	Land Use Map	1-2
1-4	Grass Valley Area and Surface Water/Wetlands Map	1-3
1-5	Water System Facilities	1-4
3-1	NUGA Sewer Conveyance System Infrastructure	3-2
3-2	NUGA Temporary Sewer Conveyance Infrastructure	3-2
3-3	Existing Downstream Sewer System	3-4
4-1	WWTF Site Plan	4-26
4-2	WWTF Process Flow Diagram	4-26
4-3	WWTF Hydraulic Profile	4-26
5-1	Reclaimed Water Distribution System Alternatives	5-6

APPENDICES

Appendix A – SEPA Checklist
Appendix B – Camas Sewer System Hydraulic Data
Appendix C – Cost Estimates
Appendix D – WWTF Mass Balance
Appendix E – Mixing Zone Study
Appendix F – Utilities Rate Study

CHAPTER 1

REVISED SEWER SERVICE AREA AND LAND USE

INTRODUCTION

This amendment to the City of Camas General Sewer and Wastewater Facility Plan has been prepared to address revisions to the City's north urban growth area (NUGA) boundary as well as a new commercial development in the Grass Valley portion of the City's service area. These revisions will impact both the sewer collection system and treatment facilities as well as potential strategies for wastewater reuse within the City. The new wastewater collection and conveyance facilities in the NUGA will be operated by the City; construction will be funded, in part, by NUGA developers and System Development Charges (SDCs).

The first chapter of this amendment describes changes to the City's urban growth boundaries and land use patterns. The second chapter presents revised flows due to the NUGA expansion and Grass Valley commercial development. The third chapter presents an evaluation of the sewer collection system requirements associated with the NUGA expansion and Grass Valley development. The fourth chapter covers associated impacts to the City's wastewater treatment facilities and the fifth chapter provides a discussion of potential water reuse strategies resulting from additional flows from the NUGA expansion. The sixth chapter provides an analysis of funding strategies to finance recommended wastewater system capital improvements to accommodate the projected growth.

This first chapter identifies the revisions to the sewer service area that were originally presented in the May 2007 *City of Camas General Sewer and Wastewater Facility Plan* (as revised and approved in November 2009). The previous sewer service area is shown in Figure 1-1. These changes are required due to the north urban growth area (NUGA) expansion as well as a prospective commercial development in the Grass Valley area.

This Plan Amendment is consistent with the Federal Water Pollution Control Act, State Environmental Policy Act (SEPA) and the federal National Environmental Policy Act (NEPA). A copy of the SEPA checklist is included in Appendix A. A NEPA Environmental Report will be produced in the future when more details of the locations and character of the new facilities are known, if a federal nexus is identified or federal funding is sought.

NORTH URBAN GROWTH AREA EXPANSION

On December 17, 2007, the City adopted a new urban growth are (UGA) boundary in its Comprehensive Plan. The new urban growth boundary and City limits are shown in Figure 1-2. Land use areas associated with the NUGA expansion are shown in

Figure 1-3. The new UGA boundary becomes the City's effective sewer service area. Table 1-1 presents a land use summary for the Camas UGA with and without the NUGA expansion.

The majority of the NUGA expansion is devoted to residential development, but a substantial portion of the expansion is intended to support commercial, light industry and business park development. Over 1,700 acres of the NUGA expansion is designated for new residential development and more than 640 acres is set aside for commercial and light industry/business park (LI/BP).

Subtracting parks, streets, utilities, wetlands, steep slopes from the area yields 1,129 net developable acres out of a total acreage of 2,349 acres in the NUGA expansion. This includes 722 acres for residential, 66 acres for commercial and 340 acres for light industry/business park.

GRASS VALLEY COMMERCIAL DEVELOPMENT

Grass Valley is an area of west Camas along 38th Street and west of Parker Avenue that is the subject of significant potential commercial development activity. The area currently includes undeveloped grassland, substantial wetlands and some residential development; however, construction of two major office complex and mixed use developments, Fisher Investments and Eiford Properties, are planned in the Grass Valley area within the next 5 years. Figure 1-4 shows the Grass Valley area, including the existing wetlands. The City has signed a pre-annexation development agreement with the developers. The Fisher Investment development alone includes plans for three 100,000 square foot office buildings and 1,000 employees.

As shown in Figure 1-3, the majority of the property in this area is designated for light industrial/business park or commercial. The entire Grass Valley area shown in Figure 1-4 includes 641 acres of which 248 are wetlands unsuitable for development. The remaining 360 acres are considered developable.

CAMAS WATER SYSTEM AND NUGA WATER SERVICE

The construction of wastewater collection, conveyance and treatment facilities to serve the NUGA and Grass Valley must be coordinated with expansion of the City's water system. The City of Camas owns and operates water source, treatment, transmission, distribution, and storage facilities. The water system serves the entire City limits and much of the UGA. Figure 1-5 shows the City's current water system facilities. Future improvements are needed to provide transmission and distribution capacity for the NUGA. These proposed improvements are described in the City's current Water System Plan.

The new Crown Road Booster Pump Station has already been designed, and will pump from the Washougal Wellfield to serve areas to the northern and western edges of the

N

0 2,500 5,000 Feet

LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON
OREGON

WWTF
OUTFALL

TO TWO CREEKS P.S.
LACAMAS SHORES P.S.
LARKSPUR P.S.
SW ERTSEON P.S.
UNDERWATERS P.S.
SKYRIDGE P.S.
GRASS VALLEY P.S.
SUNNINGDALE GARDENS P.S.
PARKER ESTATES P.S.
FITNESS CENTER P.S.
SUMMIT OAKS P.S.
PRUNE HILL PARK P.S.
CROWN VIEW P.S.
BAT P.S.
C SECT P.S.
STONE LEA F.P.S.
HERAEUS P.S.
FURUNO P.S.
LINEAR P.S.
WINCHESTER HILLS P.1 P.S.
WINCHESTER HILLS P.2 P.S.
SHARP P.S.
HILLSHIRE P.S.
KASTRUP P.S.
GRAND RIDGE P.S.
CENTENNIAL P.S.
SOUTH PRUNE HILL P.S.
WEST CAMAS P.S.
MAIN LIFT STATION
LACAMAS CREEK P.S.
ONE STOP P.S.
OAK PARK P.S.
WWTF

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- Gravity
- Force Main
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- 10' CONTOURS
- PARCELS

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-1
SEWER SERVICE AREA
PRIOR TO DECEMBER 2007

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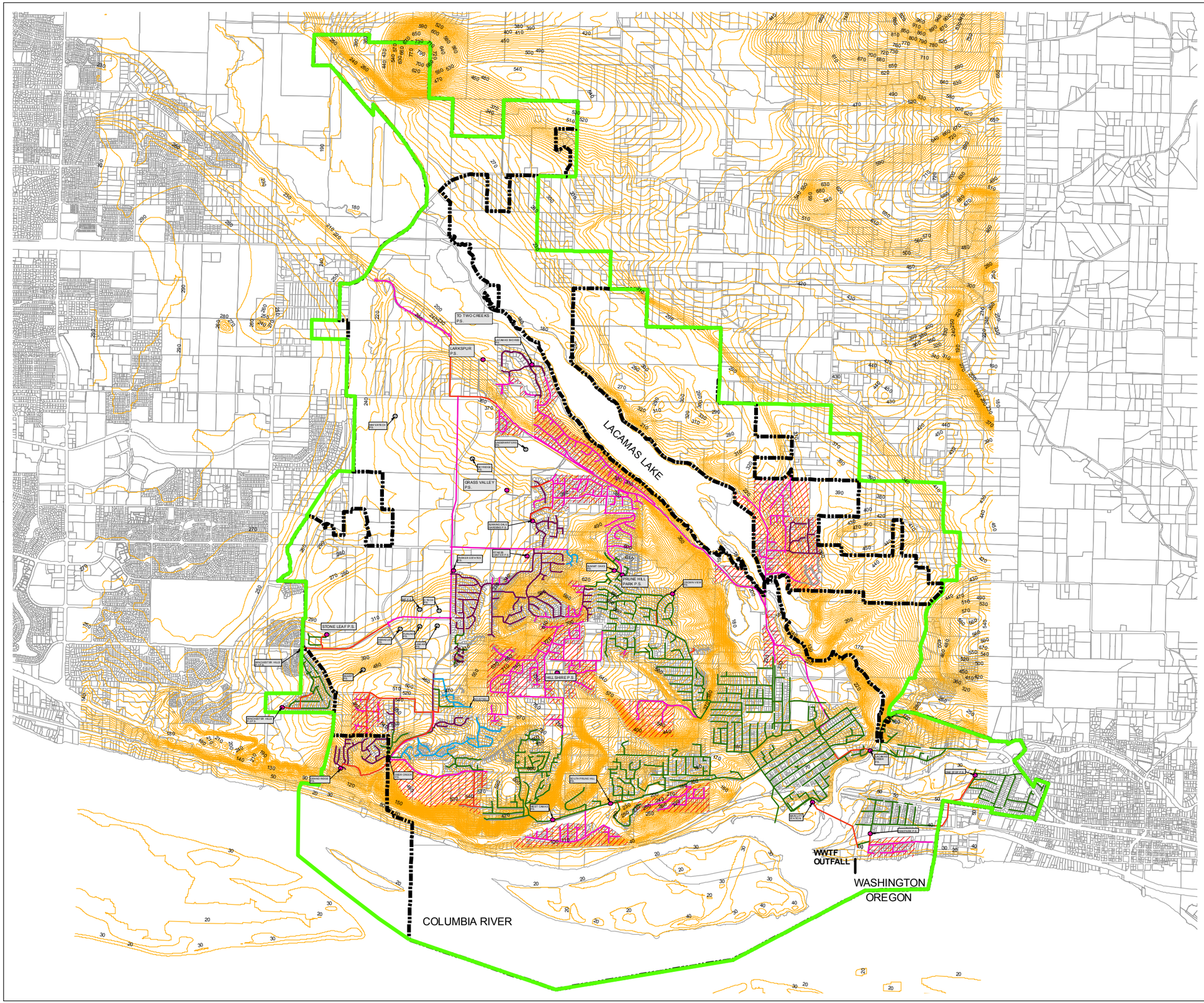
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\FIG1-1.MXD



N

0 2,500 5,000 Feet

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- GRAVITY
- FORCE MAIN
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- 10' CONTOURS
- PARCELS

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-2
CURRENT SEWER SERVICE AREA

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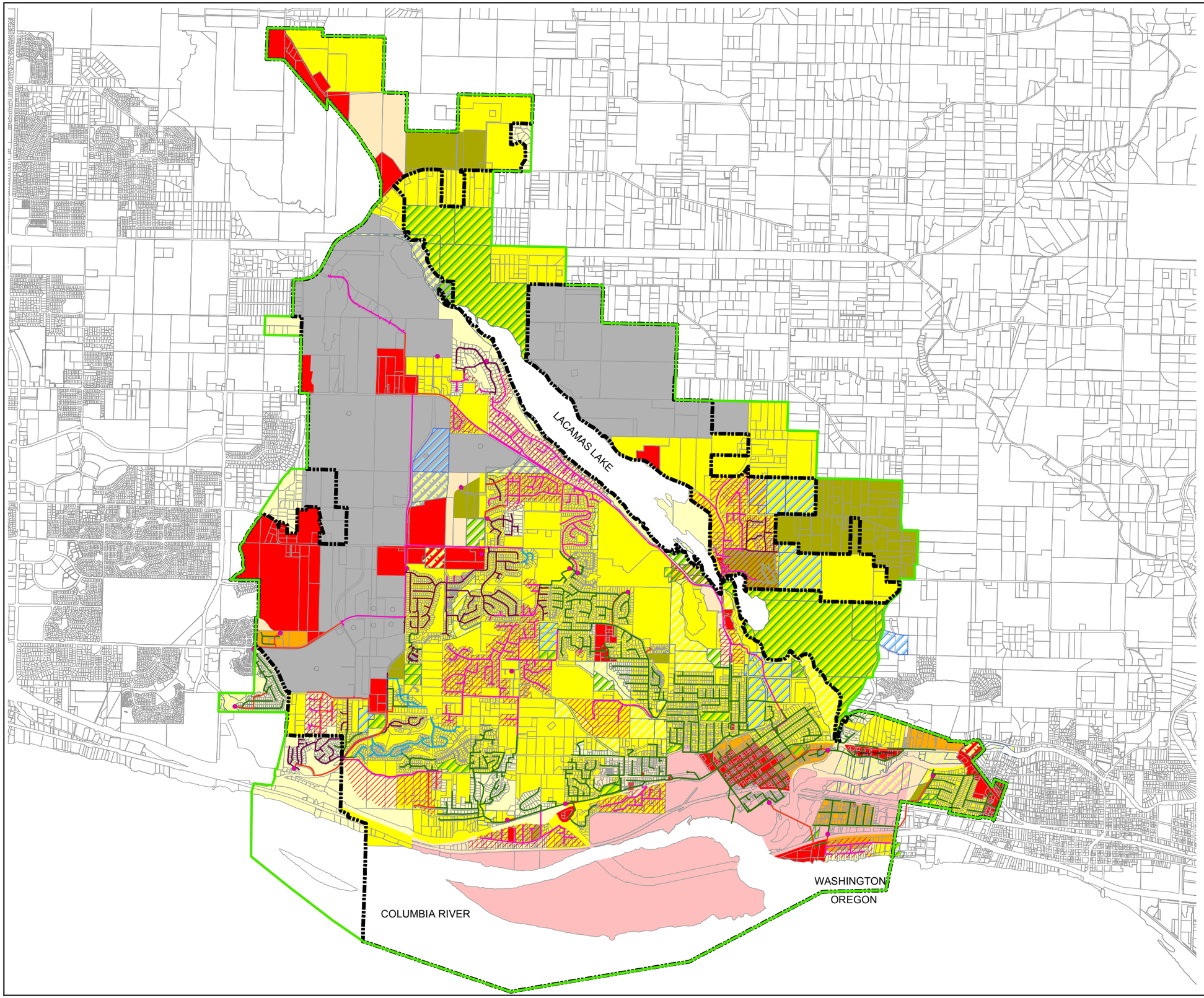

N

0 3,400 6,800 Feet

LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- PUMP STATION (PRIVATE)
- PUMP STATION (PUBLIC)
- GRAVITY
- FORCE MAIN
- STEP
- STEF
- STEG
- SEWER PIPES
- STEP SYSTEM AREA (EXISTING)
- SCHOOL PROPERTY
- PARK
- GREEN SPACE
- PARCELS

CITY OF CAMAS LAND USE:

- SINGLE-FAMILY - LOW
- SINGLE-FAMILY-MED
- SINGLE-FAMILY - HIGH
- MULTI-FAMILY-LOW
- MULTI-FAMILY-HIGH
- COMMERCIAL
- LIGHT INDUSTRIAL / BUS. PARK
- INDUSTRIAL

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-3
LAND USE MAP

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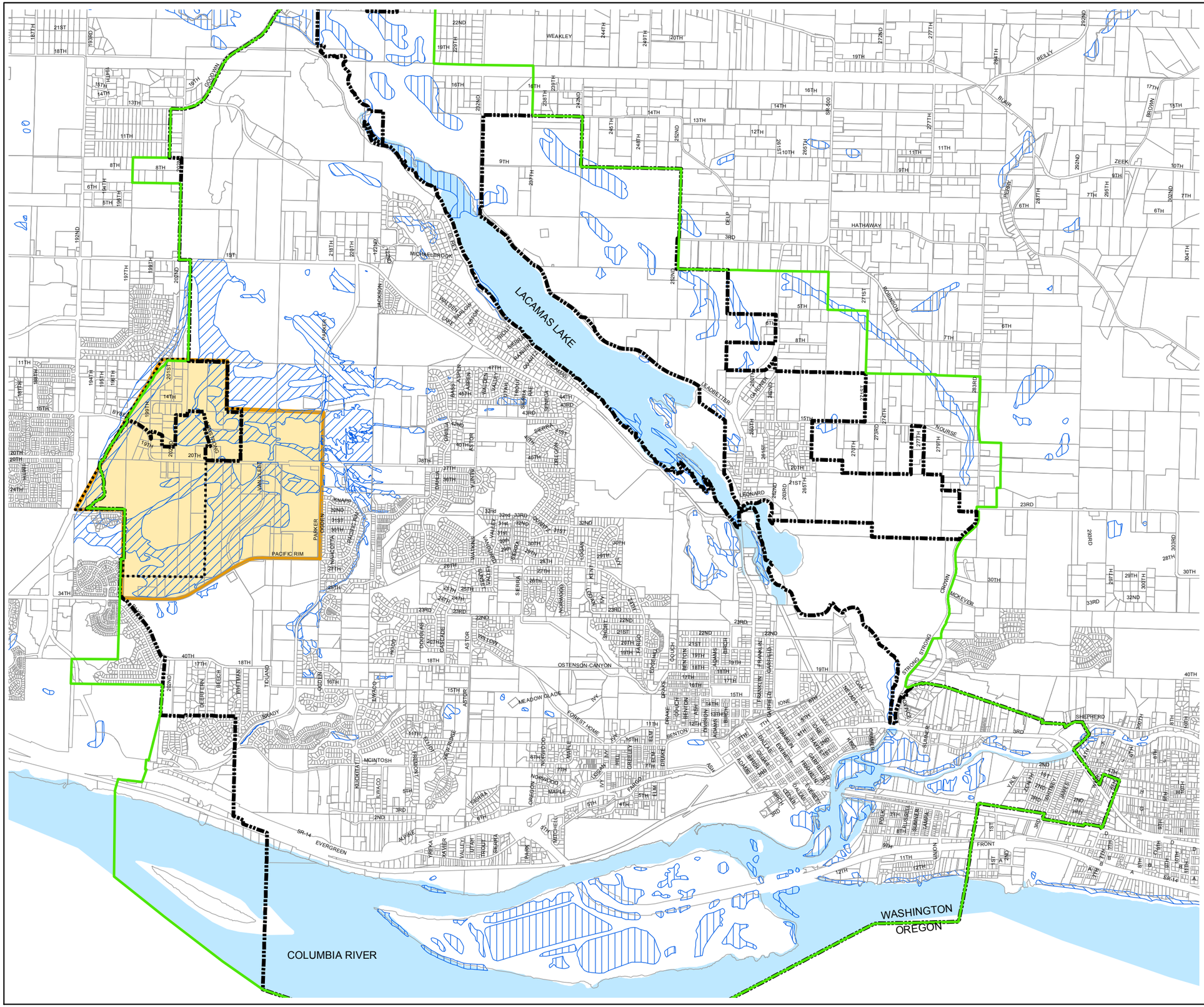
L:\CAMAS\05471 WW FAC PLAN\GIS\FIG1-3.MXD



LEGEND:

- CITY LIMITS
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- PARCELS
- GRASS VALLEY AREA
- WATER

WETLANDS:

- 1988 NWI
- PMX
- Delineated

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-4
GRASS VALLEY AREA AND CITY-WIDE
SURFACE WATERS / WETLANDS MAP

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UGA. Transmission mains will need to be constructed with the Crown Road Booster Station. Approximately 5,400 feet of 24-inch transmission main is required from the discharge of the booster station to the intersection of SE 283rd Avenue and NE Norse Road. Additionally, transmission mains must be constructed within the NUGA to connect the Gregg NUGA and the Green Mountain NUGA. Approximately 24,800 feet of 24-inch transmission main is required to directly connect these portions of the NUGA. If this improvement is not made, then growth in the NUGA will be limited by the Lacamas Booster Station. In order to meet demands, the suction side transmission main to the Lacamas Booster Station must be upgraded to increase the capacity of the booster station. While Lacamas Booster Station has source capacity as currently configured, suction side improvements will be required to serve NUGA growth if the transmission main around the north side of the lake is not installed. Approximately 5,000 feet of 20-inch DI transmission main must be replaced if the NUGA transmission main is not constructed. The remaining portions of the NUGA will be served by approximately 32,500 feet of 16-inch DI transmission main. These improvements are dependent on growth within the NUGA and are placed in the 20-year planning period.

TABLE 1-1

Land Use Summary City of Camas

CAMAS LESS NORTH UGA	Total (acres)	Parks (acres)	Green Space (acres)	Schools (acres)	Municipal (acres)	Steep Slopes (acres)	Wetlands (acres)	Wetlands/ Parks Overlap (acres)	Steep Slope/ Parks Overlap (acres)	Net Developable (acres)	Less Streets and Utiltiies (acres)
COMMERCIAL	601.02	0.00	0.00	0.00	0.00	0.34				601.02	
INDUSTRIAL	978.51	0.00	0.00	0.00	0.00	6.76				978.51	
LI/BP	1473.09	0.00	0.00	0.00	0.00	33.24				1473.09	
MULTI FAMILY HIGH	153.80	0.00	0.00	0.00	36.24					117.56	
MULTI FAMILY LOW	240.14	0.00	0.00	0.00	0.00					240.14	
SINGLE FAMILY HIGH	98.00	0.00	0.00	0.00	0.00					98.00	
SINGLE FAMILY LOW	617.33	0.00	0.00	0.00	0.00	390.83				617.33	
SINGLE FAMILY MEDIUM	3360.89	146.34	415.61	233.18	0.00					2565.76	
TOTAL LESS NORTH UGA EXPANSION	7522.77									6691.40	
NORTH UGA EXPANSION											
COMMERCIAL	89.39	0.00	0.00	0.00	0.00	0.82				88.57	66.43
LI/BP	551.39	0.00	0.00	0.00	0.00	34.53	62.56			454.30	340.73
MULTI FAMILY LOW	97.10	0.00	0.00	0.00	0.00					97.10	70.39
SINGLE FAMILY HIGH	347.10	0.00	0.00	0.00	0.00		15.51			331.59	240.40
SINGLE FAMILY LOW	62.07	0.00	0.00	0.00	0.00		3.67			58.40	42.34
SINGLE FAMILY MEDIUM	1202.41	646.10	0.00	0.00	0.00	99.52	103.94	86.44	69.58	508.86	368.93
TOTAL NORTH UGA EXPANSION	2349.45									1538.82	1129.21
ENTIRE CAMAS LANDUSE											(% of Total)
COMMERCIAL	690.41	0.00	0.00	0.00	0.00					690.41	6.99
INDUSTRIAL	978.51	0.00	0.00	0.00	0.00					978.51	9.91
LI/BP	2024.48	0.00	0.00	0.00	0.00					2024.48	20.51
MULTI FAMILY HIGH	153.80	0.00	0.00	0.00	36.24					117.56	1.19
MULTI FAMILY LOW	337.23	0.00	0.00	0.00	0.00					337.23	3.42
SINGLE FAMILY HIGH	445.09	0.00	0.00	0.00	0.00					445.09	4.51
SINGLE FAMILY LOW	679.40	0.00	0.00	0.00	0.00					679.40	6.88
SINGLE FAMILY MEDIUM	4563.30	792.44	415.61	233.18	0.00					3122.07	31.62
TOTAL ENTIRE CAMAS LAND USE	9872.22	792.44	415.61	233.18	36.24					8394.75	85.03

N

0 4,000 8,000 Feet

WTP

BUTLER RESERVOIR

GREGG BPS

GREGG RESERVOIR

LACAMAS BPS

LACAMAS RESERVOIR

LACAMAS LAKE

WELL 9

WTP

ANGELO BPS

LOWER PRUNE HILL RESERVOIRS AND BPS

WELL 13

WASHOUGAL WELLFIELD WELLS 7, 8, 10, 11, 12

SR14

UPPER PRUNE HILL RESERVOIRS AND BPS

WELL 14

FRANCIS RD BPS

FOREST HOME BPS

WELL 6

WELL 5

WASHINGTON

OREGON

COLUMBIA RIVER

LEGEND:

- Reservoir
- Pump Station
- WTP Water Treatment
- W Wells
- Water Lines
- WATER SERVICE BOUNDARY
- URBAN GROWTH BOUNDARY
- URBAN RESERVE
- CITY LIMITS
- PARCELS

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 1-5
WATER SYSTEM FACILITIES

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CONSULTING ENGINEERS

L:\CAMAS\05471\GIS\FIGURE3-3_new.MXD

CHAPTER 2

REVISED PLANNING DATA

INTRODUCTION

This chapter presents revised sewer flow projections based on the addition of the north urban growth area (NUGA) expansion to the sewer service area. Additionally, this chapter addresses additional sewer flows from the Grass Valley area due to higher commercial development in that area than what was projected in the May 2007 *General Sewer and Wastewater Facility Plan.*

WATER SYSTEM DEMANDS AND EQUIVALENT RESIDENTIAL UNITS

These flows have been derived based on water demands developed in the City's May 2009 draft *Water System Plan*. Table 2-1 provides a summary of projected water demands used to develop sewer flows for the non-NUGA area; these demands account for development in Grass Valley. Table 2-2 presents water demand projections for the NUGA expansion. Table 2-3 summarizes all water demand projections.

Tables 2-4 through 2-9 provide a breakdown of equivalent residential units (ERUs) for the water system as of 2007. These tables were prepared in order to develop a comparison between the water and sewer service ERUs later in this Chapter and assist the City's financial consultant perform a rate analysis for the two utilities, which is summarized in Chapter 6.

TABLE 2-1

Non-NUGA Demand Projections – Water

Year	Non-NUGA Population	Residential, Commercial, and City Demand[1] (gpd)	Industrial Demand[2] (gpd)	DSL @ 11%[3] (gpd)	Total ADD[4] (gpd)	MDD[5] (gpd)	PHD[6] (gpm)
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2015	19,994	2,839,153	1,948,762	591,765	5,379,679	11,835,295	14,794
2025	25,858	3,671,809	2,830,000	803,594	7,305,404	16,071,888	20,090
2028	27,932	3,966,318	2,830,000	839,994	7,636,312	16,799,887	21,000

(1) Non-NUGA Population * 142 gpcd, 142 gpcd is equal to the average of total production from 2005 to 2007 less industrial demand and DSL, divided by the population. Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 gpd for Wafertech.

(2) Spread linearly based on buildout by 2025. Total of 710 acres, and 3,000 gallons per day per acre, plus 700,000 for Wafertech.

(3) DSL = Distribution System Leakage = Total ADD * 0.11.

(4) ADD = Average Day Demand - Sum (Residential, Commercial, City, and Industrial Demand) ÷ 0.89.

(5) MDD = Maximum Day Demand = ADD * 2.2.

(6) PHD = = Peak Hour Demand = MDD * 1.8 / (24 * 60).

TABLE 2-2

NUGA Demand Projections – Water

Year	NUGA Population	Residential Demand[(1)] (gpd)	LI/BP Demand[(2)] (gpd)	Commercial Demand[(3)] (gpd)	DSL @ 11%[(4)] (gpd)	Total ADD[(5)] (gpd)	MDD[(6)] (gpd)	PHD[(7)] (gpm)
2009	-	-	-	-	-	-	-	-
2010	-	-	-	-	-	-	-	-
2011	777	90,186	4,286	2,923	12,038	109,433	240,753	301
2015	3,887	450,931	21,432	14,615	60,188	547,165	1,203,764	1,505
2025	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514
2028	11,662	1,352,792	64,296	43,844	180,565	1,641,496	3,611,292	4,514

(1) Linearly distributed based on a total buildout population of 11,662 (see G&O memo of August 7, 2008) and 116 gpcd. 116 gpcd is equal to the average residential consumption from 2005 to 2007, divided by the population.

(2) Linearly distributed based on total employees on the developable acreage, 2,819 (determined from the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 18 gpd/employee from the *Washington DOH Water System Design Manual*.

(3) Linearly distributed based on the developable acreage, 66.4 (total commercial acreage determined from the G&O memo of July 23, 2008, and reduced by 25 percent to account for infrastructure as stated in the *North UGA Expansion Water and Sewer Infrastructure Analysis* by Gray & Osborne in September 2007) and 660 gpd/acre for commercial use. This value (660 gpd/acre was determined based on the average commercial water use in 2007, 150,000 gpd, over the existing 227 commercial acres in the City (150,000 / 227 = 660 gpd/acre).

(4) DSL = Total ADD * 0.11.

(5) NUGA Total ADD = Sum(Residential , LI/BP, and Commercial Consumption) / 0.89.

(6) NUGA MDD = NUGA ADD * 2.2.

(7) NUGA PHD = NUGA MDD * 1.8 / (24 * 60).

TABLE 2-3

Total Demand Projections[(1)] – Water

Year	Total Population	Total Residential, Commercial, LI, and BP Demand (gpd)	Total Industrial Demand (gpd)	Total DSL @ 11% (gpd)	Total ADD (gpd)	Total MDD (gpd)	Total PHD (gpm)
2009	17,135	2,433,178	1,364,874	469,422	4,267,475	9,388,444	11,736
2010	17,581	2,496,566	1,462,189	489,284	4,448,039	9,785,686	12,232
2011	18,817	2,659,001	1,559,503	521,388	4,739,892	10,187,386	253,487
2015	23,881	3,326,130	1,948,762	651,953	5,926,845	11,837,176	1,218,558
2025	37,520	5,132,741	2,830,000	984,159	8,946,900	16,077,531	3,631,382
2028	39,594	5,427,250	2,830,000	1,020,559	9,277,809	16,805,530	3,632,292

(1) The sum of Non-NUGA Demands from Table 2-1, and NUGA Demands from Table 2-2.

Tables 2-4 through 2-6 project ERUs for the City through the water system 20-year planning period. These projections are based on an average ERU value from 2004 to 2007, which was determined to be 296 gpd/ERU.

TABLE 2-4

Non-NUGA ERU Projections – Water

Year	Residential[(1)]	Commercial[(2)]	City[(3)]	Irrigation[(4)]	Industrial[(5)]	DSL @11%[(6)]	Total ERUs[(7)]
2009	6,823	575	82	740	4,611	1,586	14,417
2010	7,001	590	84	759	4,940	1,653	15,027
2011	7,183	606	87	779	5,269	1,721	15,643
2015	7,961	671	96	863	6,584	1,999	18,175
2025	10,296	868	124	1,116	9,561	2,715	24,680
2028	11,122	938	134	1,206	9,561	2,838	25,798

(1) Residential ERUs = SF + MF ERU percentage from Table 4 (0.83)* third column in Table 2-1.
(2) Commercial ERUs = Commercial ERU percentage from Table 4 (0.07) * third column in Table 2-1.
(3) City ERUs = City ERU percentage from Table 4 (0.01) * third column in Table 2-1.
(4) Irrigation ERUs = Irrigation ERU percentage from Table 4 (0.09) * third column in Table 2-1.
(5) Industrial ERUs = Industrial Demand from Table 2-1, Column 4 / 296 gpd per ERU.
(6) DSL ERUs = DSL Demand from Table 2-3, Column 5 / 296 gpd per ERU.
(7) Total ERUs = sum of Residential, Commercial, City, Irrigation, Industrial, and DSL ERUs.

TABLE 2-5

NUGA ERU Projections – Water

Year	Residential[(1)]	LI/BP[(2)]	Commercial[(3)]	DSL @ 11%[(4)]	Total ERUs[(5)]
2009	-	-	-		-
2010	-	-	-		-
2011	305	14	10	41	370
2015	1,523	72	49	203	1,849
2025	4,570	217	148	610	5,546
2028	4,570	217	148	610	5,546

(1) Residential ERUs = Residential Demand from Table 2, Column 3 / 296 gpd per ERU.
(2) LI/BP ERUs = LI/BP Demand from Table 2, Column 4 / 296 gpd per ERU.
(3) Commercial ERUs = Commercial Demand from Table 2, Column 5 / 296 gpd per ERU.
(4) DSL ERUs = DSL Demand from Table 2, Column 6 / 296 gpd per ERU.
(5) Total ERUs = Sum of Residential, LI/BP, Commercial, and DSL ERUs.

TABLE 2-6

Total ERU Projections[(1)] – Water

Year	Residential	Commercial	Industrial, LI, and BP	City	Irrigation	DSL	Total ERUs
2009	6,823	575	4,611	82	740	1,586	14,417
2010	7,001	590	4,940	84	759	1,653	15,027
2011	7,488	616	5,283	87	779	1,761	16,013
2015	9,485	721	6,656	96	863	2,203	20,023
2025	14,866	1,016	9,778	124	1,116	3,325	30,226
2028	15,692	1,086	9,778	134	1,206	3,448	31,344

(1) Sum of Non-NUGA ERU projection from Table 6 and NUGA ERU projections from Table 7.

WASTEWATER FLOWS, LOADINGS AND EQUIVALENT RESIDENTIAL UNITS

Table 2-7 was developed from Table 6-11 from the City of Camas May 2007 *General Sewer and Wastewater Facility Plan.* In the *2007 Plan*, the projected flows and ERUs are based on use of the growth assumptions applied to all customer classes except the industrial category. Projected future industrial flows were developed based on evaluation of each major industry's permitted capacity. In addition, a special industrial reserve of 0.7 mgd for 2015 and 1.4 mgd for 2025 was included for low strength wastewater (less than 8 mg/L BOD_5, 10 mg/L TSS, and 10 mg/L TKN). I/I was assumed to be constant for the non-NUGA area throughout the period. (In other words, increases in I/I due to the addition of new pipes and deterioration of old pipes are assumed to equal to decreases in I/I due to ongoing I/I reduction efforts.) Future WWTF flows were projected based on a dry weather flow of 149 gpd/ERU. To estimate future annual average, maximum month, and peak day flows, the I/I flow rates were added to the base level wastewater flows derived from the population projections to obtain the respective future WWTF influent flow rates.

A comparison of the current population and ERU projections for both the water and sewer utilities within the non-NUGA service area is shown in Table 2-8 for the years 2015 and 2025. For the NUGA portion of the service area, water demands in Table 2-2 were converted to sewer flows. As indicated in note (1) of Table 2-2, a per capita water demand of 116 gpcd was used for the NUGA area residential demand projects (does not include DSL).

The per capita sewer base flows (flows without I/I) can be estimated from information provided in the May 2007 *General Sewer and Wastewater Facility Plan*. The residential sewer flows are estimated from 2004-2005 winter water demands of 1,111,000 gpd from an estimated service population of 15,710 as 70.7 gpcd. Flows from non-residential sources are estimated in a similar manner used in the May 2007 *General Sewer and Wastewater Facility Plan* by assuming that on average 15 percent of the projected water

consumption is lost to irrigation, evaporation and spills. Table 2-9 summarizes NUGA flow and ERU projections for the sewer utility.

TABLE 2-7

Non-NUGA ERUs and Sewer Flows 2005 – 2025

Customer Type	Sewer ERUs			
	2005 (Actual)	**2015 (Projected)**	**2025 (Projected)**	**Buildout[(2)]**
Single-Family Residential	5,613	8,363	9,205	13,608
Multi-family Residential	729	1,086	1,196	7,546
Commercial	652	972	1,070	2,176
Industrial	6,224	9,857	12,556	25,537
City	52	77	85	173
TOTAL	13,270	20,356	24,112	49,039
Projected Flows (mgd)[(1)]				
Total Base Flow	1.98	3.03	3.59	7.31
Low-strength Industrial Reserve	0	0.70	1.40	Included in Industrial ERUs
Average Annual Flow	2.29	4.04	5.30	7.62
Maximum Month	3.09	4.84	6.10	8.42
Peak Day	7.03	8.78	10.04	12.36
Peak Hour	9.93[(3)]	11.47	13.44	17.06

(1) I/I assumed to remain constant during planning period. However, currently "constrained I/I" is projected to reach WWTP in future. See Note 3.

(2) Buildout ERUs and flows assume that commercial, industrial and City ERUs grow at the same rate as the overall population.

(3) Includes an estimated 1.1 mgd of "constrained I/I" that did not reach the WWTP during the peak hour storm event that would be expected to reach the WWTP after increasing pipe sizes.

TABLE 2-8

Comparison of Water and Sewer ERUs for Non-NUGA Service Area

Parameter	Year			
	2015		2025	
	Water	Sewer	Water	Sewer
Population	19,994	23,375	25,858	25,821
Residential ERUs	7,961	9,449	10,296	10,401
Commercial ERUs	671	972	868	1,070
Industrial ERUs	6,584	9,857	9,561	12,556
City ERUs	96	77	124	85
Irrigation ERUs	863	n/a	1,116	n/a
Distribution System Leakage ERUs	2.203	n/a	3.325	n/a
Grass Valley (Sewer Only)	(1)	1,206	(1)	2,413
Total ERUs	18,715	21,561	24,680	26,525

(1) Grass Valley Water Demands have been incorporated into residential and commercial demands.

TABLE 2-9

NUGA Flow and ERU Projections - Sewer

Year	NUGA Population	Residential Flow[(1)] (gpd)	LI/BP Flow[(2)] (gpd)	Commercial Flow[(2)] (gpd)	Total Base Flow (gpd)	Sewer ERUs[(3)]	Water ERUs[(4)]
2009	-	-	-		-	-	-
2010	-	-	-		-	-	-
2011	777	46,694	3,097	2,112	51,903	348	370
2012	1,555	93,448	6,194	4,224	103,865	697	739
2013	2,332	140,142	9,291	6,336	155,768	1,045	1,109
2014	3,110	186,895	12,388	8,447	207,731	1,394	1,479
2015	3,887	233,589	15,484	10,560	259,633	1,743	1,849
2016	4,665	280,343	18,581	12,671	311,595	2,091	2,218
2017	5,442	327,037	21,678	14,782	363,498	2,440	2,588
2018	6,220	373,791	24,775	16,895	415,460	2,788	2,958
2019	6,997	420,485	27,872	19,006	467,363	3,137	3,327
2020	7,775	467,239	30,969	21,118	519,326	3,485	3,697
2021	8,552	513,932	34,066	23,230	571,228	3,834	4,067
2022	9,330	560,686	37,163	25,342	623,191	4,182	4,436
2023	10,107	607,380	40,260	27,453	675,094	4,531	4,806
2024	10,885	654,134	43,358	29,566	727,057	4,880	5,176
2025	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2026	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2027	11,662	700,828	46,454	31,677	778,959	5,228	5,546
2028	11,662	700,828	46,454	31,677	778,959	5,228	5,546

(1) NUGA Population * 70.7 gpcd * 0.85.
(2) NUGA Water demand from Table 2-2 * 0.85.
(3) Total Average Annual Flow ÷ 149 gpd/ERU.
(4) Table 2-5 – Water, Fifth Column.

Table 2-10 shows average annual, maximum day and peak hour sewer flows for the NUGA in years 2015 and 2025 based on information in Table 2-9 as well as projections for Grass Valley that were not included in the May 2007 *General Sewer and Wastewater Facility Plan.* NUGA average annual, maximum month and maximum day sewer flows were calculated by multiplying areal I/I rates based on the 2007 Plan by the 2015 and 2025 NUGA developed areas, and adding the product to the base flow. For calculation of average annual and maximum month flows, the actual average areal I/I rates for the entire City (90 gpad and 270 gpad respectively) were used to calculate NUGA flows.

For calculation of peak hour NUGA flow, a diurnal peaking factor of 2.82, and the maximum peak hour areal I/I rate (500 gpad) for areas developed within the last 25 years were used. Peak day flows were calculated as the addition of base flow and peak day I/I, using the same ratio of peak day I/I to peak hour I/I as in the *May 2007 Plan.*

Peak hour flows for the Grass Valley area were calculated based on an assumption of 3,000 gpad base flow. This areal flow rate is a conservative buildout value used by King County and other jurisdictions in estimating flows from commercial development. Peak hour I/I was calculated using the assumption of 500 gpad as was used in the calculation of NUGA flows. Projected daily average base flows were calculated based on a peak hour to peak day peaking factor of 3.0 (assuming an 8-hour workday). Maximum month, peak day, annual average and peak hour flows were calculated using the same areal I/I rates as for the NUGA. It was assumed that 50 percent of the 2025 (buildout) flow was present by 2015.

Total projected sewer flows were calculated as the sum of the non-NUGA, NUGA and Grass Valley flows for each flow category (average annual, maximum month, peak hour and maximum day).

Table 2-11 provides projections of sewer loadings for organics, solids and nitrogen. Future WWTF maximum month BOD_5 and TSS loadings were estimated by multiplying the total projected number of ERUs (including non-NUGA, NUGA and Grass Valley) by the respective ERU-based loadings, and adding additional loading for a low-strength industrial reserve as indicated below. As in the *2007 Plan,* the future ERU-based annual average BOD_5 and TSS loadings are estimated using the ratio of the maximum month to annual average loadings of these parameters. The current maximum month BOD_5 and TSS loadings are 0.229 lb BOD_5/ERU/d and 0.327 lb TSS/ERU/d. The ratio of the maximum month to annual average BOD_5 is 1.37:1. The ratio of the maximum month to annual average TSS is 1.36:1.

As in the *2007 Plan,* the strength of the combined industrial wastewater with regard to BOD_5 and TSS *for the industrial ERUs* discharged to the City is assumed to be that of domestic wastewater for this analysis. The industrial ERUs include a reserve of 0.50 mgd of domestic strength industrial wastewater beyond the NPDES-permitted maximum flows. (It is likely that the combined industrial wastewater is more dilute than domestic, but due to a lack of information regarding BOD_5 and TSS concentrations for current and future industries, use of domestic concentrations is appropriate and conservative.) However, the *industrial low-strength reserve* of 0.7 mgd for 2015 and 2025 for 1.4 mgd is assumed to be low strength (e.g., pretreated) with concentrations not exceeding 8 mg/L BOD_5, 10 mg/L TSS, and 10 mg/L TKN.

Ammonia nitrogen concentrations and loadings are estimated based on the projected number of Wafertech and non-Wafertech ERUs. Non-Wafertech TKN loadings are estimated based on a ammonia/TKN ratio of 0.62, and industrial TKN loadings are estimated based on a ammonia/TKN ratio of 0.78, based on the composition of Wafertech's wastewater.

TABLE 2-10

Projected Flows 2015 and 2025 – Sewer

Category	Year			
	2005 (Actual)	2015 (Projected)	2025 (Projected)	Buildout[2]
Non-NUGA Projected Flows (mgd)[1]				
Total Base Flow	1.98	3.03	3.59	7.31
Low-strength Industrial Reserve	0	0.70	1.40	Included in Industrial ERUs
Average Annual Flow	2.29	4.04	5.30	7.62
Maximum Month	3.09	4.84	6.10	8.42
Peak Day	7.03	8.78	10.04	12.36
Peak Hour	9.93[3]	11.47	13.44	17.06
NUGA Projected Flows (mgd)[4]				
Total Base Flow	n/a	0.26	0.78	0.78
Average Annual Flow	n/a	0.29	0.88	0.88
Maximum Month	n/a	0.36	1.08	1.08
Peak Day	n/a	0.41	1.23	1.23
Peak Hour	n/a	1.04	2.76	2.76
Grass Valley Projected Flows (mgd)[5]				
Total Base Flow	n/a	0.17	0.35	0.35
Average Annual Flow	n/a	0.19	0.37	0.37
Maximum Month	n/a	0.20	0.39	0.39
Peak Day	n/a	0.25	0.50	0.50
Peak Hour	n/a	0.63	1.26	1.26
Total Projected Sewer Flows (mgd)				
Average Annual Flow	2.29	4.52	6.55	8.87
Maximum Month	3.09	5.40	7.57	9.89
Peak Day	7.03	9.44	11.77	14.09
Peak Hour	9.93[3]	13.14	17.46	21.08

(1) I/I assumed to remain constant during planning period. However, currently "constrained I/I" is projected to reach WWTP in future. See Note (3).

(2) Buildout ERUs and flows assume that commercial, industrial and City ERUs grow at the same rate as the overall population.

(3) Includes an estimated 1.1 mgd of "constrained I/I" that did not reach the WWTP during the peak hour storm event that would be expected to reach the WWTP after increasing pipe sizes.

(4) See discussion in text for methods of estimating.

(5) See discussion in text for methods of estimating.

TABLE 2-11

Projected Loadings 2015 and 2025 - Sewer

	Units	2005 (actual)	2015	2025
Total ERUs	--	13,270	23,304	31,754
Average Annual BOD_5	lb/d	2,218	3,929	5,376
Maximum Month BOD_5	lb/d	3,039	5,383	7,365
Average Annual TSS	lb/d	3,191	5,647	7,720
Maximum Month TSS	lb/d	4,339	7,679	10,500
Average Annual NH_3-N	lb/d	730	1,300	2,050
Maximum Month NH_3-N	lb/d	1,029	1,833	2,890
Average Annual TKN	lb/d	1,017	1,980	2,733
Maximum Month TKN	lb/d	1,367	2,792	3,853

BOD_5 = 5-day Biochemical Oxygen Demand
TSS = Total Suspended Solids
NH_3-N = Ammonia Nitrogen
TKN = Total Kjeldahl Nitrogen

Table 2-12 presents projections for sewer ERUs for the years 2015 and 2025 using information from Tables 2-7 and 2-9.

TABLE 2-12

Total ERUs – Sewer

	Year		
Service Classification	**2005**	**2015**	**2025**
Residential(1)	6,342	11,017	15,105
Commercial(2)	652	1,043	1,283
Industrial(3)	6,224	9,961	12,868
City(4)	52	77	85
Grass Valley(5)	-	1,206	2,413
TOTAL	13,270	23,304	31,754

(1) Table 2-7 (SFR + MFR) plus Table 2-9 - Sewer Residential Flows ÷ 149 gpd/ERU.
(2) Table 2-7 (Commercial) plus Table 2-9 - Sewer Commercial Flows ÷ 149 gpd/ERU.
(3) Table 2-7 (Industrial) plus Table 2-9 - Sewer LI/BP Flows ÷ 149 gpd/ERU.
(4) Table 2-7 (City) plus Table 2-9 - Sewer City Flows ÷ 149 gpd/ERU.
(5) ERUs will be residential and commercial, partitioning to be determined in the future

Table 2-13 summarizes ERU projections for the water and sewer utilities for years 2015 and 2025 using information from Tables 2-10 and 2-11.

TABLE 2-13

Comparison of Water and Sewer ERUs for Full Service Area

Parameter	Year			
	2015		2025	
	Water	Sewer	Water	Sewer
Population	23,882	27,262	37,520	37,483
Residential ERUs	9,485	11,017	14,866	15,105
Commercial ERUs	721	1,043	1,016	1,283
Industrial ERUs	6,656	9,961	9,778	12,868
City ERUs	96	77	124	85
Irrigation ERUs	863	n/a	1,116	n/a
Distribution System Leakage ERUs	2,203	n/a	3,325	n/a
Grass Valley (Sewer Only)	(1)	1,206	(1)	2,413
Total ERUs	20,024	23,304	30,225	31,754

(1) Grass Valley Water Demands have been incorporated into residential and commercial demands.

CHAPTER 3

REVISED COLLECTION SYSTEM ANALYSIS

This chapter presents revised sewer modeling results and additional conveyance needs based on the incorporation of the North Urban Growth Area (NUGA) expansion into the sewer service area, as discussed in Chapter 1. Additionally, the effects of the Grass Valley development to the City's septic tank effluent pump (STEP) and collection system are also addressed.

NUGA BASINS

For the purposes of this analysis, the NUGA was divided into six separate drainage basins based on topography, existing roads and parcel lines. The basins were developed to allow flows within each basin to drain via gravity to a proposed new pump station located near the low point within the basin. Figure 3-1 shows the six proposed basins and the proposed location of the six pump stations and force main routings. This analysis assumes that all flows generated within the NUGA travel in a generally southeasterly direction along the north side of Lacamas Lake and enter into the City's existing sewer system on Crown Road. As an interim stage, prior to full development, the possibility of temporarily partitioning off flows from developments within Basins I and II to the existing STEP system to the southwest is also addressed. Discharge to the STEP system should be temporary because flows from NUGA were not included in the original design of STEP conveyance, and high operation and maintenance costs and unfavorable downstream impacts to conveyance and WWTP facilities have led the City to conclude that further expansion of the STEP service is undesirable. Pump station and force main routing for the temporary discharges to the STEP system are shown on Figure 3-2.

NUGA FLOWS AND PUMP STATION REQUIREMENTS

Table 3-1 summarizes the estimated flows originating from each basin. Flows within the basins were developed from a weighted average of land use areas and estimated flows from each land use within the basins. The total flow of 2.76 mgd peak hour flow in 2025, developed in Chapter 2 (Table 2-12), was used as the basis of this projection of NUGA flows. Land uses within the NUGA are shown in Figure 1-3. Table 3-2 summarizes the proposed pump station requirements.

TABLE 3-1

Projected 2025 NUGA Basin Flows

Basin	Residential Annual Average Flow (gpd)	Light Industry Estimated (gpd)	Commercial Annual Average Flow (gpd)	Total Annual Average Flow (gpd)	Peak Hour Flow (gpd)
I	297,212	-	31,576	328,788	1,031,198
II	93,032	-	-	93,033	291,784
III	35,416	19,847	-	55,263	173,325
IV	87,245	32,633	4,199	124,078	389,153
V	157041	-	-	157,040	492,540
VI	121,798	-	-	121,798	382,000
Total	791,744	52,480	35,775	880,000	2,760,000

TABLE 3-2

Projected NUGA Basin Pump Station and Force Main Requirements

Basin/Pump Station	Peak Hour Flow from Basin (gpd)	Pump Station Capacity (gpd) (gpm)	Force Main Length (ft)	Force Main Diameter (inch)	Total Dynamic Head (ft)	Horsepower
I	1,031,198	1,031,198 (716)	8,200	10	87	20
II	291,784	291,784 (203)	3,000	6	56	5
III	173,325	1,496,307[(1)] (1,040)	4,700	12	310	100
IV	389,153	389,153 (270)	3,600	14	230	100
V	492,540	492,540 (342)	9,000	16	137	70
VI	382,000	382,000 (265)	400	6	114	10

(1) Summation of Peak Hour Flows from Basins I and III.

In addition to the series of pump stations and force mains shown above, gravity lines are also required to connect Basin I to Basin IV and to connect the NUGA to the City's existing sewer system on Crown Road. Assuming a minimum slope of 0.5 percent, the gravity line required to connect Basin I to Basin IV is approximately 9,000 linear feet of 12-inch-diameter pipe. The line connecting the NUGA to the existing system is approximately 5,000 linear feet of 16-inch-diameter pipe.

N

0 2,500 5,000 Feet

PROPOSED PUMP STATION

GREEN MOUNTAIN GOLF COURSE

I

II

CAMAS MEADOWS GOLF COURSE

PROPOSED PUMP STATION

CAMP CURRIE

TO TWO CREEKS P.S.

III

IV

PROPOSED PUMP STATION

PROPOSED PUMP STATION

V

PROPOSED PUMP STATION

VI

PROPOSED PUMP STATION

LARKSPUR P.S.

GRASS VALLEY P.S.

HILLSHIRE P.S.

STONE LEAF P.S.

PACIFIC RIM

LACAMAS PARK

LACAMAS LAKE

WEAKLEY HILL

HATHAWAY

OSTENSON-CANYON

THOMPSON

BRADFORD

IRELAND

WYLIE

CAVITT

COOPER

STAUFFER

REILLY

NOURSE

BLAIR

ZEEK

INGLE

GOODWIN

COUNTY

LEADBETTER

LEVEE

JACKSON

PARKER

VAN VLEET

ARMSTRONG

BYBEE

FAIRVIEW

CROWN

STRONG

ROBINSON

DELP

PERRY

BROWN

LIVINGSTON

LESSARD

MINNEAPOLIS

SR-500

LEGEND:

GRAVITY
- 12-INCH GRAVITY
- 16-INCH GRAVITY

FORCE MAIN
- 6-INCH FM
- 10-INCH FM
- 12-INCH FM
- 14-INCH FM
- 16-INCH FM

NUGA BOUNDARY

CITY LIMITS

PARCELS

I - 524 Acres

II - 417 Acres

III - 233 Acres

IV - 500 Acres

V - 192 Acres

VI - 397 Acres

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-1
NUGA SEWER CONVEYANCE INFRASTRUCTURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\07201 UGA EXPANSION\GIS\FIGURE 3-1 FINAL.MXD

N

0 2,500 5,000 Feet

I

II

III

IV

V

VI

PROPOSED PUMP STATION

GREEN MOUNTAIN GOLF COURSE

CAMAS MEADOWS GOLF COURSE

PROPOSED PUMP STATION

CAMP CURRIE

PROPOSED PUMP STATION

PROPOSED PUMP STATION

PROPOSED PUMP STATION

PROPOSED PUMP STATION

LEGEND:

GRAVITY
- 12-INCH GRAVITY
- 16-INCH GRAVITY

FORCEMAIN
- 6-INCH FM
- 10-INCH FM
- 12-INCH FM
- 14-INCH FM
- 16-INCH FM
- SEWER PIPES
- CITY LIMITS
- PARCELS

PROPOSED SEWER BASINS
- I - 524 Acres
- II - 417 Acres
- III - 233 Acres
- IV - 500 Acres
- V - 192 Acres
- VI - 397 Acres

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-2
NUGA TEMPORARY SEWER
CONVEYANCE INFRASTRUCTURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\07201 UGA EXPANSION\GIS\FIGURE 3-2 FINAL.MXD

EXISTING COLLECTION SYSTEM MODEL RESULTS

The City's Wastewater Collection System Hydraulic Model, developed by Gray & Osborne for the May 2007 *General Sewer/Wastewater Facilities Plan,* using DHI, Inc. Mouse modeling software, was revised and utilized to determine the impact of the proposed NUGA expansion on the existing sewer system. A more detailed description of the Mouse software is included in Appendix F of the May 2007 *General Sewer/Wastewater Facilities Plan.* Projected year 2025 flow from the NUGA, 2.76 million gallons per day (mgd) peak hour, was applied as input into the model at a location near the top of the existing system on Crown Road, Manhole 7-3-5. The Crown Road system gravity feeds into the existing Lacamas Creek Pump Station, which pumps to the gravity system at Manhole 6-1-9, from which wastewater ultimately flows by gravity to the Main Pump Station. Figure 3-3 shows the existing sewer collection system affected by the NUGA expansion. The model analysis assumed that future improvements have been constructed to route the existing 21-inch STEP system currently discharging to the gravity system at 6th Avenue and Joy Street to a new alignment on the recently constructed bridge over the Washougal River and conveyed to the Wastewater Treatment Facility, as recommended in the May 2007 *General Sewer/Wastewater Facilities Plan.*

The results of the existing collection system analysis downstream of the NUGA are summarized in Table 3-3. The model shows that the existing gravity system upstream of the Lacamas Creek Pump Station requires increased capacity. The diameter of the existing gravity sewer along Crown Road to the pump station will need to be increased to 15 inches. The gravity system downstream of the Lacamas Creek Pump station is currently at or near capacity as discussed in the May 2007 *General Sewer/Wastewater Facility Plan.* The model shows an acceptable level of surcharging (less than 6 inches) in this system with the current pipe sizes, assuming the STEP flow is rerouted, even with the inclusion of Grass Valley and Green Mountain flows. If the STEP system is not rerouted, an unacceptable amount of surcharging results in all pipes downstream of the confluence of the Lacamas Creek system and the STEP system at 2nd and Joy. (This level of surcharging presents the risk of sewage backups into residential basements.) Improvements to the downstream system would be required with or without the additional flow from the NUGA if the STEP system is not rerouted. Additional hydraulic data from the collection system analysis is included in Appendix B.

TABLE 3-3

Summary of Model Results for Existing Sewer Collection System Downstream of NUGA

Pipe ID	From Manhole	To Manhole	Length (ft)	Current Diameter (in)	Required Diameter (in)	Peak Hour (mgd)	Surcharge (in)
7-3-5l1	7-3-5	7-3-4	121	8	16	2.76	None
7-3-4l1	7-3-4	7-3-3	194	8	16	2.76	None
7-3-3l1	7-3-3	7-3-2	151	8	16	2.76	None
7-3-2l1	7-3-2	7-3-1	118	8	16	2.76	None
7-3-1l1	7-3-1	7-1-1	191	8	16	2.76	None
7-1-1l1	7-1-1	L C PS	328	10	16	3.53	None
6-1-9l1	6-1-9	6-1-8	277	18	18	3.53	None
6-1-8l1	6-1-8	6-1-7	269	18	18	3.53	4
6-1-7l1	6-1-7	6-1-6	256	18	18	3.53	4
6-1-6l1	6-1-6	6-1-5	280	18	18	3.53	4
6-1-5l1	6-1-5	6-1-4	279	18	18	3.65	None
6-1-4l1	6-1-4	6-1-3	265	18	18	3.65	3
6-1-3l1	6-1-3	6-1-2	269	18	18	3.65	None
6-1-2l1	6-1-2	6-1-1	251	18	18	3.65	None
6-1-1l1	6-1-1	5-2-3	266	21	21	3.65	None
5-2-3l1	5-2-3	5-2-2	75	18	18	3.65	None
5-2-2l1	5-2-2	5-2-1	80	18	18	3.65	None
5-2-1l1	5-2-1	5-1-1	76	18	18	3.65	4
5-1-1l1	5-1-1	Main PS	142	24	24	9.216	None

As discussed in the May 2007 *General Sewer/Wastewater Facilities Plan*, the Lacamas Creek pump station had capacity to accommodate approximately 235 additional homes in 2007. Pump station capacities are established based on one pump on standby, as required by the Department of Ecology. It is recommended that a new pump station be constructed to replace the existing Lacamas Creek pump station to accommodate the increase in peak hour flow to 3.53 mgd (2,451 gpm) due to the NUGA expansion. This new pump station could be built on property adjacent to the existing pump station, which the City would need to acquire.

Additionally, the Lacamas Creek Pump Station currently pumps via a 6-inch force main to Manhole 6-1-9. The increased flow, as a result of the NUGA expansion, will require an increase in the size of the force main to 15 inches. This sizing is based on a maximum design velocity of 5.0 fps through the force main.

Sewer system hydraulic data and calculations for the NUGA are summarized in Appendix B.

GREGG RESERVOIR ANNEXATION

VI

15

PROPOSED NEW FORCEMAIN

PROPOSED NEW BASIN VI PUMP STATION

PROPOSED NEW SEWER ON CROWN ROAD

INCREASE CAPACITY OF EXISTING CROWN ROAD SEWER

NEW STEP MAIN BYPASS REQUIRED FROM 6TH AND JOY (NOT SHOWN FOR CLARITY)

REPLACE FORCEMAIN

REPLACE LACAMAS CREEK L.S.

EXISTING GRAVITY LINE

EXISTING FORCEMAIN

EXISTING MAIN L.S.

2

3s

4

5

6

7

8

9

N

0 1,000 2,000 Feet

LEGEND:

- PROPOSED PUMP STATION
- NEW MANHOLES
- MANHOLES
- PUMP STATION

PIPE SIZES (DIA.)

- 1-INCH
- 2-INCH
- 3-INCH
- 4-INCH
- 6-INCH
- 8-INCH
- 10-INCH
- 12-INCH
- 15-INCH
- 18-INCH
- 21-INCH
- 24-INCH

PROPOSED NUGA SYSTEM

- SEWERLINE
- FORCEMAIN
- SEWER CONVEYANCE FOR NUGA THROUGH EXISTING SEWER SYSTEM
- GREGG RESERVOIR ANNEXATION
- URBAN RESERVE
- CITY LIMITS
- URBAN GROWTH BOUNDARY
- EXISTING SEWER BASINS
- PARCELS

PROPOSED NUGA SEWER BASIN:

- VI - 397 Acres

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 3-3
NEW CROWN ROAD SEWER AND EXISTING SEWER SYSTEM MODIFICATIONS TO SERVE NUGA

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471\GIS\FIGURE3-3_new.MXD

SEWER SYSTEM INFRASTRUCTURE COST ESTIMATES

Cost estimates in Tables 3-4 and 3-5 are based on unit construction costs for similar projects using the collection system configuration shown on Figure 3-1. More detailed cost estimates are included in Appendix C. All estimates presented in this chapter are for a main trunk conveyance system only and do not include neighborhood collector systems. Costs of property acquisition are not included in any cost estimates. Estimated costs include engineering, sales tax, and contingency.

TABLE 3-4

NUGA and Lacamas Creek Sewage Pump Station Preliminary Cost Estimates (2009 Dollars)

Item	Capacity (Peak Hour Flow) (gpm)	Estimated Cost
Basin I Pump Station	716	$ 1,550,000
Basin II Pump Station	203	$ 720,000
Basin III Pump Station	1040	$ 2,050,000
Basin IV Pump Station	270	$ 1,500,000
Basin V Pump Station	342	$ 1,330,000
Basin VI Pump Station	265	$ 830,000
Subtotal NUGA Pump Station Costs		**$ 7,980,000**
Lacamas Creek Pump Station and Force Main(1)	2,450	$ 2,870,000
Total NUGA and Lacamas Creek Pump Station Costs		**$ 10,850,000**

(1) This cost does not include the portion ($160,000) of the total projected cost that is required to serve areas currently within the City limits (e.g., Loyal Lands, Gregg Reservoir Annexation) per Appendix L of the May 2007 General Sewer/Wastewater Facilities Plan. The total project cost including this portion is $3,030,000.

TABLE 3-5

NUGA and Crown Road Sewer Transmission Main Preliminary Cost Estimates (2009 Dollars)

Item	Location	Estimated Cost
8,200 lf 10-inch Force Main	NUGA Basin I	$ 1,701,000
3,000 lf 6-inch Force Main	NUGA Basin II	$ 543,000
4,700 lf of 12-inch Force Main	NUGA Basins III, IV	$ 1,144,000
3,600 lf of 14-inch Force Main	NUGA Basin IV	$ 1,084,000
9,000 lf of 16-inch Force Main	NUGA Basins V, VI	$ 2,809,000
400 lf of 6-inch Force Main	NUGA Basin VI	$ 63,000
9,000 lf of 12-inch Gravity Sewer Main	NUGA Basins I,II, III	$ 2,398,000
5,000 lf of 16-inch Gravity Sewer Main	Crown Road	$ 1,703,000
1,100 lf of Existing Gravity Sewer Main Replaced with 16-inch Gravity Sewer Main	Crown Road to Lacamas Creek	$ 480,000
Sub-total Estimated NUGA Sewer Main Cost		**$11,925,000**

Table 3-6 summarizes costs for a conceptual sewer collection system needed to serve the projected growth in the NUGA.

TABLE 3-6

NUGA Sewer Infrastructure Preliminary Cost Estimate Summary (2009 Dollars)

Item	Estimated Cost
Pump Stations	$10,850,000
Sewer Lines	$11,925,000
Total Estimated NUGA Sewer Infrastructure Cost	**$22,775,000**

GRASS VALLEY

Wastewater flows from the proposed Grass Valley development will discharge into the existing STEP system. A hydraulic model of the STEP system was developed as part of the May 2007 *General Sewer/Wastewater Facility Plan*. For the current analysis, the model was revised to include the flows associated with the Grass Valley development, an additional 1.2 mgd peak hour as developed in Chapter 2. The existing STEP system has sufficient capacity to adequately convey the additional flow from the proposed development. Since the design details and the pump characteristics of the multiple, individual STEP pumps are not available, capacity of the STEP line was based on a maximum velocity on the STEP main of 4.0 ft/sec. The model shows that the maximum

velocity through the system does not exceed 3.2 ft/sec with the addition of the Grass Valley development. An additional factor considered to evaluate capacity was the pressure within the STEP line. The system is constructed of thin walled, 100-psi pipe which has numerous taps and has a history of maintenance problems. Due to concerns about the integrity and durability of the pipe, it was recommended in the May 2007 *General Sewer/Wastewater Facility Plan* for replacement in phases.

Impacts of the proposed Grass Valley flows on the existing downstream gravity system were not explicitly analyzed. As discussed previously, it is assumed that the STEP flow will be rerouted through new pipe on the new pedestrian bridge over the Washougal River and conveyed to the Wastewater Treatment Facility, as recommended in the May 2007 *General Sewer/Wastewater Facility Plan.* The existing gravity system downstream of the STEP discharge is currently at or over capacity as evidenced by surcharges in the Downtown area. Improvements to the downstream system would be required with or without the additional flow from the Grass Valley development if the STEP system is not rerouted.

CHAPTER 4

REVISED WASTEWATER TREATMENT FACILITY EVALUATION

The purpose of this chapter is to evaluate the wastewater treatment facility (WWTF) to determine its ability to meet its treatment objectives based on projected Camas flows and loadings for the year 2025, including flows and loadings from the NUGA and Grass Valley, and provide recommendations for improvements required to provide the necessary capacity and level of treatment.

DESIGN CRITERIA

Wastewater design flows and loads for the City, including the NUGA, for year 2025 are presented below in Table 4-1. This table also shows existing design criteria for the Phase II wastewater treatment facility, as indicated in the 1997 *Wastewater Facility Plan*. The treatment plant effluent quality must meet projected effluent limits in the City's NPDES permit for BOD_5, TSS, ammonia, fecal coliform and pH. These projected effluent quality criteria are presented below in Table 4-2.

TABLE 4-1

Current and Projected Future Flow and Loadings

Parameter	Existing (Phase II) Design Criteria[(1)]	Projected 2025 Criteria
Average Annual Flow (mgd)	5.30	6.55
Maximum Month Average Flow (mgd)	6.10	7.57
Peak Day Flow (mgd)	10.04	11.77
Peak Hour Flow (mgd)	13.44	17.46
Average Annual BOD_5 Loading (lb/day)	4,099	5,376
Maximum Month BOD_5 Loading (lb/day)	5,616	7,365
Average Annual TSS Loading (lb/day)	5,883	7,720
Maximum Month TSS Loading (lb/day)	8,001	10,500
Average Annual NH_3-N Loading (lb/day)	1,389	2,050
Maximum Month NH_3-N Loading (lb/day)	1,956	2,890
Average Annual TKN Loading (lb/day)	1,917	2,733
Maximum Month TKN Loading (lb/day)	2,573	3,853

(1) Phase II design criteria from 2007 *Wastewater Facility Plan.*

TABLE 4-2

Projected NPDES Permit Effluent Limits

Parameter	Average Monthly	Average Weekly
BOD_5	20 mg/L, 1,263 lb/d 70% removal of influent BOD_5	30 mg/L, 1,894 lb/d
TSS	20 mg/L, 1,263 lb/d 70% removal of influent TSS	30 mg/L, 1,894 lb/d
Ammonia	Summer: 20 mg/L, 1,263 lb/d Winter: 7 mg/L, 442 lb/d	No Limit
Fecal Coliform	200 FCU/100 ml	400 FCU /100 ml
pH	Daily minimum is equal to or greater than 6 and daily maximum is equal to or less than 9	

PHASE II WWTF IMPROVEMENTS

The existing WWTF is currently being upgraded by the Phase II construction project with construction lasting through 2011. This project will address the need for an increase in the solids treatment capacity, as originally identified in the 1997 *Wastewater Facility Plan*. The scope of the construction project is further described in the May 2007 *General Sewer/Wastewater Facility Plan* (as revised and approved in November 2009).

The Phase II WWTF project will construct the following improvements and modifications:

- New anaerobic digester facility including digester building.
- New sludge dryer to produce Class A biosolids, including remodel of existing sludge storage building to enclose new dryer.
- Additional odor control biofilter area and fan.
- New Waste Activated Sludge storage tank and rotary screen thickener.
- New centrifuge centrate storage tank.
- Additional septage storage tank volume.
- Additional (second) headworks mechanical fine screen.
- Additional (fourth) aeration blower.
- Additional (fourth) UV disinfection system bank of lamps.
- Modifications to aeration basin selector zones and baffle walls.
- Decommissioning and removal of existing aerobic digester.
- Modification of existing outfall diffuser to open eight plugged ports and to reorient 16 nozzles vertically.

Construction of these improvements to the existing WWTF should be completed in 2011. The evaluations and recommendations in this Amendment for design year 2025 improvements are based on the assumption that the Phase II upgrades listed above have been constructed.

NPDES WASTE DISCHARGE PERMIT

The Department of Ecology issued the current City of Camas NPDES operating permit effective December 1, 2004. The permit expires November 30, 2009. It is expected that the re-issued permit will include revisions to the existing effluent ammonia limits, based on recent mixing zone dilution modeling. Based on discussions between the City and Ecology, it is expected that the new permit will include monthly average effluent limits for ammonia of 20 mg/L in the summer and 7 mg/L in the winter, and no daily maximum limit. This Amendment is prepared with the assumption that future NPDES permits will include the same effluent concentration limits as in the present permit, except for the noted changes to the effluent ammonia limit.

LIQUID STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA

In this section, the capacities of major WWTF liquid stream treatment components (including Phase II components currently under construction) at 2025 projected flow and loadings (see Table 4-1) are evaluated. Where applicable these capacities are compared to accepted design criteria, such as published in the Ecology *Criteria for Sewage Works Design* (1998), WEF *Manual of Practice #8* and Metcalf and Eddy *Wastewater Engineering* (4th Edition, 2003). This evaluation is summarized in Table 4-3. Abbreviations used in this table include:

- AAF = Annual Average Flow
- MMF = Maximum Month (Average) Flow
- PDF = Peak Day (Average) Flow
- PHF = Peak Hour (Average) Flow

TABLE 4-3

Comparison of Liquid Stream Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[1]	Capacity/Criteria	Reference[2]	2025 Operating Condition (meets criteria?)
Mechanical Fine Screen/Bypass Bar Screen (Capacity)	2 Mech. Screens 1 Bar Screen	Mech. Screen: 10.6 mgd Bypass Screen: 12.8 mgd Total PHF: 23.4 mgd (one screen out of service)	Manufacturer	17.46 mgd (yes)
Primary Clarifiers (Overflow Rate)	2	800 – 1,200 gpd/sf AAF	Ecology, 1998	1,158 gpd/sf (yes)
		2,000-3,000 gpd/sf PHF	Ecology, 1998	3,088 gpd/sf (yes)[3]
Primary Clarifiers (Weir Loading)	2	10,000 – 40,000 gpd/lf AAF	Ecology, 1998	17,420 gpd/lf (yes)
		MMF		20,133 gpd/lf (yes)
		PHF		46,436 gpd/lf (yes)[3]
Primary Clarifiers (Detention Time)	2	≤ 2.5 hr AAF	Ecology, 1998	1.5 hr (yes)
		MMF		1.3 hr (yes)
		PHF		0.6 hr (yes)
Biological Selector (Detention Time at max. mo. flow)	3/basin	10-45 min. design 5-25 min. design 20-60 min. design	Ecology, 1998 WEF, 1991 M&E, 2003	25 (yes)
Biological Selector (F/M Ratio) 1st Compartment	3/basin	3-8 lb BOD/ lb MLSS	M&E, 2003	7.9 (yes)
3 Compartments		2 lb BOD/lb MLSS	M&E, 2003	2.0 (yes)
Aeration Basin Aerobic Solids Retention Time (Aerobic SRT)	3 basins	9.5 days MMF	2007 Wastewater Facility Plan	6.5 days (no)
Aeration Capacity (TKN Capacity at Projected BOD load = 7,365 lb/d)	3 basins	3,853 lb/d TKN	2007 Wastewater Facility Plan	4,262 lb/d TKN (yes)

TABLE 4-3 – (continued)

Comparison of Liquid Stream Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty[(1)]	Capacity/Criteria	Reference[(2)]	2025 Operating Condition (meets criteria?)
Secondary Clarifiers (Overflow Rate) Max. Month	2	<800 gpd/sf, MMF 300-1,000 gpd/sf, MMF	Ecology, 1998 WEF, 1991	857 gpd/sf (no; per Ecology criteria)
Peak Day		600-800 gpd/sf, design	M&E, 2003	1,332 gpd/sf (no)
Peak Hour		1000-1600 gpd/sf, design	WEF, 1991	1,976 gpd/sf (no)
Secondary Clarifiers[(4)] (Solids Loading Rate) Max. Month	2	4.8 – 24 lb/d/sf 20-30 lb/d/sf	M&E, 2003 WEF, 1991	26.8 lb/d/sf (yes)
Peak Day		34 lb/d/sf 50 lb/d/sf	M&E, 2003 WEF, 1991	41.7 lb/d/sf (yes)
Filtration System (Capacity)	2 shafts (12 disks)	6.0 mgd (max. mo.)	Manufacturer	7.57 mgd (yes, with 1.57 mgd bypass)[(5)]
UV Disinfection System (Capacity)	4 banks	12.2 mgd (peak day)	Manufacturer	11.77 mgd (yes)
		9.15 mgd (max. mo.)	Manufacturer	7.57 mgd (yes)
Effluent Pumps	3	12.2 mgd (peak hour)	Manufacturer	17.46 mgd (no)

(1) Quantity of component following Phase II WWTF Improvements Project construction.
(2) Sources of design criteria include Water Environment Federation (WEF), the Washington State Department of Ecology (Ecology) and Metcalf and Eddy (M&E).
(3) Design loading slightly exceeds equipment capacity, but performance of equipment is estimated to be satisfactory at this loading and overall treatment of WWTF will not be significantly impacted.
(4) Secondary clarifier solids loading based on return activated sludge flow of 50 percent of plant flow and MLSS = 2,500 mg/L.
(5) See discussion below on adequacy of effluent filter performance at design flow.

HEADWORKS

The headworks includes a 24-inch Parshall flume for influent flow measurement and two automatic, perforated-plate, mechanical fine screens with 1/4–inch-diameter perforations. (One of these new screens is being installed in the Phase II improvements project.) Each screen is equipped with a screenings washer/compactor. Combined, the two screens have an hydraulic capacity of 21.2 mgd, which is adequate to handle the projected year 2025 peak hour flow of 17.46 mgd. If one mechanical screen were temporarily out of service due to equipment malfunction, flows in excess of the capacity of the operational screen will overflow a weir plate and will pass through the existing manual bar rack screen.

The existing Parshall flume, with a capacity of 21.4 mgd, can accommodate 2025 flows.

PRIMARY CLARIFIERS

Two 60-foot-diameter circular primary clarifiers remove grit and other settleable solids from the screened wastewater. The grit-laden sludge is pumped to the grit removal facility by three 10-hp recessed impeller torque flow pumps with a capacity of 220 gpm at a TDH of 32 feet. Scum collected from the primary clarifiers is conveyed by gravity to the primary clarifier scum pump station.

As shown in Table 4-3, the existing two primary clarifiers have adequate capacity for year 2025 flows.

AERATION BASINS AND AERATION SYSTEM CAPACITY

The existing activated sludge process consists of three parallel, equal-sized aeration basins, which are each comprised of seven compartments to create biological selector zones, anoxic zones, and aerobic (oxic) zones. The configuration and equipment in the basins enables biological treatment to remove BOD_5, ammonia (nitrification), and nitrates (denitrification). The aerobic zones are supplied air from three existing centrifugal blowers through air piping and fine bubble, membrane diffusers installed on the floor of each basin. Primary effluent and recycle flows are split equally between the three basin trains in a splitter box located immediately upstream of the basins.

The Camas activated sludge system is designed to achieve nitrification and denitrification to meet projected effluent ammonia limits and to provide process control benefits, including energy recovery, alkalinity recovery, pH control, and process stability. Based on the design analysis presented in the 1997 *Wastewater Facility Plan*, the aerobic solids retention time (SRT) required for nitrification of the wastewater TKN load is 9.5 days, which provides a nitrification safety factor of 2.0. The aeration basin volume requirements are based on this design SRT and the criteria shown in Table 4-4 below. Mass loadings shown in the table are based on the mass balances included in Appendix D.

TABLE 4-4

Activated Sludge Process Design Criteria

Parameter	Value
Net Sludge Yield, Y_N (lb/lb BOD_5 In)	0.78
BOD_5 In (lb/d)	5,413
BOD_5 Out (lb/d)	190
Design MLSS (mg/L)	2,500
SRT (days)	9.5
Waste Activated Sludge Yield (lb/d)	4,220

The aeration basin aerobic volume required to provide an SRT of 9.5 days is calculated as follows:

Aerobic volume = (Aerobic SRT x Sludge Yield)/MLSS Concentration

= [(9.5 d)(4,220 lb/d)(10^6)]/[(2,500 mg/L)(8.34)]

= 1,923,000 gallons (257,060 ft^3)

Each existing aeration basin includes 58,670 ft^3 of aerobic volume, or a total of 176,000 ft^3 within the three existing basins. The additional aerobic volume required for year 2025 design loads is 257,060 – 176,000 = 81,060 ft^3. This required additional volume is 1.4 times the volume of one basin. Since it is recommended that all aeration basins have the same volume, two additional basins will be constructed. The new basins will be constructed adjacent to the existing basins using common wall construction, as shown on Figure 4-1.

Biological treatment of the wastewater is provided in the aeration basins. The activated sludge in the basins is mixed and supplied with oxygen by blowers through submerged air distribution piping and diffusers. Automatic control of aeration blower output is accomplished based on continuous measurement of the dissolved oxygen (D.O.) in the aeration basins by submerged D.O. probes. As shown in Table 4-1, year 2025 BOD_5 and TKN (which is predominantly converted sequentially to ammonia, nitrate, and finally nitrogen gas in the WWTF) exceed the existing design loads. Thus, the aeration basins must be evaluated for their ability to accommodate the increased BOD_5 and TKN.

The aeration basin oxygen demand is decreased by the process of denitrification and by the periodic wasting of biomass growth. In the *Wasteload Assessment Report - Aeration System Capacity Analysis* (G&O, May 2006), the recorded air flow delivered by the blowers in operation at the WWTF was correlated to the actual, approximate oxygen required to achieve BOD and ammonia removal. A correlation factor, *K*, was determined

to describe the correlation between the actual oxygen required (AOR) and the airflow (standard cubic feet per minute, SCFM) delivered:

$$SCFM = K \times AOR$$

The correlation factor, *K*, is an expression of the efficiency of the blowers and the air diffusion system to deliver oxygen. The AOR is defined by the following equation:

$$AOR = 1.3 \times BOD_{removed} + 4.57 \times TKN_{oxidized} - 2.86 \times DN - 1.42 \times P_{x,bio}$$

The $BOD_{removed}$ is the amount of BOD oxidized, and the $TKN_{oxidized}$ is the nitrogen oxidized to nitrate. DN is the amount of nitrogen denitrified, which results in a decrease in oxygen demand. $P_{x,bio}$ is the amount of biomass wasted. As described in both the 2006 *Wasteload Assessment Report* and the May 2007 *General Sewer / Wastewater Facility Plan* (2007 Plan), the AOR was determined using biological kinetic factors, stoichiometric factors, and actual plant conditions and performance for the time period from March 2006 through April 2006. Assumptions used in this analysis are presented in these previous reports.

For the current analysis, the correlation factor, K, was used to estimate the aeration system capacity for biological removal of both carbonaceous and nitrogenous loads, given the air available and delivered by a maximum of three blowers in service. The blowers at the Camas WWTF are each rated at 1,650 standard cubic feet per minute (SCFM) @ 9.5 psig. Assuming three existing blowers in service (4,950 SCFM total air available), 95 percent removal of BOD_5, and complete nitrification, the influent BOD_5 and TKN loads that can be treated are summarized in Table 4-5.

As shown in Table 5-5, the maximum TKN the WWTF can treat while treating the design loading of 7,365 lb/d BOD_5 is 4,262 lb/d, which is about 11 percent greater than the design load of 3,853 lb/d TKN. Thus, the analysis shows that the existing blowers can accommodate the projected 2025 design BOD_5 and TKN loads simultaneously. Therefore, an additional blower is not required. New air supply piping from the blowers to the aeration basins will be required to prevent excessive head loss and reduced blower capacity.

TABLE 4-5

Evaluation of Oxygen Demand with Three Existing Blowers in Service

BOD_{in} (lb/d)	BOD_r (lb/d)	TKN_{ox} (lb/d)	P_{xbio} (lb/d)	DN (lb/d)	AOR (lb/d)	Airflow (SCFM)	*K* (SCFM/lb/d)	$Ammonia_{in}$ Capacity (lb/d)
1,000	950	6,038	443	3,623	17,838	4,950	0.2775	4,264
1,500	1,425	5,898	597	3,539	17,838	4,950	0.2775	4,179
2,000	1,900	5,759	752	3,455	17,838	4,950	0.2775	4,094
2,500	2,375	5,619	907	3,372	17,838	4,950	0.2775	4,010
3,000	2,850	5,480	1,061	3,288	17,838	4,950	0.2775	3,925
3,500	3,325	5,340	1,216	3,204	17,838	4,950	0.2775	3,840
4,000	3,800	5,201	1,371	3,121	17,838	4,950	0.2775	3,756
4,500	4,275	5,061	1,525	3,037	17,838	4,950	0.2775	3,671
5,000	4,750	4,922	1,680	2,953	17,838	4,950	0.2775	3,586
5,500	5,225	4,782	1,834	2,869	17,838	4,950	0.2775	3,502
6,000	5,700	4,643	1,988	2,786	17,838	4,950	0.2775	3,417
6,500	6,175	4,503	2,143	2,702	17,838	4,950	0.2775	3,332
7,000	6,650	4,364	2,297	2,618	17,838	4,950	0.2775	3,248
7,365	6,997	4,262	2,410	2,557	17,838	4,950	0.2775	3,186

Since the recommended two new aeration basins will have the same configuration and anoxic zone volumes as the existing basins, it is expected that denitrification performance at the 2025 loads will be adequate.

Biological Selectors

The selectors at the inlet ends of the aeration basins provide compartmentalization to create an environment with a high food/mass (F/M) ratio to favor the growth of floc-forming (readily settling) organisms, and produce a low sludge volume index (SVI). The selector zones in the new aeration basins will be designed to have the same volumes as in the existing basins. The design F/M gradient will be 6:3:1.5 lb BOD/ lb MLSS in the three selector compartments. As in the existing basins, the new selector zones will be mixed with aeration air using coarse bubble diffusers in the selector compartments.

The aeration basin design criteria are shown below.

Design Criteria for Aeration Basins

Aeration Basin Influent Flow	7.90 mgd
Plant Recycle Flow	0.33 mgd
Return Activated Sludge Flow, mgd	
Internal Recirculation Flow, mgd	22.5 mgd

Influent BOD5, lb/d	5,413 lb/d
Influent TSS, lb/d	2,625 lb/d
Influent TKN, lb/d	3,853 lb/d
Quantity of Basins	5 (2 new; 3 existing)
Total Volume	509,300 cubic feet
Basin Width	40 feet
Side Water Depth	21 feet
Basin Length	150 feet
Selector Zone One Total Volume	54,980 gallons
Detention Time at AAF	12.1 min
Detention Time at MMF	10.5 min
Selector Zone Two Total Volume	54,980 gallons
Detention Time at AAF	12.1 min
Detention Time at MMF	10.5 min
Selector Zone Three Total Volume	109.960 gallons
Detention Time at AAF	24.2 min
Detention Time at MMF	20.9 min
Anoxic Zone Total Volume (2 compartments)	1,350,900 gallons
Detention Time at AAF	4.95 hr
Detention Time at MMF	4.28 hr
Aerobic Zone Total Volume (3 compartments)	2,224,050 gallons
Detention Time at AAF	8.15 hr
Detention Time at MMF	7.05 hr
MLSS Conc.	2,500 mg/L
Aerobic Mass	46,370 lb MLSS
Aerobic SRT	11.0 days
Aeration Blowers	
Quantity	4 (1 new; 3 existing)
Type	Multi-stage centrifugal
Capacity each blower	1,650 scfm
Discharge pressure	9.5 psig
Stages	8
Horsepower, each	150

ALKALINITY ADDITION SYSTEM

Liquid sodium hydroxide solution is currently added to the plant flow at the aeration basin splitter box to provide supplemental alkalinity, since nitrification of the high influent TKN load results in considerable loss of alkalinity and lowered pH. The alkalinity chemical is stored in two existing 10,000-gallon, fiberglass storage tanks and pumped to the splitter box by a peristaltic metering pump.

The sizing of the existing alkalinity storage system was based on 2-week nitrification requirements for a projected maximum month 2017 influent TKN loading of 2,227 lb/d, which is less than the projected 2025 loading of 3,853 lb/d. However, the WWTF could receive its alkalinity source once per week and have enough capacity for the 2025 influent TKN loading. Therefore, the system does not need to be expanded. However, it is projected that the WWTF will need to replace the fiberglass storage tanks once during the next 15 years due to eventual deterioration of the tank materials.

SECONDARY CLARIFIERS

The WWTF has two 75-foot-diameter secondary clarifiers; one with 13-foot side water depth (SWD) and the second at 17-ft. SWD. Though Clarifier No. 2 has a greater effective capacity than Clarifier No. 1 because of the greater SWD, for the purposes of this evaluation, it is assumed that each clarifier receives the same flow rate.

The factors that influence the performance of secondary clarifiers include the clarifier physical design, overflow rate, solids loading rate and mixed liquor solids settleability (SVI). Because it is not certain that the aeration basin selector and activated sludge process will control SVI below 150 mL/g, and since historically the plant has had episodes of moderate sludge bulking, the secondary clarifiers should not be designed and operated at the upper range of design overflow and solids loading rates.

Clarifier Overflow Rate

As shown in Table 4-3, at design flow, the 1998 Ecology Design Criteria lists 800 gallons per day per square foot (gpd/sf) as a recommended limit for secondary clarifiers settling mixed liquor from a conventional activated sludge process. WEF Manual of Practice #8 lists maximum month design ranges of 300 to 1,000 gpd/sf. At projected year 2025 maximum month flows, the clarifier overflow rate of 857 gpd/sf exceeds these criteria.

WEF Manual of Practice #8 and Metcalf and Eddy list peak flow design ranges of 1,000 to 1,600 gpd/sf and 600-800 gpd/sf, respectively. At projected year 2025 flows, the design peak clarifier overflow rate of 1,976 gpd/sf exceeds the WEF criteria. (The 1998 Ecology design criteria does not address this design parameter.)

Solids Loading Rate

As shown in Table 4-3, the maximum *design* solids loading rate recommended by Metcalf and Eddy and WEF are 24 and 30 lb/sf/d, respectively. At the design maximum month flow and loadings, the solids loading rate is 26.8 lb/sf/d. These estimated solids loading rates are based on a return activated sludge flow of 50 percent of plant flow and a design MLSS concentration of 2,500 mg/L.

The *peak* solids loading rate recommended by Metcalf and Eddy and WEF are 34 and 50 lb/sf/d, respectively. At projected year 2025 peak day flow and loadings, the design peak solids loading rate is 41.7 lb/sf/d.

Though the projected solids loading rates at 2025 flows do not exceed recommended design criteria, the design hydraulic overflow rate is greater than recommended. Consequently, the existing two secondary clarifiers will not reliably settle suspended solids to meet permit limits at design flows. Therefore, it is recommended that a third secondary clarifier, of equal diameter to the existing clarifiers (75-feet diameter) be constructed to handle the 2025 design flows. The additional clarifier will be equipped with return activated and waste activated sludge pumps and a new scum sump and pump. The new clarifier will be installed in the area occupied by the abandoned Aerobic Digester No. 1, which will be demolished.

Design Criteria for Secondary Clarifiers

Quantity	3 (1 new; 2 existing)
Diameter	75 feet
Effective Settling Area, each	4,418 sf
Effective Side Water Depth	
Clarifier No. 1	13 feet
Clarifier No. 2	17 feet
Clarifier No. 3 (new)	14 feet
Volume of each clarifier	
Clarifier No. 1	429,600 gallons
Clarifier No. 2	561,800 gallons
Clarifier No. 3 (new)	462,700 gallons
Surface overflow rate at AAF	494 gpd/sf
Surface overflow rate at MMF	571 gpd/sf
Surface overflow rate at PHF	1,317 gpd/sf
Detention time at AAF (Clar. 1/2/3)	4.7/6.2/5.4 hours
Detention time at MMF (Clar. 1/2/3)	4.1/5.3/4.7 hours
Detention time at PHF (Clar. 1/2/3)	1.8/2.3/2.0 hours
Solids loading rate at AAF	15.5 lb/d/sf*
Solids loading rate at MMF	17.9 lb/d/sf*
Weir length each clarifier	226 feet
Weir loading rate at AAF	9,660 gpd/lf
Weir loading rate at MMF	11,170 gpd/lf
Weir loading rate at PHF	25,750 gpd/lf
Motor size, each	1 hp

*Based on MLSS concentration of 2,500 mg/L and return activated sludge flow equal to 50 percent of plant flow.

EFFLUENT FILTERS

The filtration system consists of two parallel fabric media filters, located in the UV Disinfection Building. Each filter consists of a steel tank, 12 fabric media covered disks, backwash system, sludge removal system, high-pressure spray wash system and disk drive assembly. The capacity of each filter is 3.0 mgd (maximum month), providing a combined capacity of 6 mgd. The purpose of the use of this unit is to filter the secondary effluent to meet the permit requirement for 70 percent removal of influent BOD_5 and TSS.

At the 2025 maximum month average design flow of 7.57 mgd, the filters would need to bypass 1.57 mgd, or about 20 percent of the flow, to remain within the rated capacity. This bypass can be provided by setting the bypass channel overflow weirs at the required level. It is not expected that the bypass of 20 percent of secondary effluent will prevent compliance with the permit requirement for 70 percent influent BOD_5 and TSS removal. At the minimum expected influent BOD_5 (or TSS) concentration of 100 mg/L, the filters should produce an effluent BOD_5 (or TSS) concentration of 10 mg/L or less. If the bypass BOD_5 (or TSS) concentration is 30 mg/L or less, then the blended final effluent will have a BOD_5 (or TSS) concentration below 15 mg/L, resulting in an overall removal performance of 86 percent:

Effluent BOD5 (or TSS) = [(6.0 mgd)(10 mg/L) + (1.57 mgd)(30 mg/L)]/7.57 mgd
= 14 mg/L

Influent BOD5 (or TSS) removal = [(100 – 14 mg/L)/100 mg/L](100) = 86%

Therefore, the filters have sufficient capacity for projected year 2025 flows.

PLANT EFFLUENT FLOW METER

The existing 36-inch-diameter magnetic flow meter, with a capacity of 25 mgd, has capacity to measure 2025 flows.

