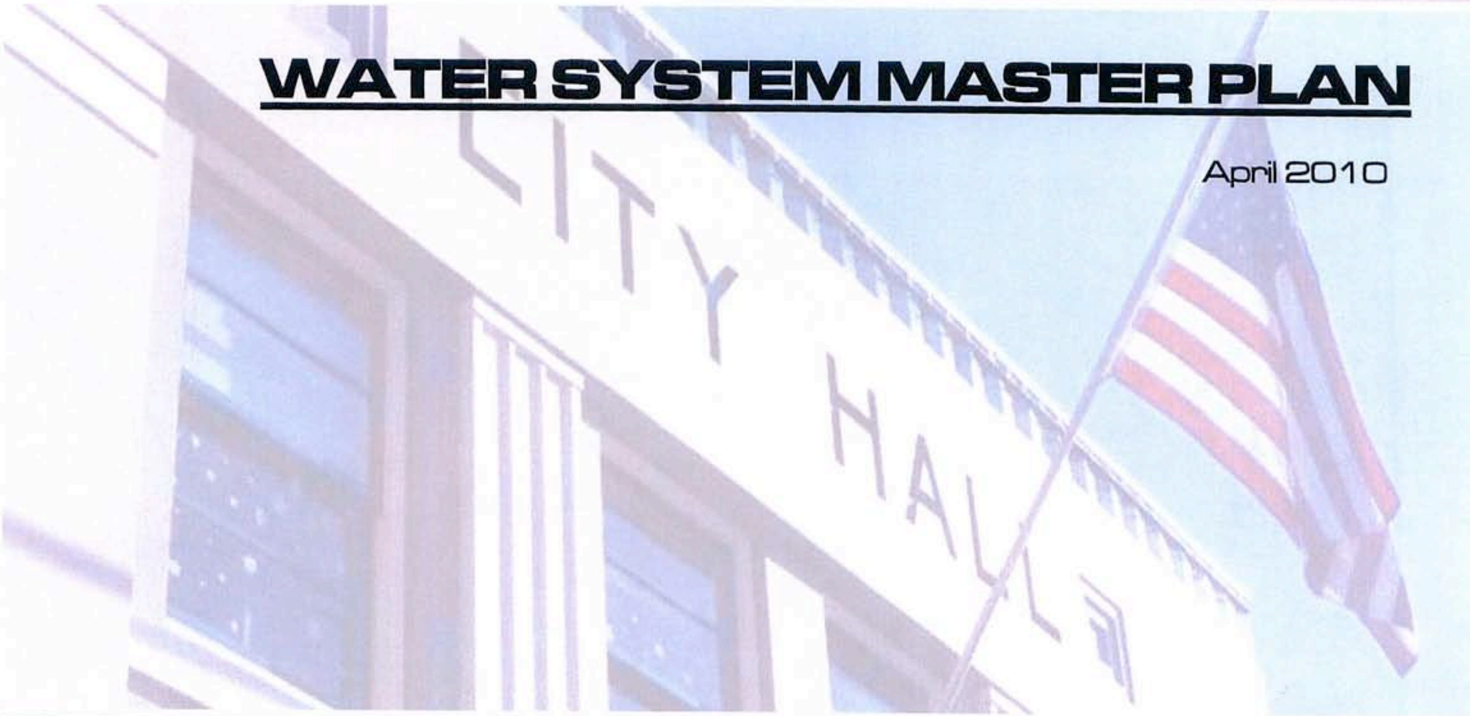
City of Toledo

Lincoln County, Oregon

WATER SYSTEM MASTER PLAN

April 2010



Civil West

Engineering Services, Inc.

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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 25, 1995
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ES.1 Introduction

The City of Toledo owns and operates a water system with in-service components dating back to the 1930's. The City provides water to residential, commercial, and industrial customers within the 2630-acre Urban Growth Boundary (UGB) and is a wholesale supplier of treated water to the Seal Rock Water District. The City is defined as a "wholesale system" and the District defined as the "purchasing water system" per OAR 333-061-0020.

The City's previous Water System Master Plan was completed in 1998. Portions of the previous recommended improvements have been completed however significant hurdles, including cost and environmental concerns, have delayed initiation of other needs. Water treatment plant improvements have been completed since the past Master Plan and a detailed study on Raw Water Transmission needs was completed. To reevaluate the current situation in light of regulatory issues and rules in place today, and to refine improvement needs and a Capital Improvement Plan, a new Water System Master Plan was needed. This Master Plan investigates the needs within the current UGB plus areas encompassing the raw water supply and transmission facilities for a 20-year period into the future, ending in the year 2030.

The estimated full-time service population of 7,660 persons (2008 figure) is projected to grow to 10,113 persons by the year 2030. The growth projections are based on a 1% average annual growth in Toledo to increase the population from 3,610 to 4,490 and a 1.5% average annual growth in Seal Rock to increase its population from 4,050 to 5,620.

ES.2 Water Demand

ES.2.1 Current Water Demand

For records from 2006 to 2008, an average of 336 million gallons of water per year is produced at the Toledo Water Treatment Plant. Historically, approximately 50% of the metered water consumption for the system goes to the Seal Rock Water District. For the 3 year period analyzed, an average of 45% of all water sold went to Seal Rock with a value of 49% in 2008.

The average daily demand is 0.92 million gallons per day (ADD=0.92 mgd). The maximum day demand is 1.75 million gallons per day (MDD=1.75 mgd). On a per person or per capita basis the ADD is 120 gallons per capita per day (gpcd) and the MDD is 228 gpcd.

Of the 336 million gallons produced per year; 12 million is used for backwashing the filters at the plant, 279 million gallons goes to metered water sales, and 45 million gallons is unaccounted water. The 3-year average unaccounted water totals 13.5% of water produced.

ES.2.2 Future Water Demand

Water demand projections over the planning period are estimated by multiplying the current per capita demand numbers by the projected future population estimates. The ADD is projected to increase to 1.2 mgd while the MDD is projected to increase to 2.3 mgd.

20-Year Water Demand Design Values

Seal Rock 2030 Data - 5620 persons

Unit	ADD	MMD	MDD	PHD
gpd	500,000	820,000	1,090,000	2,020,000
P.F.	1.00	1.64	2.18	4.04
gpcd	89	146	194	359

Toledo 2030 Data - 4,493 persons

Unit	ADD	MMD	MDD	PHD
gpd	698,000	910,000	1,200,000	2,780,000
P.F.	1.00	1.30	1.72	3.98
gpcd	155	203	267	619

Combination 2030 Data 10,113 persons

Unit	ADD	MMD	MDD	PHD
gpd	1,198,000	1,730,000	2,290,000	4,800,000
P.F.	1.00	1.44	1.91	4.01
gpcd	118	171	226	475

Based on the 20-year water demand projections, supply and treatment facilities must be designed to handle 2.3 mgd or 1,600 gpm.

ES.3 Existing Water System

ES.3.1 Water Supply

The sources of raw water supply for the City are the Siletz River and Mill Creek. Water Rights held by the City on the Siletz River date back to 1929. Water Rights held by the City on Mill Creek date back to 1911. Mill Creek includes a dam built around 1965 with a reservoir providing 250 acre-feet of storage. Due to seasonal variations in water quality, Mill Creek is used in winter months when turbidity in the Siletz is high, and the Siletz is used in summer when algae blooms degrade Mill Creek water quality and Mill Creek flows are inadequate. Stream flows in Mill Creek drop low enough during summer periods that even with the storage behind the dam; it is unlikely that Mill Creek alone could supply the entire system for prolonged periods in the summer. Water rights are adequate for the planning period and beyond.

Both sources require significant amounts of piping to convey water to town. The Mill Creek transmission piping is approximately 5.3 miles long. The Siletz River transmission piping is approximately 6.4 miles long. Water from the Mill Creek Reservoir flows by gravity to the 40+ year old Mill Creek pump station in town which then lifts the water to the treatment plant. The Siletz pump station on the bank of the Siletz River pumps water all the way to the treatment plant.

The building and electrical components of the Mill Creek Raw Water Pump Station are in good condition but the 42-year-old pumping equipment is undersized for the planning period and past its expected life.

The Mill Creek transmission piping is in poor condition and is too small to properly convey the planning period design flows. Most of the piping is 60-year-old asbestos cement (AC) and much lies in inaccessible areas including wetlands, buried creek crossings, eroded original construction alignments through forest, and even under buildings. Repairs to the Mill Creek piping are required on a regular basis.

The Siletz River transmission piping is in good condition except for a section of 50-year-old AC piping submerged under the Olalla Reservoir. Only this section should require replacement during the planning period.

The 70-year-old Siletz River Intake/Raw Water Pump Station is in very poor condition and must be entirely replaced in the near future. Ground movement in the area has damaged the wetwell and building and geotechnical investigations and site stabilization efforts are needed or a new site developed downstream.

ES.3.2 Water Treatment

The Toledo Water Treatment Plant is in good condition and the major components have sufficient capacity for the planning period. The 1976 plant is a conventional treatment plant consisting of chemical addition, rapid mix, dual-stage flocculation, sedimentation, and mixed-media gravity filtration. Instrumentation and controls improvements were constructed in 1999 along with the installation of new filter media. Current flows through the plant range from 800 to 1300 gpm.

The concrete clearwell adjacent to the plant was constructed in 1938 and needs repairs. It is also possible that chlorine contact time provided by the clearwell is inadequate. Ongoing contact time testing will be completed after the completion of this Master Plan however it is assumed that baffling of the tank will be needed.

Other needs at the plant include replacement of the deteriorated pressure tank system supplying domestic water at the plant, new sludge collection equipment in the sedimentation basins, updates to the 34-year-old electrical components in the chemical room, and larger capacity sodium hypochlorite generation equipment.

ES.3.3 Treated Water Storage

The City has 1.4 million gallons (MG) of treated water storage provided by two steel storage tanks. The Ammon Road Storage Tank is a 1 MG welded steel tank constructed in the 1970's. The tank is 30 feet tall and has a water surface elevation of 300 feet matching that in the plant clearwell tank. The Ammon Road Storage Tank coating is over 25 years old and past the expected coating life. The tank interior and exterior should be refurbished in the near future. The exterior coating still has good adhesion at this time and likely can be overcoated. The interior was reported to be significantly corroded during inspections 10 years ago and will need to be sand-blasted and fully recoated.

The City's other storage tank is a 0.4 MG tank built in 1968 called the Graham Street Storage Tank. The tank has a water surface elevation of 240 feet. The tank exterior was repainted in 2008 and is in good condition however some isolated areas of delamination are occurring. The interior was reported to be significantly deteriorated during inspections 10 years ago and will need to be sand-blasted and fully recoated. Due to the age of the tank, lead-based paint on the interior should be anticipated which will significantly increase the cost of the repainting project.

ES.3.4 Distribution System

The City's water piping system consists of over 35 miles of piping with 33% of the total being raw water piping. The system is separated into three pressure zones including the main intermediate pressure zone (hydraulic grade of 300 feet) controlled by the water surface in the Clearwell and Ammon Road Tank, the low level pressure zone (hydraulic grade of 240 feet) controlled by the water surface in the Graham Street Tank, and the high level pressure zone (hydraulic grade of 435 feet) controlled by the Wagon Road Booster Pump Station.

Over half of the distribution system piping is 6-inch and smaller which severely restricts fire flow potential in certain areas. Several long stretches of single 6-inch piping without significant looping such as along Sturdevant Road also limit flows.

ES.4 Improvement Needs

ES.4.1 Water Supply

Replacement and repair of the aging raw water supply infrastructure is the City's most challenging and expensive water system need. Without the ability to supply raw water to the treatment plant, the entire remainder of the water system becomes useless.

As recommended in a 2002 report specifically prepared to address raw water transmission needs; this Master Plan also recommends complete replacement of the 60-year-old Mill Creek Raw Water Transmission Piping and Pump Station. The 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering looked at several alignment alternatives and included an Environmental Review Report by Adolfson Associates, Inc. to estimate environmental impacts to the various alternatives. The recommended alternative based on accessibility, environmental impacts, and cost is to reconstruct the pipe on a new route along improved roadways. The estimated cost for the Mill Creek supply project is $9.6 million.

Various alternatives for the Siletz River supply are investigated in the Plan including two options utilizing the Olalla Reservoir as potential raw water storage. Based on feasibility and cost, the recommended option is to reconstruct the Siletz River Intake/Pump Station at or near its current location and to replace only the section of transmission piping which lies under the Olalla Reservoir. The estimated cost for the Siletz River supply projects is $3.95 million.

ES.4.2 Water Treatment

The existing water treatment plant is well operated and maintained and should remain in service for the planning period. A plant capacity of 1600 gpm is needed to meet the planning period demands and all primary components of the existing plant (flocculation volume, sedimentation area, and filtration area) are adequate to allow flows to be increased to 1600 gpm. For the planning period some of the ancillary equipment must be upsized, some of the aged items must be replaced, and the clearwell requires refurbishment and baffling.

Items needing attention as maintenance include replacement of the sludge collection equipment in the sedimentation basins, electrical updates in the chemical room, and replacement of the pressure tank and related equipment for domestic water supply and surface wash supply at the plant. The clearwell should also be refurbished to seal the cracks and prevent further corrosion of the interior reinforcing steel. The recommended maintenance items have an estimated project cost of $0.48 million.

To allow disinfection of the higher flow, new sodium hypochlorite generation equipment is recommended since the existing equipment has inadequate capacity. Also to allow higher flows, clearwell baffling is recommended to decrease short-circuiting in the clearwell and increase chlorine contact time. The capacity building improvements have an estimated project cost of $0.3 million.

ES.4.3 Treated Water Storage

The storage goal is to provide storage for 3 average days of water demand plus equalization volume (to account for the regular daily fluctuation in tank level) plus fire storage. For the schools and other significant commercial structures, fire storage equal to at least 3500 gpm for 3 hours is recommended. It is recommended that the City provide storage for City needs alone rather than for the needs of the City plus Seal Rock. Based upon the stated storage goal; a total of 3 million gallons (MG) of storage in the water system is needed. Since existing storage totals only 1.4 MG, the City is currently deficient in treated water storage volume by 1.1 MG and will be 1.6 MG deficient by the end of the planning period. To address the storage need a new storage tank is required in addition to the two existing tanks. The City owns a 3.7 acre parcel on Skyline Drive with a suitable elevation and location and has planned for a storage tank at this location for many years. The tank will have a base elevation of around 370 feet, a water surface elevation of 400 to 410 feet, and will set the hydraulic grade and pressure levels for the high level pressure zone.

The existing Wagon Road Booster Pump Station will need to be replaced, functioning to fill the new storage tank rather than cycling off and on based on pressure. A small above-ground building near the site of the existing pump station is recommended. A second small booster pump station will be required to serve the 15 acres of land at the top of Skyline Drive which cannot be served adequately by gravity from the new tank.

The estimated project cost for the new 1.6 MG Skyline Drive Storage Tank with associated Wagon Rd. Pump Station and small Skyline Drive Booster Pump Station is $1.87 million.

In addition to the new storage improvements, the existing tanks both need to be recoated. The Ammon Rd. Tank should be recoated on the interior and exterior. The Graham St. Tank should be recoated on the interior. Sand-blast to bare metal and full recoat is recommended for the interiors. Special provisions for lead-based paint removal should be anticipated for the Graham St. Tank. The estimated project cost to refurbish the existing tanks is $0.42 million.

ES.4.4 Distribution System

Computer hydraulic modeling was conducted on the entire distribution system. Per OAR, the system must maintain at least 20 psi at all service connections (at the property line) at all times, even during fire flow events. In addition, at least 40 psi is typically desirable at any structure during normal peak flows but is not expected during fire flows. Piping deficiencies exist in several areas of the system resulting in inadequate fire flow availability. Problem areas include large areas in the northern parts of the UGB (primarily north of NW 7th Street) including the Arcadia Elementary School and the High School, and the southeast section of town (primarily south of Ammon Road).

Because of the piping restrictions, 32% (45 out of 142) of the fire hydrants have inadequate fire flow capability. Figure 7.4-1 shows the various hydrant locations as well as the hydrants with flow deficiencies.

To remedy the flow restrictions and provide for proper fire flows, numerous piping improvements are recommended. The various piping improvements are shown in Figure 7.4-2 and together have an estimated project cost of $2.1 million.

ES.5 Capital Improvement Plan

The various improvements recommended in the Master Plan are prioritized and separated into 4 phases of work as shown below. The total cost for all improvement in the Capital Improvement Plan (CIP) is $18.7 million.

Water CIP - Phase 1			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
S1	Skyline Drive 1.6 MG Storage Tank	$1,596,437	$1,596,437	$0
P1	Skyline Drive Booster Pump Station	$82,650	$82,650	$0
P2	Wagon Road Pump Station	$192,850	$192,850	$0
D1	Phase 1 Distribution Improvements	$1,053,418	$1,053,418	$0
		$2,925,355	**$2,925,355**	**$0**

Water CIP - Phase 2			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
T1	Water Treatment Maintenance Improvements	$478,935	$239,468	$239,468
WS1	Siletz River Intake and Pump Station	$2,380,000	$1,190,000	$1,190,000
WS2	Olalla Reservoir Pipeline Crossing	$1,572,500	$786,250	$786,250
		$4,431,435	**$2,215,718**	**$2,215,718**

Water CIP - Phase 3			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
D2	Phase 2 Distribution Improvements	$1,057,703	$1,057,703	$0
S2	Ammon Rd. Storage Tank Refurbishment	$269,150	$269,150	$0
S3	Graham St. Storage Tank Refurbishment	$149,100	$149,100	$0
T2	Water Treatment Capacity Improvements	$297,250	$148,625	$148,625
		$1,773,203	**$1,624,578**	**$148,625**

Water CIP - Phase 4			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
WS3	Mill Creek Pump Station and Transmission Piping	$9,600,000	$4,800,000	$4,800,000
		$9,600,000	**$4,800,000**	**$4,800,000**

ES.6 Financing

Existing water rates in Toledo are low. Based on 2008 water sales records, the average single-family dwelling uses an average of 5,350 gallons of water per month. Under the existing rate structure this average home has a monthly water bill of $20.10 ($0.00376 per gallon). Funding agencies often use a value of 7,500 gallons per month as the normal residential use. Under the current rate structure, the average residential rate per EDU then becomes $24.68 for 7,500 gallons.

Revenue of $745,000 was generated through water sales in the last fiscal year. Of that total, $252,793 (34%) resulted from wholesale water sales to the Seal Rock Water District. Seal Rock currently pays a wholesale rate of $0.00213 per gallon.

To qualify for grant assistance for any water system improvements it is likely that water rates must first reach a level such that a bill of around $42 or more per month occurs for a residential 5/8-inch meter using 7,500 gallons. As a result, Phases 1 and 2 of the CIP will likely require 100% loan money to fund. Other options for funding municipal capital improvements include General Obligation (GO) Bonds and Revenue Bonds but this discussion focuses on funding agency loans and potential rate impacts.

Funding assistance for municipal water improvements in Oregon primarily comes through programs administered through the Infrastructure Finance Authority (IFA) – which formerly was known as the Oregon Economic and Development Department (OECDD) – and USDA Rural Development Rural Utilities Service (RUS). Programs through IFA include Block Grants, the Safe Drinking Water Revolving Loan Fund, Special Public Works Fund, and Water/Wastewater Financing. Federal money is available with grant and loans through RUS. Each program has various advantages and disadvantages and various requirements. To determine which programs are available to the City for any specific project or projects, a "One-Stop" financing meeting should be conducted once this Master Plan is adopted and a decision to move forward on specific improvements is made. The One-Stop meetings are held in Salem once per month and it is recommended that this step be initiated as soon as possible after Master Plan adoption.

Assuming a typical loan with terms of 3.5% interest over 20 years, and assuming the existing rate structure does not provide revenue to fund new significant capital improvements, the Phase 1 Improvements will require a rate increase. Using the funding agency figure of 7500 gallons per month per EDU there are about 1875 EDUs in Toledo excluding those in Seal Rock (3309 EDU total with 1434 in Seal Rock). Based on the assumed loan, a rate increase of $10 per month per EDU (for 7500 gallons) is required to increase revenue sufficiently to make the loan annuity payment. This would increase the rate for a residential meter using 7500 gallons from $25 per month to $35 per month.

Phase 2 Improvements are shared between the City and Seal Rock. Assuming a 50/50 split and similar loan terms to Phase 1, the rate in Toledo for a residential meter using 7500 gallons would need to increase to about $42 per month and the wholesale rate to Seal Rock would need to increase by about $0.0014 per gallon.

Rate increases would also necessarily occur for Phase 3 and 4 projects however grant assistance becomes a potential since rates will then begin to approach threshold amounts and might no longer be considered too low to qualify for grants.

Introduction

Section 1

1.1 Background and Need

1.1.1 Water System Background

The city of Toledo is located in Lincoln County, Oregon approximately 6 miles inland from Newport on the coast. The town is accessed off Highway 20 which runs from Newport to Corvallis. The City water system serves residential, commercial, and industrial customers through approximately 1400 water service connections. Figure 1.1.1-1 shows the location of Toledo near the Oregon coast. The study area is described in Section 2.

In the 1860s, logging and mining attracted settlers to the area with the Yaquina River and Bay used as easy transport. In 1896 Toledo became the County Seat of Lincoln County. In 1910 the Port of Toledo was officially opened with the formation of a Port Commission with the shipping of rock, timber and other goods creating healthy growth. The City's oldest water right (Certificate No. 905) is on Mill Creek and has a priority date of January 14, 1911. This water right certificate allows for the withdrawal of 5.0 cubic feet per second (cfs) from Mill Creek.

With the entry of the U.S. into the World War I in 1917 and the significant supplies in the area of Sitka spruce needed to build aircraft, the town boomed as the U.S. Army began building a large sawmill on Depot Slough. Early records describing the town water system center on the need for water to supply the large Sitka spruce mill and the City in 1918 during the war. An additional 10.0 cfs water right (Certificate No. 9040) on Mill Creek was obtained in 1919 coinciding with the construction of a small 6 foot tall wooden dam and 12-inch piping to serve the Government saw mill and town. Records in the Monthly Bulletin of the Spruce Production Division and the Loyal Legion of Loggers and Lumbermen (Vol. 2, No. 2, Oct. 1918) describe 50 men trenching for the water piping and the ongoing construction of the dam.

With continued growth, the small storage provided with the wooden dam on Mill Creek, and likely water quality issues in summer months, the City began to look to the Siletz River for additional future water supply and in 1929 a 4.0 cfs permit (Permit No. S9370) was issued. A water intake structure was constructed along with over 6 miles of piping to deliver water to the town.

In 1938, a concrete storage tank was constructed on top of a hill in town and water was pumped directly to the tank without treatment. At some point chlorination was added. This lack of filtration resulted in several feet of sediment in the concrete tank accumulating over time. The now 70-year old concrete tank functions as the clearwell adjacent to the water treatment facility today.

The original 12-inch wooden pipe from Mill Creek to town was replaced with 12-inch asbestos cement pipe in around 1950. In 1968, the Graham Road Storage Tank and the current Mill Creek Raw Water Pump Station were constructed along with various distribution piping improvements. Construction on the current 65 foot tall Mill Creek Dam also was completed around 1968 in approximately the same location as the original timber dam constructed by the Army. The current raw water piping from the Mill Creek Pump Station to the 1938 concrete storage tank was primarily constructed in the 1960s and 1970s. Much of the Siletz River raw water piping was also replaced in the 1970s.

In 1972 the city of Toledo coordinated with the Seal Rock Water District to utilize the Siletz River as a mutual water source and to construct an intertie between the two communities with treatment occurring in Toledo. This long-range water supply plan was approved by the Lincoln County Board of Commissioners in 1974. The two communities then split the costs and constructed the 1979 Toledo Water Treatment Plant (WTP), some improvements to the Siletz River raw water piping, and the Seal Rock intertie pipeline and pumping station. The SRWD forfeited water rights on smaller coastal streams in order to obtain water rights on the Siletz River. Water Use Permit No. S40277 with a priority date of February 28, 1973 was issued to the SRWD allowing for withdrawal of 2.6 cfs from the Siletz River. The SRWD permit on the Siletz River is junior to the instream water rights and therefore could be restricted during low streamflow periods. The city of Toledo has 5.75 cfs of water rights on the Siletz which are senior to the instream water rights.

The 30-year old water plant received updates to instrumentation and controls in the year 2000 along with some piping improvements and new filter media. Today this plant serves a growing population of 7,660 persons, including the Seal Rock Water District, requiring an average of almost 1 million gallons of water per day.

1.1.2 Need for Plan

Almost 15 years have elapsed since the analysis work done for the 1998 Master Plan. Various treatment plant improvements were constructed in response to the Plan however significant issues remain regarding raw water supply and storage. Large expense and difficult environmental protection challenges will be faced with past recommended raw water supply improvements thus this work has not been undertaken to date. Much of the piping system and other components such as the Siletz River Intake, the clearwell, and the Mill Creek Pump Station are 40 years old or more and must receive attention to ensure continued service to the community. Finish water storage deficiencies discussed 15 years ago remain today but should be reevaluated. At this point, the City considers it prudent to reevaluate overall system needs and to complete a new 20-year Water System Master Plan in accordance with OAR 333-061-0060(5). In conjunction with this new Master Plan, additional investigations are being conducted to evaluate raw water supply options involving the Olalla Reservoir owned by Georgia-Pacific.

The city of Newport completed a new Water System Master Plan in 2008. The Seal Rock Water District is conducting a separate Water System Master Plan which will be completed in 2010. Seal Rock obtains water from Toledo and Newport has a water piping intertie with Seal Rock which is normally closed. Certainly there is benefit from both Toledo and Seal Rock having concurrent and up-to-date water system planning due to their direct connection. There may also be some benefit in the future with the city of Newport having a similar planning timeline as Seal Rock and Toledo.

1.1.3 Plan Authorization

The City solicited engineering proposals for this Water System Master Plan in August of 2008. After a review of proposals and a formal selection process, the District contracted with Civil West Engineering Services, Inc. on November 26, 2008 to complete this Plan and to provide other engineering services.

1.1.4 Past Studies and Reports

- Master Water System Plan, 1999 – KPFF Consulting Engineers
- Raw Water Transmission System Replacement and Rehabilitation, 2002 – Lee Engineering, Inc.
- Sanitary Survey Deficiency Summary Report, 2008 – Bill Goss, DHS Drinking Water Program

1.2 Study Objective

The purpose of the Water System Master Plan is to furnish Toledo with a comprehensive planning document that provides engineering assessment of system components and guidance for future planning and management of the water system over the next 20 years.

Principal plan objectives include:

- Description and mapping of existing water system
- Prediction of future population and water demands
- Creation of digital hydraulic model based on available mapping
- Evaluation of existing water system components
- Evaluation of the capability of the existing system to meet future needs and regulations
- Recommendations for improvements needed to meet future needs and/or address deficiencies
- Background provisions to support updated water system SDCs

This Plan details infrastructure improvements required to maintain compliance with State and Federal standards as well as provide for anticipated growth. Capital improvements are presented as projects with estimated costs to allow the District to plan and budget as needed.

1.3 Scope of Study

1.3.1 Planning Period

The planning period for this Water System Master Plan must be at least 20 years in accordance with OAR 333-061-0060(5)(b) and OAR 690-086-0170. The period must be short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand. Existing residents should not pay an unfair portion for improvements sized for future growth, yet it is not economical to build improvements that will be undersized in a relatively short period of time. The end of the planning period for this Master Plan is the year 2030, or 20 years from the completion of the Plan.

1.3.2 Planning Area

The Master Plan planning area is that contained within the Toledo Urban Growth Boundary (UGB), as well as the immediate area surrounding water system components outside the boundary, such as the raw water intakes and transmission piping. The area within the UGB includes approximately 2630 acres. Additional information and maps for the planning area are presented in Section 2.

1.3.3 Work Tasks

In compliance with Drinking Water program standards, this plan provides descriptions, analyses, projections, and recommendations for the water system over the planning period. The following elements are included:

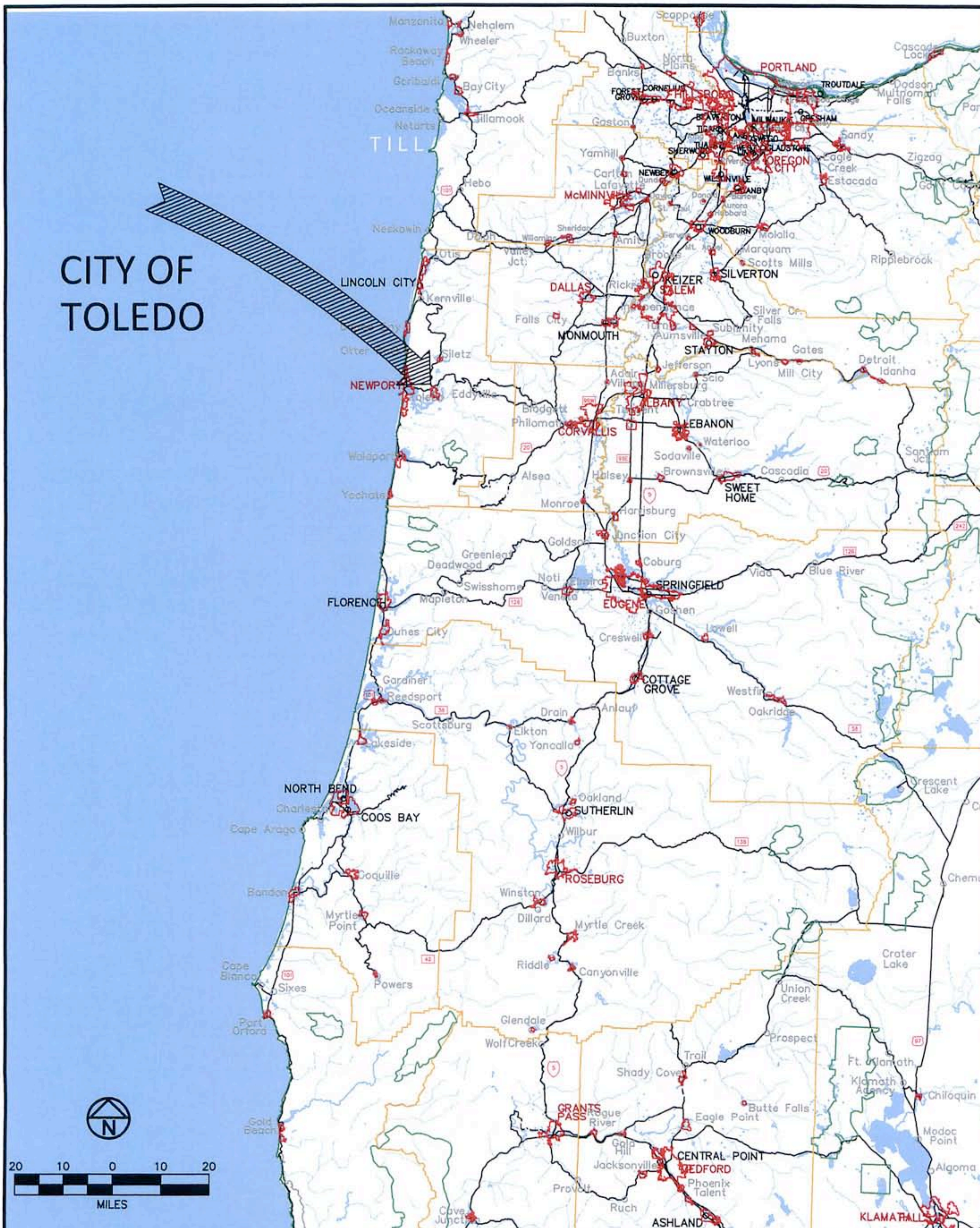
- Study area characteristics, including land use and population trends and projections
- Description of the existing water system including transmission, storage and distribution
- Existing regulatory environment including regulations, rules and plan requirements
- Current water usage quantities and allocations
- Projected water demands

- Existing system capacity analysis and evaluation
- Improvement alternatives and recommendations with associated costs
- A summary of recommendations with a Capital Improvement Plan
- Funding options
- Maps of the existing system and recommended improvements

1.4 Acknowledgments

Various members of the City Staff have contributed efforts to ensure complete information and proper planning of the community's water system needs. Water treatment operators, water distributions staff, billing records personnel, the public works director and the city manager have all helped to complete this effort. We wish to acknowledge and thank the following persons in particular:

- Michelle Amberg, City Manager
- Adam Denlinger, Public Works Director
- Polly Chavarria, Treasurer
- Linda Hughes, Water Plant Senior Operator
- Bill Montgomery, Water Plant Operator/Maintenance



Civil West Engineering Services, Inc.	DWG BY: REB DATE: OCT 6, 2009	0 1"	**Location Map**	FIGURE
	WATER SYSTEM MASTER PLAN		CITY OF TOLEDO LINCOLN COUNTY, OREGON	1.1.1-1

2.1 Physical Environment

2.1.1 Planning Area Location

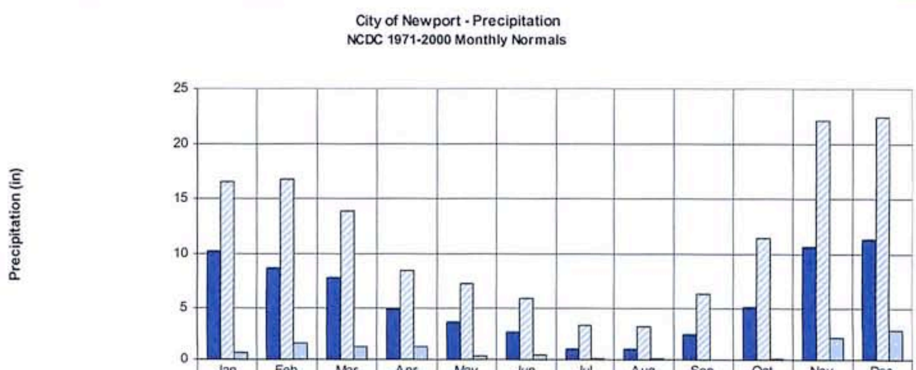
The city of Toledo is located in Lincoln County Oregon approximately 7 miles east from the city of Newport and the Yaquina Bay, and approximately 130 miles southwest of Portland. The town is located at 44°37'18"N, 123°56'14"W in Township 11S, Range 10W. The Urban Growth Boundary (UGB) extends from the Yaquina River in the south to Highway 20 in the north. The current UGB Boundary encompasses 2629 acres or 4.1 square miles. The city limits encompasses 1497 acres or 2.3 square miles.