ULTRAVIOLET DISINFECTION SYSTEM

Filtered effluent from the disk filters flows by gravity through the existing UV channel where disinfection occurs. After the Phase II upgrade, four banks of Trojan 3000 (low-pressure low-intensity) UV lamps will operate in series within the disinfection channel. The 4-bank system is rated for disinfection at a peak instantaneous flow of 9.15 mgd, since each bank has a capacity up to 3.05 mgd. The fourth bank provides redundancy; it will be automatically called in case of a major alarm on either in-use bank, and provides treatment for the peak day flow of 11.77 mgd. With the third bank on, the system capacity is 12.2 mgd. Therefore, the existing system has adequate capacity for the year 2025 design flows.

EFFLUENT PUMPS

The effluent pumps are vertical propeller, wet pit, mixed flow pumps rated at 4,300 gpm (6.2 mgd) each at 18-feet TDH. Three pumps are installed, with one of these units providing backup capacity. Transitions between gravity and pumped effluent flow are performed automatically when the pumps are placed in "auto" mode. Whenever the level of the Columbia River rises, gravity effluent discharge will be stopped by the closing of the flap gate in the Effluent Manhole

The operation of two of the existing three effluent pumps provides a maximum pumped flow of 12.2 mgd, which is not adequate to handle the year 2025 design peak hour flow of 17.46 mgd at 100-year flood elevation. Therefore, the installation of a fourth effluent pump, with a capacity of 4300 gpm, is recommended. The installation of the fourth pump will provide a total, confirmed capacity of 18.6 mgd. The design criteria for the effluent pumps is shown below.

Design Criteria for Effluent Pumps

Quantity	4 (1 new; 3 existing)
Type	Vertical Turbine
Capacity each pump	4,550 gpm
TDH	16 feet
Motor size, each	30 hp

OUTFALL

The existing 36-inch corrugated metal pipe (CMP) Camas WWTP outfall extends approximately 850 feet south into the Columbia River channel. The diffuser portion of the outfall is located along the outer 150 feet of the pipe. The existing outfall includes 16 vertical risers, each oriented vertically with rubber Tideflex, check valve-type nozzles. The risers discharge effluent perpendicular to the flow of the Columbia River.

Because the Phase II Camas outfall discharges perpendicular to the direction of the river flow, there is considerable turbulence and good dilution in the mixing zone. The change from the original horizontal discharge to a vertical discharge in the Phase II upgrade increases dilution significantly based on the UM3 model Ecology has used to model dilution in the Camas mixing zone (see Appendix E for mixing zone study). With the vertical orientation of the diffusers, there is no reasonable potential to exceed water quality standards for metals at the year 2025 design flows. Due to the industrial flows to the WWTF and Ecology regulations addressing prevention of "pass-through" of pollutants, there will be a permit limit for ammonia. The sixteen diffuser risers are fitted with Tideflex Valves on the ends of the risers to minimize entrainment of debris in the diffuser pipe.

SOLIDS STREAM TREATMENT EVALUATION AT 2025 DESIGN CRITERIA

As described and recommended in the May 2007 *General Sewer/Wastewater Facility Plan,* anaerobic digestion is the recommended option for solids treatment in the Phase II WWTF expansion. This plan is identified in the 2007 Plan as Alternative No. 1B - Anaerobic Digestion of Camas WWTF Biosolids Followed by Sludge Drying to Produce a Class A Biosolid. The new anaerobic digestion system will serve only the City of Camas and will not be designed to provide solids treatment of the load from another municipality. This Addendum is prepared based on the assumption that the new anaerobic digester system and sludge dryer described in Alternative 1B in the 2007 Plan will be constructed in the Phase II WWTF Improvements Project and is available to serve year 2025 design loads to the WWTF. Also, it is assumed that the existing Aerobic Digester No. 2 will be modified in the Phase II project to serve as a holding tank with three separate compartments for WAS, dewatering centrifuge centrate, and septage storage.

The solids treatment system design criteria for year 2025 are presented in Table 4-6. The maximum month and annual average influent wastewater BOD_5 and TSS loadings are based on the 2025 projected values. The influent TSS load includes the projected amount of solids delivered to the WWTF in septage hauled from the STEP system tanks in Camas. Estimated waste primary sludge and waste activated sludge production at the design influent loads are based on the same yields developed in the 2007 Plan.

TABLE 4-6

WWTF Design Criteria for Solids Treatment (Year 2025)

	Maximum Month	Annual Average
WWTF Influent BOD_5 (lb/d)	7,365	5,376
WWTF Influent TSS (lb/d)	10,500	7,720
Waste Primary Sludge (lb/d)	7,875	5,790
Waste Activated Sludge (lb/d)	4,220	3,086
Total Waste Sludge (lb/d)	12,095(1)	8,876(1)

(1) Load to digester estimated to be 5 percent greater due to additional solids in recycle flows.

The WWTF solids treatment system combines thickened waste primary sludge (WPS) and thickened waste activated sludge (WAS) and stabilizes the mixed solids in an anaerobic digester. The existing digester system consists of two primary digesters, one digested sludge holding tank, associated pumping and digester heating equipment, and a digester building. The digester system will produce a Class B biosolids, and produces a stabilized sludge for feeding to the existing dewatering centrifuge and the belt dryer. The dryer dries the sludge to at least 90 percent solids content and pasteurizes the sludge to generate a Class A biosolids product.

The capacities of major WWTF solids treatment components at 2025 projected flow and loadings (see Tables 4-1 and 4-6) are evaluated below, and, where applicable, compared to accepted design criteria, such as published in the Ecology *Criteria for Sewage Works Design* (1998), WEF *Manual of Practice #8* and Metcalf and Eddy *Wastewater Engineering* (4th Edition, 2003). This evaluation is summarized in Table 4-7.

TABLE 4-7

Comparison of Solids Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[(1)]	Capacity/Criteria	Capacity or Criteria Reference[(2)]	2025 Operating Condition (meets criteria?)
WAS Holding Tank (Detention Time)	1	>3 days AAF MMF	2007 Wastewater Facility Plan	4.0 days (yes) 3.0 days (yes)
Centrate Holding Tank (Detention Time)	1	>1 day AAF MMF	2007 Wastewater Facility Plan	1.7 days (yes) 1.2 days (yes)
Grit Classifier	2	<220 gpm AAF MMF	Manufacturer	48 gpm (yes) 66 gpm (yes)
Gravity Thickener (Overflow Rate)	1	<500 gpd/sf AAF/MMF	WEF, 1991 M&E, 2003	450 gpd/sf (yes)
WAS Rotary Screen Thickener (Hours of operation per day)	1	6 hr/d operation maximum AAF MMF	2007 Wastewater Facility Plan	3.1 hr/d (yes) 4.2 (yes)
Anaerobic Digesters (Hydraulic Detention Time)	2	15 – 20 days AAF MMF	WEF, 1991 M&E, 2003	18 days (yes) 13.2 days (no)
Anaerobic Digesters (VS Loading Rate)	2	0.10 – 0.20 lb VS/d/ft^3 AAF MMF	WEF, 1991 M&E, 2003	0.16 lb VS/d/ft^3 (yes) 0.21 lb VS/d/ft^3 (no)

TABLE 4-7 – (continued)

Comparison of Solids Treatment Component Design Criteria and Projected Flow and Loadings

Component (Parameter)	Existing Qty.[(1)]	Capacity/Criteria	Capacity or Criteria Reference[(2)]	2025 Operating Condition (meets criteria?)
Anaerobic Digesters (VS Loading Rate)	2	0.10 – 0.20 lb VS/d/ft^3 AAF MMF	WEF, 1991 M&E, 2003	 0.16 lb VS/d/ft^3 (yes) 0.21 lb VS/d/ft^3 (no)
Digester boiler (Heating Capacity)	1	550,000 BTU/hr	2007 Wastewater Facility Plan	807,000 BTU/hr (no)
Sludge Holding Tank (Detention Time)	1	>5 days AAF MMF	2007 Wastewater Facility Plan	4.5 days (yes)[(3)] 3.3 days (yes)[(3)]
Centrifuge (Hours of operation per week day to fill dryer feed hopper)	1	6 hr/d operation maximum AAF MMF	Manufacturer	11 hr/d (no) 15 hr/d (no)
Dewatered Sludge Conveyor	1	100 ft^3/hr at 50% fill	Manufacturer	200 ft^3/hr (yes)
Sludge Dryer (Hours of operation per 5-day week)	1	<144 continuous hr/wk operation AAF	Manufacturer	134 hrs/wk (yes)
Biofilter (Detention Time)	2	90 seconds	Manufacturer	90 seconds (yes)

(1) Quantity of component(s) following Phase II WWTF Improvements Project construction.
(2) Sources include Water Environment Federation (WEF), the Washington State Department of Ecology (Ecology) and Metcalf and Eddy (M&E).
(3) Design criteria slightly exceeded but not significantly enough to require additional capacity.

WAS HOLDING TANK

The existing 150,000-gallon Waste Activated Sludge Holding Tank will provide three days of detention at design average annual WAS production in 2025. Since this detention time is adequate for process control, additional storage volume is not required.

CENTRATE HOLDING TANK

The 45,000-gallon Centrate Holding Tank will provide more than 24 hours of detention time of centrate drained from the dewatering centrifuge operation at design conditions. This detention is adequate since the tank should be emptied by recycling the centrate to the aeration basins each day during low flow periods. Therefore, additional storage volume is not required.

PRIMARY SLUDGE PUMPS, GRIT CLASSIFIER AND GRAVITY THICKENER

Primary sludge removed from the existing primary clarifiers is pumped by the recessed-impeller, primary sludge pumps at a rate of 220 gpm to each existing grit classifier. Degritted primary sludge is discharged by gravity from the grit classifiers to the existing 30-foot gravity thickener. At the design primary sludge underflow concentration of 1 percent, the primary sludge generation is 48 gpm at annual average flow and 66 gpm at maximum month flow in 2025. Therefore, the existing pumping rate of 220 gpm will remove the primary sludge from the clarifiers, and the existing grit classifiers and gravity thickener are adequately sized to handle the 2025 primary sludge flows. The pumped flow rate to the gravity thickener results in a surface overflow rate of 450 gpd/sf, which is acceptable, as indicated in Table 4-7.

WAS ROTARY SCREEN THICKENER

Waste activated sludge is thickened in the rotary screen thickener (RST) prior to pumping into the anaerobic digesters. The RST thickens 1 percent waste activated sludge to about 6 percent solids, thereby preserving digester capacity by reducing the volume of water entering the tanks. At 2025 maximum month design conditions, about 4,220 pounds per day of WAS will be pumped to the RST. Since the RST capacity is 200 gpm, the RST will need to operate for 4.2 hours to process the daily waste activated sludge production at design conditions. As shown in Table 4-7, this operating time per day is acceptable. Therefore, additional RST capacity is not required for year 2025.

The existing thickened WAS pumps will operate longer each day, but they have adequate capacity and will not need to be replaced.

ANAEROBIC DIGESTERS AND SLUDGE HOLDING TANK

The WWTF is equipped with two 180,000-gallon primary anaerobic digesters to stabilize waste primary, waste activated sludge and scum collected from the primary and secondary clarifiers. The digesters are each mixed by a top-mounted mechanical, turbine mixer, and they are heated by a system consisting of sludge recirculation pumps, spiral heat exchangers, a gas-fired boiler, and hot water circulation pumps. The estimated volatile solids reduction in the digesters is 40 percent. The methane gas generated in the digesters is used to provide fuel for the boiler and the burner for the sludge dryer. Auxiliary fuel for the boiler is natural gas.

At the 2025 design conditions, the volatile solids loading of the existing primary digester system will exceed 0.21 lb VS/d/ft^3, which is greater than recommended design loadings for the anaerobic digester process, as shown in Table 4-7. The volatile solids loading will be excessive and could lead to digester failure. Also, the hydraulic detention time of the existing digester system will not be adequate and would not reliably provide treatment to produce a Class B biosolid. Therefore, it is recommended that a third primary anaerobic digester be constructed to handle the year 2025 loads.

It is recommended that the third digester be sized the same as the existing digesters. As for the existing digesters, the new primary digester will be mixed with a top-mounted mechanical mixer. Heat for the primary digester will be provided by a hot water boiler capable of burning either digester gas or commercial natural gas. The new digester will be provided with one spiral heat exchanger for heating of thickened feed sludge. The existing three recirculation pumps will be supplemented by the installation of a fourth pump for the new digester. The new digester equipment will be housed within the exiting digester building. Digested sludge from the existing and new primary digesters will be conveyed by gravity to the existing sludge holding tank. As for the existing digesters, excess gas produced by the new digester will be burned at the existing waste gas burner.

The addition of a third anaerobic digester will require a larger boiler system to provide additional heating capacity. The scope of the upgrade of the boiler system will depend on the schedule for construction of the new third anaerobic digester. If the expansion occurs in the near future, then a small, second boiler may be the most cost effective alternative. However, if the expansion does not occur for ten to fifteen years, it is recommended that the existing boiler be replaced with a new, larger boiler that will heat all three digester tanks. For the purposes of estimating costs of construction of this project, as presented below, it is assumed that the existing Phase II boiler is replaced with a new, larger boiler to heat all three digesters.

The existing sludge holding tank will provide slightly less than 5-days detention time at 2025 average annual loads. This volume should provide adequate holding time in case of emergency shutdown and repair of the downstream dewatering centrifuges. Therefore, additional sludge holding tank volume is not required.

The existing 160-gpm digester sludge pumps are adequately sized to pump digested sludge to the dewatering centrifuges at design conditions.

CENTRIFUGE

The existing 130-gpm centrifuge dewaters anaerobically-digested sludge and discharges the cake to an auger conveyor that transports the material outside the equipment building and drops it into the dryer feed hopper in the adjacent dryer building. At the 2025 design average loading from the digester system, the centrifuge will need to operate about 4 hours per day (5.6 hours per weekday), including startup and shutdown, to dewater the

flow from the digested sludge pump. However, at this feed rate to the centrifuge, only about 3 to 4 yards of dewatered sludge cake will be produced per day. Preferably, the centrifuge would have enough capacity to fill the 25-cubic yard hopper with sludge cake in one day-shift's operation. Therefore, it is recommended that a second centrifuge, equal in capacity to the existing one, be installed. Since the existing centrifuge is almost ten years old, and there is no spare unit, a second, a new centrifuge would also provide needed backup service. The centrifuge room was originally designed to accommodate two centrifuges.

The existing dewatered sludge auger conveyor has a capacity of 200 ft^3 per hour, which is adequate for 2025 design loading and with two centrifuges operating. A second conveyor is not required.

SLUDGE DRYER

A new belt-type sludge dryer, to produce Class A dried biosolids, will be installed in the Phase II upgrade in the existing sludge storage building, which is being remodeled to enclose the dryer system. The dryer will receive dewatered, anaerobically-digested sludge and evaporate sufficient water from this material to produce a final solids concentration of at least 90 percent. The dryer is rated at 1,570 wet pounds (0.785 wet tons) of sludge per hour, or 1,100 pounds of water evaporated per hour. At the 2025 average design loading of 15.0 wet tons per day (at 20 percent solids in the dewatered sludge discharged from the centrifuge), the dryer will operate continuously for 6 days (134 hours) during each 7-day week, including startup and shutdown time. The dryer would be required to operate continuously to dry the amount of dewatered sludge produced per week, at maximum month loading. However, the long detention time provided in the three anaerobic digesters and sludge holding tank will provide capacity to store sludge during the design maximum sludge production period. Therefore, since the dryer operates most efficiently when running continuously, and the weekly operating time at average conditions allows over a day each week for shutdown, the existing dryer is adequate for 2025 design loading. Therefore, no expansion of the dryer facility is required.

ODOR CONTROL BIOFILTER AND FAN

Since the WWTF upgrade to treat the 2025 flows and loadings does not increase the volume of air collected and discharged to the existing biofilter system, no change to this odor control system is required.

SEPTAGE STORAGE TANK

The WWTF receives septage delivered by contract haulers from residential STEP tanks and the WaferTech septic tanks. Two 30,000-gallon, aerated septage storage tanks are installed at the WWTF to receive and store this waste. One tank was constructed in the Phase I secondary upgrade project in 2001 and the second tank will be installed in the

Phase II project. The two tanks were sized to handle the septage volumes produced through year 2025 by WaferTech and existing and future City residential STEP systems. As indicated in the 2007 *Wastewater Facility Plan*, the projected annual City STEP septage production for 2025, not including the NUGA, is 3.26 million gallons, or 8,900 gallons per day on average. The 2007 Plan also indicated that up to 30,000 gallons of City septage (up to 34,000 including Wafertech septage) will be sent to the City WWTF as a maximum day septage volume. The two 30,000-gallon tanks provide enough storage capacity to hold this maximum daily septage volume and meter it into the plant flow.

Since the majority of the NUGA will be served by gravity sewers, it is not expected that the STEP systems in this area will significantly increase the maximum daily septage volume delivered to the WWTF. Therefore, the two existing septage storage tanks should provide adequate storage capacity through year 2025, including service to the NUGA, and additional septage tank volume is not required.

The design criteria for the WWTF solids treatment system components are shown below.

Design Criteria for Solids Treatment System

Primary Anaerobic Digesters	
Quantity of Primary Digesters	3 (1 new; 2 existing)
Volume (each)	24,000 cubic feet
Diameter	35 feet
Side Water Depth	25 feet
Total Primary Digester Volume	72,000 cubic feet
Maximum Month Influent Sludge Feed Rate	27,200 gpd
Annual Average Influent Sludge Feed Rate	20,000 gpd
Maximum Month Hydraulic Retention Time	19.8 days
Influent Sludge Solids Concentration	5.6 percent
Maximum Month Total Solids Loading	12,700 lb/day
Maximum Month Volatile Solids Loading	10,160 lb/day
Volatile Solids Loading	0.14 lb VS/ft^3/d
Digester Operating Temperature	35°C to 38°C
Estimated Volatile Solids Reduction	40 percent
Maximum Month Digested Sludge Production	8,640 lb/d
Digested Sludge Solids Concentration	3.8 percent
Sludge Holding Tank (existing)	
Quantity	1
Volume	12,000 cubic feet
Diameter	35 feet
Side Water Depth	12.4 feet
Sludge Flow Rate	18,000 gpd
Effluent Sludge Solids Concentration	3.3 percent
Hydraulic Retention Time	5 days

Digester Mixing	
Type of Mixing	Mechanical
Quantity of Mixers per Digester	1
Mixer Pump Capacity	9,000 gpm
Turnover Time	20 minutes
Motor Size	10 hp
Heating	
Quantity of Boilers	1 (new)
Boiler Type	Fire Tube
Boiler Size	807,000 BTU/hr
Quantity of Spiral Heat Exchangers	3 (1 new; 2 existing)
Heat Exchanger Type	Spiral
Heat Exchanger Capacity	425,000 BTU/hr
Quantity of Boiler Water Pumps	2
Boiler Water Pump Type	Centrifugal
Boiler Water Pump Capacity	200 gpm
Boiler Water Pump TDH	23 feet
Boiler Water Pump Motor Size	7.5 hp
Recirculation Pumps	
Type	Rotary Lobe
Quantity of Pumps	4 (1 new; 3 existing)
TDH	23 feet
Pump Capacity	200 gpm
Motor Size	7.5 hp
Primary Sludge Gravity Thickener (existing)	
Quantity of Tanks	1
Volume	150,000 gallons
Diameter	30 feet
Effective Settling Area, each	707 sf
Effective Side Water Depth	10 feet
Volume	52,900 gallons
Surface overflow rate at design inlet flow (220 gpm)	450 gpd/sf
Solids loading rate at MMF (0.3% sludge feed conc.)	11.1 lb/d/sf
WAS Storage Tank (existing)	
Quantity of Tanks	1
Volume	150,000 gallons
Centrate Storage Tank (existing)	
Quantity of Tanks	1
Volume	45,000 gallons

Quantity of Centrate Pumps	2
Pump Type	Submersible Centrifugal
Septage Storage Tank (existing)	
Quantity of Tanks	2
Volume each	30,000 gallons
No. of Septage Pumps per tank	2
Pump Type	Submersible Centrifugal
WAS Thickener (existing)	
Quantity	1
Type	Rotary Screen Thickener
Flow Capacity	200 gpm
Feed Solids	1%
Thickened Solids	5-7%
Thickening Polymer Feed System (existing)	
Quantity	1
Type	2-Tank
Polymer Type	Liquid or Dry
Mixing Tank Volume	520 gallons
Holding Tank Volume	500 gallons
Solution Feed Pump Capacity	100 gph
Thickened WAS Pumps (existing)	
Quantity	2
Type	Progressing Cavity
Capacity	50 gpm
Pump Head	60 psi
Motor Size	10 hp
Digested Sludge Pumps (existing)	
Quantity	2
Type	Progressing Cavity
Capacity	160 gpm
Pump Head	60 psi
Motor Size	10 hp
Centrifuge	
Quantity	2 (1 new; 1 existing)
Type	Solid Bowl, VFD Back Drive
Capacity, each	130 gpm
Bowl speed	3,000 rpm
Motor Size	
Main Drive	100 hp

Back Drive	20 hp
Dewatered Cake Solids Concentration	20 percent
Dewatered Sludge Conveyor Capacity	200 ft^3/hr
Sludge Dryer (existing)	
Type	Belt
Capacity	1,570 wet lb/hr
	1,100 lb water evaporated/hr
Hours of Operation/Week	
Annual Average	134
Drying Energy Required	1,400 BTU/lb of water
Electricity Required	63 kW
Nonpotable Water Required	50 gpm
Plant Drain Pump Station No. 2 (existing)	
Quantity of Pumps	2
Type of Pumps	Submersible Centrifugal
Capacity	500 gpm
Pump Head	40 ft
Motor Size	10 hp
Odor Control System (existing)	
Type	Soil Biofilter
Quantity of Units	2
System Size	7,200 square feet
Media Depth	63 inches
Biofilter Fan (existing)	
Type	Centrifugal
Quantity of Units	2
Fan Capacity	3,600 scfm
Fan Motor Size	15 hp

ELECTRICAL AND SCADA SYSTEMS

Based on a review of electric utility billings, the available electrical capacity at the plant is sufficient for the loads associated with the new equipment discussed in this chapter. Additional electrical equipment to provide more power to the WWTF is not required. Since there is no additional essential equipment added other than the small motor loads of the new secondary clarifier, additional auxiliary generator capacity is not required.

The City's SCADA and PLC programming will need to be revised to incorporate the new equipment in the WWTF's monitoring and process control systems.

RECOMMENDED WWTF PLAN

The WWTF expansion to treat design year 2025 flows and loadings (including from NUGA) will require the following new improvements and modifications:

- Two additional aeration basins (#4 and #5) including associated basin equipment (air diffusers, air supply piping and valves, air flow meters, dissolved oxygen meters, internal recycle pump and pipe, submersible mixers), new air supply header pipe from blowers., and expansion of the aeration basin splitter influent box.

- One new effluent pump (#4).

- Two replacement alkalinity chemical storage tanks.

- One additional anaerobic digester (#3) and associated equipment (tank mixer, sludge recirculation pump and piping, sludge/water heat exchanger, instrumentation).

- One replacement digester boiler.

- One additional sludge dewatering centrifuge.

- Electrical and controls improvements associated with the new components listed above.

The recommended future site layout, process flow diagram, and hydraulic profile for the WWTF, showing recommended improvements described above, are presented in Figures 4-1, 4-2, and 4-3, respectively. A mass balance for the future WWTF process is included in Appendix D.

The estimated capital and O&M costs for the upgraded WWTF for year 2025 design flows and loadings are presented in Tables 4-8 and 4-9, respectively. Costs are estimated total project costs in 2009 dollars and include engineering, construction management, sales tax and contingency. The O&M cost includes the cost of contracted hauling of the dried, Class A biosolids off site for land application.

TABLE 4-8

Design Year 2025 WWTF Project Cost Estimate (2009 Dollars)

No.	Item	Quantity	Unit Price	Amount
1.	Mobilization/Demobilization	1 LS	$500,000	$500,000
2.	Demolition, incl. Aerobic Dig. #1	1 LS	$80,000	$80,000
3.	Aeration Basins (#4 and #5) incl. equipment	1 LS	$2,000,000	$2,000,000
4.	Alkalinity Chemical Storage Tanks	2 EA	$25,000	$100,000
5.	3rd Secondary Clarifier incl. equipment	1 LS	$1,200,000	$1,200,000
6.	Effluent Pump	1 EA	$60,000	$60,000
7.	Anaerobic Digester (#3) incl. equipment	1 LS	$750,000	$750,000
8.	Digester Boiler	1 LS	$300,000	$300,000
9.	Centrifuge (#2)	1 LS	$500,000	$500,000
10.	Dewatering	1 LS	$100,000	$100,000
11.	Earthwork	1 LS	$80,000	$80,000
12.	Miscellaneous Metals	1 LS	$100,000	$100,000
13.	Painting	1 LS	$75,000	$75,000
14.	Site Work	1 LS	$100,000	$100,000
15.	Mechanical/Yard Piping	1 LS	$1,000,000	$1,000,000
16.	Electrical	1 LS	$1,000,000	$1,000,000

Subtotal	$ 7,895,000
Construction Contingency (20%)	$ 1,579,000
Subtotal	$ 9,474,000
Washington State Sales Tax (7.9%)	$ 748,446
TOTAL ESTIMATED CONSTRUCTION COST	**$10,222,446**
Engineering, Administrative, and Legal Services (20%)	$ 2,044,489
TOTAL ESTIMATED PROJECT COST	**$12,266,935**

L:\CAMAS\05471 WW Fac Plan\2008 FP Amendment\FIGURES\FIG4-1.DWG, 4-1, 3/9/2010 11:10:12 AM, 0.5:1, By: E SHOYMERMAN

PROPERTY LINE

S70°31'17"W
471.37'

TRANSFORMER PAD

SUCTION/DISCHARGE DRAIN MANHOLE

EQUIPMENT BUILDING

SLUDGE DRYER BUILDING

BIOFILTER NO. 1

BIOFILTER NO. 2

N21°18'22"W
159.45'

WASTE GAS BURNER

DIGESTER BUILDING

DIGESTER No. 1

DIGESTER No. 2

DIGESTER No. 3

DIGESTED SLUDGE HOLDING TANK

PLANT DRAIN PUMP STATION NO. 2

GRAVITY THICKENER

SEPTAGE / CENTRATE / WAS STORAGE TANKS

SEPTAGE TRUCK UNLOADING PAD

SEPTAGE RECEIVING TANKS

SEPTAGE RECEIVING VALVE VAULT

VACTOR TRUCK UNLOADING PAD

HEADWORKS

PRIMARY CLARIFIER NO. 1

PRIMARY CLARIFIER NO. 2

PRIMARY CLARIFIER SCUM PUMP STATION

AERATION BASIN SPLITTER BOX

PLANT DRAIN PUMP STATION NO. 1

AERATION BASIN NO. 1

AERATION BASIN NO. 2

AERATION BASIN NO. 3

AERATION BASIN NO. 4

AERATION BASIN NO. 5

SECONDARY CLARIFIER NO. 3

STORAGE SHED

GARAGE

SECONDARY CLARIFIER NO. 1

CONTROL BUILDING NO. 1

CONTROL BUILDING NO. 2

SECONDARY CLARIFIER SPLITTER BOX

EFFLUENT FLOW METER VAULT

SECONDARY CLARIFIER NO. 2

U.V. DISINFECTION/ EFFLUENT PUMP STATION

TRANSFORMER PAD

EFFLUENT MANHOLE

BONNEVILLE POWER ADMINISTRATION LINE EASEMENT BOUNDARY

N09°20'07"E
525.39'

CHAIN LINK ROLLING GATE

N88°02'16"E
314.25'

N05°57'50"W
167.95'

N81°53'39"E
414.52'

STORMWATER TREATMENT POND

WWTF SITE PLAN

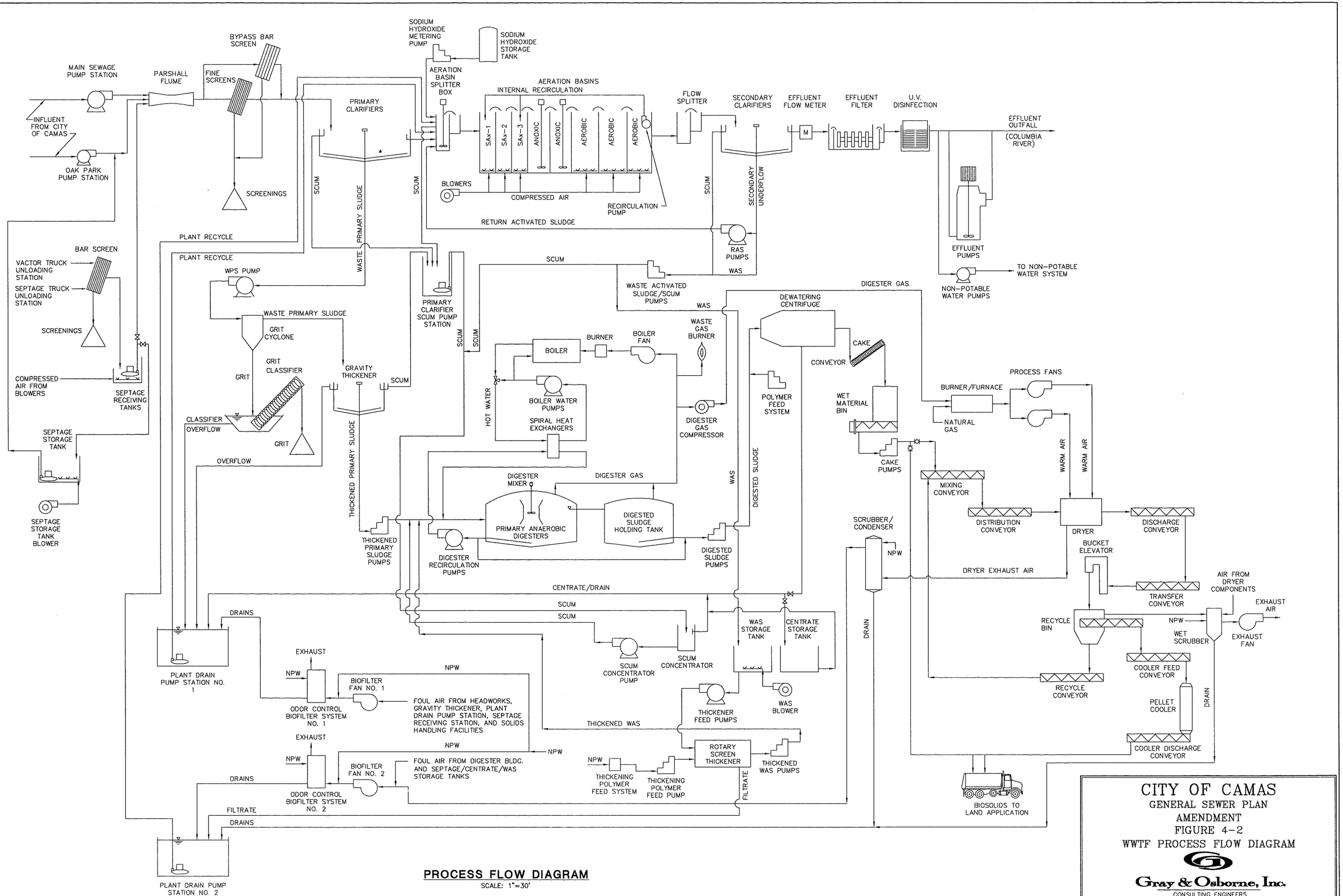
SCALE: 1"=30'

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-1
WWTF SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW Fac Plan\2008 FP Amendment\FIGURES\FIG4-2.DWG, LAYOUT1, 3/9/2010 11:10:45 AM, 0.5:1, BY: E SHOYMERMAN



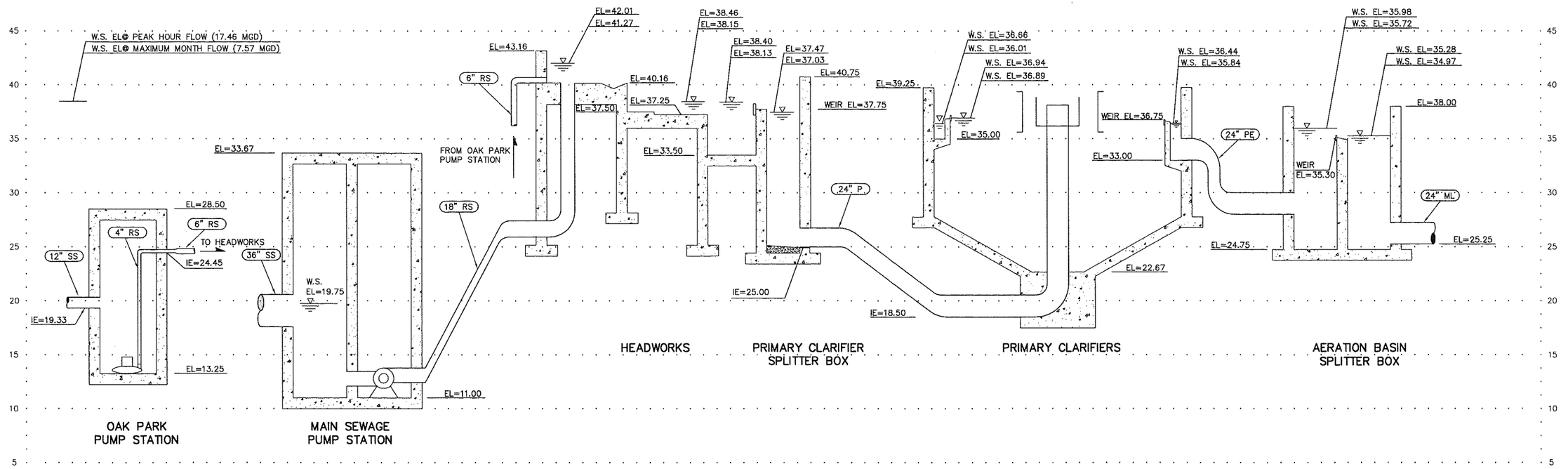
PROCESS FLOW DIAGRAM

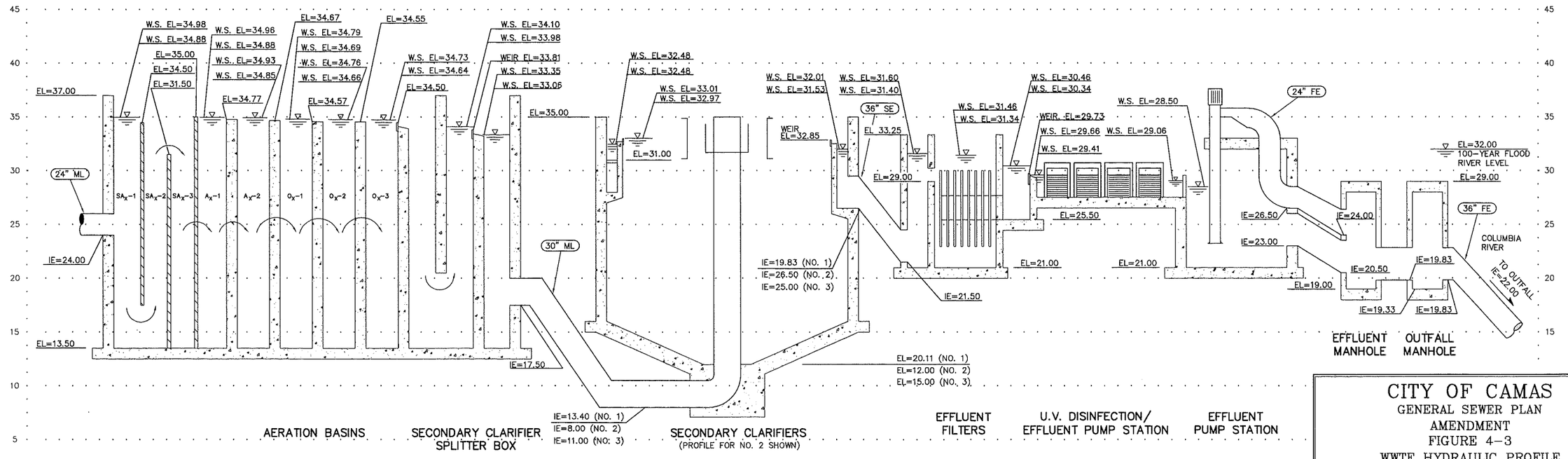
SCALE: 1"=30'

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-2
WWTF PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS





WWTF HYDRAULIC PROFILE

SCALE: VERT 1"=10', HORIZ NOT TO SCALE

CITY OF CAMAS

GENERAL SEWER PLAN
AMENDMENT
FIGURE 4-3
WWTF HYDRAULIC PROFILE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW Fac PLAN\2008 FP AMENDMENT\FIGURES\FIG4-3.DWG, LAYOUT1, 3/9/2010 11:17:13 AM, 0.5:1, BY: E SHOYMERMAN

TABLE 4-9

WWTF O&M Cost Estimate (Design Year 2025)

Item	Estimated Costs (2009 Dollars)
Labor ($38/hr)	$ 553,000
Power ($0.07/kWh)	$ 370,000
Polymer ($2.50/lb)	$ 67,000
Natural Gas ($1.15/therm)	$ 185,000
Equipment Maintenance and Repair	$ 150,000
Testing/Permitting/Misc.	$ 100,000
Contracted Hauling and Land Application ($60/wet TN)	$ 70,000
Total Annual Cost	**$1,495,000**

SOURCE CONTROL PROGRAM

Chapter 6 of the May 2007 *General Sewer/Wastewater Facilities Plan* included a detailed discussion of the characteristics of the major industrial dischargers, and Chapter 8 of the May 2007 Plan included an evaluation of the City's needs regarding managing its commercial and industrial dischargers and dischargers of FOG (Fats, Oil and Grease). In the May 2007 Plan, considering the large number of industries, apparent history of discharge of inhibitory materials, large number of restaurants/fast food establishments, automotive facilities, and potential problems from industrial and FOG disposal in the sewer, it was recommended that the City consider developing elements of a source control program including:

- A program to control Fats, Oils and Grease
- Development of local limits to control industrial discharges from Significant Industrial Users
- The purchase of a software program to manage information from industrial dischargers and FOG and staffing to manage the source control program

SIGNIFICANT INDUSTRIAL USERS

As required by its NPDES permit, the City completed an Industrial User Survey (IUS) in early 2005. The survey identified nine Significant Industrial Users (SIUs) and five Minor Industrial Users (MIUs). The SIUs identified included:

1. Bodycote, Inc.
2. Brown's Chevron
3. Columbia Litho, Inc.
4. Heraeus Shin-Etsu America

5. C-Tech
6. Linear Technology
7. Sharp Electronics Corporation
8. Shell Oil Products
9. Wafertech

The MIUs included:

1. Georgia Pacific (In addition to discharging some minor flows to the City's WWTF, Georgia Pacific discharges treated wastewater to the Columbia River from its own WWTF less than one mile west of the Camas outfall.)
2. Furuno USA Inc.
3. Lemon Aid Automotive
4. Post Record
5. Westlie Motors

Based on the information presented in Chapter 6 of the May 2007 Plan, industrial/commercial wastewater accounts for over half (56%) of the City's influent baseflow. Industrial wastewater (and wastewater from commercial enterprises that is industrial in nature) does not typically have the same concentrations of organics, solids and nutrients found in residential wastewater. Industrial wastewater can also contain higher concentrations of trace pollutants which are toxic to the biological treatment process used in the WWTF. Any industry siting in the sewer service area that has a discharge potentially deleterious to the wastewater collection or treatment systems must be required to provide adequate on-site industrial pretreatment, consistent with the City's pretreatment program, to prevent such impacts.

Considering the relatively large proportion of industrial flow, and relatively large number of industries in the City, it is recommended that the City consider developing local limits for the protection of its WWTF. Local limits are developed to implement site-specific prohibitions to protect against the discharge of pollutants at a quantity or rate that may cause pass-through or interference at (or otherwise detrimentally impact) a POTW.

The Department of Ecology has not delegated specific responsibilities for managing an industrial pretreatment program to the City. However, Ecology has asked the City to evaluate the impact of a specific wastestream (neutralized sulfuric acid discharged by Wafertech) on the City's wastewater collection and treatment systems. A report evaluating this impact and proposing Maximum Allowable Headworks Loadings (MAHLs) to the Camas WWTF for sulfate and Total Dissolved Solids will be submitted in Spring 2010. Per discussion with David Knight at the Department of Ecology, the City can expect a requirement to develop additional MAHLs and local limits, in accordance with EPA's 2004 *Local Limit Development Guidance,* to appear in its new NPDES permit, to be issued later in 2010.

INDUSTRIAL PRETREATMENT TRACKING PROGRAM

It is recommended that the City consider the purchase a computer program to track its industrial users. There are several options for pretreatment management database programs. Vendors include LINKO, Operator 10, PACS and PREWIN. All of these software programs offer similar functions to the user. In general, each program has the ability to:

- Store industrial user information
- Store sample and result information
- Make queries of stored information
- Store certain industry specific information (flow rates, pretreatment processes, etc.)
- Import and Export capabilities, also LIMS compatibility
- Generate reports and letters of violation
- Log notes, phone calls, track maintenance records, etc.

CHAPTER 5

REVISED EVALUATION OF WATER REUSE

INTRODUCTION

Wastewater reclamation can potentially be cost effective through reducing potable water costs, creating an additional new water supply, and generating revenue by selling reclaimed water to customers for irrigation and other non-potable water uses. The production and beneficial use of reclaimed water is the development of a new water supply. This chapter builds on the evaluation presented in Chapter 10 of the May 2007 *General Sewer/Wastewater Comprehensive Plan,* as modified and approved in November *2009* (May 2007 Plan*)*, and specifically provides an evaluation of the impact of the inclusion of NUGA flows on the feasibility of reusing effluent from the City of Camas WWTF or constructing a new water reclamation facility (WRF) to treat wastewater and produce water for reuse.

REGULATIONS CONCERNING REUSE

A detailed discussion of the regulations governing water reuse was provided in Chapter 10 of the May 2007 Plan. (See that chapter for more information.) The key regulations are the State of Washington Water Reclamation and Reuse Standards. The standards, developed jointly by the Washington Departments of Health and Ecology, were last published in September 1997; however, they are in the final stages of being revised, with new standards expected by 2010. As described in the May 2007 Plan, the current standards include Reclaimed Water Classification (Class A, B, C or D) by Type of Use, and requirements for uses such as:

- Groundwater Recharge
- Streamflow Augmentation
- Industrial Reuse

Additionally, the standards include treatment requirements, including:

- Reliability Criteria
- Alternative Disposal and Storage
- Redundant Process Units and Equipment

Finally, the standards, and other applicable regulations, include reuse area criteria, such as:

- Setbacks from Potable Water Systems
- Cross-Connection Control Requirements

- Residual Chlorine Requirements for Distribution System Protection

Also, depending on the use of the reclaimed water, groundwater and surface water regulations may apply.

WATER RIGHTS

The City currently has municipal water rights issued by the Washington State Department of Ecology (DOE) for two surface water sources and nine groundwater sources. The combined water right on instantaneous quantity basis (Q_i) from all of the City's sources is 10,545 gallons per minute (gpm). The annual withdrawal allocated to the City is 6,300 acre-feet. A summary of the City's water rights are presented below in Table 5-1 Four of the wells listed in Table 5-1 are no longer in use: Well 1, 2, 3, and 4. Water rights from these wells have been transferred to other sources as indicated.

The surface water diversions for Jones Creek and Boulder Creek (formerly known as the Little Washougal River) are situated in Section 3, Township 2 North, Range 4 East, W.M. All of the wells, with the exception of Well 9, are located in Section 12, Township 1 North, Range 3 East, W.M. Well 9 is located in Section 4, Township 1 North, Range 3 East. The "place of use" specified by DOE on all certificates, permits, and claims is either "within the City limits of the City of Camas" or the "area served by the City of Camas." The purpose or "type of use" for certificates, permits, and claims is "municipal supply," except for Certificate S 711 C (Jones Creek), which specifies a purpose of "domestic supplies." Ecology and the City have recently come to an agreement that eliminates the surface water withdrawals between May 15 and October 31, in exchange for additional groundwater rights.

TABLE 5-1

City of Camas Water Rights Summary

Source	ID Number	Priority Date	Instantaneous Qi (gpm)	Annual Qa (acre-ft/year)
Claims				
Well 1	121022	06/11/74	900	320[(1) (4)]
Well 2	121023	06/11/74	900	230[(1) (4)]
Well 10	Claims transferred from Wells 1 and 2[(5)]			
Well 12	Claims transferred from Wells 1 and 2[(5)]			
Certificates				
Boulder Creek[(6)]	S 712 C	08/22/23	1,120 (2.5 cfs)	1,820[(2)] (P)
Jones Creek[(6)]	S 711 C	09/05/30	450 (1.0 cfs)	730[(3)] (P)
Well 3	G 85-A C	07/21/45	1,200	118[(4)] (P)
Well 4	G 4072-A C	02/12/59	1,325	1,208[(4)] (P)
Well 5	G 6636-A C	03/22/68	600	920[(4)] (P)
Well 6	G 6635-A C	03/22/68	1,500	2,400[(4)] (P)
Well 7	G2-00501 C	03/22/71	1,000	530[(4)] (P)
Well 8	G2-24400 C	02/04/77	900	530[(4)] (P)
Well 11	Water Right transferred from Well 3[(5)]			
Well 13	Water Right transferred from Well 4[(5)]			
Permits				
Well 9	G4-27384 P	08/13/86	650	210 (S)
Anderson Site	G2-30145	08/21/03	1,000	880
Parkers Landing	G2-30146	08/21/03	1,000	880
Treatment Plant Well	G2-30147	08/21/03	1,000	880
Total			**14,045 gpm**	**11,090 (P) 210 (S) ac-ft**

(1) Claims are considered valid until proven otherwise through an adjudication process.

(2) This source was formerly known as the Little Washougal River. The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 1,820 ac-ft/yr for Boulder Creek (S 712 C), based on continuous withdrawal at the instantaneous right specified.

(3) The certificate refers to an instantaneous quantity (Qi) and does not specify an annual withdrawal. A DOE Report of Examination for Well No. 7 (G2-00501 C) summarizes existing water rights, including 730 ac-ft/yr. for Jones Creek (S 711 C), based on continuous withdrawal at the instantaneous right specified.

(4) The Permit and Report of Examination preceding this certificate limited water rights to "the total quantity withdrawn or diverted from all sources is not to exceed 5,900 ac-ft/yr."

(5) Well 10, 11, and 12 were installed to replace Well 1, 2 and 3, which have failed due to collapsed well casings; see Pacific Groundwater Group report dated June 9, 2003. Well 13 replaced Well 4 after Well 4 was determined to be groundwater under the influence of surface water; see Pacific Groundwater Group report dated August 14, 2006.

(6) See Ecology agreement that limits withdrawal from May through October.

(P) Primary water right, additive to other rights.

(S) Supplemental water right, not additive or considered when summing a cumulative total of all rights.

CURRENT WATER SYSTEM

Based on the water rights analysis in the City's *2001 Water System Comprehensive Water System Plan*, the City of Camas does not have adequate water supply capacity to meet maximum day demand requirements through the year 2020. However, since the 2001 Plan, the City has secured water rights and made the source modifications listed below:

- In an effort to maximize capacities of existing sources and water rights the City has:

  - Replaced Wells 1, 2, and 3 with Wells 10, 11, and 12;
  - Replaced Well 4 with Well 13; and
  - Drilled Well 14 under a new water right to be equipped in 2009.

- The City is in the process of transferring existing water rights from Georgia Pacific to the City.

In 2008, Ecology issued three new water rights for the City, giving the City rights to receive 4.32 million gallons per day of new water to add to its current authorization of 15.9 million gallons per day. The combined total equals 17.96 million gallons per day because rights from Jones and Boulder Creek are not available for use during peak demand days. This combined total will meet the City's peak day demand projections through 2022. In addition to Well 14, the City intends to install two additional wells under the new rights over next few years as required by demand. Although the City does not have a need to develop additional water rights for the immediate future, the potential for reclaimed water is evaluated. There may be a need for reclaimed water in the future, depending on actual future residential and industrial growth.

POTENTIAL FOR REUSE

The potential applications for reclaimed water in the Camas area include industrial process water, irrigation, constructed wetlands for mitigation banking, and stream flow augmentation. Each reuse application is first discussed, and then the treatment alternatives are described. The advantages and disadvantages of the reuse application alternatives are highlighted in the discussion below.

INDUSTRIAL PROCESS WATER

Table 5-2 shows the City's highest water users. The majority of these users are from the industrial customer class that accounts for over 35 percent of the City's water usage. Note that Camas School District #117 has a number of different accounts, but is included as a single account.

Currently, WaferTech uses potable water for the industrial processes; the potable water is treated with reverse osmosis (RO) at the WaferTech facility. It is possible WaferTech could use a significant amount of reclaimed water for their industrial process.

The potential users of reclaimed water for industrial processes also include Underwriters Laboratories and Heraeus Shin-etsu. The industries listed in Table 5-2, Underwriters Laboratories, and Heraeus Shin-etsu could also potentially use reclaimed water for irrigation purposes. Most of the industrial facilities have significant sized lawns that require irrigation during the dry season.

TABLE 5-2

City of Camas Highest Water Users

Customer	2005 Average Daily Demand (gpd)	2006 Average Daily Demand (gpd)	2007 Average Daily Demand (gpd)
Wafertech Industries	570,385	625,521	597,593
Linear Technology	233,870	171,406	257,783
Georgia Pacific Mill	238,567	253,700	261,624
Camas School District #117	38,198	55,009	41,559
Sharp Electronics Corp	17,470	15,494	14,488
Hewlett-Packard	40,647	29,633	21,329
Green Mountain Golf Course	0	20,146	0
Heraeus Shin-estu	12,657	14,543	12,789
Underwriters Laboratory	20,222	24,751	22,558
Camas Washington Associates	8,499	8,641	9,143
Bodycote	7,030	6,640	8,122

Previous estimates from WaferTech indicate a potential projected daily water demand of 3.50 mgd and the remaining industrial customers have a combined projected daily water demand of 1.73 mgd by 2020 (estimates from the *2001 Water System Plan*). Some of this water demand will be for non-industrial, non-irrigation uses such as toilet flushing. The total reclaimed water potentially used by industrial processes and irrigation of the lawns at the industries is estimated at 4.73 mgd (approximately 90 percent of the total water demand). Although WaferTech still has the potential to expand to 3.50 mgd, the current *Water System Plan Draft* projects a 0.70 mgd demand for WafterTech, and a combined industrial demand total of 2.83 mgd by 2029. However, the analysis in this chapter will use the previous industrial demand projections developed in the approved *2001 Water System Plan.*

The advantage to using reclaimed water for an industrial process is that it is a potential application for year-round use of reclaimed water, near the NUGA area. The distribution system could be costly; however, most of the industries that will use reclaimed water are clustered near the northwest boundary of the City of Camas, and the City may be able to use a portion of the reclaimed water to provide spray irrigation at Camp Currie at the north end of the Lacamas Lake. The distribution system from a satellite water reclamation facility (WRF) situated at the north end of Lacamas Lake to the northwest corridor of the City and Camp Currie is presented on Figure 5-1. The proximity of a satellite WRF to the industrial corridor could allow the distribution system to be more cost effective. It may be an option to site a water reclamation facility on-site at the WaferTech facility since most of the reclaimed water produced will be used at the facility; however, this option is not evaluated at this time.

IRRIGATION

Reclaimed water could be used for irrigation and landscaping purposes during the summer months. The Camas region has an annual average rainfall of approximately 75 inches, but the summer rainfall can average as little as 0.56 inches per month (Chapter 2 in the May 2007 Plan). Due to the significant amount of rainfall during winter months, reclaimed water could only be used for irrigation during the summer months.

Distribution will be cost-prohibitive if all parks and public property throughout the City of Camas are considered. Additionally, treating to reuse standards at the existing WWTF site and conveying the reuse water to the north end will be cost-prohibitive. Therefore, in the May 2007 Plan, only the properties in the vicinity of the WWTF (i.e., southeast Camas) were considered for irrigation with reclaimed water, including some of the City's public parks, municipal property (including City Hall, the Community Center, and the Library) and, public schools, and the Camas Cemetery. In this plan, the possibility of irrigating areas in Northwest Camas was considered. It is understood that the area golf courses, Green Mountain and Camas Meadows, have sufficient water rights for their needs. However, spray irrigation could be provided for forested areas of Camp Currie at the northwest end of Lacamas Lake. Camp Currie includes approximately 260 acres of predominantly forested park land, owned by a trust as a wildlife and recreation preserve. It is projected that spray irrigation could be provided on as much as 25 percent of this area (65 acres) without disrupting existing uses.

Table 5-3 lists the estimated potential reclaimed water usage rates for irrigation purposes at both the southeast Camas and northwest Camas areas. The irrigation usage rates are based on an irrigation rate of 14 inches/year and an irrigation season of 3 months/year. The total potential peak day demand for irrigation for the southeast and northwest areas are 0.338 mgd and 0.550 mgd, respectively, applying a peaking factor of two to the average seasonal usage. In addition to the limitation of using reclaimed water for irrigation purposes is that irrigation is only necessary approximately 3 months per year.

ALTERNATIVE NO. 2
SATELLITE WATER RECLAMATION
FACILITY SITE

ALTERNATIVE NO. 1
EXISTING WASTEWATER
FACILITY SITE

LACAMAS LAKE

COLUMBIA RIVER

WASHINGTON

OREGON

N

0 2,500 5,000 Feet

SOURCE: CITY OF CAMAS

CITY OF CAMAS

GENERAL SEWER PLAN AMENDMENT
FIGURE 5-1
RECLAIMED WATER DISTRIBUTION
SYSTEM ALTERNATIVES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\CAMAS\05471 WW FAC PLAN\GIS\FIGURE 5-1.MXD

TABLE 5-3

Potential Reclaimed Water Usage Rates[(1)]

Irrigation/Landscaping Use[(1)]	Irrigated Area (Acres)	Annual Average Usage (MG/year)	Peak Day (mgd)
Southeast Camas			
Public Schools	10	3.8	0.084
Other Municipal Property	3	1.1	0.025
Camas Cemetery	12	4.6	0.101
Public Parks	15	6	0.127
Total Potential Reclaimed Water Usage – Southeast Camas			**0.338**
Northwest Camas (Camp Currie)			
Camp Currie	65	25	0.550
Total Potential Reclaimed Water Usage – Northwest Camas			**0.550**

(1) Irrigation rate based on 14 inches per year over a 3-month irrigation season, and peak day to seasonal peaking factor of 2.0.

The irrigation sites and the distribution system from the existing WWTF are identified on Figure 5-1. The advantage of an irrigation system is the presence of several potential irrigation sites clustered including the southeast and northwest corridor of the City, near the existing treatment facility or proposed WRF site; therefore, distribution costs could be reasonable if the existing plant is modified to a water reclamation facility or a new facility is constructed. The disadvantage to irrigation as a reuse application is that irrigation is only necessary during summer months; during the remaining months the City would not need to reclaim water and would have to use the existing outfall.

MITIGATION WETLANDS BANK

The City of Camas has received funding to establish a mitigation wetlands bank in the Lacamas Watershed. A mitigation wetlands bank typically involves a larger mitigation wetlands site, providing more ecological value than several smaller mitigation wetlands. Furthermore, the potential for success of a mitigation wetland bank is greater than a smaller mitigation wetland. Mitigation wetland banks require the up-front compensation prior to impacting an existing wetland at a site undergoing development. With proper implementation and guidelines, mitigation wetland banks have the potential to increase ecological benefits, save money for project applicants, and improve efficiencies in application and permitting processes. Reclaimed water could be used to enhance the wetlands mitigation bank.

The mitigation wetlands bank in the Lacamas Watershed project will acquire 63 acres on Fifth Plain Creek, a tributary to Lacamas Creek. The property includes a 26-acre riparian

zone as well as connected wetlands and uplands. The City has received funding to restore/enhance 24 acres of the site, and the remaining 39 acres will be utilized for future restoration as banking revenues are received.

Hydrogeological studies will be required to determine the suitability of the site for the purpose of using reclaimed water. Furthermore, monitoring wells will be required if the site is developed for the use of reclaimed water. The disadvantage to using reclaimed water for the wetlands mitigation bank is that both the hydrogeological studies and the monitoring wells will be very costly. The advantage to using reclaimed water for the wetlands mitigation bank is the potential for year-round use.

STREAM FLOW AUGMENTATION

The reclaimed water could be used to augment stream flows in the Dwyer Creek basin. The habitat in the Dwyer Creek basin has been compromised due to increased development in the drainage basin. The City could augment stream flows in Dwyer Creek to enhance habitat in the drainage basin. The City would have to work with the Washington State Departments of Ecology and Fish and Wildlife to develop a stream flow augmentation system at Dwyer Creek using reclaimed water. Issues associated with this alternative that have to be addressed are as follows:

- Establish beneficial use for the additional stream flow.
- Direct discharge of reclaimed water into Dwyer Creek may not be allowed. Based on past experience, this may require the construction of an additional structure, a lined pond and a conveyance channel to reaerate, cool and polish the reclaimed water prior to its introduction to Dwyer Creek.
- Flow of reclaimed water into the creek may be required to be maintained at a constant rate 24-hours a day year round.
- The City will have to determine the quantity of water they are willing to permanently give up in order to use their reclaimed water for stream flow augmentation. Once the water begins flowing into the creek, any interruption of flow could have adverse impacts on the creek's habitat.
- Hydraulic capacity of the creek channel as well as in-stream flow goals must be established by the Department of Fish and Wildlife.
- Water quality impacts to the small stream must be established. These impacts include the effects of parameters such as dissolved oxygen, nutrients, toxics and coliform bacteria.

- WRF effluent limits for ammonia and other toxic pollutants (metals) may be more stringent due to the potential harm to aquatic life in the creek.

EVALUATION OF ALTERNATIVES

The City of Camas has several alternatives available for the production of reclaimed water. The reuse application varies with the treatment alternative based on the proximity of the reclaimed water production site. Alternatives available to the City include:

- Alternative No. 1 – Modify the Existing WWTF for Reclaimed Water Production and Application of Reclaimed Water for Irrigation and Industrial Process Water.

- Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Reclaimed Water Production and Application of Reclaimed Water for Irrigation and Industrial Process Water.

- Alternative No. 3 – Construct a Satellite Water Reclamation Facility for a Reuse Application of Wetlands Banking Mitigation.

- Alternative No. 4 – Construct a Satellite Water Reclamation Facility for a Reuse Application of Stream flow Augmentation.

Alternatives No. 3 and No. 4 are not evaluated at this time since many of the total project costs will be very similar to the cost of Alternative No. 2. The treatment costs will be the same and the distribution costs may be similar; however, Alternatives No. 3 and No. 4 will require hydrogeological studies to determine if either of these sites is adequate for a reuse application. Furthermore, the cost of hydrological studies, permitting, and monitoring wells could be cost prohibitive. Alternatives No. 1 and No. 2 are evaluated in greater detail.

ALTERNATIVE NO. 1 – MODIFY THE EXISTING WWTF FOR A REUSE APPLICATION OF IRRIGATION AND INDUSTRIAL PROCESS WATER

The City could modify the existing WWTF to provide Class A water reclamation. The Class A reclaimed water treatment process will be designed for a peak hour flow of 4.73 mgd. This amount would be sufficient for industrial reuse (the predominant use approximately 9 months of the year); during the remaining 3 months, 0.338 mgd of irrigation reuse water would be provided, and the industries would use potable water if the peak hour supply was insufficient. The remaining effluent would likely be discharged out the outfall. The advantage to modifying the existing facility is that most of the infrastructure exists already at the treatment facility.

Additional electrical reliability components would be required for the Class A water reclamation facility. The generator capacity must also be upgraded to meet Reliability Class I and additional alarms and telemetry would be required. However, substantial additional equipment reliability components are not required since the City has an existing outfall as an alternative disposal method. The City would be required to provide a UV disinfection system designed to produce Class A reclaimed water. The newest edition of the Department of Ecology's *Criteria for Sewage Works Design* (*Orange Book*) requires the UV disinfection system for reuse applications to comply with the 2003 *Ultraviolet Disinfection Guidelines for Drinking Water and Reuse (NWRI Guidelines)* published by the National Water Research Institute (NWRI) in collaboration with the American Water Works Association Research Foundation (AWWARF).

Conceptual Design and Cost Estimate

Coagulation and Filtration

The City's existing Aqua-Aerobics AquaDisk fabric filter has been approved for Title 22 reuse applications. This filter utilizes a series of rotating disks, which can be continuously backwashed while the filter continues to operate. Periodically, flow to the filter must be stopped to allow for a more intense washing of the fabric as well as to clean out solids that deposit in the filter tank. The existing filters are designed to treat a peak hour flow of 6.1 mgd (24 disks with 0.25 mgd approximate capacity per disk). The system would be reconfigured so that an alarm will trigger when the peak hour flow is greater than 6.1 mgd, at that point, the flow will be diverted to the outfall.

The current State water reuse standards include a requirement for coagulation and flocculation upstream of filtration to destabilize and agglomerate finely divided particulate into larger particles to increase the capture rate of suspended solids in the filter. The reuse standards revision process currently underway may remove or relax this requirement; however, for the purposes of this cost estimate, it is assumed that the requirement remains. Typically, for such systems, the following equipment is required: chemical feed system (for feeding coagulants), flocculation tanks, and mixing system. An ongoing concern observed in other reuse systems using cloth media filters is blinding of the filters, which can be mitigated somewhat by providing adequate detention time in the flocculation tanks.

The chemical feed systems would be paced off the secondary effluent flow meter. Gentle mixing would be provided for flocculation with a velocity gradient in the range of 20/sec to 80/sec. Detention times for such flocculation systems are typically in the range of 15 min. to 20 min. If a typical detention time of 20 minutes at maximum month flow of year 2025 (7.57 mgd) is selected, a flocculation tank volume of 105,000 gallons is required. There are space and hydraulic limitations in accommodating a coagulation/filtration at Camas. For the purposes of this report, it is assumed concrete in-ground tanks are provided, along with lift (screw) pumps.

UV Disinfection

Following Phase II construction, the City's low pressure/low intensity UV disinfection system will be capable of treating a peak design flow of 10.04 mgd to meets its secondary fecal coliform limits. However, the design flow capacity of the UV system to disinfect to reuse standards will be lower, due to the higher dosage requirements for generating reclaimed water. The 2025 peak hour reuse water demand is estimated at 4.73 mgd. Presuming the UV dosage in the existing is insufficient to disinfect the 4.73 mgd to reuse levels, an inline UV disinfection system could provide the additional UV dose needed to meet the requirements for Class A reclaimed water. The additional UV disinfection system would be installed downstream of the existing UV disinfection system. The existing filters have sufficient capacity to treat a Class A reclaimed water peak hour flow of 6.1 mgd. Rather than limit the Class A reclaimed water production peak hour flow capacity to 4.73 mgd (the projected peak hour demand), it is only slightly more expensive to design the inline UV disinfection system to a peak hour flow of 6.1 mgd. The additional reclaimed water peak hour design flow capacity of 6.1 mgd allows for the potential to reuse a greater amount of treated effluent in the future should the beneficial reuse alternatives become more cost effective.

Meeting the disinfection requirements in the NWRI guidelines results in additional capital and operating cost for the UV system, due to several factors:

- Use of conservative design transmittance; the 10^{th} percentile of transmittance measured three times per day for 6 months or 55 percent, whichever is higher. The 10^{th} percentile design transmittance is projected to be 65 percent.

- Use of a *validated* (based on performance testing of seeded pathogens) design delivered dosage of 100 mJ/cm^2

- Use of conservative lamp fouling and end-of-life factors

- Requirements to continuously monitor flowrate, UV intensity and UV transmittance. Monitoring these three parameters will allow continuous monitoring of calculated operational dose, which is also required by the Guidelines. Additionally, turbidity must be monitored continuously.

- Requirements to calibrate UV intensity monitors at least monthly. UV transmittance monitors and turbidity monitors must be calibrated in accordance with manufacturer's recommendations. Laboratory measurements of UV transmittance must be used to verify the accuracy of on-line transmittance monitoring equipment on a weekly basis.

- Requirements to operate the UV system at the same velocity range and flow per lamp as used for performance validation, and with total headloss less than or equal to that measured in equipment validation testing.

Alarms and Telemetry

The use of reclaimed water in open access areas demands a higher level of quality control than normal WWTF operations. An alarm system would need to be installed so that if the coagulation, filtration, or disinfection systems fail, then reclaimed water production will cease, the operator will be notified, and effluent will be directed to the WWTF outfall. The system could utilize new reclaimed water pumps that convey the reclaimed water through the new inline UV system to provide the additional necessary dose required for reuse. If a critical condition occurs, the pumps would be turned off, allowing all of the flow to discharge to the river.

Storage

Industrial water users require water and produce wastewater at sporadic times of the day, irrigation water is often applied to open access areas at night from about 12:00 a.m. to 4:00 a.m., so that water has time to percolate into the ground before public contact. Reclaimed water will be generated in larger amounts during the diurnal peak hours and will be generated in smaller amounts throughout the night. To match reclaimed water production and reclaimed water demand, 200,000 gallons of equalizing storage onsite at the WWTF is recommended. In addition, the industrial users of reuse water may also opt to provide additional reuse water storage onsite at the industrial facility. The City would also have the option to discharge reclaimed water via the outfall during periods of peak reclaimed water production and low reclaimed water demand.

Distribution

A pump station will be required to maintain pressure in the reclaimed water distribution system and to convey the reclaimed water to the irrigation sites and the industries that will use reclaimed water. The preliminary cost of the pump station is estimated at $110,000. The distribution system totals 25,540 linear feet and is presented on Figure 5-1.

The capital costs to modify the existing facility and construct the irrigation distribution system are summarized in Tables 5-4 and 5-5. The O&M costs for Alternative No. 1 are the costs above the O&M costs already incurred by the City for operating the existing WWTF are minimal. An annual O&M cost estimate includes one additional full-time employee (FTE) and additional power costs to operate the UV disinfection system and the alarm system.

TABLE 5-4

Alternative No. 1 – Modify Existing WWTF for Production of Reclaimed Water Treatment Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$437,000	$437,000
Polymer System	1	LS	$385,000	$385,000
Class A Inline UV Disinfection System	1	LS	$330,000	$330,000
Coagulation/Flocculation Tankage and Piping	1	LS	$1,000,000	$1,000,000
200,000 Gallon Storage Tank	200	CY	$825	$165,000
Reuse Pumps	2	EA	$66,000	$132,000
Standby Generator	1	LS	$84,000	$84,000

Subtotal	$2,530,000
Site Work (5% of subtotal)	$ 219,000
Piping (12% of subtotal)	$ 524,000
Alarms/electrical (20% of subtotal)	$ 874,000
Painting (3% of subtotal)	$ 131,000
Misc. metals (2% of subtotal)	$ 88,000
Subtotal	$4,366,000
Contingency (25%)	$1,092,000
Sales Tax (7.9%)	$ 432,000
Total Construction Cost	**$5,890,000**
Engineering and Administrative Costs (25%)	$1,473,000
Total Estimated Project Cost - WRF	**$7,363,000**

TABLE 5-5

Alternative No. 1 – Modify Existing WWTF Reclaimed Water Distribution Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$560,000	$560,000
Booster Pump Station	1	LS	$550,000	$550,000
Irrigation Supply Piping	51,000	LF	$88	$4,488,000

Subtotal	$5,598,000
Contingency (25%)	$1,400,000
Sales Tax (7.9%)	$ 553,000
Total Construction Cost	**$7,551,000**
Engineering and Administrative Costs (25%)	$1,888,000
Total Estimated Project Cost	**$9,439,000**

ALTERNATIVE NO. 2 – CONSTRUCT A SATELLITE WATER RECLAMATION FACILITY FOR A REUSE APPLICATION OF INDUSTRIAL PROCESS AND IRRIGATION

For Alternative No. 2, the City would construct a satellite water reclamation facility sited at the north end of Lacamas Lake near Camp Currie. The location is in the vicinity of the customers that would use the reclaimed water produced at the facility, although the City would be required to negotiate with the County to locate the satellite WRF in the county park, and to use some of the park for spray irrigation. In addition to flows from the NUGA, the satellite WRF could treat commercial, industrial, and residential flows and loadings from Basin Nos. 11, 12, and 13, and about two-thirds of the total flows and loadings from Basin No. 1. The flows from these basins would be rerouted to the satellite WRF and no longer be treated at the existing WWTF site. The satellite water reclamation facility would serve as a scalping plant. Only the liquid stream would be treated at the satellite WRF, while solids would be pumped and conveyed through city sewers and treated at the existing treatment facility. (Some minor modifications would be needed to the STEP line to accommodate the conveyance of solids.) The existing WWTF would continue to treat the flows from the remaining basins. The existing outfall would continue to discharge the flows treated at the existing WWTF; furthermore, the existing outfall could serve as a backup to the WRF if needed. If sufficient demand for reclaimed water were available, the water reclamation facility could be sized for the 2025 peak hour flow of the NUGA, Basin Nos. 11, 12, and 13 (including Grass Valley), and about two-thirds of the flow from Basin No. 1. The total peak projected peak hour year 2025 flow for these areas is estimated to be 8.75 mgd. However, there is insufficient demand for reclaimed water to construct a WRF of this capacity. Thus, the WRF would be designed for 4.73 mgd peak hour flow. The maximum month design flow for the satellite WRF would be 2.1 mgd.

Conceptual Design and Cost Estimate

The reclaimed water system would require tertiary treatment, storage, and distribution. This section will briefly describe each component of the process and provide a cost estimate, based on costs for other water reclamation facilities in the State, including those at Sequim, Ephrata and Royal City.

The preferred alternative for construction of the satellite water reclamation facility is a membrane bioreactor (MBR) activated sludge process. The MBR process produces a very high quality effluent in a small footprint. In an MBR, secondary effluent is separated from the activated sludge solids by filtration through membranes submerged in the aeration basin, instead of separated by gravity in secondary clarifiers. The membrane filters produce a higher quality than typical tertiary filters, such as sand or cloth disc filters. Therefore, secondary clarifiers and tertiary filters are not required for MBR systems, and the facility footprint is smaller than for a reclaimed water facility using conventional activated sludge. Waste activated sludge is removed directly from the

aeration basin, and would be pumped to the existing treatment facility for further treatment.

Influent Pump Station

The Lacamas Shores Lift Station would be modified to serve as an influent pump station to the satellite WRF. Construction of a main sewer trunk to the satellite WRF will be required to convey influent from the influent pump station.

Headworks

The headworks would consist of an influent flow meter, sampler, mechanical fine screens, and a grit removal system. MBR processes require at least 3-mm fine screening to protect the membrane cassettes. Two mechanical fine screens (band screen or rotary drum) will be placed in two parallel channels, each sized for the maximum hydraulic flow of 4.73 mgd (one duty, one standby). A bypass bar screen will not be provided because its operation, even temporarily, could allow material into the MBR basin that may damage the membrane cassettes. The grit removal system would consist of an aerated grit chamber, a grit slurry pump, grit hydrocyclone, and classifier. Grit would be collected in a dumpster, while degritted slurry is returned to the grit chamber.

Membrane Bioreactor

In this particular process, solids in the aeration basin would be separated from the liquid by an in-basin membrane unit. The membrane microfilter system evaluated in this section is produced by Kubota, and marketed in the US by Enviroquip, Inc. Other membrane systems are available that may be used for the satellite WRF. In the Kubota system, membrane cassettes containing large numbers of flat-plate membranes (with nominal 0.4 μm pores) are placed directly into the aeration basin to provide clarification and filtration. Air is added through coarse-bubble diffusers mounted directly below the membrane cassettes to scour the membrane surfaces. The flow of air upward along the membranes promotes flow of mixed liquor upward across the membrane surfaces. Permeate (membrane effluent) passes through the membrane walls into the interior of the flat-plate membrane in a cross-flow pattern, with the driving force provided by either the elevation difference between the aeration basin water depth and the elevation of the downstream processes, or by permeate suction pumps.

In-place cleaning of the membranes with chlorine solution should be performed every 6 months, by injecting a chemical cleaning solution into the permeate lines and allowing the solution to soak in the interior of the membrane. Chemical solution tanks and feed pumps are provided. In addition, the manufacturer suggests periodically relaxing the membranes, by closing the permeate valves while continuing to scour the membranes with air, for 1 minute per 10 minutes of operation.

Operation of the aeration basin is not controlled by the gravity settling characteristics of the mixed liquor (as measured by the SVI). Therefore, the mixed liquor concentration can be maintained at three to four times the typical concentrations used in activated sludge processes. For this MBR, it is recommended to operate at a mixed liquor suspended solids (MLSS) concentration of 10,000 mg/L. Due to the high MLSS concentration, longer solids retention times (SRT) can be maintained in a tank with a short hydraulic retention time (HRT). The SRT is controlled by the rate that excess sludge is removed from the reactor. To remove excess sludge, the basins are equipped with waste activated sludge (WAS) pumps that transfer the sludge to the aerobic digestion system. Reducing the WAS removal rate will lengthen the SRT and increase the MLSS concentration. Membrane bioreactors have operated at concentrations up to 20,000 mg/L, without a negative long-term effect on membrane life.

Internal recycle pumps would transfer mixed liquor from the MBR tanks to the anoxic tanks and aeration basins, to transfer solids away from the membranes and to remove nitrogen from the wastewater through denitrification. Coarse bubble aeration diffusers would provide process air in the pre-aeration tanks. The MBR tanks are aerated by diffusers mounted to the bottom of the membrane cassettes. Two MBR tanks would be provided in parallel, allowing one tank to be taken off-line for maintenance or repair independently. In addition, redundant membrane cassettes would be provided in each tank to allow a cassette to be taken offline while providing treatment of the design flow.

Membrane permeate would flow by gravity or through permeate pumps to the UV disinfection facility. Permeate lines are equipped with pressure gauges and effluent magnetic flow meters.

Kubota membranes have a standard warranty of 5 years; replacement is recommended after 8 to 10 years. Extended warrantees are available, in which, for a fixed annual fee, the manufacturer will replace membranes as needed to maintain the design flux rate and performance.

The membrane bioreactor would be sized for a maximum month design flow of 2.1 mgd.

Coagulation and Filtration

The Class A reclaimed water standards require continuous oxidation, coagulation, filtration and disinfection of the wastewater. The MBR process will not produce higher quality effluent (in terms of BOD, TSS and turbidity) with the addition of coagulation or flocculation processes. Without coagulation, MBRs produce reclaimed water with higher quality than reclaimed water from conventional tertiary processes. The Washington State Departments of Ecology and Health have indicated that they would accept the MBR process without coagulation in a water reclamation application on a case-by-case basis. Therefore, coagulation facilities are not included in this evaluation.

Filtration is provided by the membrane microfilters in the MBR process.

UV Disinfection

Numerous UV disinfection systems that meet the Class A disinfection criteria have been installed in Washington State. Pilot testing has demonstrated that microfiltration membranes are capable of physically removing most bacteria, generally meeting the Class A disinfection standard (2.2 total coliform/100 mL) prior to disinfection. Pilot testing has demonstrated that virus removal is highly variable, and has been measured at less than 1-log (90 percent) removal in some pilot tests (City of San Diego, Point Loma Wastewater Treatment Plant). This is because viruses are generally smaller than the pore size of the microfilter.

The Washington State Department of Ecology's *Criteria for Sewage Works Design* has indicated that the future requirements of the UV disinfection must follow the NWRI guidelines. The implications of the NWRI guidelines on the design of the UV disinfection system are highlighted earlier in this chapter. However, MBR effluent requires a *validated* (based on performance testing of seeded pathogens) design delivered dosage of 80 mJ/cm^2. The UV disinfection system will be designed to disinfect the peak hour design flow of 4.73 with one bank out of service.

Alarms and Telemetry

An alarm system will be installed to notify staff if MBR or disinfection systems fail, or if the reclaimed water quality falls below an acceptable level. At this point, the reclaimed water production will cease and effluent will be pumped to the existing WWTF for further treatment and ultimately will be discharged via the City's existing outfall.

Storage

Industrial water users require water and produce wastewater at sporadic times of the day, Irrigation water is often applied to open access areas at night from about 12:00 a.m. to 4:00 a.m., so that water has time to percolate into the ground before public contact. Reclaimed water will be generated in larger amounts during the diurnal peak hours and will be generated in smaller amounts throughout the night. To match reclaimed water production and reclaimed water demand, 200,000 gallons of equalizing storage onsite at the WWTF is recommended. In addition, the industrial users of reuse water may also opt to provide additional reuse water storage onsite at the industrial facility. The City would also have the option to discharge reclaimed water via the outfall during periods of peak reclaimed water production and low reclaimed water demand.

Solids Handling

Mixed liquor must be wasted from the aeration basin to maintain a constant MLSS concentration and sludge age in the activated sludge system. The waste activated sludge (WAS) would be pumped to a city sewer for conveyance to the existing WWTF.

Distribution

A pump station would be required to maintain a pressure in the reclaimed water distribution system and to convey reclaimed water to the industrial corridor.

The capital costs to construct a satellite WRF and for the distribution system are summarized in Tables 5-6 and 5-7. The O&M costs for Alternative No. 2 are estimated based on experience from other existing water reclamation facilities throughout the State. It is estimated that the satellite WRF and distribution system will add 1 FTE to the City's labor requirement. Annual equipment maintenance costs are estimated as three percent of the initial equipment capital cost. In addition, UV lamps will need to be replaced, with an average replacement rate of 40 percent per year ($12,000) and the annual UV power requirements are estimated at $8,000. The membrane cartridges must be periodically replaced, with an average life of 8 to 10 years. The cost of an extended warranty, which includes replacement of membranes as needed, was quoted at $25,000 per year. The membranes would also require sodium hypochlorite, and possibly oxalic acid, as cleaning chemicals. The total annual O&M cost for Alternative No. 2 is estimated at $200,000.

TABLE 5-6

Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water Treatment Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$295,000	$295,000
Influent Pump Station and Distribution System	1	LS	$880,000	$880,000
Headworks (incl. fine screens, grit removal)	1	LS	$488,000	$488,000
MBR concrete tanks	1	LS	$669,000	$669,000
MBR equipment	1	LS	$5,720,000	$5,720,000
WAS Pump Station and Piping to Sewer	1	LS	$330,000	$330,000
Class "A" UV Disinfection System	1	LS	$386,000	$386,000
UV Disinfection System Channel	20	CY	$1,000	$20,000
Effluent flow meter and sampler	1	LS	$33,000	$33,000
Belt Filter Press	1	LS	$385,000	$385,000
Biosolids Hauling Truck	1	LS	$138,000	$138,000
200,000 Gallon Storage Tank	200	CY	$1,000	$200,000
Standby Generator	1	LS	$110,000	$110,000

Subtotal	$ 9,654,000
Site Work (5% of subtotal)	$ 483,000
Piping (12% of subtotal)	$ 1,159,000
Alarms/electrical (20% of subtotal)	$ 1,931,000
Painting (3% of subtotal)	$ 290,000
Misc. metals (2% of subtotal)	$ 194,000
Subtotal	$13,711,000
Contingency (25%)	$ 3,428,000
Sales Tax (7.9%)	$ 1,354,000
Total Construction Cost	**$18,493,000**
Engineering and Administrative Costs (25%)	$ 4,624,000
Total Estimated Project Cost	**$23,117,000**

TABLE 5-7

Alternative No. 2 – Construct a Satellite Water Reclamation Facility for Production of Reclaimed Water Distribution Costs (2009 Dollars)

Item	Quantity	Unit	Unit Price	Total Price
Mobilization/Demobilization	1	LS	$235,000	$235,000
Supply Pump Station	1	LS	$120,000	$120,000
Subtotal				$355,000
Site Work (5% of subtotal)				$18,000
Piping (15% of subtotal)				$54,000
Alarms/electrical (15% of subtotal)				$54,000
Painting (3% of subtotal)				$11,000
Misc. metals (2% of subtotal)				$8,000
Irrigation Supply Piping	21000	LF	$90	$1,890,000

Subtotal $2,390,000
Contingency (25%) .....$ 598,000
Sales Tax (7.9%) .....$ 237,000
Total Construction Cost $3,225,000
Engineering and Administrative Costs (25%) .....$ 807,000
Total Estimated Project Cost $4,032,000

FEASIBILITY OF REUSE

BENEFITS OF REUSE

The City and the surrounding community can benefit indirectly from the use of reclaimed water. The reuse application to augment streamflows in Dwyer Creek and for wetlands mitigation banking both will have potential environmental and social benefits to the City of Camas that are difficult to evaluate. For example, creating wetlands and enhancing Dwyer Creek can provide additional outdoor recreational uses for the community. The application to use reclaimed water for irrigation of parks and playfields can add value to the community as a whole, potentially increasing property values. In addition, reusing water for irrigation and industrial uses rather than using potable water supports a cultural value of conserving the quality and quantity of the City's water resources.

Industrial water customers can benefit from the production of reuse water by having a flexible and reliable alternative water source. Initially, industrial use of reclaimed water would likely require the industry to invest additional time and costs to adapt the existing system to the use of reclaimed water. However, the additional cost could potentially be minimal to retrofit the existing system since many of the industries currently have additional water treatment components that are applied to the potable water that they are currently purchasing.

ECONOMIC FEASIBILITY

Production of reclaimed water is considered economically feasible if the cost of producing reclaimed water is less than or equal to the cost of purchasing water or developing additional water rights. The 20-year present worth for Reuse Alternative No. 1 and Alternative No. 2 is presented in Table 5-7. The cost for Alternative No. 1, to modify the existing WWTF, is much less than the cost for Alternative No. 2, to construct a satellite WRF. However, at this time, production of reclaimed water is not economically feasible since adequate water rights are available at a relatively low cost. As mentioned above, the City has recently obtained substantial additional water rights, and if necessary, the City may be able to acquire additional water rights through a transfer. The cost to develop and acquire the additional water rights will not exceed a conservative estimate of $5 million. The cost to produce reclaimed water is significantly more expensive than the cost to develop and acquire additional water rights.

There would be some reduction in conveyance costs associated with the NUGA with the north end WRF. This reduction is not included in Table 5-8, but is estimated to be approximately 25 to 35 percent ($5 to $7 million) of the approximately $20 million in conveyance infrastructure (pump stations and trunk lines). However, there is insufficient demand to accommodate all of the 2025 peak hour flow of the NUGA, Basins No. 11, 12, and 13 (including Grass Valley), and about two-thirds of the flow from Basin No. 1. Without adequate demand or water quality drivers for reuse, given the higher cost of reuse relative to secondary treatment at the existing plant, it is recommended that water reuse not be implemented. The alternatives for reuse may be reevaluated in the future as treatment costs become more competitive.

TABLE 5-8

Comparison of Reuse Alternatives[(1)]
(2009 Dollars)

	Alternative No. 1 Modify Existing WWTF	Alternative No. 2 Construct a Satellite WRF
Peak Hour Reuse Water Production	6.1 mgd	4.73 mgd
Capital Cost – Treatment	$7,363,000	$23,117,000
Capital Cost – Distribution	$9,439,000	$4,032,000
Capital Cost – TOTAL	$16,802,000	$27,149,000
Annual O&M Cost	$108,000	$240,000
20-year Present Worth	$19,704,000	$33,598,000

(1) Inflation assumed at 3 percent.

CHAPTER 6

FINANCIAL ANALYSIS

This chapter addresses the financial impacts of the proposed improvements to the collection and treatment system to support the North Urban Growth Area (NUGA) expansion as well as additional development in the Grass Valley area identified since December 2007.

The 2007 General Sewer/Wastewater Facility Plan addressed the financial impacts of the proposed improvements to the City's wastewater collection and treatment system. The City commissioned a Utilities Rate Study by FCS Group resulting in a final report issued in January 2010. The FCS Group study incorporated the NUGA expansion Capital Improvement Program (CIP) from this General Sewer Plan amendment into its analysis. A copy of the FCS Group Sewer Utility Rate Study is located in Appendix F.

The FCS Group study assumed the following for the NUGA expansion:

- Collection system costs are spread out over a 10-year period (2014-2023), with 10 percent of the improvements constructed each year.
- The City funds one third of the collection system improvements, developers will fund two thirds.
- Treatment plant expansion needed to support the NUGA will not be made until 2021.

The FCS Group financial analysis also incorporated into their analysis the debt service for a $10 million Public Works Trust Fund (PWTF) loan that was acquired for the Phase 2 upgrades to the wastewater treatment facility now under construction. The City also received a $1 million PWTF loan for the Phase 2 design.

The FCS Group analysis assumes that a limited amount of revenue from system development charges (4 percent annually) will be used to fund the collection and treatment system capital improvements, while the majority of the improvements will be funded by the PWTF loan (41 percent) and revenue bonds (53 percent), with the remaining amount coming from existing fund balances (2 percent).

An 82 percent rate increase is needed to fund the total operating and capital needs of the sewer system through 2013. A phased rate transition strategy is proposed over the time period: 34 percent in 2009, 10.6 percent in both 2010 and 2011, 8 percent in 2012 and 3 percent in 2013. Monthly residential rates that incorporate the FCSG recommended rate increases are as follows:

2008 - $24.05
2009 - $32.23

2010 - $35.64
2011 - $39.42
2012 - $42.57
2013 - $43.85

The City intends to use a combination of rate increases, public financing, revenue bonds and developer funding for the sewer collection system improvements for the NUGA expansion. Because a significant amount of developer funding is required for these improvements, the City is considering the use of system development charge (SDC) credits when appropriate.

The FCSG analysis included system development charge recommendations for the NUGA that are higher than the non-NUGA. On an equivalent residential unit (ERU) basis, the non-NUGA SDC recommended by FCSG for an ERU is $3,334 and the NUGA SDC is $5,593.

The City is also considering the use of area-specific SDCs within the NUGA that would allow costs for capital improvements that only benefit a given area to be borne by the developers that build in that area. The development of area-specific SDCs will be contingent on the level and timing of development that occurs in a given area.

APPENDIX A

SEPA CHECKLIST

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:

City of Camas General Sewer Plan Amendment (March 2010).

2. Name of applicant: **City of Camas**

3. Address and phone number of applicant and contact person:

James E. Carothers, P.E.
616 NE Fourth Avenue
Camas, Washington 98607
360 817-1561 ext. 4230
jcarothers@ci.camas.wa.us

4. Date checklist prepared: **April 2010**

5. Agency requesting checklist: **Washington Department of Ecology & City of Camas**

6. Proposed timing or schedule (including phasing, if applicable):

The General Sewer Plan Amendment was completed in April 2010. This document identifies potential improvements to the City Sewer System that will be completed in the year 2011 and beyond.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The amendment to the City of Camas General Sewer & Wastewater Facilities Plan Amendment was prepared to address revisions to the City's north urban growth area (UGA) boundary as well as a new commercial development in the Grass Valley portion of the City's service area not identified in the City's existing General Sewer and Wastewater Facility Plan (May 2007/revised November 2009). These revisions will impact the sewer collection system, treatment facilities and potential strategies for wastewater reuse.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

- **A State Environmental Policy Act Determination of Non-Significance will be issued for this plan by the City of Camas.**
- **State Environmental Review Process/National Environmental Policy Act (SERP/NEPA) Environmental Assessment will be required if loans from the State Revolving Fund Program are utilized in the future for potential sewer system improvements identified in this Plan, but not for this General Sewer Plan Amendment.**

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

No other permit applications are likely to be required for adoption of the Facilities Plan Amendment.

10. List any government approvals or permits that will be needed for your proposal, if known.

Department of Ecology approval will be required for the General Sewer Plan Amendment and the City of Camas will issue a SEPA Determination of Non-Significance.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The North UGA expansion of residential development (1,700 acres) with more than 640 acres set aside for commercial and light industry/business park. Subtracting wetlands, parks streets and steep slopes, there would be 1,129 developable acres out of the total of 2,349 acres in the North UGA expansion, 652 acres for residential development, 66 acres for commercial and 340 acres for light industry/business park.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

- **The North UGA expansion extends north and east of Lacamas Lake.**

- **The proposed development in West Grass Valley is at the end of NW 38th Ave at the City of Camas/City of Vancouver border.**

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat**, rolling, hilly**, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)?

Steep slopes are present in the North UGA.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

According to the *Soil Survey of Clark County, Washington (USDA SCS, November 1972)*, soils in the NORTH UGA north and east of Lacamas Lake are Cinebar-Yacolt association: Deep, dominantly gently sloping to very steep, medium-textured soils of the mountains and valleys. Soils in the West Grass Valley area are Hillsboro-Dollar-Cove association: Deep, dominantly nearly level to sloping, well drained to very poorly drained, medium-textured soils of the terraces.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

It is likely that there may be unstable soils in steep portions of the North UGA.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

None associated with this General Sewer Plan Amendment. Filling and grading quantities for associated construction projects will be addressed in future SEPA Checklists.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No erosion would occur associated with the General Sewer Plan Amendment. Potential erosion issues associated with associated construction projects in the North UGA and West Grass Valley will be addressed in future SEPA Checklists.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

None associated with this General Sewer Plan Amendment: impervious surfaces associated with development of the North UGA will be addressed in future SEPA Checklists and other environmental documentation.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

None required for the General Sewer Plan Amendment. Construction BMPs for control of sedimentation and erosion will be implemented during construction of projects associated with the North UGA expansion and West Grass Valley development.

a. **Air**

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

There would be no air emissions associated with the General Sewer Plan Amendment. Air emissions associated with future construction projects in the North UGA and West Grass Valley will be addressed in future SEPA Checklists.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None known.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

None required for the General Sewer Plan Amendment.

3. **Water**

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

The City of Camas North UGA is located to the north and east of Lacamas Lake. The lake is drained by Lacamas Creek. Fisher Creek is located on the boundary between Vancouver and the Camas city limits near West Grass Valley.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No, the General Sewer Plan Amendment will not require work within 200 feet of Lacamas Lake. Future development in the North UGA will likely include work within 200 feet of Lacamas Lake.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or dredge material will be placed in surface waters or wetlands associated with the General Sewer Plan Amendment. Wetland impacts associated with future development in the North UGA and West Grass Valley will be addressed in separate SEPA documents.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

The General Sewer Plan Amendment will not require surface water withdrawals or diversions. Surface water impacts associated with future projects in the North UGA will be addressed in separate SEPA documents.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

According to Flood Insurance Rate Map (FIRM) Panel Number 530024 0425B portions of the North UGA in the vicinity of Lacamas Lake and Lacamas Creek are within the 100-year floodplain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No. The General Sewer Plan Amendment addresses future wastewater collection and conveyance issues in the North UGA and West Grass Valley.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

The General Sewer Plan Amendment will not impact groundwater. Implementation of some of the recommendations in the Amendment will likely improve/preserve groundwater quality in the area by eliminating septic systems.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

None associated with the General Sewer Plan Amendment.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

No modifications to surface water flow will occur associated with the General Sewer Plan Amendment.

2) Could waste materials enter ground or surface waters? If so, generally describe.

The General Sewer Plan Amendment will not directly impacts waste materials entering ground or surface water. Implementation of the recommendations of the Plan Amendment will likely reduce flows of wastewater from septic systems into groundwater in the North UGA.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

None required for the General Sewer Plan Amendment. Construction Best Management Practices (BMPs) for the control of sedimentation and erosion will be required for development within the North UGA and West Grass Valley.

4. **Plants**

a. Check or circle types of vegetation found on the site:

__X__ deciduous tree: alder, maple, aspen, cottonwood, Oregon ash other
___X____evergreen tree: fir, cedar, pine, other
__X__ shrubs

__X___ grass
___X___ pasture
___X___ crop or grain
___X___ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other
_____ water plants: water lily, eelgrass, milfoil, other
_____ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

No vegetation will be removed associated with the General Sewer Plan Amendment.

c. List threatened or endangered species known to be on or near the site.

Bradshaw's lomatium, *Lomatium bradshawii,* was listed as Endangered on September 30, 1988. It is thought to be endemic to the area around (within ten miles of) Salem, Oregon. According to Ron Klump of the US Army Corps of Engineers, it was recently discovered along Lacamas Creek near Camas, Washington.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

None associated with this General Sewer Plan Amendment.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other:
fish: bass, salmon, trout, herring, shellfish, other:

b. List any threatened or endangered species known to be on or near the site.

Lower Columbia River Chinook salmon and Columbia River chum salmon (threatened) are present in the Washougal River. Lower Columbia River chinook, Lower Columbia River steelhead, Lower Columbia River coho and Columbia River chum, which are all listed as "threatened" pass the Camas WWTF outfall during their annual migrations. These fish spawn from mid summer through the winter, with a minimum number of smolts present during the month of August. The Washington Department of Fish & Wildlife Priority Habitat & Species Maps and Report indicated that purple martins nest in the vicinity of Camas.

c. Is the site part of a migration route? If so, explain.

Camas lies along the Pacific Flyway for migratory waterfowl. Approximately 14 Evolutionarily Significant Units and Distinct Population Segments of Columbia River salmon, trout and two species of sturgeon migrate up and down the Columbia River past the Camas WWTF.

d. Proposed measures to preserve or enhance wildlife, if any:

Implementation of the General Sewer Plan Amendment to address provisions for adequate wastewater treatment, conveyance and disposal for the North UGA and West Grass Valley will improve and preserve water quality for migratory salmonids and other fish and wildlife in and around Lacamas Lake and the Columbia River as the human population in Camas and the North UGA grows.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The General Sewer Plan Amendment will require no significant use of energy.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

None required for the General Sewer Plan Amendment.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste that could occur as a result of this proposal? If so, describe.

There are no environmental health hazards associated with adopting the General Sewer Plan Amendment.

1) Describe special emergency services that might be required.

None required for the General Sewer Plan Amendment.

2) Proposed measures to reduce or control environmental health hazards, if any:

None required for the General Sewer Plan Amendment.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

No existing noises will affect the General Sewer Plan Amendment.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

No noise would be generated associated with adoption of the General Sewer Plan Amendment.

3) Proposed measures to reduce or control noise impacts, if any:

None required.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

Land use in the recently designated North UGA is currently relatively sparse residential, light commercial and recreational centered around, east and north of Lacamas Lake. The West Grass Valley area consists mostly of open fields and sparse residential development.

b. Has the site been used for agriculture? If so, describe.

Open grass fields in West Grass Valley are harvested for livestock feed.

c. Describe any structures on the site.

There are several thousand structures in the city, including more than 6,400 dwelling units.

d. Will any structures be demolished? If so, what?

Adoption of the General Sewer Plan Amendment will not result in demolition of structures.

e. What is the current zoning classification of the site?

Zoning in the North UGA currently includes Park Land, School Properties and unzoned rural lands. The West Grass Valley area is designated Commercial and Residential.

f. What is the current comprehensive plan designation of the site?

The comprehensive plan designations or the North UGA area include single family, commercial, parks, school property and green space; the West Grass Valley area includes commercial and single family residential.

g. If applicable, what is the current shoreline master program designation of the site?

The Shoreline Master Program Designation along the west side of Lacamas Lake is largely "Conservancy."

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

A portion of the North UGA along the western shore of Lacamas Lake is designated as Shoreline Conservancy and there are steep slopes to the east of Lacamas Lake.

i. Approximately how many people would reside or work in the completed project?

The City of Camas has a current population of approximately 16,950 with a forecast population of approximately 22,000 in a 20-year planning horizon.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

None.

Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The General Sewer Plan Amendment addresses wastewater issues associated with the growth in the North UGA.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

The General Sewer Plan Amendment for the North UGA and West Grass Valley addresses wastewater collection, conveyance and treatment issues associated with residential and commercial development east and north of Camas.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Adoption of the General Sewer Plan Amendment will not result in construction of structures.

b. What views in the immediate vicinity would be altered or obstructed?

No views would change as a result of adopting the General Sewer Plan Amendment. Visual impacts associated with growth in the North UGA and Grass Valley will be addressed in future SEPA documents.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Adoption of the General Sewer Plan Amendment for the North UGA will not have aesthetic impacts.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Adoption of the General Sewer Plan Amendment will not generate light or glare.

c. What existing off-site sources of light or glare may affect your proposal?

None.

d. Proposed measures to reduce or control light and glare impacts, if any:

None.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

Boating, swimming, fishing occurs on Lacamas Lake, and windsurfing occurs along the Columbia River south of the North UGA.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

None.

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

The Pittock-Leadbetter House is located in the North UGA.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

The Pittock-Leadbetter House and Lacamas Park are two culturally important resources in the North UGA.

c. Proposed measures to reduce or control impacts, if any:

None required for adoption of the General Sewer Plan Amendment for the North UGA.

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

SR 14 provides access to the area surrounding the Camas WWTF, which is located at the intersection of SE Polk Street and SE 11th Avenue. The North UGA can be accessed from SR 14 via SR 500 and the roads around Lacamas Lake. Grass Valley is accessed from SR14 via SE 192nd Ave, Brady Rd and Parker St.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

C-Tran serves the City of Camas and a portion of the North UGA as well as West Grass Valley.

c. How many parking spaces would the completed project have? How many would the project eliminate?

None & None.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Adoption of the General Sewer Plan Amendment will not require any new roads or streets. As development occurs in the North UGA, roads and streets will be built to serve the developed areas.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The southern portion of the North UGA is approximately two miles from the Columbia River and its water transportation route.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Adoption of the General Sewer Plan Amendment will not generate additional vehicular trips. However, traffic volumes in the North UGA and West Grass Valley will increase as a result of planned development in the next few years.

g. Proposed measures to reduce or control transportation impacts, if any:

None required for adoption of the General Sewer Plan Amendment.

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Adoption of the General Sewer Plan Amendment for the North UGA would not directly result in a need for additional public services. This plan does, however, address provisions for wastewater collection, conveyance and treatment services to the North UGA.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Adoption of the General Sewer Plan Amendment for the North UGA and implementation of the recommendations for wastewater conveyance infrastructure will provide adequate service to the North UGA.

16. **Utilities**

a. Circle utilities currently available at the site: **electricity, natural gas, water, refuse service, telephone, sanitary sewer,** septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity that might be needed.

The General Sewer Plan Amendment investigates measures to provide wastewater collection and conveyance infrastructure to serve the North UGA. Gas and electrical service in the area are provided by Northwest Natural Gas and Clark Public Utilities, respectively. Telephone service is provided by Verizon.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: Tina Daugherty

Date Submitted: 4-14-2010

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(Do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Adoption of the General Sewer Plan Amendment for the North UGA provides a resource for development of sewer collection and conveyance structures to serve the area north and east of Camas and Lacamas Lake as well as the West Grass Valley area. Implementation of this General Sewer Amendment will provide for adequate wastewater conveyance and treatment to minimize adverse impacts to water quality associated with new development in the Camas North UGA and West Grass Valley through the planning period (2025).

Proposed measures to avoid or reduce such increases are:

Construction of new sewer pipelines and pump stations to serve the basins to the north and east of Lacamas Lake and to convey wastewater to the Camas WWTF will reduce/eliminate use of septic systems in the North UGA, allow for denser development, and provide for adequate wastewater treatment and conveyance through 2025.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Adoption of the General Sewer Plan Amendment will have no impact on plants, animals, fish or marine life. Implementation of the sewer system improvements identified in the plan will improve and protect water quality and fish and wildlife in the vicinity of the WWTF Outfall through 2025.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Construction best management practices (BMPs) for the control of sedimentation and erosion will be required during construction of proposed sewer system improvements. Proposed sewer system improvement projects will be reviewed via the SEPA and Shoreline Master Program regulations (associated with clearing and grading permits) for the City of Camas. Further, federally funded or permitted projects must be reviewed for their potential impacts to plant and animal species (and critical habitats) protected under the Endangered Species Act. Further, consultation with the National Marine Fisheries Service is required for projects that may impact commercially important species. Hydraulic Project Approval must be obtained from the Washington Department of Fish and Wildlife for projects with the potential to impact lakes, streams and fish habitat.

3. How would the proposal be likely to deplete energy or natural resources?

Adoption of the General Sewer Plan Amendment would not deplete energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:

Implementation of the sewer system improvements identified in the General Sewer Plan Amendment would help to provide adequate wastewater collection, conveyance and treatment infrastructure for the North UGA through 2025. Implementation of some of these projects is likely to increase energy consumption in the area slightly; i.e. sewering areas currently served by septic systems will necessarily require new pumping to convey wastewater to the Camas WWTF. New infrastructure will use modern, energy-efficient pumps, pipelines and equipment to minimize energy consumption. Once the new wastewater conveyance infrastructure is in place, water quality and fish habitat in the Columbia River near the WWTF outfall will be protected/preserved through 2025. Construction of wastewater conveyance and treatment infrastructure identified in the Facilities Plan Amendment will be subject to SEPA, Shoreline, Hydraulic Project review and Growth Management Act reviews in addition to the federal ESA consultation. Clean Water Act (CWA), Section 404 permitting from the Corps of Engineers and CWA, Section 401 Water Quality Certification from the Washington Department of Ecology.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Adoption of the General Sewer Plan Amendment will not directly impact environmentally sensitive areas: i.e. there are no designated wilderness or Wild and Scenic Rivers in the project area, and potential impacts to listed species (and their critical habitats); cultural sites (to be avoided), wetlands, floodplains or prime farmlands will be minimal or positive.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Implementation of the wastewater conveyance and treatment infrastructure improvements identified in the General Sewer Amendment will provide adequate wastewater conveyance and treatment infrastructure to serve the North UGA and General Sewer Plan Amendment through 2025. Infrastructure improvements will be subject to environmental reviews at the local, state and federal levels, as discussed above. Implementation of mitigation measures developed during the permitting processes and prudent land use decisions for the North UGA will help to minimize adverse impacts to fish and wildlife habitat associated with construction of the proposed sewer infrastructure improvements.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Adoption of the General Sewer Plan Amendment will not affect land and shoreline use directly. Implementation of the infrastructure improvement projects identified in the amendment will support existing plans to develop the North UGA and Grass Valley commercial areas.

Proposed measures to avoid or reduce shoreline and land use impacts are:

Construction projects identified in the General Sewer Plan Amendment will be subject to review under the Camas Shoreline Master Program and the Growth Management Act in addition to the Washington Hydraulic Code (WDFW), Clean Water Act and Endangered Species Act reviews discussed above.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Providing wastewater conveyance and treatment infrastructure identified in the General Sewer Plan Amendment would support planned development in West Grass Valley and North UGA, which would increase the demand for transportation, public services and water and electrical utilities in this area.

Proposed measures to reduce or respond to such demand(s) are:

Careful planning and permit review of proposed developments in the North UGA and West Grass Valley will assure that demands on transportation, public services and utilities are of an appropriate scale.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

Adoption of the General Sewer Plan Amendment for the Camas North UGA and West Grass Valley will provide the means for installation of wastewater conveyance and treatment infrastructure to serve this area, and to meet state and federal permitting requirements for the Camas WWTF discharge to the Columbia River. Adoption of the General Sewer Plan Amendment and implementation of the proposed infrastructure improvements will be consistent with local, state and federal laws to protect the environment, including:

- **Clean Water Act**
- **National Environmental Policy Act**
- **Endangered Species Act**
- **Washington Hydraulic Code**
- **Growth Management Act**
- **City of Camas Shoreline Master Program**
- **Washington State Environmental Policy Act**

APPENDIX B

CAMAS SEWER SYSTEM HYDRAULIC DATA

CITY OF CAMAS
GENERAL SEWER PLAN AMENDMENT
SANITARY SEWER HYDRAULIC DATA

This appendix includes the following sanitary sewer hydraulic data relevant to the General Sewer Plan Amendment:

1. Table 1, showing Sanitary Sewer Model Output, similar to that conducted for the 2007 *General Sewer / Wastewater Facility Plan*, revised to include Green Mountain and Grass Valley flows. For more information about the MOUSE modeling software parameters and modeling assumptions, see the 2007 *General Sewer / Wastewater Facility Plan.*

2. Data from flow monitoring conducted at the 6th and Joy discharge of the STEP Main in February 2010 for purposes of corroboration of the hydraulic model calibration. This data is plotted against WWTP daily flows and precipitation. In the 2007 *General Sewer/ Wastewater Facility Plan*, a current 2.72 MGD total peak hour flow (the sum of 2.27 MGD peak hour diurnal flow and 0.45 MGD estimated peak hour I/I) was modeled for this STEP line. This seems reasonably consistent with the data from this new monitoring, which shows 2.47 MGD peak hour flow for the STEP Main during the February monitoring period. The peak daily precipitation during this period was 0.71 inches.

   The flow levels appear to cycle ~7 - 11 times per day, consistent with a series of batch, or periodic, discharges. This pattern is due to the superposition of industrial flow patterns on top of residential flows. Industrial flows are expected to account for approximately half (0.75 MGD) of the daily STEP line flows observed. Of this 0.75 MGD industrial flow, 90% comes from Linear and Wafertech. Per discussion with Wafertech, this flow pattern is consistent with discharge. Wafertech's instantaneous pumping rate is approximately 770,000 gallon per day, with an average daily rate of 500,000 gallons per day. On Feb. 15, 2010, Wafertech discharged 9 pump cycles, with effluent pumps on for 1 ½ hours and off for about 1 hour for each cycle.

   The "4 per moving ave." is an Excel trendline showing the moving average of 4 consecutive points. As the flow is measured every 15 minutes, the smooth trendline represents hourly average flows. (It dampens out the variations seen in 15 min. flows a little.)

   The 0.45 MGD peak hour I/I estimated in the STEP line is a relatively small portion of the 6.57 mgd peak hour I/I associated with the ~9 MGD WWTP peak hour influent flow. The fact that the WWTP flow on Feb. 14, 2010 increased to 3.06 MGD in response to 0.71 in. precip., but the STEP flow apparently did not increase on that day, supports this view that most of the I/I comes from the rest of the system (the gravity system). If we had a bigger storm, I would expect to see some increase in the STEP flows.

3. A memo, dated February 8, 2010, regarding the potential of surcharging in the sanitary sewer system unless STEP flows are rerouted through a new STEP Main Bypass after the introduction of NUGA flows. Figure 1 in the memo shows the locations of manholes surveyed in support of this evaluation.

TABLE 1
SANITARY SEWER MODELING RESULTS
WITH GRASS VALLEY AND GREEN MOUNTAIN FLOWS INCLUDED

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
1-3-14l1	1-3-14	1-3-13	330.43	313	152.87	8	330.43	0.457	0.487	
1-3-13l1	1-3-13	1-3-12	313	289.73	262.09	8	313.16	0.457	0.244	
1-3-12l1	1-3-12	1-3-11	289.48	262	201.31	8	289.63	0.457	0.492	
1-3-11l1	1-3-11	1-3-10	262	235.54	308.84	8	262.16	0.457	0.246	
1-3-10l1	1-3-10	1-3-9	235.34	226	146.25	8	235.52	0.457	0.56	
1-3-9l1	1-3-9	1-3-8	226	217.87	157.97	8	226.19	0.457	0.28	
1-3-8l1	1-3-8	1-3-7	217.57	206	209.07	8	217.75	0.457	0.581	
1-3-7l1	1-3-7	1-3-6	206	199.67	141.42	8	206.19	0.457	0.325	
1-3-6l1	1-3-6	1-3-5	199.52	192	132.65	8	199.7	0.457	0.557	
1-3-5l1	1-3-5	1-3-4	192	185.33	123.75	8	192.19	0.457	0.524	
1-3-4l1	1-3-4	1-3-3	185.23	182.7	89.04	8	185.45	0.457	0.773	
1-3-3l1	1-3-3	1-3-2	182.7	179.47	214.38	8	182.96	0.457	0.386	
1-3-2l1	1-3-2	1-3-1	179.22	161.8	221.38	8	179.39	0.457	1.02	0.01
1-3-1l1	1-3-1	1-1-10	161.9	161.33	221.38	8	162.42	0.457	1.163	0.11
1-1-10l1	1-1-10	1-1-9	161.05	154.6	110.72	12	161.62	2.954	4.318	3.32
1-1-9l1	1-1-9	1-1-8	154.6	153.35	111.55	12	158.65	2.911	4.62	3.62
1-1-8l1	1-1-8	1-1-7	153.35	149.17	88.49	12	157.78	2.909	8.28	7.28
1-1-7l1	1-1-7	1-1-6	149.17	148.49	425.2	12	157.33	1.994	8.159	7.16
1-1-6l1	1-1-6	1-1-5	148.49	148.44	56.87	12	155.72	1.993	7.233	6.23
1-1-5l1	1-1-5	1-1-4	148.44	147.9	463.05	12	155.33	1.993	6.887	5.89
1-1-4l1	1-1-4	1-1-3	147.9	147.6	204.27	12	153.67	2.256	5.774	4.77

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
1-1-3l1	1-1-3	1-1-2	147.6	147.33	141.95	12	152.97	2.261	5.371	4.37
1-1-2l1	1-1-2	1-1-1	147.33	147.3	48.85	12	152.33	2.541	4.996	4.00
1-1-1l1	1-1-1	2-1-11	147	145.77	372.51	12	151.72	2.541	4.722	3.72
9-1-5l1	9-1-5	9-1-4	33.75	32.91	226.74	8	34.04	0.276	0.432	
9-1-4l1	9-1-4	9-1-3	26.95	25.22	436.41	8	27.23	0.276	0.696	
9-1-3l1	9-1-3	9-1-2	25.22	24.95	337.85	8	25.66	0.276	0.653	
9-1-2l1	9-1-2	9-1-1	23.85	23.61	65.8	8	24.16	0.331	0.459	
9-1-1l1	9-1-1	One Stp LS	23.51	22.5	32.81	12	23.66	0.331	0.149	
8-1-9l1	8-1-9	8-1-8	30.84	29.83	441.23	10	31.17	0.331	0.451	
8-1-8l1	8-1-8	8-1-7	29.83	28.67	335.14	10	30.12	0.331	0.452	
8-1-7l1	8-1-7	8-1-6	28.67	27.14	281.54	10	28.93	0.331	0.464	
8-1-6l1	8-1-6	8-1-5	27.14	25.16	266.48	10	27.38	0.331	0.619	
8-1-5l1	8-1-5	8-1-4	25.16	24.22	272.21	12	25.55	0.667	0.535	
8-1-4l1	8-1-4	8-1-3	24.22	21.83	304.05	12	24.54	0.667	0.524	
8-1-3l1	8-1-3	8-1-2	21.83	21.07	310.28	12	22.26	0.667	0.561	
8-1-2l1	8-1-2	8-1-1	21.07	20.95	41.2	12	21.45	0.667	0.382	
8-1-1l1	8-1-1	Oaks LS	20.7	17	250	12	20.95	0.667	0.252	
7-3-5l1	7-3-5	7-3-4	71.5	64.31	121.17	8	71.56	0.055	0.096	
7-3-4l1	7-3-4	7-3-3	64.26	41.81	193.99	8	64.31	0.055	0.193	
7-3-3l1	7-3-3	7-3-2	41.76	39.51	150.63	8	41.85	0.055	0.134	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
7-3-2l1	7-3-2	7-3-1	39.46	26.94	118.27	8	39.52	0.055	0.125	
7-3-1l1	7-3-1	7-1-1	26.89	16.91	190.47	8	26.96	0.055	0.569	
3-16-6l1	3-16-6	3-16-4	625.42	594.25	396.42	8	625.61	0.605	0.557	
3-16-4l1	3-16-4	3-16-3	594.25	581	141.91	8	594.44	0.605	0.61	
3-16-3l1	3-16-3	3-16-2	581	563.08	277.87	8	581.2	0.605	0.688	
3-16-2l1	3-16-2	3-16-1	563.08	554.01	222.76	8	563.31	0.605	0.714	
3-16-1l1	3-16-1	3-1-27	554.01	543.48	297.16	8	554.25	0.605	1.068	0.05
3-1-39l1	3-1-39	3-1-38	548.87	530	167.36	8	549.06	0.704	0.285	
3-1-38l1	3-1-38	3-1-37	527.99	521	215.05	8	528.26	0.704	0.546	
3-1-37l1	3-1-37	Crown LS	521	519	32.81	12	521.18	0.704	0.182	
3-19A-1l1	3-19A-1	3-19B-1	690.67	685	467.84	8	690.79	0.096	0.354	
3-19B-1l1	3-19B-1	3-19-6	685	678.77	467.84	8	685.12	0.096	0.18	
3-19-6l1	3-19-6	3-19-5	678.57	675.28	361.39	8	678.7	0.096	0.198	
3-19-5l1	3-19-5	3-19-4	675.16	671.11	334.48	8	675.28	0.096	0.345	
3-19-4l1	3-19-4	3-19-3	671.11	667.05	255.81	8	671.22	0.096	0.253	
3-19-3l1	3-19-3	3-19-2	667.05	664	51.5	8	667.13	0.096	0.267	
3-19-2l1	3-19-2	3-19-1	664	645.19	415.02	8	664.09	0.096	0.134	
3-19-1l1	3-19-1	3-1-36	645.09	627.12	269.24	8	645.17	0.096	0.771	
3-1-36l1	3-1-36	3-1-35	627.12	620.08	150.2	8	627.38	0.8	0.494	
3-1-35l1	3-1-35	3-1-34	619.88	605.44	345.62	8	620.14	0.8	0.423	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
3-1-34l1	3-1-34	3-1-33	605.24	589.5	267	8	605.48	0.8	0.781	
3-1-33l1	3-1-33	3-1-32	589.5	573.8	354.48	8	589.76	0.8	0.391	
3-1-32l1	3-1-32	3-1-31	572.42	561.9	126.18	8	572.64	0.817	0.98	
3-1-31l1	3-1-31	3-1-30	561.9	558.52	154.4	8	562.23	0.817	0.783	
3-1-30l1	3-1-30	3-1-29	558.52	554.39	83.71	8	558.78	0.817	0.818	
3-1-29l1	3-1-29	3-1-28	554.39	548.82	116.48	8	554.66	0.882	0.803	
3-1-28l1	3-1-28	3-1-27	548.82	543.48	100.57	8	549.09	0.882	1.068	0.05
3-1-27l1	3-1-27	3-1-26	543.48	533.98	143.24	8	543.84	1.486	3.797	1.86
3-1-26l1	3-1-26	3-1-25	533.98	530.74	150.68	8	536.12	1.486	4.477	2.32
3-1-25l1	3-1-25	3-1-24	530.74	527.7	296.49	8	533.35	1.486	3.911	1.94
3-1-24l1	3-1-24	3-1-23	527.7	517.67	297	8	528.16	1.772	1.5	0.33
3-1-23l1	3-1-23	3-1-22	517.67	510.51	263.25	8	518.17	1.772	0.75	
3-1-22l1	3-1-22	3-1-21	510.29	488.8	285.69	8	510.64	1.772	1.271	0.18
3-1-21l1	3-1-21	3-1-20B	488.8	480.5	191.92	8	489.22	1.772	0.927	
3-1-20Bl1	3-1-20B	3-1-20	480.5	464	137.81	8	480.81	1.772	0.911	
3-1-20l1	3-1-20	3-1-19	464	451	101.75	8	464.3	1.772	0.913	
3-1-19l1	3-1-19	3-1-18	451	422	234.31	8	451.3	1.772	1.206	0.14
3-1-18l1	3-1-18	3-1-17	422	413.73	117.92	8	422.4	2.111	0.603	
3-1-17l1	3-1-17	3-1-16	412.3	395.63	285.81	8	412.73	2.111	1.112	0.07
3-1-16l1	3-1-16	3-1-15	395.63	371	272.7	8	396	2.111	0.556	
3-1-15l1	3-1-15	3-1-14	370	361	109.1	8	370.39	2.111	0.992	
3-1-14l1	3-1-14	3-1-13	361	324.63	246.6	8	361.33	2.23	1.299	0.20
3-1-13l1	3-1-13	3-1-12	324.63	304.37	323	8	325.06	2.23	0.998	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
3-1-12l1	3-1-12	3-1-11	304.27	282	244.65	8	304.65	2.23	1.472	0.31
3-1-11l1	3-1-11	3-1-10	282	262.19	287.26	8	282.49	2.23	13.529	8.35
3-1-10l1	3-1-10	3-1-9	261.79	259.99	230.46	8	269.73	2.328	11.915	7.28
3-1-9l1	3-1-9	3-1-8	259.89	255.71	35.63	8	260.27	2.328	1.631	0.42
3-1-8l1	3-1-8	3-1-7	255.71	247.51	206.38	8	256.25	2.327	0.94	
3-1-7l1	3-1-7	3-1-6	246.66	231.4	242.11	8	247.4	2.325	9.921	5.95
3-1-6l1	3-1-6	3-1-5	231.4	226.54	256.56	8	237.18	2.325	8.668	5.11
3-1-5l1	3-1-5	3-1-4	226.24	210	262.89	8	226.69	2.325	1.371	0.25
3-1-4l1	3-1-4	3-1-3	210	194.73	259.92	8	210.46	2.325	1.076	0.05
3-1-3l1	3-1-3	3-1-2	194.63	173.42	262.16	8	195.04	2.325	0.613	
3-1-2l1	3-1-2	3-1-1	172.82	169.05	276.02	15	173.32	2.51	0.403	
3-1-1l1	3-1-1	5-8-1	168.9	83.11	442.05	18	169.19	3.815	0.197	
5-8-1l1	5-8-1	5-1-12	82.76	52.47	259.11	21	83.08	3.815	0.714	
4-2A-2l1	4-2A-2	4-2A-Q	213.76	209	281.8	8	213.88	0.107	0.325	
4-2A-Ql1	4-2A-Q	4-2A-1	209	206	115	8	209.11	0.107	0.37	
4-2A-1l1	4-2A-1	4-2-3	206	200.12	462.56	8	206.13	0.107	0.338	
4-2-3l1	4-2-3	4-2-2	200.12	198.99	374.83	8	200.3	0.107	0.275	
4-2-2l1	4-2-2	4-2-1	198.89	190.96	358.22	8	199	0.107	0.386	
4-2-1l1	4-2-1	4-1-2	190.96	190.15	256.41	8	191.13	0.107	0.972	
4-8-2l1	4-8-2	4-8-1	203.25	201.98	172.2	10	203.25	0	0.008	
4-8-1l1	4-8-1	4-1-8	201.98	200.95	441.72	10	201.99	0.001	0.498	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
4-1-8l1	4-1-8	4-1-7	200.95	199.6	468.84	10	201.28	0.382	0.679	
4-1-7l1	4-1-7	4-1-6	199.6	199.3	88.8	12	200.08	0.718	0.613	
4-1-6l1	4-1-6	4-1-5	199.3	199	70.52	12	199.74	0.718	0.54	
4-1-5l1	4-1-5	4-1-4	199	198.2	289.47	12	199.44	0.718	0.742	
4-1-4l1	4-1-4	4-1-3	198.2	197.37	315.9	12	198.74	1.011	0.64	
4-1-3l1	4-1-3	4-1-2	197.37	190.15	418.58	12	197.69	1.011	0.648	
4-1-2l1	4-1-2	4-1-1	190.15	189.6	246.78	15	190.69	1.117	0.504	
4-1-1l1	4-1-1	3-2-6	189.6	189.02	158.24	15	190.11	1.117	0.548	
3-2-6l1	3-2-6	3-2-5	189.02	188.29	224.99	15	189.54	1.117	0.549	
3-2-5l1	3-2-5	3-2-4	188.29	188.06	122.43	15	188.88	1.117	0.511	
3-2-4l1	3-2-4	3-2-3	188.06	184	261.61	15	188.38	1.117	0.509	
3-2-3l1	3-2-3	3-2-2	184	181.71	123.56	15	184.32	1.117	0.538	
3-2-2l1	3-2-2	3-2-1	181.71	175.84	342.51	15	182.05	1.306	0.306	
3-2-1l1	3-2-1	3-1-1	175.59	168.9	304.81	15	175.91	1.306	0.472	
6-5-2l1	6-5-2	6-5-1	59.47	58.27	380.57	8	59.47	0	0.007	
6-5-1l1	6-5-1	6-1-6	58.27	49.84	421.07	8	58.27	0.029	5.74	3.16
6-7-8l1	6-7-8	6-7-7	129.5	120.8	267.66	8	129.68	0.352	0.462	
6-7-7l1	6-7-7	6-7-6	120.8	100	319	8	120.95	0.352	0.552	
6-7-6l1	6-7-6	6-7-5	100	90.21	303.36	8	100.18	0.352	0.611	
6-7-5l1	6-7-5	6-7-4	90.21	82.72	344.71	8	90.41	0.352	0.535	
6-7-4l1	6-7-4	6-7-3	82.72	80.3	103.15	12	82.9	0.352	0.396	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
6-7-3l1	6-7-3	6-7-2	80.3	77.76	267.1	12	80.52	0.352	0.393	
6-7-2l1	6-7-2	6-7-1	77.76	73.87	417.65	12	77.98	0.352	0.385	
6-7-1l1	6-7-1	6-1-10	73.87	71.35	189.34	12	74.1	0.352	1.289	0.29
6-7-9l1	6-7-9	6-1-17	158.05	149.01	334.17	8	158.05	0	0.007	
6-1-17l1	6-1-17	6-1-16	149.01	141.48	280.07	8	149.01	0	0.008	
6-1-16l1	6-1-16	6-1-15	141.48	135.98	144.02	8	141.48	0	0.009	
6-1-15l1	6-1-15	6-1-14	135.98	133.05	301.36	8	135.98	0	0.007	
6-1-14l1	6-1-14	6-1-13	132.83	131.59	95.32	12	132.83	0	0.01	
6-1-13l1	6-1-13	6-1-13B	131.59	127.94	32.81	12	131.59	0	1.1	0.10
6-1-13Bl1	6-1-13B	6-1-12	127.94	115.03	136.35	15	128.49	7.52	1.058	0.07
6-1-12l1	6-1-12	6-1-11	115.03	95	256.6	12	115.69	7.52	1.233	0.23
6-1-11l1	6-1-11	6-1-10	95	71.35	247.14	12	95.62	7.52	1.289	0.29
6-1-10l1	6-1-10	6-1-9	71.35	59.76	284.88	18	71.99	7.872	1.815	1.22
6-1-9l1	6-1-9	6-1-8	59.76	57.85	276.65	18	61.68	8.491	1.285	0.43
6-1-8l1	6-1-8	6-1-7	57.85	52.04	269.02	18	58.81	8.491	2.805	2.71
6-1-7l1	6-1-7	6-1-6	52.04	49.84	256.12	18	55.43	8.491	2.551	2.33
6-1-6l1	6-1-6	6-1-5	49.84	47.68	279.68	18	52.85	8.491	2.168	1.75
6-1-5l1	6-1-5	6-1-4	47.68	45.48	278.91	18	50.07	8.702	1.716	1.07
6-1-4l1	6-1-4	6-1-3	45.48	43.32	265.09	18	47.55	8.702	1.547	0.82
6-1-3l1	6-1-3	6-1-2	43.32	41.16	268.64	18	44.48	8.702	0.773	
6-1-2l1	6-1-2	6-1-1	37.5	35.44	251.4	18	39.11	8.702	1.238	0.36
6-1-1l1	6-1-1	5-2-3	35.44	32.47	265.6	21	36.37	8.702	0.87	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
5-2-3l1	5-2-3	5-2-2	32.47	29.6	75.16	18	33.23	8.702	1.044	0.07
5-2-2l1	5-2-2	5-2-1	29.5	27.1	79.87	18	30.33	8.702	1.069	0.10
5-2-1l1	5-2-1	5-1-1	27	24.41	75.8	18	27.85	8.702	1.335	0.50
1-2-8l1	1-2-8	1-2-7	226.12	204.5	303.65	8	226.27	0.369	0.473	
1-2-7l1	1-2-7	1-2-6	204.5	181.39	354.81	8	204.66	0.369	0.492	
1-2-6l1	1-2-6	1-2-5	181.34	175.5	175.43	8	181.53	0.369	0.649	
1-2-5l1	1-2-5	1-2-4	175.45	170	80.81	8	175.69	0.835	0.769	
1-2-4l1	1-2-4	1-2-3	170	166.39	68.18	8	170.26	0.835	0.569	
1-2-3l1	1-2-3	1-2-2	166.24	160	130.65	8	166.5	0.835	0.837	
1-2-2l1	1-2-2	1-2-1	160	155.3	117.35	8	160.28	0.835	0.864	
1-2-1l1	1-2-1	1-1-2	155.2	147.33	152.69	8	155.54	0.844	7.937	4.62
2-1-11l1	2-1-11	2-1-10	145.77	144.56	413.58	12	149.52	2.958	3.753	2.75
2-1-10l1	2-1-10	2-1-9	144.56	144	178.13	12	146.19	2.958	1.629	0.63
2-1-9l1	2-1-9	2-1-8	144	128.5	366.34	12	144.45	2.958	1.38	0.38
2-1-8l1	2-1-8	2-1-7B	128.5	126.5	305.36	12	129.58	2.958	1.077	0.08
2-1-7Bl1	2-1-7B	2-1-7	126.14	124.99	64.67	12	126.75	2.958	0.767	
2-1-7l1	2-1-7	2-1-6	124.85	114.84	246.23	12	125.3	2.958	0.614	
2-3-1l1	2-3-1	2-1-6	124.49	114.84	156.08	10	124.66	0.456	0.737	
2-1-6l1	2-1-6	2-1-5	114.64	106.81	92.85	12	115.05	3.412	0.823	
2-1-5l1	2-1-5	2-1-4	106.61	101.76	131	12	107.12	3.412	0.677	
2-1-4l1	2-1-4	2-1-3	101.56	73.34	461.91	12	102	3.412	0.915	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
2-1-3l1	2-1-3	2-1-2B	73.14	66.45	246.84	12	73.7	3.412	0.897	
2-1-2Bl1	2-1-2B	2-1-2A	66.31	64.36	49	12	66.83	3.412	0.796	
2-1-2Al1	2-1-2A	2-1-2	64.2	62.25	32.81	12	64.68	3.412	0.95	
2-1-2l1	2-1-2	2-1-1	62.12	60.16	465.18	18	62.88	3.412	0.508	
2-1-1l1	2-1-1	5-1-12	56.78	52.47	401	12	57.59	3.412	1.25	0.25
10-1-23l1	10-1-23	10-1-24	586.24	582.57	246.52	8	586.37	0.119	0.392	
10-1-24l1	10-1-24	10-1-25	582.57	578.65	271.62	8	582.7	0.119	0.196	
10-1-25l1	10-1-25	10-1-26	578.46	573.76	73.84	8	578.55	0.119	0.136	
10-1-26l1	10-1-26	10-10B-1	573.52	565	71.95	8	573.6	0.119	0.118	
10-10-12l1	10-10-12	10-10-11	729.37	719.72	316.82	8	729.62	0.618	0.756	
10-10-11l1	10-10-11	10-10-10	719.72	713.46	209.66	8	719.97	0.618	0.396	
10-10-10l1	10-10-10	10-10-9	713.35	700	141.84	8	713.54	0.618	0.538	
10-10-9l1	10-10-9	10-10-9A	700	690.71	83	8	700.18	0.618	0.519	
10-10-9Al1	10-10-9A	10-10-8	690.71	673.37	136.92	8	690.88	0.618	0.259	
10-10-8l1	10-10-8	10-10-7	672.92	665.34	144.41	8	673.14	0.618	0.325	
10-10-7l1	10-10-7	10-10-6	664.94	650.23	168.4	8	665.13	0.618	0.285	
10-10-6l1	10-10-6	10-10-5	649.67	645.94	62.14	8	649.88	0.618	0.314	
10-10-5l1	10-10-5	10-10-4	645.64	617	347.43	8	645.83	0.618	0.289	
10-10-4l1	10-10-4	10-10-3	615.26	611.74	127.96	8	615.52	0.618	0.386	
10-10-3l1	10-10-3	10-10-2	611.07	595	101.85	8	611.23	0.618	0.449	
10-10-2l1	10-10-2	10-10-1	595	579.91	67.04	8	595.15	0.618	0.225	

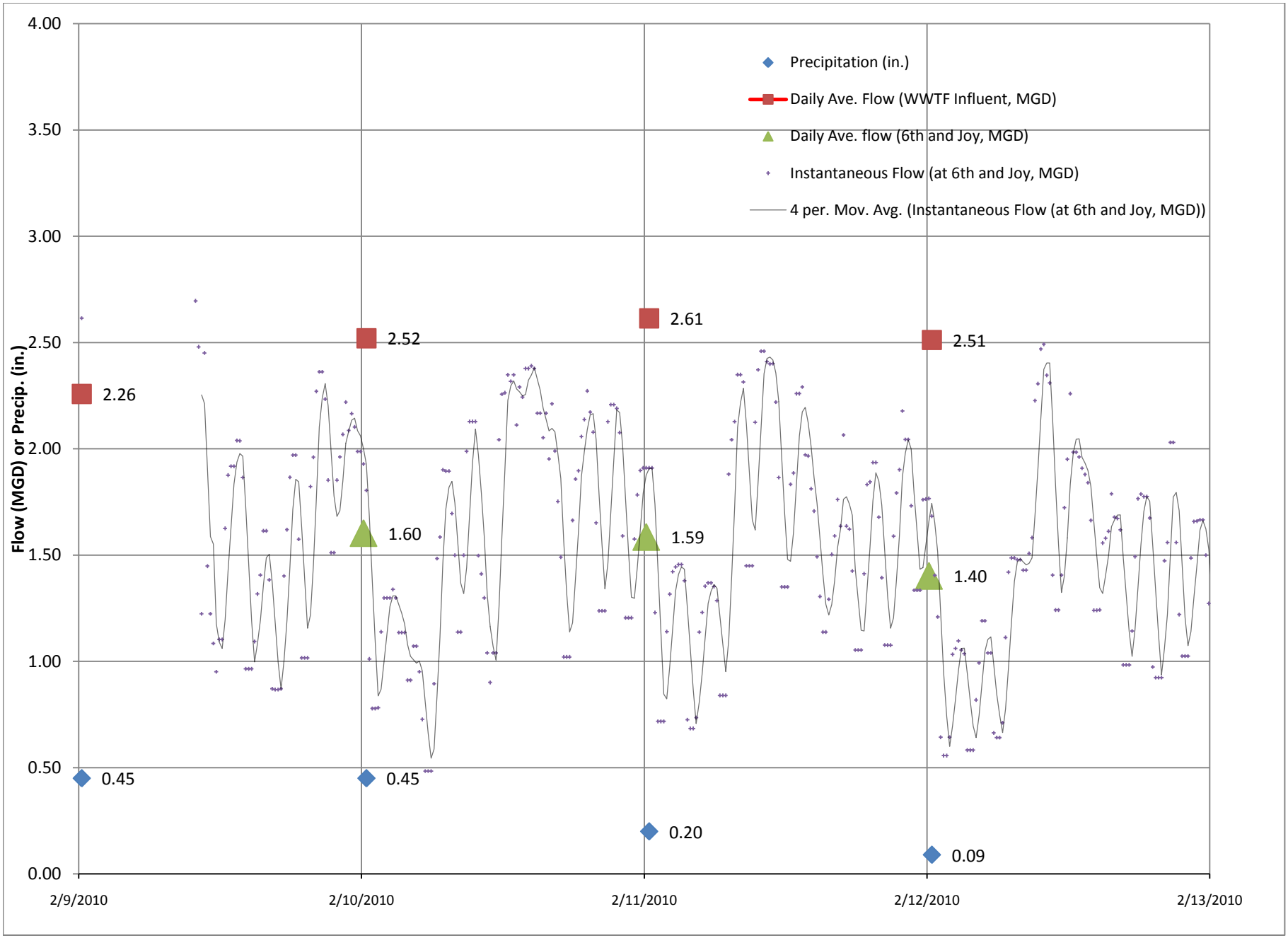
Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
10-10-1l1	10-10-1	10-10B-1	579.48	552.57	204.62	8	579.65	0.618	0.257	
10-10B-1l1	10-10B-1	10-11-8	552.32	529.58	113.51	8	552.51	0.898	0.279	
10-11-8I1	10-11-8	10-11-7	529.03	512.56	172.89	8	529.26	0.898	0.755	
10-11-7I1	10-11-7	10-11-6	512.51	504.76	172.89	8	512.79	0.898	0.415	
10-11-6I1	10-11-6	10-11-5	504.29	496.36	122.58	8	504.54	0.898	0.744	
10-11-5I1	10-11-5	10-11-4	496.36	489.35	99.68	8	496.61	0.898	0.869	
10-11-4I1	10-11-4	10-11-3	489.35	486.23	79.73	8	489.64	0.898	0.566	
10-11-3I1	10-11-3	10-11-2	485.94	481.23	202.93	8	486.27	0.898	0.5	
10-11-2I1	10-11-2	10-11-1	480.56	456.89	276.46	8	480.79	0.898	0.348	
10-11-1I1	10-11-1	10-4-4	456.17	437.78	149.06	8	456.38	0.898	0.317	
10-4-4l1	10-4-4	10-4-3	437.47	431.39	77.5	8	437.71	0.898	0.427	
10-4-3l1	10-4-3	10-4-2	431.2	422.61	105.27	8	431.44	0.898	0.774	
10-4-2l1	10-4-2	10-4-1	422.31	421.65	63.07	8	422.74	0.898	0.644	
10-4-1l1	10-4-1	10-1-10	421.53	377.51	189.32	8	421.71	0.898	0.269	
10-1-20l1	10-1-20	10-1-19	560.33	558.74	222.19	10	560.47	0.107	0.218	
10-1-19l1	10-1-19	10-1-18	558.7	557.34	180	10	558.83	0.107	0.165	
10-1-18l1	10-1-18	10-1-17	557.34	528.08	178.24	8	557.41	0.107	0.103	
10-1-17l1	10-1-17	10-1-16	527.27	510.29	82.16	8	527.34	0.107	0.098	
10-1-16l1	10-1-16	10-1-15	509.25	487.05	64.52	8	509.31	0.107	0.087	
10-1-15l1	10-1-15	10-1-14	486.88	461.89	227.99	8	486.96	0.107	0.376	
10-1-14l1	10-1-14	10-1-13	461.89	461.44	33	8	462.02	0.107	0.188	
10-1-13l1	10-1-13	10-1-12	461.44	411.61	153.23	8	461.5	0.107	0.088	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[1]	Qmax (cfs)	Hmax/D[2]	Surcharge (ft)[3]
10-1-12l1	10-1-12	10-1-11	410.71	388	158.82	8	410.88	0.625	0.253	
10-1-11l1	10-1-11	10-1-10	382.41	380.71	187.51	8	382.77	0.625	0.533	
10-1-10l1	10-1-10	10-1-9	375.1	170.58	281.66	8	375.28	1.523	1.9	0.60
10-1-9l1	10-1-9	10-1-8	171.3	159.26	89.57	8	171.57	1.523	0.41	
10-1-8l1	10-1-8	10-1-7	154.04	151.99	186.15	8	155.65	1.523	2.414	0.94
10-1-7l1	10-1-7	10-1-6	151.69	145.35	182.68	8	152.1	1.523	1.02	0.01
10-1-6l1	10-1-6	10-1-5	145.15	138.94	215.3	8	145.59	1.523	0.932	
10-1-5l1	10-1-5	S P Hill LS	138.94	137.5	32.81	12	139.25	1.523	0.311	
10-1-3l1	10-1-3	10-1-2	146.7	132	255.96	8	147.1	1.913	1.259	0.17
10-1-2l1	10-1-2	10-1-1	132	122.59	300	10	132.42	1.913	0.848	
10-1-1l1	10-1-1	W C LS	122.59	121	32.81	12	122.94	2.044	0.353	
10-6-4l1	10-6-4	10-6-3	475.28	471.48	200.3	8	475.54	0.518	0.551	
10-6-3l1	10-6-3	10-6-2	471.48	445.39	371.61	8	471.66	0.518	0.539	
10-6-2l1	10-6-2	10-6-1	445.39	424.43	273.95	8	445.57	0.518	0.688	
10-6-1l1	10-6-1	10-1A-12	424.43	417.32	238.32	8	424.66	0.518	0.344	
10-1A-12l1	10-1A-12	10-1-12	417.18	411.61	32.81	8	417.33	0.518	0.221	
7-1-6l1	7-1-6	7-1-5	23.7	22.21	286.97	8	24.05	0.468	0.757	
7-1-5l1	7-1-5	7-1-4	22.21	21.45	213.44	8	22.62	0.468	0.683	
7-1-4l1	7-1-4	7-1-3	21.45	19.75	57.12	8	21.68	0.468	0.743	
7-1-3l1	7-1-3	7-1-2	19.75	17.5	455.94	8	20.11	0.468	0.753	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
7-1-2l1	7-1-2	7-1-1	17.5	16.86	163.94	8	17.89	0.468	0.644	
7-1-1l1	7-1-1	L C LS	16.86	9.62	328.36	10	17.07	0.523	0.258	
7-2-1l1	7-2-1	L C LS	12	9.62	101	12	12.09	0.096	0.093	
5-1-25l1	5-1-25	5-1-24	179.15	175.8	170.03	8	179.15	0	0.01	
5-1-24l1	5-1-24	5-1-23	175.8	158.25	97.27	8	175.8	0	0.011	
5-1-23l1	5-1-23	5-1-22	158.25	146.53	112.21	8	158.25	0	0.396	
5-1-22l1	5-1-22	5-1-21	146.53	135	271.78	8	146.66	0.208	0.41	
5-1-21l1	5-1-21	5-1-20	135	125	272.09	8	135.14	0.208	0.386	
5-1-20l1	5-1-20	5-1-19	125	112.43	268.1	8	125.13	0.208	0.23	
5-1-19l1	5-1-19	5-1-18	112.33	100	246.71	8	112.46	0.208	0.41	
5-1-18l1	5-1-18	5-1-17	100	90	271.63	8	100.14	0.208	0.408	
5-1-17l1	5-1-17	5-1-16	90	79.7	272.88	8	90.14	0.208	0.274	
5-1-16l1	5-1-16	5-1-15	79.6	71	267.08	8	79.74	0.208	0.421	
5-1-15l1	5-1-15	5-1-14	71	66.21	143.92	8	71.14	0.208	0.242	
5-1-14l1	5-1-14	5-1-13	66.11	60.5	122.75	8	66.24	0.208	0.437	
5-1-13l1	5-1-13	5-1-12	60.5	52.47	280.67	8	60.65	0.208	1.874	0.58
5-1-12l1	5-1-12	5-1-11	52.47	43.93	272	21	53.09	7.435	0.902	
5-1-11l1	5-1-11	5-1-10	43.93	40.07	274.19	21	44.72	7.613	0.611	
5-1-10l1	5-1-10	5-1-9	39.62	37.5	245.69	24	40.56	7.613	0.796	
5-1-9l1	5-1-9	5-1-8	37.5	36.52	551.39	24	38.9	7.613	0.759	
5-1-8l1	5-1-8	5-1-7	36.52	35	130.28	24	37.45	7.613	0.819	
5-1-7l1	5-1-7	5-1-6	35	33	226.78	21	35.95	7.613	0.724	

Pipe ID	Up Stream MH	Down Stream MH	Up Stream IE	Down Stream IE	Length (ft)	Dia. (in)	Hmax[(1)]	Qmax (cfs)	Hmax/D[(2)]	Surcharge (ft)[(3)]
5-1-6l1	5-1-6	5-1-5	33	28	121.91	21	33.63	7.613	1.066	0.12
5-1-5l1	5-1-5	5-1-4	28	26.22	240	21	29.25	7.613	1.287	0.50
5-1-4l1	5-1-4	5-1-3	26.22	25.93	289.28	21	28.28	7.613	1.176	0.31
5-1-3l1	5-1-3	5-1-2	25.93	24.9	240	21	27.29	7.614	1.002	0.00
5-1-2l1	5-1-2	5-1-1	24.9	24.41	34	24	26.46	7.615	1.001	0.00
5-1-1l1	5-1-1	Main_LS	24.41	22	142	24	25.41	16.309	0.501	

1) Hmax represents the hydraulic grid line; summation of elevation head, velocity head and pressure head.
2) Hmax/D represents the percent the of the pipe diameter used to convey the flow.
3) Surcharge represents the depth of water above the crown of the pipe in the manholes.


Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2/9/2010
2/10/2010
2/11/2010
2/12/2010
2/13/2010
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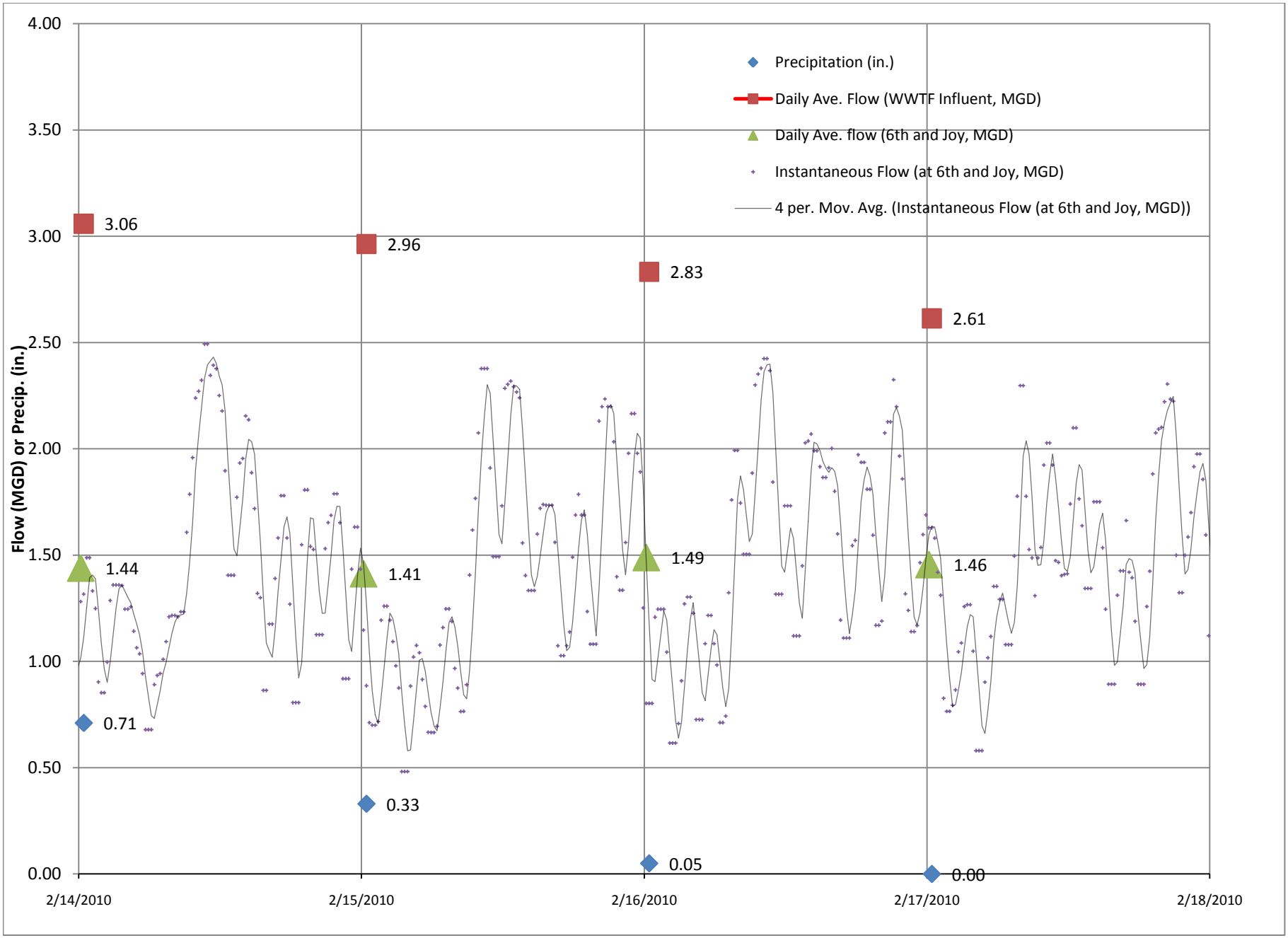
Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
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0.50
0.00
2/14/2010
2/15/2010
2/16/2010
2/17/2010
2/18/2010
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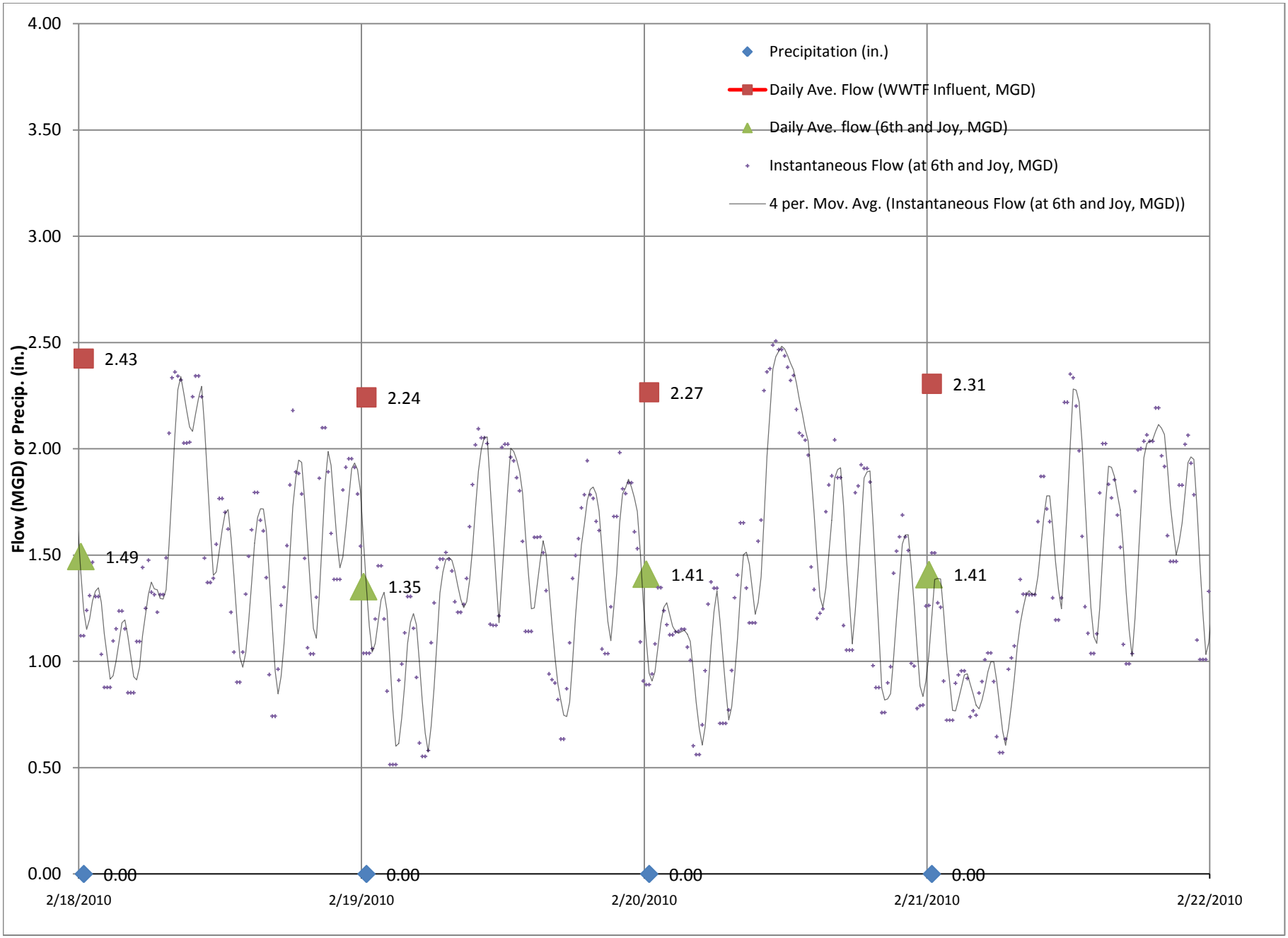
Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))
Flow (MGD) or Precip. (in.)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
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2.24
2.27
2.31
1.49
1.35
1.41
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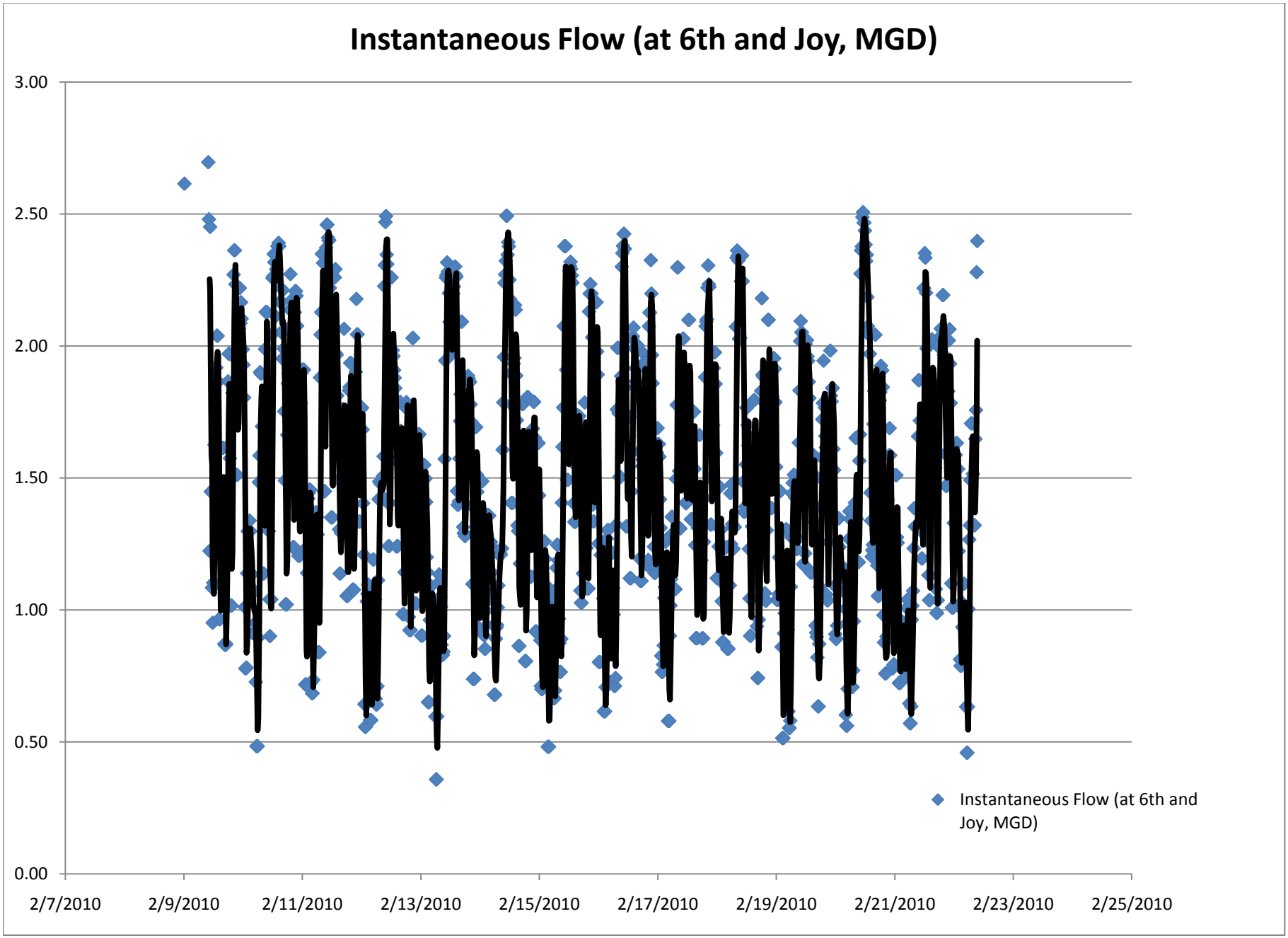
2/21/2010
2/22/2010


Instantaneous Flow (at 6th and Joy, MGD)
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2/13/2010
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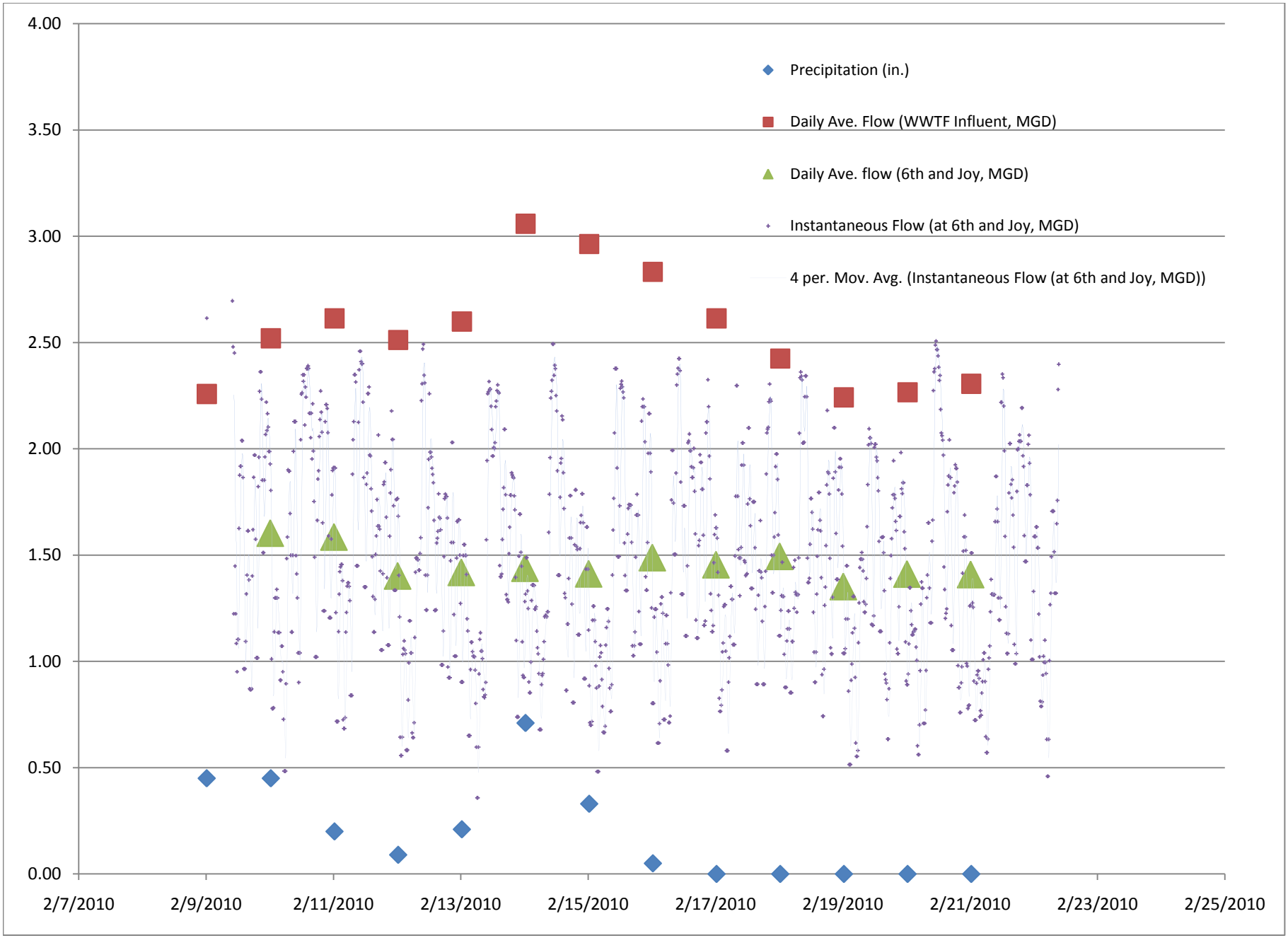
2/21/2010
2/23/2010
2/25/2010
Instantaneous Flow (at 6th and Joy, MGD)


4.00
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0.00
2/7/2010
2/9/2010
2/11/2010
2/13/2010
2/15/2010
2/17/2010
2/19/2010
2/21/2010
2/23/2010
2/25/2010
Precipitation (in.)
Daily Ave. Flow (WWTF Influent, MGD)
Daily Ave. flow (6th and Joy, MGD)
Instantaneous Flow (at 6th and Joy, MGD)
4 per. Mov. Avg. (Instantaneous Flow (at 6th and Joy, MGD))

MEMORANDUM

TO: MONTE BRACHMANN, PUBLIC WORKS DIRECTOR
FROM: KEN ALEXANDER, P.E.
DATE: FEBRUARY 8, 2010
SUBJECT: COLLECTION SYSTEM CAPACITY FOR NORTH UGA EXPANSION
CITY OF CAMAS, CLARK COUNTY, WASHINGTON
G&O #05471.01

Gray & Osborne recently received projected sewage flows from WG Cardno for the Green Mountain development (see attached) that is potentially to be part of the North Urban Growth Area (NUGA) expansion.

We have also received flow projections for the Fischer Investments facility in Grass Valley. The additional Grass Valley projections are based on 3,000 gallons per acre-day (gpad) base flow, a peaking factor of 3, and I/I of 500 gpad.

Because previous modeling of flows in the collection system during development of the Wastewater Facility Plan showed surcharging of portions of the system during high-flow events, we performed additional modeling to determine the potential impact of both the Green Mountain and Grass Valley developments.

Our modeling indicates that these additional flows, when added to existing flows, will increase surcharging of the system. While the modeling shows that projected flows do not cause the manholes to flood and release sewage to the street, in some manholes surcharging is significant enough to be of concern.

Because of this concern, we performed field measurements of selected manholes to measure the elevation difference between the manhole rim and the invert of the sewer line in the manhole. Results of field measurements and modeling are presented in Table 1. A figure showing locations of manholes measured in the field follows the table.

The modeling and fieldwork indicate that surcharging will potentially cause the liquid level in the manholes to approach 3 feet from the manhole rim in Manhole 6-1-4 when future Grass Valley and Green Mountain flows are added to existing flows. Modeling

and field measurements indicate other manholes will see liquid levels between 3.8 feet and 15 feet from the rim.

Gray & Osborne would like to discuss the implications of this analysis with the City prior to completing the Wastewater Facility Plan amendment that addresses the NUGA expansion.

TABLE 1

Collection System Modeling Results and Field Survey for the City of Camas

Manhole Number	Manhole Rim (ft)	Pipe Invert (ft)	Rim to Invert Height		Pipe Diameter (ft)	Surcharge (ft)			Rim to Surcharge Elevation (ft)		
			Model (ft)	Measured (ft)		GV + GM	GM only	GV Only	GV + GM	GM only	GV Only
6-1-13B	136.8	127.94			1.5	0.087	0	0			
6-1-12	123.3	115.03			1.5	0.3495	0	0.213			
6-1-11	104.13	95			1.5	0.4335	0.1665	0.3135			
6-1-10	78.68	71.35			1.5	1.2225	0.486	0.6255			
6-1-9	67.04	59.76			1.5	0.4275	0	0			
6-1-8	70	57.85			1.5	2.7075	0.5235	0.6315			
6-1-7	65	52.04			1.5	2.3265	0.441	0.7125			
6-1-6	59.84	49.84	10	7.08	1.5	1.752	0.528	0.669	3.8	5.1	4.9
6-1-5	64	47.68			1	1.074	0.1125	0.4335			
6-1-4	55.48	45.48	10	5.00	1	0.8205	0.4305	0.636	3.2	3.6	3.4
6-1-3	53.32	43.32	10		1.25	0	0	0			
6-1-2	47.5	37.5	10	11.17	1.5	0.357	0.102	0.2415	9.3	9.6	9.4
6-1-1	45.44	35.44	10		1.5	0	0	0			
5-2-3	42.47	32.47	10		1.75	0	0	0			
5-2-2	38.5	29.5	9	7.67	1.5	0.1035	0	0	6.1	6.2	6.2
5-2-1	38	27	11	17.00	1.5	0.5025	0.366	0.441	15.0	15.1	15.1
5-1-1	32	24.1			1	0	0	0			

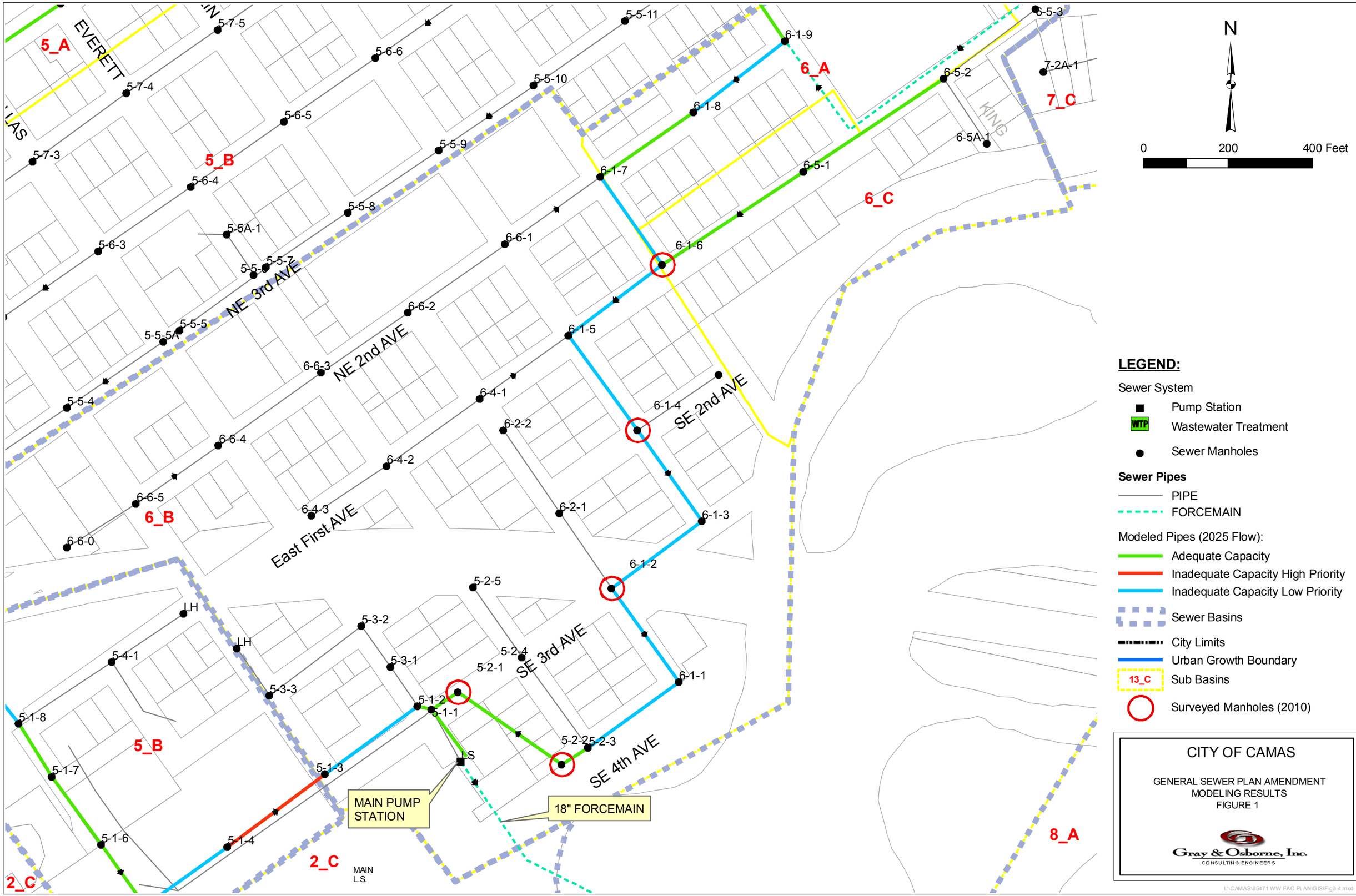
(1) Existing flows assumed to be 2.41 cfs (from 2007 Wastewater Facility Plan), with peaking factor of 2 applied in modeling.

(2) GM = Green Mountain flows assumed to be 0.54 cfs (0.059 cfs existing plus 0.481 cfs), with peaking factor of 2 applied in model.

(3) GV = Additional Grass Valley flows assumed to be 0.93 cfs, with peaking factor of 2 applied in model.

(4) Surcharge is measured as distance from crown of pipe to water surface.

KCA/hhj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KING
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5-6-6
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5-5-11
5-5-10
5-5-9
5-5-8
5-5A-1
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6-5A-1
7-2A-1
5-4-1
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5-1-3
5-1-2
5-1-1
LH
LH
LS
MAIN PUMP STATION
18" FORCEMAIN
MAIN L.S.
LEGEND:
Sewer System
Pump Station
WTP
Wastewater Treatment
Sewer Manholes
Sewer Pipes
PIPE
FORCEMAIN
Modeled Pipes (2025 Flow):
Adequate Capacity
Inadequate Capacity High Priority
Inadequate Capacity Low Priority
Sewer Basins
City Limits
Urban Growth Boundary
13_C
Sub Basins
Surveyed Manholes (2010)
CITY OF CAMAS
GENERAL SEWER PLAN AMENDMENT
MODELING RESULTS
FIGURE 1
Gray & Osborne, Inc.
CONSULTING ENGINEERS
L:\CAMAS\05471 WW FAC PLAN\GIS\Fig3-4.mxd

APPENDIX C

COST ESTIMATES

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN I LIFT STATION (720 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 97,000	$ 97,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 31,100	$ 31,100
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 37,300	$ 37,300
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 31,100	$ 31,100
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 155,200	$ 155,200
15	Piping, Valves and Accessories	1	LS	$ 99,400	$ 99,400
16	Generator System	1	LS	$ 99,400	$ 99,400
17	Electrical	1	LS	$ 149,000	$ 149,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 904,000
			Sales Tax (8.9%)		$ 80,456
			Subtotal		$ 984,456
			Contingency (25%)		$ 246,114
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,240,000
			Engineering and Adminitrative Costs (25%)		$ 310,000
			Total Project Cost (Rounded)		$ 1,550,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN II LIFT STATION (205 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 45,000	$ 45,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 8,900	$ 8,900
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 10,700	$ 10,700
8	Gravel Base	200	TN	$ 20	$ 4,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	200	FT	$ 50	$ 10,000
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 8,900	$ 8,900
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 44,200	$ 44,200
15	Piping, Valves and Accessories	1	LS	$ 28,300	$ 28,300
16	Generator System	1	LS	$ 28,300	$ 28,300
17	Electrical	1	LS	$ 42,500	$ 42,500
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 417,800
			Sales Tax (8.9%)		$ 37,184
			Subtotal		$ 454,984
			Contingency (25%)		$ 113,746
			TOTAL ESTIMATED CONSTRUCTION COST		$ 570,000
			Engineering and Adminitrative Costs (25%)		$ 150,000
			Total Project Cost (Rounded)		$ 720,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN III LIFT STATION (1040 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 129,000	$ 129,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 44,900	$ 44,900
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 53,800	$ 53,800
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 44,900	$ 44,900
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 224,200	$ 224,200
15	Piping, Valves and Accessories	1	LS	$ 143,500	$ 143,500
16	Generator System	1	LS	$ 143,500	$ 143,500
17	Electrical	1	LS	$ 215,200	$ 215,200
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 1,203,500
			Sales Tax (8.9%)		$ 107,112
			Subtotal		$ 1,310,612
			Contingency (25%)		$ 327,653
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,640,000
			Engineering and Adminitrative Costs (25%)		$ 410,000
			Total Project Cost (Rounded)		$ 2,050,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN IV LIFT STATION (270 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 95,000	$ 95,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 30,000	$ 30,000
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 36,000	$ 36,000
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 30,000	$ 30,000
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 150,000	$ 150,000
15	Piping, Valves and Accessories	1	LS	$ 96,000	$ 96,000
16	Generator System	1	LS	$ 96,000	$ 96,000
17	Electrical	1	LS	$ 144,000	$ 144,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 881,500
			Sales Tax (8.9%)		$ 78,454
			Subtotal		$ 959,954
			Contingency (25%)		$ 239,989
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,200,000
			Engineering and Adminitrative Costs (25%)		$ 300,000
			Total Project Cost (Rounded)		$ 1,500,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN V LIFT STATION (345 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 83,000	$ 83,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 25,000	$ 25,000
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 30,000	$ 30,000
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 25,000	$ 25,000
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 125,000	$ 125,000
15	Piping, Valves and Accessories	1	LS	$ 80,000	$ 80,000
16	Generator System	1	LS	$ 80,000	$ 80,000
17	Electrical	1	LS	$ 120,000	$ 120,000
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 772,500
			Sales Tax (8.9%)		$ 68,753
			Subtotal		$ 841,253
			Contingency (25%)		$ 210,313
			TOTAL ESTIMATED CONSTRUCTION COST		$ 1,060,000
			Engineering and Adminitrative Costs (25%)		$ 270,000
			Total Project Cost (Rounded)		$ 1,330,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
BASIN VI LIFT STATION (265 gpm peak flow)

NO.	ITEM	QUANTITY		UNIT PRICE	TOTAL
1	Mobilization/Demobilization	1	LS	$ 52,000	$ 52,000
2	Clearing & Grubbing	1	LS	$ 7,000	$ 7,000
3	Dewatering	1	LS	$ 20,000	$ 20,000
4	Erosion Control	1	LS	$ 7,000	$ 7,000
5	Temporary Shoring & Bracing	1	LS	$ 11,500	$ 11,500
6	Trench Excavation Safety Systems	1	LS	$ 3,000	$ 3,000
7	Concrete Slabs and Foundations	1	LS	$ 13,800	$ 13,800
8	Gravel Base	250	TN	$ 20	$ 5,000
9	Grading and Paving	1	LS	$ 20,000	$ 20,000
10	Fencing	250	FT	$ 50	$ 12,500
11	Utilities & Misc. Site Improvements	1	LS	$ 8,000	$ 8,000
12	Electrical Shelter	1	LS	$ 11,500	$ 11,500
13	Painting & Dampproofing	1	LS	$ 50,000	$ 50,000
14	Pumps and Level Control	1	LS	$ 57,200	$ 57,200
15	Piping, Valves and Accessories	1	LS	$ 36,600	$ 36,600
16	Generator System	1	LS	$ 36,600	$ 36,600
17	Electrical	1	LS	$ 54,900	$ 54,900
18	Instrumentation & Telemetry	1	LS	$ 40,000	$ 40,000
19	Utility Service (PUD)	1	LS	$ 12,000	$ 12,000
20	Programming, Startup, SCADA, Documentation	1	LS	$ 20,000	$ 20,000
			Subtotal		$ 478,600
			Sales Tax (8.9%)		$ 42,595
			Subtotal		$ 521,195
			Contingency (25%)		$ 130,299
			TOTAL ESTIMATED CONSTRUCTION COST		$ 660,000
			Engineering and Adminitrative Costs (25%)		$ 170,000
			Total Project Cost (Rounded)		$ 830,000

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 8,200 LF of 10-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	61,000.00	$	61,000.00
2	10-inch FM Sewer Pipe	8200 LF	$	75.00	$	615,000.00
3	Locate Existing Utilities	LUMP SUM	$	18,000.00	$	18,000.00
4	Traffic Control	LUMP SUM	$	3,500.00	$	3,500.00
5	Erosion Control	LUMP SUM	$	18,000.00	$	18,000.00
6	Trench Safety Systems	LUMP SUM	$	8,200.00	$	8,200.00
7	Gravel Backfill	3610 TN	$	15.00	$	54,150.00
8	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
9	Foundation Gravel	450 TN	$	25.00	$	11,250.00
10	Crushed Surfacing, Top Course	100 TN	$	25.00	$	2,500.00
11	Cold Mix Asphalt	360 TN	$	85.00	$	30,600.00
12	Asphalt Pavement Repair	5470 SY	$	20.00	$	109,400.00
13	Sawcutting	16400 LF	$	4.00	$	65,600.00

Subtotal:	$	999,700.00
Sales Tax (8.9%):	$	88,973.30
Subtotal:	$	1,088,673.30
Contingency (25%):	$	272,126.70
TOTAL ESTIMATED CONSTRUCTION COST:	$	1,360,800.00
Engineering and Administrative Costs (25%):	$	340,200.00
TOTAL ESTIMATED PROJECT COST:	$	1,701,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 3,000 LF of 6-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	24,000.00	$	24,000.00
2	6-inch FM Sewer Pipe	3000 LF	$	60.00	$	180,000.00
3	Locate Existing Utilities	LUMP SUM	$	6,000.00	$	6,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	6,000.00	$	6,000.00
6	Trench Safety Systems	LUMP SUM	$	3,000.00	$	3,000.00
7	Gravel Backfill	1100 TN	$	15.00	$	16,500.00
8	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
9	Foundation Gravel	140 TN	$	25.00	$	3,500.00
10	Crushed Surfacing, Top Course	50 TN	$	25.00	$	1,250.00
11	Cold Mix Asphalt	130 TN	$	85.00	$	11,050.00
12	Asphalt Pavement Repair	2000 SY	$	20.00	$	40,000.00
13	Sawcutting	6000 LF	$	4.00	$	24,000.00

Subtotal:	$	319,000.00
Sales Tax (8.9%):	$	28,391.00
Subtotal:	$	347,391.00
Contingency (25%):	$	86,809.00
TOTAL ESTIMATED CONSTRUCTION COST:	$	434,200.00
Engineering and Administrative Costs (25%):	$	108,600.00
TOTAL ESTIMATED PROJECT COST:	$	543,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 4,700 LF of 12-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	50,000.00	$	50,000.00
2	12-inch FM Sewer Pipe	4700 LF	$	90.00	$	423,000.00
3	Locate Existing Utilities	LUMP SUM	$	12,000.00	$	12,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	12,000.00	$	12,000.00
6	Trench Safety Systems	LUMP SUM	$	4,700.00	$	4,700.00
7	Gravel Backfill	2410 TN	$	15.00	$	36,150.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	300 TN	$	25.00	$	7,500.00
10	Crushed Surfacing, Top Course	120 TN	$	25.00	$	3,000.00
11	Cold Mix Asphalt	200 TN	$	85.00	$	17,000.00
12	Asphalt Pavement Repair	3140 SY	$	20.00	$	62,800.00
13	Sawcutting	9400 LF	$	4.00	$	37,600.00

Subtotal:	$	671,950.00
Sales Tax (8.9%):	$	59,803.55
Subtotal:	$	731,753.55
Contingency (25%):	$	182,946.45
TOTAL ESTIMATED CONSTRUCTION COST:	$	914,700.00
Engineering and Administrative Costs (25%):	$	228,700.00
TOTAL ESTIMATED PROJECT COST:	$	1,144,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 3,600 LF of 14-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	47,000.00	$	47,000.00
2	14-inch FM Sewer Pipe	3600 LF	$	120.00	$	432,000.00
3	Locate Existing Utilities	LUMP SUM	$	11,000.00	$	11,000.00
4	Traffic Control	LUMP SUM	$	1,200.00	$	1,200.00
5	Erosion Control	LUMP SUM	$	11,000.00	$	11,000.00
6	Trench Safety Systems	LUMP SUM	$	3,600.00	$	3,600.00
7	Gravel Backfill	1850 TN	$	15.00	$	27,750.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	230 TN	$	25.00	$	5,750.00
10	Crushed Surfacing, Top Course	75 TN	$	25.00	$	1,875.00
11	Cold Mix Asphalt	160 TN	$	85.00	$	13,600.00
12	Asphalt Pavement Repair	2400 SY	$	20.00	$	48,000.00
13	Sawcutting	7200 LF	$	4.00	$	28,800.00

Subtotal:	$	636,575.00
Sales Tax (8.9%):	$	56,655.18
Subtotal:	$	693,230.18
Contingency (25%):	$	173,269.83
TOTAL ESTIMATED CONSTRUCTION COST:	$	866,500.00
Engineering and Administrative Costs (25%):	$	216,600.00
TOTAL ESTIMATED PROJECT COST:	$	1,084,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 9,000 LF of 16-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	122,000.00	$	122,000.00
2	16-inch FM Sewer Pipe	9000 LF	$	125.00	$	1,125,000.00
3	Locate Existing Utilities	LUMP SUM	$	29,000.00	$	29,000.00
4	Traffic Control	LUMP SUM	$	3,500.00	$	3,500.00
5	Erosion Control	LUMP SUM	$	29,000.00	$	29,000.00
6	Trench Safety Systems	LUMP SUM	$	9,000.00	$	9,000.00
7	Gravel Backfill	5280 TN	$	15.00	$	79,200.00
8	Connections to Existing	2 EA	$	2,500.00	$	5,000.00
9	Foundation Gravel	660 TN	$	25.00	$	16,500.00
10	Crushed Surfacing, Top Course	300 TN	$	25.00	$	7,500.00
11	Cold Mix Asphalt	390 TN	$	85.00	$	33,150.00
12	Asphalt Pavement Repair	6000 SY	$	20.00	$	120,000.00
13	Sawcutting	18000 LF	$	4.00	$	72,000.00

Subtotal:	$	1,650,850.00
Sales Tax (8.9%):	$	146,925.65
Subtotal:	$	1,797,775.65
Contingency (25%):	$	449,424.35
TOTAL ESTIMATED CONSTRUCTION COST:	$	2,247,200.00
Engineering and Administrative Costs (25%):	$	561,800.00
TOTAL ESTIMATED PROJECT COST:	$	2,809,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 400 LF of 6-inch Force Main

NO.	ITEM	QUANTITY		UNIT PRICE		AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$	3,000.00	$	3,000.00
2	6-inch FM Sewer Pipe	400 LF	$	60.00	$	24,000.00
3	Locate Existing Utilities	LUMP SUM	$	1,000.00	$	1,000.00
4	Traffic Control	LUMP SUM	$	500.00	$	500.00
4	Erosion Control	LUMP SUM	$	1,000.00	$	1,000.00
6	Trench Safety Systems	LUMP SUM	$	400.00	$	400.00
9	Gravel Backfill	150 TN	$	15.00	$	2,250.00
11	Connections to Existing	1 EA	$	2,500.00	$	2,500.00
13	Foundation Gravel	20 TN	$	25.00	$	500.00
14	Crushed Surfacing, Top Course	5 TN	$	25.00	$	125.00
15	Cold Mix Asphalt	20 TN	$	85.00	$	1,700.00
16	Asphalt Pavement Repair	270 SY	$	20.00	$	5,400.00
17	Sawcutting	800 LF	$	4.00	$	3,200.00

Subtotal:	$	36,975.00
Sales Tax (8.9%):	$	3,290.78
Subtotal:	$	40,265.78
Contingency (25%):	$	10,034.23
TOTAL ESTIMATED CONSTRUCTION COST:	$	50,300.00
Engineering and Administrative Costs (25%):	$	12,600.00
TOTAL ESTIMATED PROJECT COST:	$	63,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 5,000 LF of 16-inch Sewer Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 74,000.00	$ 74,000.00
2	16-inch PVC Gravity Sewer Pipe	5000 LF	$ 130.00	$ 650,000.00
3	Precast Manhole 48"	17 EA	$ 4,000.00	$ 68,000.00
4	Locate Existing Utilities	LUMP SUM	$ 5,000.00	$ 5,000.00
5	Traffic Control	LUMP SUM	$ 500.00	$ 500.00
6	Erosion Control	LUMP SUM	$ 17,000.00	$ 17,000.00
7	Trench Safety Systems	LUMP SUM	$ 5,000.00	$ 5,000.00
8	Gravel Backfill	2930 TN	$ 15.00	$ 43,950.00
9	Connections to Existing	1 EA	$ 2,500.00	$ 2,500.00
10	Foundation Gravel	370 TN	$ 25.00	$ 9,250.00
11	Crushed Surfacing, Top Course	5 TN	$ 25.00	$ 125.00
12	Cold Mix Asphalt	220 TN	$ 85.00	$ 18,700.00
13	Asphalt Pavement Repair	3340 SY	$ 20.00	$ 66,800.00
14	Sawcutting	10000 LF	$ 4.00	$ 40,000.00

Subtotal:	$ 1,000,825.00
Sales Tax (8.9%):	$ 89,073.43
Subtotal:	$ 1,089,898.43
Contingency (25%):	$ 272,501.58
TOTAL ESTIMATED CONSTRUCTION COST:	$ 1,362,400.00
Engineering and Administrative Costs (25%):	$ 340,600.00
TOTAL ESTIMATED PROJECT COST:	$ 1,703,000.00