This Master Plan planning area is primarily that contained within the Toledo Urban Growth Boundary (UGB). Also considered is the raw water transmission pipe route from the Siletz River Intake and the Mill Creek Intake. The main town area can be seen in Figure 2.1.1-1. A larger area showing the town and the two raw water supply source locations is shown as Figure 2.1.1-2.

2.1.2 Climate

Climate data was obtained using long-term records collected at the Newport Station (Station 356032) as reported by the Western Regional Climate Center. The Newport Station is the closest weather recording station to the City.

Average annual precipitation is approximately 70-inches in Newport. Record low and high precipitation years recorded were 43-inches in 1944 and 111-inches in 1968. The maximum recorded 24-hour rainfall was 4.99-inches on November 19, 1996. On average, 46% of the annual precipitation occurs in November, December, and January. Snowfall is rare with most years recording little or no snowfall; however, record snowfall of 11-inches was reported in 1942-43 and again in 1972-73. The mean annual snowfall during the period from 1930 to 2007 is 1.02-inches. No statistically significant increasing or decreasing trend in annual rainfall is evident. Based on the NOAA Atlas 2, Volume X Isopluvial maps, the 5-year storm 24-hour rainfall is 4.5 inches.

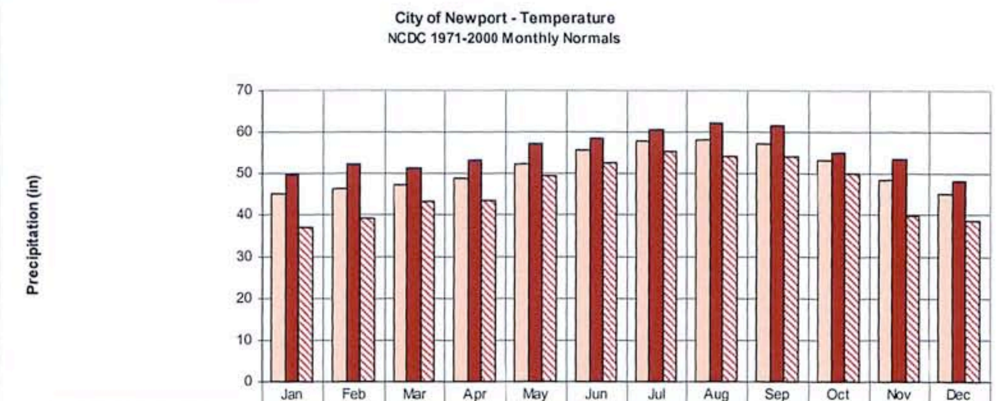


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Precipitation (in.)	10.25	8.69	7.74	4.87	3.68	2.72	1.04	1.02	2.39	5.12	10.67	11.38
Highest Precipitation (in.)	16.54	16.81	13.84	8.41	7.21	5.86	3.3	3.19	6.32	11.39	22.13	22.44
Lowest Precipitation (in.)	0.68	1.56	1.22	1.2	0.34	0.41	0.13	0.07	0.03	0.13	2.06	2.88

Month

Figure 2.1.2-1 – Precipitation Normals, NCDC 1971-2000

The average annual temperature in Newport ranges from 45 to 58°F with an annual mean of 51°F. A record high temperature of 100°F was recorded on July 11, 1961. A record low temperature of 1°F was recorded on December 8, 1972. August is statistically the warmest month with a mean of 58°F while December and January are the coldest with a mean of 45°F.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Temperature (F)	45	46.4	47.3	48.9	52.3	55.6	57.9	58.3	57.2	53.1	48.5	45.1
Highest Mean Temperature (F)	49.9	52.3	51.3	53.1	57.2	58.4	60.6	62.3	61.7	55.2	53.5	48.2
Lowest Mean Temperature (F)	37.1	39.2	43.1	43.5	49.5	52.6	55.3	54	54	50	39.9	38.6

Month

Figure 2.1.2-2 – Temperature Normals, NCDC 1971-2000

2.1.3 Land Use

Land use within Toledo is a mixture of residential, commercial, recreational, and industrial. It is the only inland coastal community in Oregon with a deep-water channel provided by the Yaquina River along the south part of town. Once home to the largest spruce sawmill in the world, Toledo still has significant industrial resource land along the river and Depot Slough. The largest employer is the Georgia Pacific Corporation paperboard mill.

2.1.4 Floodplains

Areas within the City are within the 100-year floodplain. Floodplain areas occur along the river and sloughs. FEMA FIRM map data for the City area is included at the end of this Section in Figure 2.1.4-1.

2.1.5 Wetlands

Several wetland designations occur in the city along the river and sloughs. Most of the designated wetland area within the City is along Olalla Slough. Of special concern are the significant wetland areas outside the UGB crossed by the old raw water transmission piping from the Mill Creek source making access today for maintenance or repairs difficult or impossible. A Wetland Map is included at the end of this Section in Figure 2.1.5-1.

2.1.6 Cultural Resources

According to the National Register of Historic Places, three historical sites are listed for Toledo as shown in Table 2.1.6. No other historical sites or structures are listed.

Lincoln County is part of the Siletz Service Area of the Confederated Tribes of Siletz Indians. Areas around Yaquina Bay and River were once home to the Yaquina Tribe (now included in the Siletz Tribe). Areas around Alsea Bay and River were once home to the Alsea Tribe (also now included in the Siletz Tribe). Several remnants of tribal settlements in the area have been discovered including fishing-weirs at Yaquina Bay at the Ahnkuti site (near Toledo).

Table 2.1.6 – Archaeological and Historic Sites

Historic Property/Site Name	Street Address	Period of Significance	Listed Date	NR Number
The Ahnkuti Site (Fishing Site)	~	500-1900 AD	2001	01000133
Pacific Spruce Saw Mill Tenant Houses	146-192 NE 6th St.	1900-1949	1999	99000602
St. John's Episcopal Church	110 NE Alder St.	1925-1949	1990	90001510

2.1.7 Biological Resources

Biological resources in the area include numerous fish, birds and mammals. Fish species include white sturgeon, steelhead, flatfishes, coho, chinook salmon, chum salmon. Marine mammals in the area downriver include California sea lions, harbor seals, and the threatened northern sea lion. Biological habitat in the area includes tidal and forest habitat.

2.1.8 Coastal Resources

The Oregon Coastal Zone roughly includes all land west of the crest of the Coast Range. The entire planning area is therefore within the Coastal Zone. Coastal resources in the area include coastal and marine habitat, tidal wetlands, commercial and sport fisheries, the Yaquina Bay deep draft estuary, and tourism related to the beach.

2.2 Population

2.2.1 Historic and Existing Population

According to US Census data, the City of Toledo population increased from 2818 in 1970 to 3472 in the year 2000. The most recent estimate available at the time of this writing is 3610 persons based on Portland State University's Population Research Center for the July 2008 certified population of Toledo. Other 2000 US Census Data for Toledo includes:

1.89 persons per housing unit (total population / total housing units)
2.32 persons per occupied housing unit
81.7% of housing units occupied / 18.3% of housing units vacant
8.7% of housing units are for seasonal, recreational, or occasional use

In addition to the population in the city, the Toledo water system serves wholesale water to the Seal Rock Water District. The current population of the Seal Rock Water District is estimated at 4050 persons according to the District's latest water system master plan. Combining the population of Toledo plus the population of the Seal Rock Water District results in a current service population estimate of 7660 persons.

From 1970 to 2008 the average annual growth rate in Toledo was 0.7%. An average annual growth of 1.5% has occurred in Seal Rock over the last decade.

2.2.2 Projected Population

The Oregon Office of Economic Analysis long-term population forecast (as updated April 2004) indicates an average annual population increase of 0.7% for Lincoln County from 2010 to 2030. The city of Newport adopted a 1.25% average annual growth rate in its recent Water Master Plan based on the previous decade of actual growth. The SRWD is projected to grow at an average annual rate of 1.5% for the planning period based on the best statistical fit for actual data over the last 14 years. The city of Toledo has adopted a 1.0% average annual growth rate for this Plan.

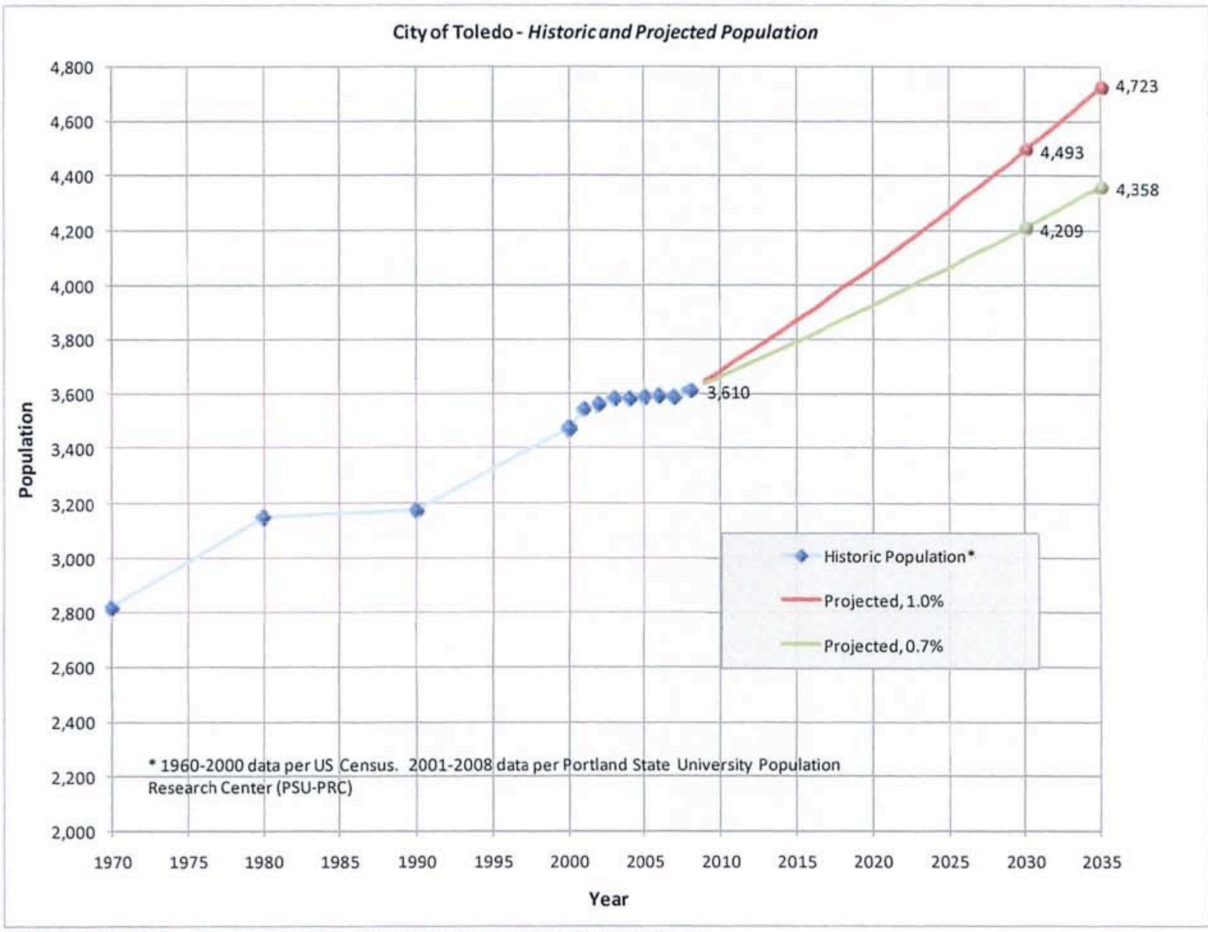


Figure 2.2.2-1 – Toledo Historic and Projected Population

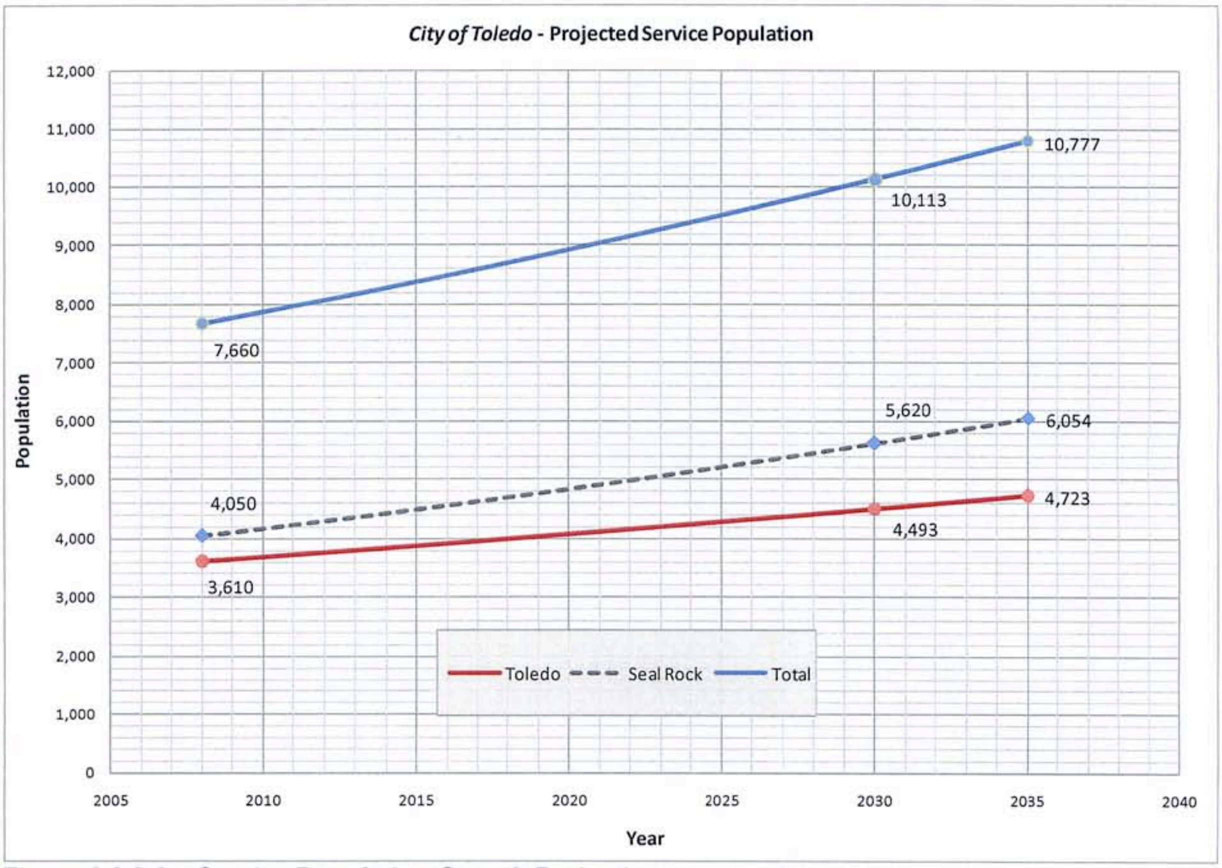


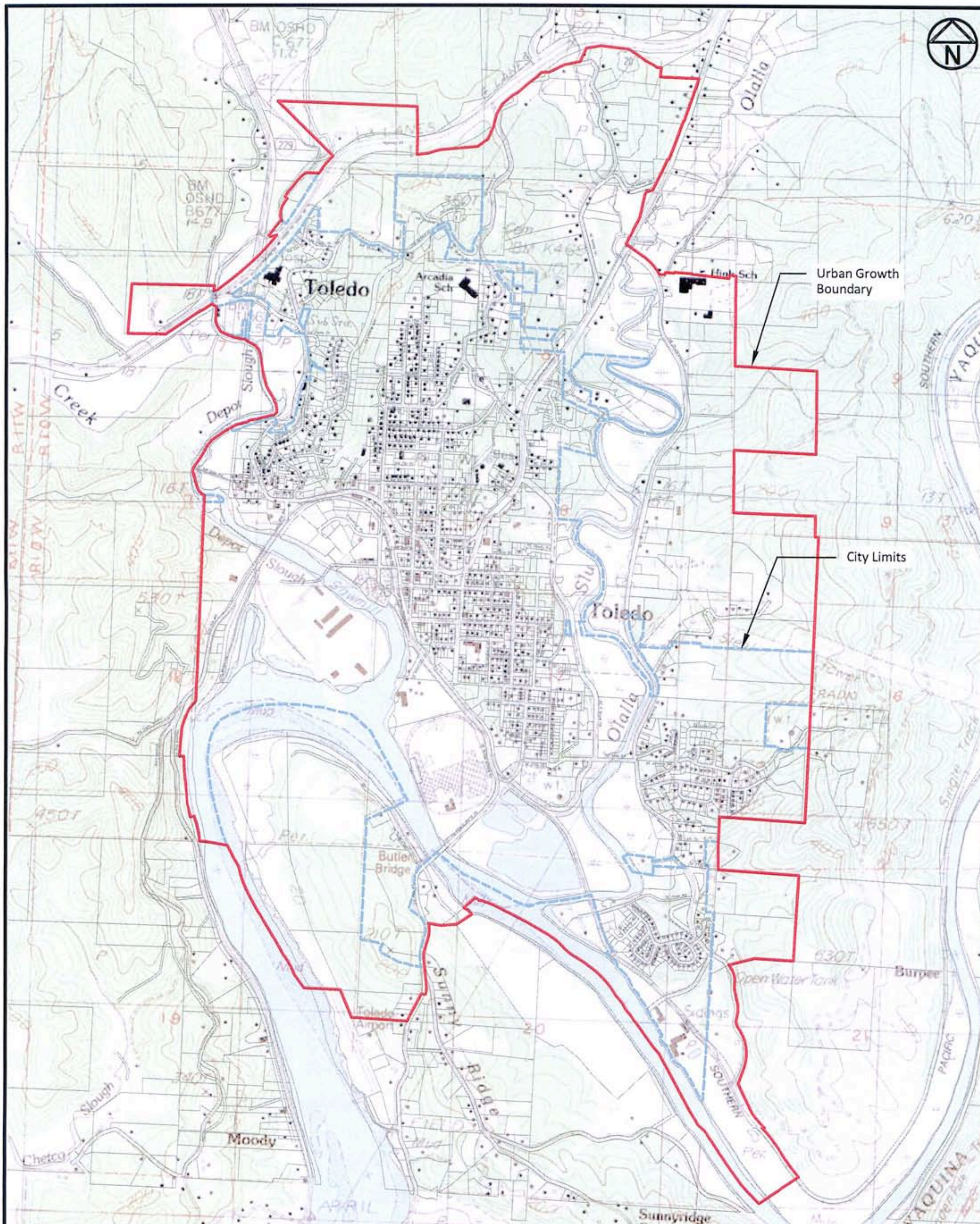
Figure 2.2.2-2 – Service Population Growth Projections

For the 20-year planning period ending in the year 2030, the estimated full-time population is 4,493 persons in Toledo and 5,620 persons in Seal Rock based upon a 1.0% growth rate in Toledo and a 1.5% growth rate in Seal Rock.

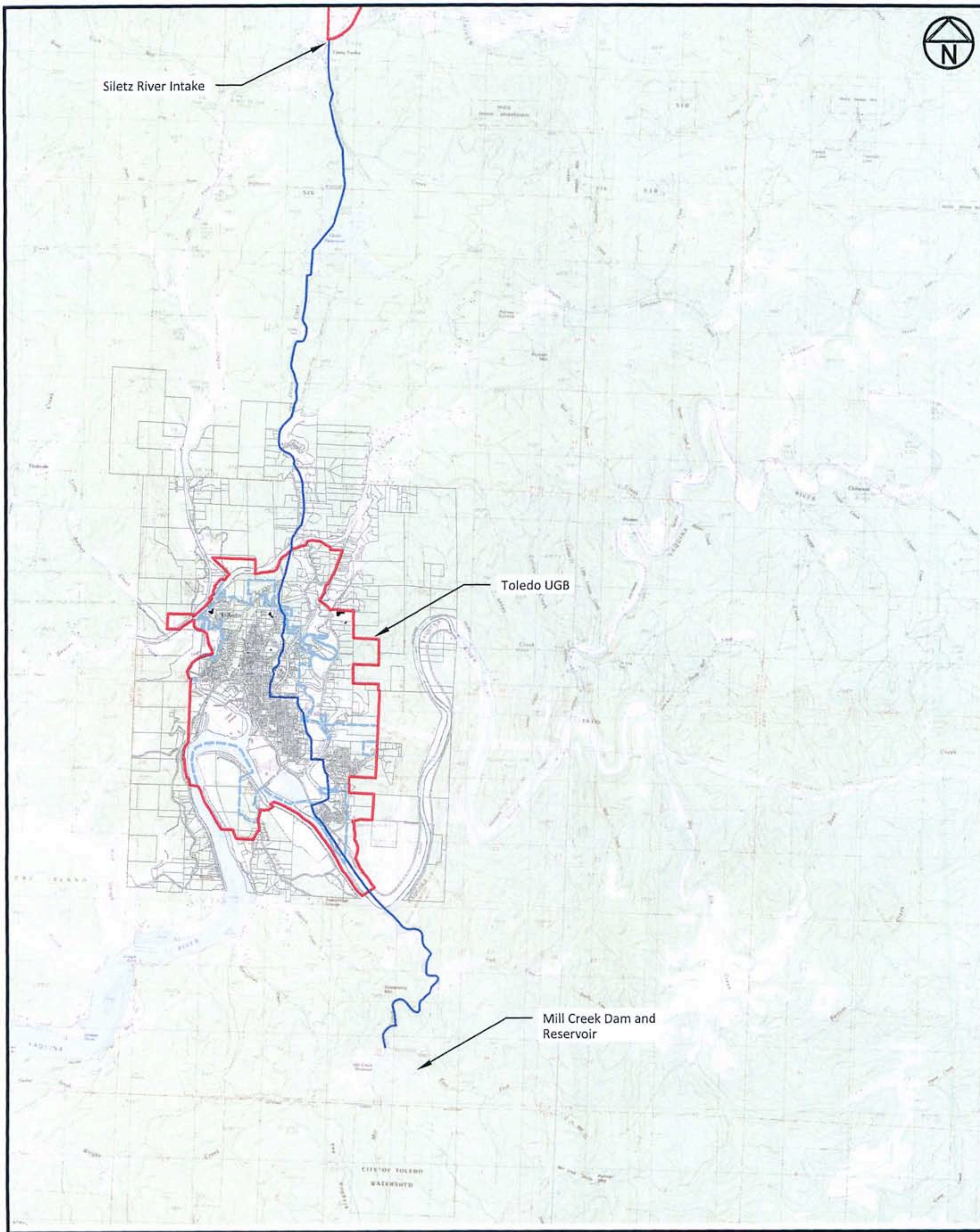
To accommodate this growth, an average of approximately 30 new occupied housing units per year would be required in Seal Rock and approximately 20 new housing units per year in Toledo.

Table 2.2.2-1 – Service Population Growth Projections

Year	Toledo Population	Seal Rock Population	Total Service Population
2008	3,610	4,050	7,660
2009	3,646	4,111	7,757
2010	3,683	4,172	7,855
2011	3,719	4,235	7,954
2012	3,757	4,299	8,055
2013	3,794	4,363	8,157
2014	3,832	4,428	8,261
2015	3,870	4,495	8,365
2016	3,909	4,562	8,471
2017	3,948	4,631	8,579
2018	3,988	4,700	8,688
2019	4,028	4,771	8,798
2020	4,068	4,842	8,910
2021	4,109	4,915	9,023
2022	4,150	4,989	9,138
2023	4,191	5,063	9,255
2024	4,233	5,139	9,372
2025	4,275	5,216	9,492
2026	4,318	5,295	9,613
2027	4,361	5,374	9,735
2028	4,405	5,455	9,860
2029	4,449	5,537	9,986
2030	4,493	5,620	10,113
2031	4,538	5,704	10,242
2032	4,584	5,789	10,373
2033	4,630	5,876	10,506
2034	4,676	5,964	10,640
2035	4,723	6,054	10,777
	Toledo	Seal Rock	
AAGR =	1.00%	1.50%	



Civil West Engineering Services, Inc.	Dwg By: REB Date: Oct 6, 2009	1" = 2000'	**Planning Area Map**	FIGURE
	Water System Master Plan		City of Toledo Lincoln County, Oregon	2.1.1-1



Civil West Engineering Services, Inc.	DWG BY: REB DATE: OCT 20, 2009 0 1" 1" = 6500'	**Planning Area Map - Water Sources**	FIGURE
	WATER SYSTEM MASTER PLAN	CITY OF TOLEDO LINCOLN COUNTY, OREGON	2.1.1-2

FIGURE 2.1.1-3

0 1"
1" = 1000 ft

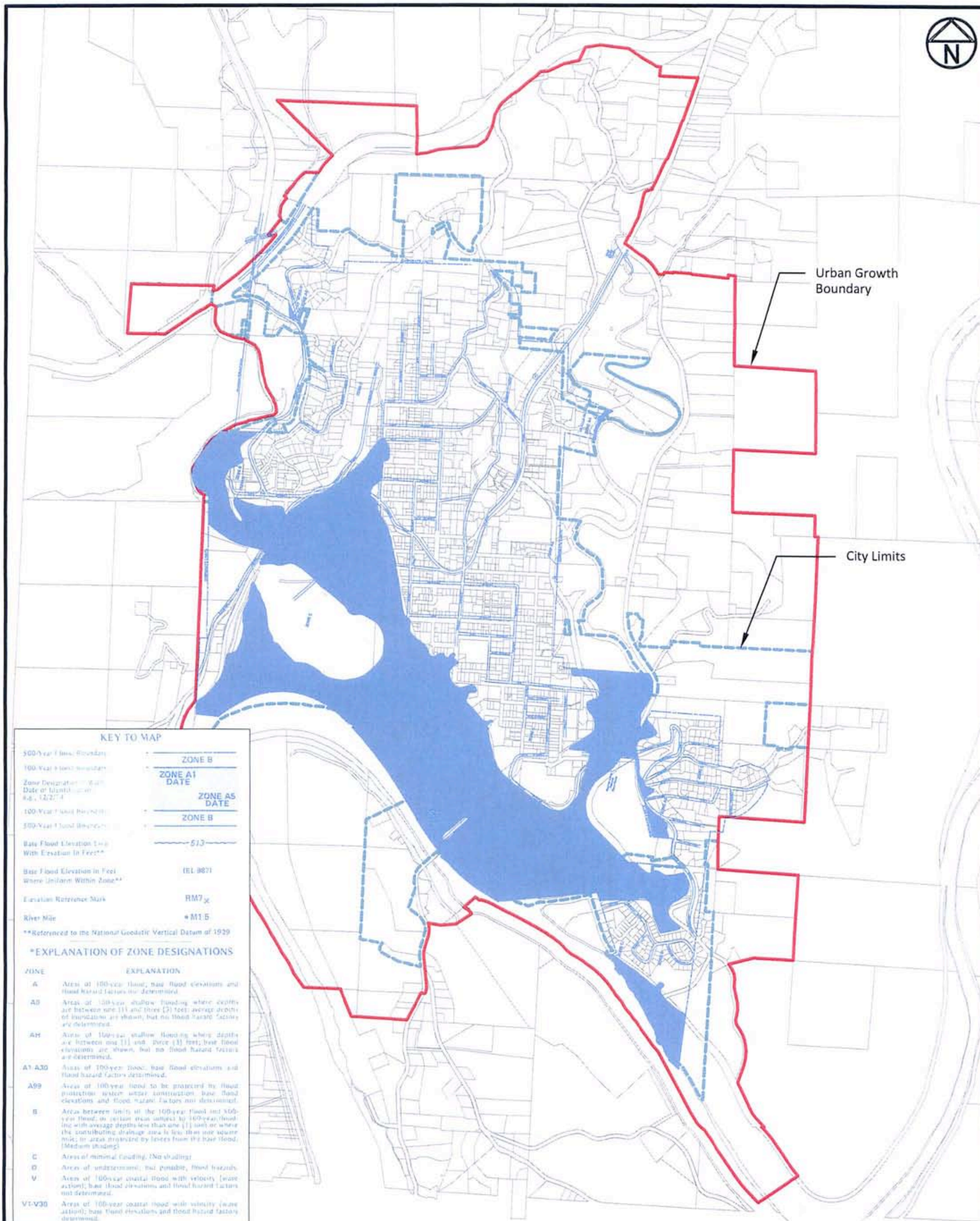
DRAWN BY: REB
DATE: NOV. 4, 2009

Toledo Aerial Map

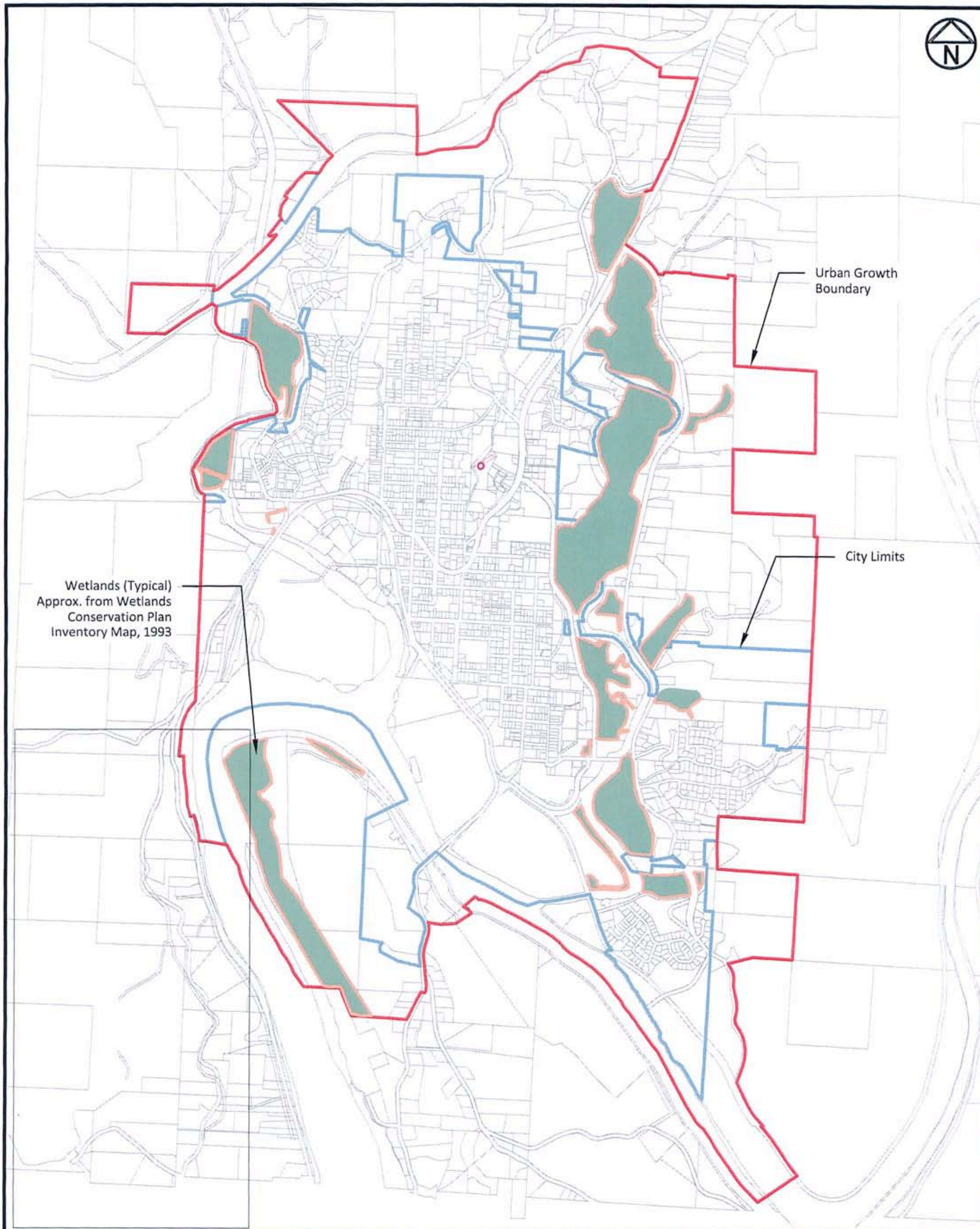
WATER SYSTEM MASTER PLAN

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

Civil West Engineering Services, Inc.