CITY OF CAMAS
GENERAL SEWER/WASTEWATER FACILITY PLAN AMENDMENT
PRELIMINARY COST ESTIMATE
Install 9,000 LF of 12-inch Sewer Main

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 104,000.00	$ 104,000.00
2	12-inch PVC Gravity Sewer Pipe	9000 LF	$ 90.00	$ 810,000.00
3	Precast Manhole 48"	30 EA	$ 4,000.00	$ 120,000.00
4	Locate Existing Utilities	LUMP SUM	$ 26,000.00	$ 26,000.00
5	Traffic Control	LUMP SUM	$ 3,500.00	$ 3,500.00
4	Erosion Control	LUMP SUM	$ 25,000.00	$ 25,000.00
6	Trench Safety Systems	LUMP SUM	$ 9,000.00	$ 9,000.00
9	Gravel Backfill	4620 TN	$ 15.00	$ 69,300.00
11	Connections to Existing	1 EA	$ 2,500.00	$ 2,500.00
13	Foundation Gravel	580 TN	$ 25.00	$ 14,500.00
14	Crushed Surfacing, Top Course	5 TN	$ 25.00	$ 125.00
15	Cold Mix Asphalt	390 TN	$ 85.00	$ 33,150.00
16	Asphalt Pavement Repair	6000 SY	$ 20.00	$ 120,000.00
17	Sawcutting	18000 LF	$ 4.00	$ 72,000.00

Subtotal:	$ 1,409,075.00
Sales Tax (8.9%):	$ 125,407.68
Subtotal:	$ 1,534,482.68
Contingency (25%):	$ 383,617.33
TOTAL ESTIMATED CONSTRUCTION COST:	$ 1,918,100.00
Engineering and Administrative Costs (25%):	$ 479,500.00
TOTAL ESTIMATED PROJECT COST:	$ 2,398,000.00

City of Camas
Preliminary Cost Estimate
Lacamas Creek Pump Station and Force Main - Upgrade to 2,450 gpm

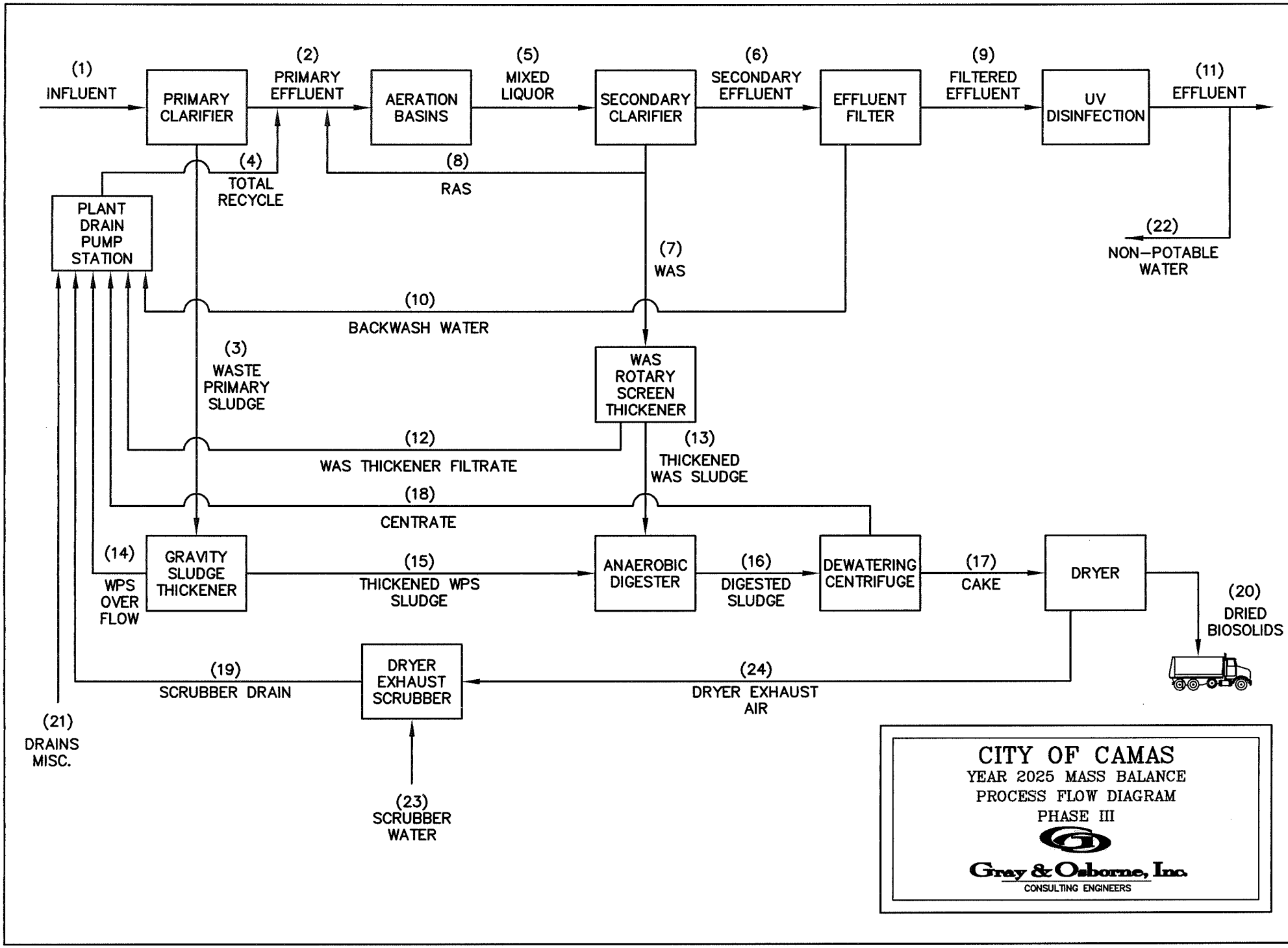
	Item	Quantity		Unit Cost	Total
1	Mobil. & Demobil.	1	LS	$ 159,300	$ 159,300
2	16" PVC Force Main	1600	LF	$ 100	$ 160,000
3	Locate Existing Utility	1	LS	$ 30,100	$ 30,100
4	Trench Safety Systems	1	LS	$ 3,200	$ 3,200
5	Trench Excavation, Backfill	1	LS	$ 32,500	$ 32,500
6	Traffic Control	1	LS	$ 6,500	$ 6,500
7	Erosion Control	1	LS	$ 30,100	$ 30,100
8	Foundation Gravel	120	TN	$ 35	$ 4,200
9	Gravel Base	1050	TN	$ 15	$ 15,750
10	Crushed Top Course	80	TN	$ 25	$ 2,000
11	Asphalt Pavement Repair	100	TN	$ 130	$ 13,000
12	Sawcutting	2000	LF	$ 3	$ 6,500
13	Dry Pit Submersible pumps	3	EA	$ 48,000	$ 144,000
14	Electrical & Control	1	LS	$ 300,000	$ 300,000
15	Generator	1	LS	$ 50,000	$ 50,000
16	HVAC	1	LS	$ 26,000	$ 26,000
17	Pump Station Excavation	1	LS	$ 150,000	$ 150,000
18	CMU Building	1	LS	$ 500,000	$ 500,000
19	Piping at Pump Station	1	LS	$ 50,000	$ 50,000
20	Shoring and Dewatering	1	LS	$ 26,000	$ 26,000
21	Demolition	1	LS	$ 13,000	$ 13,000
22	Landscaping	1	LS	$ 15,000	$ 15,000
23	Fencing	1	LS	$ 15,000	$ 15,000
24	Painting	1	LS	$ 10,000	$ 10,000
25	Bypass Pumping	1	LS	$ 50,000	$ 50,000
26	Land Acquisition	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 1,862,150
	Contigency (20%)				$ 372,430
	Subtotal				$ 2,234,580
	Sales Tax (8.2%)				$ 183,236
	Total Construction Cost				$ 2,417,816
	Engineering and Administration(25%)				$604,454
	Total Project Cost (Rounded)				$ 3,030,000

City of Camas
Evaluation of Sewer Service for the Gregg Reservoir Annexation
Preliminary Cost Estimate
Replace Sewer Upstream of Lacamas Lift Station (w/16" Sewer)

	Item	Quantity			Unit Cost		Total
1	Mobilization/Demobilization	1	LS	$	25,100	$	25,100
2	Clearing and Grubbing	1	LS	$	22,000	$	22,000
3	Environmental Controls	1	LS	$	3,000	$	3,000
4	Trench Excavation Safety Systems	1	LS	$	3,000	$	3,000
5	Dewatering	1	LS	$	4,000	$	4,000
6	Locate Existing Utilities	1	LS	$	2,000	$	2,000
7	Removal of Structures and Obstructions	1	LS	$	2,000	$	2,000
8	Traffic Control	1	LS	$	2,000	$	2,000
9	16" PVC Sewer Pipe (Including bedding)	1,100	LF	$	130	$	143,000
10	48" Precast Manhole (Basic to 8')	6	EA	$	3,900	$	23,400
11	48" Precast Manhole (Height over 8')	0	LF	$	200	$	-
12	Connection to Existing Manhole	1	EA	$	1,000	$	1,000
13	6" PVC Side Sewer Pipe (including bedding ar	0	EA	$	1,000	$	-
14	Special Excavation of Unsuitable Material	10	CY	$	35	$	350
15	Foundation Gravel	10	TN	$	35	$	350
16	Gravel Base	1,660	TN	$	15	$	24,900
17	Crushed Surfacing Top Course	210	TN	$	25	$	5,250
18	Cold Mix Asphalt (temp repair)	170	TN	$	75	$	12,750
19	Asphalt Pavement Repair	730	SY	$	20	$	14,600
20	Hydroseeding		SY	$	2	$	-
21	Saw Cutting	4,400	LF	$	2	$	8,800
			Subtotal			$	297,500
			Contingency (20%)			$	59,500
			Subtotal			$	357,000
			Sales Tax (8.2%)			$	29,274
			Total			$	386,274
			Total Construction Cost (Rounded)			**$**	**386,000**
			Engineering and Construction Administration (25%)			$	97,000
			Total Project Cost (Rounded)			**$**	**480,000**

APPENDIX D

WWTF MASS BALANCE



CITY OF CAMAS

YEAR 2025 MASS BALANCE
PROCESS FLOW DIAGRAM
PHASE III

Gray & Osborne, Inc.
CONSULTING ENGINEERS

City of Camas
Wastewater Treatment Plant
Year 2025 Mass Balance (End of Phase III)

2025 Characteristic	Units	1 Influent	2 Primary Effluent	3 WPS	4 Total Recycle	5 Mixed Liquor	6 Secondary Effluent	7 WAS	8 RAS	9 Filtered Effluent	10 Backwash Water	11 Effluent	12 WAS Thickener Filtrate
Flow	MGD	7.57	7.49	0.08	0.68	10.44	8.10	0.07	2.27	7.85	0.24	7.66	0.06
COD	lb/day	16203	6375	9828	1797	8172	2971	-----	-----	2882	89	2811	-----
BOD	lb/day	7365	5156	2210	817	5972	1350	-----	-----	1310	41	1278	-----
TSS	lb/day	10500	3675	6825	2392	195530	1350	5683	189403	655	695	639	568
VSS	lb/day	8925	3124	5801	1880	166201	1148	4173	139056	557	591	543	417
TKN	lb/day	3853	3638	215	601	14922	675	321	10683	655	118	639	32
NH4-N	lb/day	2890	2890	-----	457	3347	135	-----	-----	65	70	64	-----

2025 Characteristic	Units	13 Thickened WAS Sludge	14 WPS Overflow	15 Thickened WPS Sludge	16 Digested Sludge	17 Cake	18 Centrate	19 Scrubber Drain	20 Dried Cake	21 Drains Misc	22 Non-Potable Water	23 Scrubber Water	24 Dryer Exhaust Air
Flow	MGD	0.01	0.07	0.01	0.025	0.0039	0.021	0.1889	0.0015	0.098	0.192	0.192	0.0057
COD	lb/day	-----	786	9042	-----	-----	-----	-----	-----	-----	-----	-----	-----
BOD	lb/day	-----	177	2033	-----	-----	123	-----	-----	-----	-----	-----	-----
TSS	lb/day	5115	546	6279	6914	6568	346	236	6332	-----	24	24	-----
VSS	lb/day	3755	464	5337	4843	4601	242	166	4435	-----	20	20	-----
TKN	lb/day	288	16	197	230	218	11	166	53	-----	-----	-----	-----
NH4-N	lb/day	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

APPENDIX E

MIXING ZONE STUDY

Technical Memorandum

PO Box 1678 • Tacoma, WA 98401-1678
711 Pacific Avenue • Tacoma, WA 98402
Phone (253) 272-7220 • Fax (253) 272-7250
BFox@cosmopolitaneng.com

TM TITLE: **City of Camas Mixing Zone Study – 16-Port Diffuser Updated Effluent Flows**

DATE: September 21, 2009

TO: Jay Swift, PE, Gray & Osborne

PREPARED BY: Nick Whitaker, Cosmopolitan Engineering Group

REVIEWED BY: Bill Fox, PE, Cosmopolitan Engineering Group

PROJECT #: G&O016

TABLE OF CONTENTS

Introduction **1**

Effluent Flow Rates **1**

Potential Diffuser Modification **1**

Dilution Modeling **1**
UM3 Model 1
Model Results 2

Reasonable Potential Assessment **3**
Effluent Data 3
Ambient Data and Water Quality Standards 4
Reasonable Potential Results 4

LIST OF TABLES

Table 1 Effluent Flow Design Criteria for Facility Planning 1
Table 2 Diffuser Port Velocities for Tideflex Diffuser Valves 1
Table 3 Dilution Model Results for 2025 Effluent Flows 3
Table 4 Camas Effluent Metals Data (µg/L) 4
Table 5 Reasonable Potential Calculation Table 5

LIST OF ATTACHMENTS

Attachment 1: UM3 Model Runs

INTRODUCTION

Cosmopolitan Engineering Group completed an update to the *Mixing Zone Analysis* for the City of Camas in a Technical Memorandum (TM) dated February 19, 2009. That TM evaluated mixing for a proposed 16-port diffuser modification in which the discharge ports were oriented vertically with the addition of Tideflex elastomeric check valves. This TM evaluates the dilution and Reasonable Potential Analysis (RPA) for the proposed extended 16-port diffuser, with updated effluent flows.

EFFLUENT FLOW RATES

The updated effluent flow design criteria for facility planning are presented in Table 1.

Table 1 Effluent Flow Design Criteria for Facility Planning

Planning Year	Winter Flow Criteria		Summer Flow Criteria	
	Max. Month (mgd)	Max. Day (mgd)	Max. Month (mgd)	Max. Day (mgd)
2025	7.57	11.77	6.26	7.96

POTENTIAL DIFFUSER MODIFICATION

The potential diffuser extension would consist of 16 ports oriented to discharge vertically. Each port would be fitted with a 6-inch Tideflex elastomeric check valve. Port spacing would remain at 10 feet, effectively doubling the diffuser length. Revised performance data for the 16-port arrangement are provided in Table 2.

Table 2 Diffuser Port Velocities for Tideflex Diffuser Valves

Design Year	Season	Max Flow Period	Effluent Flow (mgd)	Flow per Port (gpm)	Discharge Velocity (fps)	Effective Area (sq. in.)	Effective Diameter (in.)
2025	Winter	30-day	7.57	3.29	10.8	9.78	3.53
2025	Winter	24-hr	11.77	511	13.88	11.81	3.88
2025	Summer	30-day	6.26	372	9.7	8.99	3.38
2025	Summer	24-hr	7.96	346	11.1	10.00	3.57

DILUTION MODELING

UM3 MODEL

The UM3 models runs were carried out through the Visual Plumes interface. A default aspiration entrainment coefficient (AEC) of 0.1 was used in all the model runs. Additional default values included the diffuser port contraction coefficient of 1. The model configuration also applied the Brooks farfield solution with the default dispersion coefficients.

The centerline dilution concentration in previous studies (CEG, 2007) was determined by dividing the calculated dilution factor by a peak-to-mean ratio of 2.3. This evaluation used a more conservative centerline dilution factor, which is calculated using the algorithms embedded in UM3.

MODEL RESULTS

A series of UM3 model runs from the Visual Plumes interface, with the Brooks farfield algorithm, are provided in Attachment 1. All model runs are based on the vertical port orientation with Tideflex valves. The basis of the model runs and the results are described below:

G-1	This chronic model run is for near-flood ambient conditions modeled by Ecology in the NPDES permit, the 90th percentile river discharge of 522 kcfs. This run is equivalent to Ecology run NC22B except for the maximum month effluent flow rate for 2025.
G-2	This acute model run is for the same near-flood ambient conditions modeled by Ecology, equivalent to Ecology run NC24 except the maximum day effluent flow rate for 2025.
G-3	This chronic model run corresponds to the 2025 winter maximum month flow rate and winter effluent temperature. Ambient current speed is tidally-averaged current profile during the low river flow condition.
G-4	This acute model run corresponds to 2025 maximum day winter flow rate and winter effluent temperature. Ambient current speed is the one-hour minimum velocity profile from the current meter deployment, which is caused by the tidal influence that occurs during low to normal Columbia River flows.
G-5	This chronic model run corresponds to 2025 summer maximum month flow rate and summer effluent temperature. Ambient current speed is tidally-averaged current profile during the low river flow condition (same as G-3).
G-6	This acute model run corresponds to 2025 maximum day summer flow rate and summer effluent temperature. Ambient current speed is the one-hour minimum velocity profile from the current meter deployment (same as G-4).

The results of the modeling are presented in Table 3. The results demonstrate that critical conditions occur during the 90th percentile high river discharge conditions (Runs G-1 and G-2). Critical acute and chronic dilution factors for the reasonable potential assessment are 23 and 124, respectively.

Table 3 Dilution Model Results for 2025 Effluent Flows

Model Run #	Ambient Condition	Discharge Depth (ft)	Avg Current Speed (m/sec)	Ambient Temp (°C)	Effluent Flow (mgd)	Effluent Temp (°C)	Acute Dilution	Chronic Dilution
G-1	[1]Winter High Flow	26.6	1.0	12.6	7.57	16.0		124
G-2	[1]Winter High Flow	26.6	1.0	12.6	11.77	16.0	23	
G-3	[2]Winter Average	21.0	0.7	12.6	7.57	16.0		233
G-4	[3]Winter 10%	21.0	0.25	12.6	11.77	16.0	31	
G-5	[2]Summer Average	21.0	0.7	21.5	6.26	22.0		194
G-6	[3]Summer 10%	21.0	0.25	21.5	7.96	22.0	27	

[1] Ambient conditions for 522 kcfs river flow (90th percentile) per Ecology NPDES permit (runs NC22 and NC24).

[2] Ambient condition for non-flood river flow based on tidally-averaged current profile from October 2004 current meter deployment.

[3] Ambient condition for acute model runs based on lowest tidally-influenced current profile (duration = 1 hr±) from October 2004 current meter deployment.

REASONABLE POTENTIAL ASSESSMENT

EPA and Ecology use a statistical test to determine a discharge's "reasonable potential" to exceed water quality standards, which is based on effluent and ambient data and acute and chronic dilution factors. If a discharge exhibits a reasonable potential to exceed water quality standards for any parameter, Ecology issues an effluent limitation for that parameter in the NPDES permit. If a parameter does not exhibit a reasonable potential to exceed water quality standards, no NPDES permit limit is required.

EFFLUENT DATA

Water quality-based effluent limits are assessed for ammonia and selected metals (cadmium, copper, lead, nickel, silver, zinc, and mercury). The critical effluent concentrations used in determination of reasonable potential are based on 12 effluent metals scans in 2005, 2006, and 2008, and over 400 effluent ammonia samples in 2005 and 2006.

The metals data are provided in Table 4. The values in red are detected concentrations, and the values in black are the detection levels for non-detected results. High concentrations of cadmium and nickel were measured on June 2, 2006. These values may be anomalous, or if realistic should be evaluated in future sampling efforts. The 95th percentile values were used in the RPA.

Table 4 Camas Effluent Metals Data (µg/L)

Date	Cd	Cu	Pb	Ni	Ag	An	Hg
5/13/2005	3	8	5	20	10	18	0.056
7/21/2005	10	31	5	20	10	19	0.05
9/30/2005	3	5	5	20	10	16	0.056
12/7/2005	3	5	5	20	10	15	0.05
3/31/2006	3	5	5	20	10	25	0.07
6/2/2006	87	12	5	373	70	20	0.05
9/12/2006	3	7	5	20	10	31	
12/18/2006	3	5	5	29	10	30	0.05
3/14/2008	5	20	10	50	10	50	
7/2/2008	5	20	5	20	10	50	0.04
9/22/2008	5	20	5	20	10	50	0.16
11/25/2008	5	20	10	20	10	50	0.2
Count	12	12	12	12	12	12	10
# Detects	2	4	0	2	0	8	3
95th percentile	44.65	24.95	10	195.35	10	50	0.182

Detected Values in Red Detection Limit in Black

AMBIENT DATA AND WATER QUALITY STANDARDS

No ambient sampling has been conducted in this mixing zone study for ammonia or metals or the parameters that affect their water quality standards (pH, temperature, and hardness). The criteria for ambient concentrations, and ambient-depended water quality criteria, are the same as Ecology cited in Appendix C of the NPDES permit.

REASONABLE POTENTIAL RESULTS

The reasonable potential to exceed water quality standards for ammonia and metals is presented in Table 5 for the recommended diffuser modifications. Ammonia is the only analyte considered seasonally due to its dependence on ambient pH and temperature. Cadmium was the only analyte with a reasonable potential to exceed water quality standards.

A comparison of the 8-port and 16-port diffusers RPA results in Table 5 shows a decrease in the maximum concentration at the edge of the acute and chronic mixing zone boundaries (except for mercury at the chronic mixing zone boundary). Based on the Visual Plumes modeling, the outfall extension would decrease the concentrations of cadmium at the acute mixing zone boundaries, but will not lower concentrations enough to meet the State Water Quality Standards. However, this finding is based on only one high detected value, and thus should be sampled more frequently in the future to determine if the reasonable potential is realistic.

Table 5 Reasonable Potential Calculation Table

8-PORT DIFFUSER

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-

				State Water Quality Standard		Max concentration at edge of...									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Modified Diffuser (Vertical Discharge)															
2025															
Ammonia-N (summer)	1.00	1.00	27.00	5100.00	830.000	939.52	239.40	NO	35200	0.60	0.55	268	0.70	27.0	116.0
Ammonia-N (winter)	1.00	1.00	19.00	2100.00	470.000	1468.77	289.84	NO	35200	0.60	0.55	268	0.70	17.0	91.0
Cadmium	0.940	0.940	0.53	1.70	0.61	4.54	1.28	YES	45.00	0.60	0.55	12	1.63	17.0	91.0
Copper	1.000	1.000	0.86	8.65	6.14	3.20	1.30	NO	25.00	0.60	0.55	12	1.63	17.0	91.0
Lead	0.470	0.470	0.06	29.3	1.14	0.51	0.14	NO	10.0	0.60	0.55	12	1.63	17.0	91.0
Nickel	1.000	1.000	0.56	770.7	85.60	19.17	4.04	NO	195.00	0.60	0.55	12	1.63	17.0	91.0
Silver	0.850	0.850	0.10	1.00	100.00	0.91	0.25	NO	10.00	0.60	0.55	12	1.63	17.0	91.0
Zinc	1.000	1.000	2.00	62.3	56.9	4.85	2.53	NO	31.000	0.60	0.55	12	1.63	17.0	91.0
Mercury	1.000	1.000		2.1	0.012	0.02	0.003	NO	0.182	0.60	0.55	10	1.74	17.0	91.0

16-PORT DIFFUSER

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-

				State Water Quality Standard		Max concentration at edge of...									
Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	Acute ug/L	Chronic ug/L	Acute Mixing Zone ug/L	Chronic Mixing Zone ug/L	LIMIT REQ'D?	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Modified Diffuser (Vertical Discharge)															
2025															
Ammonia-N (summer)	1.00	1.00	27.00	5100.00	830.000	939.52	154.00	NO	35200	0.60	0.55	268	0.70	27.0	194.0
Ammonia-N (winter)	1.00	1.00	19.00	2100.00	470.000	1090.57	217.76	NO	35200	0.60	0.55	268	0.70	23.0	124.0
Cadmium	0.940	0.940	0.53	1.70	0.61	3.50	1.08	YES	45.00	0.60	0.55	12	1.63	23.0	124.0
Copper	1.000	1.000	0.86	8.65	6.14	2.59	1.18	NO	25.00	0.60	0.55	12	1.63	23.0	124.0
Lead	0.470	0.470	0.06	29.3	1.14	0.39	0.12	NO	10.0	0.60	0.55	12	1.63	23.0	124.0
Nickel	1.000	1.000	0.56	770.7	85.60	14.32	3.11	NO	195.00	0.60	0.55	12	1.63	23.0	124.0
Silver	0.850	0.850	0.10	1.00	100.00	0.70	0.21	NO	10.00	0.60	0.55	12	1.63	23.0	124.0
Zinc	1.000	1.000	2.00	62.3	56.9	4.10	2.39	NO	31.000	0.60	0.55	12	1.63	23.0	124.0
Mercury	1.000	1.000		2.1	0.012	0.01	0.003	NO	0.182	0.60	0.55	10	1.74	23.0	124.0

ENGINEERING GROUP

Attachment 1

UM3 Model Runs

Civil, Environmental, and Recreational Consulting

G-1

/ Windows UM3. 7/8/2009 11:47:28 AM
Case 1; ambient file U:\Nick\Camas\VP plumeF1.002.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
1.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
2.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
3.0	1.07	180.0	0.0	12.6	0.0	0.0	1.07	180.0	0.0003
4.0	1.06	180.0	0.0	12.6	0.0	0.0	1.06	180.0	0.0003
5.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
6.0	1.0	180.0	0.0	12.6	0.0	0.0	1.0	180.0	0.0003
7.0	0.98	180.0	0.0	12.6	0.0	0.0	0.98	180.0	0.0003
8.0	0.95	180.0	0.0	12.6	0.0	0.0	0.95	180.0	0.0003
9.0	0.92	180.0	0.0	12.6	0.0	0.0	0.92	180.0	0.0003
10.0	0.91	180.0	0.0	12.6	0.0	0.0	0.91	180.0	0.0003
11.0	0.89	180.0	0.0	12.6	0.0	0.0	0.89	180.0	0.0003
12.0	0.85	180.0	0.0	12.6	0.0	0.0	0.85	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.53	1.0	90.0	180.0	16.0	10.0	32.0	321.0	26.6	7.57	0.0	16.0	100.0

Froude number: 159.0

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	26.6	0.947	3.53	100.0	1.0	1.0	0.0	0.0;	
74	25.88	0.953	11.6	26.88	3.72	1.419	-0.222	0.0;	begin overlap,
92	25.75	0.954	14.01	20.48	4.88	1.633	-0.352	0.0;	end overlap,
100	25.68	0.955	15.19	18.02	5.548	1.751	-0.431	0.0;	
200	24.13	0.969	41.19	2.562	39.01	9.766	-8.985	0.0;	
243	22.84	0.981	62.43	1.094	91.4	23.0	-32.53	0.0;	acute zone,
300	20.21	0.996	108.7	0.354	282.6	71.39	-166.3	0.0;	
311	19.56	1.001	120.9	0.284	351.4	89.03	-223.6	0.0;	merging,
324	18.64	1.009	141.7	0.22	454.5	124.1	-325.5	0.0;	chronic zone,
375	13.56	1.055	330.5	0.0801	1247.8	549.8	-1296.6	0.0;	surfa

G-2

/ Windows UM3. 7/8/2009 11:53:00 AM
Case 1; ambient file U:\Nick\Camas\VP plumeF2.003.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
1.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
2.0	1.09	180.0	0.0	12.6	0.0	0.0	1.09	180.0	0.0003
3.0	1.07	180.0	0.0	12.6	0.0	0.0	1.07	180.0	0.0003
4.0	1.06	180.0	0.0	12.6	0.0	0.0	1.06	180.0	0.0003
5.0	1.03	180.0	0.0	12.6	0.0	0.0	1.03	180.0	0.0003
6.0	1.0	180.0	0.0	12.6	0.0	0.0	1.0	180.0	0.0003
7.0	0.98	180.0	0.0	12.6	0.0	0.0	0.98	180.0	0.0003
8.0	0.95	180.0	0.0	12.6	0.0	0.0	0.95	180.0	0.0003
9.0	0.92	180.0	0.0	12.6	0.0	0.0	0.92	180.0	0.0003
10.0	0.91	180.0	0.0	12.6	0.0	0.0	0.91	180.0	0.0003
11.0	0.89	180.0	0.0	12.6	0.0	0.0	0.89	180.0	0.0003
12.0	0.85	180.0	0.0	12.6	0.0	0.0	0.85	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.88	1.0	90.0	180.0	16.0	10.0	32.0	321.0	26.6	11.77	0.0	16.0	100.0

Froude number: 195.1

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	26.6	0.947	3.88	100.0	1.0	1.0	0.0	0.0;	
100	25.26	0.959	19.12	16.37	6.105	2.072	-0.553	0.0;	
200	23.22	0.977	53.32	2.354	42.46	10.66	-10.13	0.0;	
239	21.73	0.987	77.79	1.088	91.9	23.14	-32.38	0.0;	acute zone,
284	19.23	1.004	120.4	0.446	224.0	56.5	-119.2	0.0;	merging,
300	17.97	1.015	146.8	0.325	307.6	85.38	-194.3	0.0;	
316	16.39	1.029	187.5	0.237	422.2	139.5	-321.1	0.0;	chronic zone,
345	12.72								

G-3

```
/ Windows UM3. 7/8/2009 12:02:27 PM
Case 1; ambient file U:\Nick\Camas\VP plumeF3.004.db; Diffuser table record 1: ---------------------------------
      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0       0.79      180.0        0.0       12.6        0.0        0.0       0.79      180.0     0.0003
        1.0       0.77      180.0        0.0       12.6        0.0        0.0       0.77      180.0     0.0003
        2.0       0.74      180.0        0.0       12.6        0.0        0.0       0.74      180.0     0.0003
        3.0        0.7      180.0        0.0       12.6        0.0        0.0        0.7      180.0     0.0003
        4.0       0.65      180.0        0.0       12.6        0.0        0.0       0.65      180.0     0.0003
        5.0       0.61      180.0        0.0       12.6        0.0        0.0       0.61      180.0     0.0003
        6.0       0.54      180.0        0.0       12.6        0.0        0.0       0.54      180.0     0.0003
        7.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
        8.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
        9.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       10.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       11.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
       12.0       0.46      180.0        0.0       12.6        0.0        0.0       0.46      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.53     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0    7.57     0.0    16.0   100.0
Froude number:      159.0
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.508     3.53    100.0      1.0      1.0      0.0      0.0;
 100      19.3    0.548    20.07    15.03     6.65    2.489   -0.566      0.0;
 200     17.11    0.594    57.16     2.23    44.83    10.96   -8.541      0.0;
 246     15.31    0.623    87.94    0.897    111.5     27.1    -32.2      0.0; acute zone,
 280     13.56    0.644    121.0    0.457    218.5    53.36   -82.66      0.0; merging,
 300     12.16    0.664    155.2    0.308    324.8    90.03   -149.6      0.0;
 327     9.778      0.7    236.4     0.18    554.3    232.8   -325.9      0.0; chronic zone, surface,
Outside chronic zone
 ;
12:02:30 PM. amb fills: 2
```

G-4

```
/ Windows UM3. 7/8/2009 11:57:24 AM
Case 1; ambient file U:\Nick\Camas\VP plumeF4.005.db; Diffuser table record 1: ---------------------------------
      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0      0.264      180.0        0.0       12.6        0.0        0.0      0.264      180.0     0.0003
        1.0      0.264      180.0        0.0       12.6        0.0        0.0      0.264      180.0     0.0003
        2.0      0.256      180.0        0.0       12.6        0.0        0.0      0.256      180.0     0.0003
        3.0      0.247      180.0        0.0       12.6        0.0        0.0      0.247      180.0     0.0003
        4.0      0.228      180.0        0.0       12.6        0.0        0.0      0.228      180.0     0.0003
        5.0       0.21      180.0        0.0       12.6        0.0        0.0       0.21      180.0     0.0003
        6.0      0.187      180.0        0.0       12.6        0.0        0.0      0.187      180.0     0.0003
        7.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
        8.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
        9.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       10.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       11.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
       12.0      0.163      180.0        0.0       12.6        0.0        0.0      0.163      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.88     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0   11.77     0.0    16.0   100.0
Froude number:      195.1
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.177     3.88    100.0      1.0      1.0      0.0      0.0;
 100     16.85    0.206     27.3     13.8    7.242    3.583   -0.525      0.0;
 200     10.74    0.241    114.0    2.063    48.44    13.14   -6.894      0.0;
 205     10.39    0.243    120.1    1.869    53.48    14.16   -7.836      0.0; merging,
 235     7.409    0.253    181.5    1.032    96.88    30.73   -19.84      0.0; surface,
Const Eddy Diffusivity.  Farfield dispersion based on wastefield width of      50.33 m
    conc  dilutn   width distnce    time
 (kg/kg)            (m)     (m)    (hrs) (kg/kg)   (s-1)   (m/s)(m0.67/s2)
 1.03009   97.03   57.33   97.84   0.156     0.0     0.0   0.163 3.00E-4
count: 1
 ;
11:57:27 AM. amb fills: 2
```

G-5

/ Windows UM3. 9/4/2009 3:02:05 PM
Case 1; ambient file U:\Nick\Camas\VP plumeF5.006.db; Diffuser table record 1: ----------

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2
0.0	0.79	180.0	0.0	21.5	0.0	0.0	0.79	180.0	0.0003
1.0	0.77	180.0	0.0	21.5	0.0	0.0	0.77	180.0	0.0003
2.0	0.74	180.0	0.0	21.5	0.0	0.0	0.74	180.0	0.0003
3.0	0.7	180.0	0.0	21.5	0.0	0.0	0.7	180.0	0.0003
4.0	0.65	180.0	0.0	21.5	0.0	0.0	0.65	180.0	0.0003
5.0	0.61	180.0	0.0	21.5	0.0	0.0	0.61	180.0	0.0003
6.0	0.54	180.0	0.0	21.5	0.0	0.0	0.54	180.0	0.0003
7.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
8.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
9.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
10.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
11.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003
12.0	0.46	180.0	0.0	21.5	0.0	0.0	0.46	180.0	0.0003

P-dia	P-elev	V-angle	H-angle	Ports	Spacing	AcuteMZ	ChrncMZ	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(in)	(ft)	(deg)	(deg)	()	(ft)	(ft)	(ft)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
3.38	1.0	90.0	180.0	16.0	10.0	32.0	321.0	21.0	6.26	0.0	22.0	100.0

Froude number: 304.2

Step	Depth (ft)	Amb-cur (m/s)	P-dia (in)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	
0	21.0	0.508	3.38	100.0	1.0	1.0	0.0	0.0;	
100	19.52	0.543	18.47	15.4	6.494	2.358	-0.524	0.0;	
200	17.55	0.585	51.92	2.267	44.11	10.79	-8.325	0.0;	
247	15.88	0.616	80.63	0.894	111.9	27.15	-32.33	0.0;	acute zone,
290	13.85	0.641	120.7	0.381	262.2	64.07	-105.8	0.0;	merging,
300	13.25	0.648	135.2	0.313	319.6	82.42	-141.5	0.0;	
328	11.21	0.678	203.9	0.18	556.4	193.9	-321.6	0.0;	chronic zone,
340	10.24								