Civil West Engineering Services, Inc.	DWG BY: REB DATE: MAY 6, 2009	0 — 1" 1" = 2000'	**Flood Map**	FIGURE
	WATER SYSTEM MASTER PLAN		CITY OF TOLEDO LINCOLN COUNTY, OREGON	2.1.4-1



Civil West Engineering Services, Inc.

DWG BY: REB
DATE: JUNE 4, 2009

0 1"
1" = 2000'

WATER SYSTEM MASTER PLAN

Wetland Map

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

FIGURE 2.1.5-1

Water Demand Analysis

Section 3

3.1 Definitions

System water demand is the quantity of water that must enter the system in order to meet all water needs in the community. Water demand includes water delivered to the system to meet the needs of consumers as well as water used for fire fighting and system flushing, and other unaccounted water. Additionally, virtually all systems have a certain amount of leakage that cannot be economically removed and thus total demand typically includes some leakage. The difference between the amount of water metered and sold and the total amount delivered to the system is referred to as unaccounted water. Unaccounted water is discussed later in this Section. Water demand varies seasonally with the lowest usage in winter months and the highest usage during summer months. Variations in demand also occur with respect to time of day. Diurnal peaks typically occur during the morning and early evening periods, while the lowest usage occurs during nighttime hours.

The objective of this section is to determine the current water demand characteristics and to project future demand requirements that will establish system component adequacy and sizing needs. Water demand is described in the following terms:

Average Annual Demand (AAD) - The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates up and down over several years, an average is used.

Average Daily Demand (ADD) - The total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day.

Maximum Month Demand (MMD) - The gallons per day average during the month with the highest water demand. The highest monthly usage typically occurs during a summer month.

Peak Weekly Demand (PWD) - The greatest 7-day average demand that occurs in a year expressed in gallons per day. Not commonly determined or used in water planning.

Maximum Day Demand (MDD) - The largest volume of water delivered to the system in a single day expressed in gallons per day. The water supply and treatment facilities should be designed to handle the maximum day demand.

Peak Hourly Demand (PHD) - The maximum volume of water delivered to the system in a single hour expressed in gallons per day or gallons per minute. Distribution systems should be designed to adequately handle the peak hourly demand or maximum day demand plus fire flows, whichever is greater. During peak hourly flows, storage reservoirs supply the demand in excess of the maximum day demand.

Demands described above, expressed in gallons per day (gpd), can be divided by the population or Equivalent Dwelling Units (EDUs) served to come up with a demand per person or per capita which is expressed in gallons per capita per day (gpcd), or demand per EDU (gpd/EDU). These unit demands can be multiplied by future population or EDU projections to estimate future water demands for planning purposes.

3.2 Current Water Demand

3.2.1 Treatment Plant Records

Daily plant records for January 1, 2006 through December 31, 2008 show a daily production range of 368,000 gpd (gallons per day) to 1,748,000 gpd to meet overall system demand including that of the Seal Rock Water District. On average 920,000 gpd is treated. The maximum day demand was 1.748 mgd.

Table 3.2.1-1 – Toledo Treatment Plant Water Production Data

Demand	2006	2007	2008	Average
AAD (gallons per year)	356,556,000	340,125,000	311,365,000	336,015,333
ADD (gpd)	976,866	931,849	853,055	920,590
MMD (gpd avg.)	1,316,290	1,134,355	1,165,129	1,205,258
MDD (gpd)	1,748,000	1,633,000	1,568,000	1,649,667
MMD Peaking Factor	1.35	1.22	1.37	1.31
MDD Peaking Factor	1.79	1.75	1.84	1.79

Unit	ADD	MMD	MDD	PHD
gallons per day (gpd)	920,000	1,316,000	1,748,000	3,680,000
Peaking Factor (P.F.)	1.00	1.43	1.90	4.00
gpcd	120	157	228	480

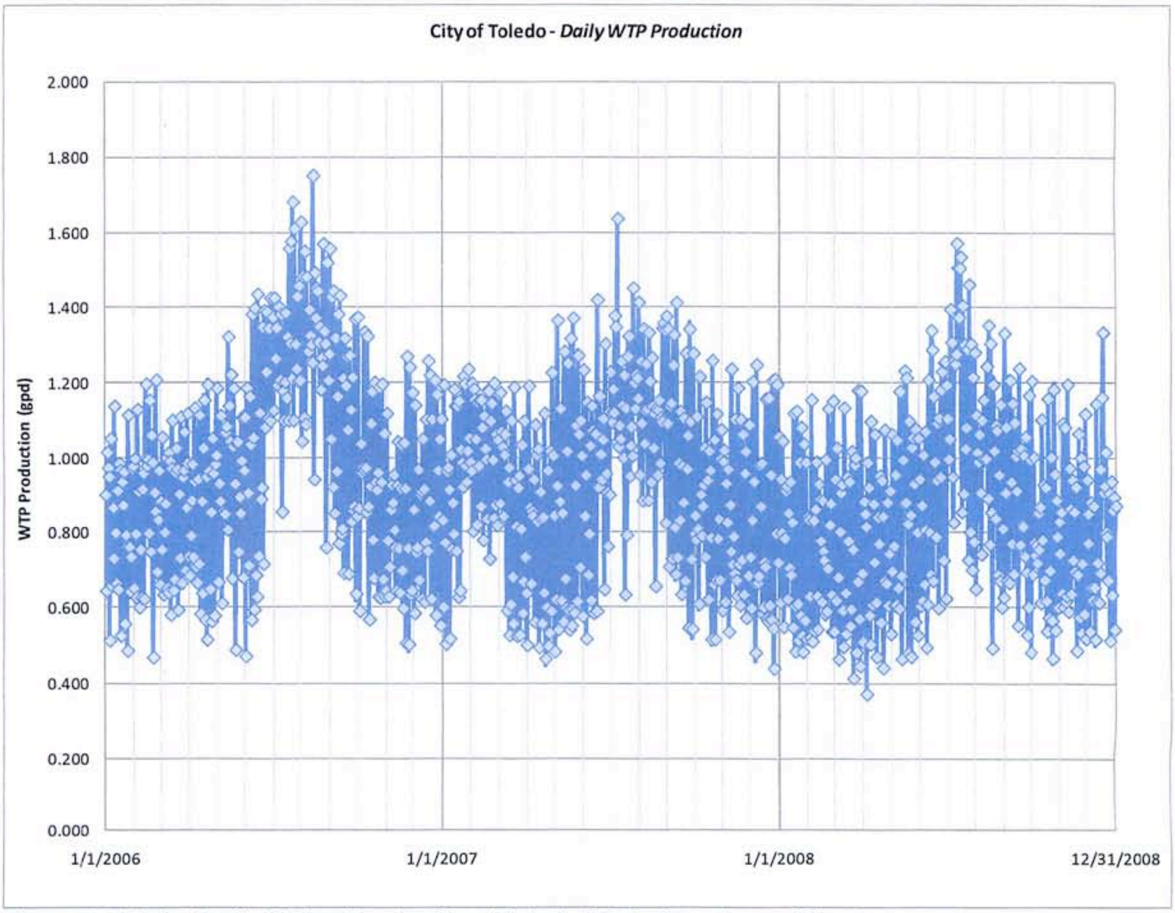


Figure 3.2.1-1 – Daily Water Production, Toledo Water Treatment Plant

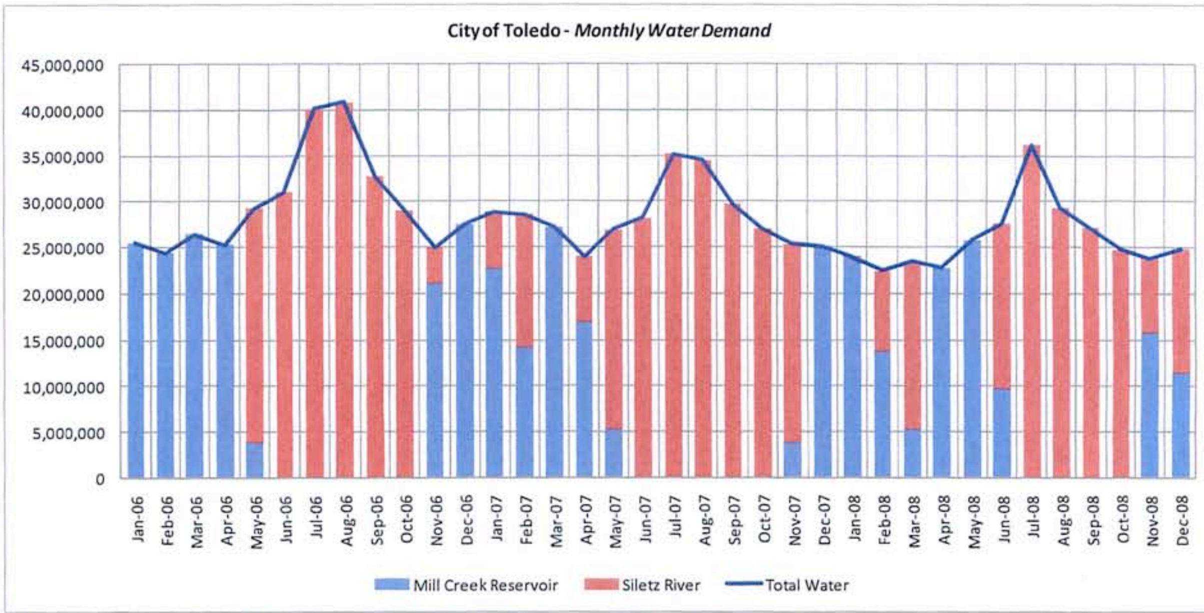


Figure 3.2.1-2 – Monthly Water Production, Toledo Water Treatment Plant

Approximately 60% of annual water need is taken from the Siletz River. The remaining 40% of the annual water needed is taken from the Mill Creek Reservoir in the winter and spring months. The Siletz is used in the summer due to algae blooms in Mill Creek as compared to high water quality in the Siletz during the summer. Mill Creek is used in the winter due to high turbidity in the Siletz and relatively high water quality in Mill Creek in the winter. An average of 18 million gallons per month is withdrawn from the Mill Creek source with about 25 million gallons per month used in months where Mill Creek is used alone without supplement from the Siletz River. The summer peak demands are met through withdrawals from the Siletz River alone with 35 to 40 million gallons per month used in July and August.

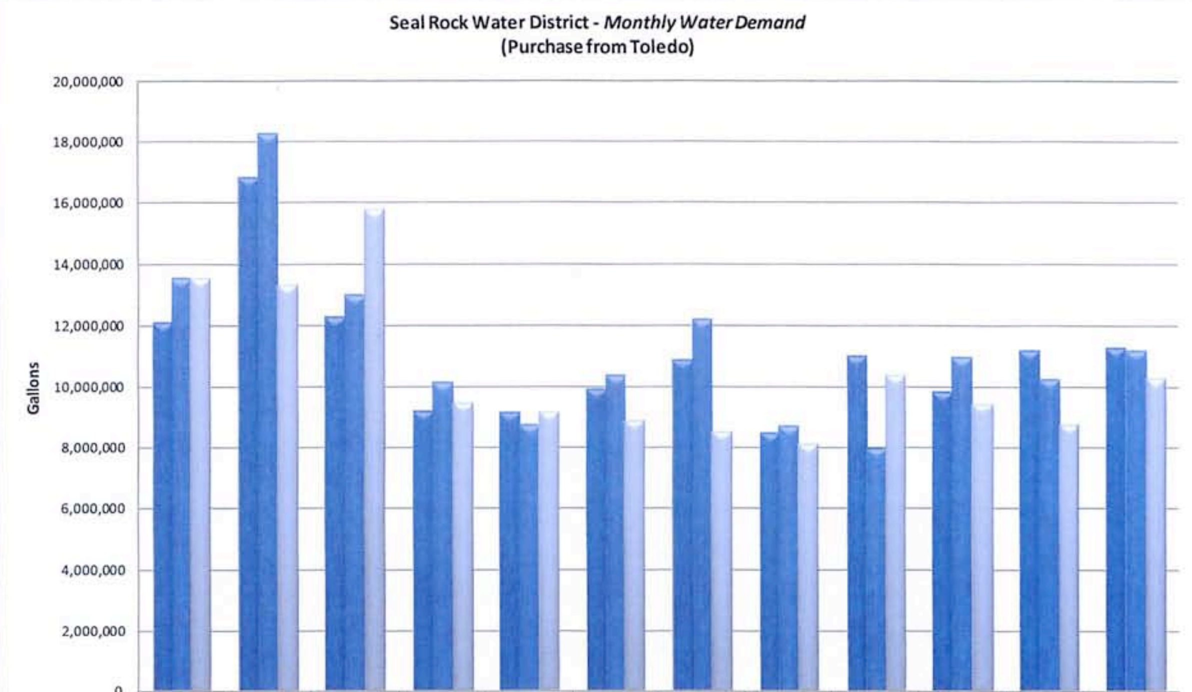
3.2.2 Seal Rock Demand

The Seal Rock Water District (SRWD) obtains all of its system water through a single pipeline conveying treated water from the City of Toledo. Seal Rock is the "purchasing water system" and Toledo is the "wholesale system" as defined in OAR 333-061-0020. A master meter records the quantity of water sent to and purchased by the SRWD. Average annual demand (AAD) for the SRWD over the last 5 years is 131.1 million gallons. The current unit demand values for Seal Rock are shown below.

Table 3.2.2-1 – Seal Rock Water District Water Demand Summary

Unit	ADD	MMD	MDD	PHD
gpd	360,000	590,000	785,000	1,450,000
P.F.	1.00	1.64	2.18	4.03
gpcd	89	146	194	358

On average 39% of the water produced at the plant is sold to Seal Rock while 61% stays in Toledo. Based on water sales records, 46% of all water sold by the City goes to the Seal Rock Water District.



	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Demand 05/06	12,124,000	16,798,000	12,272,000	9,173,000	9,115,000	9,942,000	10,872,000	8,439,000	10,978,000	9,820,000	11,168,000	11,261,000
Demand 06/07	13,539,000	18,259,000	12,994,000	10,149,000	8,732,000	10,351,000	12,215,000	8,674,000	7,977,000	10,929,000	10,256,000	11,177,450
Demand 07/08	13,511,050	13,319,700	15,740,110	9,480,650	9,126,690	8,840,660	8,494,430	8,088,059	10,385,401	9,436,590	8,736,600	10,270,300

Figure 3.2.2-1 – Monthly Water Demand, Seal Rock Water District

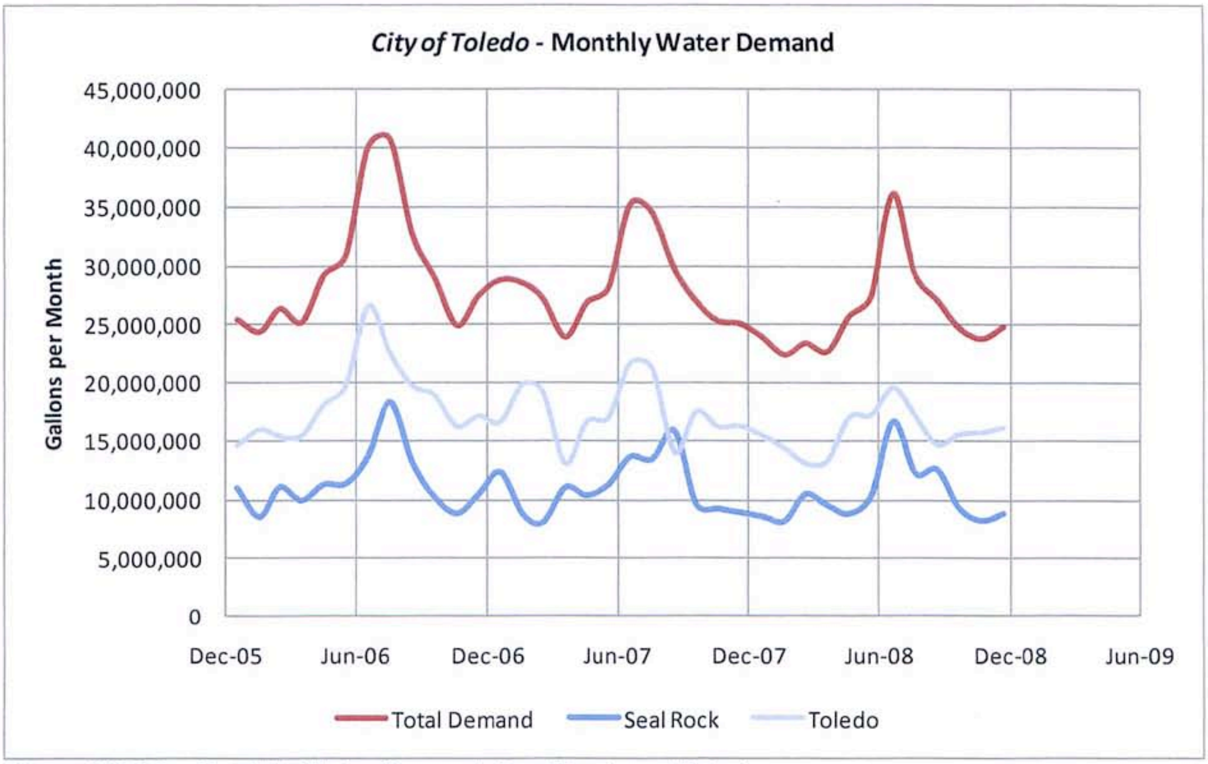


Figure 3.2.2-2 – Monthly Water Demand, Seal Rock and Toledo

3.2.3 Current Demand Summary

Based on the water demand records discussed and shown graphically in previous parts of this Section and the population estimates discussed in Section 2, the following water demand summary applies to the system for conditions occurring in late 2008/early 2009. As would be expected, per capita demand values are higher in Toledo than in Seal Rock due to larger commercial and industrial use in Toledo versus primarily residential use in Seal Rock.

For the current MDD of 1.75 mgd, the current raw water supply as well as the treatment plant capability should be at least 1214 gpm.

Table 3.2.3-1 – Current Water Demand Summary

Seal Rock 2008 Data - 4050 persons

Unit	ADD	MMD	MDD	PHD
gpd	360,000	590,000	785,000	1,450,000
P.F.	1.00	1.64	2.18	4.03
gpcd	89	146	194	358

Toledo 2008 Data - 3610 persons

Unit	ADD	MMD	MDD	PHD
gpd	560,000	726,000	963,000	2,230,000
P.F.	1.00	1.30	1.72	3.98
gpcd	155	201	267	618

Combination 2008 Data 7,660 persons

Unit	ADD	MMD	MDD	PHD
gpd	920,000	1,316,000	1,748,000	3,680,000
P.F.	1.00	1.43	1.90	4.00
gpcd	120	172	228	480

P.F. = Peaking Factor. Multiple of ADD. P.F. for PHD assumed at 4.0.

Water use in America is documented by the U.S. Department of the Interior in the 2000 U.S. Geological Survey - Circular 1268, updated last in 2005. According to the study, the average per capita water use for Oregon is 207 gallons per capita day (gpcd) including domestic, commercial, industrial, public use and loss. Of the total 207 gpcd, 63% is residential, commercial and public use/loss; 34% is industrial; and 3% is related to thermoelectric power generation. Note that the ADD value for Toledo (155 gpcd) is less than the State average as documented in the USGS Survey and the value for Seal Rock (89 gpcd) is significantly less. The low value for Seal Rock is expected since virtually all use is residential only. The lower than average value for Toledo is likely partially due to the independent, non-city, water supply maintained by and for the large Georgia-Pacific industrial user and the low transient or tourist water use in the city. Nearby Newport in comparison has an ADD value of 206 gpcd, nearly identical to the State average, with large water use by the fish processing plants as well as significant water use by part-time or tourist populations that do not count in the regular city population.

3.2.4 Water Sales Records

As is typical for most communities, the quantity of water sold in the Toledo system is less than the quantity of water entering the system (water demand) due to leakage and other unaccounted water loss. Whereas 336 million gallons of water per year is treated at the Toledo plant, only about 279 million gallons of water per year is sold. The next Section 3.2.5 discussed unaccounted water.

Based on sales records from January 2006 to December 2008, on average out of the 279 million gallons of water sold per year, 32% of water sold goes to residential use, 6% to commercial users, 11% to industrial use, and 49% to the Seal Rock Water District, with the remaining small percentage going to other miscellaneous use. A graphical representation of this distribution of water sold is shown in Figure 3.2.4-1 for the year 2008 average.

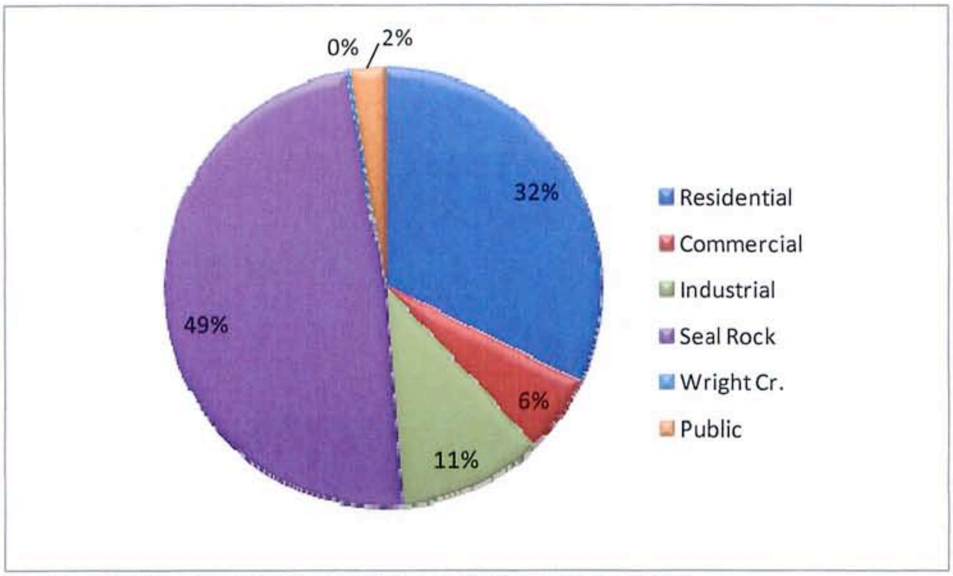


Figure 3.2.4-1 – Distribution of Water Volume Sold, 2008

3.2.5 Unaccounted Water

The difference between the quantity of water measured entering the distribution system (water demand) and the quantity of water measured exiting the distribution system is unaccounted water. This comparison is typically called a "water balance". Measured water exiting the system is primarily that measured through individual customer water meters (water sold). Other sources of exiting water include authorized non-consumptive uses such as pipeline flushing and firefighting and unauthorized uses such as water theft, line breaks, and leakage.

In addition to "real" water loss resulting from leakage, unmetered flushing, etc., unaccounted water can also include "apparent" water loss due to meter inaccuracies or meter reading errors. In general, as water meters age they tend to read lower and lower resulting in higher and higher "apparent" water loss.

If there were no leakage in the system, all water meters were 100% accurate, and every drop of water used for fire fighting and system flushing was measured, there would be zero unaccounted water. In reality every water system has a certain amount of leakage, water meters are not 100% accurate, and it is rare for every drop of water used in town to be metered and measured. Therefore virtually every community water system has unaccounted water.

The volume of unaccounted water varies significantly month by month due to meter discrepancies, differences in dates of reading master meters versus individual customer meters, and the number of days in takes to read individual meters. These factors make monthly unaccounted water comparisons of little value and annual comparisons (annual water audits) are used to lessen the impact of these variables. The 3-year averages show approximately 336 million gallons per year treated, 12 million gallons per year used for backwashing the filters, and 279 million gallons per year sold. Annual values for Toledo indicate a 3-year average unaccounted water total of 45 million gallons per year or 13.5% of the total water demand.

According to OAR 690-086 (Water Resources Department – Water Management and Conservation Plans), if the annual water audit indicates leakage exceeding 10%, a regularly scheduled and systematic program should be in place to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier. Other provisions in OAR 690-086 can require system-wide leak repair or line replacement programs to reduce leakage to no more than 15% under certain circumstances such as water permit extension requests or water diversion expansions or initiations.

Records are not available to determine how much of the current 13.5% unaccounted water is actually leakage. Some of the unaccounted water can be attributed to other plant water use (chemical feed, surface wash, etc.), system flushing through hydrants, and meter inaccuracies. It is almost certain that a portion of the unaccounted water is from leakage but it does appear that actual leakage may be less than 10%. The City should continue efforts to detect and repair leaks when discovered. Efforts should also be made to measure and record water used for flushing and other authorized non-metered uses. Metering and recording of all plant use water should also begin.

3.2.6 EDU Analysis

Based on water sales records for the last 3 years, the average quantity of water sold to a typical single-family dwelling unit inside the District boundary (5/8" single family residential meter) is 5,350 gallons per month. This volume sold per month becomes the basis for Equivalent Dwelling Unit (EDU) calculations with 1 EDU = 5350 gallons per month in metered sales. Other users can then be described as an equivalent number of EDUs based on their relative water consumption. For example, a commercial business that had an average metered consumption of 10,700 gallons per month uses twice the amount of water as the typical single-family dwelling and can be considered 2 EDUs.

The Table 3.2.6-1 shows sales data and total EDU numbers month by month for the last 3 years. Table 3.2.6-2 shows the 3-year average water sold per month per account type and the corresponding number of EDUs. Some of the data (Sep-07 and Dec-07 in Table 3.2.6-1) has some irregular numbers due to meter reading and recording discrepancies however the average overall is sufficiently accurate. The current total number of system EDUs is estimated at 4,635.

Table 3.2.6-1 – EDU Values

Month	# of 5/8" SFR Meters	Water Used (gallons)	Monthly Use per Meter	Total Sales (gallons)	EDU Total
Jan-06	1038	6,703,106	6,458	23,556,827	3,648
Feb-06	1042	4,360,612	4,185	18,124,978	4,331
Mar-06	1067	4,865,834	4,560	27,647,479	6,063
Apr-06					
May-06	1069	5,649,841	5,285	23,041,239	4,360
Jun-06	1049	5,634,137	5,371	24,071,122	4,482
Jul-06	1049	6,901,127	6,579	28,450,922	4,325
Aug-06	1051	8,823,482	8,395	38,958,972	4,641
Sep-06	1050	6,466,934	6,159	28,804,026	4,677
Oct-06	1050	4,890,835	4,658	26,797,460	5,753
Nov-06	1056	4,778,084	4,525	20,117,214	4,446
Dec-06	1077	4,525,753	4,202	20,967,338	4,990
	1054	5,781,795	5,489	25,503,416	4,701
Jan-07	1056	5,585,895	5,290	24,611,988	4,653
Feb-07	1045	4,459,659	4,268	17,317,394	4,058
Mar-07	1050	4,137,554	3,941	16,880,959	4,284
Apr-07	1052	4,803,509	4,566	21,269,079	4,658
May-07	1050	5,022,603	4,783	19,996,712	4,180
Jun-07	1041	5,248,090	5,041	22,228,700	4,409
Jul-07	1051	6,696,232	6,371	27,336,579	4,291
Aug-07	1050	6,498,660	6,189	28,813,160	4,655
Sep-07	1064	16,400,190	15,414	40,647,580	2,637
Oct-07	1058	5,054,234	4,777	20,208,884	4,230
Nov-07	1062	4,332,497	4,080	18,747,871	4,596
Dec-07	1053	4,191,933	3,981	48,147,288	12,094
	1053	6,035,921	5,725	25,517,183	4,895
Jan-08	1056	5,397,366	5,111	20,036,285	3,920
Feb-08	1059	4,611,337	4,354	18,104,249	4,158
Mar-08	1056	4,626,621	4,381	21,177,417	4,834
Apr-08	1058	5,098,907	4,819	18,496,166	3,838
May-08	1063	4,637,436	4,363	17,599,821	4,034
Jun-08	1068	5,443,196	5,097	20,961,289	4,113
Jul-08	1062	7,149,615	6,732	31,695,432	4,708
Aug-08	1072	5,706,663	5,323	23,268,218	4,371
Sep-08	1060	5,752,748	5,427	24,702,544	4,552
Oct-08	1067	4,492,149	4,210	19,031,568	4,520
Nov-08	1066	4,151,267	3,894	16,642,748	4,274
Dec-08	1061	4,653,541	4,386	17,919,041	4,086
	1062	5,143,404	4,842	20,802,898	4,284
Averages	1057	5,650,047	5,348	23,896,530	4,625

SFR = Single Family Residential

Monthly use per EDU (gallons) = 5,350

Table 3.2.6-2 – EDU Values By Account Type

Code	Meter/Account	Avgerage Monthly Use	EDU
002	5/8" single-family	5,650,047	1056.1
003	1" single-family	122,867	23.0
004	5/8" multi-family	261,986	49.0
005	1" multi-family	168,505	31.5
006	1.5" multi-family	360,729	67.4
007	2" multi-family	155,365	29.0
010	5/8" commercial	367,387	68.7
011	1" commercial	228,074	42.6
012	1.5" commercial	88,747	16.6
013	2" commercial	349,469	65.3
014	3" commercial	164,189	30.7
015	6" commercial	44,429	8.3
016	5/8" industrial	9,714	1.8
017	1" industrial	36,141	6.8
018	1.5" industrial	24,983	4.7
019	2" industrial	1,658,648	310.0
021	4" industrial	794,457	148.5
026	3/4" single-family	231,175	43.2
027	10" Fire	33	0.0
028	5/8" outside residential	369,220	69.0
029	3/4" outside residential	10,835	2.0
030	1" outside residential	20,486	3.8
032	2" outside residential	28,603	5.3
033	5/8" outside commercial	24,097	4.5
034	1" outside commercial	7,238	1.4
035	2" outside commercial	109,794	20.5
036	3" outside commercial	64,171	12.0
037	Seal Rock Water District	10,757,900	2010.8
039	6" Fire Meter	0	0.0
040	4" Fire	0	0.0
042	1.5" Fire	59,808	11.2
043	3/4" industrial	4,657	0.9
044	Wright Creek Water	62,000	11.6
	Public Use	2,579,594	482.2
	Totals	24,815,345	4638.4
	Total Estimated System EDUs =	4635	
	1 EDU (gal/month)=	*5350*	

3.3 Future Water Demand

3.3.1 Basis for Projections

Water demand estimates for future years are determined by multiplying the current unit demand values (gallons per person or per EDU) by the projected number of future users in the water system. It is assumed new users added to the system will consume water at the same rate as current users. Population projections are presented in Section 2.2.3. The unit water demand values are presented in Section 3.2.3. The projections are based on an average annual growth rate of 1.0% in the city of Toledo and a growth rate of 1.5% in the Seal Rock Water District.

3.3.2 Water Demand Projections

Table 3.3.2-1 – Water Demand Projections

Year	Toledo Population	Seal Rock Population	Toledo ADD	Toledo MDD	Seal Rock ADD	Seal Rock MDD	Total ADD	Total MDD
2008	3,610	4,050	560,000	963,000	360,000	785,000	920,000	1,748,000
2009	3,646	4,111	566,000	973,000	366,000	797,000	932,000	1,770,000
2010	3,683	4,172	572,000	983,000	371,000	809,000	943,000	1,800,000
2011	3,719	4,235	577,000	993,000	377,000	821,000	954,000	1,820,000
2012	3,757	4,299	583,000	1,003,000	383,000	834,000	966,000	1,840,000
2013	3,794	4,363	589,000	1,013,000	388,000	846,000	977,000	1,860,000
2014	3,832	4,428	595,000	1,023,000	394,000	859,000	989,000	1,890,000
2015	3,870	4,495	601,000	1,033,000	400,000	872,000	1,001,000	1,910,000
2016	3,909	4,562	607,000	1,043,000	406,000	885,000	1,013,000	1,930,000
2017	3,948	4,631	613,000	1,054,000	412,000	898,000	1,025,000	1,960,000
2018	3,988	4,700	619,000	1,064,000	418,000	912,000	1,037,000	1,980,000
2019	4,028	4,771	625,000	1,075,000	425,000	925,000	1,050,000	2,000,000
2020	4,068	4,842	632,000	1,086,000	431,000	939,000	1,063,000	2,030,000
2021	4,109	4,915	638,000	1,096,000	437,000	953,000	1,075,000	2,050,000
2022	4,150	4,989	644,000	1,107,000	444,000	967,000	1,088,000	2,080,000
2023	4,191	5,063	651,000	1,119,000	451,000	982,000	1,102,000	2,110,000
2024	4,233	5,139	657,000	1,130,000	457,000	997,000	1,114,000	2,130,000
2025	4,275	5,216	664,000	1,141,000	464,000	1,012,000	1,128,000	2,160,000
2026	4,318	5,295	670,000	1,152,000	471,000	1,027,000	1,141,000	2,180,000
2027	4,361	5,374	677,000	1,164,000	478,000	1,042,000	1,155,000	2,210,000
2028	4,405	5,455	684,000	1,176,000	485,000	1,058,000	1,169,000	2,240,000
2029	4,449	5,537	691,000	1,187,000	493,000	1,074,000	1,184,000	2,270,000
2030	4,493	5,620	698,000	1,199,000	500,000	1,090,000	1,198,000	2,290,000
2031	4,538	5,704	705,000	1,211,000	508,000	1,106,000	1,213,000	2,320,000
2032	4,584	5,789	712,000	1,223,000	515,000	1,123,000	1,227,000	2,350,000
2033	4,630	5,876	719,000	1,235,000	523,000	1,139,000	1,242,000	2,380,000
2034	4,676	5,964	726,000	1,248,000	531,000	1,157,000	1,257,000	2,410,000
2035	4,723	6,054	733,000	1,260,000	539,000	1,174,000	1,272,000	2,440,000

Water Demands in gallons per day, gpd

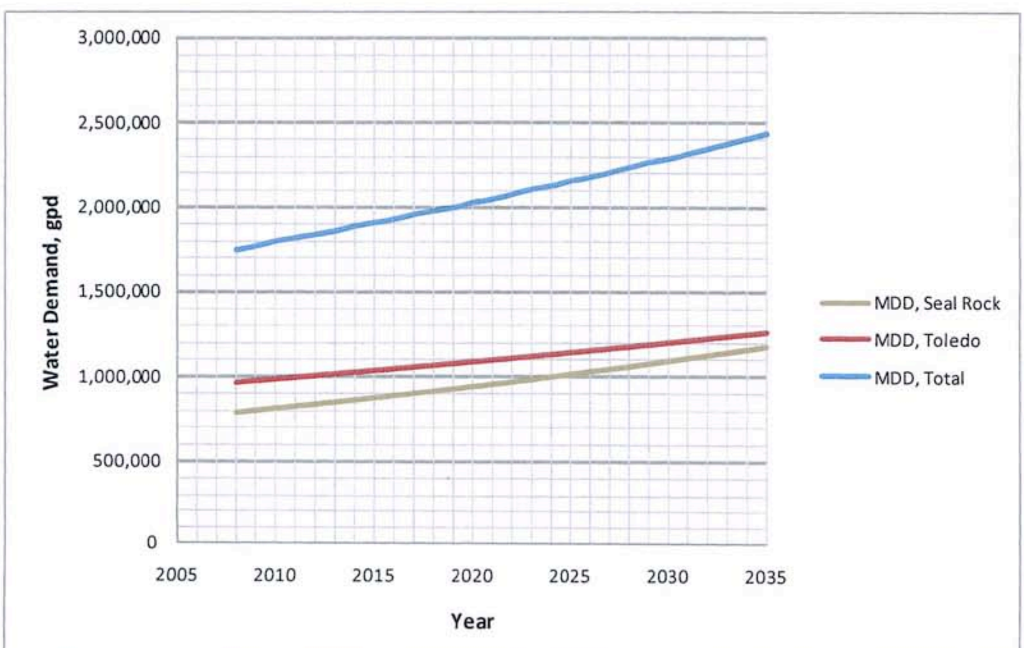


Figure 3.3.2-1 – Maximum Day Water Demand Projections

3.3.3 Design Values

For the 20-year planning period ending in the year 2030, the following water demand design values result from the analysis:

Table 3.3.3-1 – 20-Year Water Demand Values

Seal Rock 2030 Data - 5620 persons

Unit	ADD	MMD	MDD	PHD
gpd	500,000	820,000	1,090,000	2,020,000
P.F.	1.00	1.64	2.18	4.04
gpcd	89	146	194	359

Toledo 2030 Data - 4,493 persons

Unit	ADD	MMD	MDD	PHD
gpd	698,000	910,000	1,200,000	2,780,000
P.F.	1.00	1.30	1.72	3.98
gpcd	155	203	267	619

Combination 2030 Data 10,113 persons

Unit	ADD	MMD	MDD	PHD
gpd	1,198,000	1,730,000	2,290,000	4,800,000
P.F.	1.00	1.44	1.91	4.01
gpcd	118	171	226	475

The sizing criteria therefore for future supply and treatment needs is 2.29 mgd or 1,600 gpm. If Seal Rock were not included, the facilities would need to handle 835 gpm.

Design Criteria and Service Goals

Section 4

4.1 Design Life of Improvements

The design life of a water system component is the time that the component is expected to be useful based on its intended use and required function. Design life is sometimes referred to as service life or life expectancy. Actual realized design life can depend on factors such as the type and intensity of use, type and quality of materials used in construction, and the quality of workmanship during installation. The estimated and actual design life for any particular component may vary depending on the above factors. The establishment of a design life provides a realistic projection of service upon which to base an economic analysis of new capital improvements.

The planning period for a water system and the design life for its components may not be identical. The typical 20-year planning period is limited due to the need to limit economic burdens on current generations and inaccuracies that result from attempts at projecting needs too far into the future. Design life can be greater to or less than the planning period. For example, a properly maintained steel storage tank may have a design life of 60 years, but the projected fire flow and consumptive water demand for a planning period of 20 years determine its size. At the end of the initial 20-year planning period, water demand may be such that an additional storage tank is required; however, the existing tank with a design life of 60 years would still be useful and remain in service for another 40 years. The typical design life for system components are discussed below.

4.1.1 Equipment and Structures

Equipment used in water systems such as pumps, valves, and other major treatment related equipment is sized for a 20-year demand and has a similar 20-year expected design life. Minor equipment such as less expensive chemical feed pumps, turbidimeters, and other instrumentation sometimes must be replaced or updated when less than 20-years old, typically at 10 to 15 years old. The useful life of some equipment can be extended with proper maintenance if sufficient capacity still exists. It is not uncommon to see larger pumps still in service after 30 years or more if properly maintained.

Filter media such as sand and anthracite should be replaced at 12 to 15 years. Membranes used in filtration plants typically have an expected life of 10 years.

Major structures used in water systems such as concrete basins and intake wetwells can last 50 years or more when properly constructed.

4.1.2 Transmission and Distribution Piping

Water transmission and distribution piping should easily have a useful life of 50 to 60 years if quality materials and workmanship are incorporated into the construction and the pipes are adequately sized. Steel piping used in the 1950's and 60's that has been buried, commonly exhibits significant corrosion and leakage within 30 years. Cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed. PVC and HDPE pipe manufacturers claim a 100-year service life for pipe as well.

4.1.3 Treated Water Storage

Distribution storage tanks should have a design life of 60 years (painted steel construction) to 80 years (concrete construction). Steel tanks with a glass-fused coating can have a design life similar to concrete construction. Actual service life will depend on the quality of materials, the workmanship during installation, and the timely administration of maintenance activities. Several practices, such as the use of cathodic protection, regular cleaning and frequent painting can extend or assure the service life of steel reservoirs. Painting intervals for steel tanks is 15 to 25 years. The life of steel tanks is greatly reduced if not repainted periodically as needed.

4.2 Sizing and Capacity Criteria and Goals

The 20-year projected water demands presented in Section 3 are used to size improvements. Various components of the system demand are used for sizing different improvements. Methods and demands used are discussed below.

4.2.1 Water Supply

The current water supply, including pumping capacity, should at minimum be sufficient to meet the projected 20-year maximum daily demand (MDD). Considering the difficulty in obtaining new water rights, raw water supply should meet a longer-term need and it is not unreasonable to plan today for 60-year demand water sources. Currently the MDD is 1.75 million gallons per day (mgd) or 2.71 cubic feet per second (cfs). At the end of the 20-year planning period, the projected MDD is 2.29 mgd or 3.54 cfs. In order to plan for long-term water supply options, projections beyond the planning period are shown assuming the same growth rate as the planning period.

Immediate Supply Capacity Goal – 20-year MDD of 2.29 mgd (3.54 cfs)
Supply Capacity Goal – 40-year MDD of 2.94 mgd (4.55 cfs)
Supply Capacity Goal – 60-year MDD of 3.32 mgd (5.14 cfs)

4.2.2 Water Treatment

Water treatment plant equipment and components such as pumps, filters, flocculators, etc. are typically sized to provide for the 20-year MDD. Conventional filter basins are sized for 20 year flows and media may have to be replaced once during that 20-year period. Membrane filters are more modular and initial designs must have space for 20-year flow capacity but fewer modules may be installed initially. Any discussion of treatment sizing must include an additional 5-10% allowance for water use that would occur at a treatment plant itself (90-95% of water going to town) if demand estimates do not already include such allowances. Difficult to construct items with a long design life such as buried piping and concrete wetwells for surface water intakes should be sized to accommodate at least a 40 to 50 year flow capacity need. Other components such as concrete clearwells and buildings may be oversized beyond the 20-year MDD depending on future expansion ease.

Treatment Capacity Goal – 2.29 mgd (1600 gpm)

4.2.3 Fire Protection

According to the 2007 Oregon Fire Code, the minimum fire-flow requirements for one- and two-family dwellings not exceeding 3000 s.f. shall be 1,000 gpm. When square footage exceeds 3600 or for other types of buildings the minimum fire flow is 1,500 gpm. When flows of 1,750 gpm or less are required a single fire hydrant is required to be accessible within 250 feet (200 feet on dead-end streets) resulting in a maximum hydrant spacing of 500 feet (400 feet on dead-end streets).

For other types of structures, the requirements of the Oregon Fire Code require flows up to 8,000 gpm (2007 OFC Table B105.1). For fire flows less than 2,750 gpm a flow duration of 2 hours is required. For flows between 3,000 and 3,750 gpm a duration of 3 hours is required. For flows of 4,000 gpm and above a duration of 4 hours is required. The minimum number of hydrants available at a specific location, the average spacing between hydrants, and the maximum distance from any point on the street to a hydrant are dependent on the fire-flow requirement. For structures which require 4,000 gpm at least 4 hydrants must be available spaced not more than 350 feet apart.

Fire Flow Capacity Goals – Residential Only Outlying Areas; 1,000 gpm
Fire Flow Capacity Goals – General Commercial Areas; 1,500 gpm
Fire Flow Capacity Goals – Central Town Area, Industrial, and Schools; 3,500 gpm

4.2.4 Treated Water Storage

Total storage capacity must include reserve storage for fire suppression, equalization storage, and emergency storage. In larger communities it is common to provide storage capacity equal to the sum of equalization storage plus the larger of fire storage or emergency storage. In small communities it is recommended that total storage be the sum of fire plus equalization plus emergency storage. This is considered prudent since it is possible for fire danger to increase during water emergencies, such as power failures when alternative sources of heating and cooking might be used.

Equalization storage is typically set at 20-25% of the MDD to balance out the difference between peak demand and supply capacity. When peak hour flows are known, equalization storage is the difference between the MDD and PHD for a duration of 8 hours [PHD-MDD x 8 hrs.]. Equalization storage typically rises and falls daily or hourly as storage tank water levels fluctuate normally.

Emergency storage is required to protect against a total loss of water supply such as would occur with a broken transmission line, an electrical outage, equipment breakdown, or source contamination. Emergency storage should be an adequate volume to supply the system's average daily demand for the duration of a possible emergency. For most systems, emergency storage should be equal to one maximum day of demand or 2.5 to 3 times the average day demand.

Fire reserve storage is needed to supply fire flow throughout the water system to fight a major fire. The fire reserve storage is based on the maximum flow and duration of flow required to confine a major fire. Fire flows are discussed in Section 4.2.3.

With many miles of raw water transmission piping separating water supply from treatment facilities in Toledo, it is considered prudent to set emergency storage equal to 3 normal days of water demand. Since the PHD is estimated for Toledo with peaking factors rather than being measured the equalization storage should be set to 20% of the MDD (PHD-MDD x 8 hrs. is overly conservative). Fire storage volume is 3500 gpm for 3 hours. In addition to the basic volume needs calculations, storage locations and hydraulic distribution must be considered to assure each area of the system has sufficient flow and volume. Further analysis will follow in this Plan however the approximate overall storage goal is:

Storage Capacity Goal – 3.0 x $ADD_{20\text{-}year}$ + 0.2 x MDD + 630,000 fire storage = 4.7 MG

Another important design parameter for treated water storage reservoirs is elevation. Efforts should be made to locate all reservoirs at the same elevation when possible within a pressure zone. As a consistent water surface is maintained in all reservoirs, the need for altitude valves, pressure reducing valves

(PRVs), booster pumps, and other control devices may be minimized. Distribution reservoirs should also be located at an elevation that maintains adequate water pressure throughout the system; sufficient water pressures at high elevations and reasonable pressures at lower elevations. The ideal pressure range for a distribution system is between 40 and 80 psi.

For subdivisions at higher elevations than allowed within the main pressure zone, storage tanks should be required when possible rather than hydropneumatic tank booster pump stations. Tank size needs to be determined on a case-by-case basis as part of the design review. Fire pumps with a capacity of at least 1,000 gpm together with standby generators should be provided when a storage tank is not possible. Minimum tank size should be 120,000 gallons fire storage (1,000 gpm for 2 hours) plus 1 times the MDD per EDU. For very small developments, individual sprinkler systems may be most appropriate.

4.2.5 Distribution System

Distribution mains are typically sized to convey projected maximum day flows plus simultaneous fire flows while maintaining at least 20 psi at all connections, or projected peak hourly flows while maintaining approximately 40 psi, whichever case is more stringent. Looped mains should be at least six inches in diameter to provide minimum fire flow capacity. The State of Oregon requires a water distribution system be designed and installed to maintain a pressure of at least 20 psi at all service connections (at the property line) at all times, even during fire flow conditions. OAR 333-061-0050 governs the construction standards for water systems including distribution piping. The size and layout of pipelines must be designed to deliver the flows indicated above.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. In all cases, except for minor looping using 6-inch or larger pipe, a hydraulic analysis should be performed to ensure adequate sizing.

Distribution Capacity Goal – Worst Case of projected MDD + fire flow with at least 20 psi residual pressure or Projected PHD with 40 psi residual pressure

4.2.6 Transmission Piping

When un-looped transmission piping is designed, such as raw water supply mains or long runs of treated water transmission along rural routes, it is often prudent to size this piping to convey quantities beyond the 20-year demands. Since it is likely that the pipe itself will be in good condition in 20 years, and the cost increase to upsize slightly is small (approximate same labor cost with small increase in material cost), it may be desirable to ensure the piping can adequately convey 40 or 50 years flows.

4.3 Basis for Cost Estimates

The cost estimates presented in this Plan will typically include four components: construction cost, engineering cost, contingency, and legal/non-engineering project management costs. Each of the cost components is discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Study. Construction costs are based on competitive bidding as public works projects with State prevailing wage rates. As projects proceed and as site-specific information becomes available, the estimates may require updating.

4.3.1 Construction Costs

The estimated construction costs in this Plan are based on actual construction bidding results from similar work, published cost guides, and other construction cost experience. Construction costs are preliminary budget level estimates prepared without design plans and details.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the cost estimates presented herein. For this reason, common engineering practices usually tie the cost estimates to a particular index that varies in proportion to long-term changes in the national economy. The Engineering News Record (ENR) construction cost index (CCI) is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past 10 years are summarized in Table 4.3.1-1.

Table 4.3.1-1 – ENR Index 2000-2009

YEAR	INDEX	% CHANGE/YR
2000	6221	2.67
2001	6343	1.96
2002	6538	3.07
2003	6694	2.39
2004	7115	6.29
2005	7446	4.65
2006	7751	4.10
2007	7967	2.78
2008	8310	4.31
2009	8570	3.13
	Average since 2000	3.54%

Cost estimates presented in this Plan are based on the average of 2009 dollars with an ENR CCI of 8570. For construction performed in later years, costs should be projected based on the then current year ENR Index using the following method:

Updated Cost = Plan Cost Estimate x (current ENR CCI / 8570)

4.3.2 Contingencies

A contingency factor equal to approximately fifteen percent (15%) of the estimated construction cost has been added to the budgetary costs estimated in this Plan. In recognition that the cost estimates presented are based on conceptual planning, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen at this time but may tend to increase final costs. Upon final design completion of any project, the contingency can be reduced to 10%. A contingency of at least 10% should always be maintained going into a construction project to allow for variances in quantities of materials and unforeseen conditions.

4.3.3 Engineering

The cost of engineering services for major projects typically includes special investigations, predesign reports, surveying, foundation exploration, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 18 to 25% of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small or complicated projects.

Engineering costs for basic design and construction services presented in this Plan are estimated at 20% of the estimated total construction cost. Other engineering costs such as specialized geotechnical exploration, easement research and preparation, and/or specific pre-design reports will typically be in addition to the basic engineering fees charged by firms.

4.3.4 Legal and Management

An allowance of four percent (4%) of construction cost has been added for legal and other project management services. This allowance is intended to include internal project planning and budgeting, funding program management, interest on interim loan financing, legal review fees, advertising costs, wage rate monitoring, and other related expenses associated with the project that could be incurred.

4.3.5 Land Acquisition

Some projects may require the acquisition of additional right-of-way, property, or easements for construction of a specific improvement. The need and cost for such expenditures is difficult to predict and must be reviewed as a project is developed. Effort was made to include costs for land acquisition, where expected, within the cost estimates included in this Plan.

Regulatory Conditions

Section 5

5.1 Responsibilities as a Water Supplier

Per OAR 333-061-0025, water suppliers are responsible for taking all reasonable precautions to assure that the water delivered to water users does not exceed maximum contaminant levels, to assure that water system facilities are free of public health hazards, and to assure that water system operation and maintenance are performed as required by these rules. This includes, but is not limited to, the following:

- Routinely collect and submit water samples for laboratory analyses at the frequencies and sampling points prescribed by OAR 333-061-0036 "Sampling and Analytical Requirements";
- Take immediate corrective action when the results of analyses or measurements indicate that maximum contaminant levels have been exceeded and report the results of these analyses as prescribed by OAR 333-061-0040 "Reporting and Record Keeping";
- Continue to report as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels (MCLs) have not been exceeded;
- Notify all customers of the system, as well as the general public in the service area, when the maximum contaminant levels have been exceeded;
- Notify all customers served by the system when the reporting requirements are not being met, or when public health hazards are found to exist in the system, or when the operation of the system is subject to a permit or a variance;
- Maintain monitoring and operating records and make these records available for review when the system is inspected;
- Maintain a pressure of at least 20 pounds per square inch (psi) at all service connections at all times (at the property line);
- Follow-up on complaints relating to water quality from users and maintain records and reports on actions undertaken;
- Conduct an active program for systematically identifying and controlling cross connections;
- Submit, to the DWP, plans prepared by a professional engineer registered in Oregon for review and approval before undertaking the construction of new water systems or major modifications to existing water systems, unless exempted from this requirement;
- Assure that the water system is in compliance with OAR 333-061-0205 "Water Personnel Certification Rules - Purpose" relating to certification of water system operators.
- Assure that Transient Non-Community water systems utilizing surface water sources or sources under the influence of surface water are in compliance with OAR 333-061-0065 "Operation and Maintenance" (2)(c) relating to required special training.

5.2 Public Water System Regulations

Water providers should always be informed of current standards, which can change over time, and should also be aware of pending future regulations. As of this writing, OAR Chapter 333, Division 61 covering Public Water Systems is over 300 pages in length and the latest effective version is dated 5-18-2009. This Section is not meant to be a comprehensive list of all requirements but a general overview of the requirements.

Specific information on the regulations concerning public water systems may be found in the Oregon Administrative Rules (OAR), Chapter 333, Division 61. The rules can be found on the Internet at http://egov.oregon.gov/DHS/ph/dwp/rules.shtml where copies of all the rules and regulations can be printed out or downloaded for reference. A summary of Oregon drinking water quality standards is published in "*Pipeline*" (Volume 21, Issue 4, Fall 2006) by the State Drinking Water Program.

Drinking water regulations were established in 1974 with the signing of the Safe Drinking Water Act (SDWA). This act and subsequent regulations were the first to apply to all public water systems in the United States. The Environmental Protection Agency (EPA) was authorized to set standards and implement the Act. With the enactment of the Oregon Drinking Water Quality Act in 1981, the State of Oregon accepted primary enforcement responsibility for all drinking water regulations within the State. Requirements are detailed in OAR Chapter 333, Division 61. The SDWA and associated regulations have been amended several times since inception with the goal of further protection of public health.

SDWA requires the EPA to regulate contaminants which present health risks and are known, or are likely, to occur in public drinking water supplies. For each contaminant requiring federal regulation, EPA sets a non-enforceable health goal, or maximum contaminant level goal (MCLG). This is the level of a contaminant in drinking water below which there is no known or expected health risk. The EPA is then required to establish an enforceable limit, or maximum contaminant level (MCL), which is as close to the MCLG as is technologically feasible, taking cost into consideration. Where analytical methods are not sufficiently developed to measure the concentrations of certain contaminants in drinking water, the EPA specifies a treatment technique instead of an MCL to protect against these contaminants.

Water systems are required to collect water samples at designated intervals and locations. The samples must be tested in State approved laboratories. The test results are then reported to the State, which determines whether the water system is in compliance or violation of the regulations. There are three main types of violations:

(1) MCL violation — occurs when tests indicate that the level of a contaminant in treated water is above the EPA or State's legal limit (states may set standards equal to, or more protective than, EPA's). These violations indicate a potential health risk, which may be immediate or long-term.

(2) Treatment technique (TT) violation — occurs when a water system fails to treat its water in the way prescribed by EPA (for example, by not disinfecting). Similar to MCL violations, treatment technique violations indicate a potential health risk to consumers.

(3) Monitoring and reporting violation — occurs when a system fails to test its water for certain contaminants or fails to report test results in a timely fashion. If a water system does not monitor its water properly, no one can know whether or not its water poses a health risk to consumers.

If a water system violates EPA/State rules, it is required to notify the State and the public. States are primarily responsible for taking appropriate enforcement actions if systems with violations do not return to compliance. States are also responsible for reporting violation and enforcement information to the EPA quarterly.

To comply with the regulations, water systems must provide adequate treatment techniques, operate treatment processes to meet performance standards, and properly protect treated water to prevent subsequent contamination after treatment.

5.3 Current Standards

There are now EPA-established drinking water quality standards for 91 contaminants, including 7 microbials and turbidity, 7 disinfectants and disinfection byproducts, 16 inorganic chemicals (including lead and copper), 56 organic chemicals (including pesticides and herbicides), and 5 radiologic contaminants. These standards either have established MCLs or treatment techniques. In addition, there are secondary contaminant levels for 16 contaminants that represent desired goals, and in the case of fluoride, may require special public notice.

Total Coliform Rule

The total coliform rule was established by the EPA in 1989 to reduce the risk of waterborne illness resulting from disease-causing organisms associated with animal or human waste. Routine samples collected by Oregon public water suppliers are analyzed for total coliform bacteria. The number of monthly samples required varies based on population served. For Newport, a minimum of 10 samples per month is required.

Compliance is based on the presence or absence of total coliforms in any calendar month. Sample results are reported as "coliform-absent" or "coliform-present". If any routine sample is coliform-present, a set of at least three repeat samples must be collected within 24 hours. If any repeat sample is total coliform-present, the system must analyze that culture for fecal coliforms or *E. coli*, and must then collect another set of repeat samples, unless the MCL has been violated and the system has notified the State. Following a positive routine or repeat total coliform result, the system must collect a minimum of five routine samples the following month.

Systems which collect fewer than 40 samples per month are allowed no more than one coliform-present sample per month including any repeat sample results. Larger systems (40 or more samples per month) are allowed no more than five percent coliform-present samples in any month including any repeat sample results. Confirmed presence of fecal coliform or *E. coli* presents a potential acute health risk and requires immediate notification of the public to take protective actions such as boiling or using bottled water. Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal or *E. coli*-positive routine sample is a violation of the MCL.

Surface Water Treatment Rules

All water systems using surface water must provide a total level of filtration and disinfection treatment to remove/inactivate 99.9 percent (3-log) of *Giardia lamblia*, and to remove/inactivate 99.99 percent (4-log) of viruses. In addition, filtered water systems must physically remove 99 percent (2-log) of *Cryptosporidium.* Systems with source water *Cryptosporidium* levels exceeding specified limits must install and operate additional treatment processes.

Filtered water systems must meet specified performance standards for combined filter effluent turbidity levels, and water systems using conventional and direct filtration must also record individual filter effluent turbidity and take action if specified action levels are exceeded. When more than 1 filter exists, each filter's effluent turbidity must be monitored continuously and recorded at least every 15 minutes. The combined flow from all filters must have a turbidity measurement at least every four hours by grab sampling or continuous monitoring. Turbidity monitoring must occur prior to any storage such as a clearwell or contact tank. Turbidity monitoring equipment must be calibrated using an approved method at least once per quarter. General requirements for systems utilizing conventional or direct filtration are:

- Individual filter turbidity monitored continuously and recorded every 15 minutes or less
- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours
- Combined filter turbidity less than 1 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 0.3 NTU in 95% of measurements in a month
- Specific follow-up actions if individual filter turbidity exceeds 1.0 NTU twice

General requirements for systems utilizing slow sand, and alternative filtration (membrane filtration and cartridge filtration) are:

- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours Department may reduce to once per day if determined to be sufficient
- Combined filter turbidity less than 5 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 1 NTU in 95% of measurements in a month
- Department may require lower turbidity values if the above levels cannot provide the required level of treatment

All water systems must meet specified CxT [concentration x time] requirements for disinfection, and meet required removal/inactivation levels. In addition, a disinfectant residual must be maintained in the distribution system.