G-6

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/ Windows UM3. 9/4/2009 2:49:24 PM
Case 1; ambient file U:\Nick\Camas\VP plumeF6.007.db; Diffuser table record 1: ---------------------------------
      Depth    Amb-cur    Amb-dir    Amb-sal    Amb-tem    Amb-pol      Decay    Far-spd    Far-dir    Disprsn
          m        m/s        deg        psu          C      kg/kg        s-1        m/s        deg   m0.67/s2
        0.0       0.79      180.0        0.0       21.5        0.0        0.0       0.79      180.0     0.0003
        1.0       0.77      180.0        0.0       21.5        0.0        0.0       0.77      180.0     0.0003
        2.0       0.74      180.0        0.0       21.5        0.0        0.0       0.74      180.0     0.0003
        3.0        0.7      180.0        0.0       21.5        0.0        0.0        0.7      180.0     0.0003
        4.0       0.65      180.0        0.0       21.5        0.0        0.0       0.65      180.0     0.0003
        5.0       0.61      180.0        0.0       21.5        0.0        0.0       0.61      180.0     0.0003
        6.0       0.54      180.0        0.0       21.5        0.0        0.0       0.54      180.0     0.0003
        7.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
        8.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
        9.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       10.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       11.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
       12.0       0.46      180.0        0.0       21.5        0.0        0.0       0.46      180.0     0.0003
   P-dia  P-elev V-angle H-angle   Ports Spacing AcuteMZ ChrncMZ P-depth Ttl-flo Eff-sal    Temp Polutnt
    (in)    (ft)   (deg)   (deg)      ()    (ft)    (ft)    (ft)    (ft)   (MGD)   (psu)     (C) (kg/kg)
    3.57     1.0    90.0   180.0    16.0    10.0    32.0   321.0    21.0    7.96     0.0    22.0   100.0
Froude number:      337.3
       Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)    (m/s)     (in)  (kg/kg)       ()       ()     (ft)     (ft)
   0      21.0    0.508     3.57    100.0      1.0      1.0      0.0      0.0;
 100     19.24    0.549    20.51    14.94    6.691    2.525   -0.577      0.0;
 200     16.99    0.597    58.61    2.223    44.99    10.99   -8.606      0.0;
 246     15.15    0.625    90.18    0.894    111.9     27.2   -32.64      0.0; acute zone,
 277     13.52    0.644    120.6    0.484    206.7    50.38   -77.94      0.0; merging,
 300     11.89    0.668    161.3    0.307    325.9    92.59   -156.5      0.0;
 324     9.785    0.699    235.1    0.191    524.2    218.4   -319.1      0.0; surface,
Const Eddy Diffusivity.  Farfield dispersion based on wastefield width of      51.69 m
    conc  dilutn   width distnce    time
 (kg/kg)            (m)     (m)    (hrs) (kg/kg)   (s-1)   (m/s)(m0.67/s2)
 0.18983   526.7   51.71   97.84 3.41E-4     0.0     0.0    0.46 3.00E-
```

APPENDIX F

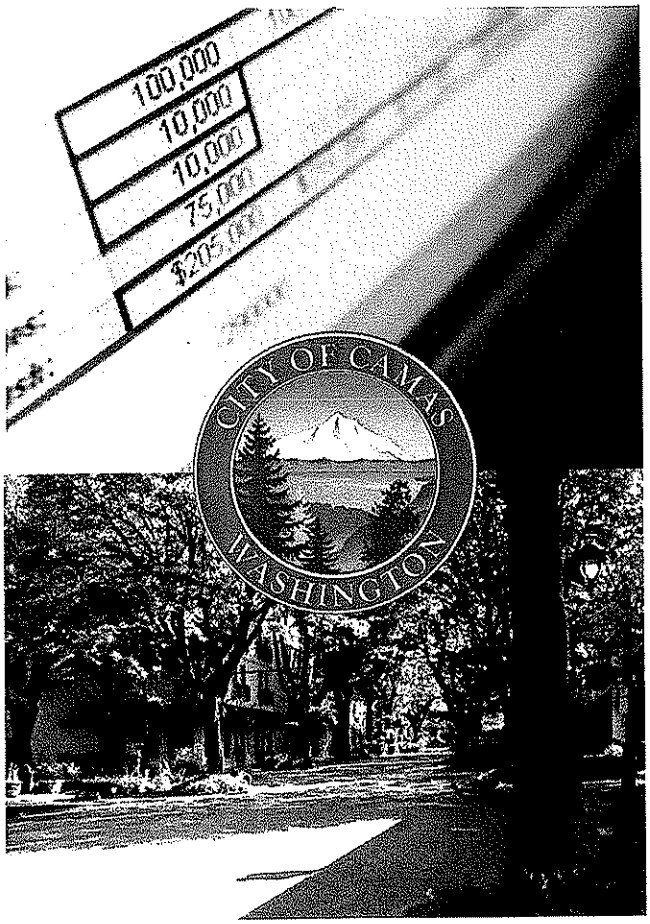
UTILITIES RATE STUDY

City of Camas, Washington

Final Report for

UTILITIES RATE STUDY

January 2010



CONSULTING SERVICES PROVIDED BY:

FCS GROUP
Solutions-Oriented Consulting

Redmond Town Center
7525 166th Avenue NE, Suite D-215
Redmond, WA 98052
T: 425.867.1802
F: 425-867-1937

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Report Contents

Section 1: Introduction 1
Introduction 1
A. North Annexation Area 1
Section 2: Rate Study Methodology 2
A. Utility Rate Setting Principles and Methodology 2
B. Revenue Requirement Analysis 2
C. Rate Design 3
Section 3: Water Utility 4
Introduction 4
A. Revenue Requirement 4
A.1 Revenue Requirements Analysis 4
A.2 Capital Funding Plan 5
A.3 Summary of Revenue Requirement 6
B. Rate Design 7
B.1 Existing Water Rates 7
B.2 Proposed Water Rates 8
C. Conservation Rate Structure 8
C.1 Introduction to Conservation 8
C.2 Conservation Rate 9
D. Fire Cost Allocation 10
E. Summary 10
Section 4: Sewer Utility 11
Introduction 11
A. Revenue Requirements 11
A.1 Operating Forecast 11
A.2 Capital Funding Plan 12
A.3 Summary of Revenue Requirement 13
B. Rate Design 14
B.1 Existing Sewer Rates 14
B.2 Proposed Sewer Rates 15
C. Summary 15
Section 5: Storm Water Utility 16
Introduction 16
A. Revenue Requirement 16
A.1 Operating Forecast 16
A.2 Capital Funding Plan 17
A.3 Summary of Revenue Requirement 17
B. Rate Design 18
B.1 Existing Stormwater Rates 18
B.2 Proposed Stormwater Rates 19
C. Summary 19
Section 6: Sanitation Utility 20
Introduction 20

A. Revenue Requirements 20
A.1 Operating Forecast 20
A.2 Summary of Revenue Requirement 20
B. Rate Design 21
B.1 Existing Sanitation Rates 21
B.2 Proposed Sanitation Rates 22
C. Summary 22
Section 7: System Development Charges 23
Introduction 23
A. Overview 23
B. Methodology 23
B.1 Existing Cost Basis 23
B.2 Future Cost Basis 24
C. Water System Development Charge 24
Determination of the Water System Development Charge 24
C.1 Existing Cost Basis 24
C.2 Future Cost Basis 25
C.3 Customer Base 25
C.4 Calculation of the General Water System Development Charge 25
D. Separate Industrial Water System Development Charge Alternatives 26
D.1 Industrial Option 1 – Current Methodology 27
D.2 Industrial Option 2 – System Unit Cost 28
E. Sewer System Development Charge 29
Determination of the Sewer System Development Charge 29
E.1 Existing Cost Basis 29
E.2 Future Cost Basis 29
E.3 Customer Base 30
E.4 Calculation of the Sewer System Development Charge 30
F. Storm System Development Charge 31
Determination of the Storm System Development Charge 31
F.1 Existing Cost Basis 31
F.2 Future Cost Basis 32
F.3 Customer Base 32
F.4 Calculation of the Storm System Development Charge 32
Technical Appendices 33
Water System
Sewer System
Storm System
Sanitation System
System Development Charges

SECTION 1: INTRODUCTION

INTRODUCTION

In 2008, the City of Camas authorized FCS GROUP to complete a utilities rate study for the water, sewer, storm and sanitation utilities. Included as part of the rate study was an update of the System Development Charges (SDC) for water and sewer and establishing a new SDC for the storm utility. The results of the study aim to establishing a blueprint for achieving strong financial performance in the future and sustaining efficient and effective services to the City's customers. The scope of the project included the following elements:

- Assess revenue needs for a multi-year period that include adequate funding for operations and maintenance, capital projects, debt service, and other program activities.
- Project long-term capital needs and incorporate these needs into a long-term funding forecast that includes rates, debt, system development charges and existing reserves.
- Develop and recommend rate structures that:
  - ✓ Generate sufficient revenue to meet each utility's financial obligations on a stand along basis;
  - ✓ Promote water conservation;
- Update system development charges imposed on new development to mitigate the impact of such development on the capital facilities of the water, sewer and storm systems.

The methodology, key factors, conclusions and recommendations for each of the key task areas of the study are summarized in this executive level report.

A. NORTH ANNEXATION AREA

In 2008, the City annexed 1,100 acres of land located in the North Urban Growth Area (NUGA) located north of Lacamas Lake. This area is mostly undeveloped with minimal utility infrastructure. The City is in discussions with major land owners on development agreements and is preparing facility plans to address future growth.

The revenue requirement portion of this study does not address the additional operating and maintenance or capital costs associated with this area since that these costs are assumed to go into effect after the study period. The system development charge section takes a look at capital expenditures for a 20-year period, and therefore, does incorporate capital costs associated to the annexed area. The proposed charges in the following sections have developed system development charges for both the existing and annexed area.

SECTION 2: RATE STUDY METHODOLOGY

A. UTILITY RATE SETTING PRINCIPLES AND METHODOLOGY

The methods used to establish utility rates are based on principles that are generally accepted and widely followed throughout the industry. These principles are designed to produce rates that equitably recover costs from each class of customer by setting the appropriate level of revenue to be collected from ratepayers, and establishing a rate structure to equitably collect those revenues.

The primary tasks of the rate study are listed below:

- Revenue Requirements Analysis. This analysis identified the total revenue requirement to fully fund each utility on a standalone basis, considering operating and maintenance expenditures, capital funding needs, debt requirements and policy objectives.
- Rate Design Analysis. This analysis includes the development of rates that generate sufficient revenue to meet each system's revenue requirement forecast and continue to address the City's pricing objectives (e.g. conservation).

B. REVENUE REQUIREMENT ANALYSIS

A revenue requirement analysis forms the basis for a long-range financial plan and multi-year rate management strategy for each utility. It also enables the City to set utility rate structures, which fully recover the total costs of operating each utility: capital improvement and replacement, operations, maintenance, general administration, fiscal policy attainment, cash reserve management, and debt repayment. Linking utility rate levels to a financial plan such as this helps to enable not only sound financial performance for the City's utility enterprise funds, but also a clear and reasonable relationship between the costs imposed on utility customers and the costs incurred to provide them the service.

When FCS GROUP conducts a revenue requirements analysis, it includes the following core elements to form a complete portrayal of the utility's financial obligations:

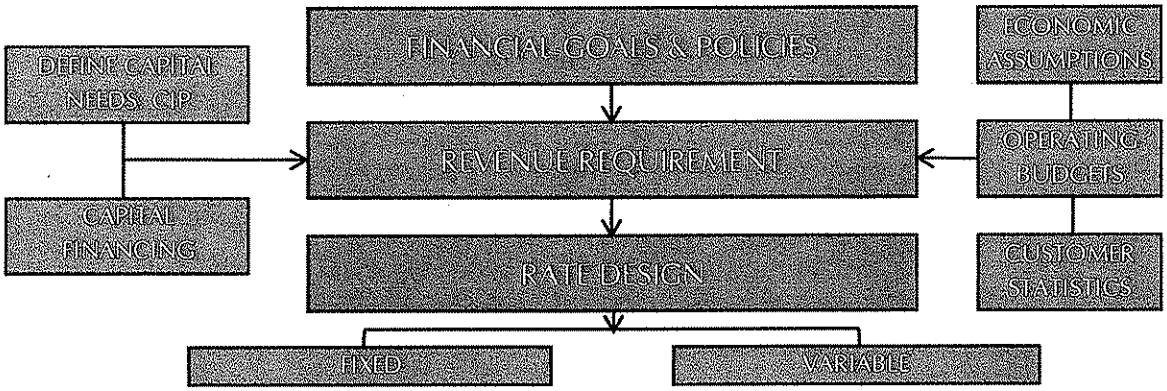
- ***Fiscal Policy Analysis*** – Identifies formal and informal fiscal policies of the City to ensure that current policies are maintained, including reserve levels, capital/system replacement funding and debt service coverage targets.
- ***Capital Funding Plan*** – Defines a strategy for funding the City's capital improvement/equipment program, including an analysis of available resources from rate revenues, system development charges, debt financing, and any special resources that may be readily available (e.g., grants, developer participation, etc.).
- ***Operating Forecast*** – Identifies future annual non-capital costs associated with the operation, maintenance, and administration of the utility systems.
- ***Reserve Analysis*** – Forecasts cash flow and fund balance activity in the City's utility reserves. Tests for satisfaction of actual or recommended minimum fund balance policies, including working capital/operating reserves and capital contingency/emergency reserves.
- ***Sufficiency Testing*** – Evaluates the sufficiency of utility revenues in meeting all obligations, including cash uses such as operating expenses, debt service, capital outlays, and reserve contributions, as well as any coverage requirements associated with long-term debt.
- ***Strategy Development*** – Designs a forward-looking strategy for adjusting utility resources to fully fund all utility obligations on a periodic or annual basis over the projection period.

From this foundation, utility rate structures can be adjusted to meet the defined annual and long-term funding targets as well the City's pricing objectives.

C. RATE DESIGN

The focus of rate design is the design of the pricing structures and is largely dictated by the objectives of the utility. The principal consideration is for the rate structure to generate sufficient revenues for the system which are reasonably commensurate with the cost of providing service. Most rate designs consist of fixed and variable charges. Fixed costs typically attempt to cover costs of the system that do not vary while variable costs vary with a change in user demand. Although majority of costs are fixed in nature, in general customers prefer more costs tied to the variable charge since changes in behavior have a direct correlation with a change in their bill. **Exhibit 2.1** provides an overview of the rate study process.

Exhibit 2.1: Overview of Rate Study Process



SECTION 3: WATER UTILITY

INTRODUCTION

The Camas Water Utility provides water to its customers for domestic, irrigation, commercial, industrial process and fire protection use. The Camas water utility has approximately 6,500 customers both within and outside the current City Limits. The system has 9,330 acre/feet of annual water rights from both surface and groundwater sources. The Jones/Boulder surface source is limited to winter time use to help protect stream flows for endangered fish. The infrastructure includes 9 wells, water filtration plant, 6 reservoir sites, 8 booster stations and over 110 miles of water main. In 2008 the average daily consumption was 3.7 million gallons per day (MGD) with a peak day of 7.8 MGD. In 2009 the Utility will complete the Water Facility Plan update that will provide guidance for system improvements needed for the next twenty years. The main capital focus of the next 6 years will be improving distribution and planning for the annexed area north of the lake.

A. REVENUE REQUIREMENT

A revenue requirement analysis forms the basis for a long-range financial plan and multi-year rate management strategy. The analysis is developed by completion of an operating forecast that identifies future annual non-operating costs and a capital funding plan that defines a strategy for funding the capital improvement needs of the City.

A.1 REVENUE REQUIREMENTS ANALYSIS

The purpose of the operating forecast is to determine whether the existing rates and charges are sufficient to recover the costs the City incurs to operate and maintain the water system. A combination of 2008 budget revenues and expenses and 2008 actual information formed the baseline for this forecast. The operating income forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the water utility revenue requirement:

Reserves

- Operating Reserves: minimum 90 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: $200 thousand (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 1.5 percent (per discussion with City staff).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- General Cost Inflation: 3.15 percent per year (based on analysis of historical Consumer Price Index data and discussion with City staff).
- Construction Cost Inflation: 6.0 percent per year (to date of anticipated construction, based on the discussion with City staff).
- Labor Cost Inflation: 5.0 percent per year (based on discussion with City staff).
- Local/State Excise Taxes: Public utility excise tax rate is 5.029 percent on all water rate revenues.
- State B&O Tax: 1.50 percent on all non-rate revenues.

Debt Service

- Three (3) existing debt obligations totaling $401 to $403 thousand: a revenue bond loan, a community economic revitalization board loan (CERB) and a public works trust fund loan (PWTF) starting in 2009.
  - ✓ The revenue bond loan is a Water and Sewer loan with 74 percent of it allocated to the water utility.
  - ✓ The CERB loan is paid off in 2016, outside the time frame covered in this study.
  - ✓ The PWTF loan is a five year loan, which starts in 2009 and is paid off in 2013.
- Two (2) new debt service obligations totaling $23 - $172 thousand per year: The first debt issue is anticipated in 2009 for an amount $240 thousand and the second in 2010 for an amount of $1.6 million. Both issues assume a 20-year term and a 5.6 percent interest rate. These debt issues will help fund numerous main installation/replacement projects.

System Reinvestment

- System reinvestment funding is to ensure system integrity through reinvestment in the system. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current water utility asset listing. The City's water utility depreciation expense is currently approximately $839 thousand (water's portion of the combined water and sewer plant).
- Historically, this rate funded component has had minimal dedicated funding; instead it depends on the availability of funds.
- This study assumes no annual funding in 2009. To avoid adding additional pressure on the rate payers, system reinvestment will not be funded through 2010 and will be incorporated at $200 thousand per year starting in 2011 through 2013.

A.2 CAPITAL FUNDING PLAN

The water utility is anticipating $7.6 million in capital costs in 2009 through 2013 (2008 dollars), $8.9 million inflated at 6 percent per year to date of construction. The annual average capital funding need is approximately $1.8 million inflated, with 2010 being the highest capital outlay year at $4.0 million inflated. **Exhibit 3.1** provides a summary of the water utility capital funding.

Exhibit 3.1: Water Utility Capital Funding Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 1,433,650	$ 3,957,881	$ 467,871	$ 28,406	$ 2,706,561	$ 8,594,369
Repairs and Replacements	55,650	58,989	62,528	66,280	70,257	313,704
TOTAL CAPITAL EXPENDITURES	$ 1,489,300	$ 4,016,870	$ 530,399	$ 94,686	$ 2,776,818	$ 8,908,073
FUNDING SOURCES						
Grants / Developer Donations	$ 1,249,300	$ 2,232,968	$ 363,657	$ -	$ 2,676,451	$ 6,522,376
System Reinvestment	-	-	166,742	94,686	100,367	361,795
System Development Charge Revenue	-	189,104				189,104
New Debt Proceeds	240,000	1,581,200	-	-	-	1,821,200
Capital Fund Balance	-	13,598	-	-	-	13,598
TOTAL CAPITAL RESOURCES	$ 1,489,300	$ 4,016,870	$ 530,399	$ 94,686	$ 2,776,818	$ 8,908,073

Notes: Does not include Capital Fund reserve funding.

Approximately 75 percent of the capital projects will be funded through grants or developer donations and the remaining 25 percent will be funded through a combination of system development charges, annual rate funded system reinvestment, existing capital fund balances and new revenue bond debt issues.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses, debt service and system reinvestment funding come together to form the multi-year revenue requirement. The revenue requirement compares the overall revenue available to the water utility to the expenses to evaluate the sufficiency of rates. **Exhibit 3.2** provides a summary of the water utility revenue requirement findings.

Exhibit 3.2: Water Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Non-Rate Revenue	222,103	238,466	254,297	264,885	280,629
Total Revenue	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**
Expenses					
Cash O&M Expenses	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	402,641	403,908	401,061	401,757	400,917
New Debt Service	22,610	171,571	171,571	171,571	171,571
Rate Funded System Reinvestment	-	-	200,000	200,000	200,000
Total Expenses	**$ 2,927,583**	**$ 3,176,346**	**$ 3,476,181**	**$ 3,583,819**	**$ 3,694,538**
Surplus (Deficiency)	$ 45,917	$ (145,211)	$ (387,326)	$ (441,858)	$ (493,676)
Additions to Meet Coverage	$ (80,813)	$ (111,885)	$ -	$ -	$ -
Total Surplus (Deficiency)	$ (34,896)	$ (257,097)	$ (387,326)	$ (441,858)	$ (493,676)
% of Rate Revenue	1.27%	9.21%	13.66%	15.36%	16.91%
Annual Rate Adjustment	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
Rate Revenues After Rate Increase	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Net Cash Flow After Rate Increase	**$ 143,906**	**$ 126,642**	**$ 14,742**	**$ 91,861**	**$ 180,652**
Coverage After Rate Increase	1.41	1.28	1.44	1.59	1.77

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirements:

- The revenue requirement analysis indicates a rate deficiency in each year of the study ranging from 1.27 percent in 2009 increasing to 16.91 percent by 2013.
- In order to fund the upcoming capital projects and to meet annual operating and maintenance requirements we recommend a 5.00 percent rate increase in 2009 and 2010 followed by a 4.25 percent increase in 2011 and 4.00 percent increases in 2012 and 2013.
- Operating fund target of 90 days is met by the end of the study period.

- Emergency construction fund of $200 thousand is met or exceeded every year of the study period.
- Debt service coverage of 1.25 minimum requirements is met after increases.
- Implementation of the new rate increases took effect March 30, 2009.

Since the City decided to adopt rates on an annual basis, we recommend that the City revisit and update economic and capital assumptions on an annual basis to make sure assumptions used have not changed significantly.

B. RATE DESIGN

The principal objective of the rate design stage of this rate study was to implement water rate structures that collect the appropriate level of revenue.

Establishing rates is a blend of "Art" and "Science" and especially so when it comes to the rate levels and structures. Several variables must be balanced to arrive at optimal rates. A cost-of-service analysis, which evaluates the rate equity by customer class, was not performed during the current study. The new rate increases were passed through to each class with a uniform across the board approach as requested by the City. In essence, each rate component (fixed and variable charge) will be increased by the same percentage. There was no greater weight put on either charge.

B.1 EXISTING WATER RATES

The existing water rates are composed of a fixed monthly charge by meter size and a variable charge per hundred cubic feet (ccf) for all water use. There are currently two separate fixed charge structures (including fire and cemetery classes) and five variable charge structures. The monthly fixed charges increase by meter size for all classes. There is a 1.5 multiplier on both the fixed and variable charges for all customers outside the City limits. **Exhibit 3.3** provides a summary of the current water utility rate structure.

Exhibit 3.3 – Current Water Rates

Existing Rates		
Meter	Monthly Fixed	Fire Line Monthly Fixed
5/8"	$ 6.43	
3/4"	6.97	
1"	8.60	
1.25"	9.68	
1.5"	10.77	
2"	16.73	
3"	60.65	
4"	76.92	$ 16.76
6"	114.88	23.53
8"		30.27
10"		44.00
Variable Charge (ccf)		
Residential	Commercial	City
$ 1.24	$ 1.50	$ 1.50
Industrial	Irrigation	Cemetery
$ 1.25	$ 1.40	$ 0.56

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

B.2 PROPOSED WATER RATES

As previously mentioned the rate increases were passed along across-the-board to each individual class. **Exhibit 3.4** provides a summary of the proposed rates for 2009.

Exhibit 3.4: 2009 Proposed Water Rates

Proposed Rates		
Meter	Monthly Fixed	Fire Line Monthly Fixed
5/8"	$ 6.75	
3/4"	7.32	
1"	9.03	
1.25"	10.16	
1.5"	11.31	
2"	17.57	
3"	63.68	
4"	80.77	$ 17.60
6"	120.62	24.71
8"		31.79
10"		46.20
Variable Charge (ccf)		
Residential	Commercial	City
$ 1.30	$ 1.58	$ 1.58
Industrial	Irrigation	Cemetery
$ 1.31	$ 1.47	$ 0.59

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

C. CONSERVATION RATE STRUCTURE

C.1 INTRODUCTION TO CONSERVATION

Part of the rate study scope of services was the development of a conservation based inverted block rate structure.

The conservation rate structure was developed in part based on the regulatory requirements of the 2003 Municipal Water Supply Efficiency Requirement Act (Municipal Water Law), which applies to municipal water suppliers to use water more efficiently in exchange for certainty and flexibility in exercising in water rights. House Bill 1338 Section 7 outlines several requirements pertaining to financials and rates. The requirements outlined are as follows:

- Ensure the efficient use of water while maintaining water system financial viability:
- Improve affordability of supplies;
- Evaluate the feasibility of adopting and implementing water delivery rate structures that encourage water conservation; and
- Identify water use patterns among utility customer classes.

An inverted block water rate structure for the residential customer class can help the City meet regulatory requirements, and achieve its conservation goals, all intended to save its precious water resources.

C.2 CONSERVATION RATE

When developing a conservation rate structure a detailed customer statistics analysis is completed separating customer usage by class and month. Understanding the class' usage profile provides useful information regarding at what level to establish usage block sizes.

The residential class was chosen for the conservation rate structure since this class is generally the largest class on the system. In addition, it tends to have the most discretionary use with the greatest peak usage during the most constrained time of the year when water supply is at the lowest.

Since the City has not had a conservation rate structure for the residential class before, a basic 3-block inverted block structure was developed. The block sizes and charges were based on residential annual, winter, summer and peak statistics. Block one was based on an expanded winter average month usage, block two was based on double the winter usage, and block three was based on any usage above block two threshold. The block two price was based on the summer to winter average month ratio and block three was based on peak to winter average month ratio; total revenue generated from the blocks had to meet the annual revenue requirement. To account for the fact that the inverted block structure would induce water conservation and to preserve revenue stability, a 5 percent consumption reduction factor was applied to the third block. **Exhibit 3.5** provides a summary of the proposed conservation rates for 2009 for the residential class.

Exhibit 3.5: 2009 Proposed Residential Conservation Water Rates

Proposed Conservation Rates	
Meter	Monthly Fixed
5/8"	$ 6.75
3/4"	7.32
1"	9.03
1.25"	10.16
1.5"	11.31
2"	17.57
Variable Charge (ccf)	
Block 1 (0-10)	$1.04
Block 2 (11-20)	$1.66
Block 3 (21+)	$2.43

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

Under the proposed block structure approximately 65 percent of customers fall into block one, 22 percent into block two and the remaining 13 percent into block three. Approximately 62 percent of the usage is in block one, 20 percent is in block two and 18 percent is in block three.

The City did not implement the proposed rate provided for the residential class.

D. FIRE COST ALLOCATION

In Lane v. Seattle, 164 Wn.2d 875 (2008), the Washington Supreme Court ruled that municipalities may not charge utility customers a monthly fire hydrant fee, and that the cost of fire hydrants must be borne by the general fund. Camas should consult with its attorney to insure that it is in compliance with Lane v. Seattle.

E. SUMMARY

The analysis described above concludes the rate study for the water utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing water system obligations. As a result a 5.0 percent increase is proposed in 2009 effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

Furthermore, we recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in utility customer class demands. A cost-of-service analysis will also identify the fire related costs and help the City comply with the requirements stemming from the Lane versus Seattle court case.

The detailed technical exhibits developed as part of the water rate study can be found at the end of this report in the Technical Appendices.

SECTION 4: SEWER UTILITY

INTRODUCTION

The Camas Sewer system provides sewer service for 6,300 residential, commercial and industrial customers in areas within the Urban Growth Boundary (UGB). The system is comprised of a main sewer treatment plant rated at 6.1 MGD average daily flow, and a collection system that includes gravity main lines, pump stations, force mains and a large number of Septic Tank Effluent Systems (STE). The utility has submitted a General Sewer Wastewater Facility Plan in 2009 to the Department of Ecology (DOE) for approval that will guide system improvements for the next twenty years. The Utility has also submitted to DOE an amendment to the above mentioned plan that will specifically address the annexation area north of the lake. The main capital focus over the next six years is a major improvement to the Waste Water Treatment Plant that will convert to anaerobic digestion and produce class A solids, and planning for the annexed area north of the lake.

A. REVENUE REQUIREMENTS

Similar to the water utility a revenue requirement was completed for the sewer utility and forms the basis for a long-range financial plan and multi-year rate management strategy.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the sewer system. A combination of 2008 budget revenues and expenses and 2008 actual figures form the baseline for this forecast. The operating income forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the sewer utility revenue requirement:

Reserves

- Operating Reserves: minimum 60 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: $200 thousand (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 1.50 percent per year (per discussion with City staff).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- General Cost Inflation: 3.15 percent per year (based on analysis of historical Consumer Price Index data and discussion with City staff).
- Construction Cost Inflation: 6.00 percent per year (to year of anticipated construction, based on the discussion with City staff).
- Labor Cost Inflation: 5.00 percent per year (based on discussion with City staff).
- Local/State Excise Taxes: Public utility excise tax rate is 3.852 percent on collection revenue and 1.50 percent on the treatment revenue. According to City's tax records, collection makes up 29 percent of rate revenue and treatment makes up 71 percent of rate revenue.
- State B&O Tax: 1.50 percent on all non-rate revenues.

Debt Service

- Seven (7) existing debt service obligations totaling approximately $1.57 million: two (2) revenue bond loans, three (3) public works trust fund loans (PWTF) and two (2) Department of Ecology loans (DOE).
  - ✓ One of the revenue bond loans is a Water and Sewer loan with 26 percent of it allocated to the sewer utility. The other revenue bond loan is a refunding of the 1998 bonds.
  - ✓ The PWTF loans consist of; a five year loan, which starts in 2009 and gets paid off in 2013, a 5-year pre construction loan for the WWF Improvements Phase II which is going to be converted into a 20-year loan starting in 2009 and a Sewer Treatment Plant Upgrade loan.
  - ✓ Two DOE loans one of which is related to the Sewer Treatment Plant (STP) Clarifier.
- Four (4) new debt service obligations totaling $10,000 to $1.7 million per year: the City has acquired $10 million in PWTF money to help pay for upcoming (STP) Upgrade related projects, which will be completed between 2009 and 2012. The PWTF money will be used for projects in 2009 and 2010. The second debt issue is anticipated in 2011 for an amount of $7.55 million, which will also be used to help pay for the STP Upgrade projects. The third debt issues is anticipated in 2012 for an amount of $4.72 million and will also be used to help finish the STP related projects and a main improvement/replacement project. The last debt issues is anticipated in 2013 for an amount of $520 thousand to help pay for pump station upgrades and STP update.

System Reinvestment

- The purpose of system reinvestment funding is to ensure system integrity through reinvestment in the system. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current sewer system asset listing. The City's sewer utility depreciation expense is currently approximately $970 thousand (sewer's portion of the combined water and sewer plant).
- Historically, this rate funded component has had minimal dedicated funding, instead funding depends on availability.
- Currently, the City is not assuming any funding for system reinvestment due to the significant level of capital which the City is undertaking during the planning period. This will avoid adding additional pressure on rate payers.

A.2 CAPITAL FUNDING PLAN

The sewer utility is anticipating $23.2 million in capital costs in 2009 through 2013 (2008 dollars) and $24.2 million inflated (6 percent per year to date of construction). The annual average capital funding need is approximately $4.84 million inflated, with 2010 being the highest capital outlay year at $8.12 million inflated. **Exhibit 4.1** below provides a summary of the sewer utility capital funding.

Exhibit 4.1: Sewer Utility Capital Fund Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 421,200	$ 4,370,790	$ 3,029,775	$ 2,464,048	$ 301,101	$ 10,586,914
Repairs and Replacements	1,790,800	3,752,810	5,054,503	2,464,048	568,746	13,630,907
TOTAL CAPITAL EXPENDITURES	$ 2,212,000	$ 8,123,600	$ 8,084,278	$ 4,928,096	$ 869,847	$ 24,217,821
FUNDING SOURCES						
Public Works Trust Fund Loans	$ 2,020,000	$ 7,980,000				$ 10,000,000
System Development Charge Revenue	186,163	143,600	186,163	186,163	186,163	888,253
New Debt Proceeds	-	-	7,550,000	4,720,000	520,000	12,790,000
Capital Fund Balance	5,837	-	348,115	21,933	163,683	539,568
TOTAL CAPITAL RESOURCES	$ 2,212,000	$ 8,123,600	$ 8,084,278	$ 4,928,096	$ 869,847	$ 24,217,821

Notes: Does not include Capital Fund reserve funding.

The projects will be funded through a combination of system development charges 4 percent, PWTF loans 41percent, revenue bond loans 53 percent and the remainder from existing fund balances 2 percent.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses, debt service and system reinvestment funding come together to form the multi-year revenue requirement. The revenue requirement compares the overall revenue available to the utility to the expenses to evaluate the sufficiency of rates. **Exhibit 4.2** below provides a summary of the sewer utility revenue requirement findings.

Exhibit 4.2: Sewer Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Non-Rate Revenue	136,992	141,419	154,924	180,689	199,286
Total Revenue	**$ 3,568,356**	**$ 3,624,253**	**$ 3,690,001**	**$ 3,768,792**	**$ 3,841,211**
Expenses					
Cash O&M Expenses	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	10,100	156,316	1,249,112	1,667,422	1,711,165
Total Expenses	**$ 4,400,561**	**$ 4,652,532**	**$ 5,853,266**	**$ 6,384,749**	**$ 6,544,840**
Surplus (Deficiency)	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	24.25%	29.52%	61.19%	72.91%	74.24%
Annual Rate Adjustment	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Net Cash Flow After Rate Increase	**$ 9,088**	**$ 585,917**	**$ 9,099**	**$ 41,379**	**$ 179,532**
Coverage After Rate Increase	2.80	4.05	2.29	1.97	2.02

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirement:

- The revenue requirement analysis indicates a rate deficiency starting in 2009 and ranging from 24.25 percent in 2009 increasing to 74.24 percent by 2013.
- In order to fund the ongoing operating needs we recommend a 34 percent rate increases in 2009 followed by two 10.60 percent increases in 2010 and 2011, an 8.00 percent increase in 2012 and a 3.00 percent in 2013.
- Operating fund target of 60 days is met every year except 2009 and 2011 with 2011 being off only by 1 day. In order to meet operating targets of 60 days in 2009 a higher increase would be required.
- Emergency construction fund of $200 thousand is met every year.
- Implementation of the new rate increases took effect March 30th, 2009.
- Debt service coverage is above the 1.25 minimum requirement after rate increases.
- No system reinvestment funding due to debt burden.

Similar to the water utility, the City Council decided to adopt rate increases on an annual basis. The City should revisit economic and capital assumptions used in the study and make sure these assumptions have not changed significantly to ensure rates remain sufficient and the fund level is adequate to meet cash flow needs and target fund balances.

B. RATE DESIGN

As discussed in the water utility section, the principal objective of the rate design stage is to implement sewer rate structures that collect the appropriate level of revenue as outlined by the revenue requirement. Since a cost-of-service analysis was not performed, the increase is passed through to each class with an across the board approach as requested by the City.

B.1 EXISTING SEWER RATES

The existing sewer rates are composed of two separate structures. The residential structure consists of a fixed monthly charge, while the commercial/industrial structure consists of a fixed monthly charge and an additional volume charge per 100 cubic feet of use. There is a 1.5 multiplier on both the fixed and variable charges for all customers outside the City limits.

Exhibit 4.3 below provides a summary of the current sewer rate structure.

Exhibit 4.3: Existing Sewer Rates

Existing Rates		
Class	Monthly Fixed	Variable Charge (ccf)
Residential	$ 24.05	
Commercial / Industrial	5.75	$ 2.45

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

B.2 PROPOSED SEWER RATES

The proposed Sewer rate schedule contains no structural changes and applies the rate increase across the board (or equally to each rate component). **Exhibit 4.4** on the following page provides a summary of the proposed 2009 sewer rate schedule.

Exhibit 4.4: Proposed Sewer

Proposed Rates		
Class	Monthly Fixed	Variable Charge (ccf)
Residential	$ 32.23	
Commercial / Industrial	7.71	$ 3.28

Notes: Outside City customers have a 1.5 multiplier on the fixed and variable charges.

C. SUMMARY

The analysis described above concludes the rate study for the sewer utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing sewer system obligations. As a result a 34.00 percent increase is proposed in 2009 for sewer rates effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

Similar with the water analysis, we recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in customer class demands.

The detailed technical exhibits developed as part of the sewer rate study can be found at the end of this report in the Technical Appendices.

SECTION 5: STORM WATER UTILITY

INTRODUCTION

The Camas Storm utility was formed to provide a funding source to comply with the National Pollution Discharge Elimination System (NPDES) Phase 2 permit issued by the Department of Ecology on January 17th, 2007. The utility maintains the public storm system that includes gravity main lines, manholes, catch basins and storm treatment/detention ponds. The utility is also responsible for street sweeping to reduce sediment entering streams. Some treatment facilities and private storm collection systems are the responsibility of private business and homeowner associations (HOAs).

A. REVENUE REQUIREMENT

The stormwater utility revenue requirement was established similar to the other utilities; it is developed by completion of an operating forecast that identifies future annual operating costs and a capital funding plan that defines a strategy for funding capital improvement needs of the stormwater system on a standalone basis.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the stormwater utility. The City provided a 6-year stormwater plan that was used as the basis for this forecast. The forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the stormwater utility revenue requirement:

Key Assumptions

- Operating Reserves: minimum 30 days of O&M expenses (per discussion with City staff).
- Capital Contingency Reserves: currently not funded.
- Fisher Basin Reserve/Cash Balance: Used for Fisher Basin capital projects only until it is depleted.

Operating Revenue

- Customer Growth Rate Revenue: 2.00 percent per year (per discussion with City staff and stormwater 6-year plan).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- All expenses were provided by the City from the stormwater 6-year plan.
- State B&O Tax: 1.50 percent.

Debt Service

- The stormwater utility currently does not hold any debt.
- New Debt Service: There are no new debt issues assumed for the study period.

System Reinvestment

- As with the water and sewer utilities it is important to fund annual system reinvestment to ensure system integrity. Ideally, the minimum funding would be an amount equal to or greater than depreciation expense. If the annual depreciation expense is not available, it can be estimated based on the current

stormwater system asset listing. The City's stormwater utility depreciation expense is currently approximately $397 thousand.

- Historically, the City has been funding all of its capital expenses through reserves and direct rate funding, thereby capturing depreciation funding through rates. The City's current annual average CIP for the storm utility is $327,000 inflated.

A.2 CAPITAL FUNDING PLAN

The stormwater utility is anticipating $1.32 million (2008 dollars) in total capital costs in 2009 through 2013, $1.64 million inflated (6 percent per year to year of construction). Approximately $996 thousand inflated of the total costs are related to Fisher Basin projects and the remaining $640 thousand inflated are for the Non Fisher Basin projects. The annual average total capital funding need is approximately $327 thousand inflated, with 2013 being the highest capital outlay year at $596 thousand inflated. **Exhibit 5.1** below provides a summary of the stormwater utility capital funding.

Exhibit 5.1: Stormwater Utility Capital Funding Summary

Summary of Expenditures	2009	2010	2011	2012	2013	Total
CAPITAL PROJECTS						
Improvement Upgrade & Expansions	$ 37,100	$ 103,933	$ 199,495	$ 211,465	$ 297,755	$ 849,748
Repairs and Replacements	37,100	103,933	199,495	148,341	297,755	786,624
TOTAL CAPITAL EXPENDITURES	$ 74,200	$ 207,866	$ 398,990	$ 359,806	$ 595,510	$ 1,636,373
FUNDING SOURCES						
Fisher Basin Capital Fund Transfers	$ 68,900	$ 95,506	$ 279,889	$ 170,434	$ 247,961	$ 862,690
Non Fisher Basin Capital Fund Balance	5,300	112,360	119,102	189,372	347,550	773,683
TOTAL CAPITAL RESOURCES	$ 74,200	$ 207,866	$ 398,990	$ 359,806	$ 595,510	$ 1,636,373

Notes: Does not include Capital Fund reserve funding.

The projects related to Fisher Basin will be funded through Fisher Basin funds only until the fund is depleted; once the fund is depleted (in 2013) the projects will be funded through rate revenue. The Non Fisher Basin projects are currently funded through rates.

A.3 SUMMARY OF REVENUE REQUIREMENT

The operating forecast components of O&M expenses and capital funded through rates join together to form the multi-year revenue requirement. The revenue requirement compares the overall available utility revenue to the expenses to evaluate the sufficiency of rates. **Exhibit 5.2** below provides a summary of the stormwater utility revenue requirement findings.

Exhibit 5.2: Stormwater Utility Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966
Non-Rate Revenue	-	-	-	1,057	2,237
Total Revenue	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 573,203
Expenses					
Cash Operating Expenses	$ 473,761	$ 571,805	$ 586,028	$ 600,678	$ 615,767
Street Cleaning	138,831	138,391	142,338	146,405	150,593
Administration / Taxes	97,754	136,407	119,519	122,583	125,739
Rate Funded System Reinvestment	30,300	112,360	119,102	189,372	347,550
Total Expenses	$ 740,646	$ 958,963	$ 966,987	$ 1,059,038	$ 1,239,649
Surplus (Deficiency)	$ (213,161)	$ (420,928)	$ (418,192)	$ (498,209)	$ (666,446)
% of Rate Revenue	40.41%	78.23%	76.20%	89.00%	116.72%
Annual Rate Adjustment	55.00%	20.00%	20.00%	3.00%	3.00%
Rate Revenues After Rate Increase	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008
Net Cash Flow After Rate Increase	$ 1,162	$ 34,841	$ 247,782	$ 218,004	$ 102,880

Notes: 2009 Rate increase assumes partial year implementation.

Summary of Revenue Requirement:

- The revenue requirement analysis indicates a rate deficiency starting in 2009 and ranging from 40.41 percent in 2009 increasing to 116.72 percent by 2013.
- In order to fund the ongoing operating needs and upcoming capital projects we recommend a 55.00 percent increase in 2009 followed by two 20.00 percent increases in 2010 and 2011 and 3.00 percent increases in 2012 and 2013.
- Operating fund target of 30 days is not met until 2012 with the current rate increases. In order to reach the 30 day reserve target larger rate increases are required.
- From an independent utility stand point, the stormwater utility had negative fund balances in the beginning of the study (not taking into account Fisher Basin funds). With the proposed increase the stormwater utility starts to carry positive balances in 2011.
- Implementation of the new rate increases took effect March 30, 2009.

Similar to the recommended approach for the water and sewer utilities, the City should revisit economic and capital assumptions on an annual basis to make sure significant changes have not occurred and that rates remain sufficient to meet cash flow needs and target fund balances.

B. RATE DESIGN

As discussed in the previous sections, the principal objective of the rate design stage is to implement stormwater rate structures that collect the appropriate level of revenue as outlined by the revenue requirement.

B.1 EXISTING STORMWATER RATES

The existing stormwater rate is made up of two components an O&M component and a capital component. The current residential O&M component is $3.76 per month and the capital component is $0.95 per month.

Existing Fisher Basin customers are paying for the O&M component only since Fisher Basin related capital is being paid for from the Fisher Basin fund, while the Non Fisher Basin customers are paying both the O&M and Capital components of the charge for a total of $4.71 per month. The charges are based on equivalent dwelling unit (EDU) which is defined as 3,218 square feet per dwelling unit. Each residential customer is considered to have one EDU, while all other classes are calculated based on their impervious surface area and are charged for each EDU. **Exhibit 5.3** below provides a summary of the current stormwater rate structure.

Exhibit 5.3: Existing Stormwater Rates

Existing Rates		
Monthly Charge per EDU		
O&M	Capital	Total
$3.76	$0.95	$4.71

Notes: Fisher Basin pays the O&M fee only

B.2 PROPOSED STORMWATER RATES

Under the existing rate structure Fisher Basin customers only pay the O&M component of the total charge due to the fact that Fisher Basin capital gets paid out of the Fisher Basin fund balance. Once the fund balance is depleted, Fisher Basin customers will have to pay for capital out of rates. Since there are significantly less Fisher Basin customers than Non Fisher Basin customers the Fisher Basin capital portion of the charge could be substantial. We propose changing the existing charge into a uniform charge, which covers the entire rate revenue requirement for Fisher Basin and Non Fisher Basin customers. The proposed charge contains no other structural changes and applies the rate increases across the board. **Exhibit 5.4** provides a summary of the proposed 2009 stormwater rate schedule.

Exhibit 5.4: Proposed Stormwater Rates

Proposed Rates
Total Monthly Charge per EDU
$6.89

Notes: Includes both O&M and Capital

C. SUMMARY

The analysis described above concludes the rate study for the stormwater utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing stormwater obligation. As a result a 55.00 percent increase is proposed in 2009 for stormwater rates effective March 30th, 2009. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

The detailed technical exhibits developed as part of the stormwater rate study can be found at the end of this report in the Technical Appendices.

SECTION 6: SANITATION UTILITY

INTRODUCTION

The Sanitation Utility collects solid waste from all residential, commercial, and industrial accounts using containers 2 yards and smaller. The City has entered into a non-exclusive franchise agreement with Waste Connects Inc. for solid waste collection for containers larger than 2 yards. Solid waste collection is mandatory in Camas. The utility owns four refuse trucks and has four FTE. The utility also collects mandatory recycle fees from the residential customers and has entered into a contract with Waste Connections Inc. to collect and dispose of residential recycle material. Commercial recycling is provided by a variety of purveyors. The City begins servicing newly annexed areas seven years after the annexation occurs in accordance with State law.

A. REVENUE REQUIREMENTS

The sanitation utility revenue requirement was established similar to the other utilities; it is developed by completion of an operating forecast that identifies future annual operating costs and a capital funding plan that defines a strategy for funding capital improvement needs of the sanitation system on a standalone basis.

A.1 OPERATING FORECAST

The purpose of the operating forecast is to determine whether the currently adopted rates and charges are sufficient to recover the costs the City incurs to operate and maintain the sanitation utility. The City provided a 6-year sanitation plan that was used as the basis for this forecast. The forecast was developed for the 2009 through 2013 time period. The following list highlights some of the key assumptions used in the development of the sanitation utility revenue requirement:

Key Assumptions

- Operating Reserve: minimum 30 days of O&M expenses (per discussion with City staff).

Operating Revenue

- Customer Growth Rate Revenue: 2.00 percent per year (per discussion with City staff and sanitation 6-year plan).
- Interest Earnings Rate: 3.13 percent per year (per discussion with City staff using the five-year average for the Washington State Local Government Investment Pool).

Operating & Maintenance (O&M) Expenses

- All expenses were provided by the City from the sanitation 6-year plan,

Equipment Reinvestment

- The City currently funds equipment replacement (consisting of truck rental and operations center lease) in the amount of approximately $320-$380 thousand annually.

A.2 SUMMARY OF REVENUE REQUIREMENT

The detailed operating forecast joins the anticipated O&M expenses with any equipment replacement costs to form the multi-year revenue requirement. The revenue requirement compares the overall available utility revenue to the expenses to evaluate the sufficiency of rates. **Exhibit 6.1** below provides a summary of the sanitation utility revenue requirement findings.

Exhibit 6.1: Sanitation Revenue Requirement Summary

Revenue Requirement	2009	2010	2011	2012	2013
Revenues					
Rate Revenues Under Existing Rates	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457
Non-Rate Revenue	35,401	26,492	27,390	28,402	29,301
Total Revenue	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**
Expenses					
Disposal	$ 565,020	$ 595,219	$ 643,205	$ 677,621	$ 713,836
Recycling	314,647	345,329	372,799	389,727	407,583
Collection	701,461	721,536	757,213	763,510	785,447
Customer Accounts / A&G / Taxes	238,217	239,574	246,268	253,902	261,006
Total Expenses	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**
Surplus (Deficiency)	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114)**
% of Rate Revenue	0.00%	0.00%	3.43%	2.09%	4.09%
Annual Rate Adjustment	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Rate Revenues After Rate Increase	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686
Net Cash Flow After Rate Increase	**$ 67,356**	**$ 50,360**	**$ 10,644**	**$ 77,238**	**$ 80,606**

Notes: Includes revenue assumptions for additional connections at Lacamas Heights in 2012.

Summary of Revenue Requirement:

- The analysis assumes that there will be new connections coming online at Lacamas Heights starting in 2011/2012 generating additional rate revenue starting in 2012 (approximately $50 thousand). New connections are made up of 268 residential customers, ranging in sizes of can pickup, and 6 commercial customers.
- The revenue requirement analysis indicates a rate deficiency of 3.43 percent beginning in 2011 increasing to 4.09 percent by 2013.
- In order to fund the ongoing operating needs we recommend a 2.00 percent rate increase beginning in 2010 through 2013. The increases begin in 2010 instead of 2011 in order to minimize customer impacts by phasing in the adjustments over time.
- Operating fund target of 30 days of working capital met throughout the 2009 – 2013 time period. Revenue in excess of 30 days of working capital is assumed to be transferred to the equipment fund.

B. RATE DESIGN

The sanitation rate design is fairly straightforward. Unlike other operations that charge a combination of fixed and variable charges, all charges are recovered by container size and frequency of pickup.

B.1 EXISTING SANITATION RATES

As previously mentioned the existing sanitation rate structure is composed of a charge by container size and frequency of pickup. **Exhibit 6.2** provides a summary of the existing sanitation rates.

Exhibit 6.2: Existing Sanitation Rates

Existing Rates	
Regular Monthly Service	
Service	Monthly Charge
35 gallon (EOW)	$ 9.25
35 gallon weekly	14.12
65 gallon weekly	18.95
95 gallon weekly	25.70

Existing Rates				
# of Empties	Regular Dumpster		Compacted	
	1.5 Yards	2 Yards	1.5 Yards	2 Yards
1	$ 64.35	$ 89.27	$ 135.31	$ 178.54
2	135.31	178.54	282.89	357.08
3	209.10	267.81	430.46	535.62
4	282.89	357.08	578.04	714.16
5	356.67	446.35	725.62	892.70

B.2 PROPOSED SANITATION RATES

The proposed sanitation rate schedule contains no structural changes and applies the rate increase across the board (or equal to each rate component). Since the first rate increase is proposed for 2010 for the sanitation utility, **Exhibit 6.3** below provides a summary of the proposed 2010 sanitation rate schedule.

Exhibit 6.3: Proposed 2010 Sanitation Rates

Proposed Rates 2010	
Regular Monthly Service	
Service	Monthly Charge
35 gallon (EOW)	$ 9.44
35 gallon weekly	14.40
65 gallon weekly	19.33
95 gallon weekly	26.21

Proposed Rates 2010				
# of Empties	Regular Dumpster		Compacted	
	1.5 Yards	2 Yards	1.5 Yards	2 Yards
1	$ 65.64	$ 91.06	$ 138.02	$ 182.11
2	138.02	182.11	288.55	364.22
3	213.28	273.17	439.07	546.33
4	288.55	364.22	589.60	728.44
5	363.80	455.28	740.13	910.55

C. SUMMARY

The analysis described above concludes the rate study for the sanitation utility. After performing a rate revenue analysis, it was shown that the revenues at current level are not sufficient to fund ongoing sanitation system obligations starting in 2011. As a result a 2.00 percent increase is proposed in 2010 for sanitation rates effective January 1st, 2010. Although the rate study has provided a financial forecast and rate transition plan through 2013, the City is not proposing a multi-year rate increase at this time. Staff will review rates annually and bring recommendations back for council consideration.

We recommend that the City update the cost-of-service rate study (last performed in 2003) to update the rate structure for changes in utility costs and customer class demands.

The detailed technical exhibits developed as part of the sanitation rate study can be found at the end of this report in the Technical Appendix.

SECTION 7: SYSTEM DEVELOPMENT CHARGES

INTRODUCTION

As part of the utility rate study the City of Camas requested the study include an update to the water and sewer system development charges (SDCs) and to create a new SDC for the storm drainage utility. This section will provide a general overview of SDCs, summarize the methodology used, outline key factors and present the recommended charges.

A. OVERVIEW

"System Development Charge (or connection) charge" is a generic term referring to charges imposed as a condition of connecting to the utility system. SDCs differ from installation fees in that they are intended as a means of ensuring that new customers bear their equitable share of the cost of the system assets that serve all customers, and are not direct reimbursement for out-of-pocket costs to physically connect the new customer to the system. It is assumed that SDCs are imposed in addition to meter charges, labor and material charges, tap fees, inspection fees, or other non-capital charges related to the immediate expense of connecting a new service.

B. METHODOLOGY

The purpose of the SDC is two-fold: 1) to provide a source for capital financing and 2) to equitably recover the proportionate share of utility plant-in-service from new customers. In the absence of SDCs, growth-related costs would be borne in large part by existing customers. The cost of the system to be recovered by SDCs can be defined in two parts: an existing cost basis portion, which recover existing costs, and a future cost basis portion, which recover future costs.

Revenues generated from the SDCs can be used to fund capital projects or to pay debt service incurred to finance capital projects, but cannot be used to pay operating and maintenance costs.

There are several documented approaches used in the industry to establish a SDC that is legally defensible if designed properly. Within the range of legally defensible approaches, the choice of the costs the City targets is a matter of policy. It is important that the City follow a methodical and rational approach to consistently determine and implement cost-based SDCs.

Since the calculated charges represent the maximum allowable charge, the City may choose to implement a charge at any level up to the calculated charge. Revenues generated from the charge will vary depending upon whether or not the full charge is implemented (e.g., phase-in strategies). The lower the charge and longer the phase-in period, the less revenue will be collected and available to help pay the cost of these facilities. This loss in revenue could result in delays in completing the capital improvement program and/or result in increased costs to the City's existing ratepayers through rates for service.

B.1 EXISTING COST BASIS

The existing cost basis portion of the charge developed in this study is based on facilities of general benefit, such as storage reservoirs, transmission mains, interceptor trunk lines, etc. It is intended to recognize the current ratepayers' net investment in estimated original cost of the non-donated system assets and the accumulated interest on that investment. For Washington cities and towns, State statute (RCW 35.92.025) and subsequent legal interpretations provide a guideline for connection charges which suggest that such charges should reflect the actual original cost of the utility system, and can include interest on that cost at the rate applicable at the time of construction. Interest can be accumulate for a maximum of ten years from the

date of construction, and cannot exceed the original cost of the asset. In addition, outstanding debt principal (less any cash available to buy down debt) is deducted from plant-in-service because new customers will pay their share of debt service through user rates. For this study, the existing cost basis for each utility is based on the City's record of system assets as of December 31, 2007, incorporating the adjustments noted above.

B.2 FUTURE COST BASIS

The statue enabling connection charges for cities and towns does not specifically address a charge based on planned future improvements. Common practice and legal opinion suggest that future facilities needed to serve growth, as well as to provide for regulatory system improvement, can be included in the connection charge. It is common practice for Cities and Towns to include up to twenty (20) years of future costs consistent with the planning period used in the City's comprehensive planning process. The future cost basis can include utility capital projects planned for construction and identified in comprehensive system planning documents.

It is important to note that current-year dollars are used when calculating the SDC and not inflated dollars. This approach assumes that the SDC will be updated annually to track construction cost inflation. Projects directly funded by developers, grants, or special property assessments are not included in the calculation. Replacement projects are most often excluded from the calculation unless they are needed to increase the size of the system. The capital improvement program has been allocated between existing and future customers based on engineering and planning criteria.

A separate future cost basis charge is calculated for the non-NUGAE customers and NUGAE customers. The NUGAE customers require an extensive amount of capital to allow the City to incorporate them into the water, sewer and stormwater utilities. The analysis has developed separate SDC rates for both NUGAE and non-NUGAE areas. The resulting rate differential of the NUGAE only costs being spread over a much smaller customer base.

C. WATER SYSTEM DEVELOPMENT CHARGE

The City currently uses a cost of service allocation basis approach when calculating the SDC and establishes an individual charge for each customer class based on the results of the cost-of-service functional allocation which includes assignment of costs based on individual customer flow statistics, meter equivalents and number of accounts.

After assessing the current structure and individual class charges it seemed that most class specific SDCs resulted in similar charges with the exception of the industrial class, which demonstrated a significantly higher disproportionate demand on the system based on its size and usage.

From these observations a "general" approach is proposed, which changes the class specific SDC and instead calculates the value of one meter customer equivalent (MCE) and assesses all new system connections based on this equivalent unit buy-in value. This recommended approach is applicable to all customer classes with the exception of the industrial class due to the disproportionate demand placed on the system by these customers. A separate charge is recommended specifically for the industrial class.

DETERMINATION OF THE WATER SYSTEM DEVELOPMENT CHARGE

C.1 EXISTING COST BASIS

As of 2007, water utility total fixed assets equal $37.75 million. Of this amount, approximately $4.83 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million to the total asset value. The water utility's existing cash reserves were less than outstanding debt, and thus a reduction of $5.72 million was made to account for principal outstanding. After

adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $42.82 million.

C.2 FUTURE COST BASIS

According to the 2008 Draft Water System Plan the City has planned for approximately $69.80 million of capital projects in the water utility between 2008 and 2027. Recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting engineer working on the Water System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $66.12 million.

From the $66.12 million, $34.12 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement (R&R) ($1.10 million) was also deducted. The resulting allocable future cost basis was $30.90 million, which was made up of $20.72 million project costs related to NUGAE, $6.10 million of project costs related to non-NUGAE and $4.08 million of project costs related to both customer bases.

C.3 CUSTOMER BASE

Using the detailed customer statistics provided by the City, the water utility had approximately 9,446 Non NUGAE meter customer equivalents (MCEs) in 2008 – MCEs relate to flow factor assumptions that vary by meter size and are established by the American Water Works Association. The consulting engineer working on the Water System Plan provided a growth forecast, by class, for the 20-year study period using flow based equivalent residential units (ERUs). Since a different unit of measure was used in estimating the future demand ERUs than in the calculation of the charge (MCEs), a growth rate was calculated from the demand projection ERUs (percentage growth from current ERUs to 20-year future ERUs) and applied to the MCEs to calculate the 20-year MCEs. Using this approach the City will add 6,780 non-NUGAE MCEs over the next twenty-year period – reaching a total non-NUGAE customer base of 16,226 MCEs.

NUGAE customers are new and in addition to the current customer base. The method used to estimate the 20-year NUGAE customer base in MCEs consisted of using the flow based demand ERUs provided by class and developing a ratio between the 20-year non-NUGAE ERUs and MCEs. These ratios were then applied to the NUGAE flow based demand ERUs and converted to MCEs for the 20-year period; 5,581 MCEs. The total customer base, NUGAE and non-NUGAE, for the 20-year period is calculated to be 21,807 MCEs.

C.4 CALCULATION OF THE GENERAL WATER SYSTEM DEVELOPMENT CHARGE

Exhibit 6.1 shows the calculation of the water system development charge by calculating the existing and the future cost bases.

Exhibit 6.1: Calculation of Water System Development Charge

Water System Development Charge Calculation			
	Non-NUGAE	NUGAE	Notes
Existing Allocable Cost	$ 42,818,181	$ 42,818,181	
Allocable Customer Base	21,807	21,807	Total customer base (existing & future)
Existing Portion	**$ 1,964**	**$ 1,964**	
Future Cumulative Cost*	$ 4,082,100	$ 4,082,100	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	12,361	12,361	Total future customers
Future Cumulative Portion	**$ 330**	**$ 330**	
Future Cost	$ 6,095,575	$ 20,720,667	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	6,780	5,581	Total future customers
Future Portion	**$ 899**	**$ 3,713**	
TOTAL SDC	$ 3,193	$ 6,007	per MCE

*Notes: Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis.

Exhibit 6.2 shows the proposed non-NUGAE and the NUGAE system development charges by meter size using the MCEs to differentiate the demands each meter size place on the system.

Exhibit 6.2: Proposed Non-NUGAE and NUGAE System Development Charges

Meter	MCEs	Proposed	
		Non-NUGAE	NUGAE
5/8"	1	$ 3,193	$ 6,007
3/4"	1.5	4,790	9,011
1"	2.5	7,983	15,018
1.5"	5	15,965	30,035
2"	8	25,544	48,056
3"	16	51,088	96,112
4"	25	79,825	150,175
6"	50	159,650	300,350
8"	80	255,440	480,560

As previously mentioned the proposed charges are a calculated ceiling, the City can implement a charge of any level up to the indicated amount.

D. SEPARATE INDUSTRIAL WATER SYSTEM DEVELOPMENT CHARGE ALTERNATIVES

As previously mentioned the industrial class exhibited high disproportionate demands on the system based on its size and usage compared to other classes. To avoid the remaining classes subsidizing the industrial class a separate industrial system development charge is proposed.

A charge based on MCEs represents the peaking (maximum instantaneous) requirements placed on the system by a customer. The increase in the charge from one meter to the next represents the maximum peaking requirement for that meter size and the relationship between each different size meter to the base 5/8" meter. If every customer class uses water on an equitable basis (usage per MCE) the peaking approach is appropriate.

If there are customers who use disproportionate amounts of water on an average daily basis whereby the average usage exceeds the standard MCE factor, the peaking methodology alone may not be appropriate. This is because the system is sized not only based on peak demand of the individual customer, but is sized based on the total system requirements of "all" individual customer demands. A large user places a disproportionate demand on other parts of the system such as storage requirements and source of supply and should be charged commensurate with these increased demands. The SDC options proposed address this issue.

Two options are proposed to the City for the Industrial SDC. The first option keeps the City's current methodology and simply updates the industrial charge based on the functional allocation of updated costs. The second approach uses a similar functional allocation approach as the existing methodology, but spreads the "base" costs by ERUs instead of MCEs.

D.1 INDUSTRIAL OPTION 1 – CURRENT METHODOLOGY

The water system costs were spread based on a functional allocation (base, peak, fire, etc.). The previous study was used since a cost-of-service analysis was not performed during the 2008 update. Similar to the general approach existing and future infrastructure costs were calculated, however instead of dividing through by the applicable total customer base, the costs were spread through by the industrial customer class statistics representing accounts, meter customer equivalents (MCEs) and meter service equivalents (MSEs – related to actual cost of the meter/hardware) depending on the function.

Exhibit 6.3 summarizes the Industrial charge for the base 5/8" meter.

Exhibit 6.3: Industrial Charge for 5/8" Base Meter

Industrial Option 1						
Industrial	Customer / Account	Meters & Services/MSE	Base/MCE	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 14,725	$ 2,134	$ 2,567	**$ 19,819**
NUGAE	$ -	$ 393	$ 29,551	$ 4,326	$ 4,206	**$ 38,476**

Exhibit 6.4 escalates the SDC based on each function and an appropriate factor by meter size.

Exhibit 6.4: SDC Escalation Based on Function and Meter Size

Meter	MCEs	MSEs	Proposed	
			Non NUGAE	NUGAE
5/8"	1	1	$ 19,819	$ 38,476
3/4"	1.5	1.1	28,288	55,454
1"	2.5	1.4	45,265	89,449
1.5"	5	1.8	87,569	174,298
2"	8	2.9	138,579	276,362
3"	16	11	276,634	550,561
4"	25	14	429,544	856,633
6"	50	21	853,770	1,706,309
8"	80	29	1,362,684	2,725,763

D.2 INDUSTRIAL OPTION 2 – SYSTEM UNIT COST

Similar to the first option the costs were spread based on a functional allocation. In this scenario the costs were based on the customer statistics for the system as a whole to determine unit costs instead of allocating costs based on individual customer statistics first. This approach also spreads "base" costs or total average water flow based on the ERU for the system (283.6 gpd/ERU) instead of MCEs.

Exhibit 6.5 summarizes the Industrial charge for the base 5/8" meter and one (1) ERU. When comparing the two options it is important to remember that each industrial class will be multiple ERUs.

Exhibit 6.5: Industrial Charge for 5/8" Base Meter

Industrial Option 2						
Industrial	Customer / Account	Meters & Services/MSE	Base/ERU	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 988	$ 1,147	$ 518	$ 3,046
NUGAE	$ -	$ 393	$ 2,704	$ 2,324	$ 845	$ 6,266

The calculation of system development charges by meter size will depend on the size of meter factors associated with that meters size (as with option 1). In addition, the projected demand will be needed to estimate the number of ERUs.

As an example, two existing accounts are used to calculate an SDC using both options and compare the outcomes:

- The first account (6346) is on a two inch meter and its usage for 2008 was 2,076 ccf.
- The second account (6344) is on a six inch meter and its usage for 2008 was 296,967 ccf

OPTION 1 CALCULATION: 2" METER, NON-NUGAE CUSTOMER

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $14,725/MCE representing the "Base" portion is escalated by 8 to represent the meter size = [8 * $14,752 = $117,800]

Step 4: $2,134/MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $2,134 = $17,072]

Step 5: $2,567/account is added representing the Fire portion

Total charge = $138,579 [$0 + $1,139.70 + $117,800 + $17,072 + 2,567]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base ($14,725*50 = $736,250) + Peak ($2,134*50 = $106,700) + Fire ($2,567) for a combined charge of $853,770.

OPTION 2 CALCULATION: 2" METER, NON-NUGAE CUSTOMER

Step 1: $0 is added for the customer/account portion of the charge.

Step 2: $393 per MSE representing the Meters & Services portion is multiplied by 2.9 to represent the fact that the meter size is two inches = [$393*2.9 = $1,139.70].

Step 3: $988/ERU (this is the change between the options). Determine the number of ERUs for the customer by dividing the projected annual use of 2,076 ccf by 283.6 gpd (represents 1 ERU). First you must convert ccf to gallons per day (2,076 ccf *748(g/ccf)/365(days/year) = 4,254 gpd. Calculate ERUs = 4,254 gpd/283.6(gpd/ERU) = 15. Calculate base allocation $988 * 15 = $14,821

Step 4: $1,147/MCE representing the "Peak" portion is escalated by 8 to represent the meter size = [8 * $1,147 = $9,176]

Step 5: $518/account is added representing the Fire portion

Total charge = $25,655 [$0 + $1,139.70 + $14,821 + $9,176 + 518]

Similarly, the calculation for the six inch meter would be as follows: Customer ($0) + Meters & Services ($393*21= $8,253) + Base (296,967ccf*748(g/ccf)/365(days/year) = 608,579 gpd, 608,579 gpd/283.6(gpd/ERU) = 2,146 ERUs), 2,146 ERUs * $988 = $2,120,248) + Peak ($1,147*50 = $57,350) + Fire ($518), results in a charge of $2,186,369.

Comparing the resulting charges for the two and six inch meters side by side shows that option two results in lower charges if consumption is lower (two inch meter option one: $138,579; two inch meter option two: $25,655), while the opposite is true if the customers consumption is on the higher side (six inch meter option one: $853,770; six inch meter option two: $2,186,369).

E. SEWER SYSTEM DEVELOPMENT CHARGE

The sewer utility follows the same methodology currently in place where Residential and Commercial I customers are charged a fixed system development charge for the base meter size of 5/8" (Commercial I customers charge increases based on meter size by AWWA flow factors). Commercial II charge is calculated based on functionally allocated costs and established unit costs for flow and strength (Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS).

DETERMINATION OF THE SEWER SYSTEM DEVELOPMENT CHARGE

E.1 EXISTING COST BASIS

As of 2007, sewer utility total fixed assets equal $43.60 million. Of this amount approximately $6.24 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $15.62 million. The sewer utility's existing cash reserves were less than outstanding debt, and thus a reduction of $16.48 million was made to account for principal outstanding. After adjusting the utility's total assets for capital contributions and principal outstanding, the total existing cost basis is approximately $39.77 million.

E.2 FUTURE COST BASIS

According to the 2008 Draft Sewer System Plan the City has planned for approximately $102.62 million of capital projects in the sewer utility between 2008 and 2027. Similar to the water utility, recognizing the fact that some of the projects will provide capacity beyond the 20-year period, with the help of the City and the consulting Engineer working on the Sewer System Plan, the project costs were reduced based on the capacity they will provide by the end of the 20-year period (this reduction in costs only applies to the non-NUGAE customers since NUGAE customers build out by 2025). The resulting 20-year project capital total was $79.31 million.

From the $79.31 million $13.70 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement (R&R) was deducted as well; total R&R deduction was $24.37 million. The resulting allocable future cost basis was $41.27 million, which was made up of $22.06 million project costs related to NUGAE, $18.36 million of project costs related to non-NUGAE and $850 thousand of project costs related to both customer bases.

E.3 CUSTOMER BASE

The consulting Engineer working on the Sewer System Plan provided a growth forecast, which listed 2005 actual ERUs and estimates for 2015 and 2025. An annual compounding interest rate was calculated based on the 2005 and 2015 ERUs and applied to the 2005 ERU counts for three years to estimate the number of existing ERUs in 2008, which is 15,086. Since the non-NUGAE city build out is outside the 20-year study period an annual compounding growth rate was calculated from 2015 to 2025 and applied to the 2025 year for two years to estimate the total ERUs in the 20-year study period. The total non-NUGAE ERUs assumed in 2027 was 24,959. From the information provided by the consulting Engineer NUGAE customers reached build out by 2025 at 5,228 ERUs.

E.4 CALCULATION OF THE SEWER SYSTEM DEVELOPMENT CHARGE RESIDENTIAL/COMMERCIAL I

Exhibit 6.6 shows the calculation of the sewer system development charge by calculating the existing and future cost bases.

Exhibit 6.6: Sewer System Development Charge Calculation – Existing and Future Cost Bases

Sewer System Development Charge Calculation			
	Non-NUGAE	NUGAE	Notes
Existing Allocable Cost	$ 39,767,590	$ 39,767,590	
Allocable Customer Base	30,187	30,187	Total customer base (existing & future)
Existing Portion	**$ 1,317**	**$ 1,317**	
Future Cumulative Cost*	$ 850,000	$ 850,000	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	15,101	15,101	Total future customers
Future Cumulative Portion	**$ 56**	**$ 56**	
Future Cost	$ 7,724,178	$ 22,060,325	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base	9,873	5,228	Total future customers
Future Portion	**$ 782**	**$ 4,220**	
Future Cost - non NUGAE**	$ 10,634,955		Capital allocable to non-NUGAE Phase III portion
Allocable Customer Base	9,026		Future through 2025 (Phase III capacity)
Future Portion	**$ 1,178**		
TOTAL SDC	**$ 3,334**	**$ 5,593**	per ERU

Notes:

*Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis.

**Phase III treatment plant upgrade will only provide enough capacity for ERUs through 2025

NUGAEs portion is included in the NUGAE Future Cost section since all NUGAE builds out in 2025.

Exhibit 6.7 shows the non-NUGAE and the NUGAE system development charges and how they vary by meter size for Commercial I customers.

Exhibit 6.7: Non-NUGAE and NUGAE System Development Charges for Commercial I Customers

Flow Factors	Meter	Proposed	
		Non-NUGAE	NUGAE
1	5/8"	$ 3,334	$ 5,593
1.5	3/4"	5,001	8,390
2.5	1"	8,335	13,983
5	1.5"	16,670	27,965
8	2"	26,672	44,744
16	3"	53,344	89,488
25	4"	83,350	139,825
50	6"	166,700	279,650
80	8"	266,720	447,440

COMMERCIAL II

For Commercial II customers the costs were spread based on a functional allocation from the previous study since a cost-of-service analysis was not performed during the 2008 update. Once the costs were functionalized, unit costs were developed for each function for each portion of the charge (existing and future). **Exhibit 6.8** summarizes the Commercial II charge.

Exhibit 6.8: Non-NUGAE and NUGAE System Development Charges for Commercial II Customers

Commercial II	Proposed	
	Non-NUGAE	NUGAE
Flow (gallons)	$ 16.94	$ 28.78
BOD (lbs / day)	$ 3,149	$ 5,071
TSS (lbs / day)	$ 1,192	$ 1,921

As with the water system development charge, the proposed charges are a calculated ceiling, the City can implement a charge of any level up to the indicated amount.

F. STORM SYSTEM DEVELOPMENT CHARGE

Currently the City does not have a system development charge for its storm water utility. To stay consistent with the water and sewer utilities the same methodology was used in the development of the stormwater utility's system development charges.

DETERMINATION OF THE STORM SYSTEM DEVELOPMENT CHARGE

F.1 EXISTING COST BASIS

As of 2007, storm water utility total fixed assets equal $10.77 million. Of this amount approximately $8.08 million was contributed and, therefore, excluded from the cost basis. Calculating 10 years of interest on each allocable asset adds $489 thousand. Currently the storm water utility holds no debt. After adjusting the utility's total assets for capital contributions the total existing cost basis is approximately $3.18 million.

F.2 FUTURE COST BASIS

According to the City's six year Capital Improvement Program (CIP) the City has planned for approximately $1.89 million in projects. In addition to the six year CIP 20 percent of all street fund 20-year projects are assumed to be allocated to the storm water utility with 15 percent of the storm water utility's portion being contributed/donated. The total combined 20-year plan is $41.03 million. The City split projects between non-NUGAE, NUGAE and projects which benefit both customer groups. The NUGAE portion of total projects was $30.67 million, non-NUGAE portion was $10.25 million and the cumulative portion was $104 thousand.

From the $41.03 million $5.78 million are considered to be contributed/donated, reducing the future cost basis portion for NUGAE and non-NUGAE customers. In addition to the contributions/donations any project or portion of the project designated as repair and replacement was also deducted. The resulting allocable future cost basis was $34.36 million, which is made up of $26.07 million related to NUGAE, $8.18 million related to non-NUGAE and $104 thousand of project costs related to both customer bases.

F.3 CUSTOMER BASE

According to the City's billing records, in 2008 there were approximately 9,692 non-NUGAE Equivalent Domestic Units (EDUs). After a discussion with City staff the same growth rate was assumed for the storm water utility 20-year period as for the sewer utility. Using the appropriate growth rate the total non-NUGAE 20-year period EDUs are 16,023. The NUGAE EDUs assume to tie sewer utility's ERUs directly at 5,225.

F.4 CALCULATION OF THE STORM SYSTEM DEVELOPMENT CHARGE

Exhibit 6.9 shows the calculation of the sewer system development charge by calculating the existing and future cost bases.

Storm

Exhibit 6.9: Sewer System Development Charge by Existing and Future Cost Bases

Storm Water System Development Charge Calculation					
	Non-NUGAE		NUGAE		Notes
Existing Allocable Cost	$	3,178,410	$	3,178,410	
Allocable Customer Base		21,251		21,251	Total customer base (existing & future)
Existing Portion	**$**	**150**	**$**	**150**	
Future Cumulative Cost*	$	104,375	$	104,375	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base		11,559		11,559	Total future customers
Future Cumulative Portion	**$**	**9**	**$**	**9**	
Future Cost	$	8,181,558	$	26,071,200	Capital allocable to NUGAE & non-NUGAE
Allocable Customer Base		6,331		5,228	Total future customers
Future Portion	**$**	**1,292**	**$**	**4,987**	
TOTAL SDC	**$**	**1,451**	**$**	**5,145**	per EDU

*Notes: Cumulative costs apply to both NUGAE & non-NUGAE, the remaining future costs apply to each area on an individual basis

As with water and sewer system development charges, the proposed charges are a calculated maximum, the City can implement a charge of any level up to the indicated amount.

TECHNICAL APPENDICES

WATER SYSTEM

City of Camas
Water Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Non-Rate Revenues	330,300	222,103	238,466	254,297	264,885	280,629
Total Revenues	**$ 3,041,036**	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**
Expenses						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	380,659	402,641	403,908	401,061	401,757	400,917
New Debt Service	-	22,610	171,571	171,571	171,571	171,571
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
Total Expenses	**$ 2,785,796**	**$ 2,927,583**	**$ 3,176,346**	**$ 3,476,181**	**$ 3,583,819**	**$ 3,694,538**
Net Surplus (Deficiency)	**$ 255,240**	**$ 45,917**	**$ (145,211)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**
% of Rate Revenue	0.00%	0.00%	5.20%	13.66%	15.36%	16.91%
Additions To Meet Coverage	$ (95,165)	$ (80,813)	$ (111,885)	$ -	$ -	$ -
Total Surplus (Deficiency)	**$ 160,075**	**$ (34,896)**	**$ (257,097)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**
% of Rate Revenue	0.00%	1.27%	9.21%	13.66%	15.36%	16.91%
Annual Rate Adjustment	**0.00%**	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
Rate Revenues After Rate Increase	$ 2,710,736	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Additional Taxes from Rate Increase	$ -	$ 5,189	$ 14,395	$ 21,291	$ 28,262	$ 35,708
Net Cash Flow After Rate Increase	**255,240**	**143,906**	**126,642**	**14,742**	**91,861**	**180,652**
Coverage After Rate Increases	1.67	1.41	1.28	1.44	1.59	1.77
Sample Monthly Bill (5/8" 11ccf)	$ 20.07	$ 21.07	$ 22.13	$ 23.07	$ 23.99	$ 24.95
Monthly Increase	$ -	$ 1.00	$ 1.05	$ 0.94	$ 0.92	$ 0.96

Notes:

If growth accelerates in NUGAE than need to revisit study. Current study assumes that NUGAE growth begins after 2013

2009 increase is in effect for 9 month (effective April)

City of Camas
Water Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ 479,154**	**$ 175,000**	**$ 318,906**	**$ 445,547**	**$ 460,290**	**$ 552,151**
Net Cash Flow after Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
Transfer of Surplus to Capital Fund	(141,346)	-	-	-	-	(12,297)
Ending Balance	$ 593,047	$ 318,906	$ 445,547	$ 460,290	$ 552,151	$ 720,505
Minimum Target Balance	*$ 593,047*	*$ 617,013*	*$ 641,309*	*$ 666,628*	*$ 692,998*	*$ 720,505*
90 Day Target	90	47	63	62	72	90
Capital						
Beginning Balance	**$ 181,256**	**$ (100,000)**	**$ 207,204**	**$ 200,090**	**$ 428,714**	**$ 736,549**
plus: Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
plus: Grants / Developer Donations / Other Outside Sources	-	1,367,400	2,232,968	363,657	-	2,676,451
plus: Transfer from REET	500,000	-	-	-	-	-
plus: Existing Bond Proceeds	4,084,800	-	-	-	-	-
plus: System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104
plus: Net Debt Proceeds Available for Projects	-	240,000	1,581,200	-	-	-
plus: Interest Earnings	5,673	-	6,485	6,262	13,417	23,051
plus: Transfer of Surplus from Operating Fund	141,346	-	-	-	-	12,297
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	5,102,178	1,696,504	4,216,960	959,113	831,235	3,837,453
less: Capital Expenditures (inflated)	(5,030,000)	(1,489,300)	(4,016,870)	(530,399)	(94,686)	(2,776,818)
Ending Balance	**72,178**	**207,204**	**200,090**	**428,714**	**736,549**	**1,060,635**
Minimum Capital Contingency Target	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*

City of Camas
Water Utility Rate Study
Assumptions

Economic & Financial Factors		2008	2009	2010	2011	2012	2013
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
5	General Inflation plus Growth	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%
6	Taxes on Connection Charges	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	5.03%	5.03%	5.03%	5.03%	5.03%	5.03%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions	2008	2009	2010	2011	2012	2013
FISCAL POLICY RESTRICTIONS						
Min. Op. Fund Balance Target (days of O&M expense)	90	90	90	60	60	60
Max. Op. Fund Balance (days of O&M expense)	90	90	90	90	90	90
Minimum Capital Fund Balance Target						
Select Minimum Capital Fund Balance Target: 2	**User Input**					
1 - Defined as % of Plant						
Plant-in-Service in 2008: $ 37,749,068						
Minimum Capital Fund Balance - % of plant assets	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
RATE FUNDED SYSTEM REINVESTMENT						
Select Reinvestment Funding Strategy: 3	**User Input**					
Amount of Annual Cash Funding from Rates						
1 - Equal to Annual Depreciation Expense						
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments						
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ 200,000	$ 200,000	$ 200,000
4 - Do Not Fund System Reinvestment						

City of Camas
Water Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013
System Development Charges							
Select SDC Alternative	1	**Current Charge is in use**					
1 - User Input (Current Charge)	$ -						
2 - Calculated Charge	$ -						
Total Customer Equivalents (Estimate)							
SDC Revenue		$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104	$ 189,104
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]							
Term (years)		20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	4.00%	4.00%	4.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Rate revenues								
Residential	4	Customer Growth	$ 1,662,561	$ 1,687,499	$ 1,712,811	$ 1,738,504	$ 1,764,581	$ 1,791,050
Commercial	4	Customer Growth	178,585	181,264	183,983	186,743	189,544	192,387
Industrial	4	Customer Growth	706,592	717,191	727,949	738,868	749,951	761,200
Irrigation	4	Customer Growth	162,998	165,443	167,925	170,444	173,001	175,596
Total Rate revenue			**$ 2,710,736**	**$ 2,751,397**	**$ 2,792,668**	**$ 2,834,558**	**$ 2,877,076**	**$ 2,920,233**
Non-rate revenues [a]								
Public Fire Protection	1	General Cost Inflation	$ 2,000	$ 2,063	$ 2,128	$ 2,195	$ 2,264	$ 2,335
Private Fire Protection	1	General Cost Inflation	14,000	14,441	14,896	15,365	15,849	16,348
Other - Public Author/Hydrants	1	General Cost Inflation	10,800	11,140	11,491	11,853	12,226	12,611
Water Hook-up Fees (physical connect)	4	Customer Growth	70,000	71,050	72,116	73,197	74,295	75,410
Interest Income	1	Calculated	125,000	5,477	10,688	19,314	19,775	22,650
Water Turn off Fees (100% Water)	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Penalties (50% Water)	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Space & Facilities Leases (50% Water)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Other Rents & Use Charges (50% Water)	1	General Cost Inflation	37,500	38,681	39,899	41,156	42,452	43,789
	1	General Cost Inflation	-	-	-	-	-	-
	1	General Cost Inflation	-	-	-	-	-	-
Total Non-rate revenues			**$ 339,494**	**$ 222,103**	**$ 238,466**	**$ 254,297**	**$ 264,885**	**$ 280,629**
TOTAL REVENUES			**$ 3,050,230**	**$ 2,973,500**	**$ 3,031,134**	**$ 3,088,855**	**$ 3,141,961**	**$ 3,200,861**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Expenditures		FORECAST BASIS						
100 **Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 116,000	$ 136,216	$ 138,412	$ 140,629	$ 142,798	$ 145,074
810 **WTR S.O.S**								
Regular Salaries	3	Labor Cost Inflation	$ 39,955	$ 41,953	$ 44,050	$ 46,253	$ 48,566	$ 50,994
Overtime	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Personnel Benefits	3	Labor Cost Inflation	14,474	15,198	15,958	16,755	17,593	18,473
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Fuel Consumed	1	General Cost Inflation	400	413	426	439	453	467
Small Tools and Minor Equip	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Professional Ser	3	Labor Cost Inflation	75,000	78,750	82,688	86,822	91,163	95,721
Communication	1	General Cost Inflation	2,000	2,063	2,128	2,195	2,264	2,335
Advertising	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Public Utility	1	General Cost Inflation	200	206	213	219	226	234
Repairs & Maintenance	3	Labor Cost Inflation	50,000	52,500	55,125	57,881	60,775	63,814
Miscellaneous	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Interfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR S.O.S			**$ 214,029**	**$ 224,109**	**$ 234,673**	**$ 245,745**	**$ 257,350**	**$ 269,513**
820 **WTR Pumping**								
Reg Salaries	3	Labor Cost Inflation	$ 39,955	$ 41,953	$ 44,050	$ 46,253	$ 48,566	$ 50,994
Overtime	3	Labor Cost Inflation	3,000	3,150	3,308	3,473	3,647	3,829
Personnel Benefits	3	Labor Cost Inflation	14,654	15,387	16,156	16,964	17,812	18,703
Office and Operating Supplies	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equipment	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Professional Ser	3	Labor Cost Inflation	22,000	23,100	24,255	25,468	26,741	28,078
Communication	1	General Cost Inflation	-	-	-	-	-	-
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals	1	General Cost Inflation	-	-	-	-	-	-
Public Utility	1	General Cost Inflation	195,000	201,141	207,476	214,011	220,751	227,703
Repairs & Maintenance	3	Labor Cost Inflation	58,000	60,900	63,945	67,142	70,499	74,024
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Infund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR Pumping			**$ 350,609**	**$ 364,198**	**$ 378,342**	**$ 393,065**	**$ 408,393**	**$ 424,350**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
830 **WTR Treatment**								
Reg Salaries	3	Labor Cost Inflation	$ 41,166	$ 43,224	$ 45,386	$ 47,655	$ 50,038	$ 52,539
Overtime	3	Labor Cost Inflation	6,000	6,300	6,615	6,946	7,293	7,658
Personnel Benefits	3	Labor Cost Inflation	15,360	16,128	16,934	17,781	18,670	19,604
Office and Operating Supplies	1	General Cost Inflation	7,500	7,736	7,980	8,231	8,490	8,758
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Supplies - Chemicals	1	General Cost Inflation	10,000	180,000	185,669	191,517	197,548	203,770
Small Tools and Minor Equipment	1	General Cost Inflation	120,000	123,779	127,678	131,699	135,847	140,125
Professional Ser	3	Labor Cost Inflation	8,000	8,400	8,820	9,261	9,724	10,210
Communication	1	General Cost Inflation	2,000	2,063	2,128	2,195	2,264	2,335
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	500	516	532	549	566	584
Insurance	3	Labor Cost Inflation	42,000	44,100	46,305	48,620	51,051	53,604
Public Utility	1	General Cost Inflation	15,000	15,472	15,960	16,462	16,981	17,516
Repairs & Maintenance	3	Labor Cost Inflation	10,000	10,500	11,025	11,576	12,155	12,763
Miscellaneous	1	General Cost Inflation	8,000	8,252	8,512	8,780	9,056	9,342
Intgovt Profess Services	1	General Cost Inflation	-	-	-	-	-	-
Interfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total WTR Treatment			**$ 290,526**	**$ 471,628**	**$ 488,863**	**$ 506,759**	**$ 525,344**	**$ 544,646**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
850 **WTR Trans/Distrr**								
Reg Salaries	3	Labor Cost Inflation	$ 131,854	138,447	145,369	152,637	160,269	168,283
Overtime	3	Labor Cost Inflation	15,000	15,750	16,538	17,364	18,233	19,144
Personnel Benefits	3	Labor Cost Inflation	47,652	50,035	52,536	55,163	57,921	60,817
Uniforms and Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	16,000	16,504	17,024	17,560	18,113	18,683
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	6,000	6,189	6,384	6,585	6,792	7,006
Professional Ser	3	Labor Cost Inflation	18,000	18,900	19,845	20,837	21,879	22,973
Communication	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Public Utility	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	37,500	7,875	8,269	8,682	9,116	9,572
Miscellaneous	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
Intfund Oper. Rentals & Lease	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Intfund Repairs & Maint	1	General Cost Inflation	-	-	-	-	-	-
Total WTR Trans/Distrr			**$ 335,006**	**$ 318,683**	**$ 332,995**	**$ 347,971**	**$ 363,643**	**$ 380,045**
860 **WTR Services**								
Reg Salaries	3	Labor Cost Inflation	43,082	45,236	47,498	49,873	52,366	54,985
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	15,509	16,284	17,099	17,954	18,851	19,794
Office and Operating Supplies	1	General Cost Inflation	7,000	7,220	7,448	7,682	7,924	8,174
Professional Ser	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	1,500	1,547	1,596	1,646	1,698	1,752
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	200	206	213	219	226	234
Intfund Oper. Rentals & Leases	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Total Total WTR Trans/Distrr			**78,291**	**81,860**	**85,596**	**89,507**	**93,603**	**97,891**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
870 **WTR Meters**								
Regular Salaries	3	Labor Cost Inflation	126,299	132,614	139,245	146,207	153,517	161,193
Overtime	3	Labor Cost Inflation	500	525	551	579	608	638
Personnel Benefits	3	Labor Cost Inflation	45,513	47,789	50,178	52,687	55,321	58,087
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Small Tools and Minor Equip	1	General Cost Inflation	190,000	41,260	42,559	43,900	45,282	46,708
Professional Services	3	Labor Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals and Leases	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Total WTR Meters			**375,812**	**236,131**	**246,936**	**258,249**	**270,095**	**282,500**
100 **Admin/Gen**		50% to water 50% to Sewer						
Regular Salaries	3	Labor Cost Inflation	78,369	82,287	86,402	90,722	95,258	100,021
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	27,284	28,648	30,080	31,584	33,163	34,821
Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
OPEB Expense	1	General Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	4,750	4,900	5,054	5,213	5,377	5,547
Professional Ser	3	Labor Cost Inflation	76,500	80,325	84,341	88,558	92,986	97,636
Communication	1	General Cost Inflation	4,500	4,642	4,788	4,939	5,094	5,255
Travel	1	General Cost Inflation	250	258	266	274	283	292
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Insurance	3	Labor Cost Inflation	-	-	-	-	-	-
Public Utility	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	-	-	-	-	-	-
Miscellaneous	1	General Cost Inflation	10,750	11,089	11,438	11,798	12,170	12,553
Interfund Profess. Serv.	1	General Cost Inflation	274,981	283,641	292,574	301,789	311,293	321,098
Intfund Oper. Rentals & Lease	1	General Cost Inflation	43,165	44,524	45,927	47,373	48,865	50,404
Total Admin/Gen			**523,048**	**542,892**	**563,530**	**584,994**	**607,320**	**630,545**

City of Camas
Water Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
170 **Customer Services**								
Regular Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
Personnel Benefits	3	Labor Cost Inflation	-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Small Tools and Minor Equip	1	General Cost Inflation	-	-	-	-	-	-
Professional Ser	3	Labor Cost Inflation	12,500	13,125	13,781	14,470	15,194	15,954
Communication	1	General Cost Inflation	375	387	399	412	425	438
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Interfund Profess. Serv.	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
Total Customer Services			**16,875**	**17,656**	**18,475**	**19,332**	**20,230**	**21,171**
Additional Expenses								
Conservation Program (C:1-6)	1	General Cost Inflation	25,000	25,787	26,600	27,437	28,301	29,193
Total Additional Expenses			**25,000**	**25,787**	**26,600**	**27,437**	**28,301**	**29,193**
Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-
Total Cash O&M Expenditures			**$ 2,405,137**	**$ 2,502,332**	**$ 2,600,866**	**$ 2,703,549**	**$ 2,810,491**	**$ 2,922,049**

Depreciation Expense in	2007	$ 839,932	Water and Sewer Annual Depreciation Allocated Based on Fixed Assets					
Depreciation Expense [b]	*Last year's plus annual additions from CIP*		$ 959,598	$ 990,020	$ 1,070,358	$ 1,080,966	$ 1,082,859	$ 1,138,396
TOTAL EXPENSES			**$ 3,364,735**	**$ 3,492,352**	**$ 3,671,224**	**$ 3,784,514**	**$ 3,893,351**	**$ 4,060,445**

City of Camas
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Water & Sewer Revenue Bonds	74%										
Annual Interest Payment		$ 184,998	$ 179,180	$ 173,047	$ 166,600	$ 159,995	$ 151,855	$ 143,345	$ 134,465	$ 125,030	$ 115,225
Annual Principal Payment		136,900	144,300	151,700	155,400	162,800	170,200	177,600	188,700	196,100	207,200
Total Annual Payment		$ 321,898	$ 323,480	$ 324,747	$ 322,000	$ 322,795	$ 322,055	$ 320,945	$ 323,165	$ 321,130	$ 322,425
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
CERB Loan											
Annual Interest Payment		$ 23,534	$ 21,474	$ 19,292	$ 16,983	$ 14,539	$ 11,952	$ 9,214	$ 6,316	$ 3,248	$ -
Annual Principal Payment		35,227	37,288	39,469	41,778	44,222	46,809	49,547	52,446	55,514	-
Total Annual Payment		$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ 58,761	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 5											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt Reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
TOTAL REVENUE BONDS											
Annual Interest Payment		$ 208,533	$ 200,654	$ 192,339	$ 183,583	$ 174,535	$ 163,808	$ 152,560	$ 140,781	$ 128,278	$ 115,225
Annual Principal Payment		172,127	181,588	191,169	197,178	207,022	217,009	227,147	241,146	251,614	207,200
Total Annual Payment		$ 380,659	$ 382,241	$ 383,508	$ 380,761	$ 381,557	$ 380,817	$ 379,707	$ 381,927	$ 379,892	$ 322,425
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds		383,508	383,508	383,508	381,927	381,927	381,927	381,927	381,927	379,892	323,350

City of Camas
Water Utility Rate Study
Existing Debt Input

Existing Debt Service - PWTF Loans		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Public Works Trust Fund Loan											
Annual Interest Payment	50%	$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -
Loan 2											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Loan 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL PWTF LOANS											
Annual Interest Payment		$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1							1	Enterprise Fund	$ -	$ -	$ -
2	SR-12 WELL 13 (WELL 4 GWI)	1,200,000	2008	50	100%	0%	1	Enterprise Fund	1,200,000	-	1,200,000
3	SR-11 WATER RIGHT PURCHASE	165,000	2021	50	100%	0%	1	Enterprise Fund	165,000	-	274,737
4	"	300,000	2022	50	100%	0%	1	Enterprise Fund	300,000	-	519,503
5							1	Enterprise Fund	-	-	-
6	D-5 8" MAIN ON 8TH FOR FIRE FLOW	50,000	2014	50	0%	100%	1	Enterprise Fund	-	50,000	70,926
7	D-9 OSTENSON CANYON MAIN	800,000	2008	50	100%	0%	1	Enterprise Fund	800,000	-	800,000
8	D-10 FIRE FLOW ON SIERRA ST	50,000	2014	50	50%	50%	1	Enterprise Fund	25,000	25,000	70,926
9	S-1 WEST PRUNE HILL RES ACQUISITION (FEASIBIL	50,000	2014	50	100%	0%	1	Enterprise Fund	50,000	-	70,926
10	T-7 WASHOUGAL RIVER TRANS CROSS	2,500,000	2008	50	100%	0%	1	Enterprise Fund	2,500,000	-	2,500,000
11	WATER FACILITY PLAN UPDATE	130,000	2008	6	50%	50%	1	Enterprise Fund	65,000	65,000	130,000
12	BOULDER CREEK FISH SCREEN PROJ	25,000	2014	50	0%	100%	1	Enterprise Fund	-	25,000	35,463
13	LOWER PRUNE HILL PUMP #4	20,000	2009	20	100%	0%	1	Enterprise Fund	20,000	-	21,200
	"	50,000	2014	21	100%	0%	1	Enterprise Fund	50,000	-	70,926
14	Source Development	20,000	2009	50	100%	0%	1	Enterprise Fund	20,000	-	21,200
15	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	1,064,400	2010	50	100%	0%	2	Grants/Developer Donation	1,064,400	-	1,195,960
16	CROWN RD PS /MAIN LINE INSTALLATION 40% P	709,600	2010	50	100%	0%	2	Grants/Developer Donation	709,600	-	797,307
17	CROWN RD PS /MAIN LINE INSTALLATION 60% TD	393,600	2010	50	100%	0%	1	Enterprise Fund	393,600	-	442,249
18	CROWN RD PS /MAIN LINE INSTALLATION 40% P	262,400	2010	50	100%	0%	1	Enterprise Fund			294,833
19	WELL 14	900,000	2009	50	100%	0%	2	Grants/Developer Donation	900,000	-	954,000
20	WELL 14	390,000	2009	50	100%	0%	2	Grants/Developer Donation	390,000	-	413,400
21	D-6 12" LINE FOR AIRPORT FIRE FLOW (2/3 Develops	305,333	2011	50	100%	0%	2	Grants/Developer Donation	305,333	-	363,657
22	D-6 12" LINE FOR AIRPORT FIRE FLOW (1/3 City)	152,667	2014	50	100%	0%	1	Enterprise Fund	152,667	-	216,561
23	D-7 BOOSTER STATION ON COUCH FIRE FL	53,800	2014	50	100%	0%	1	Enterprise Fund	53,800	-	76,316
24	T-2 SUCTION SIDE MAIN ON LAKE RD	1,260,000	2015	50	100%	0%	1	Enterprise Fund	1,260,000	-	1,894,574
25	T-3 ADDITIONAL PUMP ON LACAMAS BS	65,000	2011	50	100%	0%	1	Enterprise Fund	65,000	-	77,416
26	T-6 FOREST HOME BOOSTER UPGRADE	100,000	2014	50	100%	0%	1	Enterprise Fund	100,000	-	141,852

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
27	NW 38th AVENUE WATER LINE	750,000	2010	50	100%	0%	1	Enterprise Fund	750,000	-	842,700
28	PAC RIM/38TH WATER INTERTIE (2/3) Developer	213,333	2010	50	100%	0%	2	Grants/Developer Donation	213,333	-	239,701
29	PAC RIM/38TH WATER INTERTIE (1/3) City	106,667	2010	50	100%	0%	1	Enterprise Fund	106,667	-	119,851
30	D-8 8" MAIN ON KLICKITAT FIRE FLOW	62,000	2014	50	100%	0%	1	Enterprise Fund	62,000	-	87,948
31	Reservoir	2,500,000	2014	50	100%	0%	1	Enterprise Fund	2,500,000	-	3,546,298
32	Reservoir Transmission Line	350,000	2014	50	100%	0%	1	Enterprise Fund	350,000	-	496,482
33	UGA RESERVOIR	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
34	"	1,600,000	2018	50	100%	0%	1	Enterprise Fund	1,600,000	-	2,368,391
35	UGA PRV (2/3) Developer	74,667	2014	50	100%	0%	2	Grants/Developer Donation	74,667	-	105,916
36	UGA PRV (1/3) City	37,333	2014	50	100%	0%	1	Enterprise Fund	37,333	-	52,958
37	UGA PRV (2/3) Developer	74,667	2015	50	100%	0%	2	Grants/Developer Donation	74,667	-	112,271
38	UGA PRV (1/3) City	37,333	2015	50	100%	0%	1	Enterprise Fund	37,333	-	56,136
39	UGA PRV (2/3) Developer	74,667	2016	50	100%	0%	2	Grants/Developer Donation	74,667	-	119,007
40	UGA PRV (1/3) City	37,333	2016	50	100%	0%	1	Enterprise Fund	37,333	-	59,504
41	UGA PRV (2/3) Developer	74,667	2017	50	100%	0%	2	Grants/Developer Donation	74,667	-	126,148
42	UGA PRV (1/3) City	37,333	2017	50	100%	0%	1	Enterprise Fund	37,333	-	63,074
43	D-15 12" MAIN LAKE TO 38TH	815,000	2020	50	100%	0%	2	Grants/Developer Donation	815,000	-	1,304,841
44	T-4 TRANSMSN MAIN EVERETT SOUTH	1,130,000	2014	50	100%	0%	1	Enterprise Fund	1,130,000	-	1,602,927
45	T-5 TRANSMSN MAIN EVERETT NORTH	1,130,000	2015	50	100%	0%	1	Enterprise Fund	1,130,000	-	1,699,102
46	UGA BOOSTER STATION	400,000	2014	50	100%	0%	1	Enterprise Fund	400,000	-	567,408
47	WATER FACILITY PLAN UPDATE	150,000	2014	6	50%	50%	1	Enterprise Fund	75,000	75,000	212,778
48	"	150,000	2020	6	50%	50%	1	Enterprise Fund	75,000	75,000	240,155
49	"	150,000	2026	6	50%	50%	1	Enterprise Fund	75,000	75,000	303,872
50	STIEGERWALD SOURCE DEVELOPMENT	1,000,000	2020	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
51	MISC WATER MAIN REPLACEMENT	400,000	2008	50	30%	70%	1	Enterprise Fund	120,000	280,000	400,000
52	"	75,000	2009	50	30%	70%	1	Enterprise Fund	22,500	52,500	79,500
53	"	75,000	2010	50	30%	70%	1	Enterprise Fund	22,500	52,500	84,270
54	"	75,000	2011	50	30%	70%	1	Enterprise Fund	22,500	52,500	89,326
55	"	75,000	2012	50	30%	70%	1	Enterprise Fund	22,500	52,500	94,686
56	"	75,000	2013	50	30%	70%	1	Enterprise Fund	22,500	52,500	100,367
57	"	75,000	2014	50	30%	70%	1	Enterprise Fund	22,500	52,500	106,389
58	"	75,000	2015	50	30%	70%	1	Enterprise Fund	22,500	52,500	112,772
59	"	75,000	2016	50	30%	70%	1	Enterprise Fund	22,500	52,500	119,539

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
60	"	75,000	2017	50	30%	70%	1	Enterprise Fund	22,500	52,500	126,711
61	"	75,000	2018	50	30%	70%	1	Enterprise Fund	22,500	52,500	111,018
62	"	75,000	2019	50	30%	70%	1	Enterprise Fund	22,500	52,500	115,459
63	"	75,000	2020	50	30%	70%	1	Enterprise Fund	22,500	52,500	120,077
64	"	75,000	2021	50	30%	70%	1	Enterprise Fund	22,500	52,500	124,881
65	"	75,000	2022	50	30%	70%	1	Enterprise Fund	22,500	52,500	129,876
66	"	75,000	2023	50	30%	70%	1	Enterprise Fund	22,500	52,500	135,071
67	"	75,000	2024	50	30%	70%	1	Enterprise Fund	22,500	52,500	140,474
68	"	75,000	2025	50	30%	70%	1	Enterprise Fund	22,500	52,500	146,093
69	"	75,000	2026	50	30%	70%	1	Enterprise Fund	22,500	52,500	151,936
70	"	75,000	2027	50	30%	70%	1	Enterprise Fund	22,500	52,500	158,014
71	UGA MAIN LINE (2/3) Developer	2,000,000	2013	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,676,451
72	UGA MAIN LINE (1/3) City	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
73	UGA MAIN LINE (2/3) Developer	2,000,000	2014	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,837,038
74	UGA MAIN LINE (1/3) City	1,000,000	2014	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,418,519
75	UGA MAIN LINE (2/3) Developer	2,000,000	2015	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,007,261
76	UGA MAIN LINE (1/3) City	1,000,000	2015	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,503,630
77	UGA MAIN LINE (2/3) Developer	2,000,000	2016	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,187,696
78	UGA MAIN LINE (1/3) City	1,000,000	2016	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,593,848
79	UGA MAIN LINE (2/3) Developer	2,000,000	2017	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,378,958
80	UGA MAIN LINE (1/3) City	1,000,000	2017	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,689,479
81	UGA MAIN LINE (2/3) Developer	2,000,000	2018	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	2,960,489
82	UGA MAIN LINE (1/3) City	1,000,000	2018	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,480,244
83	UGA MAIN LINE (2/3) Developer	2,000,000	2019	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,078,908
84	UGA MAIN LINE (1/3) City	1,000,000	2019	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,539,454
85	UGA MAIN LINE (2/3) Developer	2,000,000	2020	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,202,064
86	UGA MAIN LINE (1/3) City	1,000,000	2020	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,601,032
87	UGA MAIN LINE (2/3) Developer	2,000,000	2021	50	100%	0%	2	Grants/Developer Donation	2,000,000	-	3,330,147
88	UGA MAIN LINE (1/3) City	1,000,000	2021	50	100%	0%	1	Enterprise Fund	1,000,000	-	1,665,074

City of Camas
Water Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
89	UGA MAIN LINE (2/3) Developer	2,000,000	2022	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,463,353
90	UGA MAIN LINE (1/3) City	1,000,000	2022	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,731,676
91	UGA MAIN LINE (2/3) Developer	2,000,000	2023	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,601,887
92	UGA MAIN LINE (1/3) City	1,000,000	2023	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,800,944
93	UGA MAIN LINE (2/3) Developer	2,000,000	2024	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,745,962
94	UGA MAIN LINE (1/3) City	1,000,000	2024	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,872,981
95	UGA MAIN LINE (2/3) Developer	2,000,000	2025	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	3,895,801
96	UGA MAIN LINE (1/3) City	1,000,000	2025	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,947,900
97	UGA MAIN LINE (2/3) Developer	2,000,000	2026	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,051,633
98	UGA MAIN LINE (1/3) City	1,000,000	2026	50	100%	0%	1 Enterprise Fund	1,000,000	-	2,025,817
99	UGA MAIN LINE (2/3) Developer	2,000,000	2027	50	100%	0%	2 Grants/Developer Donation	2,000,000	-	4,213,698
100	UGA MAIN LINE (1/3) City	1,000,000	2027	50	100%	0%	1 Enterprise Fund	1,000,000	-	2,106,849
101					100%	0%	1 Enterprise Fund	-	-	-
102					100%	0%	1 Enterprise Fund	-	-	-
	Total Capital Projects	**$ 69,796,800**			**98%**	**2%**		**$ 67,866,900**	**$ 1,667,500**	**$ 108,674,720**
	Total Upgrade/Expansion Projects									106,236,945
	Total R&R Projects									2,437,775
	Projects by Grants / Developer Donations							34,696,333	-	56,363,555
	Projects by Enterprise Fund							33,170,567	1,667,500	52,311,165

Year	2008$	Inflated	2008$ Grants	Inifated Grants	2008$ No Grants	Inflated No Grants
2008	5,030,000	5,030,000	-	-	5,030,000	5,030,000
2009	1,405,000	1,489,300	1,290,000	1,367,400	115,000	121,900
2010	3,575,000	4,016,870	1,987,333	2,232,968	1,587,667	1,783,902
2011	445,333	530,399	305,333	363,657	140,000	166,742
2012	75,000	94,686	-	-	75,000	94,686
2013	2,075,000	2,776,818	2,000,000	2,676,451	75,000	100,367
Total	**12,605,333**	**13,938,073**	**5,582,667**	**6,640,476**	**7,022,667**	**7,297,597**

City of Camas
Water Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2008 - 2013 TOTAL
CAPITAL PROJECTS							
Improvement Upgrades & Expansions	$ 4,685,000	$ 1,433,650	$ 3,957,881	$ 467,871	$ 28,406	$ 2,706,561	$ 13,279,369
Repairs and Replacements	345,000	55,650	58,989	62,528	66,280	70,257	658,704
TOTAL CAPITAL EXPENDITURES	**$ 5,030,000**	**$ 1,489,300**	**$ 4,016,870**	**$ 530,399**	**$ 94,686**	**$ 2,776,818**	**$ 13,938,073**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	TOTAL
Existing PWTF/ Bond Proceeds	4,084,800	-	-	-	-	-	4,084,800
Transfer from REET Fund	500,000	-	-	-	-	-	500,000
Project Specific Grants / Developer Donations	$ -	$ 1,367,400	$ 2,232,968	$ 363,657	$ -	$ 2,676,451	$ 6,640,476
Project to be Funded	945,200	121,900	1,783,902	166,742	94,686	100,367	3,212,797
OTHER FUNDING SOURCES [NOTE A]							
Other Outside Sources	-	-	-	-	-	-	$ -
PWTF Loan Proceeds	-	-	-	-	-	-	-
Other Loan Proceeds	-	-	-	-	-	-	-
System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104	1,134,623
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000	600,000
Capital Fund Balance Deficiency	(756,096)	-	(1,594,798)	-	-	-	(2,350,895)
Capital Fund Balance	756,096	-	207,204	-	-	-	963,300
Capital Fund Balance Deficiency	-	-	(1,387,595)	-	-	-	(1,387,595)
Revenue Bond Proceeds [Note B]	-	240,000	1,581,200	-	-	-	1,821,200
Rates							
Total							-

City of Camas
Water Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Existing Debt Service	380,659	402,641	403,908	401,061	401,757	400,917
New Debt Service	-	22,610	171,571	171,571	171,571	171,571
Rate-Funded CIP	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-
Total Expenses	$ 2,785,796	$ 2,927,583	$ 3,176,346	$ 3,476,181	$ 3,583,819	$ 3,694,538
REVENUES						
Rate Revenue	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Other Revenue	205,300	216,626	227,778	234,983	245,110	257,979
Operating Fund & Debt Reserve Fund Interest Earnings	125,000	5,477	10,688	19,314	19,775	22,650
Total Revenue	$ 3,041,036	$ 2,973,500	$ 3,031,134	$ 3,088,855	$ 3,141,961	$ 3,200,861
NET CASH FLOW (DEFICIENCY)	**$ 255,240**	**$ 45,917**	**$ (145,211)**	**$ (387,326)**	**$ (441,858)**	**$ (493,676)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,405,137	$ 2,502,332	$ 2,600,866	$ 2,703,549	$ 2,810,491	$ 2,922,049
Revenue Bond Debt Service	380,659	404,851	555,080	552,333	553,128	552,388
Revenue Bond Coverage Requirement at 1.25	95,165	101,213	138,770	138,083	138,282	138,097
Total Expenses	$ 2,880,961	$ 3,008,396	$ 3,294,716	$ 3,393,964	$ 3,501,901	$ 3,612,535
ALLOWABLE REVENUES						
Rate Revenue	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Other Revenue	205,300	216,626	227,778	234,983	245,110	257,979
Interest Earnings - All Funds	125,000	5,477	17,173	25,576	33,192	45,702
Total Revenue	$ 3,041,036	$ 2,973,500	$ 3,037,619	$ 3,095,117	$ 3,155,379	$ 3,223,913
Coverage Realized	1.67	1.16	0.79	0.71	0.62	0.55
COVERAGE SURPLUS (DEFICIENCY)	**$ 160,075**	**$ (34,896)**	**$ (257,097)**	**$ (298,847)**	**$ (346,523)**	**$ (388,622)**

City of Camas
Water Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013
Sufficiency Test Driving the Deficiency	*None*	*Coverage*	*Coverage*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ -	$ 34,896	$ 257,097	$ 387,326	$ 441,858	$ 493,676
less: Net Revenue From Prior Rate Increases	-	-	(132,611)	(275,931)	(408,099)	(541,725)
Revenue Deficiency	$ -	$ 34,896	$ 124,485	$ 111,395	$ 33,759	$ -
Plus: Adjustment for State Excise Tax	-	1.848	6.592	5.899	1.788	-
Total Revenue Deficiency	**$ -**	**$ 36,743**	**$ 131,077**	**$ 117,294**	**$ 35,546**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenue with no Increase	$ 2,710,736	$ 2,751,397	$ 2,792,668	$ 2,834,558	$ 2,877,076	$ 2,920,233
Revenues from Prior Rate Increases	-	-	139,633	290,542	429,709	570,410
Rate Revenue Before Rate Increase (Incl. previous increases)	2,710,736	2,751,397	2,932,301	3,125,100	3,306,786	3,490,643
Required Annual Rate Increase	0.00%	1.34%	4.47%	3.75%	1.07%	0.00%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*0.00%*	*1.78%*	*4.47%*	*3.75%*	*1.07%*	*0.00%*
Policy Induced Rate Increases	0.00%	5.00%	5.00%	4.25%	4.00%	4.00%
ANNUAL RATE INCREASE	**0.00%**	**5.00%**	**5.00%**	**4.25%**	**4.00%**	**4.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**5.00%**	**10.25%**	**14.94%**	**19.53%**	**24.31%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenues After Rate Increase	$ 2,710,736	$ 2,854,574	$ 3,078,916	$ 3,257,917	$ 3,439,057	$ 3,630,269
Full Year Rate Revenues After Rate Increase	*2,710,736*	*2,888,967*	*3,078,916*	*3,257,917*	*3,439,057*	*3,630,269*
Additional State Taxes Due to Rate Increases	-	5,189	14,395	21,291	28,262	35,708
Net Cash Flow After Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
Coverage After Rate Increase	1.67	1.41	1.28	1.44	1.59	1.77

City of Camas
Water Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013
OPERATING FUND						
Beginning Balance	$ 479,154	$ 175,000	$ 318,906	$ 445,547	$ 460,290	$ 552,151
plus: Net Cash Flow after Rate Increase	255,240	143,906	126,642	14,742	91,861	180,652
less: Transfer of Surplus to Capital Fund	(141,346)	-	-	-	-	(12,297)
Ending Balance	$ 593,047	$ 318,906	$ 445,547	$ 460,290	$ 552,151	$ 720,505
Minimum Target Balance	*593,047*	*617,013*	*641,309*	*444,419*	*461,999*	*480,337*
Maximum Funds to be Kept as Operating Reserves	*593,047*	*617,013*	*641,309*	*666,628*	*692,998*	*720,505*
Info: No of Days of Cash Operating Expenses	*90*	*47*	*63*	*62*	*72*	*90*
CAPITAL FUND						
Beginning Balance	$ 181,256	$ (100,000)	$ 207,204	$ 200,090	$ 428,714	$ 736,549
plus: Rate Funded System Reinvestment	-	-	-	200,000	200,000	200,000
plus: Grants / Developer Donations / Other Outside Sources	-	1,367,400	2,232,968	363,657	-	2,676,451
plus: Transfer from REET	500,000	-	-	-	-	-
plus: Existing PWTF / Bond Proceeds	4,084,800	-	-	-	-	-
plus: System Development Charges	189,104	189,104	189,104	189,104	189,104	189,104
plus: Net Debt Proceeds Available for Projects	-	240,000	1,581,200	-	-	-
plus: Interest Earnings	5,673	-	6,485	6,262	13,417	23,051
plus: Transfer of Surplus from Operating Fund	141,346	-	-	-	-	12,297
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	**5,102,178**	**1,696,504**	**4,216,960**	**959,113**	**831,235**	**3,837,453**
less: Capital Expenditures	(5,030,000)	(1,489,300)	(4,016,870)	(530,399)	(94,686)	(2,776,818)
Ending Balance	**$ 72,178**	**$ 207,204**	**$ 200,090**	**$ 428,714**	**$ 736,549**	**$ 1,060,635**
Minimum Target Balance	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
DEBT RESERVE						
Beginning Balance	$ -	$ -	$ 22,610	$ 171,571	$ 171,571	$ 171,571
plus: Reserve Funding from New Debt	-	22,610	148,962	-	-	-
less: Use of Reserves for Debt Service	-	-	-	-	-	-
Ending Balance	$ -	$ 22,610	$ 171,571	$ 171,571	$ 171,571	$ 171,571
Minimum Target Balance	*383,508*	*406,118*	*555,080*	*553,498*	*553,498*	*553,498*

SEWER SYSTEM

City of Camas
Sewer Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Non-Rate Revenues	252,500	136,992	141,419	154,924	180,689	199,286
Total Revenues	**$ 3,633,154**	**$ 3,568,356**	**$ 3,624,253**	**$ 3,690,001**	**$ 3,768,792**	**$ 3,841,211**
Expenses						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,453,353	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	-	10,100	156,316	1,249,112	1,667,422	1,711,165
Rate Funded System Reinvestment	-	-	-	-	-	-
Total Expenses	**$ 4,138,434**	**$ 4,400,561**	**$ 4,652,532**	**$ 5,853,266**	**$ 6,384,749**	**$ 6,544,840**
Net Surplus (Deficiency)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	14.95%	24.25%	29.52%	61.19%	72.91%	74.24%
Additions to Meet Coverage	$ -	$ -	$ -	$ -	$ -	$ -
Total Surplus (Deficit)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
% of Rate Revenue	14.95%	24.25%	29.52%	61.19%	72.91%	74.24%
Annual Rate Adjustment	**0.00%**	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 3,380,654	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Additional Taxes from Rate Increase	$ -	$ 33,705	$ 64,670	$ 87,032	$ 106,461	$ 115,509
Net Cash Flow After Rate Increase	**(505,280)**	**9,088**	**585,917**	**9,099**	**41,379**	**179,532**
Coverage After Rate Increases	1.84	2.80	4.05	2.29	1.97	2.02
Sample Monthly Bill (SF Fixed)	$ 24.05	$ 32.23	$ 35.64	$ 39.42	$ 42.57	$ 43.85
Monthly Increase	$ -	$ 8.18	$ 3.42	$ 3.78	$ 3.15	$ 1.28

Notes:

No revenue from NUGAE growth is assumed in the study period

2009 increase is in effect for 9 month (effective April)

City of Camas
Sewer Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	$ 479,154	$ 175,000	$ 184,088	$ 479,095	$ 488,194	$ 516,230
Net Cash Flow after Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
Transfer of Surplus to Capital Fund	-	-	(290,910)	-	(13,343)	(159,835)
Ending Balance	$ (26,127)	$ 184,088	$ 479,095	$ 488,194	$ 516,230	$ 535,928
	$ 441,383	*$ 461,636*	*$ 479,095*	*$ 497,276*	*$ 516,230*	*$ 535,928*
60 Day Target	(4)	24	60	59	60	60
Capital						
Beginning Balance	$ 1,052,178	$ 200,000	$ 200,423	$ 540,169	$ 208,959	$ 206,909
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	250,000	-	-	-	-	-
plus: Existing PWTF / Bond Proceeds	1,435,200	2,020,000	7,980,000	-	-	-
plus: System Development Charges	186,163	186,163	186,163	186,163	186,163	186,163
plus: Net Debt Proceeds Available for Projects	-	-	-	7,550,000	4,720,000	520,000
plus: Interest Earnings	32,930	6,259	6,273	16,905	6,540	6,476
plus: Transfer of Surplus from Operating Fund	-	-	290,910	-	13,343	159,835
Total Capital Funding Sources	2,956,471	2,412,423	8,663,769	8,293,237	5,135,006	1,079,383
less: Capital Expenditures	(1,950,000)	(2,212,000)	(8,123,600)	(8,084,278)	(4,928,096)	(869,847)
Ending Balance	**1,006,471**	**200,423**	**540,169**	**208,959**	**206,909**	**209,536**
Minimum Capital Contingency Target	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*	*$ 200,000*

City of Camas
Sewer Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth (Historical Ann.from Budget)	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
5	General Inflation plus Growth	4.70%	4.70%	4.70%	4.70%	4.70%	4.70%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	3.85%	3.85%	3.85%	3.85%	3.85%	3.85%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
	Collection	29.00%	29.00%	29.00%	29.00%	29.00%	29.00%
	Treatment	71.00%	71.00%	71.00%	71.00%	71.00%	71.00%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013
FISCAL POLICY RESTRICTIONS						
Min. Op. Fund Balance Target (days of O&M expense)	60	60	60	60	60	60
Max. Op. Fund Balance (days of O&M expense)	60	60	60	60	60	60

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	2	**User Input**

1 - Defined as % of Plant

		2008	2009	2010	2011	2012	2013
Plant-in-Service in 2007	$ 43,604,604						
Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>		$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments

	2008	2009	2010	2011	2012	2013
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -

4 - Do Not Fund System Reinvestment

City of Camas
Sewer Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013
System Development Charges							
Select SDC Alternative	1	Current Charge is in use					
1 - User Input (Current Charge)	$ -						
2 - Calculated Charge	$ -						
Total Customer Equivalents							
SDC Revenue		$ 186,163	$ 186,163	$ 186,163	$ 186,163	$ 186,163	$ 186,163
REVENUE BONDS							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25						
PWTF LOAN							
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20
Interest Cost		0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]							
Term (years)		20	20	20	20	20	20
Interest Cost		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Rate revenues								
Residential	4	Customer Growth (Historical Ann.from Budget)	$ 2,003,351	2,033,401	2,063,902	2,094,860	2,126,283	2,158,177
Swr Comm/Industrial	4	Customer Growth (Historical Ann.from Budget)	751,256	762,525	773,963	785,573	797,356	809,317
Swr Ind/Wafer Tech	4	Customer Growth (Historical Ann.from Budget)	626,047	635,438	644,969	654,644	664,464	674,430
Total Rate revenue			**$ 3,380,654**	**$ 3,431,364**	**$ 3,482,834**	**$ 3,535,077**	**$ 3,588,103**	**$ 3,641,924**
Non-rate revenues								
Sewer Hook-up Fees	1	General Cost Inflation	$ 10,000	$ 10,315	$ 10,640	$ 10,975	$ 11,321	$ 11,677
Inspection Fees-Step Syst (100% Sewer)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Space & Facilities Leases (50% Sewer)	1	General Cost Inflation	10,000	10,315	10,640	10,975	11,321	11,677
Interest Income (50% sewer)		Calculated	125,000	5,477	5,761	14,994	36,352	50,403
Wtr-Swr Turn off Fees By Owner (100% Water)	1	General Cost Inflation	-	-	-	-	-	-
Penalties	1	General Cost Inflation	60,000	61,890	63,839	65,849	67,923	70,063
Other Rents & Use Charges	1	General Cost Inflation	37,500	38,681	39,899	41,156	42,452	43,789
Total Non-rate revenues			**$ 130,396**	**$ 70,746**	**$ 73,592**	**$ 79,770**	**$ 93,706**	**$ 103,473**
TOTAL REVENUES			**$ 3,511,050**	**$ 3,502,109**	**$ 3,556,426**	**$ 3,614,847**	**$ 3,681,809**	**$ 3,745,398**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

			Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
Expenditures		FORECAST BASIS						
Excise Tax State Tax		*Excise and B&O Tax Rate*	$ 66,000	$ 78,729	$ 79,895	$ 81,127	$ 82,493	$ 83,814
810 **SWR Collection**								
Reg Salar	3	Labor Cost Inflation	$ 21,241	$ 22,303	$ 23,418	$ 24,589	$ 25,819	$ 27,109
Overtime	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
Personnel Benefits	3	Labor Cost Inflation	7,737	8,124	8,530	8,957	9,404	9,875
Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
Small Tools and Minor Equip	1	General Cost Inflation	500	516	532	549	566	584
Supplies - Chemicals	1	General Cost Inflation	-	-	-	-	-	-
Professional Ser	3	Labor Cost Inflation	-	-	-	-	-	-
Communication	1	General Cost Inflation	-	-	-	-	-	-
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
Repairs & Maintenance	3	Labor Cost Inflation	40,000	42,000	44,100	46,305	48,620	51,051
Miscellaneous	1	General Cost Inflation	500	516	532	549	566	584
Intfund Oper. Rentals & Lease	1	General Cost Inflation	5,000	5,157	5,320	5,487	5,660	5,839
Total SWR Collection			**$ 78,478**	**$ 82,245**	**$ 86,195**	**$ 90,337**	**$ 94,681**	**$ 99,237**
811 **Swr Pressure Coll**								
Reg	3	Labor Cost Inflation	$ 96,305	$ 101,120	$ 106,176	$ 111,485	$ 117,059	$ 122,912
Overtime	3	Labor Cost Inflation	10,000	10,500	11,025	11,576	12,155	12,763
Personnel Benefits	3	Labor Cost Inflation	35,570	37,349	39,216	41,177	43,236	45,397
Office and Operating Supplies	1	General Cost Inflation	30,000	30,945	31,919	32,925	33,962	35,031
Fuel consumed	1	General Cost Inflation	-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
Chemicals	1	General Cost Inflation	128,000	132,031	136,190	140,479	144,903	149,467
Professional Services	3	Labor Cost Inflation	2,000	2,100	2,205	2,315	2,431	2,553
Travel	1	General Cost Inflation	-	-	-	-	-	-
Operating rentals and Leases	1	General Cost Inflation	200	206	213	219	226	234
Repairs & Maintenance	3	Labor Cost Inflation	50,000	52,500	55,125	57,881	60,775	63,814
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
Intfund Oper. Rentals & Lease	1	General Cost Inflation	7,000	7,220	7,448	7,682	7,924	8,174
Intfund Repairs & Maint	1	General Cost Inflation	-	-	-	-	-	-
Total Swr Pressure Coll			**$ 362,075**	**$ 377,066**	**$ 392,709**	**$ 409,033**	**$ 426,068**	**$ 443,848**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
830 **SWR Pumping**									
Reg Salaries	3	Labor Cost Inflation	$	127,409	$ 133,779	$ 140,468	$ 147,492	$ 154,866	$ 162,610
Overtime	3	Labor Cost Inflation		6,000	6,300	6,615	6,946	7,293	7,658
Personnel Benefits	3	Labor Cost Inflation		46,407	48,727	51,164	53,722	56,408	59,228
Uniforms and Clothing	1	General Cost Inflation		-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation		10,000	10,315	10,640	10,975	11,321	11,677
Fuel Consumed	1	General Cost Inflation		-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation		1,000	1,031	1,064	1,097	1,132	1,168
Professional Ser	1	General Cost Inflation		7,500	7,736	7,980	8,231	8,490	8,758
Communication	1	General Cost Inflation		2,000	2,063	2,128	2,195	2,264	2,335
Travel	1	General Cost Inflation		-	-	-	-	-	-
Operating Rentals and Leases	1	General Cost Inflation		3,000	3,094	3,192	3,292	3,396	3,503
Public Utility	1	General Cost Inflation		90,000	92,835	95,758	98,774	101,885	105,094
repairs & Maintenance	1	General Cost Inflation		30,000	30,945	31,919	32,925	33,962	35,031
Miscellaneous	1	General Cost Inflation		500	516	532	549	566	584
Intfund Oper. Rentals & Lease	1	General Cost Inflation		15,000	15,472	15,960	16,462	16,981	17,516
Public Utility	1	General Cost Inflation		-	-	-	-	-	-
Total SWR Pumping			**$**	**338,816**	**$ 352,814**	**$ 367,420**	**$ 382,661**	**$ 398,564**	**$ 415,162**
850 **SWR Treatment**									
Reg Salary	3	Labor Cost Inflation	$	174,627	183,358	192,526	202,153	212,260	222,873
Overtime	3	Labor Cost Inflation		5,000	5,250	5,513	5,788	6,078	6,381
Personnel Benefits	3	Labor Cost Inflation		60,984	64,033	67,235	70,597	74,126	77,833
Uniforms & Clothing	1	General Cost Inflation		-	-	-	-	-	-
Office and Operating Supplies	1	General Cost Inflation		20,000	20,630	21,280	21,950	22,641	23,354
Fuel Consumed	1	General Cost Inflation		-	-	-	-	-	-
Small Tools and Minor Equip	1	General Cost Inflation		20,000	20,630	21,280	21,950	22,641	23,354
Supplies - Chemicals	1	General Cost Inflation		240,000	255,000	263,031	271,315	279,860	288,674
Professional Ser	1	General Cost Inflation		147,500	152,145	156,937	161,880	166,978	172,237
Communication	1	General Cost Inflation		2,500	2,579	2,660	2,744	2,830	2,919
Travel	1	General Cost Inflation		1,000	1,031	1,064	1,097	1,132	1,168
Operating rentals and leases	1	General Cost Inflation		12,000	12,378	12,768	13,170	13,585	14,013
Insurance	1	General Cost Inflation		80,000	82,520	85,119	87,799	90,565	93,417
Public Utility	1	General Cost Inflation		130,000	134,094	138,318	142,674	147,167	151,802
Repairs & Maintenance	3	Labor Cost Inflation		36,600	38,430	40,352	42,369	44,488	46,712
Miscellaneous	1	General Cost Inflation		25,000	25,787	26,600	27,437	28,301	29,193
Intfund Oper. Rentals & Lease	1	General Cost Inflation		5,000	5,157	5,320	5,487	5,660	5,839
Total SWR Treatment			**$**	**960,211**	**$ 1,003,024**	**$ 1,040,000**	**$ 1,078,410**	**$ 1,118,313**	**$ 1,159,769**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
860	**SWR Services**								
	Reg Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
	Overtime	3	Labor Cost Inflation	500	525	551	579	608	638
	Personnel Benefits	3	Labor Cost Inflation	45	47	50	52	55	57
	Repairs & Maintenance	3	Labor Cost Inflation	500	525	551	579	608	638
	Miscellaneous	1	General Cost Inflation	1,000	1,031	1,064	1,097	1,132	1,168
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
	Total SWR Services			**2,045**	**2,129**	**2,216**	**2,307**	**2,402**	**2,501**
100	**Admin/Gen**		50% to water 50% to Sewer						
	Regular Salaries	3	Labor Cost Inflation	78,369	82,287	86,402	90,722	95,258	100,021
	Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
	Personnel Benefits	3	Labor Cost Inflation	27,284	28,648	30,080	31,584	33,163	34,821
	Uniforms & Clothing	1	General Cost Inflation	-	-	-	-	-	-
	OPEB Expense	1	General Cost Inflation	-	-	-	-	-	-
	Office and Operating Supplies	1	General Cost Inflation	2,500	2,579	2,660	2,744	2,830	2,919
	Fuel Consumed	1	General Cost Inflation	-	-	-	-	-	-
	Small Tools and Minor Equip	1	General Cost Inflation	4,750	4,900	5,054	5,213	5,377	5,547
	Professional Ser	3	Labor Cost Inflation	76,500	80,325	84,341	88,558	92,986	97,636
	Communication	1	General Cost Inflation	4,500	4,642	4,788	4,939	5,094	5,255
	Travel	1	General Cost Inflation	250	258	266	274	283	292
	Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
	Insurance	3	Labor Cost Inflation	-	-	-	-	-	-
	Public Utility	1	General Cost Inflation	-	-	-	-	-	-
	Repairs & Maintenance	3	Labor Cost Inflation	-	-	-	-	-	-
	Miscellaneous	1	General Cost Inflation	10,750	11,089	11,438	11,798	12,170	12,553
	Interfund Profess. Serv.	1	General Cost Inflation	274,981	283,641	292,574	301,789	311,293	321,098
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	43,165	44,524	45,927	47,373	48,865	50,404
	Total Admin/Gen			**523,048**	**542,892**	**563,530**	**584,994**	**607,320**	**630,545**

City of Camas
Sewer Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013
170	**Customer Services**								
	Regular Salaries	3	Labor Cost Inflation	-	-	-	-	-	-
	Overtime	3	Labor Cost Inflation	-	-	-	-	-	-
	Personnel Benefits	3	Labor Cost Inflation	-	-	-	-	-	-
	Office and Operating Supplies	1	General Cost Inflation	3,000	3,094	3,192	3,292	3,396	3,503
	Small Tools and Minor Equip	1	General Cost Inflation	-	-	-	-	-	-
	Professional Ser	3	Labor Cost Inflation	12,500	13,125	13,781	14,470	15,194	15,954
	Communication	1	General Cost Inflation	375	387	399	412	425	438
	Travel	1	General Cost Inflation	-	-	-	-	-	-
	Operating Rentals and Leases	1	General Cost Inflation	-	-	-	-	-	-
	Repairs & Maintenance	3	Labor Cost Inflation	1,000	1,050	1,103	1,158	1,216	1,276
	Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-
	Interfund Profess. Serv.	1	General Cost Inflation	-	-	-	-	-	-
	Intfund Oper. Rentals & Lease	1	General Cost Inflation	-	-	-	-	-	-
	Total Customer Services			**16,875**	**17,656**	**18,475**	**19,332**	**20,230**	**21,171**
	Other Additions								
	Step Tank Pumping	1	General Cost Inflation	150,000	154,724	159,597	164,624	169,808	175,157
	Total Other Additions			**150,000**	**154,724**	**159,597**	**164,624**	**169,808**	**175,157**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 2,685,081**	**$ 2,808,286**	**$ 2,914,495**	**$ 3,025,097**	**$ 3,140,399**	**$ 3,260,227**
	Depreciation Expense in	2007	$ 970,219						
	Depreciation Expense		*Last year's plus annual additions from CIP*	$ 1,012,219	$ 1,056,459	$ 1,218,931	$ 1,380,617	$ 1,479,179	$ 1,496,576
	TOTAL EXPENSES			**$ 3,697,300**	**$ 3,864,745**	**$ 4,133,427**	**$ 4,405,714**	**$ 4,619,578**	**$ 4,756,803**

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1- Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1	BIOSOLIDS LAND APPLICATION	$ 100,000	2008	20	2%	98%	1 Enterprise Fund	$ 2,000	$ 98,000	$ 100,000
2	"	-	2009	20	2%	98%	1 Enterprise Fund	-	-	-
3	"	-	2010	20	2%	98%	1 Enterprise Fund	-	-	-
4	LACAMAS CREEK LAND ACQUISITION	50,000	2014	50	100%	0%	1 Enterprise Fund	50,000	-	70,926
5	JOY TO MAIN STATION DESIGN	150,000	2014	50	0%	100%	1 Enterprise Fund	-	150,000	212,778
6	STP ROTARY SCREEN REPLACE	150,000	2008	50	0%	100%	1 Enterprise Fund	-	150,000	150,000
7	SEWER MAIN REPLACE (NW 6th, et. al.)	1,400,000	2008	50	0%	100%	1 Enterprise Fund	-	1,400,000	1,400,000
8	STP Upgrade	2,000,000	2009	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	2,000,000
9	SANITARY PS UPGRADES	200,000	2008	50	10%	90%	1 Enterprise Fund	20,000	180,000	200,000
10	SEWER FACILITY PLAN UPDATE	100,000	2008	50	50%	50%	1 Enterprise Fund	50,000	50,000	100,000
11	STP UPGRADE START	7,000,000	2010	50	50%	50%	1 Enterprise Fund	3,500,000	3,500,000	7,000,000
12	"	6,000,000	2011	50	50%	50%	1 Enterprise Fund	3,000,000	3,000,000	6,000,000
13	" Dryer	2,500,000	2012	50	50%	50%	1 Enterprise Fund	1,250,000	1,250,000	2,500,000
14	ANNUAL PS UPGRADES	200,000	2009	50	10%	90%	1 Enterprise Fund	20,000	180,000	212,000
15	LACAMAS CREEK PS UPGRADE(FORCEMAIN)	1,500,000	2015	50	100%	0%	2 Grants/Developer Donation	1,500,000	-	2,255,445
16	JOY TO MAIN STATION CONSTRUCTION	1,000,000	2015	50	100%	0%	1 Enterprise Fund	1,000,000	-	1,503,630
17	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2014	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,730,593
18	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2014	50	100%	0%	1 Enterprise Fund			
19	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2015	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,834,429

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
20	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2015	50	100%	0%	1 Enterprise Fund			
21	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2016	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,944,495
22	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2016	50	100%	0%	1 Enterprise Fund			
23	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2017	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,736,440
24	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2017	50	100%	0%	1 Enterprise Fund			
25	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2018	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,805,898
26	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2018	50	100%	0%	1 Enterprise Fund			
27	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2019	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,878,134
28	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2019	50	100%	0%	1 Enterprise Fund			
29	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2020	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	1,953,259
30	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2020	50	100%	0%	1 Enterprise Fund			
31	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2021	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,031,390
32	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2021	50	100%	0%	1 Enterprise Fund			
33	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2022	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,112,645
34	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2022	50	100%	0%	1 Enterprise Fund			
35	G&O NUEA SANITARY (total 18,300,000) 10% (2/3) Developer	1,220,000	2023	50	100%	0%	2 Grants/Developer Donation	1,220,000	-	2,197,151
36	G&O NUEA SANITARY (total 18,300,000) 10% (1/3) City	610,000	2023	50	100%	0%	1 Enterprise Fund			
37	WEST CAMAS FORCE MAIN-SOUTH PH	1,000,000	2012	50	60%	40%	1 Enterprise Fund	600,000	400,000	1,262,477
38	COLLECTION SYSTEM UPGRADES	1,500,000	2014	50	20%	80%	1 Enterprise Fund	300,000	1,200,000	2,127,779
39	"	2,000,000	2015	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	3,007,261
40	"	2,000,000	2016	50	20%	80%	1 Enterprise Fund	400,000	1,600,000	3,187,696
41	"	2,500,000	2017	50	20%	80%	1 Enterprise Fund	500,000	2,000,000	3,558,280
42	"	1,428,571	2018	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,114,635
43	"	1,428,571	2019	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,199,220
44	"	1,428,571	2020	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,287,189
45	"	1,428,571	2021	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,378,676

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
46	"	1,428,571	2022	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,473,823
47	"	1,428,571	2023	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,572,776
48	"	1,428,571	2024	50	20%	80%	1 Enterprise Fund	285,714	1,142,857	2,675,687
49	"	1,714,286	2025	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,339,258
50	"	1,714,286	2026	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,472,828
51	"	1,714,286	2027	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	3,611,741
52	"	1,714,286	2028	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
53	"	1,714,286	2029	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
54	"	1,714,286	2030	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
55	"	1,714,286	2031	50	20%	80%	1 Enterprise Fund	342,857	1,371,429	-
56	PUMP STATION UPGRADES	250,000	2010	50	10%	90%	1 Enterprise Fund	25,000	225,000	280,900
57	"	250,000	2011	50	10%	90%	1 Enterprise Fund	25,000	225,000	297,754
58	"	250,000	2012	50	10%	90%	1 Enterprise Fund	25,000	225,000	315,619
59	"	250,000	2013	50	10%	90%	1 Enterprise Fund	25,000	225,000	334,556
60	"	250,000	2014	50	10%	90%	1 Enterprise Fund	25,000	225,000	354,630
61	"	250,000	2015	50	10%	90%	1 Enterprise Fund	25,000	225,000	375,908
62	"	250,000	2016	50	10%	90%	1 Enterprise Fund	25,000	225,000	398,462
63	"	250,000	2017	50	10%	90%	1 Enterprise Fund	25,000	225,000	355,828
64	"	250,000	2018	50	10%	90%	1 Enterprise Fund	25,000	225,000	370,061
65	"	250,000	2019	50	10%	90%	1 Enterprise Fund	25,000	225,000	384,864
66	"	250,000	2020	50	10%	90%	1 Enterprise Fund	25,000	225,000	400,258

City of Camas
Sewer Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation % Upgrade / Expansion	For CFC Calculation % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
67	STP UPGRADE CLOSE-OUT (15%)	850,000	2012	50	50%	50%	1 Enterprise Fund	425,000	425,000	850,000
68	STEP BYPASS LINE, PH. I NUGAE	1,500,000	2014	50	100%	0%	1 Enterprise Fund	1,500,000	-	2,127,779
69	STEP BYPASS LINE, PH. II (SR-14?) NUGAE	1,700,000	2015	50	100%	0%	1 Enterprise Fund	1,700,000	-	2,556,171
70	"	250,000	2016	50	100%	0%	1 Enterprise Fund	250,000	-	398,462
71	TRANSMISSION TRUNK (WEST) TO MAIN STATION	1,500,000	2011	50	0%	100%	1 Enterprise Fund	-	1,500,000	1,786,524
72	PARKER PUMP STATION REPLACEMENT	1,500,000	2014	50	30%	70%	1 Enterprise Fund	450,000	1,050,000	2,127,779
73	WWTF PLAN UPDATE	400,000	2013	50	50%	50%	1 Enterprise Fund	200,000	200,000	535,290
74	"	400,000	2021	50	50%	50%	1 Enterprise Fund	200,000	200,000	666,029
75	38th AVENUE SEWER LINE	750,000	2010	50	100%	0%	1 Enterprise Fund	750,000	-	842,700
76	STP UPGRADE: EQUIPMENT REPLACE	5,000,000	2015	50	0%	100%	1 Enterprise Fund	-	5,000,000	7,518,151
77	STP UPGRADE: DEMO G.P. CONNECTIONS RELAY ADAMS (UPS	1,000,000	2021	50	0%	100%	1 Enterprise Fund	-	1,000,000	1,665,074
78	TREATMENT PLAN EXPANSION (new plnt)	20,026,000	2021	50	100%	0%	1 Enterprise Fund	20,026,000	-	33,344,762
79					100%	0%	1 Enterprise Fund	-	-	-
	Total Capital Projects	**$ 109,276,000**			**56%**	**44%**		**$ 55,368,000**	**$ 47,808,000**	**$ 141,486,102**
	Total Upgrade/Expansion Projects									81,177,244
	Total R&R Projects									60,308,858
	Projects by Grants / Developer Donations							13,700,000	-	21,479,880
	Projects by Enterprise Fund							41,668,000	47,808,000	120,006,222

Year	2008 $	Inflated
2008	1,950,000	1,950,000
2009	2,200,000	2,212,000
2010	8,000,000	8,123,600
2011	7,750,000	8,084,278
2012	4,600,000	4,928,096
2013	650,000	869,847
Total	**25,150,000**	**26,167,821**

City of Camas
Sewer Utility Rate Study
Existing Debt Input

Existing Debt Service - Revenue Bonds		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Water & Sewer Revenue Bonds	26.00%										
Annual Interest Payment		$ 64,999	$ 62,955	$ 60,800	$ 58,535	$ 56,215	$ 53,355	$ 50,365	$ 47,245	$ 43,930	$ 40,485
Annual Principal Payment		48,100	50,700	53,300	54,600	57,200	59,800	62,400	66,300	68,900	72,800
Total Annual Payment		$ 113,099	$ 113,655	$ 114,100	$ 113,135	$ 113,415	$ 113,155	$ 112,765	$ 113,545	$ 112,830	$ 113,285
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Water and Sewer Revenue and Refunding Bonds 1998	100% Sewer										
Annual Interest Payment		$ 137,514	$ 125,456	$ 111,498	$ 96,840	$ 81,473	$ 65,293	$ 47,971	$ 29,485	$ 10,013	$ -
Annual Principal Payment		265,000	335,000	350,000	365,000	380,000	395,000	415,000	430,000	450,000	-
Total Annual Payment		$ 402,514	$ 460,456	$ 461,498	$ 461,840	$ 461,473	$ 460,293	$ 462,971	$ 459,485	$ 460,013	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 3											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 4											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
REVENUE BOND 5											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Use of Debt Reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
TOTAL REVENUE BONDS											
Annual Interest Payment		$ 202,513	$ 188,411	$ 172,298	$ 155,375	$ 137,687	$ 118,647	$ 98,336	$ 76,730	$ 53,942	$ 40,485
Annual Principal Payment		313,100	385,700	403,300	419,600	437,200	454,800	477,400	496,300	518,900	72,800
Total Annual Payment		$ 515,613	$ 574,111	$ 575,598	$ 574,975	$ 574,887	$ 573,447	$ 575,736	$ 573,030	$ 572,842	$ 113,285
Use of Debt reserve for Debt Service		-	-	-	-	-	-	-	-	-	-
Annual Debt Reserve Target on Existing Revenue Bonds		575,736	575,736	575,736	575,736	575,736	575,736	575,736	573,030	572,842	113,610

City of Camas
Sewer Utility Rate Study
Existing Debt Input

Existing Debt Service - PWTF Loans		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
PW-07-962-PRE-104	5-Year Loan was converted into a 20 Year										
Annual Interest Payment		$ 3,385	$ 5,000	$ 4,750	$ 4,500	$ 4,250	$ 4,000	$ 3,750	$ 3,500	$ 3,250	$ 3,000
Annual Principal Payment		-	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Total Annual Payment		$ 3,385	$ 55,000	$ 54,750	$ 54,500	$ 54,250	$ 54,000	$ 53,750	$ 53,500	$ 53,250	$ 53,000
			$1,000,000	$950,000	$900,000	$850,000	$800,000	$750,000	$700,000	$650,000	$600,000
PW-99-791-006											
Annual Interest Payment		$ 20,291	$ 18,600	$ 16,909	$ 15,218	$ 13,527	$ 11,836	$ 10,146	$ 8,455	$ 6,764	$ 5,073
Annual Principal Payment		169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092	169,092
Total Annual Payment		$ 189,383	$ 187,692	$ 186,001	$ 184,310	$ 182,619	$ 180,929	$ 179,238	$ 177,547	$ 175,856	$ 174,165
DOE Loan											
Annual Interest Payment		$ 265,088	$ 248,886	$ 232,012	$ 214,440	$ 196,140	$ 177,082	$ 157,234	$ 136,564	$ 115,039	$ 92,621
Annual Principal Payment		391,170	407,372	424,245	441,818	460,118	479,176	499,024	519,693	541,219	563,637
Total Annual Payment		$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258	$ 656,258
STP Clarifier (DOE Loan)											
Annual Interest Payment		$ 28,858	$ 26,257	$ 23,542	$ 20,710	$ 17,754	$ 14,670	$ 11,452	$ 8,094	$ 4,590	$ 934
Annual Principal Payment		59,856	62,457	65,172	68,004	70,960	74,044	77,262	80,620	84,124	43,423
Total Annual Payment		$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 88,714	$ 44,357
Public Works Trust Fund Loan											
Annual Interest Payment	50%	$ -	$ 400	$ 400	$ 300	$ 200	$ 100	$ -	$ -	$ -	$ -
Annual Principal Payment		-	20,000	20,000	20,000	20,000	20,000	-	-	-	-
Total Annual Payment		$ -	$ 20,400	$ 20,400	$ 20,300	$ 20,200	$ 20,100	$ -	$ -	$ -	$ -
Public Works Trust Fund Loan - WWTP Pre-Construction											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Public Works Trust Fund Loan - WWTP Construction											
Annual Interest Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Principal Payment		-	-	-	-	-	-	-	-	-	-
Total Annual Payment		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
TOTAL PWTF LOANS											
Annual Interest Payment		$ 317,623	$ 299,143	$ 277,614	$ 255,168	$ 231,871	$ 207,688	$ 182,581	$ 156,613	$ 129,642	$ 101,627
Annual Principal Payment		620,118	708,921	728,509	748,914	770,170	792,312	795,378	819,406	844,436	826,152
Total Annual Payment		$ 937,740	$ 1,008,064	$ 1,006,123	$ 1,004,082	$ 1,002,041	$ 1,000,000	$ 977,959	$ 976,018	$ 974,078	$ 927,780

City of Camas
Sewer Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2008 - 2015 TOTAL
CAPITAL PROJECTS							
Improvement Upgrades & Expansions	$ 72,000	$ 421,200	$ 4,370,790	$ 3,029,775	$ 2,464,048	$ 301,101	$ 10,658,914
Repairs and Replacements	1,878,000	1,790,800	3,752,810	5,054,503	2,464,048	568,746	15,508,907
TOTAL CAPITAL EXPENDITURES	**$ 1,950,000**	**$ 2,212,000**	**$ 8,123,600**	**$ 8,084,278**	**$ 4,928,096**	**$ 869,847**	**$ 26,167,821**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	TOTAL
Existing PWTF/ Bond Proceeds	$ 1,435,200	$ -	$ -	$ -	$ -	$ -	$ 1,435,200
Project Specific Grants / Developer Donations	250,000	-	-	-	-	-	250,000
Project to be Funded	264,800	2,212,000	8,123,600	8,084,278	4,928,096	869,847	24,482,621
OTHER FUNDING SOURCES [NOTE A]							
Other Outside Sources							$ -
PWTF Loan Proceeds		2,020,000	7,980,000				10,000,000
Other Loan Proceeds							-
Connection Charges	186,163	186,163	186,163	186,163	186,163	186,163	1,116,979
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(78,637)	(5,837)	-	(7,898,115)	(4,741,933)	(683,683)	(13,408,205)
Capital Fund Balance	78,637	5,837	-	540,169	222,303	366,744	1,213,689
Capital Fund Balance Deficiency	-	-	-	(7,357,946)	(4,519,630)	(316,940)	(12,194,516)
Revenue Bond Proceeds [Note B]	-	-	-	7,550,000	4,720,000	520,000	12,790,000
Rates							
Total							

City of Camas
Sewer Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Existing Debt Service	1,453,353	1,582,175	1,581,721	1,579,057	1,576,928	1,573,447
New Debt Service	-	10,100	156,316	1,249,112	1,667,422	1,711,165
Rate-Funded CIP	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-
Total Expenses	$ 4,138,434	$ 4,400,561	$ 4,652,532	$ 5,853,266	$ 6,384,749	$ 6,544,840
REVENUES						
Rate Revenue	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Other Revenue	127,500	131,516	135,658	139,930	144,337	148,883
Operating Fund & Debt Reserve Fund Interest Earnings	125,000	5,477	5,761	14,994	36,352	50,403
Total Revenue	$ 3,633,154	$ 3,568,356	$ 3,624,253	$ 3,690,001	$ 3,768,792	$ 3,841,211
NET CASH FLOW (DEFICIENCY)	**$ (505,280)**	**$ (832,204)**	**$ (1,028,279)**	**$ (2,163,265)**	**$ (2,615,957)**	**$ (2,703,629)**
		80,243				

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013
EXPENSES						
Cash Operating Expenses	$ 2,685,081	$ 2,808,285	$ 2,914,495	$ 3,025,097	$ 3,140,399	$ 3,260,227
Revenue Bond Debt Service	515,613	574,111	575,598	1,248,303	1,669,156	1,714,091
Revenue Bond Coverage Requirement at 1.25	128,903	143,528	143,899	312,076	417,289	428,523
Total Expenses	$ 3,329,597	$ 3,525,925	$ 3,633,992	$ 4,585,475	$ 5,226,844	$ 5,402,841
ALLOWABLE REVENUES						
Rate Revenue	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Other Revenue	127,500	131,516	135,658	139,930	144,337	148,883
Interest Earnings - All Funds	125,000	11,736	12,034	31,899	42,891	56,879
Total Revenue	$ 3,633,154	$ 3,574,616	$ 3,630,526	$ 3,706,906	$ 3,775,332	$ 3,847,686
Coverage Realized	1.84	1.33	1.24	0.55	0.38	0.34
COVERAGE SURPLUS (DEFICIENCY)	**$ 303,557**	**$ 48,691**	**$ (3,467)**	**$ (878,569)**	**$ (1,451,513)**	**$ (1,555,155)**

City of Camas
Sewer Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 505,280	$ 832,204	$ 1,028,279	$ 2,163,265	$ 2,615,957	$ 2,703,629
less: Net Revenue From Prior Rate Increases	-	-	(1,138,550)	(1,638,408)	(2,204,949)	(2,697,196)
Revenue Deficiency	$ 505,280	$ 832,204	$ -	$ 524,856	$ 411,008	$ 6,433
Plus: Adjustment for State Excise Tax	20,243	33,341	-	21,027	16,466	258
Total Revenue Deficiency	**$ 525,523**	**$ 865,545**	**$ -**	**$ 545,884**	**$ 427,474**	**$ 6,690**

Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenue with no Increase	$ 3,380,654	$ 3,431,364	$ 3,482,834	$ 3,535,077	$ 3,588,103	$ 3,641,924
Revenues from Prior Rate Increases	-	-	1,184,164	1,704,048	2,293,287	2,805,255
Rate Revenue Before Rate Increase (Incl. previous increases)	3,380,654	3,431,364	4,666,998	5,239,125	5,881,390	6,447,179
Required Annual Rate Increase	15.55%	25.22%	0.00%	10.42%	7.27%	0.10%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*15.55%*	*33.63%*	*0.00%*	*10.42%*	*7.27%*	*0.10%*
Policy Induced Rate Increases	0.00%	34.00%	10.60%	10.60%	8.00%	3.00%
ANNUAL RATE INCREASE	**0.00%**	**34.00%**	**10.60%**	**10.60%**	**8.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**34.00%**	**48.20%**	**63.91%**	**77.03%**	**82.34%**
						4.78%

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013
Rate Revenues After Rate Increase	$ 3,380,654	$ 4,306,362	$ 5,161,700	$ 5,794,472	$ 6,351,901	$ 6,640,595
Full Year Rate Revenues After Rate Increase	*3,380,654*	*4,598,028*	*5,161,700*	*5,794,472*	*6,351,901*	*6,640,595*
Additional State Taxes Due to Rate Increases	-	33,705	64,670	87,032	106,461	115,509
Net Cash Flow After Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
Coverage After Rate Increase	1.84	2.80	4.05	2.29	1.97	2.02

City of Camas
Sewer Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013
OPERATING FUND						
Beginning Balance	$ 479,154	$ 175,000	$ 184,088	$ 479,095	$ 488,194	$ 516,230
plus: Net Cash Flow after Rate Increase	(505,280)	9,088	585,917	9,099	41,379	179,532
less: Transfer of Surplus to Capital Fund	-	-	(290,910)	-	(13,343)	(159,835)
Ending Balance	$ (26,127)	$ 184,088	$ 479,095	$ 488,194	$ 516,230	$ 535,928
Minimum Target Balance	*441,383*	*461,636*	*479,095*	*497,276*	*516,230*	*535,928*
Maximum Funds to be Kept as Operating Reserves	*441,383*	*461,636*	*479,095*	*497,276*	*516,230*	*535,928*
Info: No of Days of Cash Operating Expenses	*(4)*	*24*	*60*	*59*	*60*	*60*
CAPITAL FUND						
Beginning Balance	$ 1,052,178	$ 200,000	$ 200,423	$ 540,169	$ 208,959	$ 206,909
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	250,000	-	-	-	-	-
plus: Existing / New PWTF / Existing Bond Proceeds	1,435,200	2,020,000	7,980,000	-	-	-
plus: System Development Charges	186,163	186,163	186,163	186,163	186,163	186,163
plus: Net Debt Proceeds Available for Projects	-	-	-	7,550,000	4,720,000	520,000
plus: Interest Earnings	32,930	6,259	6,273	16,905	6,540	6,476
plus: Transfer of Surplus from Operating Fund	-	-	290,910	-	13,343	159,835
plus: Direct Rate Funding	-	-	-	-	-	-
Total Capital Funding Sources	**2,956,471**	**2,412,423**	**8,663,769**	**8,293,237**	**5,135,006**	**1,079,383**
less: Capital Expenditures	(1,950,000)	(2,212,000)	(8,123,600)	(8,084,278)	(4,928,096)	(869,847)
Ending Balance	**$ 1,006,471**	**$ 200,423**	**$ 540,169**	**$ 208,959**	**$ 206,909**	**$ 209,536**
Minimum Target Balance	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000
DEBT RESERVE						
Beginning Balance		$ -	$ -	$ -	$ 673,328	$ 1,094,269
plus: Reserve Funding from New Debt	-	-	-	673,328	420,941	46,375
less: Use of Reserves for Debt Service	-	-	-	-	-	-
Ending Balance	$ -	$ -	$ -	$ 673,328	$ 1,094,269	$ 1,140,644
Minimum Target Balance	*575,736*	*575,736*	*575,736*	*1,249,063*	*1,670,005*	*1,716,380*

Storm Water System

City of Camas
Storm Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966
Non-Rate Revenues	35,000	-	-	-	1,057	2,237
Total Revenues	**$ 552,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 560,828**	**$ 573,203**
Expenses						
Cash Operating Expenses	$ 322,726	$ 473,761	$ 571,805	$ 586,028	$ 600,678	$ 615,767
Street Cleaning	132,421	138,831	138,391	142,338	146,405	150,593
Administration / Taxes	57,300	97,754	136,407	119,519	122,583	125,739
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-
Rate Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550
Total Expenses	**$ 568,447**	**$ 740,646**	**$ 958,963**	**$ 966,987**	**$ 1,059,038**	**$ 1,239,649**
Net Surplus (Deficiency)	**$ (16,305)**	**$ (213,161)**	**$ (420,928)**	**$ (418,192)**	**$ (498,209)**	**$ (666,446)**
% of Rate Revenue	3.15%	40.41%	78.23%	76.20%	89.00%	116.72%
Annual Rate Adjustment	**0.00%**	**55.00%**	**20.00%**	**20.00%**	**3.00%**	**3.00%**
Rate Revenues After Rate Increase	$ 517,142	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008
Additional Taxes from Rate Increase	$ -	$ 3,264	$ 6,941	$ 10,142	$ 10,907	$ 11,716
Net Cash Flow After Rate Increase	**(16,305)**	**1,162**	**34,841**	**247,782**	**218,004**	**102,880**
Coverage After Rate Increases	n/a	n/a	n/a	n/a	n/a	n/a
Sample Monthly Residential Bill (1 EDU)	$ 4.45	$ 6.89	$ 8.27	$ 9.92	$ 10.22	$ 10.53
Monthly Increase	$ -	$ 2.45	$ 1.38	$ 1.65	$ 0.30	$ 0.31

Notes:

No revenue from NUGAE growth is assumed in the study period

2009 increase is in effect for 9 month (effective April)

City of Camas
Storm Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ (58,653)**	**$ (250,000)**	**$ (248,838)**	**$ (213,997)**	**$ 33,785**	**$ 71,479**
Net Cash Flow after Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880
Transfer of Surplus to Capital Fund	-	-	-	-	(180,309)	(101,036)
Ending Balance	$ (74,958)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323
	$ 42,119	*$ 58,385*	*$ 69,584*	*$ 69,689*	*$ 71,479*	*$ 73,323*
30 Day Target	(53)	(128)	(92)	15	30	30
Capital - Non FB						
Beginning Balance	**$ (36,000)**	**$ (25,000)**	**$ -**	**$ -**	**$ 0**	**$ 180,310**
plus: Rate Funded System Reinvestment	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	75,000	-	-	-	-	-
plus: Existing Revenue Bond and PWTF and Proceeds	-	-	-	-	-	-
plus: System Development Charges	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-
plus: Transfers from FB Capital Fund for FB Projects	220,000	68,900	95,506	279,889	170,434	247,961
plus: Rate Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550
plus: Interest Earnings	-	-	-	-	0	5,643
plus: Transfer of Surplus from Operating Fund	-	-	-	-	180,309	101,036
Total Capital Funding Sources	315,000	74,200	207,866	398,991	540,116	882,500
less: Capital Expenditures	(315,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)
Ending Balance	**-**	**-**	**-**	**0**	**180,310**	**286,990**
Capital - FB						
Beginning Balance	**$ 853,937**	**$ 775,000**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**
plus: Reserve Funding from New Debt	26,725	24,255	22,858	20,584	12,469	7,525
less: Transfer to Non-Fisher Basin Capital Fund for FB Capital	(220,000)	(68,900)	(95,506)	(279,889)	(170,434)	(247,961)
Ending Balance	**$ 660,662**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**	**$ -**

City of Camas
Storm Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013	2014
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
5	General Inflation plus Growth	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	Local / State Excise Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013	2014
FISCAL POLICY RESTRICTIONS							
Min. Op. Fund Balance Target (days of O&M expense)	30	30	30	30	30	30	30
Max. Op. Fund Balance (days of O&M expense)	30	30	30	30	30	30	30

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**

1 - Defined as % of Plant

		2008	2009	2010	2011	2012	2013	2014
Plant-in-Service in 2007	$ 10,770,683							
Minimum Capital Fund Balance - % of plant assets		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>		$ -	$ -	$ -	$ -	$ -	$ -	$ -

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments

	2008	2009	2010	2011	2012	2013	2014
3 - Equal to Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -	$ -

4 - Do Not Fund System Reinvestment

City of Camas
Storm Utility Rate Study
Assumptions

Capital Financing Assumptions

		2008	2009	2010	2011	2012	2013	2014
System Development Charges								
Select SDC Alternative	1	Current Charge is in use						
1 - User Input (Current Charge)	$ -							
2 - Calculated Charge	$ -							
Total Customer Equivalents		-	-	-	-	-	-	-
Connection Charge		$ -	$ -	$ -	$ -	$ -	$ -	$ -
REVENUE BONDS								
Term (years)		20	20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Revenue Bond Coverage Requirement	1.25							
PWTF LOAN								
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]								
Term (years)		20	20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
Rate revenues									
Storm Drainage - O&M Fisher Basin	4	Customer Growth	$ 121,274	123,699	126,173	128,696	131,270	133,896	136,574
Storm Drainage Revenues - Capital	4	Customer Growth	79,846	81,443	83,072	84,733	86,428	88,156	89,920
Strom Drainage Revenues - O&M Non Fisher B	4	Customer Growth	316,022	322,343	328,790	335,365	342,073	348,914	355,892
Total Rate revenue			**$ 517,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 559,771**	**$ 570,966**	**$ 582,386**
Non-rate revenues [a]									
Miscellaneous	1	General Cost Inflation	-	-	-	-	-	-	-
Interest Income		Calculated	35,000	-	-	-	1,057	2,237	2,295
	1	General Cost Inflation	-	-	-	-	-	-	-
Total Non-rate revenues			**$ 35,000**	**$ - **	**$ - **	**$ - **	**$ 1,057**	**$ 2,237**	**$ 2,295**
TOTAL REVENUES			**$ 552,142**	**$ 527,485**	**$ 538,034**	**$ 548,795**	**$ 560,828**	**$ 573,203**	**$ 584,681**

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

			FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
Expenditures										
53	**Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 7,097	$ 7,097	$ 8,071	$ 8,382	$ 8,562	$ 8,748	$ 8,920
300	**Operations and Maintenance**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 53,162	$ 69,240	$ 143,973	$ 148,292	$ 152,741	$ 157,323	$ 162,043
12	Overtime	3	Labor Cost Inflation	500	500	500	500	500	500	500
21	Personnel Benefits	3	Labor Cost Inflation	17,971	22,641	50,390	51,902	53,459	55,063	56,715
31	Office and Operating Supplies	1	General Cost Inflation	500	500	-	-	-	-	-
35	Small Tools and Minor Equipment	1	General Cost Inflation	4,000	4,000	4,000	4,000	4,000	4,000	4,000
41	Professional Services	3	Labor Cost Inflation	40,000	29,335					
45	Operating Rentals	1	General Cost Inflation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
46	Insurance	3	Labor Cost Inflation	3,396	3,396	3,498	3,603	3,711	3,822	3,937
48	Repairs and Maintenance	1	General Cost Inflation	65,000	62,750					
	TV and cleaning program	1	General Cost Inflation	-	-	30,000	30,000	30,000	30,000	30,000
	ditch cleaning	1	General Cost Inflation	-	-	15,000	15,000	15,000	15,000	15,000
	pond cleaning	1	General Cost Inflation	-	-	10,000	10,000	10,000	10,000	10,000
	miscellaneous repairs	1	General Cost Inflation	-	-	20,000	20,000	20,000	20,000	20,000
	stencil program	1	General Cost Inflation	-	-	5,000	5,000	5,000	5,000	5,000
49	Miscellaneous	1	General Cost Inflation	6,200	6,200	6,200	6,200	6,200	6,200	6,200
51	Intergovernmental services	1	General Cost Inflation	6,000	6,000	6,000	6,000	6,000	6,000	6,000
95	Interfund Operating Rentals and Leases	1	General Cost Inflation	25,333	58,847	60,612	62,431	64,304	66,233	68,220
91	Intfund Profess Serv	1	General Cost Inflation	99,664	209,352	215,632	222,100	228,763	235,626	242,695
	Total Operations and Maintenance			**$ 322,726**	**$ 473,761**	**$ 571,805**	**$ 586,028**	**$ 600,678**	**$ 615,767**	**$ 631,309**

City of Camas
Storm Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 2014
315	**Street Cleaning**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 49,073	$ 50,058	$ 50,787	$ 52,311	$ 53,880	$ 55,497	$ 57,161
21	Personnel Benefits	3	Labor Cost Inflation	16,548	20,023	16,995	17,505	18,030	18,571	19,128
31	Supplies	5	General Inflation plus Growth	100	100	100	100	100	100	100
48	Other Services and Charges (cath basin cleanir	1	General Cost Inflation	6,700	6,700	6,700	6,700	6,700	6,700	6,700
95	Interfund Payments for Services	5	General Inflation plus Growth	60,000	61,950	63,809	65,723	67,694	69,725	71,817
	Total Street Cleaning			**$ 132,421**	**$ 138,831**	**$ 138,391**	**$ 142,338**	**$ 146,405**	**$ 150,593**	**$ 154,907**
318	**Administration**									
11	Salaries and Wages	3	Labor Cost Inflation	$ 22,208	$ 28,471	$ 44,572	$ 45,909	$ 47,287	$ 48,705	$ 50,166
21	Personnel Benefits	3	Labor Cost Inflation	7,995	10,842	15,600	16,068	16,550	17,047	17,558
41	Other Services and Charges (rate study and lic	3	Labor Cost Inflation	20,000	5,000	-	-	-	-	-
	Education program	1	General Cost Inflation	-	-	10,000	10,000	10,000	10,000	10,000
	code rewrite	1	General Cost Inflation	-	-	-	-	-	-	-
	mapping consultant	1	General Cost Inflation	-	-	20,000				
	Inspection and maintenance procedure	1	General Cost Inflation	-	-	-	-	-	-	-
	rate study	1	General Cost Inflation	-	-	-	-	-	-	20,000
49	Miscellaneous	1	General Cost Inflation	-	2,500					
49	Training	1	General Cost Inflation	-	-	5,000	5,000	5,000	5,000	5,000
95	Interfund Oper. Rentals & Leases	1	General Cost Inflation	-	43,844	33,164	34,159	35,184	36,239	37,326
	Total Administration			**$ 50,203**	**$ 90,657**	**$ 128,337**	**$ 111,137**	**$ 114,021**	**$ 116,991**	**$ 140,051**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 512,447**	**$ 710,346**	**$ 846,603**	**$ 847,885**	**$ 869,666**	**$ 892,099**	**$ 935,187**
Depreciation Expense in		2006								
	Depreciation Expense [b]		*Last year's plus annual additions from CIP*	$ 6,300	$ 7,784	$ 11,941	$ 19,921	$ 45,634	$ 57,544	$ 67,899
	TOTAL EXPENSES			**$ 518,747**	**$ 718,130**	**$ 858,544**	**$ 867,806**	**$ 915,299**	**$ 949,643**	**$ 1,003,086**

City of Camas
Storm Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source (1-Enterprise Fund, 2-Grants & Developer Donations)		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1	**Fisher Basin CIP**							Select Source	$ -	$ -	$ -
2	Professional Services	50,000	2008	50	100%	0%	1	Enterprise Fund	50,000	-	50,000
3	Wetland Mitigation Enhancement	35,000	2009	50	50%	50%	1	Enterprise Fund	17,500	17,500	37,100
4	"	35,000	2010	50	50%	50%	1	Enterprise Fund	17,500	17,500	39,326
5	"	35,000	2011	50	50%	50%	1	Enterprise Fund	17,500	17,500	41,686
6	"	35,000	2012	50	50%	50%	1	Enterprise Fund	17,500	17,500	44,187
7	"	35,000	2013	50	50%	50%	1	Enterprise Fund	17,500	17,500	46,838
8	"	35,000	2014	50	50%	50%	1	Enterprise Fund	17,500	17,500	49,648
9	Develop Capital Plan	50,000	2012	6	50%	50%	1	Enterprise Fund	25,000	25,000	63,124
10	Other Improvements	170,000	2008	50	50%	50%	1	Enterprise Fund	85,000	85,000	170,000
11	1/2 decant facility with Washougal	5,000	2009	50	50%	50%	1	Enterprise Fund	2,500	2,500	5,300
12	misc. drainage improvements	25,000	2009	50	50%	50%	1	Enterprise Fund	12,500	12,500	26,500
13	"	50,000	2010	50	50%	50%	1	Enterprise Fund	25,000	25,000	56,180
14	"	50,000	2011	50	50%	50%	1	Enterprise Fund	25,000	25,000	59,551
15	"	50,000	2012	50	50%	50%	1	Enterprise Fund	25,000	25,000	63,124
16	"	50,000	2013	50	50%	50%	1	Enterprise Fund	25,000	25,000	66,911
17	"	50,000	2014	50	50%	50%	1	Enterprise Fund	25,000	25,000	70,926
18	payments for major road improvements in grass valley	150,000	2011	50	50%	50%	1	Enterprise Fund	75,000	75,000	178,652
19	"	200,000	2013	50	50%	50%	1	Enterprise Fund	100,000	100,000	267,645
20					100%	0%	1	Enterprise Fund	-	-	-
21	**Non-Fisher Basin CIP**				100%	0%	1	Enterprise Fund	-	-	-
22	develop capital plan	50,000	2012	6	100%	0%	1	Enterprise Fund	50,000	-	63,124
23	Other Improvements	75,000	2008	50	50%	50%	1	Enterprise Fund	37,500	37,500	75,000
24	1/2 Decant facility with Washougal	5,000	2009	50	50%	50%	1	Enterprise Fund	2,500	2,500	5,300
25	capital reserve building for next permit cycle & payment	-	2009	50	50%	50%	1	Enterprise Fund	-	-	-
26	"	50,000	2010	50	50%	50%	1	Enterprise Fund	25,000	25,000	56,180
27	"	50,000	2011	50	50%	50%	1	Enterprise Fund	25,000	25,000	59,551
28	"	50,000	2012	50	50%	50%	1	Enterprise Fund	25,000	25,000	63,124

City of Camas
Storm Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source 1-Enterprise Fund, 2-Grants & Developer Donations	Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
29	"	50,000	2013	50	50%	50%	1 Enterprise Fund	25,000	25,000	66,911
30	"	50,000	2014	50	50%	50%	1 Enterprise Fund	25,000	25,000	70,926
31	Construction Projects	20,000	2008	50	50%	50%	1 Enterprise Fund	10,000	10,000	20,000
32	pipe replacement/rehab	-	2009	50	50%	50%	1 Enterprise Fund	-	-	-
33	"	50,000	2010	50	50%	50%	1 Enterprise Fund	25,000	25,000	56,180
34	"	50,000	2011	50	50%	50%	1 Enterprise Fund	25,000	25,000	59,551
35	"	50,000	2012	50	50%	50%	1 Enterprise Fund	25,000	25,000	63,124
36	"	110,000	2013	50	50%	50%	1 Enterprise Fund	55,000	55,000	147,205
37	"	115,000	2014	50	50%	50%	1 Enterprise Fund	57,500	57,500	163,130
	Total Capital Projects	**$ 1,885,000**			**53%**	**47%**		**$ 992,500**	**$ 892,500**	**$ 2,306,002**
	Total Upgrade/Expansion Projects									1,209,563
	Total R&R Projects									1,096,439
	Projects by Grants / Developer Donations							-	-	-
	Projects by Enterprise Fund							992,500	892,500	2,306,002

Year	2008 $	Inflated
2008	315,000	315,000
2009	70,000	74,200
2010	185,000	207,866
2011	335,000	398,990
2012	285,000	359,806
2013	445,000	595,510
2014	135,000	354,630
2015	-	-
Total	**1,770,000**	**2,306,002**

City of Camas
Storm Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2014	2008 - 2015 TOTAL
CAPITAL PROJECTS								
Improvement Upgrades & Expansions	$ 182,500	$ 37,100	$ 103,933	$ 199,495	$ 211,465	$ 297,755	$ 177,315	$ 1,209,563
Repairs and Replacements	132,500	37,100	103,933	199,495	148,341	297,755	177,315	1,096,439
TOTAL CAPITAL EXPENDITURES	**$ 315,000**	**$ 74,200**	**$ 207,866**	**$ 398,990**	**$ 359,806**	**$ 595,510**	**$ 354,630**	**$ 2,306,002**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	2014	TOTAL
Existing Revenue Bond and PWTF Proceeds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Project Specific Grants / Developer Donations	75,000	-	-	-	-	-	-	75,000
Project to be Funded	240,000	74,200	207,866	398,990	359,806	595,510	354,630	2,231,002
OTHER FUNDING SOURCES [NOTE A]								
Other Outside Sources								$ -
PWTF Loan Proceeds								-
Other Loan Proceeds								-
Connection Charges	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(240,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)	(354,630)	(2,231,002)
Capital Fund Balance	184,000	43,900	95,506	279,889	350,744	529,307	354,630	1,837,975
Capital Fund Balance Deficiency	(56,000)	(30,300)	(112,360)	(119,102)	(9,062)	(66,204)	-	(393,027)
Revenue Bond Proceeds [Note B]	-	-	-	-	-	-	-	-
Rates	56,000	30,300	112,360	119,102	189,372	347,550	354,630	
Total								

City of Camas
Storm Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
Existing Debt Service	-	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-	-
Rate-Funded CIP	56,000	30,300	112,360	119,102	189,372	347,550	354,630
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-	-
Total Expenses	$ 568,447	$ 740,646	$ 958,963	$ 966,987	$ 1,059,038	$ 1,239,649	$ 1,289,817
REVENUES							
Rate Revenue	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Other Revenue	-	-	-	-	-	-	-
Operating Fund & Debt Reserve Fund Interest Earnings	35,000	-	-	-	1,057	2,237	2,295
Total Revenue	$ 552,142	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 573,203	$ 584,681
NET CASH FLOW (DEFICIENCY)	**$ (16,305)**	**$ (213,161)**	**$ (420,928)**	**$ (418,192)**	**$ (498,209)**	**$ (666,446)**	**$ (705,137)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
Revenue Bond Debt Service	-	-	-	-	-	-	-
Revenue Bond Coverage Requirement at 1.25	-	-	-	-	-	-	-
Total Expenses	$ 512,447	$ 710,346	$ 846,603	$ 847,885	$ 869,666	$ 892,099	$ 935,187
ALLOWABLE REVENUES							
Rate Revenue	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Other Revenue	-	-	-	-	-	-	-
Interest Earnings - All Funds	35,000	-	-	-	1,057	7,880	11,277
Total Revenue	$ 552,142	$ 527,485	$ 538,034	$ 548,795	$ 560,828	$ 578,847	$ 593,662
Coverage Realized	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COVERAGE SURPLUS (DEFICIENCY)	**$ 39,695**	**$ (182,861)**	**$ (308,568)**	**$ (299,090)**	**$ (308,837)**	**$ (313,253)**	**$ (341,525)**

City of Camas
Storm Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013	2014
Sufficiency Test Driving the Deficiency	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ 16,305	$ 213,161	$ 420,928	$ 418,192	$ 498,209	$ 666,446	$ 705,137
less: Net Revenue From Prior Rate Increases	-	-	(291,480)	(464,884)	(679,293)	(730,538)	(784,712)
Revenue Deficiency	$ 16,305	$ 213,161	$ 129,448	$ -	$ -	$ -	$ -
Plus: Adjustment for State Excise Tax	248	3,246	1,971	-	-	-	-
Total Revenue Deficiency	**$ 16,553**	**$ 216,407**	**$ 131,420**	**$ -**	**$ -**	**$ -**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenue with no Increase	$ 517,142	$ 527,485	$ 538,034	$ 548,795	$ 559,771	$ 570,966	$ 582,386
Revenues from Prior Rate Increases	-	-	295,919	471,964	689,638	741,663	796,662
Rate Revenue Before Rate Increase (Incl. previous increases)	517,142	527,485	833,953	1,020,759	1,249,409	1,312,629	1,379,048
Required Annual Rate Increase	3.20%	41.03%	15.76%	0.00%	0.00%	0.00%	0.00%
Number of Months New Rates Will Be In Effect	12	9	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*3.20%*	*54.70%*	*15.76%*	*0.00%*	*0.00%*	*0.00%*	*0.00%*
Policy Induced Rate Increases	0.00%	55.00%	20.00%	20.00%	3.00%	3.00%	3.00%
ANNUAL RATE INCREASE	**0.00%**	**55.00%**	**20.00%**	**20.00%**	**3.00%**	**3.00%**	**3.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**55.00%**	**86.00%**	**123.20%**	**129.90%**	**136.79%**	**143.90%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenues After Rate Increase	$ 517,142	$ 745,072	$ 1,000,744	$ 1,224,911	$ 1,286,891	$ 1,352,008	$ 1,420,419
Full Year Rate Revenues After Rate Increase	*517,142*	*817,601*	*1,000,744*	*1,224,911*	*1,286,891*	*1,352,008*	*1,420,419*
Additional State Taxes Due to Rate Increases	-	3,264	6,941	10,142	10,907	11,716	12,571
Net Cash Flow After Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880	120,327
Coverage After Rate Increase	n/a	n/a	n/a	n/a	n/a	n/a	n/a

City of Camas
Storm Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
OPERATING FUND							
Beginning Balance	$ (58,653)	$ (250,000)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323
plus: Net Cash Flow after Rate Increase	(16,305)	1,162	34,841	247,782	218,004	102,880	120,327
less: Transfer of Surplus to Capital Fund	-	-	-	-	(180,309)	(101,036)	(116,785)
Ending Balance	$ (74,958)	$ (248,838)	$ (213,997)	$ 33,785	$ 71,479	$ 73,323	$ 76,865
Minimum Target Balance	*42,119*	*58,385*	*69,584*	*69,689*	*71,479*	*73,323*	*76,865*
Maximum Funds to be Kept as Operating Reserves	*42,119*	*58,385*	*69,584*	*69,689*	*71,479*	*73,323*	*76,865*
Info: No of Days of Cash Operating Expenses	*(53)*	*(128)*	*(92)*	*15*	*30*	*30*	*30*
CAPITAL FUND							
Beginning Balance	$ (36,000)	$ (25,000)	$ -	$ -	$ 0	$ 180,310	$ 286,990
plus: Rate Funded System Reinvestment	-	-	-	-	-	-	-
plus: Grants / Developer Donations / Other Outside Sources	75,000	-	-	-	-	-	-
plus: Existing Revenue Bond and PWTF and Proceeds	-	-	-	-	-	-	-
plus: System Development Charges	-	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-	-
plus: Transfers from FB Capital Fund for FB Projects	220,000	68,900	95,506	279,889	170,434	247,961	-
plus: Interest Earnings	-	-	-	-	0	5,643	8,982
plus: Transfer of Surplus from Operating Fund	-	-	-	-	180,309	101,036	116,785
plus: Direct Rate Funding	56,000	30,300	112,360	119,102	189,372	347,550	354,630
Total Capital Funding Sources	**315,000**	**74,200**	**207,866**	**398,991**	**540,116**	**882,500**	**767,386**
less: Capital Expenditures	(315,000)	(74,200)	(207,866)	(398,990)	(359,806)	(595,510)	(354,630)
Ending Balance	**$ -**	**$ -**	**$ -**	**$ 0**	**$ 180,310**	**$ 286,990**	**$ 412,757**
Minimum Target Balance	$ 221,714	$ 223,198	$ 227,355	$ 235,335	$ 242,531	$ 254,441	$ 261,534
DEBT RESERVE		(5,300)	(112,360)	(119,102)	(189,372)	(347,550)	(354,630)
Beginning Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -
plus: Reserve Funding from New Debt	-	-	-	-	-	-	-
less: Use of Reserves for Debt Service	-	-	-	-	-	-	-
Ending Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Minimum Target Balance	-	-	-	-	-	-	-

City of Camas
Storm Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
FISHER BASIN PROJECTS							
Beginning Balance	$ 853,937	$ 775,000	$ 730,355	$ 657,706	$ 398,402	$ 240,436	$ -
plus: Interest Earnings	26,725	24,255	22,858	20,584	12,469	7,525	-
less: Transfer to Non-Fisher Basin Capital Fund for FB Capital	(220,000)	(68,900)	(95,506)	(279,889)	(170,434)	(247,961)	-
Ending Balance	**$ 660,662**	**$ 730,355**	**$ 657,706**	**$ 398,402**	**$ 240,436**	$ -	$ -
Fisher Basin Projects	**220,000**	**68,900**	**95,506**	**279,889**	**170,434**	**381,394**	**120,574**
Cumulative Ending Fund Balance	**$ 585,704**	**$ 481,517**	**$ 443,709**	**$ 432,187**	**$ 492,225**	**$ 360,313**	**$ 489,621**

SANITATION SYSTEM

City of Camas
Sanitation Utility Rate Study
Summary

Revenue Requirements	2008	2009	2010	2011	2012	2013
Revenues						
Rate Revenues Under Existing Rates	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457
Non-Rate Revenues	55,500	35,401	26,492	27,390	28,402	29,301
Total Revenues	**$ 1,870,500**	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**
Expenses						
Cash Operating Expenses						
Disposal	$ 560,000	$ 565,020	$ 595,219	$ 643,205	$ 677,621	$ 713,836
Recycling	260,000	314,647	345,329	372,799	389,727	407,583
Collection	717,698	701,461	721,536	757,213	763,510	785,447
Customer Accounts / A&G / Taxes	285,561	238,217	239,574	246,268	253,902	261,006
Existing Debt Service	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-
Total Expenses	**$ 1,823,259**	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**
Net Surplus (Deficiency)	**$ 47,241**	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114**
% of Rate Revenue	0.00%	0.00%	0.00%	3.43%	2.09%	4.09%
Annual Rate Adjustment	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
Rate Revenues After Rate Increase	$ 1,815,000	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686
Additional Taxes from Rate Increase	$ -	$ -	$ 566	$ 1,167	$ 1,819	$ 2,508
Net Cash Flow After Rate Increase	**47,241**	**67,356**	**50,360**	**10,644**	**77,238**	**80,606**
Coverage After Rate Increases	n/a	n/a	n/a	n/a	n/a	n/a
Sample Monthly Bill (35 gallon can weekly)	$ 14.12	$ 14.12	$ 14.40	$ 14.69	$ 14.98	$ 15.28
Monthly Increase	$ -	$ -	$ 0.28	$ 0.29	$ 0.29	$ 0.30

Notes:

Starting 2012 Rate Revenue includes additional revenue from Lacams Heights

No revenue from NUGAE growth is assumed in the study period

City of Camas
Sanitation Utility Rate Study
Summary

Fund Balance	2008	2009	2010	2011	2012	2013
Operating:						
Beginning Balance	**$ 618,000**	**$ 455,500**	**$ 149,535**	**$ 156,301**	**$ 165,985**	**$ 171,350**
Net Cash Flow after Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606
Transfer of Surplus to Capital Fund	(515,384)	(373,321)	(43,595)	(960)	(71,873)	(73,775)
Ending Balance	$ 149,857	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181
	$ 149,857	*$ 149,535*	*$ 156,301*	*$ 165,985*	*$ 171,350*	*$ 178,181*
30 Day Target	30	30	30	30	30	30
Capital						
Beginning Balance	**$ 55,000**	**$ 344,500**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**
plus: Interest Earnings	1,721	10,782	12,021	13,762	14,222	16,917
plus: Transfer of Surplus from Operating Fund	515,384	373,321	43,595	960	71,873	73,775
less: Capital Expenditures	(55,000)	(344,500)	-	-	-	-
Ending Balance	**$ 517,105**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**	**$ 631,228**

City of Camas
Sanitation Utility Rate Study
Assumptions

Economic & Financial Factors

		2008	2009	2010	2011	2012	2013	2014
1	General Cost Inflation	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%	3.15%
2	Construction Cost Inflation	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
3	Labor Cost Inflation	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
4	Customer Growth*	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
5	General Inflation plus Growth	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%	5.21%
6	Connection Charge Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%
8	No Escalation	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Fund Earnings (5-year average of the LWGSIP)	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%	3.13%
	State B&O Tax	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%	1.50%

Accounting Assumptions

	2008	2009	2010	2011	2012	2013	2014
FISCAL POLICY RESTRICTIONS							
Min. Op. Fund Balance Target (days of O&M expense)	30	30	30	30	30	30	30
Max. Op. Fund Balance (days of O&M expense)	30	30	30	30	30	30	30

Minimum Capital Fund Balance Target

Select Minimum Capital Fund Balance Target	1	**Defined as % of Plant**

1 - Defined as % of Plant

Plant-in-Service in 2007 $ -

	2008	2009	2010	2011	2012	2013	2014
Minimum Capital Fund Balance - % of plant assets	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
2 - Amount at Right ==>	$ -	$ -	$ -	$ -	$ -	$ -	$ -

RATE FUNDED SYSTEM REINVESTMENT

Select Reinvestment Funding Strategy	3	**User Input**

Amount of Annual Cash Funding from Rates

1 - Equal to Annual Depreciation Expense
2 - Equal to Annual Depreciation Expense less Annual Debt Principal Payments
3 - Equal to Amount at Right ==> $ - $ - $ - $ - $ - $ - $ -
4 - Do Not Fund System Reinvestment

City of Camas
Sanitation Utility Rate Study
Assumptions

Capital Financing Assumptions		2008	2009	2010	2011	2012	2013	2014
REVENUE BONDS								
Term (years)		20	20	20	20	20	20	20
Interest Cost		5.00%	5.60%	5.60%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		2.00%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
Revenue Bond Coverage Requirement	1.25							
PWTF LOAN								
Term (years; 10 year minimum and no more than 20 years)		20	20	20	20	20	20	20
Interest Cost		2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
OTHER LOANS & REVENUE-SUPPORTED GENERAL OBLIGATION BONDS [a]								
Term (years)		20	20	20	20	20	20	20
Interest Cost		4.00%	4.00%	4.00%	5.00%	5.00%	5.00%	5.00%
Issuance Cost		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

[a] Tax-supported general obligation bonds are assumed to be accounted for in the General Fund; terms and annual obligations of such bonds are not factors in this analysis.

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

Revenues		FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
Rate revenues									
Residential Revenue	4	Customer Growth*	$ 1,170,000	1,193,400	1,217,268	1,241,613	1,309,578	1,335,769	1,362,485
Commercial Revenue	4	Customer Growth*	360,000	367,200	374,544	382,035	396,103	404,025	412,106
Public Authority / City Revenue	4	Customer Growth*	20,000	20,400	20,808	21,224	21,649	22,082	22,523
Multifamily Dwelling Revenue	4	Customer Growth*	45,000	45,900	46,818	47,754	48,709	49,684	50,677
Residential Rev - Recycling	4	Customer Growth*	220,000	224,400	228,888	233,466	238,135	242,898	247,756
Total Rate revenue			**$ 1,815,000**	**$ 1,851,300**	**$ 1,888,326**	**$ 1,926,093**	**$ 2,014,174**	**$ 2,054,457**	**$ 2,095,546**
Non-rate revenues [a]									
Other Rents & Use Charges	1	General Cost Inflation	15,000	15,472	15,960	16,462	16,981	17,516	18,067
Interest Income		Calculated	35,000	14,256	4,680	4,892	5,195	5,363	5,576
Rents Containers	1	General Cost Inflation	5,500	5,673	5,852	6,036	6,226	6,422	6,625
Total Non-rate revenues			**$ 55,500**	**$ 35,401**	**$ 26,492**	**$ 27,390**	**$ 28,402**	**$ 29,301**	**$ 30,268**
TOTAL REVENUES			**$ 1,870,500**	**$ 1,886,701**	**$ 1,914,818**	**$ 1,953,483**	**$ 2,042,576**	**$ 2,083,758**	**$ 2,125,815**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

			FORECAST BASIS	Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
Expenditures										
53	**Excise Tax State Tax**		*Excise and B&O Tax Rate*	$ 81,000	$ 28,301	$ 28,722	$ 29,302	$ 30,639	$ 31,256	$ 31,887
500	**Disposal**		Rate	$ 76.77	$ 79.29	$ 81.89	$ 84.57	$ 87.35	$ 90.21	$ 93.17
47	C-1 1/2	1	General Cost Inflation		$ 27,255	$ 28,712	$ 30,244	$ 31,863	$ 33,565	$ 35,361
	C-2yd	1	General Cost Inflation		106,352	112,036	120,806	127,270	134,072	141,243
	temp 2yd	1	General Cost Inflation		8,330	8,775	9,244	9,738	10,259	10,808
	35 gal	1	General Cost Inflation		251,208	264,634	286,730	302,072	318,217	335,236
	35 eow*	1	General Cost Inflation		12,352	13,012	14,099	14,853	15,647	16,484
	65 gal	1	General Cost Inflation		138,121	145,503	157,653	166,088	174,965	184,323
	95 gal	1	General Cost Inflation		21,402	22,546	24,428	25,735	27,111	28,561
	Total Disposal			**$ 560,000**	**$ 565,020**	**$ 595,219**	**$ 643,205**	**$ 677,621**	**$ 713,836**	**$ 752,016**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
600	**Recycling**									
31	Office and Operating Supplies	1	General Cost Inflation	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000	$ 15,000
35	Small Tools and Minor Equipment	1	General Cost Inflation	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	recycle containers 5% repacement/new = $160	1	General Cost Inflation	-	-	16,000	16,000	16,000	16,000	16,000
41	Professional Services	1	General Cost Inflation	220,000	274,647	289,329	316,799	333,727	351,583	370,382
	Total Recycling			**$ 260,000**	**$ 314,647**	**$ 345,329**	**$ 372,799**	**$ 389,727**	**$ 407,583**	**$ 426,382**
700	**Customer Accounts**									
31	Office and Operating Supplies	1	General Cost Inflation	$ 2,000	$ 2,060	$ 2,122	$ 2,185	$ 2,251	$ 2,319	$ 2,388
41	Professional Services	1	General Cost Inflation	10,000	12,000	12,360	12,731	13,113	13,506	13,911
42	Communication	1	General Cost Inflation	500	500	500	500	500	500	500
91	Interfund Professional Services	1	General Cost Inflation	141,568	145,815	150,189	154,695	159,336	164,116	169,040
	Total Customer Accounts			**$ 154,068**	**$ 160,375**	**$ 165,171**	**$ 170,111**	**$ 175,200**	**$ 180,441**	**$ 185,839**
800	**Administration and General Expenses**									
11	Regular Salaries and Wages	3	Labor Cost Inflation	$ 10,021	$ 10,322	$ 10,631	$ 10,950	$ 11,279	$ 11,617	$ 11,966
21	Personnel Benefits	3	Labor Cost Inflation	3,006	3,096	3,189	3,285	3,383	3,485	3,589
22	Uniforms and Clothing	1	General Cost Inflation	750	750	750	750	750	750	750
31	Office and Operating Supplies	1	General Cost Inflation	1,500	1,500	1,500	1,500	1,500	1,500	1,500
41	Professional Services	1	General Cost Inflation	5,000						
	1. Rate study	1	General Cost Inflation							15,000
	2. recycle contract review	1	General Cost Inflation		5,000					
42	Communication	1	General Cost Inflation	2,500	2,500	2,500	2,500	2,500	2,500	2,500
46	Insurance	1	General Cost Inflation	5,942	4,000	4,120	4,244	4,371	4,502	4,637
48	Repairs and Maintenanvce	1	General Cost Inflation	300	300	300	300	300	300	300
49	Miscellaneous	1	General Cost Inflation	1,500	1,500	1,500	1,500	1,500	1,500	1,500
91	Interfund Professional Services	1	General Cost Inflation	19,974	20,573	21,190	21,826	22,481	23,155	23,850
	Total Administration and General Expenses			**$ 50,493**	**$ 49,541**	**$ 45,681**	**$ 46,855**	**$ 48,064**	**$ 49,309**	**$ 65,592**

City of Camas
Sanitation Utility Rate Study
Operating Revenue and Expenditure Forecast

				Budget 2008	Projection 2009	Projection 2010	Projection 2011	Projection 2012	Projection 2013	Projection 201
900	**Collection**									
11	Regular Salaries and Wages	3	Labor Cost Inflation	$ 223,356	$ 230,057	$ 236,958	$ 244,067	$ 251,389	$ 258,931	$ 266,699
12	Overtime	3	Labor Cost Inflation	30,000	15,000	15,450	15,914	16,391	16,883	17,389
21	Personnel Benefits	1	General Cost Inflation	92,043	94,804	97,648	100,578	103,595	106,703	109,904
31	Office and Operating Supplies	1	General Cost Inflation	47,000	30,000	30,000	45,000	30,000	30,000	30,000
35	Small Tools and Minor Equipment	1	General Cost Inflation	3,000	500	500	500	500	500	500
42	Communication	1	General Cost Inflation	500	500	500	500	500	500	500
48	Repairs and Maintenance	1	General Cost Inflation	1,000	1,000	1,000	1,000	1,000	1,000	1,000
49	Miscellaneous	1	General Cost Inflation	300	300	300	300	300	300	300
95	Interfund Operating Rentals & Leases	1	General Cost Inflation	320,499	329,300	339,179	349,354	359,835	370,630	381,749
	Total Collection			**$ 717,698**	**$ 701,461**	**$ 721,536**	**$ 757,213**	**$ 763,510**	**$ 785,447**	**$ 808,041**
	Add'l O&M from CIP		*From CIP*	-	-	-	-	-	-	-
	Total Cash O&M Expenditures			**$ 1,823,259**	**$ 1,819,345**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**	**$ 2,269,757**
Depreciation Expense in		2006								
	Depreciation Expense [b]		*Last year's plus annual additions from CIP*	$ 1,100	$ 34,450	$ -	$ -	$ -	$ -	$ -
	TOTAL EXPENSES			**$ 1,824,359**	**$ 1,853,795**	**$ 1,901,657**	**$ 2,019,486**	**$ 2,084,760**	**$ 2,167,872**	**$ 2,269,757**

City of Camas
Sanitation Utility Rate Study
Capital Improvement Program

Project Costs and O&M Impacts in Year:	2008

(Project costs are escalated using Construction Cost Inflation assumptions)

No	Description	Current Cost	Year	Annual O&M Impact	Life in Years	For CFC Calculation: % Upgrade / Expansion	For CFC Calculation: % R&R	Specific Funding Source (1-Enterprise Fund, 2-Grants & Developer Donations)		Upgrade / Expansion	R&R	TOTAL ESCALATED COSTS
1						50%	50%	1	Enterprise Fund	$ -	$ -	$ -
2	Machiney & Equipment (6500 containers)	325,000	2009		10	0%	100%	1	Enterprise Fund	-	325,000	344,500
3	Other Financing Uses	55,000	2008		50	50%	50%	1	Enterprise Fund	27,500	27,500	55,000
4					50	50%	50%	1	Enterprise Fund	-	-	-
5					50	50%	50%	1	Enterprise Fund	-	-	-
	Total Capital Projects	**$ 380,000**		**$ -**		**7%**	**93%**			**$ 27,500**	**$ 352,500**	**$ 399,500**
	Total Upgrade/Expansion Projects											27,500
	Total R&R Projects											372,000
	Projects by Grants / Developer Donations			-						-	-	-
	Projects by Enterprise Fund			-						27,500	352,500	399,500

Year	2008 $	Inflated
2008	55,000	55,000
2009	325,000	344,500
2010	-	-
2011	-	-
2012	-	-
2013	-	-
2014	-	-
2015	-	-
Total	**380,000**	**399,500**

City of Camas
Sanitation Utility Rate Study
Capital Funding Analysis

Summary of Expenditures	2008	2009	2010	2011	2012	2013	2014	2008 - 2015 TOTAL
CAPITAL PROJECTS								
Improvement Upgrades & Expansions	$ 27,500	$ -	$ -	$ -	$ -	$ -	$ -	$ 27,500
Repairs and Replacements	27,500	344,500	-	-	-	-	-	372,000
TOTAL CAPITAL EXPENDITURES	**$ 55,000**	**$ 344,500**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 399,500**

Capital Financing Plan	2008	2009	2010	2011	2012	2013	2014	TOTAL
Existing Revenue Bond and PWTF Proceeds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Project Specific Grants / Developer Donations	-	-	-	-	-	-	-	-
Project to be Funded	55,000	344,500	-	-	-	-	-	399,500
OTHER FUNDING SOURCES [NOTE A]								
Other Outside Sources								$ -
PWTF Loan Proceeds								-
Other Loan Proceeds								-
Connection Charge	-	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-
Capital Fund Balance Deficiency	(55,000)	(344,500)	-	-	-	-	-	(399,500
Capital Fund Balance	55,000	344,500	-	-	-	-	-	399,500
Capital Fund Balance Deficiency	-	-	-	-	-	-	-	-
Revenue Bond Proceeds [Note B]	-	-	-	-	-	-	-	-
Rates	-	-	-	-	-	-	-	
Total								

City of Camas
Sanitation Utility Rate Study
Revenue Requirements Analysis

Cash Flow Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
Existing Debt Service	-	-	-	-	-	-	-
New Debt Service	-	-	-	-	-	-	-
Rate-Funded CIP	-	-	-	-	-	-	-
Rate Funded System Reinvestment	-	-	-	-	-	-	-
Additions Required to Meet Minimum Op. Fund Balance	-	-	-	-	-	-	-
Total Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
REVENUES							
Rate Revenue	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Other Revenue	20,500	21,146	21,812	22,499	23,207	23,938	24,692
Operating Fund & Debt Reserve Fund Interest Earnings	35,000	14,256	4,680	4,892	5,195	5,363	5,576
Total Revenue	$ 1,870,500	$ 1,886,701	$ 1,914,818	$ 1,953,483	$ 2,042,576	$ 2,083,758	$ 2,125,815
NET CASH FLOW (DEFICIENCY)	**$ 47,241**	**$ 67,356**	**$ 13,160**	**$ (66,003)**	**$ (42,185)**	**$ (84,114)**	**$ (143,942)**

Coverage Sufficiency Test	2008	2009	2010	2011	2012	2013	2014
EXPENSES							
Cash Operating Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
Revenue Bond Debt Service	-	-	-	-	-	-	-
Revenue Bond Coverage Requirement at 1.25	-	-	-	-	-	-	-
Total Expenses	$ 1,823,259	$ 1,819,345	$ 1,901,657	$ 2,019,486	$ 2,084,760	$ 2,167,872	$ 2,269,757
ALLOWABLE REVENUES							
Rate Revenue	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Other Revenue	20,500	21,146	21,812	22,499	23,207	23,938	24,692
Interest Earnings - All Funds	35,000	25,037	16,701	18,653	19,417	22,280	25,332
Total Revenue	$ 1,870,500	$ 1,897,483	$ 1,926,839	$ 1,967,244	$ 2,056,798	$ 2,100,675	$ 2,145,570
Coverage Realized	n/a	n/a	n/a	n/a	n/a	n/a	n/a
COVERAGE SURPLUS (DEFICIENCY)	**$ 47,241**	**$ 78,138**	**$ 25,181**	**$ (52,241)**	**$ (27,962)**	**$ (67,197)**	**$ (124,187)**

City of Camas
Sanitation Utility Rate Study
Revenue Requirements Analysis

Maximum Revenue Deficiency	2008	2009	2010	2011	2012	2013	2014
Sufficiency Test Driving the Deficiency	*None*	*None*	*None*	*Cash*	*Cash*	*Cash*	*Cash*
Maximum Deficiency From Tests	$ -	$ -	$ -	$ 66,003	$ 42,185	$ 84,114	$ 143,942
less: Net Revenue From Prior Rate Increases	-	-	-	(37,944)	(78,180)	(121,811)	(168,015)
Revenue Deficiency	$ -	$ -	$ -	$ 28,059	$ -	$ -	$ -
Plus: Adjustment for State Excise Tax	-	-	-	427	-	-	-
Total Revenue Deficiency	**$ -**	**$ -**	**$ -**	**$ 28,486**	**$ -**	**$ -**	**$ -**

Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenue with no Increase	$ 1,815,000	$ 1,851,300	$ 1,888,326	$ 1,926,093	$ 2,014,174	$ 2,054,457	$ 2,095,546
Revenues from Prior Rate Increases	-	-	-	38,522	79,370	123,666	170,573
Rate Revenue Before Rate Increase (Incl. previous increases)	1,815,000	1,851,300	1,888,326	1,964,614	2,093,544	2,178,123	2,266,120
Required Annual Rate Increase	0.00%	0.00%	0.00%	1.45%	0.00%	0.00%	0.00%
Number of Months New Rates Will Be In Effect	12	10	12	12	12	12	12
Info: Percentage Increase to Generate Required Revenue	*0.00%*	*0.00%*	*0.00%*	*1.45%*	*0.00%*	*0.00%*	*0.00%*
Policy Induced Rate Increases	0.00%	0.00%	2.00%	2.00%	2.00%	2.00%	2.00%
ANNUAL RATE INCREASE	**0.00%**	**0.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**	**2.00%**
CUMULATIVE RATE INCREASE	**0.00%**	**0.00%**	**2.00%**	**4.04%**	**6.12%**	**8.24%**	**10.41%**

Impacts of Rate Increases	2008	2009	2010	2011	2012	2013	2014
Rate Revenues After Rate Increase	$ 1,815,000	$ 1,851,300	$ 1,926,093	$ 2,003,907	$ 2,135,415	$ 2,221,686	$ 2,311,442
Full Year Rate Revenues After Rate Increase	*1,815,000*	*1,851,300*	*1,926,093*	*2,003,907*	*2,137,457*	*2,223,811*	*2,313,653*
Additional State Taxes Due to Rate Increases	-	-	566	1,167	1,819	2,508	3,238
Net Cash Flow After Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606	68,715
Coverage After Rate Increase	n/a	n/a	n/a	n/a	n/a	n/a	n/a

City of Camas
Sanitation Utility Rate Study
Fund Activity

Funds	2008	2009	2010	2011	2012	2013	2014
OPERATING FUND							
Beginning Balance	$ 618,000	$ 455,500	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181
plus: Net Cash Flow after Rate Increase	47,241	67,356	50,360	10,644	77,238	80,606	68,715
less: Transfer of Surplus to Capital Fund	(515,384)	(373,321)	(43,595)	(960)	(71,873)	(73,775)	(60,341)
Ending Balance	$ 149,857	$ 149,535	$ 156,301	$ 165,985	$ 171,350	$ 178,181	$ 186,555
Minimum Target Balance	*149,857*	*149,535*	*156,301*	*165,985*	*171,350*	*178,181*	*186,555*
Maximum Funds to be Kept as Operating Reserves	*149,857*	*149,535*	*156,301*	*165,985*	*171,350*	*178,181*	*186,555*
Info: No of Days of Cash Operating Expenses	*30*	*30*	*30*	*30*	*30*	*30*	*30*
EQUIPMENT REPLACEMENT FUND							
Beginning Balance	$ 55,000	$ 344,500	$ 384,103	$ 439,719	$ 454,440	$ 540,536	$ 631,228
plus: Rate Funded System Reinvestment	-	-	-	-	-	-	-
plus: Net Debt Proceeds Available for Projects	-	-	-	-	-	-	-
plus: Interest Earnings	1,721	10,782	12,021	13,762	14,222	16,917	19,755
plus: Transfer of Surplus from Operating Fund	515,384	373,321	43,595	960	71,873	73,775	60,341
plus: Direct Rate Funding	-	-	-	-	-	-	-
Total Capital Funding Sources	**572,105**	**728,603**	**439,719**	**454,440**	**540,536**	**631,228**	**711,324**
less: Capital Expenditures	(55,000)	(344,500)	-	-	-	-	-
Ending Balance	**$ 517,105**	**$ 384,103**	**$ 439,719**	**$ 454,440**	**$ 540,536**	**$ 631,228**	**$ 711,324**
Minimum Target Balance	$ 1,100	$ 7,990	$ 7,990	$ 7,990	$ 7,990	$ 7,990	$ 7,990

System Development Charges

City of Camas
Water Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant in Service			
Utility Capital Assets		$ 37,749,068	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(4,830,000)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		15,616,414	Interest on assets up to a maximum 10-year period
Existing Cash Balances	665,226		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	(6,382,527)		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		(5,717,301)	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 42,818,181**	
FUTURE COST BASIS:			**NOTES:**
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 4,372,100	Projects which apply to both Non NUGAE & NUGAE
Non NUGAE		7,621,300	Projects which apply to only Non NUGAE
NUGAE		54,127,000	Projects which apply to only NUGAE
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		(290,000)	R&R projects which apply to both Non NUGAE & NUGAE
Non NUGAE		(814,875)	R&R projects which apply only to Non NUGAE
NUGAE		-	R&R projects which apply only to NUGAE
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	Contributions which apply to both Non NUGAE & NUGAE
Non NUGAE		(710,850)	Contributions which apply only to Non NUGAE
NUGAE		(33,406,333)	Contributions which apply only to NUGAE
TOTAL FUTURE COST BAISIS		$ 30,898,342	
CUSTOMER BASE			**NOTES:**
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Non NUGAE		9,446	From G&O
NUGAE		-	From G&O
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Non NUGAE		6,780	From G&O
NUGAE		5,581	From G&O
TOTAL CUSTOMER BASE		21,807	Estimated growth in Customer Equivalents 20-year growth 2008-2027
RESULTING CHARGE			
Existing Cost Basin Portion		MCE	
Allocable Existing Portion		$ 42,818,181	
Allocable Customer Base		21,807	
Existing Cost Basis Charge Non NUGAE & NUGAE		**$ 1,964**	Applies To Both Non NUGAE and NUGAE
Future Cost Basin Portion - CUMULATIVE			
Allocable Future Portion to Both		$ 4,082,100	
Allocable Customer Base		12,361	
Future Cost Basis Charge Cumulative		**$ 330**	Applies To Both Non NUGAE and NUGAE
Allocable Future Portion Non NUGAE		6,095,575	
Allocable Customer Base		6,780	
Future Cost Basis Charge Non NUGAE		**$ 899**	Applies Only to Non NUGAE
Allocable Future Portion NUGAE		$ 20,720,667	
Allocable Customer Base		5,581	Applies Only to NUGAE
NUGAE Future Cost Basis Charge		**$ 3,713**	Applies Only to NUGAE
Non NUGAE		**3,193**	Applies Only to Non NUGAE
NUGAE		**6,007**	Applies Only to NUGAE

City of Camas
Water Utility Rate Study
System Development Charge

SDC - All classes except Industrial

Meter	MCEs	Proposed	
		Non-NUGAE	NUGAE
5/8"	1	$ 3,193	$ 6,007
3/4"	1.5	4,789	9,010
1"	2.5	7,982	15,016
1.5"	5	15,964	30,033
2"	8	25,542	48,053
3"	16	51,084	96,106
4"	25	79,819	150,165
6"	50	159,637	300,330
8"	80	255,420	480,528

City of Camas
Water Utility Rate Study
System Development Charge

SDC - Industrial Option 1

Meter	MCEs	MSEs	Proposed	
			Non-NUGAE	NUGAE
5/8"	1	1	$ 19,819	$ 38,476
3/4"	1.5	1.1	28,288	55,454
1"	2.5	1.4	45,265	89,449
1.5"	5	1.8	87,569	174,298
2"	8	2.9	138,579	276,362
3"	16	11	276,634	550,561
4"	25	14	429,544	856,633
6"	50	21	853,770	1,706,309
8"	80	29	1,362,684	2,725,763

City of Camas
Water Utility Rate Study
System Development Charge

SDC - Industrial Option 2

Industrial	Customer / Account	Meters & Services/MSE	Base/ERU	Peak/MCE	Fire/Account	SDC
Non-NUGAE	$ -	$ 393	$ 988	$ 1,147	$ 518	**$ 3,046**
NUGAE	$ -	$ 393	$ 2,704	$ 2,324	$ 845	**$ 6,266**

Meter	MCEs	MSEs
5/8"	1	1
3/4"	1.5	1.1
1"	2.5	1.4
1.5"	5	1.8
2"	8	2.9
3"	16	11
4"	25	14
6"	50	21
8"	80	29

Charge Calculation

Non-NUGAE

Customer:	$	-	zero for all customers.
Meter & Service:	$	393	multiplied by appropriate MSE index from the table above.
Base:	$	988	multiplied by (projected consumption divided by 283.6)
Peak:	$	1,147	multiplied by appropriate MCE index from the table above.
Fire:	$	518	for all customers
Total SDC	Sum of all parts		

NUGAE

Customer:	$	-	zero for all customers.
Meter & Service:	$	393	multiplied by appropriate MSE index from the table above.
Base:	$	2,704	multiplied by (projected consumption divided by 283.6)
Peak:	$	2,324	multiplied by appropriate MCE index from the table above.
Fire:	$	845	for all customers
Total SDC	Sum of all parts		

City of Camas
Sewer Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant In Service			
Utility Capital Assets		$ 43,604,604	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(6,238,872)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		18,879,806	Interest on assets up to a maximum 10-year period
Existing Cash Balances	1,006,471		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	(17,484,419)		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		(16,477,948)	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 39,767,590**	

FUTURE COST BASIS:			NOTES:
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 4,152,500	Projects which apply to both Non NUGAE & NUGAE (cost reflect 20-year capacity)
Non NUGAE		25,260,622	Projects which apply to only Non NUGAE
Phase III		10,634,955	
NUGAE		39,259,124	Projects which apply to only NUGAE (100% build out within 20-years)
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		(3,302,500)	R&R projects which apply to both Non NUGAE & NUGAE
Non NUGAE		(17,536,444)	R&R projects which apply only to Non NUGAE
Phase III		-	
NUGAE		(3,498,800)	R&R projects which apply only to NUGAE
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	Contributions which apply to both Non NUGAE & NUGAE
Non NUGAE		-	Contributions which apply only to Non NUGAE
Phase III		-	
NUGAE		(13,700,000)	Contributions which apply only to NUGAE
TOTAL FUTURE COST BAISIS		$ 41,269,458	

CUSTOMER BASE			NOTES:
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Non NUGAE		15,086	From G&O
NUGAE		-	From G&O
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Non NUGAE		9,873	From G&O
NUGAE		5,228	From G&O
Phase III Capacity	9,026		
TOTAL CUSTOMER BASE		30,187	Estimated growth in Customer Equivalents 20-year growth 2008-2027

RESULTING CHARGE			
Existing Cost Basin Portion			
Allocable Existing Portion		$ 39,767,590	
Allocable Customer Base		30,187	
Existing Cost Basis Charge Non NUGAE		**$ 1,317**	Applies To Both Non NUGAE and NUGAE
Future Cost Basin Portion			
Allocable Future Portion to Both		$ 850,000	
Allocable Customer Base		15,101	
Future Cost Basis Charge Cumulative		**$ 56**	Applies To Both Non NUGAE and NUGAE
Allocable Future Portion Non NUGAE		$ 7,724,178	
Allocable Customer Base		9,873	
Future Cost Basis Charge Non NUGAE		**$ 782**	Applies Only to Non NUGAE
Allocable Future Portion Non NUGAE Phase III		$ 10,634,955	
Allocable Customer Base		9,026	
Future Cost Basis Charge Non NUGAE Phase III		**$ 1,178**	
Allocable Future Portion NUGAE		$ 22,060,325	
Allocable Customer Base		5,228	
NUGAE Future Cost Basis Charge		**$ 4,220**	Applies Only to NUGAE
Non NUGAE		**3,334**	Applies Only to Non NUGAE
NUGAE		**5,593**	Applies Only to NUGAE

City of Camas
Sewer Utility Rate Study
SDC

Meter Size	Existing Rates	Proposed Non NUGAE	Difference	Proposed NUGAE	Difference
Residential	$ 2,349	$ 3,334	$ 985	$ 5,593	$ 3,244
Commercial I					
5/8"	$ 2,349	$ 3,334	$ 985	$ 5,593	$ 3,244
3/4"	3,523	5,001	1,478	8,390	4,867