- Continuous recording of disinfectant residual at entry point to the distribution system. Small system may be allowed to substitute 1-4 daily grab samples.
- Daily calculation of CxT at highest flow (peak hourly flow)
- Provide adequate CxT to meet needed removal/inactivation levels
- Maintain a continuous minimum 0.2 mg/L disinfectant residual at entry point to the distribution system
- Maintain a minimum detectable disinfectant residual in 95% of the distribution system samples (collected at coliform bacteria monitoring points)

Filtered water systems that recycle spent filter backwash water or other waste flows must return those flows through all treatment processes in the filtration plant. Systems wishing to recycle filter backwash water must provide notice to the State including a plant schematic showing the origin, conveyance, and return location of recycled flows. Design flows, observed flows, and typical recycle flows are also required along with a state-approved plant operating capacity.

Disinfectants and Disinfection Byproducts

Disinfection treatment chemicals used to kill microorganisms in drinking water can react with naturally occurring organic and inorganic matter in source water, called DBP precursors, to form disinfection byproducts (DBPs). Some disinfection byproducts have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans. The challenge is to apply levels of disinfection treatment needed to kill disease-causing microorganisms while limiting the levels of disinfection byproducts produced. The primary disinfection byproducts of concern in Oregon are the total trihalomethanes (TTHM) and the haloacetic acids (HAA5).

Disinfection byproducts must be monitored throughout the distribution system at frequencies of daily, monthly, quarterly, or annually, depending on the population served, type of water source, and the specific disinfectant applied, and in accordance with an approved monitoring plan. Disinfectant residuals must be monitored at the same locations and frequency as coliform bacteria.

Total organic carbon (TOC) is an indicator of the levels of DBP precursor compounds in the source water. Systems using surface water sources and conventional filtration treatment must monitor source water for TOC and alkalinity monthly and practice enhanced coagulation to remove TOC if it exceeds 2.0 mg/L as a running annual average.

Compliance is determined based on meeting maximum contaminant levels (MCLs) for disinfection byproducts and maximum levels for disinfectant residual (MRDLs) over a running annual average of the sample results, computed quarterly.

- TTHM/HAA5 monitoring required in distribution system. One sample per quarter for systems serving 500-9,999 persons. One sample per year in warmest month required for systems serving less than 500.
- MCL for TTHM is 0.080 mg/L. MCL for HAA5 is 0.060 mg/L.
- Any system having TTHM > 0.064 mg/L or HAA5 > 0.048 based on a running annual average must conduct disinfection profiling.
- TOC and alkalinity monitoring in source water monthly. Enhanced coagulation if TOC greater than 2.0 mg/L
- Comply with MRDLs. Limit for chlorine (free Cl_2 residual) is 4.0 mg/L. Limit for chloramines is 4.0 mg/L (as total Cl_2 residual). Limit for chlorine dioxide is 0.8 mg/L (as ClO_2)
- Bromate MCL of 0.010 mg/L
- Chlorite MCL of 1.0 mg/L

Long-Term 2 Enhanced Surface Water Treatment Rule

LT2ESWTR was published by the U.S. EPA on January 5, 2006. The Oregon rule is due by January 5, 2010. The rule requires source water monitoring for public water systems that use surface water or ground water under the influence of surface water. Based on the system size and filtration type, systems must monitor for *Cryptosporidium*, *E. coli*, and turbidity. Source water monitoring data will be used to categorize the source water *Crypto* concentration into four "bin" classifications that have associated treatment requirements. Systems serving 10,000 or more people are required to conduct 24 months of *Crypto* monitoring. Systems serving fewer than 10,000 people are required to conduct 12 months of *E. coli* monitoring and 12-24 months of *Crypto* monitoring if E. coli trigger levels are exceeded. The rule provides other options to comply with the initial source water monitoring that include either submitting previous *Crypto* data meeting (grandfathered data) the requirements or committing to provide a total of at least 5.5-log treatment for *Cryptosporidium.* A second round of source water monitoring will follow 6 years after the system makes its initial bin determination.

<u>Critical Deadlines for LT2ESWTR for systems serving less than 10,000 persons include:</u>

Submit sample schedule and sample location description:____________July 1, 2008 (July 1, 2010*)
Begin first round of source water monitoring:______________________October 2008 (April 2010*)
Submit Grandfathered Data (if applicable):________________________Dec. 1, 2008 (June 1, 2010*
Submit Bin Classification:_______________________________________September 2012
Comply with Rule:____October 1, 2014
Begin second round of source water monitoring: __________________Oct. 1, 2017 (April 1, 2019*)

** Cryptosporidium monitoring - applies to filtered systems that exceed E. coli trigger*

Critical Deadlines for LT2ESWTR for systems serving 10,000 to 49,999 persons include:

Submit sample schedule and sample location description:______January 1, 2008
Begin first round of source water monitoring:_______________April 2008
Submit Grandfathered Data (if applicable):________________June 1, 2008
Submit Bin Classification:_______________________________September 2010
Comply with Rule:___________________________________October 1, 2013
Begin second round of source water monitoring: ____________October 2016

Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 DBPR was published by the U.S. EPA on January 4, 2006. The Oregon rule is expected to be finalized on January 4, 2010. The rule builds on existing regulations by requiring water systems to meet disinfection byproduct (DBP) MCLs at each monitoring site in the distribution system. Whereas the Stage 1 Rule controls average DBP levels across distribution systems, the Stage 2 Rule controls the occurrence of peak DBP levels within distribution systems.

The rule requires all community water systems to conduct an Initial Distribution System Evaluation (IDSE). The goal of the IDSE is to characterize the distribution system and identify monitoring sites where customers may be exposed to high levels of TTHM and HAA5. There are four ways to comply with the IDSE requirements: Standard Monitoring, System Specific Study, 40/30 Certification, and Very Small System (VSS) Waiver.

Standard monitoring (SM) is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. These data will be used with the Stage 1 data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the Initial Distribution System Evaluation (IDSE) requirements of the Stage 2 DBPR. The number of monitoring sites, the monitoring periods, and monitoring frequency vary depending on population served.

Systems that have extensive TTHM and HAA5 data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study (SSS) to select the Stage 2 DBPR compliance monitoring locations.

The term "40/30" refers to a system that during a specific time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and no monitoring violations during the same period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

The Very Small System (VSS) Waiver applies to systems that serve fewer than 500 people and have eligible TTHM and HAA5 data. The VSS eligibility does not depend on the actual TTHM and HAA5 sample results. These systems also have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring. 40/30 certifications were previously due for systems larger than 10,000 persons. For systems less than 10,000 persons, the 40/30 due date is April 1, 2008.

Critical Deadlines for Stage 2 DBPR for systems serving less than 10,000 persons include:

Submit SM Plan or SSS Plan:_____________________________April 1, 2008
Complete SM:____March 31, 2010
Submit IDSE Report:___________________________________July 1, 2010
Begin Compliance Monitoring:____________________________October 1, 2013

Critical Deadlines for Stage 2 DBPR for systems serving 10,000 to 49,999 persons include:

Submit SM Plan or SSS Plan:________________October 1, 2007
Complete SM:________________September 30, 2009
Submit IDSE Report:________________January 1, 2010
Begin Compliance Monitoring:________________October 1, 2013

Lead and Copper

Excessive levels of lead and copper are harmful and rules exist to limit exposure through drinking water. Lead and copper enter drinking water mainly from corrosion of plumbing materials containing lead and copper. Lead comes from solder and brass fixtures. Copper comes from copper tubing and brass fixtures. Protection is provided by limiting the corrosivity of water sent to the distribution system. Treatment alternatives include pH adjustment, alkalinity adjustment, or both, or adding passivating agents such as orthophosphates.

Samples from community systems are collected from homes built prior to the 1985 prohibition of lead solder in Oregon. One-liter samples of standing water (first drawn after 6 hours of non-use) are collected at homes identified in the water system sampling plan. Two rounds of initial sampling are required, collected at 6-month intervals. Subsequent annual sampling from a reduced number of sites is required after demonstration that lead and copper action levels are met. After three rounds of annual sampling, samples are required every 3 years. The number of initial and reduced samples required is dependent on the population served by the water system.

In each sampling round, 90% of samples from homes must have lead levels less than or equal to the Action Level of 0.015 mg/L and copper levels less than or equal to 1.3 mg/L. Water systems with lead above the Action Level must conduct periodic public education, and either install corrosion control treatment, change water sources, or replace plumbing.

- Have Sampling Plan for applicable homes
- Collect required samples
- Meet Action Levels for Lead and Copper (0.015 mg/L for Lead and 1.3 mg/L for Copper)
- Rule out source water as a source of significant lead levels
- If Action Levels not met, provide corrosion control treatment and other steps

On October 10, 2007 EPA published the 2007 Final Revisions to the Lead and Copper Rule. The Oregon rule is projected for 2009 to 2011. The rule addresses confusion about sample collection by clarifying language that speaks to the number of samples required and the number of sites from which samples should be collected. The rule also modifies definitions for monitoring and compliance periods to make it clear that all samples must be taken within the same calendar year. Finally, the rule adds a new reduced monitoring requirement, which prevents water systems above the lead action level to remain on a reduced monitoring schedule.

Inorganic Contaminants

The level of many inorganic contaminants is regulated for public health protection. These contaminants are both naturally occurring and can result from agriculture or industrial operations. Inorganic contaminants most often come from the source of water supply, but can also enter water from contact with materials used for pipes and storage tanks. Regulated inorganic contaminants include arsenic, asbestos, fluoride, mercury, nitrate, nitrite, and others. A possible future MCL for Nickel is currently being evaluated by EPA.

Compliance is achieved by meeting the established MCLs for each contaminant. Systems that cannot meet one or more MCL must either install treatment systems (such as ion exchange or reverse osmosis) or develop alternate sources of water.

- Sample quarterly for Nitrate (reduction to annual may be available)
- Communities with Asbestos Cement (AC) pipe must sample every 9 years for Asbestos
- Sample annually for Arsenic. New MCL of 0.010 mg/L effective January 2006
- Sample annually for all other inorganics. Waivers are available based on monitoring records showing three samples below MCLs. MCLs vary based on contaminant

Organic Chemicals

Organic contaminants are regulated to reduce exposure to harmful chemicals through drinking water. Examples include acrylamide, benzene, 2,4-D, styrene, toluene, and vinyl chloride. Major types of organic contaminants are Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs). Organic contaminants are usually associated with industrial or agricultural activities that affect sources of drinking water supply, including industrial and commercial solvents and chemicals, and pesticides. These contaminants can also enter from materials in contact with the water such as pipes, valves and paints and coatings used inside water storage tanks.

At least one test for each contaminant from each water source is required during every 3-year compliance period. Public water systems serving more than 3,300 people must test twice during each 3-year compliance period for SOCs. Public water systems using surface water sources must test for VOCs annually.

Compliance is achieved by meeting the established MCL for each contaminant. Quarterly follow up testing is required for any contaminants that are detected above the specified MCL. Only those systems determined by the State to be at risk must monitor for dioxin. Water systems using polymers containing acrylamide or epichlorohydrin in their water treatment process must keep their dosages below specified levels. Systems that cannot meet one or more MCL must either install or modify water treatment systems (such as activated carbon and aeration) or develop alternate sources of water.

- At least one test for each contaminant (for each water source) every 3-year compliance period
- Sample twice each compliance period for each SOCs when system over 3,300 people
- Test VOCs annually
- Quarterly follow up testing required for any detects above MCL
- Maintain polymer dosages in treatment process below specified levels
- MCLs vary based on contaminant

Radiologic Contaminants

Radioactive contaminants, both natural and man-made, can result in an increased risk of cancer from long-term exposure and are regulated to reduce exposure through drinking water. Rules were recently revised to include a new MCL for uranium (30 µg/L), and to clarify and modify monitoring requirements. Initial monitoring tests, quarterly for one year at the entry point from each source, were to be completed by December 31, 2007 for gross alpha, radium-226, radium-228 and uranium. A single analysis for all four contaminants collected between June 2000 and December 2003 will substitute for the four initial samples. Gross alpha may substitute for radium-226 if the gross alpha result does not exceed 5 pCi/L and may substitute for uranium monitoring if the gross alpha result does not exceed 15 pCi/L. Subsequent monitoring is required every three, six, or nine years depending on the initial results, with a return to quarterly monitoring if the MCL is exceeded. Compliance with MCLs is based on the average of the four initial test results, or subsequent quarterly tests. Community water systems than cannot meet MCLs must install treatment (such as ion exchange or reverse osmosis) or develop alternate water sources.

5.4 Future Water System Regulations

The 1996 Safe Drinking Water Act (SDWA) requires EPA to review and revise as appropriate each current standard at least every six years. Data is continually collected on contaminants currently unregulated in order to support development of future drinking water standards. Drinking water contaminant candidate lists (CCL) are prepared and revised every five years. The first DWCCL (CCL1) was published on March 2, 1998 which included 51 chemicals and 9 microbials. In 2003, EPA decided not to regulate any of the 9 microbials from the initial list. In 2005 EPA published the second CCL (CCL2) consisting of the remaining 51 contaminants from the first list. The Agency published the preliminary regulatory determinations for 11 of the 51 contaminants listed on the second CCL in April of 2007. In 2008 EPA published the draft third Contaminant Candidate List (CCL3) to help identify unregulated contaminants that may require a national drinking water regulation in the future. In September 2009 EPA finalized CCL3which includes 104 chemicals or chemical groups and 12 microbiological contaminants. The EPA must publish a decision on whether to regulate at least five contaminants from the CCL every 5 years. As a result, additional contaminants can become regulated in the future.

In addition, rule revisions and new rules will occur to further address health risks from disinfection byproducts and pathogenic organisms. Rules such as the Long-Term Stage 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfectants/Disinfection Byproducts Rule (State 2 DBPR) have recently gone into effect at the federal level and require systems to begin planning for compliance. New and revised drinking water quality standards are mandated under the 1996 federal SDWA. Known future standards (and their likely EPA promulgation date) include:

- Radon Rule (2009)
- Distribution Rule, including revised coliform bacteria requirements (2010)

Water suppliers should be aware of and familiar with these mandates and deadlines, and plan strategically to meet them. DHS, under the Primacy Agreement with the EPA, has up to two years to adopt each federal rule after it is finalized. Water suppliers generally have at least three years to comply with each federal rule after it is finalized; however, some of these rules will likely establish a significant number of compliance dates for water suppliers that will occur prior to state adoption of the rules. These "early implementation" dates will likely have to be implemented in Oregon directly by the EPA, because the state program will not yet have the rules in place or the resources to carry them out.

These anticipated rules are described generally below. Additional details will be found in the final EPA rules once they are promulgated.

Radon Rule

All community water systems using groundwater sources will conduct quarterly initial sampling at distribution system entry points for one year. Subsequent sampling will occur once every 3 years. The Radon MCL is expected to be 300 pCi/L. An alternative MCL (AMCL) of 4,000 pCi/L is proposed if the State develops and adopts an EPA-approved statewide Multi-Media Mitigation (MMM) program. Local communities may have the option of developing an EPA-approved local MMM program in the absence of a statewide MMM program, and meeting the AMCL.

Distribution Rule

Under this rule, current requirements for coliform bacteria will be revised, emphasizing fecal coliforms and *E. coli*, and focusing on protection of water within the distribution system. The rule will apply to all public water systems and will involve identifying and correcting sanitary defects and hazards in water systems and using best management practices for disinfection to control coliform bacteria in the system.

5.5 Water Management and Conservation Plans

The Municipal Water Management and Conservation Planning (WMCP) program provides a process for municipal water suppliers to develop plans to meet future water needs. Municipal water suppliers are encouraged to prepare water management and conservation plans, but are not required to do so unless a plan is prescribed by a condition of a water use permit; a permit extension; or another order or rule of the Commission. These plans will be used to demonstrate the communities' needs for increased diversions of water under the permits as their demands grow. A master plan prepared under the requirements of the Department of Human Resources Drinking Water Program or the water supply element of a public facilities plan prepared under the requirements of the Department of Land Conservation and Development which substantially meets the requirements of OAR 690-086-0125 to 690-086-0170 may be submitted to meet the requirements for WMCPs. Rules for WMCPs are detailed in OAR 690, Division 86.

A WMCP provides a description of the water system, identifies the sources of water used by the community, and explains how the water supplier will manage and conserve supplies to meet future needs. Preparation of a plan is intended to represent a pro-active evaluation of the management and conservation measures that suppliers can undertake. The planning program requires municipal water suppliers to consider water that can be saved through conservation practices as a source of supply to meet growing demands if the saved water is less expensive that developing new supplies. As such, a plan represents an integrated resource management approach to securing a community's long-term water supply.

Many of the elements required in a plan are also required under similar plans by the Drinking Water Section of the state Department of Human Services (water system master plans) and Department of Land Conservation and Development (public facilities plans). Water providers can consolidate overlapping plan elements and create a single master plan that meets the requirements of all three programs.

Every municipal water supplier required to submit a WMCP shall exercise diligence in implementing the approved plan and shall update and resubmit a plan consistent with the requirements of the rules as prescribed during plan approval. Progress reports are required showing 5-year benchmarks, water use details, and a description of the progress made in implementing the associated conservation or other measures.

The WMCP shall include the following elements:

1) Water System Description including infrastructure details, supply sources, service area and population, details of water use permits and certificates, water use details, customer details, system schematic, and leakage information.

2) Water Conservation Element including description of conservation measures implemented and planned, water use and reporting program details, progress on conservation measures, and conservation benchmarks.

3) Water Curtailment Element including current capacity limitations and supply deficiencies, three or more stages of alert for potential water shortages or service difficulties, levels of

water shortage severity and curtailment action triggers, and specific curtailment actions to be taken for each stage of alert.

4) Water Supply Element detailing current and future service areas, estimates of when water rights and permits will be fully exercised, demand projections for 10 and 20 years, evaluation of supply versus demand, and additional details should an expansion of water rights be anticipated.

Failure to comply with rules for WMCPs can result in enforcement actions by the Water Resources Department Director. Enforcement actions can include requirements for additional information and planning, water use regulation, cancellation of water use permits, or civil penalties under OAR 690-260-0005 to 690-260-0110.

Existing Water System

Section 6

6.1 Water Supply

6.1.1 Water Sources

The City of Toledo holds water rights and obtains water from both Mill Creek and from the Siletz River (mid-coast basin). Mill Creek, a tributary to the Yaquina River, was the original supply for the town with water rights dating back to 1911. The Siletz was added as a source in 1929. The Mill Creek Dam and Reservoir is located approximately 2.75 miles by road to the south of town and the Siletz River Intake is located approximately 6 miles north of town (see Figure 6.1.1-1). Due to seasonal changes in water quality at each source, each water source is utilized at different times of the year. Mill Creek is primarily used in the winter and spring when high turbidity exists in the Siletz River and the Siletz is used primarily in the summer and fall when algae blooms in the Mill Creek Reservoir affect water quality. No contaminants of concern including excessive nitrates, radionuclides, arsenic, or other chemicals have ever been detected in the source water and total organic carbon (TOC) is typically less than 1 mg/L.

The Mill Creek source includes the Mill Creek Dam and Reservoir. Water from the reservoir flows by gravity through a single raw water transmission pipe to the Mill Creek Raw Water Pump Station where it is boosted up to the water treatment plant. The Siletz River source includes a screened river intake and pump station at the river bank which conveys water to the treatment plant through another raw water transmission pipe. The various components the water supply system are discussed in following sections.

6.1.2 Water Rights

Water rights on the Siletz River held by Toledo total 9.8 cfs or 4398 gpm. The Seal Rock Water District water right of 2.6 cfs or 1166 gpm may also be considered since the diversion point is the same as Toledo's and the Toledo infrastructure must be used to pump and treat that water. Instream Water Rights (ISWR) were established in the Siletz River in 1966, 1974 and 1991.

Table 6.1.2-1 – Water Rights Summary

Source Name	Permit	Certificate	Use	Priority Date	Rate (cfs)
Siletz River > Siletz Bay	S9370	~	Municipal	10/24/1929	4.0
Siletz River > Siletz Bay	S12553	14396	Municipal	2/12/1937	1.75
Siletz River > Siletz Bay	S44083	~	Municipal	3/23/1979	4.0
Siletz River (Seal Rock)	S40277	~	Municipal	2/28/1973	2.6
				Siletz Total	12.4
Mill Creek > Yaquina R.	S709	905	Domestic	1/14/1911	5.0
Mill Creek > Yaquina R.	S4085	9040	Domestic	5/15/1919	10.0
Mill Creek > Yaquina R.	S7192	9048	Municipal	12/22/1924	0.75
Unnamed Stream > Mill Cr.	S7191	9047	Municipal	12/22/1924	0.75
				Mill Creek Total	16.50

Storage	Permit	Certificate		Priority Date	Storage (acre-feet)
Mill Creek	S33124	42194		11/9/1959	250

At the point of diversion (POD) for Toledo's water supply near river mile 40, the 1966 ISWR reserves 100 cfs from July 1 to September 30. The 1974 ISWRs in the Siletz are upstream from the POD and should not affect Toledo's water rights. The 1991 ISWR modifies the 1966 ISWR only by slightly increasing the rights in November and December. Streamflow records for USGS Gauging Station 14-3055 near river mile 42.6 show that summer flows in the Siletz can often drop below the 100 cfs ISWR thereby potentially causing a restriction in use for water rights dated after 1966 (junior to ISWR). Toledo's water rights on the Siletz River senior to the ISWR total 5.75 cfs or 2580 gpm.

Water rights held by Toledo on Mill Creek total 16.50 cfs or 7405 gpm however only 15.0 cfs or 6732 gpm can likely be used. The original 1911 water right has a POD upstream of the dam and the 1919 water right has a POD at the dam. The two 1924 water rights on Mill Creek and an unnamed tributary (possibly Slack Creek now) have PODs located downstream of the dam and are not being used. It is typically allowable to withdraw water downstream from a listed POD but not upstream therefore the 1924 rights likely cannot be withdrawn at the dam. The State filed for ISWR on Mill Creek in 1991 however Toledo's rights are senior. A small 0.06 cfs water right was issued to ODFW in 2005 to operate a pelton wheel to develop energy necessary to operate batteries for a fish trap at the dam's fish ladder.

6.1.3 Mill Creek Dam and Reservoir

A concrete-core earthen dam was constructed on Mill Creek in 1965 to 1967 to create the current Mill Creek Reservoir. The dam is approximately 65 feet tall from the original stream channel bottom and 265 feet long at the top. The permitted storage amount in the reservoir is 250 acre-feet (81.5 million gallons) with approximately 15 acres of surface area. According to the original permit, the depth averages 16.6 feet with a maximum of 55 feet. The spillway consists of three 5 foot diameter corrugated metal pipes (CMP). The outlet is a 30-inch concrete pipe. A concrete fish ladder also exists. According to the past Master Plan, the original dam design includes provisions to raise the height by 10 feet.

Mill Creek Reservoir

The water surface elevation in the reservoir is approximately 170 to 180 feet above sea level based on USGS Toledo South quadrangle map and 145 feet based on the 2002 Lee Engineering report.

The City of Toledo owns approximately 400 acres of the Mill Creek watershed above the reservoir and the remainder is owned by the United States Forest Service, along with other private forestland owners.

Mill Creek Dam Fish Ladder

In 2007, Artisan Forestry Inc. conducted a rough analysis for the City of Toledo to estimate logging income potential in the Mill Creek watershed. The analysis determined that a 280 acre parcel surrounding the reservoir could be commercially logged now and a smaller 120 acre parcel could be logged in 10 to 15 years. Income potential to the City varied widely depending on log prices and was estimated to range from $500,000 to $1,000,000.

Possibly due to the relatively shallow average water depth, algae problems are reported in summer months for water from the Mill Creek Reservoir creating taste and odor issues. In addition, higher than desired iron and manganese levels are reported creating more difficult treatment conditions. For these water quality reasons, Mill Creek water is historically used only in winter and spring months when water quality is high. Past plans report that during winter months, even during storm events, turbidity from the Mill Creek source rarely exceeds 1.0 NTU.

Even though certificated water rights on Mill Creek that can be withdrawn at the current dam POD total 15.0 cfs (9.7 mgd), the actual flow of water available is often substantially less than this amount. The original water treatment plant operations and maintenance manual indicates that the minimum dependable yield of the Mill Creek Reservoir over the worst case July 1 to September 30 period was estimated at 1.1 to 1.3 mgd based on a low streamflow in the basin itself of 0.4 mgd. It is unlikely that the Mill Creek source alone could supply the entire City for prolonged periods in the summer months without increasing the height of the dam.

6.1.4 Mill Creek Raw Water Pump Station

The existing Mill Creek Raw Water Pump Station was constructed in 1968. Raw water from the Mill Creek Dam flows by gravity to the pump station and the pump station adds energy to lift the water up to the treatment plant.

The station contains two Worthington vertical-turbine can pumps installed side by side. One pump is a 6 stage model 10M-50-5 and the other is a 5 stage model 10M-50-5. Each pump includes a 40 Hp G.E. motor running on 480 volt, 3-phase power. Based on plant records (no flowmeter exists in pump station), the station pumps 790-850 gpm to the plant with both pumps running simultaneously and approximately 425 gpm with a single pump running.

The pump station floor is at elevation 14 feet and the water surface behind the dam at the spillway is 145 feet providing an estimated suction pressure at the pump station of 56 psi under static conditions. The water treatment plant water level is at approximately 311 feet resulting in a static pressure of approximately 128 psi on the pump discharge. With existing conditions, the total dynamic head is approximately 190 feet at 425 gpm and 235 feet at 800 gpm.

At least one of the pump bowl assemblies has been replaced since installation 41 years ago. In 2003 electrical improvements were constructed at the Mill Creek Raw Water PS including a new 480/277V service with service transformer and CT style metering, new motor control panel with 600 amp main breaker and full voltage starters, and a new 600V transfer switch and wire to generator.

The Mill Creek Raw Water PS building is in good condition including the electrical system. The pumps and mechanical piping are in fair condition but are past their expected design life. Replacement of the pumps and valves during the planning period is likely to be required. Even with both pumps operating simultaneously, the station is not able to produce the current peak day demands although this goes unnoticed since summer peaks are pulled from the Siletz River. If problems were to occur preventing supply from the Siletz Intake in the summer, the Mill Creek PS would not be able to keep up with current demands. Future demands will further underscore this capacity deficiency.

6.1.5 Mill Creek Raw Water Transmission Pipe

The Mill Creek raw water transmission piping is approximately 28,230 feet long and is mostly 12-inches in diameter. Detailed descriptions of the condition and routing of the pipe were developed in the 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering, Inc.

The portion from the Mill Creek Dam to the Mill Creek Raw Water PS is about 18,130 feet long. This section consists of 12-inch AC pipe installed in 1950 (11.5-inch internal diameter) except for a 330 foot section of 12-inch cast iron pipe under the Yaquina River. This section of piping has numerous difficult to access areas including overgrown and eroded construction roads, buried creek crossings, marsh/wetland crossings, the Yaquina River crossing, and sections under buildings and the railroad. The capacity of this suction side portion of the transmission main is limited to approximately 1,540 gpm before negative pipeline pressures occur based on 130 feet of head between the dam and pump station. If the Mill Creek Reservoir water level is 10 feet below the spillway (120 feet of head to pump station), the capacity of the suction line drops to 1,475 gpm.

The portion from the Mill Creek Raw Water PS to the Water Treatment Plant is about 10,100 feet long. This section consists of 8,650 feet of 12-inch AC installed in 1968 and 1975, 250 feet of 14-inch DIP on Beech Street between 2nd and 3rd Streets installed around 2002, and about 1,200 feet of 8-inch AC leading up to the treatment plant installed prior to 1975. This section of piping also has difficult to access wetland crossing areas however much of the route is along roadways. The capacity of this discharge side portion of the transmission main is limited to approximately 1000 gpm before pump discharge pressures in excess of 150 psi occur.

In general, the 60 year old Mill Creek Raw Water Transmission Pipe is undersized and deteriorating. If Mill Creek is to continue as a reliable source of water for the city the piping must be replaced. Numerous repairs have been required in the past and the frequency of leaks and failures can be expected to increase as the pipe continues to age. Especially of concern is the difficult access due to physical terrain and environmental considerations.

The 1998 Water Master Plan recommended replacement of 15,000 feet of the Mill Creek piping. In 2002, another report focused purely on raw water transmission and further investigated alternative routes and environmental mitigations. The 2002 report recommended replacement of the entire Mill Creek Raw Water Transmission Pipe, except for the 14-inch section on Beech Street, with new 16-inch piping. The preferred route was selected based on input from environmental specialists and generally follows roadways thus eliminating much of the wetlands issues. Such rerouting requires the abandonment of the existing Mill Creek Raw Water Pump Station and its reconstruction near the Mill Creek Dam. Estimated construction cost for the 2002 recommended Mill Creek supply improvements were $5.5 million.

6.1.6 Siletz River Intake and Pump Station

The Siletz River Intake and Pump Station were constructed around 1938 near Camp Twelve at river mile 40. Screen upgrades were constructed in 1979 to include bi-level withdrawal elevations with bar screens, fine screens, and manual sluice gates to select the upper or lower withdrawal point. Floor elevation at the pump station is approximately 120 feet and the bottom of the 8 foot diameter wetwell is at 82.5 feet. The station has three Johnson 8-stage model 10 B-C vertical turbine pumps with 30 foot columns into the wetwell below. Each pump has a 40 Hp G.E. motor running on 480V, 3-phase power. Each pump discharge includes a propeller type flowmeter and swing type check valve. A galvanized metal-sided and wood framed building houses the pumps and appurtenances. The pump station lifts water from the Siletz River near elevation 90 and pumps all the way to the treatment plant at elevation 311 feet.

Heavy sand and silt loads in the winter months in the Siletz destroy pump bearings and increase treatment difficulty. Due to the high seasonal turbidity, the Siletz pump station is not used in winter and spring months.

Based on plant records the Siletz River Raw Water Pump Station outputs 820 to 1300 gpm depending on the number of pumps running. At 1300 gpm the pressure at the pump station is around 115 psi. The pump station has the ability to convey current peak demands to the treatment plant however future demands for the planning period cannot be met.

The 1998 Master Plan describes voids and erosion at the base of the wetwell, the apparent lack of a concrete base at the wetwell bottom, and significant cracks in the station concrete floor. During site visits in 2009 the significant structural cracking of the slab was noted indicating continued ground movement. In addition, evidence of ground sloughing and slides are visible at the site around the building due to a general instability of the river bank in the area.

The 70-year old Siletz River Intake and Pump Station is in poor condition and significant improvements would be needed to correct the existing station including improved fish screening, new pumps and mechanical piping, new electrical system, and significant structural stabilization and repair. The evidence of ground movement at the site indicates the need for geotechnical investigations and potentially expensive site stabilization efforts before any major investment at the site.