1"	5,872	8,336	2,463	13,983	8,111
1.5"	11,745	16,671	4,926	27,967	16,222
2"	18,792	26,674	7,882	44,747	25,955
3"	37,584	53,348	15,764	89,493	51,909
4"	58,725	83,357	24,632	139,833	81,108
6"	117,449	166,713	49,264	279,666	162,217
8"	187,919	266,741	78,822	447,466	259,547
Commercial II					
Flow (gallons)	$ 8.55	$ 16.94	$ 8.39	$ 28.78	$ 20.23
BOD (lbs / day)	1,364	3,149	1,785	5,071	3,708
TSS (lbs / day)	1,006	1,192	186	1,921	914

City of Camas
Storm Utility Rate Study
System Development Charge

EXISTING COST BASIS:	2008		NOTES:
Plant in Service			
Utility Capital Assets		$ 10,770,683	Original cost of plant-in-service as of 12/31/2007
less: Contributed Capital		(8,081,647)	CIAC, Grants, and other contributed capital
plus: Interest on Non-Contributed Plant		489,374	Interest on assets up to a maximum 10-year period
Existing Cash Balances	-		Available Construction Cash and Debt Fund Cash
less: Debt Principal Outstanding	-		Total principal outstanding for the existing debt
less: Net Debt Principal Outstanding		-	Debt principal outstanding, net of cash reserves
TOTAL EXISTING COST BASIS		**$ 3,178,410**	

FUTURE COST BASIS:			NOTES:
Capital Improvement Plan			
Total Future Projects (2008$)			Total projects identified in the 20-year CIP
Cumulative		$ 104,375	
Non NUGAE CIP		10,249,380	
NUGAE CIP		30,672,000	
less: Identified Repair & Replacement Projects			R&R projects are not eligible for GFC
Cumulative		-	
Non NUGAE CIP		(892,500)	
NUGAE CIP		-	
less: Contributed Future Upgrade and Expansion Projects			Not eligible for recovery through GFC
Cumulative		-	
Non NUGAE CIP		(1,175,322)	
NUGAE CIP		(4,600,800)	
TOTAL FUTURE COST BAISIS		$ 34,357,133	

CUSTOMER BASE			NOTES:
Existing Residential Equivalent Domestic Units			Existing residential customer equivalents 2008
Cumulative		9,692	
Non NUGAE		9,692	Assumed annualized sewer growth rates
NUGAE		-	Assumed annualized sewer growth rates
Future Residential Equivalent Domestic Units (Incremental)			Estimated growth in Customer Equivalents 20-year growth 2008-2027
Cumulative		11,559	
Non NUGAE		6,331	Assumed annualized sewer growth rates
NUGAE		5,228	Assumed annualized sewer growth rates based on Sewer to Storm Proporti...
TOTAL CUSTOMER BASE		21,251	Estimated growth in Customer Equivalents 20-year growth 2008-2027

RESULTING GENERGAL CHARGE		
Existing Cost Basin Portion		
Allocable Existing Portion	$ 3,178,410	
Allocable Customer Base	21,251	
Existing Cost Basis Charge	**$ 150**	
Future Cost Basin Portion		
Cumulative		
Allocable Future Portion	$ 104,375	
Allocable Customer Base	11,559	Growth portion is allocable to future customers only
Future Cost Basis Cumulative Charge	**$ 9**	
Non NUGAE Only		
Allocable Future Portion	$ 8,181,558	
Allocable Customer Base	6,331	Growth portion is allocable to future customers only
Future Cost Basis Non NUGAE Charge	**$ 1,292**	
NUGAE Only		
Allocable Future Portion	$ 26,071,200	
Allocable Customer Base	5,228	Growth portion is allocable to future customers only
Future Cost Basis Charge	**$ 4,987**	
Non NUGAE	**$ 1,451**	
NUGAE	**$ 5,145**	

Seattle Office
701 Dexter Avenue North
Suite 200
Seattle, Washington 98109
Phone: (206) 284-0860
Fax: (206) 283-3206
E-mail: grayosborne@g-o.com

Yakima Office
107 South 3rd Street
P.O. Box 2069
Yakima, Washington 98901
Phone: (509) 453-4833
Fax: (509) 453-5953
E-mail: yakima@g-o.com

Olympia Office
2102 Carriage Drive SW
Building I
Olympia, Washington 98502
Phone: (360) 292-7481
Fax: (360) 292-7517
E-mail: olympia@g-o.com

Arlington Office
3710 168th Street NE
Building B, Suite 210
Arlington, Washington 98223
Phone: (360) 454-5490
Fax: (360) 454-5491
E-mail: mjauhola@g-o.com

Vancouver Office
8513 NE Hazel Dell Avenue
Suite 106
Vancouver, Washington 98665
Phone: (360) 571-3350
Fax: (360) 571-4547
E-mail: kalexander@g-o.com

City of Camas
Camas 2035
Camas, Washington

Appendix I
Comprehensive Stormwater Drainage Plan

City of Camas

Comprehensive Stormwater Drainage Plan

Submitted to:

City of Camas, Washington

616 NE Fourth Avenue

Camas, WA 98607

Prepared by:

Otak, Inc.

700 Washington Street, Suite 401

Vancouver, WA 98660

Otak Project No.16060

April 2013

Table of Contents

Abbreviations and Acronyms v

Section 1—Introduction 1

1.1 Introduction 1

1.2 Plan Goals 2

1.3 Previous Studies 5

Section 2—Regulatory Environment 7

2.1 Introduction 7

2.2 The Clean Water Act (CWA) 7

2.3 The Safe Drinking Water Act (SDWA) 11

2.4 Endangered Species Act (ESA) 14

2.5 City of Camas Municipal Code Requirements 14

2.6 Growth Management Act (GMA) 15

2.7 Shoreline Management Act (SMA) 16

2.8 State Environmental Policy Act (SEPA) 16

2.9 Tribal Consultation and Collaboration 17

Section 3—Study Area Characteristics 19

3.1 Introduction 19

3.2 Study Area 19

3.3 Land Use and Zoning 19

3.4 Physical Characteristics 20

3.5 Existing Storm Drainage System 22

Table of Contents

Continued

Section 4—Study Area Watersheds 31

4.1 Introduction 31

4.2 Columbia River Watershed 32

4.3 Lacamas Lake Watershed 36

4.4 Washougal River & Lower Lacamas Creek Watershed 40

Section 5—Capital Improvements 47

5.1 Introduction 47

Project Name: Transportation Related Stormwater Facilities 51

Project Name: Storm Sewer Conveyance Modeling 53

Project Name: North Dwyer Creek Stormwater Basin Plan 55

Project Name: Grass Valley Stormwater Basin Plan 57

Project Name: Pacific Rim Boulevard Crossing 59

Project Name: Julia Street Stormwater Pond Retrofit 61

Project Name: Thomas/Carson Estates Flooding 63

Project Name: North Urban Growth Area (NUGA) Stormwater Basin Plan 65

Project Name: Forest Home Road Sediment Basin 67

Project Name: Blue Creek Sediment Basin 69

Section 6—Financing 71

6.1 Introduction 71

Section 7—References 73

Table of Contents
Continued

Appendices

Appendix A: Storm Facilities Maintained by City

Appendix B: Cost Estimates

Appendix C: SEPA

Table of Figures

Figure 1-1: The Importance of Stormwater Management (Courtesy of Clark County) 4

Figure 3-1: City Limits and UGA Boundaries 25

Figure 3-2: Current City Zoning 26

Figure 3-3: City Contour Map 27

Figure 3-4: NRCS Soil Categories 28

Figure 3-5: Environmental Constraints and Unstable Slopes 29

Figure 3-6: Watersheds and Basin Boundaries 30

Figure 4-1: Columbia River Watershed and Basins 43

Figure 4-2: Lacamas Lake Watershed and Basins 44

Figure 4-3: Washougal River & Lacamas Creek Watershed and Basins 45

Figure 5-1: CIP Project Locations 49

Figure 5-3: Julia Street Pond in a spring 2012 flood event 61

Figure 5-4: Sediment collection facility at Blue Creek. 69

Table of Contents

Continued

Table of Tables

Table 1.1: Past Stormwater and Drainage Studies 5

Table 2.1: Class V Well Identification Guide From EPA 12

Table 3.1: Camas Land Use Zoning 19

Table 4.1: Camas Watersheds and Basins 31

Table 4.2: Columbia River Watershed Stormwater Strategies 34

Table 4.3: Lacamas Lake Watershed Stormwater Strategies 37

Table 4.4: Washougal River/Lower Lacamas Creek Watershed Stormwater Strategies 41

Table 5.1: CIP Summary 47

Table 5.2: Transportation Related Stormwater Facilities Estimate and Funding Plan 52

Table 5.3: Storm Sewer Conveyance Modeling Estimate and Funding Plan 54

Table 5.4: North Dwyer Creek Estimate and Funding Plan 56

Table 5.5: Grass Valley Estimate and Funding Plan 58

Table 5.6: Pacific Rim Boulevard Estimate and Funding Plan 60

Table 5.7: Julia Street Stormwater Retrofit Estimate and Funding Plan 62

Table 5.8: Thomas/Carson Estates Flooding Estimate and Funding Plan 63

Table 5.9: NUGA Estimate and Funding Plan 66

Table 5.11: Forest Home Road Sediment Basin Estimate and Funding Plan 67

Table 5.12: Blue Creek Sediment Basin Estimate and Funding Plan 70

Table 6.1: Stormwater Utility Rates 71

Abbreviations and Acronyms

303(d) List	An EPA-mandated listing of streams that do not meet water quality standards. It includes the contaminant type and source, stream segment length, and other information.
BMP	Best Management Practice: A Best Management Practice is an activity, device, or structure that serves as a means of reducing or eliminating the generation of pollution or the movement of pollution towards stream, rivers, and lakes.
CIP	Capital Improvement Project or Capital Improvement Plan
Collection and conveyance system	means the drainage facilities, both natural and man-made, which collect, contain, and provide for the flow of surface and stormwater to a receiving water or infiltration facility. The natural elements of the conveyance system include, but are not limited to, small drainage courses, streams, rivers, lakes, and wetlands. The human-made elements of the collection and conveyance system include, but are not limited to, gutters, inlets, ditches, pipes, channels, and retention/detention facilities.
CWA	Clean Water Act
DMA	Designated Management Agencies
Detention	To hold runoff in a basin (pond) for a short period of time, thereby delaying the introduction of its volume (quantity) of stormwater to the neighboring stream.
Ecology	Washington State Department of Ecology
EIA	Effective Impervious Area: Refers to impervious area that is directly connected to a collection system, as opposed to running across grass or some other type of pervious system before entering the collection system.
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESC Plan	Erosion and Sediment Control Plan

Abbreviations and Acronyms
Continued

Flood Control Facility	A detention, retention or other storage facility that reduces the flow rate of stormwater runoff and retains and releases storage volumes.
Flood Plain	The land bordering a stream subject to inundation when the stream is at flood stage.
Flow Control Exempt	Large water bodies shown in Appendix I-E of the 2012 Stormwater Management Manual for Western Washington are exempt from Minimum Requirement 7.
FTE	Full-time Equivalent Employee
Ground Water	The water under the surface of the earth that is found within the pore spaces and cracks between the particles of soil, sand, gravel and bedrock.
Hydraulic Connectivity	Similar to EIA, where runoff from impervious surfaces are directly connected to a collection system. Reducing Hydraulic connectivity refers to discharging stormwater to pervious areas rather than a collection system.
IDDE	Illicit Discharge and Detection Elimination Program
Illicit Discharges	Any discharge to a storm sewer that is not composed entirely of stormwater and is not allowed per the NPDES permit and C.M.C. 14.04
Injection Well	Means a "well" into which "fluids" are being injected.
LEED	Leadership in Energy and Environmental Design.
LID	Low Impact Development
MS4	Municipal Separate Storm Sewer System: The Municipal Separate Storm Sewer System is an EPA-mandated program that requires municipalities to initiate activities to reduce its quantity and improve its quality of stormwater.
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Services
NOAA	National Oceanic and Atmospheric Administration

Abbreviations and Acronyms
Continued

NPDES	National Pollutant Discharge Elimination System: A permit required from EPA for the discharge of stormwater into rivers, streams, and lakes. It is the permit that governs the activities under the MS4 program.
NRCS	Natural Resource Conservation Service
Non-Point Source	Water pollution that does not come from a specific pipe, but is derived from stormwater runoff and flows to streams, rivers, and lakes directly from adjacent properties.
NUGA	North Urban Growth Area
Non–Structural BMP	A BMP that does not include the use of a structural device, such as public education.
O & M	Operations and Maintenance
Point Source	Water pollution that is released from a specific pipe into a stream, river, or lake.
SDC	System Development Charges
SEPA	State Environmental Policy Act
SFHA	Special Flood Hazard Areas
SMMWW	The 2012 Stormwater Management Manual for Western Washington, prepared by the Washington State Department of Ecology.
Storm Sewer	A system of below-ground pipes that convey stormwater to its discharge point.
Stormwater	Stormwater is rainwater that accumulates on land as a result of storms and runoff from urban areas such as roads and roofs.
Structural BMP	A BMP that involves the use of a structure, such as a vegetated filter strip or catch basin with sump.
Surface Water	Surface water includes stormwater, and water in a stream, river, lake, wetland, or ocean.
SWMP	Stormwater Master Plan

Abbreviations and Acronyms
Continued

SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load: Total maximum daily load is a measurement of the maximum concentration of a specific contaminant possible in stream water without causing harm to the stream.
TSS	Total Suspended Solids
UIC	Underground Injection Control: means the Underground Injection Control program under Part C of the Safe Drinking Water Act, which regulates injection wells.
Waters of the State	Includes those waters as defined as "waters of the United States" in 40 CFR Subpart 122.2 within the geographic boundaries of Washington State and "waters of the State" as defined in Chapter 90.48 RCW, which includes lakes rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and water courses within the jurisdiction of the State of Washington.
WLA	Wasteload Allocation
WQ	Water Quality

Section 1—Introduction

1.1 Introduction

As with many communities across the country, the City of Camas is facing the challenge of balancing growth and development with quality of life and environmental stewardship. Recent information regarding the impact of urban stormwater on the environment has prompted new regulations, including National Pollutant Discharge Elimination System (NPDES) permitting, Underground Injection Control (UIC) regulations, and the Endangered Species Act (ESA). These regulations have forced jurisdictions to fund ever-expanding stormwater programs. And, the implementation of water quality and flow control regulations finds jurisdictions with a need to manage and maintain an ever larger list of stormwater infrastructure components.

As with all utilities, stormwater infrastructure requires routine inspection and maintenance. Some pipelines in the downtown core are well over 70-years old, and repairs become more frequent to properly maintain these assets. Some stormwater facilities such as detention ponds and biofiltration swales have been in place for 20 years or more, and these facilities require routine maintenance and repairs such as re-grading and landscaping, fencing replacements, access road upkeep, or structural repairs.

The City's NPDES stormwater discharge permit with the Washington State Department of Ecology (Ecology) continues to consume more of the City's resources. Retrofit programs, monitoring, mapping, record-keeping and reporting, illicit discharge and detection, public education and outreach, and the myriad of other requirements takes more staff time and requires more capital projects to stay in compliance.

The current stormwater utility rate does not include a large capital. Financial Consulting Solutions Group (FCSG) conducted a rate study in 2009, and this study set the storm rate to recover the cost of basic operation and maintenance of the existing storm system and modest amounts for replacement of existing infrastructure. As part of the Fisher Basin Utility, some capital dollars have been available but that account has been depleted. To provide a secure long term capital fund, the FSCG study proposed implementation of a System Development Charge (SDC) with a methodology consistent with the current water and sewer SDC. The rate would capture both historical costs and future capital needs. Prior to considering an SDC the City is required to adopt a basis for the SDC.

For these reasons and others, the City proposes to develop a stormwater capital improvement program similar to those for their transportation, water, and wastewater systems. These well-established programs are used for developing, implementing, and funding projects necessary for the ongoing maintenance, repair, and upgrade of existing assets, and for the planning and construction of new facilities. This plan will provide the basis for the future capital component of a SDC.

Continued

This inaugural CIP provides a capital program list that can be used to plan and fund stormwater maintenance activities, retrofits, repairs, and new facilities to serve existing and new development. This list can be used to develop a six-year capital plan similar to other city infrastructure programs. The intent of this inaugural plan is to identify an initial list of maintenance and capital improvement projects necessary to adequately care for the city's stormwater infrastructure. This plan includes the following components:

- Section Two: A discussion of stormwater regulations that the city follows.
- Section Three: A discussion of the study area (City limits plus urban growth area) characteristics that influence stormwater management.
- Section Four: A discussion of future development potential and how the City's stormwater ordinance may be met with the future development.
- Section Five: A list of capital projects identified for correcting deficiencies with existing facilities or identifying future capital improvement needs.
- Section Six: A description of the City's stormwater funding through their stormwater utility. Future editions to this plan will include a plan to meet the City's ongoing funding needs for stormwater infrastructure.

1.2 Plan Goals

The City has initiated the development of a Capital Improvement Plan as part of their structured approach for implementing stormwater programs and projects, and maintaining the City's existing stormwater assets. This plan seeks to align itself with and ascribe to the goals of the City's mission statement:

> *The City of Camas commits to preserving its heritage, sustaining and enhancing a high quality of life for all its citizens and developing the community to meet the challenges of the future. We take pride in preserving a healthful environment while promoting economic growth. We encourage citizens to participate in government and community, assisting the city in its efforts to provide quality services consistent with their desires and needs.*

This mission statement describes the City's commitment to protecting the environment and quality of life for its citizens, while promoting economic development to maintain vitality in the urban area. With that in mind, the following goals have been developed for this stormwater capital program:

- Create a program for stormwater management that replicates capital programs for the City's other infrastructure systems and allows for capital program planning and funding.
- Develop a program that allows for adequate funding of stormwater projects that supports the City's transportation infrastructure program.

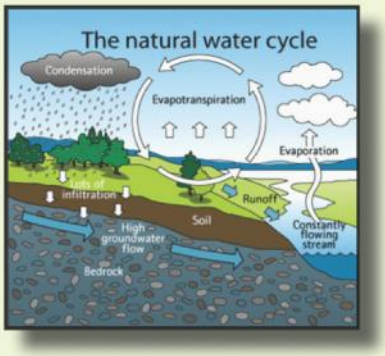
- Provide stormwater management in a way that is consistent with the City's mission statement in regard to environmental protection and economic development.

Figure 1-1 provides a discussion of stormwater runoff and how land use affects both the quantity and quality of the runoff. As this water is what feeds our creeks and streams, it has a direct affect on the quality of aquatic habitat. This discussion provides information on the framework from which stormwater management tools are developed.

The Importance of Stormwater Management

The Water Cycle

The earth's water continuously circulates between the atmosphere to the land in the forms of evapotranspiration (from earth to atmosphere) and rainfall where it becomes surface water and infiltrates into the soil to become groundwater. This is called the water cycle, or hydrologic cycle, and is key to understanding stormwater impacts.



In natural (undeveloped) conditions, rainfall infiltrates slowly into the ground. Natural biologic processes cleanse the water as it moves through vegetation and soil and into groundwater. Because most rainstorms are not large enough to fully saturate the soil, only a small percentage of rainwater flows over the surface as runoff. What does become runoff usually travels in a slow, meandering pace. Particles and sediments settle out along the way, ridding the water of impurities before it flows into rivers and streams.

The Effects of Development

Development drastically alters part of the natural water cycle. Impervious surfaces such as buildings and roads prevent rain from soaking into the ground. There is also less vegetation to soak up, store, and evaporate water. In addition, the natural soil structure is lost as a result of grading and compaction during construction. As a result, stormwater runoff greatly increases, flowing over land surfaces or through conveyance systems (such as pipes and ditches) into rivers and streams.

This alteration of the water cycle can have significant negative effects on surface water and groundwater, causing harm to fish and wildlife, drinking water supplies, property, recreation, and other beneficial uses.

- Increased runoff volume and speed may cause flooding and erosion and impairment of natural habitat in rivers and streams.
- Because less water infiltrates into the ground, less groundwater recharge may occur. This can reduce drinking water and irrigation supplies and may also reduce base flows in streams, which can be detrimental to fish and aquatic organisms.
- Developed surfaces retain heat, which increases runoff temperature during warm weather. This in turn may raise the temperature of the receiving waters, with potential negative impacts on aquatic life.
- Stormwater runoff picks up oil, fertilizers, pesticides, metals, chemicals, sediments, bacteria, debris, and other pollutants and may carry them into rivers and streams.

Mitigation through Stormwater Management

Stormwater management goals are intended to mitigate stormwater impacts created by typical development practices so new development and redevelopment maintain a better balance with the natural water cycle. This is achieved through the following approaches.

- Source control best management practices (BMPs) prevent stormwater from coming into contact with pollutants in the first place. Examples include sweeping instead of using water to clean an outdoor area and minimizing the use of chemicals for yard care. Source control BMPs are a cost-effective means of reducing pollutants in stormwater and should be a first consideration in all projects.
- Treatment BMPs reduce pollutant loads and concentrations in stormwater runoff through physical, biological, and chemical removal mechanisms. Examples include biofiltration, dispersion, constructed wetlands, and proprietary filter systems. These BMPs may accomplish significant levels of pollutant load reductions if properly designed and maintained.
- Flow control BMPs detain, retain, or infiltrate stormwater runoff to control the flow rate, frequency, duration, and volume of runoff leaving the site. Examples include detention ponds, infiltration systems, and constructed wetlands.
- Low impact development approaches emphasize capturing, treating, and infiltrating stormwater at the source. Techniques are used that mimic natural processes by allowing stormwater to slowly soak into the ground or filter through vegetation—for example, porous pavement, rain gardens, infiltration planters, and green roofs. Design and construction methods that preserve and take advantage of the site's natural features, such as open spaces, native vegetation, natural depressions, and wetlands are also considered LIDA. This approach provides multiple environmental, aesthetic, and cost benefits in addition to stormwater management.

Figure 1-1: The Importance of Stormwater Management (Courtesy of Clark County)

1.3 Previous Studies

The City has conducted stormwater studies to address specific problems or to provide master plans for specific areas. This Capital Improvement Plan includes a review of these past reports to identify opportunities for implementing projects developed with those studies. The key plans and studies are listed in Table 1.1.

Table 1.1: Past Stormwater and Drainage Studies

Study Name (City Job No.)	Date Published	Author
Fisher Basin Sub-area Plan (S-253)	Early 1990's	Parametrix, Inc.
North Dwyer Creek Master Plan (S-370)	October 1998	David Evans and Associates
Technical Memorandum for Long-Term Assessment of North Dwyer Creek (S-370)	February 2001	David Evans and Associates
Fisher Basin Stormwater and Wetlands Master Plan, Phase 1 (S-370)	July 2001	David Evans and Associates
Lacamas Lake: Nutrient Loading and In-lake Conditions (NA)	April 2004	Clark County
Fisher Basin Hydrologic and Hydraulic Analysis (S-456)	October 2005	Maul, Foster, and Alongi
Monitoring Report Lacamas Lake Annual Date Summary for 2007(NA)	2007	Clark County

Section 1—Introduction

Continued

Section 2—Regulatory Environment

2.1 Introduction

The City of Camas is required to meet local, state and federal regulations applicable to its operations and activities. Environmental regulations that apply to the City are summarized in this section. While the primary focus of this CIP is stormwater, the impacted natural resources include surface waters and associated aquatic species and habitat as well as groundwater.

This section provides a description of each requirement with the majority of the narrative focusing on those regulations deemed to be the primary drivers that most influence City functions. Because it is a regulation that spans multiple environmental media, the State Environmental Policy Act (SEPA) is covered as an adjunct to other environmental regulations. Similar to SEPA, tribal input through the consultation and collaboration process spans multiple regulation and environmental media and is also an adjunct to the other listed regulations. Consequently, these two topics are treated separately and are discussed at the conclusion of this section.

2.2 The Clean Water Act (CWA)

The CWA is the primary federal law governing water pollution. The goal of the CWA is to eliminate releases of pollution into water and ensure that surface waters meet standards to protect fish, shellfish, wildlife and human health. Under the CWA, EPA has implemented pollution control programs including the National Pollutant Discharge Elimination System (NPDES) permit system which applies to industrial, municipal, and construction discharges to surface waters. In Washington State, EPA has delegated authority to administer the NDPES permit program to the Washington State Department of Ecology (Ecology). The NPDES Phase II Municipal Stormwater Permit applies to the City of Camas.

The CWA also regulates quality standards for surface waters and requires that water bodies not meeting standards be placed on the CWA section 303(d) list. Waters placed on the 303(d) list require the development of a water cleanup plan, also known as a Total Maximum Daily Load (TMDL). Following the issuance of a TMDL, NPDES permits are modified to include implementation of requirements to reduce pollutant loading.

The NPDES stormwater permit, standards, the 303(d) list and TMDLs and their applicability to the City are further described in the following sections.

Section 2—Regulatory Environment

Continued

2.2.1 NPDES Permit Description and Applicability

Phase 11 NPDES Municipal Stormwater Permit

NPDES Phase II permits, first issued in 1999, requires regulated small Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. Small MS4s are jurisdictions or agencies with populations under 100,000 that are not regulated by a Phase I program.

Small MS4s outside of a UA are required to obtain an NPDES permit if it is serving a jurisdiction with a population of at least 10,000 and a population density of at least 1,000 people per square mile.

Each regulated MS4 is required to develop and implement a stormwater management program (SWMP) to reduce the contamination of stormwater runoff and prohibit illicit discharges.

An MS4 is a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).

NPDES Permit terms run for five years. The current Municipal permit was issued January 17, 2007, went into effect on February 16, 2007, was modified on June 12, 2009, and expired on February 15, 2012. A draft permit for the next permit term is currently undergoing review, and Ecology has extended coverage for the existing permit until the new permit is reissued.

Implementing the City's NPDES permit requires a Comprehensive Stormwater Management Program that includes:

- Mapping stormwater systems
- Educating employees and the public
- Detecting and eliminating illicit discharges
- Controlling stormwater runoff from new development, redevelopment and construction

- An operations and maintenance program
- Annual reporting

NPDES Stormwater Permit – Construction General

The NPDES Construction Stormwater General Permit was originally issued in 1995 and regulated sites with greater than five acres of disturbance. It was re-issued by Ecology November 16, 2005, where coverage changed from 5 acres down to one acre and reissued again on December 10, 2010.

In general, the permit regulates clearing, grading and/or excavation that results in the disturbance of one acre or more for sites that discharge stormwater to surface waters of the state. In some cases, smaller sites may be subject to the permit if Ecology determines the site to be a significant contributor of pollutants or expects discharges from the site could reasonably cause a violation of water quality standards.

The requirements of the Construction General Permit include:

- Compliance with applicable state water quality and sediment management standards
- Monitoring Requirements
- Reporting and Recordkeeping
- Solid and Liquid Waste Disposal
- Additional Restrictions for Discharges to 303(d) listed or TMDL Water bodies
- Stormwater Pollution Prevention Plan (SWPPP)

The permit requires monitoring for turbidity and in certain cases for pH. When benchmark values for these constituents are exceeded, the SWPPP must be revised as needed, source control and treatment BMPs must be implemented, and all activities documented in the site log book. In addition, Ecology must be notified by phone and daily sampling continued until constituent levels are reduced to acceptable levels. Any discharges to TMDL or 303(d)-listed waters that exceed numerical effluent limits for turbidity and pH constitute a violation of the permit.

The Construction Permit applies to:

- land disturbing operations that disturb one or more acres, or
- Sites that are part of a larger common plan of development or sale that disturb less than one acre of total land area if the larger common plan will ultimately disturb one or more acres.

Section 2—Regulatory Environment

Continued

2.2.2 303(d) List and TMDLs

303(d) List

Under Section 303(d) of the CWA, states are required to prepare a list of surface waters where beneficial uses have been impaired. These beneficial uses include industrial use, aquatic habitat, drinking water, and recreation. In Washington State, Ecology conducts biennial water quality assessments to determine whether surface waters are meeting state surface water quality standards. Ecology's assessment of which surface waters are placed on the 303(d) list is guided by federal laws, state water quality standards, and the Policy on the Washington State Water Quality Assessment. This water quality policy describes how the standards are applied, requirements for the data used, and how to prioritize TMDLs. The goal of the policy is to provide a guide for selecting which surface water is impaired by pollutants and how severely.

The 303(d) List represents polluted waters that require the development of a water quality improvement project or TMDL. A TMDL is the amount of pollutant loading that a given water body can receive and still meet water quality standards established to protect beneficial uses.

The Environmental Protection Agency (EPA) approved Washington's current water quality assessment and 303(d) list on January 29, 2009. In Camas, the water bodies and constituents include the following:

- Lacamas Creek (dissolved oxygen, temperature, bacteria and pH)
- Lacamas Lake (total phosphorous)
- Washougal River (fecal coliform)
- Dwyer Creek (dissolved oxygen)
- Lower Columbia River (temperature, total dissolved gas, dioxin)

Ecology expects to submit a new Freshwater Assessment and 303(d) list to the EPA for approval during the winter of 2012-2013.

TMDLs

Currently, the City has not been identified as a party with implementation responsibilities under any existing TMDLs. A new TMDL is currently under development by Ecology associated with the listings for Lacamas Creek on the current 303(d) List. Ecology's TMDL prioritization and scheduling process is a five-step, five-year process that includes public notice, public involvement, scoping, data collection and analysis, action plan development and implementation. Implementation requirements are included in NPDES waste discharge permits when issued or through permit modifications.

Under RCW 90.48 – Water Pollution Control, and in the absence of an established TMDL, Ecology has the authority to condition the Construction Stormwater General Permit with additional requirements to control discharge of pollutants to impaired water bodies listed on the 303(d) list.

2.3 The Safe Drinking Water Act (SDWA)

The SDWA is the primary federal law governing protection of drinking water and applies to all public water systems. Under the SDWA, the EPA has established National Primary Drinking Water Regulations that set standards for maximum contaminant levels to ensure drinking water quality. The SDWA also authorizes the EPA to regulate injection wells to protect underground drinking water supplies.

2.3.1 Underground Injection Control (UIC) Rule

To satisfy the intent and requirements of the SDWA and the Washington State Water Pollution Control Act, chapter 90.48 RCW, the Washington State Legislature adopted the UIC Program, chapter 173-218 WAC. Under this program UICs used for stormwater discharge and/or treatment are considered Class V UICs.

Class V injection wells are usually shallow injection wells that inject fluids above the uppermost groundwater aquifer. Some examples include dry wells, french drains used to manage stormwater, and drain fields. Examples of Class V injection wells that are allowed in Washington, and relate to stormwater, include drywells and infiltration trenches used to drain stormwater runoff into the ground surface.

All Class V injection wells must be registered with Ecology, except wells receiving residential roof runoff from a single family home or to control basement flooding at single family homes (including duplexes). These wells are exempt from the registration requirements.

To provide clarification on which stormwater infiltration techniques meet the Class V well definition, the Department of Ecology's UIC website includes a memorandum from the EPA which identifies specific infiltration practices/technologies and discusses whether or not they are constitute a Class V well (Boornazian, & Heare, 2008). The guidance information provided in the EPA memorandum is summarized in Table 2.1.

Section 2—Regulatory Environment

Continued

Table 2.1: Class V Well Identification Guide From EPA	
Infiltration Practice/Technology	**Considered a Class V Well?**
Rain Gardens & Bioretention Facilities	No.
Vegetated Swales	No.
Pocket Wetlands & Stormwater Wetlands	No.
Vegetated Landscaping	No.
Vegetated Buffers	No.
Tree Boxes & Planter Boxes	No.
Permeable Pavement	No.
Reforestation	No.
Downspout Disconnection	No – typically these are downspouts are redirected from sewers to permeable surfaces where runoff can infiltrate.
Infiltration Trenches	Yes – when they include an assemblage of perforated pipes, or are deeper than their widest surface dimension.
Commercially Manufactured Stormwater Infiltration Devices	Yes.- typically these constitute a subsurface fluid distribution system.
Drywells, Seepage Pits, Improved Sinkholes	Yes – typically these are deeper than their widest surface dimension.

The governing EPA criteria used to make the determinations in Table 2.1 includes:

- A Class V has a sub-surface distribution system
- A Class V well is a hole that is deeper than its widest surface dimension

If either one of these criteria apply to a particular stormwater infiltration practice or technology, then it would be considered a Class V well and would be subject to UIC regulations.

The following summary from Ecology's December 2006 *Guidance for UIC Wells that Manage Stormwater* speaks to the requirements for existing UIC wells and requirements for municipalities with NPDES stormwater permits.

Existing UIC Wells

UIC wells constructed before February 3, 2006 are considered by Ecology to be "existing" wells and have different requirements than wells constructed after.

Existing UIC wells must be registered with Ecology, except for wells receiving residential roof runoff from a single family home or to control basement flooding at single family homes (including duplexes).

An assessment of existing wells must be completed to determine if the existing UIC wells are a high threat to ground water. UIC wells that are high threat to ground water must be retrofitted to protect ground water quality.

New UIC Wells

UIC wells constructed after February 3, 2006 are considered by Ecology to be "new" wells and must meet Ecology's Non-endangerment standard. This can be done through the presumptive approach (following the guidelines in Ecology 2006, or through the demonstrative approach, where evidence is provided that the non-endangerment standard is met.

Requirements for Municipalities with NPDES Stormwater Permits

Municipalities that are under an NPDES stormwater permit may also have stormwater discharges to UIC wells. The Stormwater Management Program required by the NPDES stormwater permit includes best management practices that also may be applied to stormwater discharges to UIC wells. To avoid duplication, municipalities that are under an NPDES stormwater permit may meet UIC program requirements by applying their Stormwater Management Program to areas served by UIC wells. See Chapter 173-218-090(2) WAC.

Since the NPDES permit does not fulfill all the requirements of the UIC Program, the following must be added to the Stormwater Management Program (SWMP) and implemented:

- UIC wells must be registered
- New UIC wells must be constructed according to the specifications in this guidance
- A well assessment must be completed for all existing UIC wells
- Existing UIC wells that are determined to be a high threat to ground water must be retrofitted

More information on these procedures can be found in Ecology (2006).

Section 2—Regulatory Environment

Continued

2.4 Endangered Species Act (ESA)

The purpose of the federal ESA is to protect species and the ecosystems upon which they depend. Two primary goals of the ESA are to prevent the extinction of endangered plant and animal life and their critical habitats, and to pursue survival and recovery of these populations. It is administered by two agencies, the U.S. Fish and Wildlife (USFWS) (freshwater fish and all other species) and the National Oceanic and Atmospheric Administration (NOAA) (marine species). The ESA prohibits any "take" of species listed as endangered. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect. In 1999, 12 groups of Pacific Northwest salmon and several populations of bull trout were listed as threatened or endangered under the ESA, and in July 2000, NOAA NMFS adopted a rule governing the "take" of 14 groups of salmon and steelhead listed as threatened under the ESA.

Salmon Recovery

The ESA and Washington State law require development of plans to recover salmon. The Governor's Salmon Recovery Office was established by the Legislature to coordinate a statewide salmon recovery strategy.

The Lower Columbia Fish Recovery Board (LCFRB) is charged with coordinating salmon recovery in the lower Columbia River basin, including Camas. They have developed and documented a plan to support salmon recovery for Willamette/Lower Columbia River Evolutionary Significant Units (ESU) in Washington.

The City of Camas, along with other members of the Planning Unit, unanimously approved the plan developed by the LCFRB on December 13, 2004. The Watershed Management Plan was adopted by the parent counties of Clark, Cowlitz and Skamania counties on July 21, 2006. Detailed implementation planning was completed in June of 2008. Each implementing entity documents its commitment and approach to implementing specific actions in its Six-Year Implementation Work Schedule that addresses recovery plan and watershed plan actions. Camas is currently implementing actions and tracking its activities in a web-based data system called Salmon PORT accessed from the LCFRB website.

2.5 City of Camas Municipal Code Requirements

There are currently five sections of the City of Camas Municipal Code (CMC) that pertain to stormwater management and pollution prevention: Stormwater Drainage Utility, CMC 13.88; Stormwater Utility Service Charges, CMC 13.89; Stormwater Control, CMC 14.02; Illicit Discharge, Dumping and Illicit Connections, CMC 14.04; and Erosion and Sediment Control, CMC 14.06. These ordinances are discussed in detail below.

CMC Chapter 14.02 – Stormwater Control

This chapter applies to new development and redevelopment and includes requirements that address the following topics:

- Reducing and preventing stormwater pollution during construction
- Reducing the introduction of pollutants into surface water runoff
- Installing flow control and/or stormwater treatment facilities, depending on size and the character of the project, and implementing low impact development practices

This chapter also sets minimum standards consistent with Ecology's Stormwater Management Manual for Western Washington as modified by the City's Stormwater Design Standards Manual.

CMC 14.04 Illicit Discharges, Dumping and Illicit Connections

This chapter applies to all new and existing development, public and private. It defines prohibited, allowable, and conditional discharges to the municipal storm drain system, and/or surface and ground waters. It further prohibits illicit connections to the municipal storm drain system.

CMC 14.06 Erosion and Sediment Control

This chapter applies to any person undertaking any land-disturbing activity, with the exception of small parcel development which is regulated under the small parcel requirements of Chapter 3.03 of the City's Stormwater Design Standards Manual. Requirements include the development and implementation of an Erosion Prevention and Sediment Control Plan as well as the development and implementation of a Stormwater Pollution Prevention Plan for sites one acre or larger meeting certain criteria. Best management practices must be applied to the site and be maintained to prevent sediment from leaving the site.

CMC 13.88 Stormwater Drainage Utility/CMC 13.89 Stormwater Utility Services Charges

These chapters define the creation of the city-wide stormwater drainage utility, the creation of the stormwater drainage utility fund, and the rate structure and fee charged for the stormwater utility. See Section 6 for more information.

2.6 Growth Management Act (GMA)

The Washington State GMA was adopted in 1990 in response to concerns about unplanned and uncoordinated growth posing threats to the environment, sustainable economic development, and the quality of life in the state. The GMA requires state and local government to manage the state's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing comprehensive plans and

implementing them through capital investment and development regulations.

Critical Areas Ordinances

The GMA identified five critical areas that each city and county in Washington State must identify, designate and protect:

- Wetlands (CMC 16.53)
- Areas with critical recharging effect on aquifers used for potable water(CMC 16.55)
- Frequently flooded areas(CMC 16.57)
- Geologically hazardous areas(CMC 16.59)
- Fish and wildlife habitat conservation areas(CMC 16.61)

Approaches to critical areas protection can incorporate both regulatory and non-regulatory methods and involve a spectrum of strategies. These range from conservation policies, designation of open space and regulation of land uses that may impact critical areas. The City's activities are subject to the City's Critical Areas Ordinance's including those regulations that relate to habitat conservation and restoration.

2.7 Shoreline Management Act (SMA)

The Washington State SMA applies to the "shorelines" of Washington, which are defined as marine waters, most lakes, streams, rivers, shorelands, wetlands and floodplains. It also designates "shorelines of statewide significance" including all waters of Puget Sound and certain Puget Sound shorelines. The Act is administered by the Department of Ecology and addresses three basic policy areas: shoreline use, environmental protection and public access.

Under the SMA, all cities and counties with "shorelines" must develop and adopt a Shoreline Master Program (SMP), which according to Ecology is "essentially a shoreline-specific combined comprehensive plan, zoning ordinance, and development permit system." The City's activities, as applicable, are subject to the Camas SMP, including those that relate to habitat conservation and restoration.

2.8 State Environmental Policy Act (SEPA)

The SEPA provides a process for identifying and evaluating possible environmental impacts that may result from governmental decisions and conditioning proposals when adverse impacts are anticipated. The SEPA process applies to state and local agency decisions that relate to projects, such as private development projects or construction of public facilities, or non-projects, such as adopting regulations, policies or plans.

Proposals are reviewed by the "lead" agency (state, city or county) based on information

provided by the applicant, and environmental impacts are evaluated and documented in the areas of earth, air, water, plants, animals, energy, environment health, land use, transportation, public services and utilities. Following the review and evaluation, the lead agency will either issue a Determination of Non-significance (DNS), a Mitigated Determination of Non-significance (MDNS), or require the preparation of an Environmental Impact Statement (EIS). The DNS, MDNS and EIS can impose conditions on the proposal to address environmental impacts identified in the review and evaluation. These are tools used by the lead agency to provide information to all agencies that must approve the proposal. Proposals are rarely denied unless an EIS identifies likely significant environmental impact that cannot be mitigated to within acceptable limits.

2.9 Tribal Consultation and Collaboration

Pursuant to Federal Executive Order 13175 issued on November 6, 2000, executive departments and agencies of the federal government were charged with engaging in regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications. The EPA's Region 10 Tribal Consultation Framework defines consultation to mean "respectful, meaningful, and effective two-way communication that works toward a consensus reflecting the concerns of the affected federally recognized tribe(s) before making decisions or taking action.

In Washington State, the Centennial Accord was executed on April 4, 1989, slightly ahead of the federal Executive Order. The Accord between the State of Washington and the federally recognized Indian tribes of Washington "encourages and provides the foundation and framework for specific agreements among the parties outlining specific tasks to address or resolve specific issues." Under the Ecology Centennial Accord Implementation Plan, "Ecology is committed to government consultation with tribes on all actions and issues of interest to tribes under Ecology's statutory authority."

At the local level, the City of Camas provides opportunities for tribal input through the SEPA and archaeological review process.

Section 2—Regulatory Environment

Continued

Section 3—Study Area Characteristics

3.1 Introduction

This section describes the study area for this plan and the current and planned zoning for areas within the study area. It also discusses the physical characteristics that influence stormwater management, such as climate, topography, and soil types. Lastly, this section discusses characteristics of the existing storm drainage system.

3.2 Study Area

The study area for this Comprehensive Stormwater Drainage Plan includes the Camas city limits and its current urban growth area.

Camas's Urban Growth Area encompasses the City limits plus areas north and west of the City that will be annexed for future expansion. The current City limits consist of approximately 9,717 acres, while the unincorporated areas of the UGA are approximately 2,110 acres

The city limits and urban growth area are shown in Figure 3-1.

3.3 Land Use and Zoning

How land is developed can affect both the amount of runoff generated from a project and the quality of the stormwater as it leaves the site. Commercial and industrial areas tend to create more impervious area than residential sites. Depending upon the exact use type, industrial areas potentially generate more pollutants in runoff than residential areas and may require a different type of treatment. Therefore, understanding land use can help determine what regulatory and management measures should take place within a basin.

Camas currently has 36 different zoning categories. These different categories have been summarized into more general land types as shown in Table 3.1.

Table 3.1: Camas Land Use Zoning

Project Zoning Category	City Zoning Classification
Single-Family Residential	R-5, R-6, R-7.5, R-10, R-12, R-15, R-20, R1-6, R1-10, R1-20
Multifamily Residential	R-12, R-18, MR-10, MF-24
Commercial	BP, CC, DC, GC, NC, OC, RC, CH, CV, MX, RGX,
Industrial	HI, LI, LI/BP, ML, A

Table 3.1: Camas Land Use Zoning	
Project Zoning Category	City Zoning Classification
Agriculture	AG-20
Special Districts	P/OS, P/WL, FR-40

These areas are shown in Figure 3-2. The special districts within the City of Camas consist of parks and open space.

3.4 Physical Characteristics

The analysis and management of stormwater is influenced by physical characteristics of the watershed, such as precipitation amounts, soil types, level and type of development, and topography. This section provides a description of these and other characteristics that influence stormwater management.

3.4.1 Climate

The City receives an average of 51 inches of rain per year according to the National Oceanic and Atmospheric Administration data. December is historically the wettest month, and July the driest, with normal precipitation varying from 0.5 to 6.5 inches per month.

The average annual temperature is about 53 degrees Fahrenheit (°F), with a summer time average of 65 °F and a winter average of 40 °F.

3.4.2 Topography

The City of Camas is characterized by varied topography including the flatter areas downtown on the banks of the Columbia, the ridge of Prune Hill running east-west through the City just north of downtown, the low lands of Grass Valley northwest of Prune Hill, and the valleys and hills surrounding Lacamas Lake, including the North Urban Growth Area (NUGA) on the northeast side of the lake.

The elevation within the City ranges from about 20 feet above sea level along the shores of the Columbia and Washougal Rivers, to approximately 750 feet at the top of Prune Hill. Much of the development is centered on the downtown area, on Prune Hill where the slopes allow, and along the southwestern shore of Lacamas Lake. Currently, the top and bottom of Lacamas Lake, along with much of the northeastern shore, is forested. Grass Valley is a patchwork of homes, businesses, open grassland, and stands of trees.

Figure 3-3 shows contour elevations for the City.

3.4.3 Soils

The type of soil - granular, sandy, clayey, etc. has a strong influence on stormwater management, mostly in the determination of whether stormwater can be infiltrated or whether it needs to be detained and conveyed to a surface water body.

The majority of the soils within the City are classified by the Natural Resource Conservation Service (NRCS) as Hesson, Powell, Olympic Lauren, and Dollar. These soils are mostly poorly drained and consist of medium to moderately fine textured terrace soil. Figure 3-4 shows a map of the soil types in the city, as mapped by the NRCS.

Except for isolated pockets and areas of Hillsboro soils in the west part of the city, soil conditions are generally not favorable for infiltration of stormwater. For this reason most developments built since flow control has been required use detention systems and do not infiltrate stormwater. However, as most soils have some infiltration capacity, the City's stormwater ordinance (CMC 14.02) requires testing for infiltration and the use of infiltration where possible. Even if detention is necessary, infiltration through the detention pond will affect the size of the facility.

3.4.4 Geologic Hazard Areas

There are approximately 891 acres within the City that are classified as steep and unstable slopes. The southern slope of Prune Hill is either historically or potentially unstable. Slopes along the drainage ways coming down Prune Hill, to the north and east, are also potentially unstable. The hill slopes in the natural area draining to Lacamas Creek are also active and potentially unstable. Figure 3-5 maps known and potentially unstable slopes as noted in the City's Geographic Information System (GIS).

3.4.5 Flood Hazard Areas

Flood hazard areas are areas adjacent to lakes, rivers, and streams that are prone to flooding during peak runoff periods. Construction of buildings and other development in these areas is regulated in accordance with the City's floodplain ordinance. Figure 3-5 shows mapped floodplains in the Camas area.

3.4.6 Wetlands

Wetlands are defined by the EPA as areas that are inundated by surface or ground water at a frequency and duration sufficient to support vegetation adapted for saturated conditions. Wetlands support valuable and complex ecosystems and development is severely restricted, if not prohibited, in most wetlands.

Section 404 of the Clean Water Act regulates discharge of materials to wetlands and a permit from the Army Corps of Engineers is required for most activities that potentially impact wetlands. Wetlands within the City of Camas are generally adjacent to the Columbia River and Lacamas Lake and in the low flat lands of Grass Valley on the west side. Figure 3-5 shows wetlands as listed in the City's GIS.

3.4.7 Surface waters

Major water features within the City include the Columbia River, the Washougal River, Lacamas Lake, Lacamas Creek, Fallen Leaf Lake, and Round Lake.

The Columbia River begins in Canada, enters the United States in northeastern Washington, and travels southwest through Washington to the Pacific Ocean. The river exits the Columbia River Gorge shortly before it travels past downtown Camas.

The Washougal River flows southwest from the Cascade Mountains to the City of Camas, where it empties into the Columbia River.

Upper Lacamas Creek (above Lacamas Lake) receives flow from 5 tributaries, only one of which is within the city limits (Dwyer Creek). The other tributaries - China Ditch, Matney Creek, Shanghai Creek, and Fifth Plain Creek - enter Lacamas Creek in rural Clark County.

Lacamas Lake is a 2.4 mile long lake that receives runoff from the surrounding hills and flow from Lacamas Creek. It is connected to Round Lake by a channel that runs under State Route 500. The water level in Round Lake is controlled by a dam at the south end of the lake, which is run by Georgia Pacific Consumer Products LLC. Lacamas Lake has significant algal growth in the summer time, which can impair the water quality.

Lower Lacamas Creek, below Round Lake, travels down a steep slope and over waterfalls to its confluence with the Washougal River.

Numerous streams and creeks discharge from Prune Hill, including Blue Creek and Forest Home Creek on the south side, and Dwyer Creek on the north side. The Fisher Swale follows the west limits of the city as it heads south to the Columbia River. See Figure 3-6 for the location of these creeks.

3.5 Existing Storm Drainage System

The City owns and maintains a stormwater conveyance system that drains approximately 7,500 acres. This storm system includes approximately 75 miles of stormwater conveyance pipe and 1,800 stormwater inlets and catch basins. It also includes numerous culverts and drainage channels. All storm pipelines are separate from the City's sanitary sewer system.

The City has a long standing policy of requiring commercial and residential stormwater facilities to be privately owned and maintained. As part of its March 2010 stormwater code update the City retained this policy and codified it under CMC 14.02.200 Ownership and Maintenance.

The City estimates that there are 110 private stormwater facilities within its boundaries. Private facility maintenance inspection occurs primarily on a complaint-driven basis. However, the city's current NPDES permit requires that all private stormwater facilities built after February 2010 be inspected yearly by the City. The City is now responsible for annual inspections of private stormwater facilities and for ensuring that property owners maintain their facilities.

At the time of this report the City owns and maintains approximately 25 facilities, including underground treatment vaults, detention ponds, biofiltration swales, and wet ponds, drainage ditches, and culverts. A list of these facilities is included in Appendix A. It is important to note that 23 of the 25 facilities on this list were constructed before February 2010 and are therefore not subject to the NPDES inspection requirements in the city's current NPDES permit.

Section 3—Study Area Characteristics

Continued

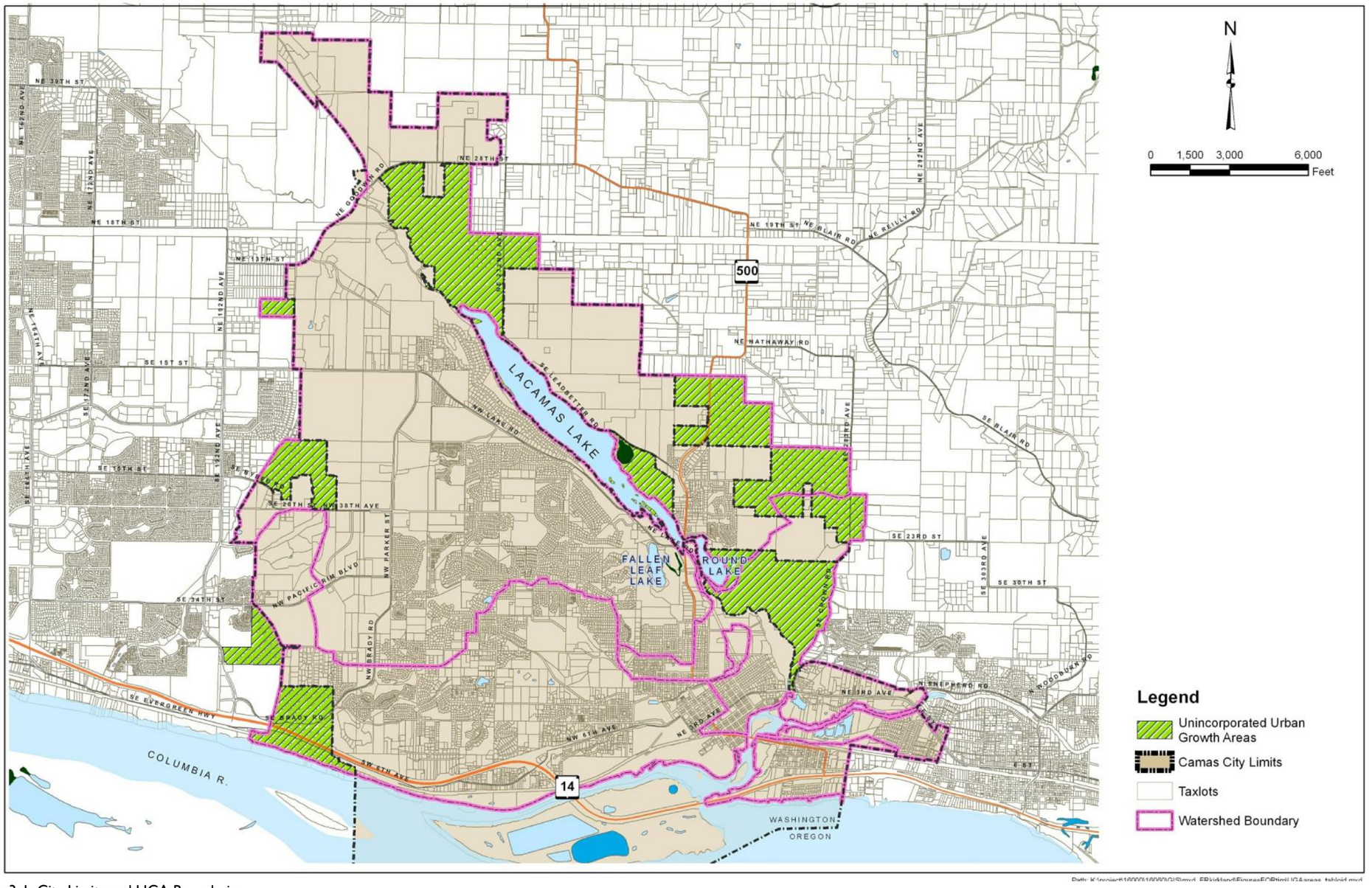


Figure 3-1: City Limits and UGA Boundaries

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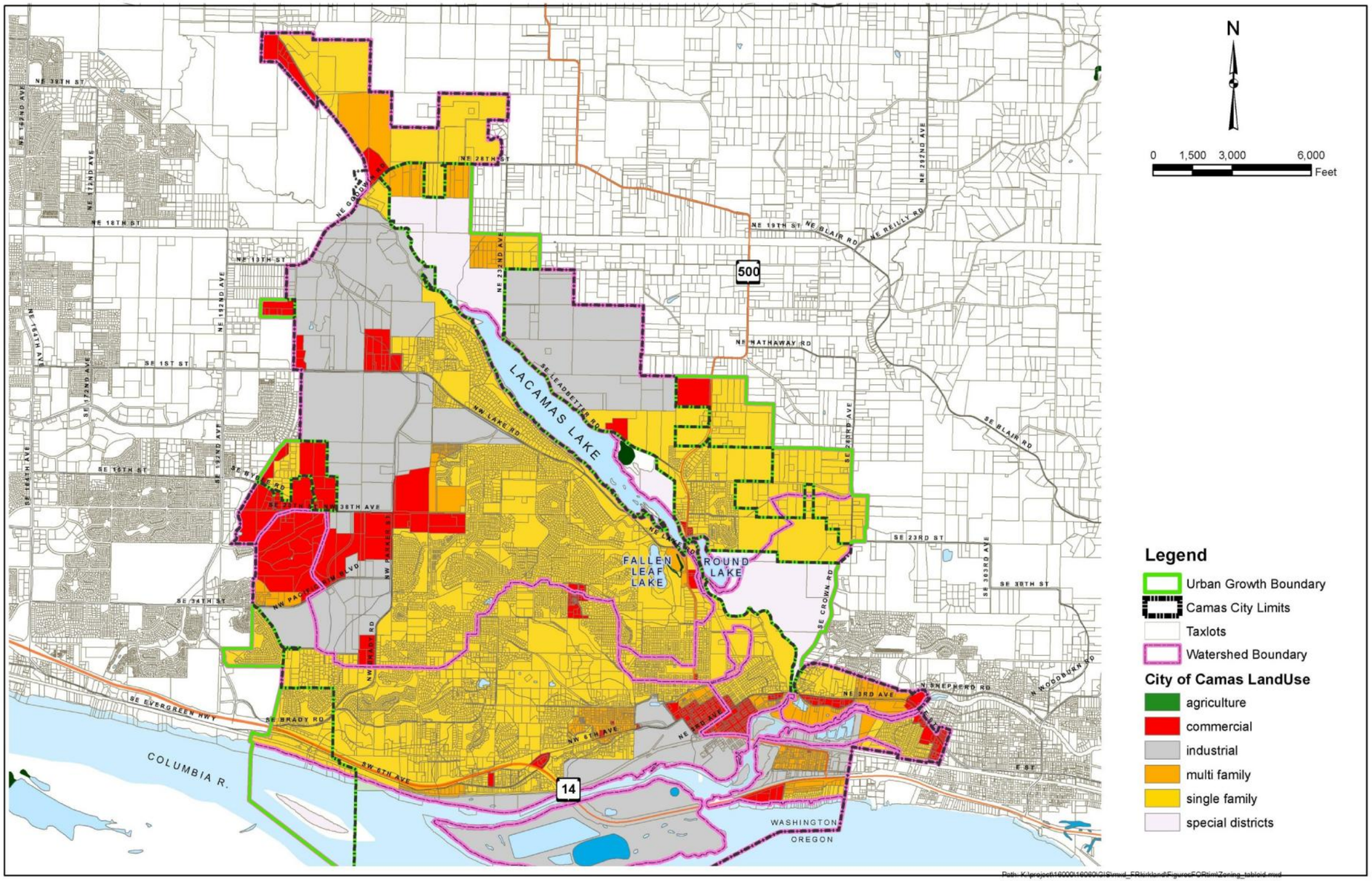

Figure 3-2: Current City Zoning

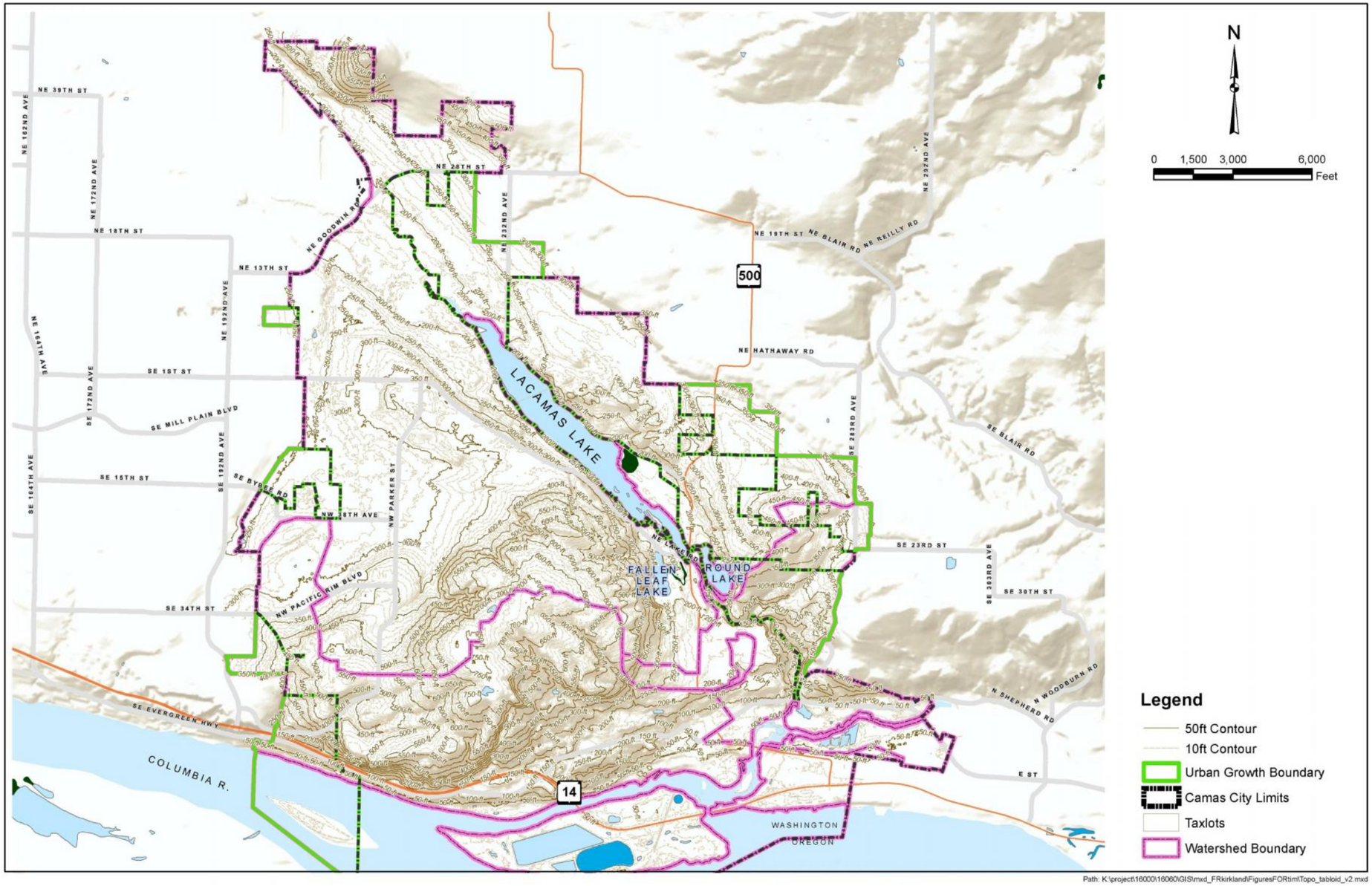

Figure 3-3: City Contour Map

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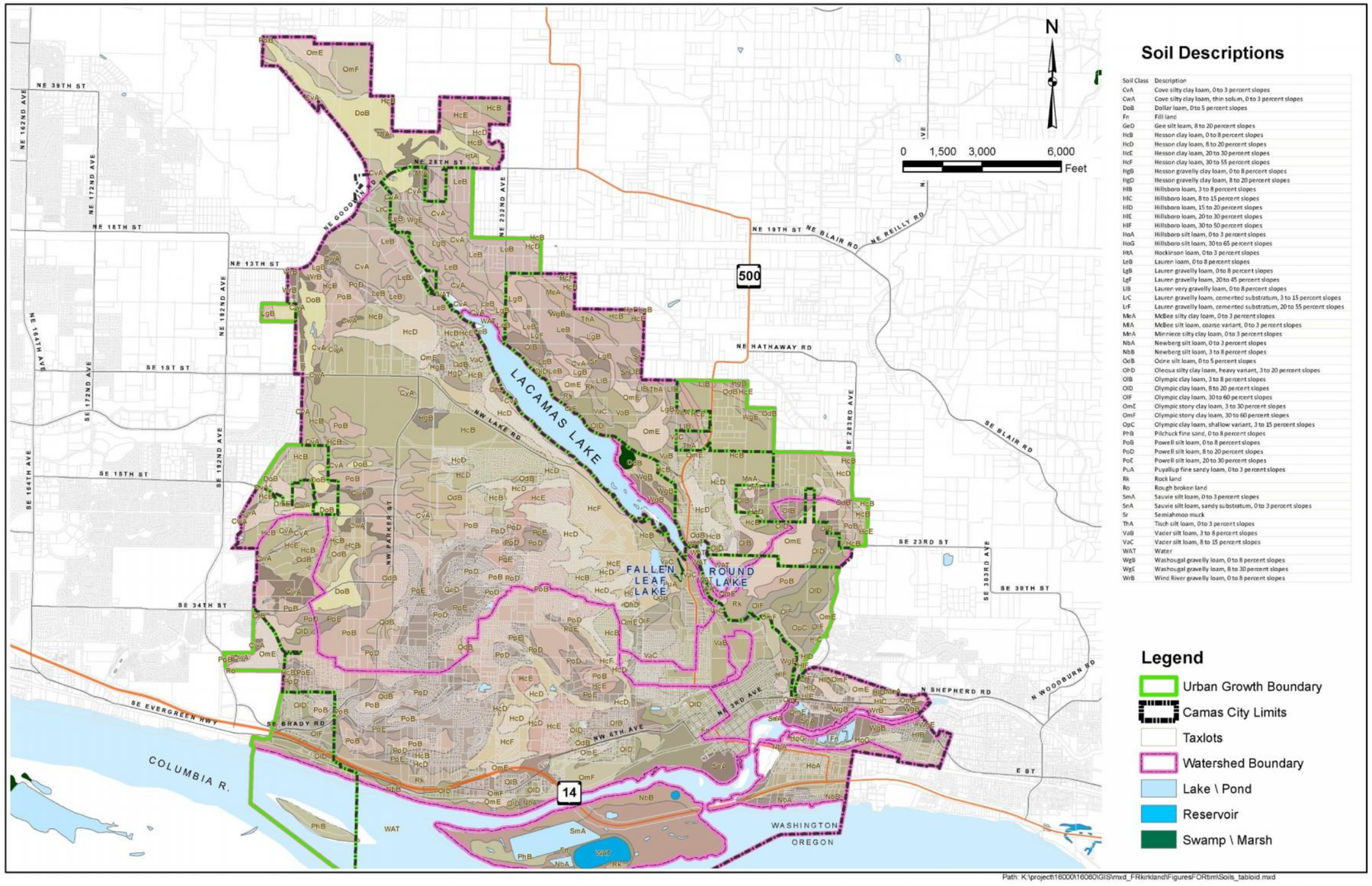

Figure 3-4: NRCS Soil Categories

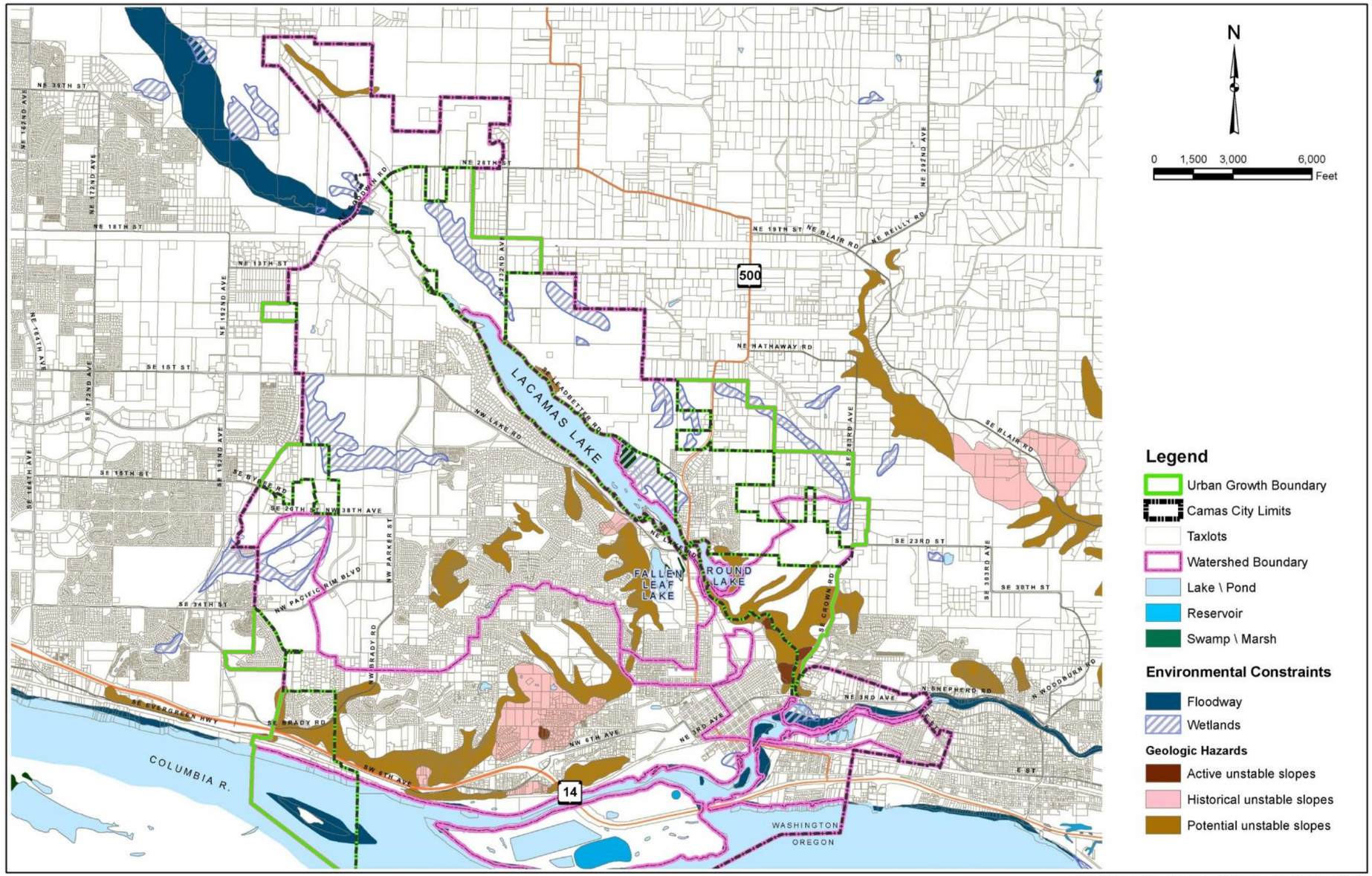

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Figure 3-5: Environmental Constraints and Unstable Slopes

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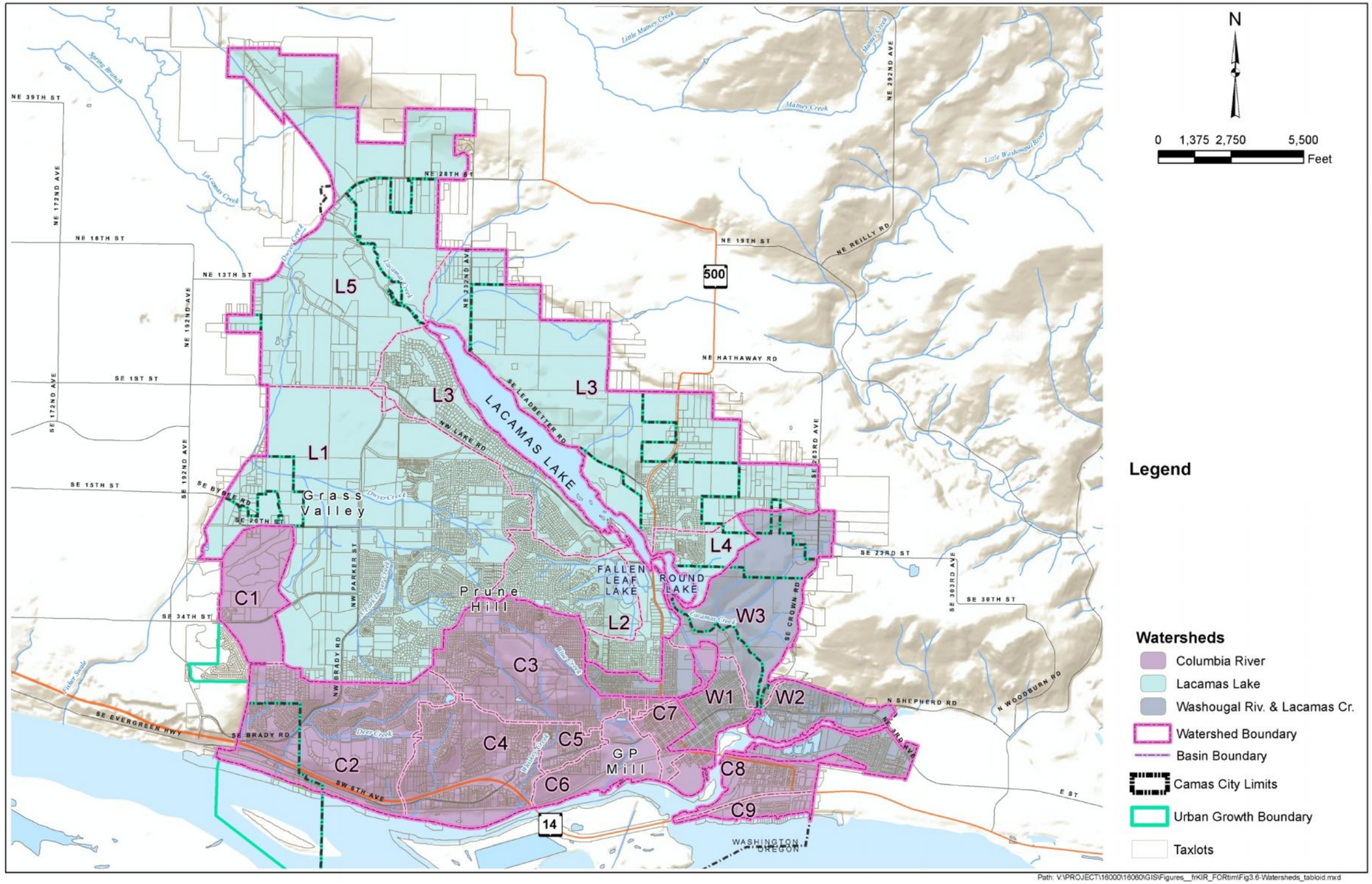

Figure 3-6: Watersheds and Basin Boundaries

Section 4—Study Area Watersheds

4.1 Introduction

The study area includes three major watersheds: Columbia River, the Washougal River, and Lacamas Lake. All surface water and piped stormwater conveyance systems drain to one of these water bodies through a network of interconnected drainage channels, creeks and storm pipes.

Previous studies have divided the City's watersheds into separate watersheds and basins. Table 4.1 lists the basins within each watershed and Figures 4-1 - 4-3 shows each watershed and basin.

Table 4.1: Camas Watersheds and Basins

Watershed	Basin	Area (AC)
Columbia	Fisher (C1)	340
	Brady Creek (C2)	687
	Blue Creek (C3)	593
	SW 6th (C4)	462
	Forest Home (C5)	76
	GP Mill (C6)	775
	Downtown (C7)	87
	Oak Park (C8)	137
	River Walk (C9)	66
Lacamas Lake	Dwyer Creek (L1)	2016
	Fallen Leaf (L2)	309
	Frontage (L3)	1822
	Round Lake (L4)	320
	Upper Lacamas (L5)	1463
Washougal	Downtown (W1)	151
	Frontage (W2)	360
	Lower Lacamas (W3)	522

Section 4—Study Area Watersheds

Continued

The characteristics of each watershed that influence stormwater management are presented in this section. This includes soil types, geological hazards, steep slopes, current land use and future development potential. This section discusses existing stormwater systems within each watershed, and it also lists the number of outfall pipes larger than 24-inches, as these outfalls are regulated under the City's NPDES Stormwater permit.

Ecology's Stormwater Management Manual for Western Washington (SMMWW) and Camas's Stormwater ordinance requires water quality treatment and control of flows over pre-European conditions to be provided for all development activities that generate 5,000 square feet or more of impervious surface. The SMMWW emphasizes infiltration and low impact over traditional flow detention facilities. The use of these measures is influenced by land use and soil characteristics, along with how steep the slopes are and whether there are geological hazards. This section discusses stormwater management options with these factors in mind.

Stormwater Management strategies are designed to meet the city's goals and objectives, as described in Section One. The key strategy relating to stormwater is to support economic development while protecting the environment.

4.2 Columbia River Watershed

Watershed Boundaries

The Columbia River marks the southern boundary of the City. Although all runoff in the City eventually makes it to the Columbia River, this watershed as defined within the study area just includes areas that either drains directly to the river through manmade conveyance pipes, or areas that drain through small streams to the river. The limits of the Columbia River watershed, along with individual basin boundaries within the watershed, are shown in Figure 4-1.

This watershed lies primarily between Prune Hill and the Columbia River, extending to the City's east and west boundaries. This watershed includes a portion of downtown Camas, the Georgia-Pacific paper mill, and the neighborhoods west and northwest of downtown, including the southern slopes of Prune Hill. One area, Basin C1 (See Figure 4-1), lies on the west edge of the City northwest of Prune Hill. This area drains to the Columbia River through the Fisher Swale.

Soil Characteristics

NRCS mapped soil types in this watershed consist mostly of Powell, Hesson, Olympic, and Cove soils, with some pockets of Vador and Sauvie soils (see Figure 3-4). All of these soils have moderate to slow infiltration rates, and as such infiltration of stormwater throughout this area is very limited.

Current Stormwater Systems

The portion of the watershed encompassing downtown Camas (Basin C7) is primarily drained

through manmade conveyance systems to the Columbia Runoff in these basins is discharged through small creeks and conveyance systems to the Columbia River. Since the development of these areas predates water quality regulations there are currently no water quality facilities.

Basin C6 encompasses the Georgia-Pacific paper mill. Blue Creek is piped under the mill site to the Columbia River, conveying stormwater from Basin C3. The mill has an industrial NPDES permit from Ecology that has its own requirements for discharges from the mill to the Columbia River.

Runoff from Basins C2-C5 is conveyed by small streams to the Columbia River.

Basin C1 drains west to the Fisher Swale. This swale runs south to the Columbia River (see Figure 4-1).

Current/Future Land Use Characteristics

Downtown is the traditional center of Camas and is the oldest and most developed part of town. It is a mix of commercial, light industrial, and some housing. As this area is densely developed, any future development activities would consist primarily of redeveloping existing properties or developing infill parcels.

The slopes of Prune Hill are zoned exclusively for single family residential development. Steep slopes and historically unstable areas may limit new development along the hill slopes.

The areas north and west of downtown, below Prune Hill (Basins C2, C3, C4, and C5), are more sparsely developed, and property improvements would consist mostly of infill and redevelopment. Drainage from these areas is conveyed to the Columbia River through Forest Home Creek and Blue Creek (which is piped through the George-Pacific paper mill site to the river).

Basin C1 (See Figure 4-1) is in this watershed, as it drains to the Fisher Swale, which drains to the Columbia River. This basin is primarily undeveloped, except for a recently constructed office complex and a small subdivision on the north side of NW Pacific Rim Boulevard at the City limits. This basin has large tracts with significant wetlands that have discouraged development to date. This basin has areas zoned for industrial, commercial, single-family and multifamily residential development (see Figure 3-2).

Stormwater Management

Stormwater management for development activities must meet the requirements in CMC 14.02 and follow the SMMWW. Options for meeting the most pertinent requirements, i.e. Minimum Requirements 5, 6 and 7 are described below and summarized in Table 4.2. The CIP projects that support these strategies are also listed in the table and complete descriptions are included in Section 5.

Table 4.2: Columbia River Watershed Stormwater Strategies	
On-site stormwater management	All projects must implement • BMP T5.13 (Post Construction Soil Quality and Depth); • BMPs T5.10A, B, or C (Downspout Full Infiltration, Downspout Dispersion Systems, Perorated Stub-out Connections); and • BMP T5.11 (Concentrated Flow Dispersion) or BMP T5.12 (Sheet Flow Dispersion) if feasible. Where required, bioretention facilities can be used with underdrains in areas where soil permeability is low. The use of permeable pavements in this area should review the requirements and exemptions in the 2012 SMMWW, and follow the guidelines in the "Low Impact Development Technical Guidance Manual for Puget Sound".
Runoff Treatment	Development activities should provide their own facilities designed per the SMMWW and the city code.
Flow Control	Convey flow directly to the Columbia River through man-made conveyance systems where possible. Where man-made conveyance systems aren't available, or where there are capacity constraints in existing systems, either upgrade the systems or provide on-site detention.
Related CIP Projects	SS02, Storm Sewer Conveyance Modeling SS05: Outfall Protection

On-site Stormwater Management

On-site stormwater management includes dispersion methods and Low Impact Development (LID) measures and are required to be used to the maximum extent feasible for all development activities that result in 2,000 square feet, or greater, of new, replaced, or new plus replaced hard surface area, or has land disturbing activities of 7,000 square feet or more.

All development will be required to amend their soils (BMP T5.13) and dispose of roof runoff in one of three methods (BMPs T5.10 A, B, or C). See the SMMWW for a complete description of these BMPs. All sites will also be required to implement concentrated or sheet flow dispersion BMPs where feasible.

Development activities required to meet flow control and runoff treatment must also meet an LID

performance standard described on page 2-29, Volume I of the SMMWW.

Soils in the Columbia River Watershed have moderate to low infiltration potential. As such, some sites may be able to use LID measures to treat and infiltrate some portion of the site stormwater. Where rates are low or questionable, under-drains can be placed above the bottom of the rock chamber within bioretention facilities to convey water after being treated through the soil media. Placing the under-drain above the facility bottom will allow for some infiltration. The SMMWW provides criteria for the use of these systems.

Development activities that are exempt from Minimum Requirement #7 (Flow Control) do not have to meet the SMMWW's LID Performance Standard, nor are they required to implement bioretention, rain gardens, permeable pavement, and full dispersion. For the Columbia River Watershed, this means that if the development can discharge directly to the Columbia River through a man-made conveyance facility with available capacity, these facilities are not needed unless used for runoff treatment.

Runoff Treatment

Runoff treatment is required for any new development or redevelopment meeting the size thresholds listed in the City's stormwater ordinance. Existing dense development in downtown limits the ability to place water quality facilities; streetscape LID facilities (i.e. stormwater planters, pervious pavement, green roofs) and mechanical treatment systems will likely be the most feasible options. Although soil conditions are not conducive for infiltration, bioretention facilities can still be used with under drains. They will provide robust stormwater treatment and some flow attenuation.

New residential areas on Prune Hill can likely accommodate larger water quality and flow control facilities in addition to LID and onsite stormwater management options. Particular attention should be paid to sediment transport and downstream impacts since the creeks draining the hill are very steep and have potential to carry high sediment loads (see CIP projects BC 01 and BC 02 in Section 5).

Flow Control

The Columbia River is listed in the 2012 SMMWW as a flow control exempt water body, which means stormwater discharges to the river are exempt from the city's flow control requirement, provided runoff is conveyed directly to the river in a man-made conveyance system sized to convey the flow. Development activities that discharge stormwater to conveyance systems without sufficient capacity, or to other water bodies or creeks, must meet the City's flow control requirements.

The City's downtown core currently contains a storm sewer system that conveys runoff directly to the Columbia River. The system has been in place for many years, and the maintenance staff have

Continued

not identified any areas of flooding or other signs of capacity issues. The capacity of the system will be quantified with *Capital Project SS02, Storm Sewer Modeling* (See Section 5). If capacity constraints are identified, the model can be used to determine pipe size upgrades.

Basins C1-C5 discharge to small streams that convey stormwater to the Columbia River. Development or redevelopment in these basins would need to provide detention. Basin C6 is the mill site, which is completely developed. Runoff from Basins C8 and C9 could discharge directly to the Columbia River if the conveyance system has capacity or if the system size was increased.

4.3 Lacamas Lake Watershed

Watershed Boundaries

This watershed encompasses the northern, mostly undeveloped, areas of the City as well as the north side of Prune Hill and lakeshore areas. Lacamas Lake is fed by Lacamas Creek, which in turn is fed by five different creeks, many conveying water from outside the City limits. Dwyer Creek, which conveys runoff from a large portion of northwest Camas, discharges to Lacamas Creek.

Note that all discharges to Lacamas Lake, either directly or indirectly, are required to treat for phosphorus.

The limits of the Lacamas Lake watershed, along with basin boundaries within the watershed, are shown in Figure 4-2.

Current/Future Land Use Characteristics

Large portions of Grass Valley and the north shore of Lacamas Lake are currently undeveloped. Grass Valley is zoned primarily for industrial and commercial development, and the Northern Urban Growth Area (NUGA) is zoned for multi-family and single family developments, along with some commercial and light industrial. The northern and eastern slopes of Prune Hill are zoned primarily for single-family residential development but there are some mixed-use areas with multifamily residential, commercial, and open space tracts. The south lakeshore areas are zoned primarily for single-family residential development with some industrial and park open spaces on the east end of the lake. Currently, the south side of the lake is developed as single-family residential properties but the north side remains mostly undeveloped. Please see Figure 3-2 for zoning.

The residential areas on Prune Hill and the south shore of Lacamas Lake are unlikely to see new development except infill or redevelopment. The industrially zoned areas in Grass Valley and northern parts of the City have many wetlands which limit the developable area. The land north of the lake is zoned for light-industrial, single family, and multifamily development.

Soil Characteristics

NRCS mapped soil types in this watershed consist mostly of Hesson, Powell, Olympic, and Vader

soils with some areas of Odne, Dollar, Cove, Lauren, Puyallup, Hockinson, McBee, Semaihmoo and Tisch soils (see Figure 3-4). Most of these soils are moderately to poorly drained and limit the infiltration of stormwater, except for Lauren soils, which are present in the NUGA area. This soil is generally moderate to rapidly draining and may support infiltration of stormwater. Lenses of moderately-draining Puyallup, Olympic, and Hesson soils are present near Round Lake and Fallen Leaf Lake, and infiltration facilities have been installed in these areas (see Figure 4-2).

Current Drainage System

Grass Valley and the northwest slopes of Prune Hill drain to Dwyer Creek. Most of the residential areas on Prune Hill were developed in the 1990s and include privately-owned stormwater treatment and flow control facilities. Information on the stormwater infrastructure in the industrial and commercial areas is incomplete but some private water quality facilities exist. There are two NPDES regulated outfalls to Dwyer Creek (see Figure 4-2). Developments along the south side of Lacamas Lake do not include flow control facilities, as direct discharges to the lake are exempt.

There is one mapped NPDES regulated outfall on the west side of Lacamas Lake (see Figure 4-2).

Most of the area on the west side of Round Lake lack runoff treatment and flow control facilities. A small area in the far western corner of the basin as well as the eastern side of the basin was developed during a time when treatment and flow control facilities were required (see Figure 4-2).

Stormwater Management

Stormwater management for development activities must meet the requirements in CMC 14.02 and follow the SMMWW. Options for meeting the most pertinent requirements, i.e. Minimum Requirements 5, 6 and 7 are described below and summarized in Table 4.3. The CIP projects that support these strategies are also listed in the table and complete descriptions are included in Section 5.

Table 4.3: Lacamas Lake Watershed Stormwater Strategies

On-site stormwater management	All projects must implement • BMP T5.13 (Post Construction Soil Quality and Depth); • BMPs T5.10A, B, or C (Downspout Full Infiltration, Downspout Dispersion Systems, Perorated Stub-out Connections); and • BMP T5.11 (Concentrated Flow Dispersion) or BMP T5.12 (Sheet Flow Dispersion) if feasible. Where required, bioretention facilities can be used with underdrains in areas where soil permeability is low. The use of permeable pavements in this area should review the

Table 4.3: Lacamas Lake Watershed Stormwater Strategies	
	requirements and exemptions in the 2012 SMMWW, and follow the guidelines in the "Low Impact Development Technical Guidance Manual for Puget Sound".
Runoff Treatment	Development activities should provide their own facilities designed per the SMMWW and the city code.
Flow Control	Convey flow directly to Lacamas Lake through man-made conveyance systems where possible. Where man-made conveyance systems aren't available, or where there are capacity constraints in existing systems, either upgrade the systems or provide on-site flow control. This may be met through detention or through infiltration, depending upon the results of on-site infiltration testing.
Related CIP Projects	ULB 01: Leadbetter Road Culvert Capacity Review ULB 02: North Urban Growth Area Stormwater Plan

On-site Stormwater Management

On-site stormwater management includes dispersion methods and Low Impact Development (LID) measures and are required to the maximum extent feasible for all development activities that result in 2,000 square feet, or greater, of new, replaced, or new plus replaced hard surface area, or have land disturbing activities of 7,000 square feet or more.

All development will be required to amend their soils (BMP T5.13) and dispose of roof runoff in one of three methods (BMPs T5.10 A, B, or C). All sites will also be required to implement concentrated or sheet flow dispersion BMPs where feasible.

Development activities required to meet flow control and runoff treatment must also meet an LID performance standard described on page 2-29, Volume I of the SMMWW.

Soils in the Lacamas Lake Watershed have moderate to low infiltration potential, except in the NUGA area where the potential for infiltration may be higher. As such, some sites may be able to use LID measures to treat and infiltrate some portion of the site stormwater. Where rates are low or questionable, under-drains can be placed above the bottom of the rock chamber within bioretention facilities to convey water after being treated through the soil media. Placing the under-drain above the facility bottom will allow for some infiltration. The SMMWW provides criteria for the use of these systems.

Development activities that are exempt from Minimum Requirement #7 (Flow Control) do not

have to meet the SMMWW's LID Performance Standard, nor are they required to implement bioretention, rain gardens, permeable pavement, and full dispersion. For the Lacamas Lake Watershed, this means that if the development can discharge directly to Lacamas Lake through a man-made conveyance facility with available capacity, these facilities are not needed unless used for runoff treatment.

A capital project has been are defined and is included in Section 5 to determine what is needed for the NUGA area to meet the flow control exemption. This project (ULB 01) has two components:

- One is to prepare a stormwater basin plan
- The second is to assess the capacity of the culverts under Leadbetter Road, as these could be used to convey water from the NUGA to Lacamas Lake to meet the flow control exemption. If the culverts are found to be too small to convey the developed site runoff, appropriate pipe sizes can be determined.

Runoff Treatment

Runoff treatment is required for any new development or redevelopment meeting the size thresholds listed in the City's stormwater ordinance. LID measures or more traditional treatment measures as described in the SMMWW can be used. Note that discharges above the dam at Round Lake are required to treat for phosphorus.

Flow Control

Lacamas Lake is listed in the 2012 SMMWW as a flow control exempt water body, which means stormwater discharges to the lake are exempt from the city's flow control regulation provided runoff is conveyed directly to the lake in a man-made conveyance system sized to convey the flow. Development activities that discharge stormwater to conveyance systems without sufficient capacity, or to other water bodies or creeks, must meet the City's flow control requirements.

The north side of Prune Hill and Grass Valley will need to meet the flow control standard. Regionally based facilities may be a feasible option for Grass Valley if private partners are willing to pool efforts.

The NUGA may have soils suited for infiltration. As such, flow control requirements may be met through installation of UICs or shallow LID facilities. If UICs are used, these should be registered with Ecology and rule-authorized before acceptance by the city. This report includes a capital project to generate a stormwater basin plan for the NUGA area.

Section 4—Study Area Watersheds

Continued

4.4 Washougal River & Lower Lacamas Creek Watershed

Watershed Boundaries

The Washougal River watershed drains the southwestern portion of the City (see Figure 4-3). Within the City limits this watershed encompasses both sides of the Washougal River, portions of downtown Camas, and tributaries to Lower Lacamas Creek. The watershed boundaries are approximately SR-14 on the south, 3rd Avenue and Garfield Street to the west in downtown Camas, and approximately SE Nourse Road to the north (the watershed extends east beyond the City limits).

Current/Future Land Use Characteristics

The downtown area in Basin W1 is zoned primarily for single-family residential development with some commercial and multifamily residential areas. The downtown was mostly developed between the 1920s and 1950s. Some infill and redevelopment may occur, but the existing development is fairly dense. The riverfront areas along the Washougal River in Basin W2 are zoned for industrial, commercial, and multi-family and single-family residential. Development in this basin is from the 1940s to 1970s with some infill in the last 15 years. Additional infill is likely, especially in the areas zoned for multifamily residential properties. Most of the large tracts that border the Washougal River will not be developed because they belong to Camas (Parks) or are encumbered by other facilities.

The Lower Lacamas Creek Basin W3 is located within the urban growth area and is zoned for single-family residential development and park open space. This area is currently undeveloped and will likely see new development. See Figure 3-2 for zoning. Much of this is park property owned by Camas & Clark County. It won't be developed.

Soil Characteristics

NRCS mapped soil types in this watershed consist of Olympic and Vader soils with large areas of fill near downtown Camas and pockets of Hesson, Powell, Rockland, Hillsboro, Washougal and Sauvie soils throughout the watershed (see Figure 3-4). The soils are rated as moderate to poorly draining and will not likely support the infiltration of stormwater.

Current Drainage System

Stormwater from the downtown area (Basin W1) is piped without treatment or flow control to discharge to the Washougal River on the south side of the basin through an NPDES regulated outfall (see Figure 4-3).

Stormwater from some of the newer residential developments in Basin W2 is routed though runoff treatment and flow control facilities prior to discharging to Lower Lacamas Creek just upstream of its confluence with the Washougal River. This basin includes one NPDES regulated outfall, as shown in Figure 4-3.

Stormwater Management

Stormwater management for development activities must meet the requirements in CMC 14.02 and follow the SMMWW. Options for meeting the most pertinent requirements, i.e. Minimum Requirements 5, 6 and 7 are described below and summarized in Table 4.4. There are no CIP projects identified in Section 5 that support stormwater strategies in this watershed.

Table 4.4: Washougal River/Lower Lacamas Creek Watershed Stormwater Strategies	
On-site stormwater management	All projects must implement • BMP T5.13 (Post Construction Soil Quality and Depth); • BMPs T5.10A, B, or C (Downspout Full Infiltration, Downspout Dispersion Systems, Perorated Stub-out Connections); and • BMP T5.11 (Concentrated Flow Dispersion) or BMP T5.12 (Sheet Flow Dispersion) if feasible. Where required, bioretention facilities can be used with underdrains in areas where soil permeability is low. The use of permeable pavements in this area should review the requirements and exemptions in the 2012 SMMWW, and follow the guidelines in the "Low Impact Development Technical Guidance Manual for Puget Sound".
Runoff Treatment	Development activities should provide their own facilities designed per the SMMWW and the city code.
Flow Control	Flow Control per CMC 14.02 and the SMMWW will be required. This may be met through detention or through infiltration, depending upon the results of on-site infiltration testing.
Related CIP Projects	None identified

On-site Stormwater Management

On-site stormwater management includes dispersion methods and Low Impact Development (LID) measures and are required to the maximum extent feasible for all development activities that result in 2,000 square feet, or greater, of new, replaced, or new plus replaced hard surface area, or have land disturbing activities of 7,000 square feet or more.

All development will be required to amend their soils (BMP T5.13) and dispose of roof runoff in one of three methods (BMPs T5.10 A, B, or C). All sites will also be required to implement

concentrated or sheet flow dispersion BMPs where feasible.

Development activities required to meet flow control and runoff treatment must also meet an LID performance standard described on page 2-29, Volume I of the SMMWW.

Soils in this watershed are moderate to poorly draining. As such, some sites may be able to use LID measures to treat and infiltrate some portion of the site stormwater. Where rates are low or questionable, under-drains can be placed above the bottom of the rock chamber within bioretention facilities to convey water after being treated through the soil media. Placing the under-drain above the facility bottom will allow for some infiltration. The SMMWW provides criteria for the use of these systems.

Runoff Treatment

Similar to the downtown area in the Columbia River watershed, existing dense development limits the water quality treatment options in Basin W1 to LID facilities and mechanical systems. Residential infill in Basin W2 can likely accommodate larger water quality and flow control facilities in addition to LID techniques.

Water quality treatment must meet the TMDL standards since Lacamas Creek is a 303(d) listed water body; please see the discussion in Section 2.2.2 for more information.

Runoff treatment is required for any new development or redevelopment meeting the size thresholds listed in the City's stormwater ordinance. LID measures or more traditional treatment measures as described in the SMMWW can be used.

Flow Control

Discharges to the Washougal River and to Lower Lacamas Creek and its tributaries must meet the City's flow control requirements, as these water bodies are not included on the flow control exemption list in the 2012 SMMWW. Runoff treatment is required for any new development or redevelopment meeting the size thresholds listed in the City's stormwater ordinance.

The banks of Lower Lacamas Creek and its tributaries are steep with active and potentially unstable slopes. Meeting the flow control requirements for new development in Basin W3 will be essential to prevent further degradation.

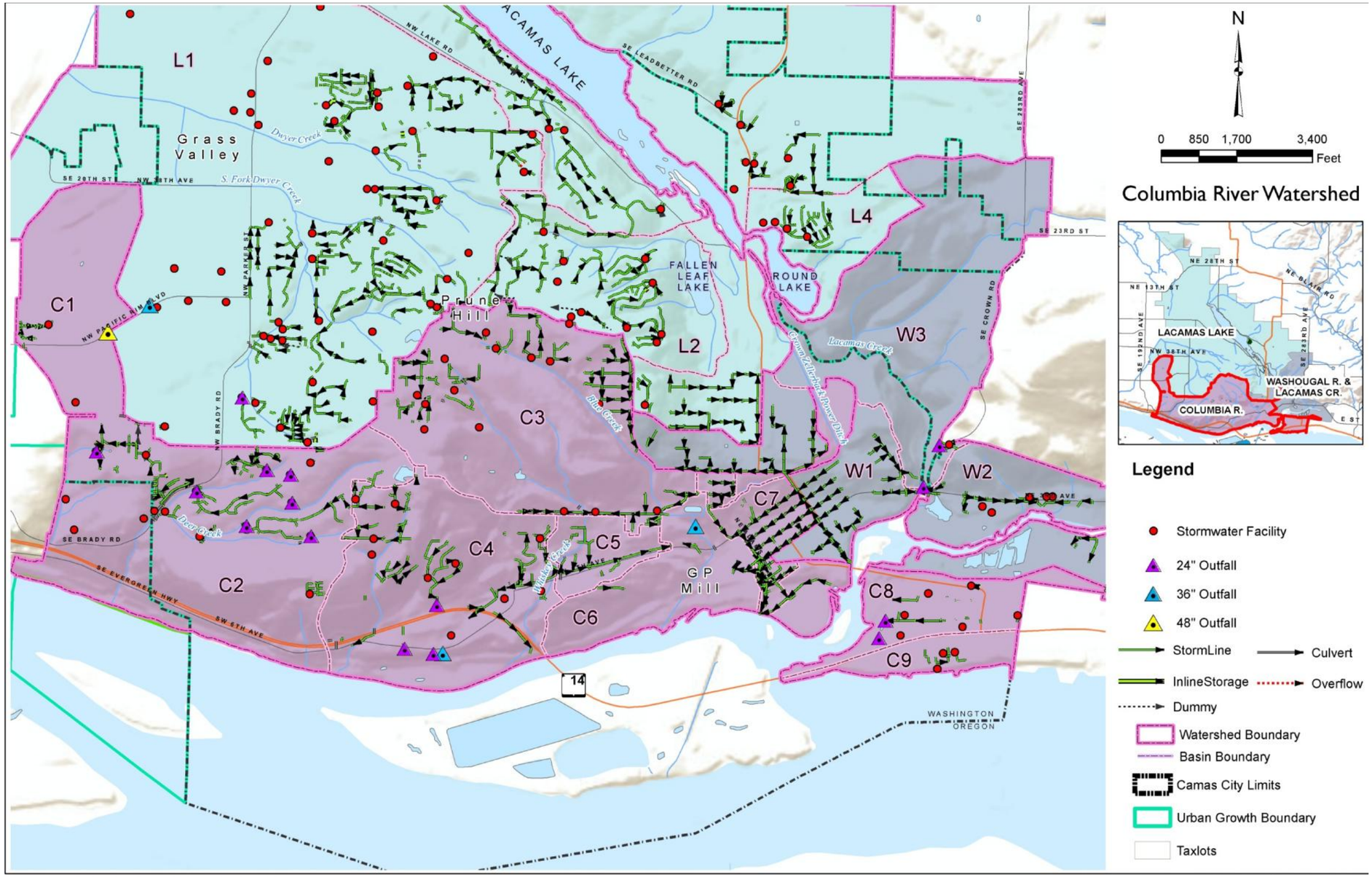

Figure 4-1: Columbia River Watershed and Basins

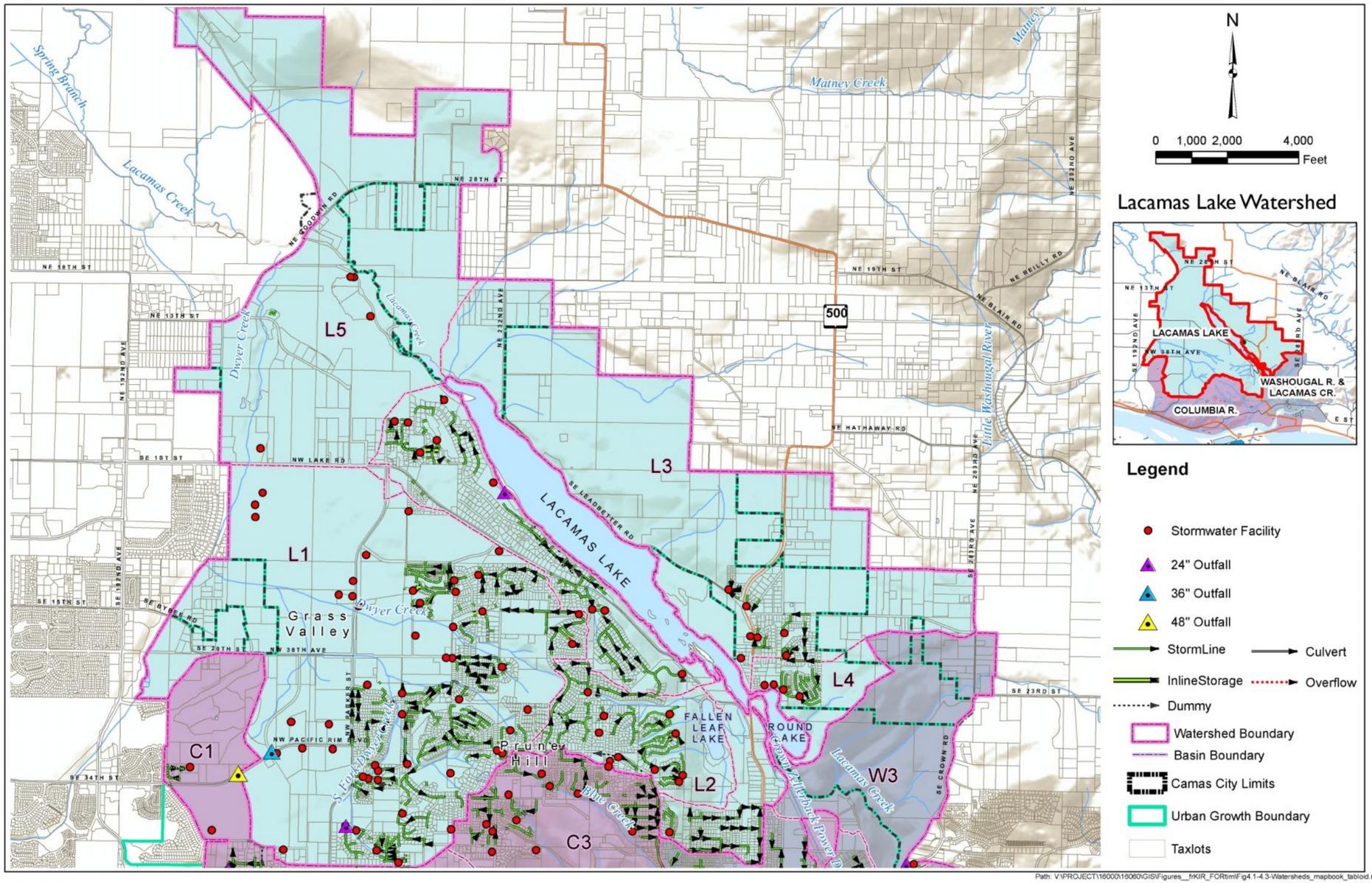

Figure 4-2: Lacamas Lake Watershed and Basins

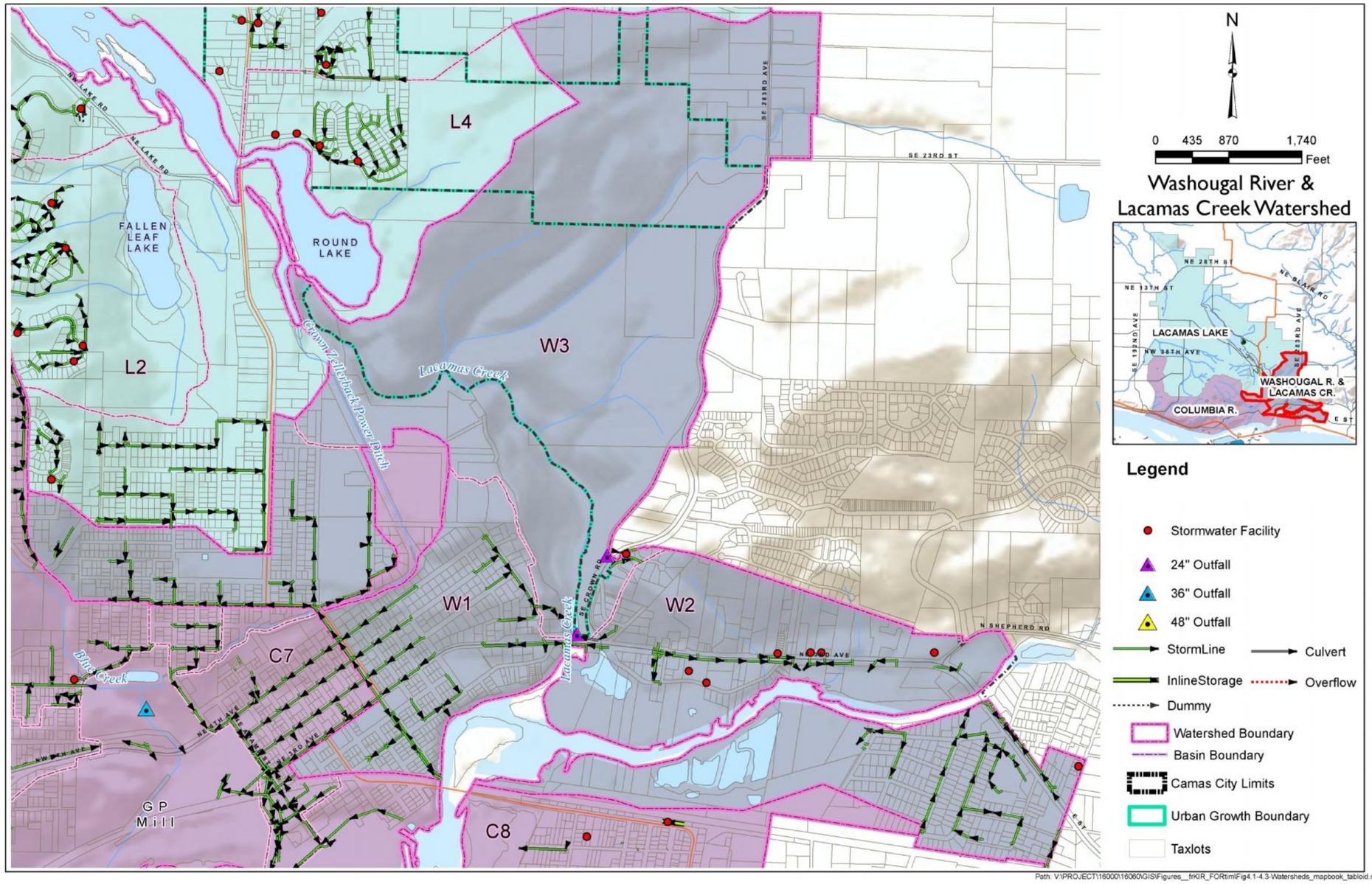

Figure 4-3: Washougal River & Lower Lacamas Creek Watershed and Basins

Section 5—Capital Improvements

5.1 Introduction

This section describes the capital improvement projects for this first version of the City's Stormwater Capital Improvement Plan. The projects described in this section were selected by City staff and are based on:

- Addressing existing facilities in need of repairs
- Addressing identified flooding concerns
- Coordinating stormwater facility design and construction with transportation project needs
- Reducing reoccurring maintenance activities
- Planning for future development and capacity needs

Table 5.1 lists the recommended CIP's, a priority assignment (low, medium, or high), and an estimated implementation cost. A City map with CIP locations is shown in Figure 5-1.

There are two basic categories of capital improvement projects; those that deal with the planning aspects of stormwater management, and those that involve the improvements of structures and facilities in the City's stormwater drainage system. The projects are broken out by watershed, and the project descriptions include the basin name and the location, where applicable.

The project numbering is based upon the basin the project is located in, except for projects that are City-wide. Referring to Table 5.1, "SS" stands for Storm Sewer and is used for City-wide projects. "DC" stands for Dwyer Creek and is used for projects in the Dwyer Creek basin. "ULB" stands for Upper Lacamas Basin, and "CR" is for Columbia River.

Table 5.1: CIP Summary

	Project Name
SS 01	Transportation Related Stormwater Facilities
SS 02	Storm Sewer Conveyance Modeling
DC 01	North Dwyer Creek Stormwater Basin Plan
DC 02	Grass Valley Stormwater Basin Plan

Section 5—Capital Improvements

Continued

Table 5.1: CIP Summary	
	Project Name
DC 03	Pacific Rim Boulevard Crossing
DC 04	Julia Street Stormwater Pond Retrofit
DC 05	Thomas/Carson Estates Runoff Control
ULB 02	North Urban Growth Area (NUGA) Stormwater Basin Plan
CR 01	Forest Home Road Sediment Basin
CR 02	Blue Creek Sediment Basin

Separate project sheets have been prepared for each project listed in Table 5.1. These sheets are included on the following pages and include a description of the problem to be addressed and a description of the proposed solution. The sheets also include a cost estimate and possible funding sources.

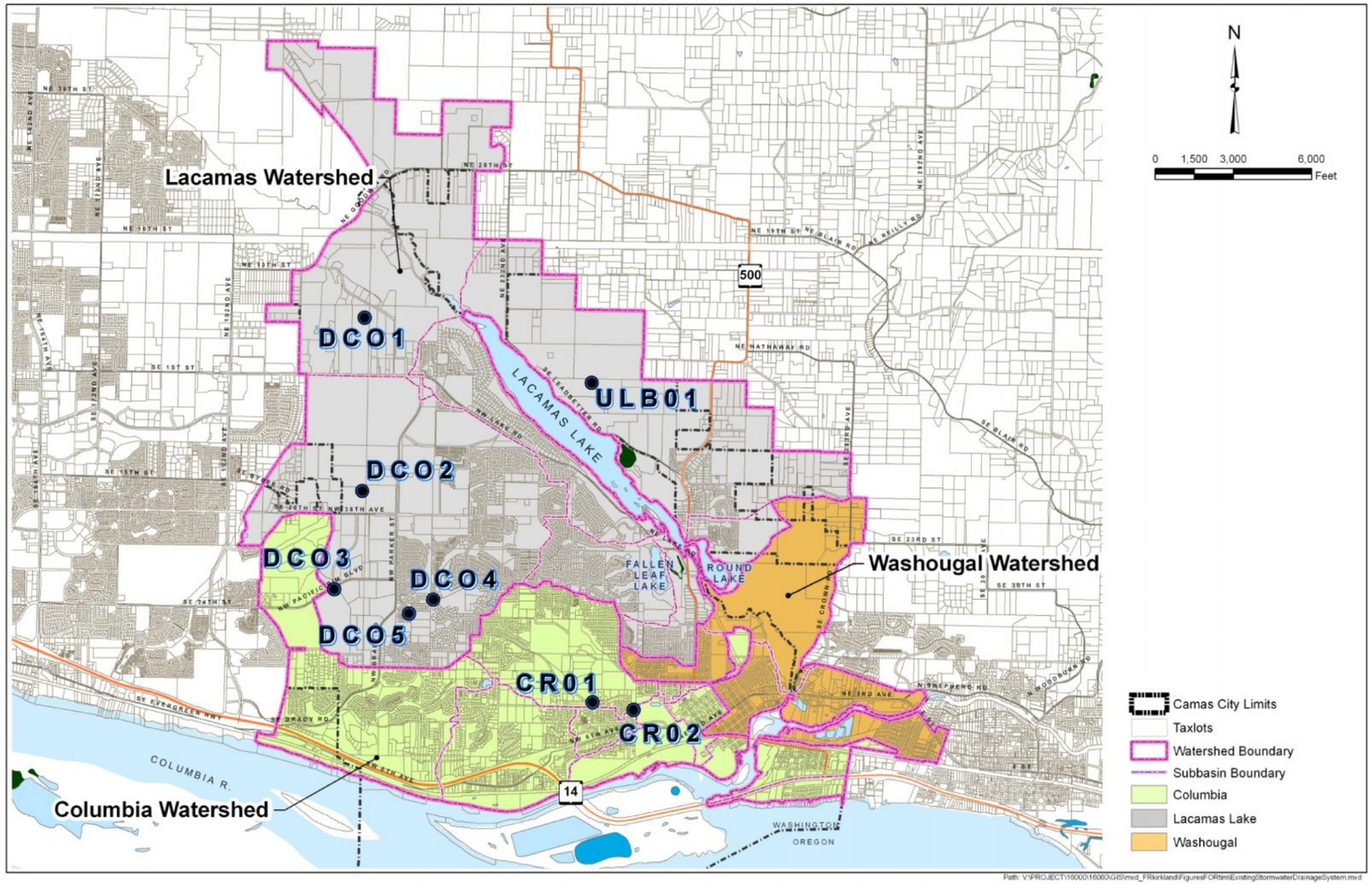

Figure 5-1: CIP Project Locations

Project Name: Transportation Related Stormwater Facilities

Project ID: SS 01

Watershed: City-Wide

Location: City-Wide

Description

As the City develops or improves their roadway network, they are finding that the construction of stormwater facilities to meet their NPDES Phase II permit adds significantly to the roadway costs. Stormwater treatment, conveyance and runoff control facilities, along with property acquisition, and design account for 20 to 30 percent of a new roadway. As such, these costs influence the City's road construction fund. The City is exploring options to establish a dedicated funding source for City stormwater construction costs.

The current storm utility is not designed for major capital improvements and has not been able to support the stormwater portion of new roadway construction. To adequately fund these capital improvements a System Development Charge (SDC) could be implemented. The SDC could be allocated at a rate of 67% Developer funded and 33% City to be consistent with the water and sewer SDC. This breakdown accounts for the developer responsibility per code to install the minimum requirements for their development and allowing a credit or providing funding for the regional component.

Proposed Project

This is for the creation of a funding source for the design, acquisition, and construction of facilities to convey, treat, and control the volume of runoff from public road projects as required in the City's stormwater ordinance. This fund will be used to support the regional component of the roadway improvements included in the City's Six Year Transportation Plan in conjunction with other funding sources such as Transportation Impact Fee (TIF).

Cost Estimate/Funding Sources

The City's transportation plan is embodied in two documents: the Six Year Transportation Plan and the TIF study. The adopted Transportation Impact Fee includes collection and conveyance storm water costs but not land acquisition or treatment/detention, which is estimated to be 11 percent of the total roadway cost.

Funding for stormwater facilities tied to transportation projects generally consists of developer contributions, loan, grants and city funding sources (REET and General Fund).

Section 5—Capital Improvements

Continued

The dollar amount shown in the table below represents the unfunded stormwater portion of the city's proposed transportation projects. They consist of the storm components from the TIF study (which include the land costs, and treatment/detention requirements) and any additional projects listed on the Six Year Street Plan (costs include design, collection, land, treatment and detention based on a 30 percent cost of construction).

Table 5.2: Transportation Related Stormwater Facilities Estimate and Funding Plan

Cost Estimates

TIF Eligible Routes

Item	Cost	Developer Share	Regional cost and SDC credit eligible if enacted
Land	$4,000,000	$2,680,000	$1,320,000
Treatment/Detention	$4,000,000	$2,680,000	$1,320,000
Total	**$8,000,000**	**$5,360,000**	**$2,640,000**

Six Year Eligible Routes

Item	Cost total 30% of overall six year cost	Developer Share	Regional cost and SDC credit eligible if enacted
Design			
Conveyance system			
Land			
Treatment/Detention			
Total	**$4,500,000**	**$3,015,000**	**$1,485,000**

Funding Source

City	Grant	Developer	SDC
X	X	X	X

Project Name: Storm Sewer Conveyance Modeling

Project ID: SS 02

Watershed: City-Wide

Location: City-Wide

Description

The City's conveyance system is over 70 years old in some locations in the downtown core and the City anticipates the need to repair or replace some of these pipes. In addition, the carrying capacity of some of the City's stormwater pipelines has been reached or exceeded.

As systems age and replacement or upgrades are considered, it is important that new systems are sized properly to convey existing flows and to carry future flows that may result from new development or redevelopment. The City does not currently have a model for helping them decide how to size a replacement system.

New pipes can be sized fairly easily using simple models (i.e. Manning's Equation). These models can quickly determine the pipe size needed to convey flows assuming open channel flow. However, they can underestimate the capacity of existing systems, as they do not account for system surcharging. In addition, the hydraulics of existing pipe systems can be very complex. This is because flow enters the system from many different locations, and the interaction between these flows combined with the characteristics of the pipe system itself causes the water to do unpredictable things, even moving upstream. The equations and methods to model these systems are complex but are now routinely performed with computer models.

A hydrologic and hydraulic model of the city's conveyance system would provide them with a tool for planning and building necessary improvements. This can be used for existing systems to size upgrades, and for sizing new systems where planned by the city.

Proposed Project

Develop a hydraulic computer model of the City's storm sewer pipe system. This model can be built in phases and would only need to include the larger pipes which serve as system trunk sewers or backbones. Important systems to model include:

- Systems where excessive surcharging (water coming out of manholes or catch basins) occurs

Continued

- Older systems where replacements are planned or likely
- Systems where proposed development will contribute runoff to existing conveyance pipes and may exceed the system capacity

Cost Estimate/Funding Sources

A cost estimate has been prepared assuming most of the storm system in the downtown core is modeled, along with limited areas outside the downtown core. The work includes sub-basin hydrologic modeling and hydraulic modeling of pipes 12-inches and larger.

Table 5.3: Storm Sewer Conveyance Modeling Estimate and Funding Plan

Cost Estimate			
Item		**Cost**	
Hydrologic and hydraulic modeling		$50,000	
Funding Source			
City	**Grant**	**Developer**	**SDC**
X	X	X	X

Project Name: North Dwyer Creek Stormwater Basin Plan

Project ID: DC 01

Watershed: Lacamas Lake

Basin: Dwyer Creek

Location: North Dwyer Creek Basin

Description

The North Dwyer Creek study area is bounded by NW Lake Road on the south, Friberg Road on the west, NW Payne Road on the east, and the Camas Meadows development on the north (see Figure 5-1). The City developed a comprehensive land-use master plan for this area in 2001 and will be updating this plan in 2012.

The updated basin plan will include a stormwater management strategy that addresses flow control, water quality, and conveyance. This plan will be designed to meet the City's recently adopted stormwater ordinance and the Stormwater Management Manual for Western Washington (SMMWW).

Stormwater from this area is tributary to North Dwyer Creek, which runs north along the west edge of the study area, then east to Lacamas Creek, which flows to Lacamas Lake. Lacamas Lake eventually discharges to the Washougal River approximately one-half mile from its confluence with the Columbia River.

Lacamas Creek and five of its tributaries (Dwyer Creek, Fifth Plain Creek, Shanghai Creek, Matney Creek, and China Ditch) are listed on Washington State's 303(d) list of impaired water bodies for fecal coliform bacteria, temperature, dissolved oxygen, and pH. A Total Maximum Daily Load (TMDL) plan is currently being prepared by the Washington State Department of Ecology for Lacamas Creek and four of the five tributaries.

The City requires phosphorus treatment in the Lacamas watershed above the dam at the south end of Round Lake for all development sites exceeding one acre in size.

Proposed Project

This CIP is to provide funding for development of a stormwater basin plan in conjunction with the updated land-use master plan. This plan should include the following:

Continued

- An evaluation to determine the feasibility of using Low Impact Development BMPs in the study area. This determination should be made in conjunction with the development of road sections to determine if measures such as biorention planters can be placed within the right-of-way for treating roadway stormwater.
- An evaluation of the feasibility of providing regional detention for meeting flow control and/or runoff treatment requirements.
- A list of runoff treatment BMPs to be used in the study area that meets SMMWW requirements, TMDL requirements, and the City's phosphorus requirement to be used with private developments.
- Sizing of major stormwater conveyance pipes that serve multiple properties.
- Documentation of the stormwater portion of a larger master plan document.
- An evaluation of the ability to discharge to Lacamas Lake to access the flow control exemption.

Cost Estimate/Funding Sources

Table 5.4: North Dwyer Creek Estimate and Funding Plan

Cost Estimate			
Item		**Cost**	
Stormwater Component of Master Plan		$30,000	
Funding Source			
City	**Grant**	**Developer**	**SDC**
X	X	X	X

Project Name: Grass Valley Stormwater Basin Plan

Project ID: DC 02

Watershed: Lacamas Lake

Basin: Dwyer Creek

Location: Grass Valley (vicinity of NW 38th Street and Parker Road)

Description

The Grass Valley Area of Camas is bordered by Pacific Rim Boulevard on the south, NW Dahlia Road on the east, Lake Road on the north, and the City limits on the west. The center of Grass Valley is roughly at the intersection of Parker Road and 38th Avenue. The area contains both homes and many light industrial and technology businesses.

The Grass Valley area contains many acres of low-quality wetlands. Because of this wetland designation, these properties have remained undeveloped and are used for grassland farming.

The headwaters of Dwyer Creek are on the northwest slopes of Prune Hill. The creek runs north to NW 38th Avenue, then west along the south side of the road until it reaches Parker Road. From there it crosses the road diagonally from the southeast to northwest where it then travels along the north side of NW 38th Avenue for approximately 1,200 feet. At that point it turns north through private properties.

Where Dwyer Creek turns north an intermittent stream carries runoff from south to north under NW 38th Avenue and joins with Dwyer Creek. At this location along NW 38th Avenue, nuisance flooding that impacts NW 38th Avenue occurs on a frequent basis.

Proposed Project

This project is to develop a plan that will:

- Develop a plan for the property owners' that consolidates and enhances the portions of the delineated wetlands on these properties, allowing other portions of the properties to be developed.
- Develop a concept for a regional stormwater facility to meet the city's flow control requirement. This facility could be integrated with the wetland enhancement area and could provide flow control for the private parcel's and for the city's planned improvements to NW 38th Avenue.

Section 5—Capital Improvements

Continued

Cost Estimate/Funding Sources

Table 5.5: Grass Valley Estimate and Funding Plan			
Cost Estimate			
Item		**Cost**	
Conceptual Designs		$75,000	
Funding Source			
City	**Grant**	**Developer**	**SDC**
X	X	X	X

Project Name: Pacific Rim Boulevard Crossing

Project ID: DC 03

Watershed: Lacamas Lake

Basin: Dwyer Creek

Location: Pacific Rim Boulevard west of NW Fisher Creek Drive

Description

Pacific Rim Boulevard experiences routine flooding in a low spot west of NW Fisher Creek Drive and the entrance to Sharp Electronics (See Figure 5-1). The stormwater conveyance system that collects stormwater in Pacific Rim Boulevard comes from both directions to this low point and discharges north to a tributary of Dwyer Creek. In addition, there are two culverts under the road that carry stormwater from properties south of the street to the north side.

The land adjacent to Pacific Rim Boulevard rises steeply to the south. The area contains shallow groundwater and surface water that runs towards Pacific Rim Boulevard. The property owner has attempted to collect this water with French drains and surface trenches. This water is directed to culverts that carry it under NW Pacific Rim Boulevard.

Proposed Project

Determine the cause of the flooding at this low spot and develop a plan for alleviating this problem. This should include:

- A hydrologic study that includes the private parcel south of Pacific Rim Boulevard
- The development of a model of the system to determine capacity
- Development of a conceptual design and construction cost estimate

Continued

Cost Estimate/Funding Sources

Table 5.6: Pacific Rim Boulevard Estimate and Funding Plan			
Cost Estimate			
Item		**Cost**	
Hydrologic and hydraulic model		$5,000	
Conceptual Designs and Cost Estimate		$15,000	
Total		**$20,000**	
Funding Source			
City	**Grant**	**Developer**	**SDC**
X	X	X	X

Project Name: Julia Street Stormwater Pond Retrofit

Project ID: DC 04

Watershed: Lacamas Lake

Basin: Dwyer Creek

Location: East of cul-de-sac at intersection of NW Julia Street and NW 26th Avenue

Description

The Julia Street Stormwater Facility lies at the bottom of a steep canyon at the end of a cul-de-sac east of the NW Julia Street and NW 26th Avenue intersection. A small intermittent stream in the bottom of the canyon runs in a 36-inch diameter pipe around this pond. The pond was constructed in the late 1990's as a detention facility, and it detains flow from two subdivisions that sit on top of each side of the canyon - Columbia Ridge on the south side and Oak Ridge Estates on the north side.

Stormwater is discharged from several subdivisions into the intermittent stream upstream of the detention facility. Sediment from upstream development and landslides in the steep canyon walls is carried in this intermittent stream and deposited at the entrance to the pipe. The pipe routinely gets filled in from this sediment, causing the stream to overflow into the detention pond.

Figure 5-3: Julia Street Pond in a spring 2012 flood event

Although the facility is privately-owned and maintained, it sits on City-owned property. Occasionally the City has removed sediment from the pipe and from the bottom of the pond. Although there is an access road leading to the pond, access to the storm pipe and pond bottom is challenging.

Continued

Proposed Project

An evaluation should be performed to determine if this pond can be reconstructed and retrofitted to eliminate these issues. Consideration should be given to the following:

- Installation of a debris collection structure where the stream enters the pipe to prevent the pipe from clogging
- Remove the bypass pipe and allow the stream to flow through the pond
- Enlarge the pond to the northwest to allow more flood storage
- Construct a forebay for trapping sediment
- Construct a maintenance road for access to the forebay and all parts of the facility

Cost Estimate/Funding Sources

Table 5.7: Julia Street Stormwater Retrofit Estimate and Funding Plan

Cost Estimate

Item	Cost
Alternatives Analysis	$5,000
Conceptual Designs and Construction Cost Estimate	$20,000
Construction	$210,000
Construction Management	$20,000
Total	**$255,000**

Funding Source

City	Grant	Developer	SDC
X	X		

Project Name: Thomas/Carson Estates Flooding

Project ID: DC 05

Watershed: Lacamas Lake

Basin: Dwyer Creek

Location: Thomas and Carson Estates, along NW Maryland Street

Description

These two subdivisions sit near the bottom of the northwest slope of Prune Hill. Runoff from the hillside above these subdivisions streams down the hillslope and floods nearby roads and lawns. Various ditches and swales provide some collection and routing of stormwater to stormwater facilities located in these subdivisions; however, these conveyance facilities are overtopped in large storm events.

Proposed Project

Design and construct a conveyance system capable of adequately conveying the upstream stormwater flows safely downstream around these two subdivisions.

Cost Estimate/Funding Sources

Table 5.8: Thomas/Carson Estates Flooding Estimate and Funding Plan

Cost Estimate

Item	Cost
Alternatives Analysis	$5,000
Construction Drawing Preparation	$10,000
Construction	$100,000
Construction Management	$12,000
Total	**$127,000**

Continued

Table 5.8: Thomas/Carson Estates Flooding Estimate and Funding Plan			
Funding Source			
City	**Grant**	**Developer**	**SDC**
X	X	X	

Project Name: North Urban Growth Area (NUGA) Stormwater Basin Plan

Project ID: ULB 01

Watershed: Lacamas Lake

Basin: Upper Lacamas Basin

Location: NUGA (North of Lacamas Lake)

Description

The City's urban growth boundary includes an area on the north side of Lacamas Lake called the North Urban Growth Area (NUGA). The NUGA is bounded by NW Leadbetter Road and Lacamas Lake on the south, NE 232nd Avenue on the west, State Route 500/Everett Street on the east, and varying roads and properties on the north. The City will be developing a long-term plan for this area, including the establishment of detailed zoning and a street layout for arterials and collectors.

The city's planning effort for NUGA includes development of a stormwater basin plan that addresses water quality, flow control and conveyance. This plan will be designed to meet the City's recently adopted stormwater ordinance that follows the Stormwater Management Manual for Western Washington (SMMWW).

The City's code exempts Lacamas Lake from flow control requirements if the following criteria are met:

- The project site is drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and
- The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected.

The conveyance systems for the NUGA area will be sized to carry undetained runoff so detention of stormwater will not be required.

There are multiple culverts under Leadbetter Road that convey runoff from the north side of the road to Lacamas Lake. If these culverts can convey runoff from the NUGA then flow control facilities will not be required. This project will determine the capacity of these

culverts and whether or not they need to be upsized to convey the runoff from the NUGA to the lake.

Lacamas Lake is on the state's 303(d) list for total phosphorus. Lake eutrophication occurs most summers and restoration efforts have focused on reducing phosphorus loadings. The City requires phosphorus treatment in the Lacamas watershed above the dam at the south end of Round Lake for all development sites exceeding one acre in size.

Proposed Project

This CIP is to provide funding for development of a stormwater basin plan for the NUGA. The stormwater master plan should include the following:

- An evaluation to determine the feasibility of using Low Impact Development BMPs in the study area. This determination should be made in conjunction with the development of road sections to determine if measures such as biorention planters can be placed within the right-of-way for treating roadway stormwater.
- A list of runoff treatment BMPs to be used in the study area that meet SMMWW requirements, and the City's phosphorus requirement.
- Sizing of major stormwater conveyance pipes that serve multiple properties.
- An evaluation of the existing culverts under Leadbetter Road to determine their hydraulic capacity to convey the discharges from the estimated build-out of the NUGA area. Recommendations for upsizing the culverts should be included.

Cost Estimate/Funding Source

Table 5.9: NUGA Estimate and Funding Plan

Cost Estimate

Item	**Cost**
Alternatives Analysis/Conceptual Designs/Plan development	$100,000
Hydrologic and Hydraulic Modeling	$75,000
Total	**$175,000**

Funding Source

City	Grant	Developer	SDC
X	X	X	X

Project Name: Forest Home Road Sediment Basin

Project ID: BC 01

Watershed: Columbia River

Basin: Blue Creek

Location: Intersection of NW 10th Avenue and NW Ivy Drive

Description

Forest Home Road travels from the top of Prune Hill at NW Astor Street to NW 10th Avenue. This road drops close to 400 feet over less than a mile in length. A creek parallels Forest Home Road until it reaches NW 10th Avenue, where it enters a pipe. Because it is so steep and heavily vegetated, this creek carries a lot of sediment and debris, which collects at the entrance to this pipe. The City has built a sediment collection facility that allows them to excavate out this debris; they are called to this site to load out debris frequently during the winter months.

Proposed Project

Design a system for sediment and debris collection that will allow the entrance to the pipe to remain clear and requires city crews to clean the facility less frequently.

Cost Estimate/Funding Sources

Table 5.11: Forest Home Road Sediment Basin Estimate and Funding Plan

Cost Estimate

Item	Cost
Design	$25,000
Construction	$75,000
Total	**$100,000**

Section 5—Capital Improvements

Continued

Funding Source			
City	Grant	Developer	SDC
X	X		

Project Name: Blue Creek Sediment Basin

Project ID: BC 02

Watershed: Columbia River

Basin: Upper Blue Creek

Location: Intersection of NW 10th Avenue and NW Drake Street

Description

Blue Creek travels steeply down the south east slope of Prune Hill until it reaches NW 10th Avenue, where it enters a pipe. Because it is so steep and heavily vegetated, this creek carries a lot of sediment, sticks, and debris with it, which collects at the entrance to this pipe. The City has built a sediment collection facility that allows them to excavate out this debris; they are called to this site to load out debris frequently during the winter months.

Figure 5-4: Sediment collection facility at Blue Creek.

Continued

Proposed Project

Design a system for sediment and debris collection that will allow the entrance to the pipe to remain clear and requires city crews to clean the facility less frequently.

Cost Estimate/Funding Sources

Table 5.12: Blue Creek Sediment Basin Estimate and Funding Plan

Cost Estimate

Item	Cost
Design	$25,000
Construction	$75,000
Total	**$100,000**

Funding Source

City	Grant	Developer	SDC
X	X		

Section 6—Financing

6.1 Introduction

The Camas stormwater utility was formed to fund the city's stormwater program and to meet their first NPDES permit requirements. The utility is responsible for the upkeep of the publicly-owned stormwater system, including conveyance pipelines, manholes, catch basins, detention ponds, and treatment systems. It is also responsible for street sweeping, as this is a regulatory requirement that reduces the amount of sediment that enters the City's creeks and streams (FCSG 2010). The utility collects monthly rates to fund operations and maintenance of the existing stormwater system and to fund capital improvements.

Historically, the Fisher Basin has had a stormwater utility fee collected to fund projects in that basin. However, with the formation of the new citywide utility, this fee was discontinued, and the funds collected will be retired in 2013.

A utility rate study conducted by Financial Consulting Services Group (FCSG) in 2009 set the stormwater utility rates from 2009 through 2013. Those rates were adopted by the city council, are included in CMC 13.89 and are shown in Table 6.1.

Table 6.1: Stormwater Utility Rates

2010	2011	2012	2013
$7.65	$8.49	$9.00	$9.27

The current rates do not have a large capital component built in to the structure. The FSCG 2009 rate study set the storm rate to cover the cost of the operation and maintenance of the existing storm system and modest amounts for replacement of existing infrastructure. As part of the Fisher Basin Utility, some capital dollars have been available but that account has been depleted. To provide a secure long term capital fund, the FSCG study proposed implementation of a System Development Charge (SDC) with a methodology consistent with the current water and sewer SDC. The rate would capture both historical costs and future capital needs. .

To be consistent with the water and sewer SDC, the SDC could be allocated at a rate of 67% Developer funded and 33% City. This breakdown accounts for the developer responsibility per code to install the minimum requirements for their development and allowing a credit or providing funding for the regional component. If Council chooses not to implement the SDC, other funds would be responsible to implement this capital plan.

Future versions of this plan will include a rate study that will be developed to ensure the future rate structure is suitable for continued funding of both O&M activities and capital construction projects.

Section 6—Financing

Continued

The city is scheduled to conduct a utility rate study in 2013. A policy decision should be made on funding critical stormwater system capital needs through adoption of SDC's or through rates. The utility currently has no debt associated with the rates.

Section 7—References

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City of Camas
Camas 2035
Camas, Washington

Appendix J
School Districts Capital Facilities Plans and Impact Fee Calculations

ORDINANCE NO. 15-026

AN ORDINANCE approving and adopting by reference the text of that certain document entitled Camas School District Capital Facilities Plan 2015-2021.

WHEREAS, the Camas School District has submitted an amended capital facilities plan entitled "Camas School District Capital Facilities Plan 2015-2021" to the City for its review and approval, and

WHEREAS, the Council has considered said capital facilities plan and has conducted a public hearing, and desires to adopt the same as the capital facilities plan for the Camas School District,

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF CAMAS AS FOLLOWS:

Section I

The Council hereby approves and adopts by reference a volume of text entitled "Camas School District Capital Facilities Plan 2015-2021" as the amended capital facilities plan of the school district, which shall provide the basis for the collection of school impact fees by the City on behalf of the school district.

Section II

A copy of the Camas School District Capital Facilities Plan 2015-2021 shall be maintained in the council file on these proceedings, and copies of said Capital Facilities Plan shall be made available for public inspection at the Public Works Department.

Section III

This ordinance shall take force and be in effect five (5) days from and after its publication according to law.

PASSED by the Council and APPROVED by the Mayor this 21st day of December, 2015.

SIGNED: _____
Mayor

ATTEST: _____
Clerk

APPROVED as to form:

_____
City Attorney

CAMAS SCHOOL DISTRICT
CAPITAL FACILITIES PLAN
2015 – 2021

Board of Directors

District I	**Casey O'Dell**
District II	**Julie Rotz**
District III	**Connie Hennessey**
District IV	**Douglas Quinn**
District V	**Mary Tipton**

Superintendent
Mike Nerland

May 2015

SECTION 1
INTRODUCTION AND SUMMARY

A. Introduction

The Washington State Growth Management Act (the "GMA") includes schools in the category of public facilities and services. School districts are required by the Cities of Camas, Washougal, and Vancouver ("Cities") and Clark County ("County") to adopt capital facilities plans at least every four years to satisfy the requirements of the GMA and to identify additional school facilities necessary to meet the educational needs of projected enrollment growth for a six-year period.

The Camas School District ("District") has prepared the 2015 Capital Facilities Plan ("CFP") to provide the Cities and the County with a schedule and financing program for capital improvements over the next six years (Oct. 1, 2015 through Oct. 1, 2021) to maintain a 6 year adoption cycle. The 2015 CFP includes the following elements:

- The District's standard of service (Section 2)
- An inventory of existing capital facilities owned by the District, including functional capacities and locations (Section 3)
- Future enrollment projections for each grade span (elementary, middle, and high schools) (Section 4)
- A forecast of future needs for capital facilities and school sites, including proposed capacities of expanded or new capital facilities and a six-year plan for financing capital facilities within projected funding capacities, which identifies sources of money for such purposes. The financing plan separates projects and portions of projects which add capacity from those which do not, since the latter are generally not appropriate for impact fee funding (Section 5)
- A calculation of impact fees based on the formula in the Cities and County impact fee ordinances and supporting data substantiating such fees (Section 6)

B. Summary

Camas is a financially and academically sound school district. The 57 square mile Camas School District has a comprehensive and an alternative high school, two middle schools, and six elementary schools. The District serves residents from the cities of Camas, Washougal, Vancouver and unincorporated rural Clark County. It is bordered by Evergreen School District to the west, Hockinson School District to the north, Washougal School District to the east, and the Columbia River and the state line to the south.

The overall October 1, 2014 enrollment (head count) for the District was 6,566 students. Of the total enrollment, 2,777 are elementary students, 1,648 are middle school students, and 2,141 are high school students. When reduced by the number of special education students in self-contained classrooms, the enrollment counts are 2,558 elementary, 1,420 middle, and 1,850 high school students, for a total of 5,828 students in standard basic education classrooms. Special education students in self-contained classrooms and spaces for these programs have been extracted for corresponding school capacity calculations.

School facility and student capacity needs are dictated by a complex matrix of regulatory mandates, educational program components, collective bargaining agreements, and community expectations,

more fully described in Section 2. The District's existing capital facilities are summarized in Section 3. In addition, the district owns 16 portable classrooms located at school facilities, housing approximately 6.3% or 412 students. The remaining 12 portable classrooms are used for support services such as art, rainy day activities and special education.

Between 2007 and 2014, enrollment growth within the District grew by 2.2% per year, compared to the countywide rate of 0.6%. A total of 923 students were added to Camas School District during that time. Although there had been a general leveling off of enrollment during the recent economic downturn, the District expects to continue to see an increase in enrollment over time. Much of the land within district and urban growth boundaries has yet to be developed, and there continues to be market interest in housing development in Camas and Washougal. Future K-12 enrollment is projected to increase by an average 2.1% per year, or 1,048 students over the next 7 years (see Section 4). The projected number of students minus current capacity equals a projected capacity need for 175 middle school and 612 high school students by 2021. Elementary school capacity is sufficient to accommodate the projected growth.

The calculated maximum allowable impact fees for the District are $5,371.85 per single family residence and $10,336.11 per multi-family residence (**Appendix A**).

SECTION 2
DISTRICT EDUCATIONAL PROGRAMS AND STANDARD OF SERVICE

School facility and student capacity needs are dictated by the types and amounts of space required to accommodate the District's educational program. The educational program components which drive facility space needs include grade configuration, optimum facility size, class size, educational program offerings, classroom utilization and scheduling requirements, and use of modular classrooms (portables).

In addition to student population, other factors such as collective bargaining agreements, government mandates, and community expectations also affect classroom space requirements. In addition to basic education programs, other programs such as special education, bilingual education, pre-school, and art and music must be accommodated. These programs can have a significant impact on the available student capacity of school facilities.

The District educational program guidelines, which directly affect school capacity are outlined below for elementary, middle, and high school grade levels.

- Elementary Schools: Average class size for elementary classrooms is estimated at 24 students. The actual number of students in an individual classroom depends on the above factors. Elementary school capacity is calculated utilizing only classroom spaces containing a basic education teacher and his/her complement of students. Students may be pulled out to attend additional programs (which may also be held in classrooms, if there is no designated space available). Working building capacity calculations do not include classrooms used for these special programs, such as resource rooms, learning support centers, computer labs, and self-contained special education classrooms.
- Middle Schools: Average class size for middle school classrooms is estimated at 30 students. The actual number of students in an individual classroom depends on the above factors. Middle school capacity is calculated utilizing the number of basic education teaching stations and applying a utilization factor of 85%. Working building capacity calculations do not include classrooms used for resource rooms, computer labs, and self-contained special education classrooms.
- High Schools: Average class size for middle and high school classrooms is estimated at 31 students. The actual number of students in an individual classroom depends on the above factors. High school capacity is calculated utilizing the number of basic education teaching stations and applying a utilization factor of 85%. Working building capacity calculations do not include classrooms used for resource rooms, computer labs, and self-contained special education classrooms.

SECTION 3
CAPITAL FACILITIES INVENTORY

This section provides a summary of capital facilities owned and operated by the District including schools, modulars, undeveloped land, and support facilities.

A. Elementary Schools

Elementary School	Location	Year of Occupancy	Building SF	Capacity	Teaching Stations
Dorothy Fox (K-5)	2623 NW Sierra St Camas WA 98607	1982/2000/2011	62,237	576	24
Grass Valley (K-5)	3000 NW Grass Valley Dr Camas WA 98607	2009	70,023	600	25
Helen Baller (K-5)	1954 NE Garfield St Camas WA 98607	2009	64,417	576	24
Lacamas Heights (K-5)	4600 NE Garfield St Camas WA 98607	1964/1997/2008/ 2013	42,757	408	17
Prune Hill (K-5)	1602 NW Tidland St Camas WA 98607	2001	59,130	480	20
Woodburn (K-5)	2400 NE Woodburn Dr Camas WA 98607	2013	72,857	600	25
TOTALS:			**369,989**	**3,240**	**110**

Note: capacity includes full day kindergarten

B. Middle Schools

Middle School	Location	Year of Occupancy	Building SF	Capacity	Teaching Stations
Liberty (6-8)	1612 NE Garfield St Camas WA 98607	1937/1952/1969/1985/ 1995/2006	121,047	892	35
Skyridge (6-8)	5220 NW Parker St Camas WA 98607	1996	112,133	790	31
TOTALS:			**233,180**	**1,682**	**65**

Note: capacity includes a utilization factor of 85%

C. High Schools

High School	Location	Year of Occupancy	Building SF	Capacity	Teaching Stations
Camas (9-12)	26900 SE 15th St Camas WA 98607	2003/2011	241,621	1,792	68
Hayes Freedom (9-12)	1919 NE Ione St Camas WA 98607	2010	20,500	211	8
TOTALS:			**262,121**	**2,003**	**76**

Note: capacity includes a utilization factor of 85%

D. Portables Inventory

Facility Type	No. of Portable Classrooms	No. of Portable Classrooms used as Interim Teaching Stations	Interim Capacity
Elementary Schools	14	2	48
Middle Schools	6	6	153
High Schools	8	8	211
TOTALS:	**28**	**16**	**412**

E. Support Facilities

Type	Location
Grounds Shop, Bus Maintenance and Warehouse (1963/2001)	1707 NE Ione St Camas WA 98607
Transportation Center (2001/2012)	1125 NE 22nd Ave Camas WA 98607
JD Zellerbach Administration Center (1967/1974/1985/1998/2010)	841 NE 22nd Ave Camas WA 98607
Community Education Center (same as above)	841 NE 22nd Ave Camas WA 98607
Jack, Will & Rob Center (2001)	2033 NE Ione St Camas WA 98607
Transition House (remodeled 2009)	612 NE 2nd Ave Camas WA 98607

F. Land Inventory

The district owns the following under- and undeveloped sites:

- 48.7 acres located south of 15th Street and east of NE Ione Street, Camas, WA 98607 – site unsuitable for education purposes, declared surplus and is currently for sale.
- 0.9 acres located at 918 NW Hill Street, Camas, WA 98607 – former Armory site, under-utilized for education purposes, currently leased as a gymnastics center.

SECTION 4
STUDENT ENROLLMENT PROJECTIONS

The District enrollment forecast was most recently updated by Paul Dennis, AICP of the Cascade Planning Group in December 2014.

The approach used in making the updated enrollment forecast included the following:

- Kindergarten (K) enrollment is forecast based on population of each school area (and expected population growth) together with birth rate data from five years previous using an age-cohort methodology. Data required for the K-level forecast includes projections of population growth, women of childbearing age and age-specific fertility rates.
- Actual enrollment patterns from prior years are used as a basis for projecting future enrollment for grades 1-12. For example, the number of students in a particular grade as of October 1, 2014 are promoted into the next grade level for 2015 (adjusting for expected population growth together with gains or losses typically associated with a particular grade-to-grade change for each grade level at each individual school).
- The 2014/2015 school year enrollment is based on the October 1, 2014 enrollment data.
- Economic growth impacts, land use and zoning provisions, buildable lands inventory, and new residential developments are taken into account.

A. Projected Enrollment 2015 – 2021 (Headcount)

Grade	Actual 2014	2015	2016	2017	2018	2019	2020	2021
K-5	2,777	2,809	2,869	2,856	2,939	2,996	3,061	3,142
6-8	1,648	1,678	1,689	1,757	1,765	1,833	1,788	1,857
9-12	2,141	2,200	2,276	2,387	2,470	2,500	2,643	2,615
TOTALS:	**6,566**	**6,687**	**6,834**	**7,000**	**7,174**	**7,329**	**7,492**	**7,614**

SECTION 5
CAPITAL FACILITY NEEDS

Projected facility capacity is derived by subtracting the 2021 projected student enrollment from the 2014 school facility capacity. The resulting deficit is used to determine facility needs.

A. Projected Facility Capacity Needs

Type of Facility	2014 Capacity	2021 Projected Enrollment	2021 Facility Need
Elementary	3,240	3,142	NA
Middle	1,682	1,857	175
High	2,003	2,615	612

The district will add four (4) portable classrooms to address the increase in high school enrollment for the 2015-16 school year. In February 2016, the district plans to propose to voters a bond to address future capacity needs.

B. 6-Year Plan – Facility Capacity Needs

	Project Description	Added Capacity	Estimated Cost	Cost for Added Capacity to Serve Growth
Phase I	High School Expansion	800	$50,723,000	$38,803,095
	K-5 Replacement	150	$33,697,464	$8,424,366
	6-8	900	$55,546,000	$10,775,924
	Property Acquisition	600	$5,000,000	$5,000,000
Phase II	Transportation –Bus Parking Lot		$690,000	$690,000
	K-5 New	600	$33,697,464	N/A
	TOTAL:	**2,450**	**$179,353,928**	**$63,693,385**

The additional 612 projected high school students can be accommodated by the construction of a new 800 student facility. The additional 175 middle school students could be accommodated by adding a 900 student facility. In addition, the District proposes the use of portable classrooms purchased with impact fees to handle short-term capacity needs.

C. Six-Year Financing Plan

Facility Capacity Need	Total	Estimated Impact Fees	State Match Funds	Bonds
Secured	**$400,000**	$400,000	0	0
Unsecured	**$150,000,000**	$2,000,000	$8,000,000	$140,000,000

General Obligation Bonds
Bonds are used to fund site acquisition, construction of new schools, and other capital improvement projects. A 60% majority vote is required to approve the issuance of bonds. Bonds are then retired through collection of property taxes.

State Match Funds
State Match funds primarily come from the Common School Construction Fund (the "Fund"). School districts may qualify for State Match funds for specific capital projects based on eligibility requirements and a state prioritization system. Based on the District's assessed valuation per student and the formula in the State regulations, the District is currently eligible for State Match funds for new schools at the 63.26% match level.

Impact Fees
The collection of school impact fees generates partial funding for construction of public facilities needed to accommodate new development. School impact fees are collected by the Cities and County on behalf of the District. Impact fees are calculated based on a formula, which includes the portion of District construction resulting in increased capacity in schools.

SECTION 6
SCHOOL IMPACT FEES

The Growth Management Act (GMA) authorizes local jurisdictions to collect impact fees to supplement funding of additional public facilities needed to accommodate new development.

Local jurisdictions in Clark County have adopted impact fee programs that require school districts to prepare and adopt Capital Facilities Plans. Impact fees are calculated in accordance with the jurisdiction's formula, which is based on school facility costs to serve new growth.

The District's impact fees have been calculated utilizing the formula in the Clark County and the Cities of Camas, Washougal, and Vancouver Impact Fee Ordinances. The resulting figures, in the attached Appendix A and paragraph below are based on the District's cost per dwelling unit to build the new facilities which add capacity that is needed to serve new development. Credits have also been applied in the formula to account for State Match funds the District receives and projected future property taxes that will be paid by the owner of the dwelling unit.

The calculated maximum allowable impact fees are:

$5,371.85 per single family residence
$10,336.11 per multi-family residence

The District Board of Directors, at its May 26, 2015 meeting, recommends collecting school impact fees in the following amounts:

$ 5,371.00 per single family residence
$ 5,371.00 per multi-family residence

Camas
2015 Impact Fee Calculation

APPENDIX A

$$SIF = \left[CS(SF) - (SM) - \left(\frac{(1+i)^{10} - 1}{i(1+i)^{10}} \times AAV \times TLR \right) \right] \times A - FC$$

Single Family Residence:

Elementary	Middle School	High School	Formula
$0.00	$55,546,000.00	$50,723,000.00	Facility Cost
150	900	800	Additional Capacity
$0.00	$61,717.78	$63,403.75	Cost per Student (CS)
0.297	0.159	0.136	Student Factor (SF)
$0.00	**$9,813.13**	**$8,622.91**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
63.74%	63.74%	63.74%	State Match Eligibility %
$0.00	$0.00	$2,258.35	State Match Credit (SM)
$0.00	**$9,813.13**	**$6,364.56**	**CS x SF - SM**
		$16,177.68	**Cost per Single Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$338,448.00	Average Assessed Value (AAV)
		3319144.73	TCM x AAV
		0.00297	Tax Levy Rate (TLR)
		$9,857.86	**TCM x AAV x TLR = (TC)**
		$6,319.82	**Cost per Single Family Residence - Tax Credit**
		$947.97	15% reduction (A)
		$5,371.85	**Calculated Single Family Fee Amount**
		$5,371.00	**Recommended Fee Amount**

Multi-Family Residence:

Elementary	Middle School	High School	Formula
$0.00	$55,546,000.00	$50,723,000.00	Facility Cost
150	900	800	Additional Capacity
$0.00	$61,717.78	$63,403.75	Cost per Student (CS)
0.338	0.185	0.123	Student Factor (SF)
$0.00	**$11,417.79**	**$7,798.66**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
63.74%	63.74%	63.74%	State Match Eligibility %
$0.00	$2,764.82	$2,042.48	State Match Credit (SM)
$0.00	**$8,652.97**	**$5,756.18**	**CS x SF - SM**
		$14,409.14	**Cost per Multi-Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$77,215.00	Average Assessed Value (AAV)
		757244.13	TCM x AAV
		0.00297	Tax Levy Rate (TLR)
		$2,249.02	**TCM x AAV x TLR = (TC)**
		$12,160.13	**Cost per Multi-Family Residence - Tax Credit**
		$1,824.02	15% reduction (A)
		$10,336.11	**Calculated Multi- Family Fee Amount**
		$5,371.00	**Recommended Fee Amount**

CAMAS SCHOOL DISTRICT 117
RESOLUTION 14-11
CAPITAL FACILITIES PLAN 2015-2021

A Resolution of the Board of Directors (the "Board") of the Camas School District No. 117 (the "District") to adopt a Capital Facilities Plan (the "Plan") for school facilities conforming to requirements of the State Growth Management Act and the Clark County General Policy Plan.

WHEREAS, Districts are required to update their Capital Facilities Plan every six years in compliance with RCW 36.70A (the Growth Management Act); and

WHEREAS, this Plan update was developed by the District in accordance with accepted methodologies and requirements of the Growth Management Act; and

WHEREAS, the proposed impact fees utilize calculation methodologies meeting the conditions and tests of RCW 82.02; and

WHEREAS, the District finds that the Plan meets the basic requirements of RCW 36.70A and RCW 82.02; and

WHEREAS, the District conducted a review of the Plan in accordance with the State Environmental Policy Act, state regulations implementing the act, and District policies and procedures;

NOW, THEREFORE BE IT RESOLVED as follows:

1. The 2015 Capital Facilities Plan for the years 2015-2021 is hereby adopted by the District.
2. The Clark County Board of Commissioners is hereby requested to adopt the Plan by reference as part of the capital facilities element of the County's General Policy Plan.
3. The Cities of Camas, Washougal, and Vancouver are hereby requested to adopt the Plan by reference as part of the Capital Facilities Plan element of their respective General Policy Plans.

ADOPTED, this 26th day of May 2015 at the Regular Meeting of the Board of Directors for Camas School District 117.

CAMAS SCHOOL DISTRICT 117
BOARD OF DIRECTORS

Attest:

Secretary to the Board

ORDINANCE NO. 15-027

AN ORDINANCE approving and adopting by reference the text of that certain document entitled Evergreen Public Schools Capital Facilities Plan 2015-2021.

WHEREAS, the Evergreen School District has submitted an amended capital facilities plan entitled "Evergreen Public Schools Capital Facilities Plan 2015-2021" to the City for its review and approval, and

WHEREAS, the Council has considered said capital facilities plan and has conducted a public hearing, and desires to adopt the same as the capital facilities plan for the Evergreen School District,

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF CAMAS AS FOLLOWS:

Section I

The Council hereby approves and adopts by reference a volume of text entitled "Evergreen Public Schools Capital Facilities Plan 2015-2021" as the amended capital facilities plan of the school district, which shall provide the basis for the collection of school impact fees by the City on behalf of the school district.

Section II

A copy of the Evergreen Public Schools Capital Facilities Plan 2015-2021 shall be maintained in the council file on these proceedings, and copies of said Capital Facilities Plan shall be made available for public inspection at the Public Works Department.

Section III

This ordinance shall take force and be in effect five (5) days from and after its publication according to law.

PASSED by the Council and APPROVED by the Mayor this 21st day of December, 2015.

SIGNED: _____
Mayor

ATTEST: _____
Clerk

APPROVED as to form:

_____
City Attorney

Evergreen Public Schools

EVERGREEN PUBLIC SCHOOLS
CAPITAL FACILITIES PLAN

2015-2021

BOARD OF DIRECTORS

Julie Bocanegra, Board President
Victoria Bradford, Board Vice President
Todd Yuzuriha, Director
Michael Parsons, Director
Rob Perkins, Director

SUPERINTENDENT

John Deeder

DIRECTOR OF FACILITIES

Susan Steinbrenner

Adopted by the Evergreen School District Board of Directors
May 26, 2015

	SECTION	Page
I.	INTRODUCTION	3
II.	DISTRICT EDUCATIONAL PROGRAMS AND STANDARDS OF SERVICE	6
III.	CAPITAL FACILITIES INVENTORY	9
IV.	STUDENT ENROLLMENT PROJECTIONS	12
V.	CAPITAL FACILITIES NEEDS	13
VI.	CAPITAL FACILITIES FINANCE PLAN	14
VII.	SCHOOL IMPACT FEES	15

I. INTRODUCTION

A. Purpose of the Capital Facilities Plan

The Washington State Growth Management Act (the "GMA") includes schools in public facilities and services that must be provided for as cities and counties plan for growth. School districts have adopted capital facilities plans to satisfy the requirements of the GMA and to identify additional school facilities necessary to meet the educational needs of the growing student populations anticipated in their districts.

The Evergreen School District (the "District") prepared this Capital Facilities Plan (the "CFP") to provide Clark County (the "County) and the Cities of Vancouver and Camas (the "City") with the district's anticipated capital facility needs over the next six years (2015-2021) to ensure that adequate school facilities are available to serve new growth and development.

In accordance with the Growth Mangement Act and the County and City Impact Fee Ordinances, this CFP contains the following required elements:

- The District's standard of service, which is based on program year, class size by grade span, number of classrooms, types of facilities, and other factors identified by the District, including teacher contracts and funding requirements.
- An inventory of existing capital facilities owned by the District, showing the locations and capacities of the facilities, based on the District's standard of service.
- A forecast of the future needs for capital facilities and school sites based on the District's enrollment projections.
- The proposed capacities of expanded or new capital facilities over the next six years based on the inventory of existing facilities and the standard of service.
- A six-year plan for financing capital facilities within projected funding capacities, which clearly identifies sources of public money for such purposes. The financing plan separates projects and portions of projects which add capacity from those which do not, since the latter are generally not appropriate for impact fee funding.
- A calculation of impact fees based on the formula in the County and City impact fee ordinances and supporting data substantiating such fees.

In developing this CFP, the District used the following guidelines:

- The District will use information from recognized sources, such as professional demographers and planners, county and city adopted land use plans and county GIS data.
- The District will use data it generates from reasonable methodologies.

- The CFP and methodology to calculate the impact fees will comply with the GMA and county and city codes.
- The six year facility needs are based on an enrollment forecast that takes local development trends into account.
- The District plans to construct permanent/bricks and mortar facilities for its students and will develop a CFP to accomplish that objective. At the same time, the District expects there will be a time period when some of the students that the District serves will be housed in portables. Housing students in portables, temporarily, is necessary to qualify for state funds that are needed to build new schools.

B. Overview of the Evergreen School District

The Evergreen School District is comprised of 54 square miles. It serves a significant portion of the Vancouver Urban Growth Area and smaller areas in the Camas Urban Growth Area and rural Clark County.

The District serves residents from the cities of Vancouver and Camas and from unincorporated Clark County. The District is bordered by the Vancouver School District to the west, the Camas School District to the east and the Battle Ground and Hockinson School Districts to the north. It is bordered by the Columbia River and state line to the south.

The Districts serves a population of 26,343 students (October 2014 enrollment). Of the 26,343 students, 44% attend classes in 21 elementary schools (grades K-5), 22% attend classes in six middle schools (grades 6-8), and 34% students attend classes in six high schools (grades 9-12). For purposes of facility planning this CFP considers grades K-5 as an elementary, grades 6-8 as a middle school, and grades 9-12 as a high school.

In addition, the Clark County Skills Center is located in and operated by Evergreen School District serving students half days from all Clark County school districts. The district serves home schooled students in grades K-8 through a supplemental program operated by the Flex Academy and pre-school special needs students through a program operated by the Early Childhood Center.

The most significant issues facing the District in terms of providing classroom capacity to accommodate existing and projected demands are:

- The Washington State Supreme Court ruled in the McLeary school funding case that the Legislature was not fulfilling its constitutional requirement of funding schools. The court ruled the Legislature should fund its own funding bills previously agreed to. One component is class-size reduction in grades K-3. The Senate, and House of Representatives have brought forward plans to fund the class-size reduction by the 2017-18 school year. Reducing class sizes from current levels to a level of 17:1 by the 2017-18 school year will require additional teachers, and additional classrooms. The impact of additional capacity is not included in our Capital Facilities Plan.
- The Washington State Board of Education has increased the graduation requirements of high school students to a level of 24 credits. To allow for additional credit options schedules will need to be altered to provide further

student options. Anticipated schedule changes will require more teachers, and additional classroom space not currently figured in our plan.

- The majority of growth in the District has been residential rather than industrial. Because residential growth does not increase assessed value to the same degree that industrial growth does, the comparative per pupil assessed value is lower in Evergreen School District than in many of its neighboring districts. The low assessed value means that any tax is spread over a smaller base and, consequently, tax rates are high in Evergreen. For example, in 2015 it would cost the taxpayer in Evergreen $4.38/$1,000 in assessed value to collect the maximum levy. Comparatively, in Camas School District with the assessed value added by industry, it would cost the taxpayer $3.41/$1,000 in assessed value to raise the maximum levy.
- In the last 10 years, bilingual enrollment in the District increased 175%. In the 2004-05 school year, the number of students with English as a Second Language (ESL) was 1,749; in the 2014-15 school year, the number of ESL students is 3,049. Students living in poverty within district boundaries has also significantly increased in recent years. The District continues to monitor the need for additional space to accommodate staff needed to provide support for students who need additional assistance.
- Other concerns regarding growth management and schools relate to the link that exists between a quality education and the ability to provide quality facilities for all students.

II. DISTRICT EDUCATIONAL PROGRAMS AND STANDARDS OF SERVICE

School facility and student capacity needs are dictated by the types and amounts of space required to accommodate the District's adopted educational program. Quality education plays a vital role in growing a strong local economy. To provide quality education, the District must have quality facilities to serve as the supporting space for developing the whole child within a community to prepare them for a competitive world. The educational program standards which typically drive facility space needs include grade configuration, optimum facility size, class size, educational program offerings, classroom utilization and scheduling requirements.

In addition to student population, other factors such as collective bargaining agreements, government mandates, state and federal funding requirements and community expectations affect classroom space requirements. Programs, such as special education, bilingual education, preschool and daycare programs, and other specialized programs, often supplement traditional educational programs. These programs can have a significant impact on the available student capacity of school facilities.

The District's current program and educational standards are summarized below. The program and educational standards may vary during the six year CFP planning horizon. Absent significant changes in factors that are beyond the District's control, the District will provide the following programs and standards of service in 2015 through 2021. If significant changes occur that require new facilities or improvements, beyond what is identified in this CFP, the District will prepare and submit an updated CFP.

A. Elementary Educational Standards

Elementary schools provide education in all core subject areas including reading, writing, math, social studies and science. All students receive instruction in P.E., music, art and have access to media programs. Full day kindergarten is provided at each elementary school. The District educational standards of service, which directly affect elementary school capacity, include:

- Class sizes for grades K-3 are targeted not to exceed 23 students per class.
- Class sizes for grades 4-5 are targeted not to exceed 25 students per class.
- Music instruction and physical education are provided in separate (pull-out) classrooms.
- All elementary schools have a library media resource center which includes additional space for a technology lab.
- All elementary schools have a computer lab in a room that is separate from the classrooms.
- Special education is provided for some students in self-contained classrooms are separate from regular teaching stations (pull-out program). Special education classrooms serve 5 to 15 students.
- Title I and LAP (Learning Assistance Program) are provided in rooms separate from regular classrooms.

B. Middle and High School Program Standards

Middle schools provide instruction in the core disciplines of english, math, social studies, science, physical education, music and art. Students have elective offerings available including music, art and technology courses.

High schools provide course work including english, history, science, math, physical education, music and art. Additionally elective offerings include vocational technical programs.

The District educational standards of service, which directly affect middle school and high school capacity include:

- Class sizes for grades 6-8 are targeted not to exceed 25 students per class.
- Class sizes for grades 9-12 are targeted not to exceed 25 students per class.
- Special programs, such as music, art, physical education, drama, home and family education learning assistance, are provided in separate instructional space. The class size ranges from 20 to 70 students.
- The District provides science classroom space that supports advanced coursework at the secondary level that require water, sinks, gas, hoods, safety equipment, etc. Schools are working to meet expanded science standards and this will require spaces that cannot typically be met by adding portables.
- It is not possible to achieve 100% utilization of all regular teaching stations throughout the day due to schedule conflicts, the need for specialized rooms for certain programs and the need for teachers to have work space during their planning period.

C. District-wide Educational Programs:

In addition to Elementary, Middle, and High School program standards, the Evergreen School District's core services and program offerings include the following:

- Physical education space is provided to meet strengthened health standards. This can include covered play areas, field space, gyms and other multi-use spaces.
- Technology access is necessary and expectations are increasing. Technology (either within the classroom or in dedicated labs) takes extra space that is not calculated in current state square footage allowances, but is necessary for student learning. Technology support and infrastructure needs are also increasing, which further erodes the state square footage allowances.
- Art and music spaces are critical to the District's educational programs. As student population grows, additional support space for these essential programs is required.
- Library/Media demands are crucial. In an information driven environment, access to knowledge through appropriately sized library/media spaces is essential.
- Extra-curricular activities need space in order to be supported properly with growing student populations.

D. District-wide Support and Special Services:

In addition to the above core educational programs, the following support services are essential to the District's educational program:

- Food service preparation, delivery and use space. As student populations increase, cafeteria, food preparation and delivery space must be enlarged. Miscalculating the need for this core service can have significant impacts on the overall learning environment for students.
- Other support centers, including Transportation, Maintenance, Warehouse and Print Shop facilities are critical to support the educational program and the business operation.

The following special services are also necessary to meet the needs of special populations:

- Special Education programs are provided at all schools within the District. Special needs program standard change year to year as a result of various external or internal changes. External changes may include mandates or needs for special programs, or use of technology. Internal changes may include modifications to the program year, class sizes, and grade span configurations. Changes in physical aspects of the school facilities also affect special educational program standards.
- Special populations require special support, which often requires special spaces. Federal and state programs, including Title 1 reading and math, highly capable, and bilingual are required but come with limited funds that do not cover the expense of adding facilities to support the program.
- Early Childhood programs, such as new or expanded preschool programs are a vital service and an essential educational component. They place additional demands on facilities.
- Supplementary services in core academic areas and multiple pathways that prepare students for a broader range of post-secondary learning opportunities require additional space.

III. CAPITAL FACILITIES INVENTORY

The facilities inventory serves to establish a baseline for determining the facilities needed to accommodate future demand at acceptable levels of service. This section provides an inventory of capital facilities owned and operated by the District including schools, portables, undeveloped land and support facilities.

A. Elementary Schools

ELEMENTARY SCHOOLS	LOCATION	YEAR OF OCCUPANCY	BUILDING Sq. Ft.	CAPACITY	TEACHING STATIONS
Burnt Bridge Creek	14619-A NE 49th Street Vancouver, WA 98682	1988	51,529	512	21
Burton	14015 NE 28th Street Vancouver, WA 98682	1970	41,392	453	20
Columbia Valley	17500 SE Sequoia Circle Vancouver, WA 98683	2004	61,656	582	26
Crestline	13003 SE 7th Street Vancouver, WA 98683	2014	63,904	546	24
Ellsworth	512 SE Ellsworth Road Vancouver, WA 98664	1958	38,014	430	19
Endeavour	2701 NE Four Seasons Lane Vancouver, WA 98682	2008	61,656	629	26
Flex Academy (Elementary and Middle School)	13501 NE 28th Street Vancouver, WA 98682	2003	13,295	128	6
Fircrest	12001 NE 9th Street Vancouver, WA 98684	1976	56,650	501	21
Fisher's Landing	3800 SE Hiddenbrook Drive Vancouver, WA 98683	1996	51,977	488	21
Harmony	17404-A NE 18th Street Vancouver, WA 98684	1991	51,529	489	21
Hearthwood	801 NE Hearthwood Boulevard Vancouver, WA 98684	1981	51,350	477	21
Illahee	19401 SE 1st Street Camas, WA 98607	2001	58,627	605	26
Image	4400 NE 122nd Avenue Vancouver, WA 98682	1976	56,650	581	25
Marrion	10119 NE 14th Street Vancouver, WA 98664	1968	40,158	453	20
Mill Plain	400 SE 164th Avenue Vancouver, WA 98684	1952	50,145	547	23
Orchards	11405 NE 69th Street Vancouver, WA 98662	2006	61,656	629	25
Pioneer	7212 NE 166th Avenue Vancouver, WA 98682	1993	51,529	489	20

Riverview	12601 SE Riveridge Drive Vancouver, WA 98683	1976	56,650	536	22
Sifton	7301 NE 137th Avenue Vancouver, WA 98682	1958	43,292	408	16
Silver Star	10500 NE 86th Street Vancouver, WA 98662	1973	43,995	419	17
Sunset	9001 NE 95th Street Vancouver, WA 98662	1976	56,650	570	24
York	9301 NE 152nd Avenue Vancouver, WA 98682	2003	57,208	582	25
TOTAL ELEMENTARY			***1,119,512***	***11,054***	***469***

B. Middle Schools

MIDDLE SCHOOLS	LOCATION	YEAR OF OCCUPANCY	BUILDING Sq. Ft.	CAPACITY	TEACHING STATIONS
Cascade	13900 NE 18th Street Vancouver, WA 98684	2004	114,600	796	41
Covington	11200 NE Rosewood Road Vancouver, WA 98662	2006	113,361	881	46
Frontier	7600 NE 166th Avenue Vancouver, WA 98682	1996	101,046	675	36
Pacific	2017 NE 172nd Avenue Vancouver, WA 98684	1983	97,598	608	31
Shahala	601 SE 192nd Avenue Vancouver, WA 98683	2001	105,018	768	40
Wy'east	1112 SE 136th Avenue Vancouver, WA 98683	1979	117,127	675	36
TOTAL MIDDLE SCHOOLS			***648,750***	***4,403***	***230***

C. High Schools

HIGH SCHOOLS	LOCATION	YEAR OF OCCUPANCY	BUILDING Sq. Ft.	CAPACITY	TEACHING STATIONS
Evergreen	14300 NE 18th Street Vancouver, WA 98684	1969 Modernization 2007	264,354	1,780	84
HeLa	9105 NE 9th Street Vancouver, WA 98664	2013	69,008	521	25
Heritage	7825 NE 130th Avenue Vancouver, WA 98682	1999	227,437	1,270	60
IQ Academy	13501 NE 28th Street Vancouver, WA 98682	2003	N/A	610	N/A
Legacy	2205 NE 138th Avenue Vancouver, WA 98684	1987	11,554	104	5
Mountain View	1500 SE Blairmont Drive Vancouver, WA 98683	1981	229,015	1,694	77
Union	6201 NW Friberg/Strunk Camas, WA 98607	2007	235,908	1,706	79
TOTAL HIGH SCHOOLS			***1,037,276***	***7,685***	***330***

D. Portables

Portable classrooms are used on an interim basis to house students until funding can be secured to construct permanent classrooms.

Facility Type	No. of Portable Classrooms	Capacity	Teaching Stations
Elementary Schools	175	2,553	134
Middle Schools	120	1,966	90
High Schools	75	1431	63
TOTAL	***370***	***5,950***	***287***

E. Support Facilities

In addition to schools, the District owns and operates additional facilities which provide special programs and operational support functions to the schools.

SUPPORT FACILITIES	Location	Description
Administrative Service Center	13501 NE 28th Street Vancouver, WA 98682	Supports all Facilities
Maintenance Facility	3004 NE 124th Avenue Vancouver, WA 98682	Supports all Facilities
McKenzie Stadium	2205 NE 138th Avenue Vancouver, WA 98682	Supports all Facilities
Transportation	13909 NE 28th Street Vancouver, WA 98682	Supports all Facilities
Warehouse (Central Receiving & Distribution)	2205 NE 138th Avenue Vancouver, WA 98684	Supports all Facilities
Crestwood Business Park (Leased)	1168 SE Mill Plain Blvd Vancouver, WA 98684	47 enrolled, capable of serving 55
49th Street Academy	14619-B 49th Street Vancouver, WA 98682	110 enrolled, capable of serving 113
Clark County Vocational Skills Center	12200 NE 28th Street Vancouver, WA 98682	Consortium program with pull-out enrollment

F. Land Inventory

The District owns the following undeveloped sites in addition to the sites with built facilities:

- 8 acres located at NE 202nd Avenue and SE 1st Street, Camas WA 98607. The District does not anticipate building a school facility on this site. The property has been declared surplus.
- 10 acres located at NE 39th Street and NE 162nd Avenue, Vancouver, WA 98682. The District anticipates building an elementary school.
- 20 acres located at NE 52nd Street and NE 132nd Avenue, Vancouver WA 98682. The District anticipates building a middle school.

IV. STUDENT ENROLLMENT PROJECTIONS

A. Projected Student Enrollment 2015-2021 (Headcount)

The District's six year enrollment projection is based on a forecast prepared by Educational Service District 112 in April, 2015. The consulting team used several different enrollment projection models to estimate future enrollment, including cohort survival, grade progression, and population ratio. The forecast also considered local population and housing and development trends, and the District's observations of enrollment over the past ten years.

The summary of the various methodologies used to predict growth shows enrollment to remain fairly constant in the coming six years, as follows:

Grade	Fall 2014	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Total K-5	11,455	11,530	11,597	11,660	11,708	11,756	11,830
Total 6-8	5,918	5,904	5,909	5,935	5,973	6,003	6,004
Total 9-12	8,970	9,028	9,059	9,400	9,539	9,680	9,208
TOTAL	***26,343***	***26,462***	***26,565***	***26,659***	***26,788***	***26,906***	***27,042***

V. CAPITAL FACILITIES NEEDS

A. Facility Needs

Projected facility capacity is derived by subtracting the projected student enrollment from the existing school capacity (excluding portable classrooms). As shown below, the District does not have permanent capacity available to serve all students.

Facility	2014 Capacity	2021 Projected Enrollment	2021 Facility Need
Elementary Schools	11,054	11,830	776
Middle Schools	4,403	6,004	1,601
High Schools	7,685	9,208	1,523
TOTAL	***23,142***	***27,042***	***3,900***

B. Six Year Plan – Facility Capacity Needs

To address existing needs and add capacity to serve forecast growth, the District needs to build a new 500 student elementary school, replace 3 elementary schools and 1 middle school, and expand an existing high school. The forecast growth in enrollment is 375 elementary school students, 86 middle school students and 238 high school students. Because a portion of the planned improvements will remedy an existing deficiency, only a portion of the improvement will serve future growth and therefore only a portion of the cost is included in the District's impact fee calculations. The capacity and cost for the required improvements is shown in the table below:

Project Description	Capacity	Estimated Cost	Cost for Added Capacity to Serve Growth*
New ES	500	$19,940,635	$14,955,476
Replace 3 ES	0	$59,821,905	$0
Replace 1 MS	1,000	$43,506,840	$3,741,588
HS addition	500	$23,566,205	$11,217,514
Transportation	0	$6,000,000	$0
Land Acquisition	0	$8,000,000	$0
TOTAL	***2,000***	***$160,835,585***	***$29,914,578***

* *The cost of added capacity to serve growth equals the percentage of the total cost of the improvements needed to serve the forecast growth.*

VI. CAPITAL FACILITIES FINANCE PLAN

A. Six Year Financing Plan

Facility Capacity Need	Total	Estimated Impact Fees	State Match	Bonds
Secured	$5,800,000			
Unsecured	$96,000,000	$9,000,000	$64,000,000	$87,835,585

The total cost estimate for the six-year improvements and property acquisition is $160,835,585. Funding for planned improvements is typically secured from a number of sources including voter approved bonds, state match funds, and impact fees. The following information explains each of the funding sources in greater detail.

1. ***General Obligation Bonds***

   Bonds are typically used to fund construction of new schools and other capital improvement projects. A 60% voter approval is required to approve the issuance of bonds. Bonds are then retired through collection of property taxes. The District must pass a bond since it is the primary source of funding for the capital improvements listed in this plan.

2. ***State Match Funds***

   State match funds come from the Common School Construction Fund ("the Fund"). Bonds are sold on behalf of the Fund, and then retired from revenues accruing predominantly from the sale of timber from the common school lands. If these sources are insufficient, the Legislature can appropriate funds or the State Board of Education can change the standards. School districts may qualify for state match funds for specific capital projects based on a prioritization system.

3. ***Impact Fees***

   Impact fees are a means of supplementing traditional funding sources for construction of public facilities needed to accommodate new development. School impact fees are generally collected by the permitting agency at the time plats are approved or building permits are issued.

Anticipated property acquisition and new construction is based on the enrollment forecast, capacity, the District's educational standards and the community's support of finance tools to fund the improvements.

In the event that planned construction projects and property acquisition does not fully address space needs for student growth and a reduction in interim student housing (portables), the Board could consider various courses of action, including, but not limited to:

- Increase class sizes;
- House students in additional portables;
- Alternative scheduling options;
- Change the instructional model, or
- Modify the school calendar

VII. SCHOOL IMPACT FEES

The GMA authorizes jurisdictions to collect impact fees to supplement funding of additional public facilities needed to accommodate new development. Impact fees cannot be used for the operation, maintenance, repair, alteration, or replacement of existing capital facilities used to meet existing service demands.

A. School Impact Fees

The county's and city's impact fee programs require school districts to prepare and adopt CFPs meeting the specifications of the GMA and the county and city ordinances. Impact fees are calculated in accordance with the local jurisdiction's formula, which is based on projected school facility costs necessitated by new growth contained in the District's CFP. The formula allocates a portion of the cost for new facilities to the single family and multi-family house that create the demand (or need) based on a student factor, or the average number of students that live in new single family and multi-family homes. The formula also provides a credit for state match and Bond Proceeds (or property taxes).

B. Methodology and Variables Used to Calculate School Impact Fees

The District's impact fees have been calculated utilizing the formula in the Clark County and cities of Vancouver and Camas Impact Fee Ordinances. Application of the formula is shown in Appendix A which follows on the next page.

C. Proposed Impact Fee Schedule

In accordance with the school impact fee calculation in Appendix A, the District's school impact fees are:

$ 6,100 per single family home

$ 7,641 per multi-family unit

Evergreen School District
2015 Impact Fee Calculation

APPENDIX A

$$SIF = \left[CS(SF) - (SM) - \left(\frac{(1+i)^{10} - 1}{i(1+i)^{10}} \times AAV \times TLR \right) \right] \times A - FC$$

Single Family Residence:

Elementary	Middle School	High School	Formula
$19,940,635.00	$43,506,840.00	$23,566,205.00	Facility Cost
500	1000	500	Additional Capacity
$39,881.27	$43,506.84	$47,132.41	Cost per Student (CS)
0.168	0.086	0.137	Student Factor (SF)
$6,700.05	**$3,741.59**	**$6,457.14**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
65.59%	65.59%	65.59%	State Match Eligibility %
$1,987.41	$1,322.57	$2,340.99	State Match Credit (SM)
$4,712.64	**$2,419.02**	**$4,116.15**	**CS x SF - SM**
		$11,247.81	**Cost per Single Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$224,395.00	Average Assessed Value (AAV)
		2200631.95	TCM x AAV
		0.00185	Tax Levy Rate (TLR)
		$4,071.17	**TCM x AAV x TLR = (TC)**
		$7,176.64	**Cost per Single Family Residence - Tax Credit**
		$1,076.50	15% reduction (A)
		$6,100.15	**Calculated Single Family Fee Amount**
		$6,100.00	**Recommended Fee Amount**

Multi-Family Residence:

Elementary	Middle School	High School	Formula
$19,940,635.00	$43,506,840.00	$23,566,205.00	Facility Cost
500	1000	500	Additional Capacity
$39,881.27	$43,506.84	$47,132.41	Cost per Student (CS)
0.153	0.083	0.131	Student Factor (SF)
$6,101.83	**$3,611.07**	**$6,174.35**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
65.59%	65.59%	65.59%	State Match Eligibility %
$1,809.96	$1,276.44	$2,238.46	State Match Credit (SM)
$4,291.87	**$2,334.63**	**$3,935.88**	**CS x SF - SM**
		$10,562.39	**Cost per Multi-Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$86,672.00	Average Assessed Value (AAV)
		849988.51	TCM x AAV
		0.00185	Tax Levy Rate (TLR)
		$1,572.48	**TCM x AAV x TLR = (TC)**
		$8,989.91	**Cost per Multi-Family Residence - Tax Credit**
		$1,348.49	15% reduction (A)
		$7,641.42	**Calculated Multi- Family Fee Amount**
		$7,641.00	**Recommended Fee Amount**

RESOLUTION #5716

Approval of 2015-2021 Capital Facilities Plan and School Impact Fees

WHEREAS, the Growth Management Act (GMA) requires the County and Cities to adopt a comprehensive land use plan that, among other things, addresses the provision of public services for future growth and development and;

WHEREAS, public schools are one of the public services that Clark County and the City of Vancouver and the City of Camas plans for, with assistance from the school districts and;

WHEREAS, the Evergreen School District has prepared an updated six-year capital facility plan, which identifies an increase in student enrollment and the need build new classrooms to serve students from new development and;

WHEREAS, school capital project funding sources are not sufficient to fund the property and classrooms that are needed to serve forecast growth and;

WHEREAS, Clark County and the City of Vancouver and the City of Camas collect school impact fees from residential development in accordance with the GMA, the Comprehensive Land Use Plan and the District's Capital Facility Plan to ensure school facilities will be available to serve new growth and development and;

NOW, THEREFORE, BE IT RESOLVED that the 2015-2021 Evergreen School District Capital Facilities Plan (CFP) is hereby adopted.

BE IT FURTHER RESOLVED that the District respectfully requests that Clark County and the City of Vancouver and the City of Camas adopt the 2015-2021 Evergreen School District Capital Facilities Plan for incorporation into the Comprehensive Land Use Plan and collect school impact fees in the amount of $6,100.00 per single family residence and $7,641.00 per multi family residence.

EVERGREEN SCHOOL DISTRICT #114
BOARD OF DIRECTORS

Attest:

Secretary, Board of Directors
May 26, 2015

ORDINANCE NO. 15-028

AN ORDINANCE approving and adopting by reference the text of that certain document entitled Washougal School District Capital Facilities Plan 2015-2021.

WHEREAS, the Washougal School District has submitted an amended capital facilities plan entitled "Washougal School District Capital Facilities Plan 2015-2021" to the City for its review and approval, and

WHEREAS, the Council has considered said capital facilities plan and has conducted a public hearing, and desires to adopt the same as the capital facilities plan for the Washougal School District,

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF CAMAS AS FOLLOWS:

Section I

The Council hereby approves and adopts by reference a volume of text entitled "Washougal School District Capital Facilities Plan 2015-2021" as the amended capital facilities plan of the school district, which shall provide the basis for the collection of school impact fees by the City on behalf of the school district.

Section II

A copy of the Washougal School District Capital Facilities Plan 2015-2021 shall be maintained in the council file on these proceedings, and copies of said Capital Facilities Plan shall be made available for public inspection at the Public Works Department.

Section III

This ordinance shall take force and be in effect five (5) days from and after its publication according to law.

PASSED by the Council and APPROVED by the Mayor this 21st day of December, 2015.

SIGNED: _____
Mayor

ATTEST: _____
Clerk

APPROVED as to form:

_____
City Attorney

WASHOUGAL SCHOOL DISTRICT
CAPITAL FACILITIES PLAN

2015-2021

BOARD OF DIRECTORS

Ron Dinius, President
Elaine Pfeifer, Vice President
Karen Rubino
Teresa Lees
Bruce Westfall

SUPERINTENDENT

Dawn Tarzian

DIRECTOR OF Facilities

Joe Steinbrenner

Adopted by the Washougal School District Board of Directors
May 26th, 2015

I. INTRODUCTION

A. Purpose of the Capital Facilities Plan

The Washington State Growth Management Act (the "GMA") includes public school facilities and services that must be provided as cities and counties plan for growth. School districts have adopted capital facilities plans to satisfy the requirements of the GMA and to identify additional school facilities necessary to meet the educational needs of the growing student populations anticipated in their districts.

The Washougal School District (the "District") has prepared this Capital Facilities Plan (the "CFP") to provide Clark County (the "County") and the cities of Camas and Washougal (the "Cities") with the District's anticipated capital facility needs and the District's schedule and financing plan for those improvements over the next six years (2015-2021).

In accordance with the Growth Management Act and the County and City Impact Fee Ordinances, this CFP contains the following required elements:

- The District's standard of service, which is based on program year, class size by grade span, number of classrooms, types of facilities, and other factors identified by the District, including teacher contracts and funding requirements.
- An inventory of existing capital facilities owned by the District, showing the locations and capacities of the facilities, based on the District's standard of service.
- Future enrollment forecasts for each grade span (elementary, middle, and high schools).
- A forecast of the future needs for capital facilities and school sites based on the District's enrollment projections.
- The proposed capacities of expanded or new capital facilities over the next six years based on the inventory of existing facilities and the standard of service.
- A six-year plan for financing capital facilities within projected funding capacities, which clearly identifies sources of public money for such purposes. The financing plan separates projects and portions of projects that add capacity from those that do not, since the latter are generally not appropriate for impact fee funding.
- A calculation of impact fees based on the formula in the County and City impact fee ordinances and supporting data substantiating such fees.

B. Overview of the Washougal School District

The Washougal School District is located in southwest Washington and serves residents of Washougal, Camas and unincorporated Clark County, as well as residents in the Columbia River Gorge who live in the Cape Horn area of Skamania County. The District map reveals a long, narrow band of land that extends from the Columbia River on the south all the way north to the White Pass School district in Lewis County. This geographical configuration gives Washougal the unusual feature of being incorporated into two counties (Clark and Skamania) and bordering two other counties to the north and west (Cowlitz and Lewis). The District is bordered on the west by seven school districts—Camas, Hockinson, Battle Ground, Woodland, Kalama, Kelso, and Toutle Lake school districts. It is bordered on the east by the Skamania School District. The northern end of the District includes the uninhabited wilderness around Mt. St. Helens in the Gifford Pinchot National Forest. One of the district's schools, Jemtegaard Middle School, is located within the national boundary of the Columbia River Gorge Scenic Area.

The District serves a population of 3,104 students. Of the 3,104 students, 1,399 students attend classes in 3 elementary schools (grades K-5), 741 students attend classes in two middle schools (grades 6-8), and 964 students attend classes in one high school and one alternative high school (grades 9-12). For purposes of facility planning this CFP considers grades K-5 as elementary, grades 6-8 as middle school, and grades 9-12 as high school.

In November 2015, the District re-evaluated enrollment forecasts and student generation rates based on recognized methodologies including trends in land development, housing starts, and residential construction and that data is reflected in this plan.

The most significant issues facing the District in terms of providing classroom capacity and maintaining support facilities to accommodate existing and projected demands are:

- In 2005, the district purchased two portable units (4 classrooms) to alleviate overcrowding at Gause Elementary and Cape Horn-Skye Elementary.

- Jemtegaard Middle School was constructed in 1982 and now qualifies for state matching funds. The main structure is surrounded by older portables used to house students beyond the school's original capacity. The entire facility is in need of modernization and repair to function as a quality educational space.

- The District completed the OSPI Study and Survey in 2015 and presented a multi-project bond to voters in February 2015 that includes construction of a new K-8 school on the existing Jemtegaard site, which will be comprised of a new elementary school and a replacement middle school. The bond also includes construction of a new Alternative High School on the Excelsior High School site. Extensive collaboration between the District and the Columbia River Gorge Commission resulted in preliminary understandings that can be drawn upon in the future.

- The District is overcrowded at the middle schools and two elementary schools. The former shop classroom and a home economics classroom at Jemtegaard Middle School continue to be used as general classroom space. Gause and Hathaway elementary schools have reached capacity.

- The District owns property known as the Kerr property, which is suitable for a new elementary and a new middle school and a new district transportation facility. The

Kerr property was paid off in 2013. Purchase of additional land for future school facility sites is currently being studied.

- The City of Washougal has initiated construction to modernize Washougal's main "E" Street corridor. The current school district transportation facility is located on "E" Street, and the District and Board met several times in 2009 with the City to determine the impact of the street construction on the district transportation property. Significant changes include a reduction in the number of driveways and a new pedestrian sidewalk, which will change the traffic flow from "E" street into and out of the bus maintenance garage. In order to accommodate the reduced access, five buses have been moved and are being parked at another district location to allow for a circular traffic flow into and out of the bus maintenance garage.

- In 2005, the City of Washougal in partnership with the District began development of three baseball fields on District property known as the George Schmid Fields. Two fields have been completed. Completion plans for the third field includes the addition of a restroom and a small office/concession stand.

- The District Administrative Services Center has no additional office space available.

- District growth has been residential rather than industrial. Assessed valuation is slowly increasing since 2013. The District and local property taxpayers would still benefit from industrial growth.

In summary, Washougal School District recognizes that quality schools are essential to a positive, growing community. People gravitate to communities with great schools, and businesses thrive in communities where there is pride and accomplishment associated with educational opportunity. Washougal School District is engaged in long-range educational, fiscal and operational planning that will benefit the students, families and community members it serves.

II. DISTRICT EDUCATIONAL PROGRAMS AND STANDARDS OF SERVICE

To provide quality education, the District must have quality facilities. Facilities provide the physical structure necessary for achieving educational goals established by the Board of Directors.

School facility needs are dictated not only by student enrollment, but also by the space required to accommodate the District's adopted educational program. Beyond regular education, the district also provides specialized programs with unique facility needs such as special education, bilingual education, and technology education, pre-kindergarten and after school programs.
The District's program and educational standards for 2015 are summarized below. The program and educational standards may vary during the six-year CFP window. Absent significant changes in factors that are beyond the District's control, the District will provide the following programs and standards of service in 2015, 2016, 2017, 2018, 2019 and 2020. If significant changes occur that require new facilities or improvements, beyond what is identified in this CFP, the District will prepare and submit an updated CFP.

A. District-wide Educational Programs

The Washougal School District's core services and program offerings include the following:

- Elementary schools provide education in all core subject areas including reading, writing, math, social studies and science. In addition, students participate in P.E., music, art and library programs.

- Middle schools provide instruction in the core disciplines of English, mathematics, social studies, science, P.E., music and art. Students have elective offerings available including robotics, music and art. An extracurricular sports program is offered after school to students in 7th and 8th grades.

- High schools provide course work including English, history, science, mathematics, P.E., music and art. Additional offerings include career and technical education programs, career counseling, access to Running Start at Clark College, and Advanced Placement courses. An extracurricular program includes clubs, sports, arts, etc.

- The District provides science classroom space supporting advanced coursework at the secondary level that require water, sinks, gas, hoods, safety equipment, etc. Schools are working to meet expanded science standards and this will require spaces that cannot typically be met by adding portables.

- The District will need to upgrade elementary, middle school, and high school spaces supporting health, fitness, and extracurricular activities. This includes replacing the turf and gym floor at the high school.

- Technology access is necessary and expectations are increasing. Technology (either within the classroom or in dedicated labs) takes extra space that is not calculated in current state square footage allowances, but is necessary for student learning. Technology support and infrastructure needs are also increasing including the installation of fiber optic cable to Jemtegaard and Canyon Creek Middle School as well as Cape Horn Elementary.

- Beginning in the fall of 2014, the District changed to an all-day Kindergarten program. This change has required one additional classroom space per elementary school.

- Art and Music spaces are critical to the District's educational programs. As student population grows, so too will the need grow for spaces to support these essential programs.

- Library/Media demands are crucial. In an information driven environment, access to knowledge through appropriately sized library/media spaces is essential.

- Extra-curricular activities need space in order to be supported properly with growing student populations.

- Supplementary services in core academic areas and multiple pathways that prepare students for a broader range of post-secondary learning opportunities require additional space.

In addition to the above core educational programs, the following support services are essential to the District's educational program:

- Given current enrollment, the core facilities are sufficient at all schools except Jemtegaard Middle School where the addition of six basic education portable classrooms is beyond the capacity of the older commons area where all students have lunch.

- Maintenance and warehouse support facilities are a necessary component to the District operations.

The following special services are also required to meet the needs of special populations:

- Special Education programs are provided at all schools within the District. Special needs program standards change year to year as a result of various state and Federal regulation adjustments. Changes may also be prompted by research-based modifications to programs, class sizes, and the changes in the population of students eligible for services. Modifications in school facilities are sometimes needed to meet the unique needs of individual students or cluster small groups of students with similar needs.

- Federal and state programs, including Title 1 Reading and Math, Highly Capable, and Bilingual are required programs with limited funds that do not cover the expense of adding facilities as needed to support the programs.

- The District's pre-school program is housed in five classrooms across the district, one or two classrooms at each elementary school.

B. Elementary Educational Standards

The following District educational standards of service affect elementary school capacity:

- Class sizes for grades K-3 are targeted not to exceed 25 students per class.

- Class sizes for grades 4 and 5 are targeted not to exceed 28 students per class.

- Music instruction will be provided but in separate (pull-out) classrooms.

- Physical education is provided in a separate area.

- All elementary schools have a library/media resource center.

- A standard for technology is being developed for elementary classrooms.

- Special education, Title I and LAP (Learning Assistance Program) instruction is provided for some students in classrooms that are separate from regular teaching stations. Class sizes in these programs tend to be small, usually not more than 15 students.

C. Middle and High School Program Standards

The following District educational standards of service affect middle and high school capacity:

- Class sizes for grades 6-8 are targeted not to exceed 28 students per class.

- Class sizes for grades 9-12 are targeted not to exceed 28 students per class.

- Music, art, PE, drama, and career and technical education classes are provided in separate instructional space.

- Counseling and career center programs are provided in separate spaces.
- A standard for technology is being developed for secondary classrooms. Technology labs and distance learning labs are provided in separate spaces.
- Each middle and high school has a separate library/media resource center.

III. CAPITAL FACILITIES INVENTORY

The facilities inventory serves to establish a baseline for determining the facilities that will be necessary to accommodate future demand (student enrollment) at acceptable levels of service. This section provides an inventory of capital facilities owned and operated by the District including schools, portables, and support facilities.

A. Schools

The District maintains three (3) elementary schools, two (2) middle schools, one (1) high school, and one (1) alternative school. The elementary schools serve grades K-5, middle schools serve grades 6-8, and the high school serves grades 9-12. Presently the alternative school serves grades 9-12.

Table 1 shows the name, number of teaching stations and student capacity for the elementary schools based on the District's standard of service described above.

Table 1: Elementary School Inventory 2014/15

Three (3) Elementary Schools	Total Bldg. Sq. Ft.	Teaching Stations	Student Capacity	2014/15 Enrollment
Gause Elem.	**56,196**	19	475	**587**
Hathaway Elem.	**48,901**	17	425	**405**
Cape-Horn Skye	**43,838**	16	400	**407**
Total	**148,935**	52	1300	**1399**

Table 2 shows the name, number of teaching stations and student capacity of the two (2) middle schools based on the District standard of service described above.

Table 2: Middle School Inventory 2014/15

Two (2) Middle Schools	Total Bldg. Sq. Ft.	Teaching Stations	Student Capacity	2014/15 Enrollment
Canyon Creek MS	**46,609**	9	252	**249**
Jemtegaard MS	**50,808**	11	308	**492**
Total	**97,417**	20	560	**741**

Table 3 shows the name and number of teaching stations and student capacity of each school based on the District standard of service described above.

Table 3: High School Inventory 2014/15

High Schools	Total Bldg. Sq. Ft.	Teaching Stations	Student Capacity	2014/15 Enrollment
Washougal HS	150,471	34	952	**895**
Excelsior	Portables	3	0	**69**
Total	157,291	37	952	**964**

Student capacity was determined based on the number of teaching stations within each building and the space requirements of the District's current educational programs and standards of service. Student capacity as noted in Tables 1, 2, and 3 does not include capacity that is currently provided in portables at each school.

B. Portables

Portable classrooms are used on an interim basis to house students until funding can be secured to construct permanent classrooms. To accommodate future growth on a short term and immediate basis, the Washougal School District may purchase and utilize portable classrooms.

The District currently uses a total of 16 dual classroom portables and 1 single room portable. Of the 16 dual classroom portables (32 teaching stations), 16 teaching stations are used for basic education instructional classrooms. Table 4 identifies the total number of portables at elementary, middle and high school sites distinguishing between the number that are used to provide interim capacity (as teaching stations) and those are used for special programs or to address other educational needs.

Table 4: Portables Inventory

Facility Type	Number of Portables Number of Classrooms	Number of Classrooms Used as Teaching Stations	Number of Students Housed in Portable Classrooms
Elementary Schools	9 Portables 18 Classrooms	10 teaching stations	230
Middle Schools	5 Portables 9 Classrooms	9 teaching stations	225
High Schools	0	0	0
Other (Excelsior)	2 Portables 4 Classrooms	3 teaching stations	69
TOTAL	16 / 31	22	524

C. Support Facilities

In addition to schools, the District owns and operates additional facilities that provide special programs and operational support functions to the schools. An inventory of these facilities is provided in Table 5.

Table 5: Support Facility Inventory

Facility	Location
Community Education Center	630 24th Street Washougal, WA 98671
Administrative Service Center	4855 Evergreen Way Washougal, WA 98671
Maintenance Facility/ Warehouse	4855 Evergreen Way Washougal, WA 98671
Fishback Stadium	1201 39th Street Washougal, WA 98671
Transportation Facility	995 E Street Washougal, WA 98671
Transportation Facility North	9731 Washougal River Rd. Washougal, WA 98671

IV. STUDENT ENROLLMENT PROJECTIONS

A. Existing Enrollment

The District's enrollment by grade level in October 2014 was 3,104 students. Of the 3,104 students, 1,399 were enrolled in elementary schools, 741 were enrolled in middle schools and 964 were enrolled in high schools.

B. Projected Student Enrollment 2015-2020

The District's six-year enrollment projections are based on a report from OSPI Report 1049. The following table shows existing enrollment and the District's six-year enrollment forecast by grade level bands. As reflected in Table 6, the District is forecasting an increase of 199 elementary students, 50 middle school students and 36 high school students.

Table 6: Enrollment Forecast

Grade	2014	2015	2016	2017	2018	2019	2020
Total K-5	**1399**	**1448**	**1450**	**1,491**	**1531**	**1564**	**1598**
Total 6-8	**741**	**721**	**750**	**753**	**782**	**766**	**791**
Total 9-12	**964**	**974**	**994**	**1006**	**967**	**1004**	**1000**
TOTALS	**3104**	**3143**	**3194**	**3250**	**3280**	**3334**	**3389**

V. CAPITAL FACILITY NEEDS

Capital Facility Needs are determined by existing conditions of support facilities, the need to make improvements and expand to serve growth, and the current school capacity in light of forecast enrollment. Table 7A below shows existing capacity at the schools, the forecast enrollment and the facility need to serve the enrollment. Improvements that are needed at facilities that support the schools are identified in Table 7B.

Table 7: Facility Needs for Schools

Facility	Current Capacity	Forecast Enrollment	Facility Needs
Elementary (K-5)	**1,300**	**1598**	**298**
Middle (6-8)	**560**	**791**	**231**
High (9-12)	**952**	**1000**	**48**

To provide additional capacity for 298 elementary school students, the District will construct a new 400 student elementary school at the Jemtegaard Middle School site. The District will replace Jemtegaard Middle School with a new/replacement middle school that will serve 600 students. This will increase the middle school capacity by 292. Forecast growth in the high school will be accommodated by adding portables at the high school and with the construction of a 90 student alternative high school, which will take the place of Excelsior High School. These planned improvements, along with other improvements at facilities that support the schools, are listed in Table 8 below.

Table 8: Planned Improvement and Facility Costs to Address Needs

Project Description	Cost **Estimate**	Added Capacity	Capacity Added to Serve Growth*	Cost for Added Capacity **
New Elementary School	$19,097,675	400	301	$14,371,000
New/Replacement Middle School	$28,646,512	600 (292 new)	111	$5,299,604
New/Replacement Excelsior High	$4,507,004	90	78	$3,906,070
High School Portables	$250,000	0***	0	$0
Future School Site	$2,000,000	TBD****	TBD	$2,000,000
Maintenance Facility/Warehouse	$1,000,000	Forecast growth	Forecast growth	$90,000
Transportation Facility on Kerr Property	$1,500,000	Forecast growth	Forecast growth	$135,000
Fishback Stadium	$300,000	Forecast growth	Forecast growth	$27,000
TOTAL	**$57,301,191**	**782**	**490**	**$25,828,674**

* Capacity that is added to serve growth is determined by subtracting the existing need from the total capacity that will be provided.

** Cost for added capacity is the percentage of the total cost for the improvement that will be incurred to serve the forecast growth. For schools it is calculated by dividing total added capacity by capacity needed for increased enrollment and using that percentage of the total cost. For support facilities it is calculated by dividing the forecast growth (285) by the total forecast enrollment (3389) that will be served, which is approximately 9% and using that percent of the total cost.

*** Portables provide a temporary interim capacity and not treated as permanent facilities that add capacity.

**** Additional capacity will be determined when the type of school and capacity needs for that school are determined.

To accommodate growth on a short term and immediate basis, the Washougal School District may purchase and utilize portable classrooms and this plan incorporates those facilities and the equipment and furniture necessary to equip these classrooms in the District's project list. Impact fee revenue can be available to fund portable facilities if these facilities are needed to serve growth.

V. CAPTIAL FACILITIES FINANCE PLAN

A. Six Year Finance Plan for Planned Facility Improvements

The total cost for the above planned and needed improvements is $57,301,191. Secured and unsecured funds for the improvements are identified in Table 9A and 9B below.

Table 9A: Secured Finance Plan

Type	Amount
Impact Fees (as of 8/31/14)	$401,524
Unreserved Capital Projects Funds	$0
Total Secured	$401,524

Table 9B: Unsecured Finance Plan

Type	Amount
[1]Impact Fees	$1,020,000*
[h]Capital Projects Funds (bonds and state match)	$57,685,000
[e]Total Unsecured	$58,705,000

*Unsecured impact fees are an estimate that is based on an assumption that building permits will continue to be issued at a constant rate that is similar to that observed over the past three years and the fee amounts being recommended are collected for the six year planning period. If there is a decrease in the number of building permits that are issued for single family homes in the District, or the impact fee amounts are decreased, the District will collect less impact fees, if there is an increase in the number of building permits that are issued or an increase in the impact fee amounts, the District will collect more impact fees.

B. Financing Sources

The cost for all the planned improvements will be paid for with a combination of voter approved bonds, state match and school impact fees, which are described below. If there is insufficient revenue using these funding sources, the District may have to use its general fund to pay for the facilities that are needed. A summary of the funding sources is below.

1. General Obligation Bonds

In February, 2015 the District voters approved a $57,000,000 bond. A 60% majority vote is required to approve the issuance of the bonds. Bond proceeds are placed in the Capital Projects Fund and are used to pay for the facility improvement costs identified in the ballot measure and set forth in this CFP. The bond is retired through collection of property taxes.

2. State Match Funds

State Match Funds primarily come from the Common School Construction Fund, which is administered by OSPI. The District may receive state match for a portion of eligible costs to rebuild and expand Jemtegaard Middle School. The amount of funds is based on a state

prioritization schedule, a formula in state regulations and the District's assessed valuation per student. The District is eligible for 59.76% state match.

3. Impact Fees

Impact fees are a means of supplementing traditional funding sources for construction of public facilities needed to accommodate new development. School impact fees are generally collected by the permitting agency at the time plats are approved or building permits are issued. They are calculated as described below.

VI. SCHOOL IMPACT FEES

The Growth Management Act (GMA) authorizes local jurisdictions to collect impact fees to supplement funding of additional public facilities needed to accommodate new development. Local jurisdictions in Clark County have adopted impact fee programs that require school districts to prepare and adopt Capital Facilities Plans. Impact fees are calculated in accordance with an established formula, which is based on school facility costs to serve new growth.

The District's impact fees have been calculated utilizing the formula in the Clark County and the City of Washougal Impact Fee Ordinance. The resulting figures in the attached Appendix A, are based on the proportionate share of the costs to build a new elementary and middle school to serve growth. Credits have also been applied in the formula to account for State Match funds the District could receive and projected future property taxes that will be paid by the owners of the dwelling units.

Amount of School Impact Fees:

Single Family: $5,600

Multi-Family: $5,800

Appendices

Appendix A Impact Fee Calculation

Appendix B District SEPA documents for CFP

WASHOUGAL SCHOOL DISTRICT 112-6
RESOLUTION NO. 2014-15-09
Capital Facilities Plan

WHEREAS, the Clark County Planning Commission requires school districts to update their 6-year Capital Facilities Plans every three years, and

WHEREAS, the Washougal School District has assessed future needs for capital facilities improvements for 2015-2021,

THEREFORE, BE IT RESOLVED, the Board of Directors of Washougal School District, Clark County, Washington, hereby do approve this Capital Facilities Plan, 2015-2021.

DATED this 26th day of May 2015.

Ron Dinius, President

Elaine Pfeifer, Vice-President

Karen Rubino

Teresa Lees

Bruce Westfall

Dawn Tarzian, Board Secretary

Washougal School District
2015 Impact Fee Calculation

APPENDIX A

$$SIF = \left[CS(SF) - (SM) - \left(\frac{(1+i)^{10} - 1}{i(1+i)^{10}} \times AAV \times TLR \right) \right] \times A - FC$$

Single Family Residence:

Elementary	Middle School	High School	Formula
$14,371,000.00	$5,299,604.00	$3,906,070.00	Facility Cost
301	111	78	Additional Capacity
$47,744.19	$47,744.18	$50,077.82	Cost per Student (CS)
0.147	0.077	0.080	Student Factor (SF)
$7,018.40	**$3,676.30**	**$4,006.23**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
59.76%	59.76%	59.76%	State Match Eligibility %
$1,584.41	$1,078.91	$1,245.49	State Match Credit (SM)
$5,433.98	**$2,597.39**	**$2,760.73**	**CS x SF - SM**
		$10,792.11	**Cost per Single Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$256,643.00	Average Assessed Value (AAV)
		2516886.67	TCM x AAV
		0.00167	Tax Levy Rate (TLR)
		$4,203.20	**TCM x AAV x TLR = (TC)**
		$6,588.91	**Cost per Single Family Residence - Tax Credit**
		$988.34	15% reduction (A)
		$5,600.57	**Calculated Single Family Fee Amount**
		$5,600	**Recommended Fee Amount**

Multi-Family Residence:

Elementary	Middle School	High School	Formula
$14,371,000.00	$5,299,604.00	$3,906,070.00	Facility Cost
301	111	78	Additional Capacity
$47,744.19	$47,744.18	$50,077.82	Cost per Student (CS)
0.165	0.089	0.087	Student Factor (SF)
$7,877.79	**$4,249.23**	**$4,356.77**	**CS x SF**
$200.40	$200.40	$200.40	Boeck Index
90.00	117.00	130.00	OSPI Sq Ft
59.76%	59.76%	59.76%	State Match Eligibility %
$1,778.42	$1,247.05	$1,354.47	State Match Credit (SM)
$6,099.37	**$3,002.18**	**$3,002.30**	**CS x SF - SM**
		$12,103.85	**Cost per Multi-Family Residence**
		0.00356	Average Interest Rate
		0.03617576	Tax Credit Numerator
		0.003688786	Tax Credit Denominator
		9.806956251	Tax Credit Multiplier (TCM)
		$55,262.00	Average Assessed Value (AAV)
		541952.02	TCM x AAV
		0.00167	Tax Levy Rate (TLR)
		$905.06	**TCM x AAV x TLR = (TC)**
		$11,198.79	**Cost per Multi-Family Residence - Tax Credit**
		$1,679.82	15% reduction (A)
		$9,518.97	**Calculated Multi- Family Fee Amount**
		$5,800	**Recommended Fee Amount**