An analysis of Siletz River streamflows recorded at USGS gauging station 1430550 near the City's intake was completed using data from 1904 to 2006. Average mean monthly flow ranged from a high of 2364 cfs in 1933 to a low of 863 cfs in 1944 with an average of 1516 cfs. The lowest streamflow month is August with a mean of 130 cfs. The lowest average monthly flow recorded was 62.5 cfs in August 2003. The lowest daily flow recorded was 42 cfs on September 6, 2003. In terms of streamflow, the driest year on record was 1944. The streamflow records indicate that sufficient flow should always be available to supply the Toledo water rights necessary for the planning period, as well as the full 5.75 cfs water right senior to the instream rights.

6.1.7 Siletz River Raw Water Transmission Pipe

The Siletz River Raw Water Transmission Pipe is approximately 33,975 feet long and consists of 19,075 feet of 18-inch, 2,100 feet of 16-inch, 10,000 feet of 14-inch and 2,800 feet of 12-inch pipe. The 18-inch pipe is ductile iron installed in 1975 or after. The 16-inch is ductile iron installed in 1979 along with the Siletz Intake screening improvements. The 14-inch is ductile and cast iron installed sometime prior to 1978. The 12-inch is AC pipe installed around 1961 which was later submerged when the Olalla Dam was constructed and the Olalla Reservoir was created. Detailed descriptions of the condition and routing of the pipe were developed in the 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering, Inc. The extreme high point in the piping rises to an elevation of 350 feet above sea level.

Of primary concern with the pipeline is the inaccessible and nearly 50-year-old section of 12-inch AC under the Olalla Reservoir (pipe existed prior to Olalla dam construction). The detailed 2002 report evaluated several alternatives and recommended a new lake crossing with HDPE pipe as the lowest cost option at approximately $1.1 million in construction. The remaining ductile iron piping should have a remaining material life longer than the planning period for this Plan.

If the Siletz River is to be used as a reliable source of water for the community, the Olalla Reservoir section of the transmission pipe must be addressed. Continued service without problems for another 20-year period is unlikely. The ductile iron portions of the piping should be materially sound for many years beyond the planning period, potentially up to 100 years in age. Since the Siletz Intake and Pump Station must also receive replacement and/or improvement, overall sizing and replacement of 14-inch sections of the raw water transmission pipe should be considered when sizing pumps and evaluating long-term energy costs.

6.2 Water Treatment

6.2.1 General

The Toledo Water Treatment Plant is a conventional surface water treatment plant constructed in 1976. The adjacent concrete clearwell at the plant was constructed in 1938. Upgrades to the instrumentation and controls system, individual filter effluent turbidimeters, new filter media, and other minor improvements were constructed in 1999. Primary plant control is now through PLC programming with a Wonderware interface and SCADA system. Original design capacity of the plant was 3.0 mgd or 2080 gpm. Today, flows required through the plant range from 850 to 1300 gpm.

The plant consists of two side-by-side identical treatment trains in exterior concrete basins with a chemical feed and storage room, a lower equipment/pipe gallery room, an upper control room overlooking the treatment basins, and a fairly deep concrete-walled backwash waste basin. The plant pumps including a backwash pump, surface wash pump, plant water supply pump, and booster pump are located outside over a wetwell type basin adjacent to the clearwell. The booster pump is not used at this time as treated water flows by gravity to the clearwell and then by gravity to the Ammon Road Storage Tank. At times the Ammon Road Tank fills more slowly than desired due to hydraulic restrictions and demand in the distribution system however use of the booster pump to increase flows (also boosts pressure 10 psi) to the tank results in pipeline failures, especially in some of the older piping along Sturdevant Road. A basic site plan of the plant is shown in Figure 6.2.1-1. A simple hydraulic schematic of the plant and other parts of the system is shown in Figure 6.2.1-2.

The 34-year old plant is located on the top of a hill with little extra room available for expansion. Evidence of ground movement is apparent on the northerly slope and some cracking of the concrete backwash waste basin can be seen. Horizontal cracking and minor leakage is evident at the 70-year old concrete clearwell.

In general, finished water quality is good and the plant functions properly. Typical finished water turbidity is around 0.03 NTU. The State of Oregon credits the plant filtration process with 2.5-log removal credit for *Giardia* and 2.0-log removal credit for *Cryptosporidium*. Several components of the plant are past their design life and will undoubtedly require replacement in the near future. Even though flows today are lower than the 2080 gpm original design flow, treatment standards today are much more stringent than existed in 1976 during plant design and construction. Various major components of the plant are discussed in following sections.

6.2.2 Chemical Addition and Rapid Mix

Original plant provisions included injection points for activated carbon for taste and odor control, potassium permanganate for iron and manganese precipitation, alum for primary coagulation, lime for pH and alkalinity adjustment, and polymer for a coagulant aid. Coagulant addition occurs in the chemical room where an in-line mechanical flash mixer is situated in the 18-inch raw water feed line. Provisions for feed points also exist after flocculation. Activated carbon and permanganate are not being used at this time.

Alum dosage at the Toledo plant typically ranges from 8 to 11 mg/L. During periodic storm events dosage is increased to 15 to 30 mg/L. Liquid alum is stored in a 7,600 gallon fiberglass reinforced plastic tank. A cationic polymer (573C) used as coagulant aid at a dose of 0.1 mg/L.

As with many surface waters in Oregon, the Siletz River and Mill Creek are relatively low in natural alkalinity and supplemental alkalinity is required to allow proper alum coagulation. Approximately 30 pounds per day of lime is used most of the year to adjust the raw water alkalinity to allow proper alum coagulation. Often during the summer months of July, August and September using the Siletz River source little to no lime is used. When lime is being fed, dosages typically range from 5 to 8 mg/L. Lime is dosed with adjustable dry hopper and the solution is fed downstream of the rapid mix and alum feed point.

Soda Ash is added to the final filtered water for pH adjustment and corrosion control. An average of 30 to 50 pounds per day of Soda Ash is required with dosages ranging from 4 to 8 mg/L and averaging about 5 mg/L.

Sodium hypochlorite is added for final disinfection as discussed in Section 6.2.7. Prechlorination provisions are not currently used but may be used in the future as needed.

6.2.3 Flocculation

Following chemical addition and rapid mix, raw water enters the flocculation section through an open channel flume located along the northern side of the concrete basins. Two flocculator basins, each measuring 20 feet by 20 feet by 14 feet deep provide a volume of 5600 ft^3 or 41,890 gallons each. The water surface elevation in the flocculators is 311.00 feet according to the 1976 plans. The total flocculation volume provides a theoretical hydraulic detention time of 40 minutes at 3.0 mgd.

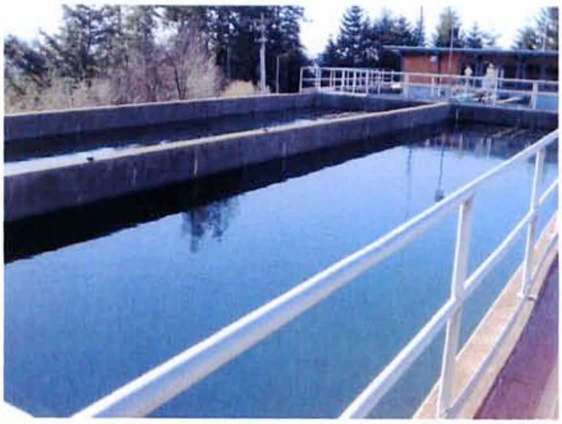
Each basin has a vertically-mounted mechanical flocculator with 40-inch diameter propellers and 1.5 Hp DC motors. The two basins can be operated either in series or in parallel. Current normal operation is in series to provide dual-stage flocculation. The first stage flocculator is operated around 40 rpm while the second stage is operated around 35 rpm. Maximum speed is 100 rpm. Shafts and propellers for each unit were replaced about 10 years ago. One motor was replaced in 2008 and the other was replaced this year in 2009. The flocculation equipment is now in good condition.

The EPA suggests that 30 minutes of detention time be provided when water temperatures drop below 5°C. The often cited "10-State Recommended Standards for Waterworks" also requires at least 30 minutes for flocculation. The existing flocculation volume is sufficient to adequately treat the original design flow of 2,080 gpm and likely would function properly at flows up to 2,790 gpm.

Problems have occurred in the past with water intrusion into the electrical junction boxes at the flocculator motors. Plastic 5-gallon buckets are being used successfully to protect the motors from wind-driven rain but some type of more formal and permanent protection would be helpful. The variable speed DC drives recently replaced were hard to find with only a few available in the country.

6.2.4 Sedimentation

Two sedimentation basin sections, each measuring 20 feet by 85 feet by 13.5 feet deep provide a volume of 22,950 ft^3 or 171,680 gallons each. The basins can be independently shut-off and dewatered. The water surface elevation in the sedimentation basins is 310.50 feet according to the 1976 plans. The total sedimentation volume provides a theoretical hydraulic detention time of 165 minutes or 2.75 hours at 3.0 mgd. Surface area is 1700 ft^2 each (3400 ft^2 total) which results in a gross surface overflow rate of 882 gpd/ft^2 or 0.61 gpm/ft^2 at 3.0 mgd. Each basin has a weir length of 100 feet for a total weir loading rate of 15,000 gpd/ft.



Sedimentation basin design criteria according to EPA (Optimizing Water Treatment Plant Performance Using the Composite Correction Program, 1998, EPA/625/6-91/027) suggests a surface overflow rate (SOR) of 0.6 gpm/ft^2 for turbidity removal and 0.4 gpm/ft^2 for color removal for conventional rectangular basins with depth between 12 and 14 feet. With vertical tube settlers (>45°), the SOR can be increased to 2.0 gpm/ft^2 for turbidity removal and 0.75 gpm/ft^2 for color removal (based on area over tubes only). AWWA/ASCE recommends (Water Treatment Plant Design, Third Edition) a SOR of 0.55 to 0.83 for turbidity removal with reduction to 0.35 to 0.55 gpm/ft^2 for water with high algae content. The AWWA/ASCE text also recommends SOR of 1.0 to 3.0 gpm/ft^2 over tube settlers with the normal design based on 2.0 gpm/ft^2. The 10-State Recommended Standards for Waterworks, requires 4 hours of detention time as well as a maximum horizontal through velocity of 0.5 fpm. Detention time may be reduced when the SOR is less than 0.5 gpm/ft^2.

The AWWA/ASCE text and most other references recommend weir loading rates of 20,000 gpd/ft or less. When turbidity can exceed 50 NTU, rates of 15,000 gpd/ft are commonly used. Typically the sedimentation basin has a length to width ratio of 3:1 to 5:1 and the weirs extend into the basin 1/3 of the length or less. The existing sedimentation basins each have a length to width ratio of 4.25:1 with weirs extending 1/5 of the length. The existing horizontal through velocity at the original design rate of 2080 gpm is a proper 0.5 fpm.

At the 20-year projected MDD of 1,600 gpm, the SOR will be 0.47 gpm/ft^2, the detention time 3.6 hours, and the weir loading rate 11,520 gpd/ft. These values are sufficiently conservative and would indicate good sedimentation basin performance will occur at this flow.

The existing sludge collection equipment consists of a mechanical sludge scraper system by Envirex with metal chains, sprockets, and redwood scrapers called a chain-and-scraper or chain-and-flight system. The scrapers run along the bottom and move the settled sludge to hoppers at one end. Manual telescoping sludge valves are opened and adjusted to blow-off sludge without completely dewatering the basin. The original metal chain has been replaced at least one time since 1979 and is now in need of replacement again. It is recommended that the entire system be replaced with a modern chain and scraper system with non-metallic components. The original equipment manufacturer, Envirex is now owned by Siemens and still manufactures sludge collection equipment. The plant operator has already contacted Siemens and obtained a budget price of $40,000 for new equipment.

6.2.5 Filtration

Each of the two dual-media filters measures 16 feet by 33 feet providing 528 ft^2 each or 1,056 ft^2 of total filter surface area. At the design flow of 3.0 mgd the filter loading rate is 1.97 gpm/ft^2. At the current peak flows of 1250 gpm through one filter at a time, the filter loading rate is 2.37 gpm/ft^2. The water surface elevation at the filters is 307.5 feet according to the 1976 plans.

At the 20-year projected MDD of 1600 gpm, the filter loading rate will be 1.5 gpm/ft^2 with both filters operated simultaneously and 3.0 gpm/ft^2 when one filter is off line. A maximum filter loading rate of 4.0 gpm/ft2 is recommended by EPA and AWWA for mixed media filters in good condition and no signs of air binding.

The filter underdrain consists of clay tiles manufactured by Leopold as originally installed. A 12-inch thick layer of graded support gravel lies on top of the clay tile underdrain. The actual filter media consists of a 12-inch layer of silica sand (specific gravity of 2.6, effective size of 0.45-0.55 mm, uniformity coefficient 1.40 or less) under an 18-inch thick layer of anthracite (specific gravity of 1.6, effective size of 0.95-1.05 mm, uniformity coefficient 1.40 or less). The filter media and support gravel were replaced in 2000. It is assumed that the tile underdrains were inspected and found to be in satisfactory condition at that time. The interior of the concrete filter basin was also refurbished.

Backwashing of the filters is accomplished with hydraulic upflow and surface washers as described in the following Section.

6.2.6 Backwash

The filters at the Toledo WTP are backwashed between 8 and 16 times per month (total for both filters). Filter runs typically range from 20 to 50 hours in the winter and 40 to 75 hours in the summer.

Filter backwash is accomplished with hydraulic upflow water and surface washers. No auxiliary air scour is provided. The original backwash pump from the 1976 plant remains in use today. The 60 Hp vertical turbine pump conveys treated water from the clearwell and forces the water upwards through the filter media to expand the bed and remove sediment. Filter backwash occurs at a rate of 8000 gpm with a total of 85,000 gallons of water required to backwash one filter. The total backwash volume used equates to 161 gal/ft^2. With a filter area of 528 ft^2 each, the resulting backwash rate is 15 gpm/ft^2. Based on the size and type of filter media, this backwash rate should achieve approximately 10 to 20% expansion of the filter bed.

The goal for ideal hydraulic backwash is to achieve a 25-50% expansion of the media. To achieve this expansion, backwash rates required will vary between 17 and 23 gpm/ft^2 depending on the media configuration and the water temperature. For each 1°C increase in water temperature, an increase in the backwash rate of approximately 2% is required to prevent a reduction in bed expansion. A 25% expansion of the existing filter media during a backwash equates to 7.5-inches of rise in the existing filters. The backwash pump output (15 gpm/ft^2 maximum) is slightly less than optimal and mudball formation deep in the media is possible over time. This may be partially offset under current operations due to the lengthy backwash cycle and high total volume of water being used.

Rotary surface washers are installed in each filter to agitate the surface of the media. Fixed nozzle washers are also installed in the corners to reach areas where the rotary washers are ineffective. The washers should be approximately 2-inches above the surface of the anthracite and become submerged in the media during backwashing. A flowrate of at least 265 gpm (0.5 gpm/ft^2) to each filter at a minimum pressure of 50 psi is required for proper surface wash function. A 40 Hp vertical turbine pump conveys water from the clearwell to the surface wash system.

Backwash waste water is dumped into the 100,000 gallon backwash waste basin prior to being discharged into the municipal sanitary sewer system. The use of filter backwash recycling provisions originally designed into the plant has been discontinued.

6.2.7 Disinfection

The disinfection system consists of sodium hypochlorite injection in the filter effluent and the clearwell which provides chlorine contact time prior to water use.

Two MIOX SAL-80 units produce sodium hypochlorite and other mixed oxidants on-site. One unit was installed as part of the 2000 plant upgrade and the other unit had a new cell installed in 2007. Each unit should produce the equivalent of about 10 pounds per day (ppd or lb/day) of free available chlorine for a total of 20 ppd.

Both units have been plagued with problems with numerous repairs, upgrades, cell replacements, and other maintenance issues. MIOX is currently investigating the issues however the City is concerned about the reliability and capability of the existing equipment. Recent measurements by the operator show that the older cell only produces 6.5 ppd and the new unit 8.75 ppd (should be 10 ppd each). Run times range from 6.5 to 13 hours per day (both on) with 30 to 80 pounds of salt required per day. During current peak flows the units are unable to keep up with demand and maintain the hypochlorite solution tank full.

The MIOX mixed-oxidant units should produce the equivalent of a 4000 mg/L hypochlorite solution. At a plant flow of 1000 gpm and a chlorine dose of 1 mg/L, approximately 15 gallons per hour of a 4000 mg/L hypochlorite solution is required which is equivalent to about 12 pounds per day of free chlorine over a 24 hour period. For a design dose of 2.5 mg/L (allowing for prechlorination and post chlorination) into the 20-year design flow of 1600 gpm, the equivalent of 48 ppd of free available chlorine is needed. New equipment with a 50 ppd capacity is therefore needed for the planning period.

Immediately following post-filtration chlorination, the treated water enters the 0.85 million gallon clearwell where chlorine contact time is provided. The clearwell is an 85-foot diameter circular concrete storage tank constructed in 1938. An aluminum dome roof was added in 1979. A separate outlet pipe from the clearwell feeds the pump well where the treatment plant pumps are located and from which water flows by gravity to the distribution system. Water surface elevation in the clearwell is 300.0 feet when full at 19 feet depth. Overflow occurs at 20 foot depth and the level is allowed to drop normally to 17 to 17.5 feet deep before the filters are started again. During extreme drought years the clearwell water level has been dropped to as low as 8 feet deep. According to the 1979 operation and maintenance manual, the tank holds 51,900 gallons per foot of depth between elevations 290.5 and 300.0. The tank has separate inlet and outlet pipes but contains no baffling to prevent short-circuiting.

At the EPA recommended efficiency value of 10% for non-baffled chlorine contact basins, the effective volume of the clearwell would be 85,000 gallons. At the planning period design flow of 1,600 gpm the theoretical contact time would be 53 minutes – if the flow out of the clearwell were equal to the flow into the clearwell (1600 gpm). However contact time must be based on the worst case peak hourly flow leaving the contact chamber, not the flow entering the chamber. Since no flow metering is provided on the tank outlet, there is no record of peak hourly flow exiting the clearwell tank. Programming changes are being discussed at this time to allow this peak hourly flow to be determined and in the future a precise calculation can be made. As an estimate, we can assume that the peak hourly demand (PHD) is equal to 4 times the average day flow or 3.68 mgd (2556 gpm) now and 4.80 mgd in 20 years. With these PHD numbers the theoretical contact time would be 33 minutes now and 25 minutes under the future condition. This analysis assumes 10% efficiency and the clearwell volume remaining full at 850,000 gallons. Actual PHD must be determined and a tracer study conducted to verify actual efficiency and contact time however it does appear that contact may be marginal and baffling the clearwell should be considered.

The 70-year-old clearwell exhibits horizontal cracking, potentially due to delays between concrete pours in the original construction. Water seepage is evident from several locations at these cracks and it is very likely that corrosion of the internal reinforcing steel has been occurring for decades. In a December 2009 report divers found gaps up to 2-inches wide at the interior cold joints in the floor and reported the seal to be in fair to poor condition in numerous locations. To prevent additional deterioration and potential spalling of the concrete as the corrosion progresses, it is recommended that refurbishment of the concrete be conducted.

6.2.8 Plant Domestic Water Supply System

Plant water is supplied by the plant water pump located at the plant pump station near the other pumps (backwash, surface wash, booster). The pump is a Peerless Pump vertical turbine pump rated for 175 gpm at 217 feet total dynamic head. The pump has a 15 Hp, 1760 rpm motor. Four-inch piping with a propeller flowmeter connects the pump to a steel hydropneumatic tank. The tank is 5 feet in diameter, 10 feet tall, and is an ASME 125 pound pressure vessel. An air compressor is used to maintain a pocket of air at the top of the tank and the tank contains no internal liner or bladder. A safety pressure relief valve is set at 100 psi. A pressure switch turns the plant water pump on and off at 60 psi and 85 psi respectively. Discharge piping connections are such that the surface wash pump can supply the relatively large flows to the yard hydrants at the plant which cannot be supplied sufficiently with the plant water pump alone.

A recent failure of the pressure switch and safety relief valve resulted in dangerous pressurization of the tank. Repairs were conducted however replacement of the large tank and pressure feed system with a more modern and efficient system should be considered.

6.2.9 Electrical System

The 34-year old motor control center (MCC) in the chemical room and is still in use today and repair and replacement parts are hard to find as the equipment is antiquated. The MCC should be updated to allow for continued reliability and safety. New HOA switches and other minor modifications were done in 2000 to update the plant automation control system.

A 100 kW (125 kVA) diesel generator provides standby backup power for the plant's primary functions. The gen-set has a newer above ground fuel tank. With proper maintenance and exercising the generator should function for the planning period.

6.3 Treated Water Storage

6.3.1 Ammon Road Storage Tank

The Ammon Road Storage Tank is a 1 MG painted steel tank located in the southeast hills of town along Ammon Road. The tank was constructed in the 1970s and is approximately 75 feet in diameter and 30 feet tall. The Ammon Road Tank has a normal maximum water surface elevation of 300 feet (29 feet water depth) matching that in the clearwell tank at the plant. The water level in the Ammon Road Tank is used to control the water treatment plant on and off cycles.

The tank interior received spot repair painting in 1983. The tank exterior was repainted in 1984. Radio telemetry was installed in 2007. Since it has been 25 years since the last coating refurbishment, the tank is now due for recoating once again.

6.3.2 Graham Street Storage Tank

The Graham Street Storage Tank is a 0.4 MG steel tank constructed in 1968 at an elevation 60 feet lower than the Ammon Road Tank. The tank is 60 feet in diameter by 20 feet tall and has a water surface elevation when full of 240 feet. The Graham Street Tank and its service area is fed through pressure reducing valves (PRVs) from the higher Ammon Road Tank/WTP service area. Adjustment of at least four PRVs is necessary to maintain a proper hydraulic grade for the tank.

The tank interior received spot repair painting in 1983. The tank exterior was repainted in 1984 and again in 2008. The interior is due for refurbishment and lead removal should be anticipated.

6.3.3 Clearwell Storage Tank

The 0.85 MG clearwell tank, discussed in Section 6.2.7, provides some storage however its primary function is to provide the necessary chlorine contact time needed for disinfection prior to the first water user. If the clearwell water level is allowed to drop significantly the contact time provided also drops significantly. During normal operation of the plant, the clearwell depth varies between 17 and 19 feet deep with 19 feet being the full point where filtration is ceased. At times in the past the depth of water in the clearwell has dropped to 13 feet and even as low as 8 feet during extreme drought times. Data is being collected at the plant to determine the actual chlorine contact time provided by the clearwell (see 6.2.7). There is a certain minimum depth that must be maintained in the clearwell to ensure that adequate chlorine contact time is being provided and further study is needed to verify what that depth is and whether or not baffling is needed. Since proper chlorine contact time is required regardless of the water demand situation in the system, the entire 0.85 MG of storage cannot be utilized and there is some depth below which the clearwell must not fall.

6.4 Distribution System

6.4.1 Pressure Zones

The Toledo water system is currently separated into three pressure zones. The distribution piping system, major component locations, and the approximate boundaries of the pressure zones is shown in Figure 6.4.1-1.

The main pressure zone in town (intermediate pressure zone) has a hydraulic grade of 300 feet provided by the water surface elevation of 300 feet in the WTP clearwell tank and the Ammon Rd. Tank. For an ideal minimum pressure of 40 psi in the intermediate pressure zone, elevations above 208 feet need pressure boosting. To avoid pressures over 80 psi in the intermediate pressure zone, elevations below 115 feet need pressure reducing valves or need to be served by the low level pressure zone.

Table 6.4.1-1 – Pressure Zones

Pressure Zone	Hydraulic Grade Control	Hydraulic Grade	Maximum Service Elevation (~25 psi static)	Ideal Service Elevations (80 to 40 psi)
Intermediate Zone	WTP Clearwell Ammon Rd. Tank	300 feet	240 feet	115 to 208 feet
Low Level Zone	Graham Rd. Tank Various PRVs	240 feet	180 feet	55 to 148 feet
High Level Zone	Wagon Rd. BPS	435 feet	375 feet	250 to 340 feet

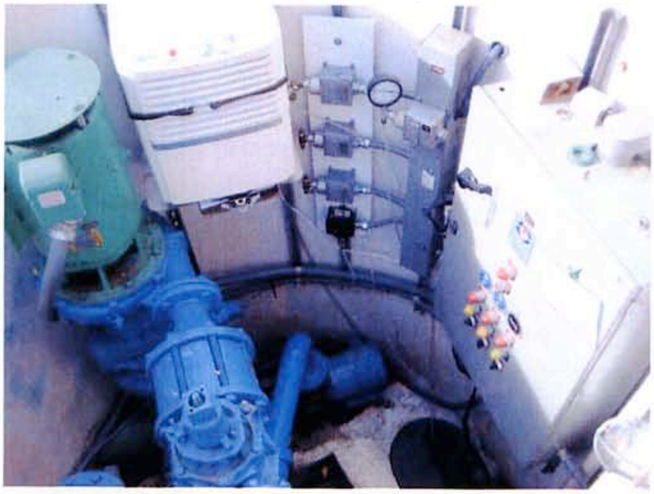
Lower elevations in town are served by the low level pressure zone which has a hydraulic grade of 240 feet provided by the Graham Road Storage Tank and the various PRVs feeding this level. For an ideal minimum pressure of 40 psi in the low level pressure zone, elevations above 148 feet need pressure boosting or should be served by the intermediate pressure zone. To avoid pressures over 80 psi in the low level pressure zone, elevations below 55 feet need pressure reducing valves.

Elevations at the north end of town too high to be properly served off the intermediate pressure zone are supplied with boosted pressure from the Wagon Road Booster Pump Station (BPS) creating the high pressure zone. The highest ground elevations in the high pressure zone area reach approximately 380 feet based on the USGS quadrangle map. To provide the minimum required pressure of 20 psi at the high point, an effective hydraulic grade of 426 feet is required in the high level zone. It appears that the elevations of the public property are about 20 feet lower than the actual high point thus a slightly lower hydraulic grade may provide for the minimum 20 psi at the service connection.

6.4.2 Wagon Road Booster Pump Station

As discussed in the previous paragraph, the Wagon Road BPS boosts pressure to the high level service zone. The station is located at an elevation of approximately 215 feet resulting in a suction side pressure of around 35 psi depending on the depth of water in the clearwell and system flow demands. The current discharge pressure is approximately 95 psi (60 psi boost) resulting in a hydraulic grade of 434 feet and a pressure of 32 psi at elevation 360 feet and 23 psi at 380 feet.

The original Wagon Rd. BPS is a Hydronix Model 710C, 3-pump constant pressure water booster pump station installed in 1979. The station contains three centrifugal booster pumps with constant speed drives and a small 16-gallon hydropneumatic tank. The equipment is located in a buried fiberglass enclosure. The pump include 5-, 15-, and 20-Hp motor driven pumps rated for 50, 250, and 400 gpm respectively at 128 feet total dynamic head (55 psi boost).



The original design was not optimal in that each pump was operating near shut-off head on a flat portion of the pump curve. The smallest jockey pump ran virtually continuously and the second lead pump started and stopped intermittently. The largest pump was for fire flow conditions only. It appears that as development occurred in the area the need for slightly higher pressures arose. At some point the boost was increased from 55 psi to 60 psi resulting in operation virtually at the shut-off head. This resulted in the jockey pump running continuously with virtually zero flow output. Based on the original pump curves, the 15 Hp lead pump would also be operating at shut-off conditions with virtually zero flow output and very frequent on/off cycling.

Plans have been made to install a properly sized pump as a temporary measure to provide suitable flow while maintaining minimum suitable pressures at the top of the hill. The pump station should be reconstructed during the planning period with construction of a new storage tank serving the high level zone.

6.4.3 Piping System Summary

The City of Toledo water system includes over 186,000 feet (over 35 miles) of piping over 2-inches in diameter. Due to the great distance of both raw water sources from town, 33% of the total pipe in the system is raw water piping.

Table 6.4.3-1 – Water System Piping Inventory

Nominal Diameter (inch)	Approximate Length (feet)	Percent of Total Length
18"	2,630	1.41%
12"	7,820	4.18%
10"	14,080	7.53%
8"	21,650	11.58%
6"	65,500	35.05%
4"	13,000	6.96%
18" Raw Water	19,075	10.21%
16" Raw Water	2,100	1.12%
14" Raw Water	10,250	5.48%
12" Raw Water	29,580	15.83%
8" Raw Water	1,200	0.64%
	186,885	100.00%

The system includes around 13,000 feet of 4-inch piping in the distribution grid with numerous fire hydrants served from 4-inch piping. Almost half of the system piping is 6-inch or smaller. This undersized piping severely restricts fire flow potential in certain areas. Modern fire hydrants normally have 6-inch diameter barrels and require 6-inch minimum water mains feeding them.

The water distribution system also contains several long stretches of 6-inch piping generally isolated from the grid network such as along NE Sturdevant Road, SE Sturdevant Road/SE 16th Street, NW Sunset Road/NW Dundon Road/ NW Lincoln Way, and others. Such lengths of 6-inch piping without looping connections also generally restricts proper fire flows.

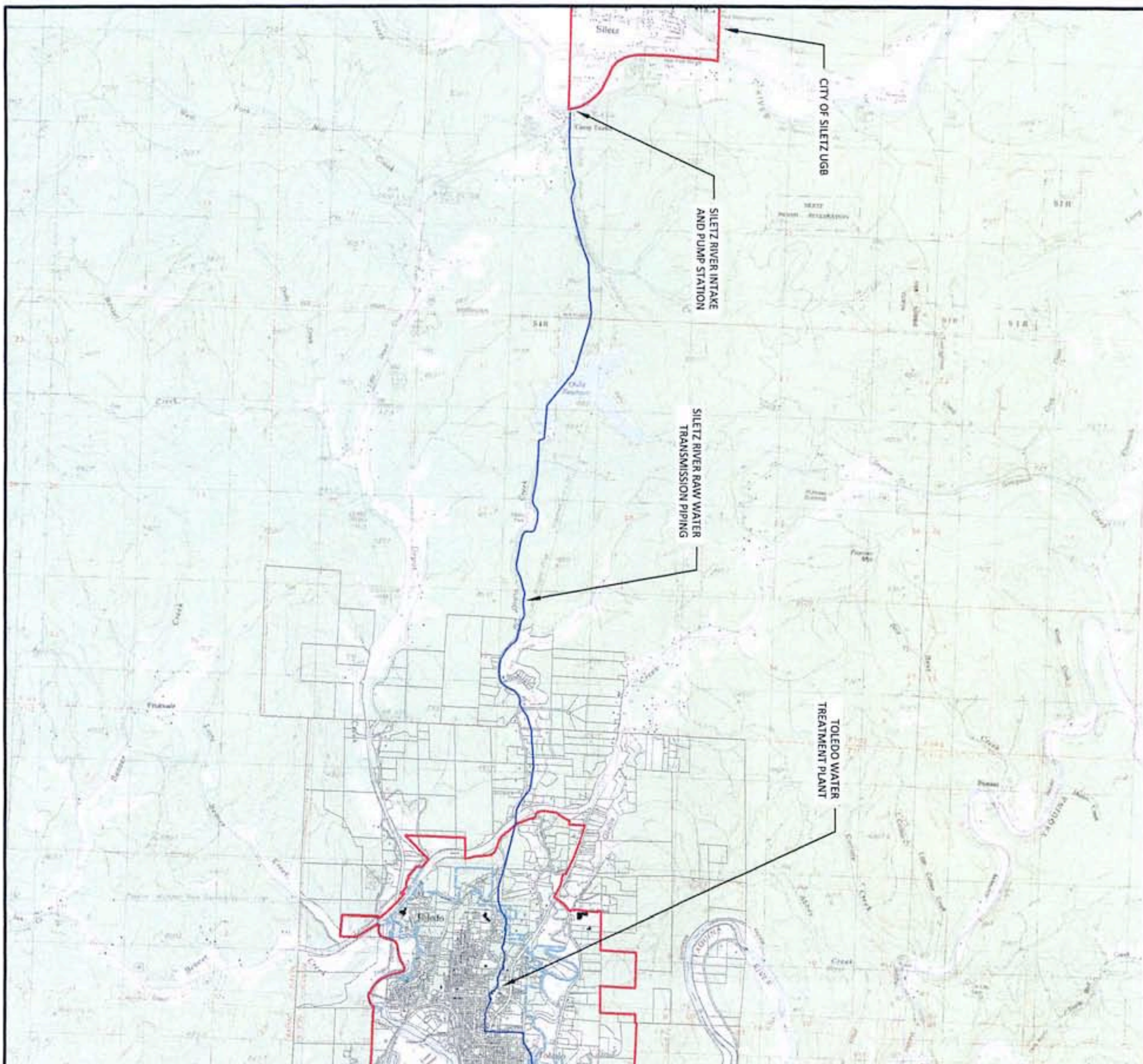


FIGURE 6.1.1-1

0 1"
1" = 4000 ft

DRAWN BY: REB
DATE: OCT. 21, 2009

Existing Raw Water Supply System

WATER SYSTEM MASTER PLAN

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

Civil West Engineering Services, Inc.

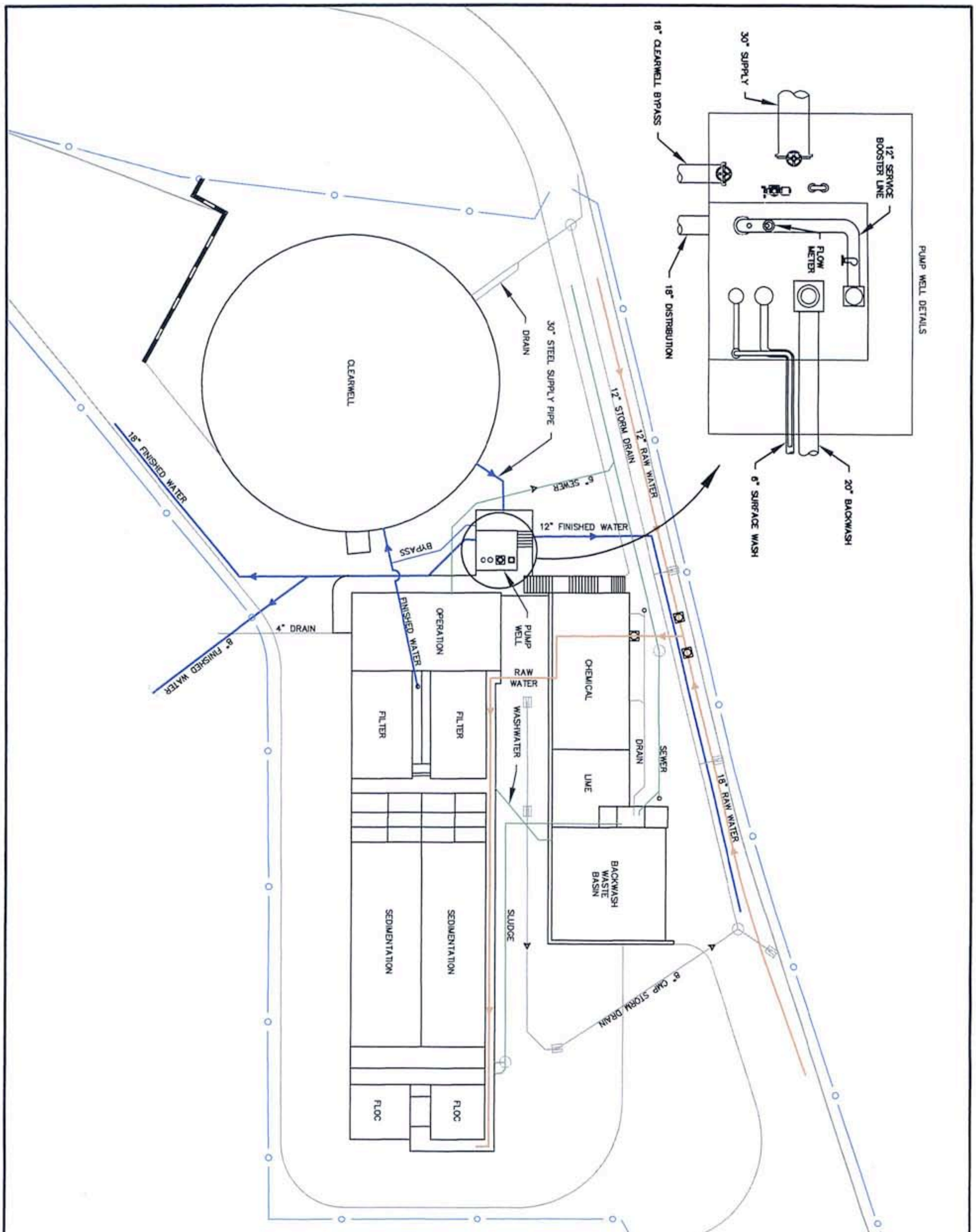


FIGURE 6.2.1-1	0 30 SCALE: 1" = 30' DRAWN BY: CDA DATE: OCT 2009	**Water Treatment Plant Site Plan** WATER SYSTEM MASTER PLAN	CITY OF TOLEDO LINCOLN COUNTY, OREGON	Civil West Engineering Services, Inc.

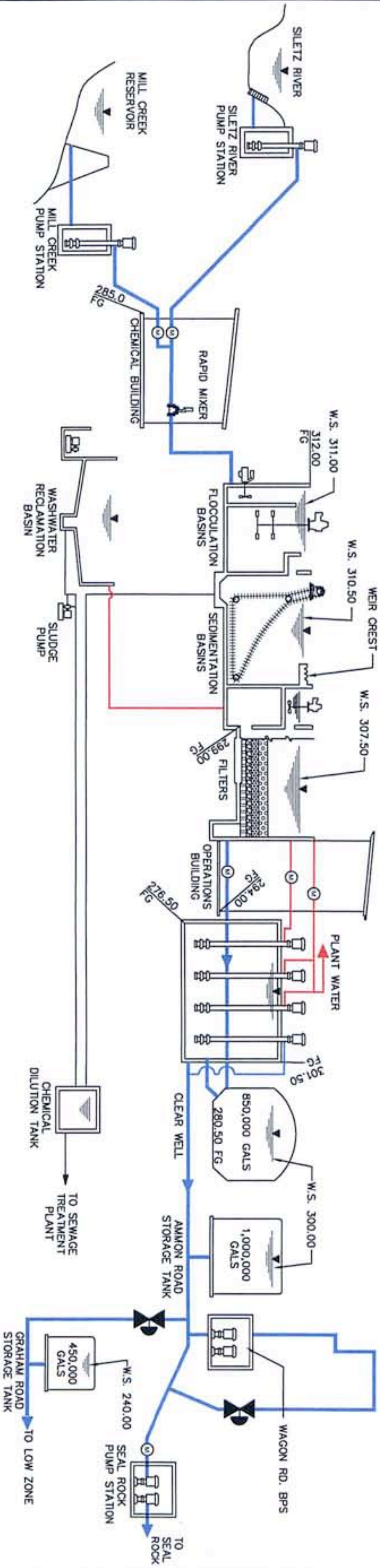


FIGURE 6.2.1-2

NOT TO SCALE

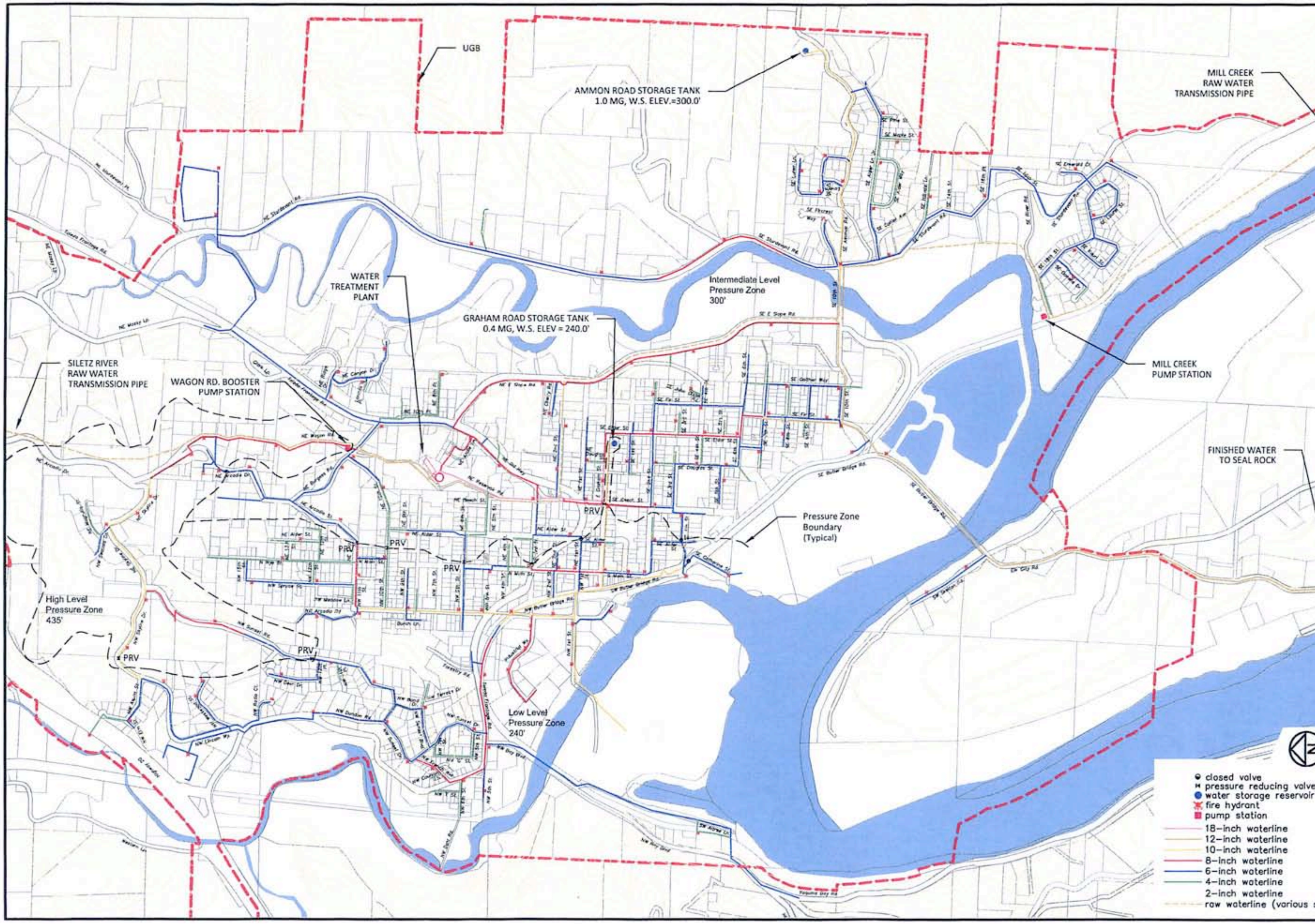
DRAWN BY: CLB
DATE: MAY 11, 2009

Water Treatment Plant Hydraulic Schematic

WATER SYSTEM MASTER PLAN

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

Civil West Engineering Services, Inc.



Civil West Engineering Services, Inc.

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

Existing Water System

WATER SYSTEM MASTER PLAN

0 1'
1" = 1000 ft
DRAWN BY: REB
DATE: NOV. 4, 2009

FIGURE
6.4.1-1

Improvement Needs

Section 7

7.1 Water Supply Needs and Alternatives

7.1.1 Water Supply Needs

Fortunately, the City of Toledo has plentiful water rights which are sufficient for many years beyond the planning period. The 5.75 cfs water rights on the Siletz River with priority dates in 1937 and 1929 are alone sufficient to satisfy a projected 60-year demand. There are no significant water rights with earlier priority dates on the Siletz River owned by others which would impact Toledo's rights, and minimum streamflows also appear large enough to not restrict these Toledo water rights. In addition, the City holds another 4.0 cfs right on the Siletz and another 15.0+ cfs rights on Mill Creek (though Mill Creek flows in summer are low enough such that only as estimated 1.7 to 2.0 cfs is actually available – See Section 6.1.3).

Those water rights, however, must be delivered to the system through reliable and maintainable infrastructure. Replacement and or repair of the aging raw water supply infrastructure is the City's most challenging water system need. The 5 mile long Mill Creek Raw Water Transmission Piping is 60 years old and is undersized, deteriorating, and extremely difficult to access in many areas. The 70 year old Siletz River Intake and Pump Station is extremely deteriorated and appears to be located in an unstable area on the river bank. In addition, a portion of the Siletz River Raw Water Transmission Piping is undersized 50-year-old AC piping that is completely inaccessible under the Olalla Reservoir. Past studies have also identified these needs and at the time estimated a price tag of over $9 million to remedy the City's raw water supply problems.

7.1.2 Mill Creek Supply Alternatives

Alternatives for the Mill Creek Raw Water Supply include:

1) Do Nothing – Would require eventual abandonment of source as piping deteriorates further
2) Continue with upkeep and pipeline spot repairs as necessary
3) Replace piping along new routes and construct new Mill Creek Raw Water Pump Station

The do nothing alternative essentially results in the Mill Creek raw water source eventually being completely unavailable to the city which is an unacceptable consequence. The 60-year old asbestos cement (AC) Mill Creek transmission piping is currently so deteriorated in certain areas that even short periods of use result in further line failures in difficult to access areas. It appears that varying thicknesses or pressure classes of pipe were used during installation in the 1950s. It is the thinner-wall sections, typically in the difficult to access wetland areas, which result in the greatest number of failures and maintenance issues today. Various options for replacing the transmission piping were investigated in detail in the 2002 Raw Water Transmission System Replacement and Rehabilitation Preliminary Design Report by Lee Engineering. Included as part of the 2002 Report - due to the significant amount of wetlands, waterways, and forest land along the pipe routes - an Environmental Review Report was prepared by Adolfson Associates, Inc. to investigate potential environmental impacts and hurdles to various alignment alternatives. The recommended option in the 2002 Report was based on accessibility, minimizing environmental impacts, and cost. The 2002 estimated cost for the project was approximately $7.2 million and appears reasonable and accurate. Updating this cost to current dollars results in a project cost to replace the Mill Creek Raw Water Transmission Piping and Pump Station of $9.6 million.

The Mill Creek Source has the ability to meet the average winter water demands of the system for more than 50 years due to rainfall recharge of the basin during the wet season. Due to the low flows actually entering the basin during dry periods, the Mill Creek Source does not have the ability to meet even current summer peak water demands, even through sufficient water rights exist.

If the 45-year old dam were to be increased in height by 10 feet, apparently as the original design intended for later expansion, the storage volume would be increased from the current 250 acre-feet to approximately 500 acre-feet (average depth increase from 16.6 feet to 26.6 feet and surface area increased from 15 to 19 acres), or 163 million gallons. In this case, the Mill Creek Source could supply the system's year-round needs, including summer peaks, for around 50 years; however a more detailed hydrologic study would be required to verify. Based on costs presented in the "Regional Water Projection: Polk and Lincoln Counties" done in March 2009 by WH Pacific for expansion (40 foot height increase) of the Barney Reservoir Dam ($38.1 million) and the McGuire Reservoir Dam ($14.8 million), a 10-foot increase in the height of the Mill Creek Dam would likely exceed $7 million in project costs.

The only other option for the City is to continue with spot repairs of the pipeline as needed and continue upkeep and maintenance of the pump station. This option may not allow reliable long-term use of the source since a pipe failure could occur in an inaccessible wetland area however it would be available for occasional, backup and emergency use. The Mill Creek source is important as a redundant supply of water and the City has ample water rights on the source.

7.1.3 Siletz River Supply Alternatives

Alternatives for the Siletz River Raw Water Supply include:

1) Do Nothing – Eventually abandon source as intake and pump station deteriorate further
2) Utilize Georgia-Pacific Intake with modifications and Olalla Reservoir
3) Rebuild/New Siletz River Intake and Pump Station, Use Olalla for Storage
4) Rebuild/New Siletz River Intake and Pump Station, Replace pipe section under Olalla Reservoir

The City has sufficient water rights on the Siletz to provide for the system for well over 50 years however the 70-year old intake and pump station are at capacity and are significantly deteriorated. The majority of the ductile iron transmission piping is adequately sized and expected to last in excess of 50 additional years however the portion under the Olalla Reservoir is undersized AC pipe which should be replaced. Since the intake is essentially at capacity and severely deteriorated, the do nothing alternative can support no additional growth and would very soon result in a complete loss of the Siletz source of water due to failure of the intake. Options for improvements are discussed below.

Utilize GP Siletz Intake/Pump Station, Use Olalla Reservoir for Storage

Georgia-Pacific, LLC (GP) has water facilities separate from the City to supply the large volumes of water required by the paper mill in addition to being a large industrial user of potable water from the City water plant. GP has a well constructed intake on the Siletz which pumps water to the Olalla Reservoir in May, June and July when flows from the tributaries of West Olalla Creek are inadequate to meet the needs of the GP paper mill. In a typical year sometime around mid-July flows in the Siletz drop below 100 cfs and the Watermaster prohibits GP from further pumping out of the Siletz and the mill relies on water stored in the 1.1 billion gallon Olalla Reservoir to meet the 11 million gallon per day need. During the later summer months the water level in the Olalla Reservoir drops steadily as the mill consumes water. In mid to late October the rainfall begins and the reservoir level begins to raise eventually filling the reservoir and simultaneously meeting the needs of the paper mill. By May, rainfall runoff is once again insufficient to meet the mill's water demand, the reservoir water level begins to drop, and pumping by GP from the Siletz is again initiated.

The GP Intake is only 650 feet upstream from the city's deteriorated intake. Due to the close proximity of the intakes and the similar piping route (at least to the Olalla Reservoir) an attempt to coordinate with GP was initiated. In meetings with GP representatives it was determined that GP was agreeable to consider shared intake and reservoir options with the City and that the GP facilities were in good condition. In various subsequent discussions with the Oregon Water Resources Department (WRD) it was determined that the Department is highly unlikely to allow the City to withdraw water at the GP intake site since this would constitute an upstream transfer of the city's point of diversion (POD). Upstream transfers of water rights are not allowed since pulling water out farther upstream results in reduced streamflows for additional length of stream. Downstream transfers are usually not a problem since that effectively leaves the water in the stream longer resulting in a theoretical net benefit to wildlife. Since an upstream transfer is highly unlikely, Toledo cannot modify and share the GP intake and withdraw municipal water at the GP location and this option is not feasible.

<u>New Siletz Intake/Pump Station, Use Olalla Reservoir for Storage</u>
A new or completely rebuilt intake and pump station on the Siletz River will be required as well as other improvements. In addition to an agreement with GP, this option would also require the Water Resources Department (WRD) to issue a storage permit to allow the city to store water in the Olalla Reservoir and a use permit to withdraw that water for municipal use at an additional point of diversion (POD) at the reservoir or along West Olalla Creek. A second raw water intake and pump station at or downstream of the Olalla Reservoir would be needed to lift water to the plant since the reservoir water surface is below the plant site elevation. The City would then pump water from the Siletz during the summer months into the Olalla Reservoir (GP will not agree to allow the turbid winter water to be pumped into the Reservoir), depend on stored water and basin runoff in the winter, and pump again to the plant. Potentially, West Olalla Creek could be used to convey water to town and the second intake could be located near the existing Mill Creek Raw Water Transmission Pipe to reduce piping costs. Several alternative locations along the existing Siletz Raw Water Transmission Pipe between the Olalla Reservoir and town might also be considered. Locating the second pump station and intake at the Olalla Reservoir would be most costly since electrical power would need to be extended to the site.

Discussions with WRD indicate that a storage permit allowing the City to store water in the Olalla Reservoir might be possible, however pumping at higher rates than actually needed in the summer months in order to build up storage is contrary to the goals of the Department of Fish and Wildlife (ODFW). ODFW has expressed concern with low streamflows and high late-summer water temperatures in the Siletz for several years and would likely oppose efforts in summer months to pump greater amounts than actually needed by the community in any given day.

GP continues to be open to dialog regarding a cooperative use of the Olalla Reservoir but must not damage or reduce its own water supplies, must not incur additional cost, and must realize a net benefit from allowing outside use of its Olalla Reservoir. GP currently struggles at times to balance its water needs for production with attempts to maintain reservoir water levels in the summer and would pump more water from the Siletz if allowed to. City use of the reservoir is only attractive to GP if additional water can be pumped into the reservoir to help maintain summer water levels. Winter pumping of highly turbid water into the Olalla Reservoir will not be allowed by GP due to siltation concerns and is of no benefit since natural recharge from rainfall is sufficient to keep the reservoir full. Summer pumping of additional water from the Siletz River by the City in order to store up water for winter consumption will likely be opposed by regulatory agencies, even if only for municipal use. Certainly any additional pumping of Toledo's municipal water rights on the Siletz in quantities sufficient enough to benefit GP with their industrial needs by alleviating low Olalla Reservoir levels in the late summer will be very unlikely to receive approval.

Table 7.1.3-1 – West Olalla Creek Intake/Pump Station Probable Cost

West Olalla Creek Intake / Pump Station				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$90,000
Intake Structure and Wetwell	ls	1	$450,000	$450,000
Fish Screens and Air Burst System	ea	1	$50,000	$50,000
Building, Electrical	sf	400	$250	$100,000
Pumping Equipment	ea	3	$55,000	$165,000
Site Work, Gravel, Site Piping	ls	All	NA	$40,000
Construction Cost Total				$895,000
Contingency (20%)				$179,000
Engineering (20%)				$179,000
Land Acquisition				$50,000
Permitting and Environmental Reviews				$40,000
Project Management and Legal (5%)				$44,750
Total Project Budget Estimate				**$1,387,750**

Table 7.1.3-2 – Siletz River Intake/Pump Station Probable Cost

Siletz River Intake / Pump Station				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$160,000
Intake Structure and Wetwell	ls	1	$750,000	$750,000
Fish Screens and Air Burst System	ea	1	$60,000	$60,000
Building, Electrical	sf	600	$250	$150,000
Slope Stabilization, Piles	ls	All	NA	$200,000
Pumping Equipment	ea	3	$60,000	$180,000
Site Work, Gravel, Site Piping	ls	All	NA	$100,000
Construction Cost Total				$1,600,000
Contingency (20%)				$320,000
Engineering (20%)				$320,000
Permitting and Environmental Reviews				$60,000
Project Management and Legal (5%)				$80,000
Total Project Budget Estimate				**$2,380,000**

Based on the cost estimates presented above for the two required intake/pump station facilities plus an additional budget estimate cost of $150,000 for piping modifications necessary at the reservoir to deposit water from the Siletz into the Olalla Reservoir, the total potential budget cost of this option is $3.92 million.

<u>New Siletz Intake/Pump Station, Replace Pipe under Olalla Reservoir</u>

The 1998 Master Plan estimated a construction cost of $550,000 to fix the intake and pump station and another $300,000 to replace the piping under the reservoir. Both of these costs were too low, even in 1998 dollars. The 2002 Raw Water Transmission System Report updated the intake cost to $670,000 based only on inflation from 1998 but did not investigate the reasonableness of this cost. After recent site inspections and comparisons with actual construction cost of the similar Newport intake, the current budget level estimate for a new/rebuilt intake on the Siletz River at the current City-owned site is $2.15 million as shown above for the previously discussed option. The 2002 Raw Water Transmission System Report looked at piping options in much greater detail than can be done under the scope of this Master Plan and estimated the reservoir crossing pipe segment construction cost at $965,000. Other alignments were considered around the Olalla Reservoir however these options had higher costs and potentially greater land disturbance. The current estimated budget cost for the Olalla Reservoir crossing using the same route as recommended in the 2002 Report with 900 feet of float-and-sink HDPE pipe and the remainder as conventional trenching is $1.5 million as shown below.

Table 7.1.3-3 – Olalla Reservoir Crossing Pipeline Probable Cost

Olalla Reservoir Crossing Pipeline				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$100,000
18" HDPE Lake Crossing	lf	900	$400	$360,000
18" HDPE Conventional Trenching	lf	2,600	$150	$390,000
Road Restoration, Gravel	lf	2,500	$20	$50,000
Fittings, Connections, Valves	ls	All	$50,000	$50,000
Erosion and Sediment Control, Misc.	ls	All	$100,000	$100,000
Construction Cost Total				$1,050,000
Contingency (20%)				$210,000
Engineering (20%)				$210,000
Permitting and Environmental Reviews				$50,000
Project Management and Legal (5%)				$52,500
Total Project Budget Estimate				**$1,572,500**

The total estimated cost of this option including a new/rebuilt intake and pump station on the Siletz and a new 18-inch pipe crossing the Olalla Reservoir is $3.95 million.

7.1.4 Recommended Supply Alternatives

The two viable alternatives for the Siletz raw water source are roughly equal in cost. Operation and maintenance costs are higher with the option using the Olalla Reservoir as storage which requires double pumping of the raw water (two pump stations to maintain rather than one and increased electrical consumption). Due to the higher long-term costs associated with the Olalla as storage option, and considering the significant hurdles which exist in obtaining storage rights, additional withdrawal rights at a new point of diversion, and potential other hidden costs associated with long-term maintenance responsibility of the Olalla Dam, the recommended alternative is to construct a new/rebuilt intake on the Siletz River and the replace the piping under the Olalla Reservoir. The budget level opinion of probable cost is $3.95 million.

The recommended plan for Mill Creek is to continue to maintain and repair the existing infrastructure as necessary while beginning to plan for eventual improvement after the Siletz supply recommendations are implemented. The recommended alternative in the 2002 Report remains as the most viable option today. This recommended option includes reroute of the pipeline along improved roadways to avoid wetlands and environmental issues and a new pump station near the dam site as required due to the new hydraulic grade. Updating the 2002 costs to today results in an estimated project cost of $9.6 million for the Mill Creek supply improvements.

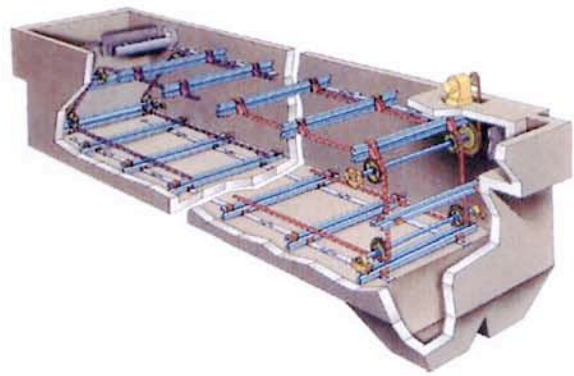
7.2 Water Treatment Needs and Alternatives

7.2.1 Water Treatment Plant Needs Summary

In general, the Toledo Water Treatment Plant is well maintained, well operated, and produces high quality treated water. Fortunately for today's residents, the plant was originally overdesigned and still has sufficient capacity to meet the City's current needs as well as the projected needs over the next 20 years. To continue to produce safe drinking water over the next 20 years, only a few relatively minor improvements will be required.

The current needs at the treatment plant include:
1) Replace sludge collection equipment in Sedimentation Basins
2) Rehabilitate Clearwell and add baffling
3) Replace disinfection equipment with new larger capacity system
4) Update motor controls and related electrical system in chemical building
5) Replace plant water supply system including pump and hydropneumatic tank

Certain improvements at the plant are needed regardless of capacity or growth; being required merely due to deterioration and age of the existing components.



A new chain-and-flight or chain/scraper type sludge collection system is recommended to replace the deteriorated existing scrapers in the rectangular basins. Modern equipment utilizing non-metallic carrier chains, sprockets, and scrapers is recommended.

The existing domestic water supply system in the plant consists of a constant-speed pump, a large steel pressure tank, and an air compressor. This plant-water system is inefficient and deteriorating. At least one instance of equipment failure has caused a dangerous over-pressurization of the tank. The plant-water system should be replaced with a supply system utilizing a variable frequency drive (VFD) and a smaller bladder-type hydropneumatic tank to replace the deteriorating components while increasing efficiency and safety.

The existing 70-year old concrete clearwell exhibits minor leakage which causes corrosion of the interior reinforcing steel and will eventually lead to concrete spalling and significant damage. Divers (Liquivision Technology) inspected the interior of the clearwell in December 2009 and found portions of the interior in poor condition with gaps of up to 2-inches at the old cold joints in the floor. Rehabilitation of the concrete is recommended to eliminate the water weeping and protect the structure from further damage. The condition of the rebar inside the concrete is unknown however no structural failure or cracking is evident at this time. Since rebar corrosion has been occurring for many years, no easy location for a new clearwell exists, and failure of the concrete structure at the top of the hill would be catastrophic, strength improvements are recommended. Strength improvements can be made by wrapping the tank with FRP/carbon fiber bands at a construction cost of approximately \$20-\$25 per square foot. Since chlorine contact time is insufficient with the clearwell out of service, the repairs need to be made while the tank is full or need to be made very quickly (constructing the new storage tank on Skyline Drive first will provide several days of water supply and may allow clearwell improvements to be made with the clearwell drained for a few days).

With the tank in service, injection of a water-activated, NSF approved, urethane-grout can be used to repair small cracks from the exterior. The cost of crack injection is highly site specific however a typical construction cost is around $50-$70 per lineal foot. This won't allow repair of cracks which may be located in the buried portions of the tank however.

If the tank can be drained, the large interior gaps of 2-inches can be filled with quick-cure non-shrink grout and then an NSF approved spray on lining material can be applied to seal the entire interior surface. These spray-on linings are typically applied around 80- to 100-mils thick and some can cure in 72 hours or less. Alternatively, a drop-in PVC liner can be installed.

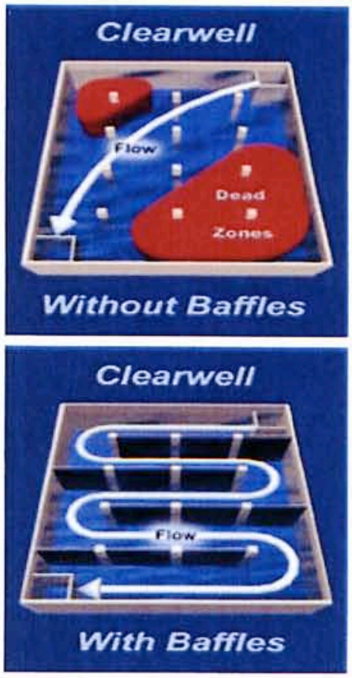
A coating on the tank exterior will further protect and enhance the tanks longevity. If composite wrapping (for strength) is not done, an elastomeric coating (±$15/s.f.) is recommended on the exterior. If composite wrapping is done to strengthen the tank, a less expensive paint coating (±$5/s.f.) can be used.

Estimated project costs for maintenance items are shown below assuming a rough cost of $20 per square foot to drain the clearwell, make minor spot repairs, install a full spray-on interior liner, and add some composite wrapping to the exterior.

Table 7.2.1-1 – WTP Immediate Update/Maintenance Improvements Probable Cost

Water Treatment Plant - Immediate Update/Maintenance Improvements				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$20,000
Sludge Collection Equipment	ls	2	$20,000	$40,000
Plant-Water System, Demo Exist.	ls	All	$20,000	$20,000
Rehabilitate Clearwell Concrete	sf	11,015	$20	$220,300
Equipment Installation Labor Estimate	ls	All	$15,000	$20,000
Electrical and Controls	ls	All	NA	$10,000
Construction Cost Total				$330,300
Contingency (20%)				$66,060
Engineering (20%)				$66,060
Project Management and Legal (5%)				$16,515
Total Project Budget Estimate				**$478,935**

Other improvements at the plant are required to allow for increased flows in order to provide the capacity needed to serve the 20-year planning population.



The capacity building improvements include baffling the clearwell to prevent short-circuiting and to allow adequate chlorine contact time with increases flows, and new hypochlorite generation equipment with a higher capacity to replace the existing MIOX units.

Clearwell baffling can be achieved by utilizing reinforced synthetic rubber curtains weighted at the bottom and with floats at the top or hangers from the roof. The materials used must meet NSF Standard 61 for potable water contact. An approach often used in round tanks is to install curtains or baffle walls to divide the tank into quarters and to use smaller windows in the curtains to direct flow. Diving teams are used when the tank cannot be taken out of service. To the right is an example from Environetics, Inc. in a square tank to exhibit how short-circuiting can be solved with baffles.

If future data collection and testing reveal that the existing chlorine contact time is inadequate under current conditions due to short-circuiting in the existing clearwell, clearwell baffling becomes an immediate need for existing users rather than only for capacity building.

Table 7.2.1-2 – WTP Capacity Building Improvements Probable Cost

Water Treatment Plant - Capacity Building Improvements				
Item Description	*Unit*	*Quantity*	*Unit Cost*	*Item Cost*
Mobilization, Overhead, Profit	ls	All	NA	$20,000
Clearwell Baffling	ls	All	$85,000	$85,000
Disinfection Equipment, 40-50 ppd	ls	1	$90,000	$90,000
Electrical and Controls	ls	All	NA	$10,000
Construction Cost Total				$205,000
Contingency (20%)				$41,000
Engineering (20%)				$41,000
Project Management and Legal (5%)				$10,250
Total Project Budget Estimate				**$297,250**

7.3 Treated Water Storage Needs and Alternatives

7.3.1 Water Storage Needs Analysis

As discussed in Section 4, the goal for treated water storage is to have 3 average days of emergency water (3 x ADD), a modest amount of equalization storage to provide for diurnal fluctuations in tank water levels (20% of one MDD), plus fire storage sufficient to supply 3500 gpm for 3 hours. Existing storage is equal to 1.4 MG between the Ammon Road Tank and the Graham Street Tank assuming the tanks are 100% full. The Clearwell should not be included as storage volume since it is not designed to empty and in fact must stay full to provide chlorine contact time.

Based on the storage goals, the City is 2.3 million gallons (MG) deficient today and will be 3.3 million gallons deficient at the end of the planning period when total demand including that of the Seal Rock Water District is included. In this case, a new 3.3 MG storage tank is needed to supplement the existing storage facilities with Toledo and Seal Rock benefitting.

It may also be appropriate for the Seal Rock Water District to provide its own storage facilities within the District and for Toledo to build storage within the City for the City alone. In this case a smaller 1.6 MG storage tank would be needed based on Toledo's 20-year water demands alone. In the event of a significant plant shut-down or other failure of the water system, provisions and/or agreements to stop the pumping of water to Seal Rock would need to be made so that emergency storage needed by Seal Rock comes from the storage tanks in Seal Rock (and emergency storage needed in Toledo comes from tanks in Toledo) rather than automatically pumping from Toledo to maintain Seal Rock storage tanks full.

Table 7.3.1-1 – Treated Water Storage Needs, Toledo plus Seal Rock Water District

Year	Emergency Storage Need	Fire Storage Need	Equalization Storage Need	Total Storage Need (MG)	Existing Storage (MG)	Storage Deficiency (MG)
2008	2,760,000	630,000	349,600	3.7	1.4	2.3
2009	2,796,000	630,000	354,000	3.8	1.4	2.4
2010	2,829,000	630,000	360,000	3.8	1.4	2.4
2011	2,862,000	630,000	364,000	3.9	1.4	2.5
2012	2,898,000	630,000	368,000	3.9	1.4	2.5
2013	2,931,000	630,000	372,000	3.9	1.4	2.5
2014	2,967,000	630,000	378,000	4.0	1.4	2.6
2015	3,003,000	630,000	382,000	4.0	1.4	2.6
2016	3,039,000	630,000	386,000	4.1	1.4	2.7
2017	3,075,000	630,000	392,000	4.1	1.4	2.7
2018	3,111,000	630,000	396,000	4.1	1.4	2.7
2019	3,150,000	630,000	400,000	4.2	1.4	2.8
2020	3,189,000	630,000	406,000	4.2	1.4	2.8
2021	3,225,000	630,000	410,000	4.3	1.4	2.9
2022	3,264,000	630,000	416,000	4.3	1.4	2.9
2023	3,306,000	630,000	422,000	4.4	1.4	3.0
2024	3,342,000	630,000	426,000	4.4	1.4	3.0
2025	3,384,000	630,000	432,000	4.5	1.4	3.1
2026	3,423,000	630,000	436,000	4.5	1.4	3.1
2027	3,465,000	630,000	442,000	4.5	1.4	3.1
2028	3,507,000	630,000	448,000	4.6	1.4	3.2
2029	3,552,000	630,000	454,000	4.6	1.4	3.2
2030	3,594,000	630,000	458,000	4.7	1.4	3.3
2031	3,639,000	630,000	464,000	4.7	1.4	3.3
2032	3,681,000	630,000	470,000	4.8	1.4	3.4
2033	3,726,000	630,000	476,000	4.8	1.4	3.4
2034	3,771,000	630,000	482,000	4.9	1.4	3.5
2035	3,816,000	630,000	488,000	4.9	1.4	3.5

Based on the storage goals and with Seal Rock water storage needs excluded, the City is 1.1 million gallons (MG) deficient today and will be 1.6 million gallons deficient at the end of the planning period. In this case, a new 1.6 MG storage tank is needed to supplement the existing storage facilities.

Table 7.3.1-2 – Treated Water Storage Needs, Toledo Only (excluding Seal Rock)

Year	Emergency Storage Need	Fire Storage Need	Equalization Storage Need	Total Storage Need (MG)	Existing Storage (MG)	Storage Deficiency (MG)
2008	1,680,000	630,000	192,600	2.5	1.4	1.1
2009	1,698,000	630,000	194,600	2.5	1.4	1.1
2010	1,716,000	630,000	196,600	2.5	1.4	1.1
2011	1,731,000	630,000	198,600	2.6	1.4	1.2
2012	1,749,000	630,000	200,600	2.6	1.4	1.2
2013	1,767,000	630,000	202,600	2.6	1.4	1.2
2014	1,785,000	630,000	204,600	2.6	1.4	1.2
2015	1,803,000	630,000	206,600	2.6	1.4	1.2
2016	1,821,000	630,000	208,600	2.7	1.4	1.3
2017	1,839,000	630,000	210,800	2.7	1.4	1.3
2018	1,857,000	630,000	212,800	2.7	1.4	1.3
2019	1,875,000	630,000	215,000	2.7	1.4	1.3
2020	1,896,000	630,000	217,200	2.7	1.4	1.3
2021	1,914,000	630,000	219,200	2.8	1.4	1.4
2022	1,932,000	630,000	221,400	2.8	1.4	1.4
2023	1,953,000	630,000	223,800	2.8	1.4	1.4
2024	1,971,000	630,000	226,000	2.8	1.4	1.4
2025	1,992,000	630,000	228,200	2.9	1.4	1.5
2026	2,010,000	630,000	230,400	2.9	1.4	1.5
2027	2,031,000	630,000	232,800	2.9	1.4	1.5
2028	2,052,000	630,000	235,200	2.9	1.4	1.5
2029	2,073,000	630,000	237,400	2.9	1.4	1.5
2030	2,094,000	630,000	239,800	3.0	1.4	1.6
2031	2,115,000	630,000	242,200	3.0	1.4	1.6
2032	2,136,000	630,000	244,600	3.0	1.4	1.6
2033	2,157,000	630,000	247,000	3.0	1.4	1.6
2034	2,178,000	630,000	249,600	3.1	1.4	1.7
2035	2,199,000	630,000	252,000	3.1	1.4	1.7

In addition to more storage volume being needed, the existing storage facilities must be maintained. The expected coating life of the epoxy-based coatings on the existing tanks is 20 to 25 years when properly applied. Since it has been 27 years since the last interior coating, the interior of both the Ammon Road Storage Tank and the Graham Street Storage Tank should be recoated early in the planning period. The exterior of the Ammon Road Storage Tank should also be recoated early in the planning period since it has been 26 years since this was conducted.

7.3.2 Water Storage Improvement Alternatives

The 1998 Master Plan discussed the need for a 2.0 MG storage tank on Skyline Drive within the high level pressure zone however the 1998 storage improvements were never implemented. The City owns a 3.7 acre parcel on Skyline Drive at a nearly ideal location at the top of the hill. The City has allowed a Verizon communications tower to exist on the site but this does not interfere with the usefulness of the site to locate a storage tank. Since the City already owns a suitable site at the correct location and at the correct elevation, no alternative sites need to be considered. The water surface elevation in the new high level tank should be 400 to 410 feet with a base elevation of around 370 feet available at the site.

For the current planning period ending in the year 2030, a total of 3.3 MG or 1.6 MG of additional storage is needed depending on the approach used to site storage facilities in Seal Rock and Toledo. The estimated budget cost of these two options is shown on the following page.

Table 7.3.2-1 – 3.2 MG Skyline Drive Storage Tank Probable Cost

Skyline Drive Storage Tank, 3.2 MG				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$150,000
Glass-Fused, Bolted Steel Tank, 33'Hx134'	ls	1	$1,760,000	$1,760,000
Earthwork, Grading	ls	1	$55,000	$55,000
Gravel Surfacing/Base	sf	20,000	$1.30	$26,000
Asphalt, 3"	sf	8,000	$2.60	$20,800
Site Piping and Vaults	ls	All	$30,000	$30,000
System Connecting Piping, 12"	lf	500	$75.00	$37,500
Level Transducer and Telemetry Panel	ls	1	$20,000	$20,000
Flushing and Disinfection	ls	All	NA	$5,000
Construction Cost Total				$2,104,300
Contingency (20%)				$420,860
Engineering (18%)				$378,774
Geotechnical Investigations				$15,000
Project Management and Legal (5%)				$105,215
Total Project Budget Estimate				**$3,024,149**

Table 7.3.2-2 – 1.6 MG Skyline Drive Storage Tank Probable Cost

Skyline Drive Storage Tank, 1.6 MG				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$100,000
Glass-Fused, Bolted Steel Tank, 30'Hx95'	ls	1	$850,000	$850,000
Earthwork, Grading	ls	1	$45,000	$45,000
Gravel Surfacing/Base	sf	10,000	$1.30	$13,000
Asphalt, 3"	sf	4,000	$2.60	$10,400
Site Piping and Vaults	ls	All	$25,000	$25,000
System Connecting Piping, 12"	lf	500	$75.00	$37,500
Level Transducer and Telemetry Panel	ls	1	$20,000	$20,000
Flushing and Disinfection	ls	All	NA	$5,000
Construction Cost Total				$1,105,900
Contingency (20%)				$221,180
Engineering (18%)				$199,062
Geotechnical Investigations				$15,000
Project Management and Legal (5%)				$55,295
Total Project Budget Estimate				**$1,596,437**

With either size storage tank, a pump station is required to lift water and fill the tank. The pump station should consist of two redundant pumps with one operating at a time to supply at least 400 to 500 gpm to the new storage tank. It is assumed that the existing Wagon Road booster pump station will be abandoned and a new above ground pump station constructed nearby. With a ground elevation at the station of around 215 feet, the pump station suction pressure will be approximately 35 psi and the discharge pressure will be approximately 80 psi. Preliminary calculations with typical efficiencies show that pumps with 20 Hp motors will be required. Radio telemetry between the storage tank and the pump station will allow automatic operation of the pumps with "stop" when tank is full and "run" when tank water level drops to some preset level such as 5 feet down from full. Variable frequency drives will not be required since the on/off pump station will function at a constant speed. Soft start motor starters should be considered however. Estimated budget cost for the new pump station is shown below assuming no land acquisition is needed.

Table 7.3.2-3 – New Wagon Road Pump Station Probable Cost

Wagon Road Pump Station (To Fill Skyline Tank)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$10,000
Pumping Equipment, Control Panel	ls	1	$40,000.00	$40,000
Radio Telemetry Equipment	ls	1	$15,000.00	$15,000
Building, 12x16	sf	192	$250.00	$48,000
Electrical Improvements	ls	All	$10,000.00	$10,000
Site Work	ls	All	$10,000.00	$10,000
Construction Cost Total				$133,000
Contingency (20%)				$26,600
Engineering (20%)				$26,600
Project Management and Legal (5%)				$6,650
Total Project Budget Estimate				**$192,850**

There are several properties in the vicinity of the proposed storage tank which would have inadequate pressure through gravity service from the tank. To provide the required minimum of 20 psi at the service connections a small booster pump station is required at the tank site to serve approximately 15 acres of land at the top of the hill. This booster pump station will be located at the tank site on the City property and will contain two small pumps and a small hydropneumatic tank functioning to maintain a constant downstream pressure of between 50 and 70 psi.

Table 7.3.2-4 – Skyline Drive Booster Pump Station Probable Cost

Skyline Drive Booster Pump Station (To Serve 15 Acres of 300'+ Elevations Near Skyline Tank)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,000
Pumping Equipment, VFDs, Control Panel	ls	1	$12,000.00	$12,000
Building, 8x12	sf	96	$250.00	$24,000
Connecting Piping, 6"	lf	200	$50.00	$10,000
Electrical Service	ls	All	$5,000.00	$5,000
Construction Cost Total				$57,000
Contingency (20%)				$11,400
Engineering (20%)				$11,400
Project Management and Legal (5%)				$2,850
Total Project Budget Estimate				**$82,650**

In addition, as discussed in Section 6, it is now time to recoat the entire interior and exterior of the steel Ammon Road Storage Tank as well as the interior of Graham Street Storage Tank in order to protect the steel substrate from corrosion damage.

Table 7.3.2-5 – Ammon Road Storage Tank Recoating Probable Cost

Ammon Road Storage Tank Recoating				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$10,000
Interior Blasting/Recoating	sf	16,000	$8.00	$128,000
Exterior Wash, Hand Tool/Recoating	sf	11,500	$4.50	$51,750
Flushing and Disinfection	ls	All	NA	$2,500
Construction Cost Total				$192,250
Contingency (20%)				$38,450
Engineering (15%)				$28,838
Project Management and Legal (5%)				$9,613
Total Project Budget Estimate				**$269,150**

Table 7.3.2-6 – Graham Street Storage Tank Recoating Probable Cost

Graham Street Storage Tank Recoating				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$5,000
Interior Blasting/Recoating (Lead Present)	sf	6,600	$15.00	$99,000
Exterior Spot Repair/Recoating	sf	0	$4.50	$0
Flushing and Disinfection	ls	All	NA	$2,500
Construction Cost Total				$106,500
Contingency (20%)				$21,300
Engineering (15%)				$15,975
Project Management and Legal (5%)				$5,325
Total Project Budget Estimate				**$149,100**

7.3.3 Recommended Water Storage Improvements

The Seal Rock Water District is located several miles away and already has its own local storage tanks. By providing a large 3.3 MG storage tank in Toledo to serve both the City of Toledo and the Seal Rock Water District, the potential for low chlorine residuals exists. It is recommended that the smaller 1.6 MG storage tank be constructed in the City to reduce the potential for low chlorine residual in the system and to better geographically spread the location of storage facilities out. The budget cost of this tank is $1.6 million.

In addition to the new Skyline Drive Storage Tank, the Wagon Road Pump Station must be constructed to fill the new tank and the Skyline Drive Booster Pump Station must be constructed to supply adequate water pressure to homes near the new tank. The budget cost for these two pump stations is $275,000.

Finally, it is recommended that recoating of the interior and exterior of the existing Ammon Road Storage Tank and recoating the interior of the existing Graham Street Storage Tank be initiated within the next few years to protect those assets. The budget cost for repainting the two existing tanks is $418,000.

7.4 Distribution System Needs and Alternatives

7.4.1 Water Distribution System Hydraulic Analysis

As discussed in Section 6.4.3, the system contains some undersized piping which limits fire flow ability. In order to accurately investigate potential problems and determine the most economical solutions a computer model of the system is developed to mimic the actual physical system in spatial layout, elevation, storage tank locations, and pipe sizes. A program called Bentley WaterCAD V8i was used to model the system. The GIS data layers provided by the City were used as the base map to determine elevations and layout.

The modeling is used to check that the goals outlined in Section 4 are met. In general those goals include:

1) During Peak Hourly Demands, the system maintains at least 40 psi
2) During Fire Flow Demands plus Maximum Day Demands, the system maintains at least 20 psi

Existing conditions and future conditions were modeled to determine deficiencies and solutions. As is typical, pipe size needs are almost entirely dictated by fire flow goals with normal domestic water demands having little impact. Fire flow availability is limited by the rule which requires at least 20 psi in the system at all times. The model predicts the maximum flow that can be withdrawn at any location before pressures either at that location or anywhere else in the system are pulled below 20 psi.

A visual summary of the fire hydrant coverage and flow deficiencies is presented in Figure 7.4-1.

7.4.2 Water Distribution System Pipe Deficiencies

With 62% of the distribution piping being 6-inches in diameter and smaller and over 10% being 4-inches in diameter, fire flows are severely limited in several areas. As discovered in the 1998 Master Plan, fire flow deficiencies exist in relatively large areas along NE Sturdevant Road around the High School and SE Sturdevant Road near Yaquina View (SE 18th St., SE Kauri St., SE Donelle Dr., SE Laurel St., SE Emerald Ct.). In town, much of NE Alder St. has poor fire flow. In addition, poor flow exists in various outlying streets including SE Hillvale Ln., SE Maple St., NE 8th Pl., NW Deer Dr., NW Westwood St., and Yaquina Bay Rd.

Areas with less than ideal pressure (at times less than 40 psi) include along Ammon Rd. near the storage tank, SE Pine St., SE Maple St., SE Elder St. between Graham St. and 3rd St., areas near the top of the hill on Skyline Dr., areas near the intersection of Wagon Rd. and Burgess Rd., on Sunset Rd. around NW 11th and NW 12th Pl., and areas on NE Reservoir Rd. near the water treatment plant. Certain areas such as near the water treatment plant and near the Ammon Rd. Storage Tank have less than 20 psi however this is due to the close proximity to the storage facility and cannot be corrected.

7.4.3 Fire Hydrant Deficiencies

There are 142 fire hydrants in the Toledo water system with fairly uniform coverage. According to the Oregon Fire Code, fire hydrant spacing should not exceed 500 feet. Figure 7.4-1 shows the locations and coverage of fire hydrants in the system based on a 250 foot hose reach (500 foot diameter or hydrant spacing) at each hydrant. Areas with no coverage can be clearly seen in the Figure and additional hydrants should be considered for placement in these areas.

Approximately 10 of the fire hydrants are connected to 4-inch main piping and are smaller than the normal 6-inch barrel hydrants used in municipal water systems. Most of these smaller hydrants cannot provide the 1,000 gpm minimum fire flow goal. Hydrants with inadequate flow capability due to piping restrictions can also be seen in Figure 7.4-1. Hydrants near the middle school and Mary Harrison elementary school have greater than 1500 gpm available but do not have the ability to meet the 3500 gpm goal for these structures.

7.4.4 Water Distribution System Improvement Recommendations

Figure 7.4-2 shows the piping improvements necessary to correct most of the various deficiencies in the distribution system. Cost estimates for these various pipeline improvements are shown below.

Table 7.4.4-1 – Distribution Piping Projects Probable Cost

Distribution Piping - Piping to High School				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$55,000
Pipe, Trenching, Gravel Backfill - 12"	lf	3,870	$75	$290,250
Pipe, Trenching, Native Backfill - 12"	lf	1,500	$65	$97,500
Asphalt Patching	lf	3,000	$15	$45,000
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Pressure Reducing Station	ls	1	$60,000	$60,000
Construction Cost Total				$551,250
Contingency (20%)				$110,250
Engineering (20%)				$110,250
Easement Acquisition, Legal				$15,000
Project Management and Legal (5%)				$27,563
Total Project Budget Estimate				**$814,313**

Distribution Piping - NE 5th St./NE Alder St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,000
Pipe, Trenching, Gravel Backfill - 8"	lf	720	$55	$39,600
Asphalt Patching	lf	720	$15	$10,800
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$59,900
Contingency (20%)				$11,980
Engineering (20%)				$11,980
Project Management and Legal (5%)				$2,995
Total Project Budget Estimate				**$86,855**

Distribution Piping - NW Westwood St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,500
Pipe, Trenching, Gravel Backfill - 8"	lf	700	$55	$38,500
Asphalt Patching	lf	700	$15	$10,500
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$62,500
Contingency (20%)				$12,500
Engineering (20%)				$12,500
Project Management and Legal (5%)				$3,125
Total Project Budget Estimate				**$90,625**

Distribution Piping - SE Beech St./SE 5th St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$5,000
Pipe, Trenching, Gravel Backfill - 8"	lf	520	$55	$28,600
Asphalt Patching	lf	520	$15	$7,800
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$44,900
Contingency (20%)				$8,980
Engineering (20%)				$8,980
Project Management and Legal (5%)				$2,245
Total Project Budget Estimate				**$65,105**

Distribution Piping - SE Hillvale Ln.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$4,000
Pipe, Trenching, Gravel Backfill - 6"	lf	450	$50	$22,500
Asphalt Patching	lf	450	$15	$6,750
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$36,750
Contingency (20%)				$7,350
Engineering (20%)				$7,350
Project Management and Legal (5%)				$1,838
Total Project Budget Estimate				**$53,288**

Distribution Piping - SE Ammon Rd. to SE Maple St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$8,000
Pipe, Trenching, Gravel Backfill - 8"	lf	765	$55	$42,075
Pipe, Trenching, Gravel Backfill - 6"	lf	335	$50	$16,750
Asphalt Patching	lf	520	$15	$7,800
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$81,625
Contingency (20%)				$16,325
Engineering (20%)				$16,325
Project Management and Legal (5%)				$4,081
Total Project Budget Estimate				**$118,356**

Distribution Piping - NE Arcadia Dr.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$4,000
Pipe, Trenching, Gravel Backfill - 8"	lf	480	$55	$26,400
Asphalt Patching	lf	480	$15	$7,200
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$41,100
Contingency (20%)				$8,220
Engineering (20%)				$8,220
Project Management and Legal (5%)				$2,055
Total Project Budget Estimate				**$59,595**

Distribution Piping - SE Sturdevant Rd. (North of Ammon Rd.)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,000
Pipe, Trenching, Gravel Backfill - 10"	lf	640	$65	$41,600
Asphalt Patching	lf	640	$15	$9,600
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$60,700
Contingency (20%)				$12,140
Engineering (20%)				$12,140
Project Management and Legal (5%)				$3,035
Total Project Budget Estimate				**$88,015**

Distribution Piping - SE Sturdevant Rd. (South of Ammon Rd.)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$30,000
Pipe, Trenching, Gravel Backfill - 10"	lf	430	$65	$27,950
Pipe, Trenching, Gravel Backfill - 8"	lf	3,475	$55	$191,125
Asphalt Patching	lf	3,000	$15	$45,000
Fire Hydrant Assemblies	ea	6	$3,500	$21,000
Construction Cost Total				$315,075
Contingency (20%)				$63,015
Engineering (20%)				$63,015
Project Management and Legal (5%)				$15,754
Total Project Budget Estimate				**$456,859**

Distribution Piping - N Nye St./NE 12th St./NE Alder St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$8,000
Pipe, Trenching, Gravel Backfill - 8"	lf	420	$55	$23,100
Pipe, Trenching, Gravel Backfill - 6"	lf	575	$50	$28,750
Asphalt Patching	lf	900	$15	$13,500
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$80,350
Contingency (20%)				$16,070
Engineering (20%)				$16,070
Project Management and Legal (5%)				$4,018
Total Project Budget Estimate				**$116,508**

Distribution Piping - NE 10th Pl./NE 8th Pl.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$9,500
Pipe, Trenching, Gravel Backfill - 8"	lf	300	$55	$16,500
Pipe, Trenching, Gravel Backfill - 6"	lf	875	$50	$43,750
Asphalt Patching	lf	1,100	$15	$16,500
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$93,250
Contingency (20%)				$18,650
Engineering (20%)				$18,650
Project Management and Legal (5%)				$4,663
Total Project Budget Estimate				**$135,213**

Distribution Piping - NE Burgess Rd.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$3,000
Pipe, Trenching, Gravel Backfill - 12"	lf	130	$75	$9,750
Asphalt Patching	lf	130	$15	$1,950
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$18,200
Contingency (20%)				$3,640
Engineering (20%)				$3,640
Project Management and Legal (5%)				$910
Total Project Budget Estimate				**$26,390**

The total estimated probable cost of these distribution piping improvements is $2.1 million. Prioritization of these improvements into two phases is shown below.

Table 7.4.4-2 – Distribution Piping Projects Prioritization

Priority 1 - Correct Fire Flow Deficiencies to Schools	
Distribution Piping - Piping to High School	$814,313
Distribution Piping - NE Arcadia Dr.	$59,595
Distribution Piping - SE Sturdevant Rd. (North of Ammon Rd.)	$88,015
Distribution Piping - NE Burgess Rd.	$26,390
Distribution Piping - SE Beech St./SE 5th St.	$65,105
	$1,053,418

Priority 2 - Correct Extreme Fire Flow Deficiencies Areas (700 gpm or less)	
Distribution Piping - N Nye St./NE 12th St./NE Alder St.	$116,508
Distribution Piping - NW Westwood St.	$90,625
Distribution Piping - NE 10th Pl./NE 8th Pl.	$135,213
Distribution Piping - SE Ammon Rd. to SE Maple St.	$118,356
Distribution Piping - SE Sturdevant Rd. (South of Ammon Rd.)	$456,859
Distribution Piping - SE Hillvale Ln.	$53,288
Distribution Piping - NE 5th St./NE Alder St.	$86,855
	$1,057,703
Total All Distribution Improvements	**$2,111,120**

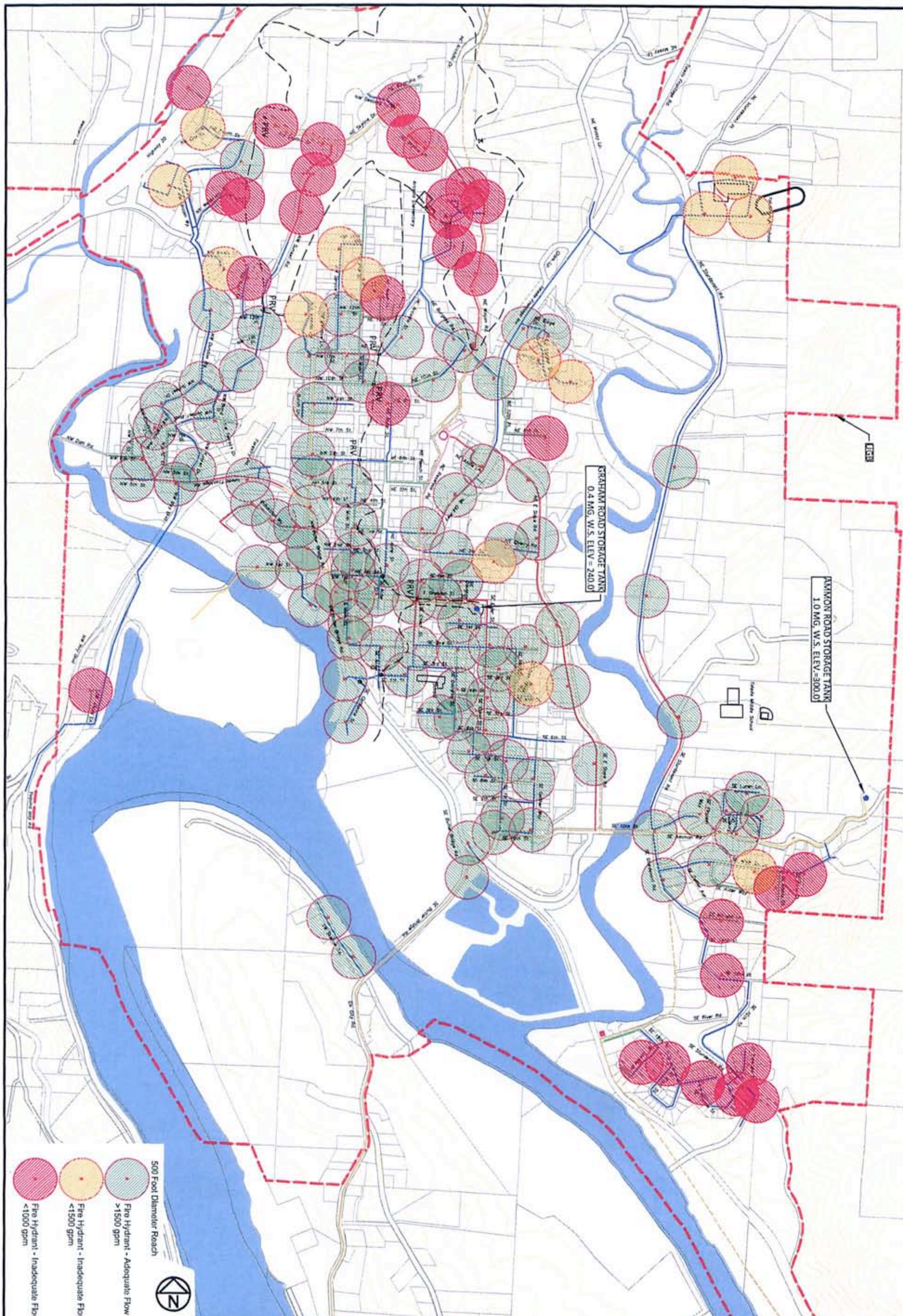


FIGURE 7.4-1	0 — 1" — 1" = 1000 ft DRAWN BY: REB DATE: FEB. 2, 2010	**Existing Water System** **Fire Hydrant Coverage** WATER SYSTEM MASTER PLAN	CITY OF TOLEDO LINCOLN COUNTY, OREGON

Civil West
Engineering Services, Inc.

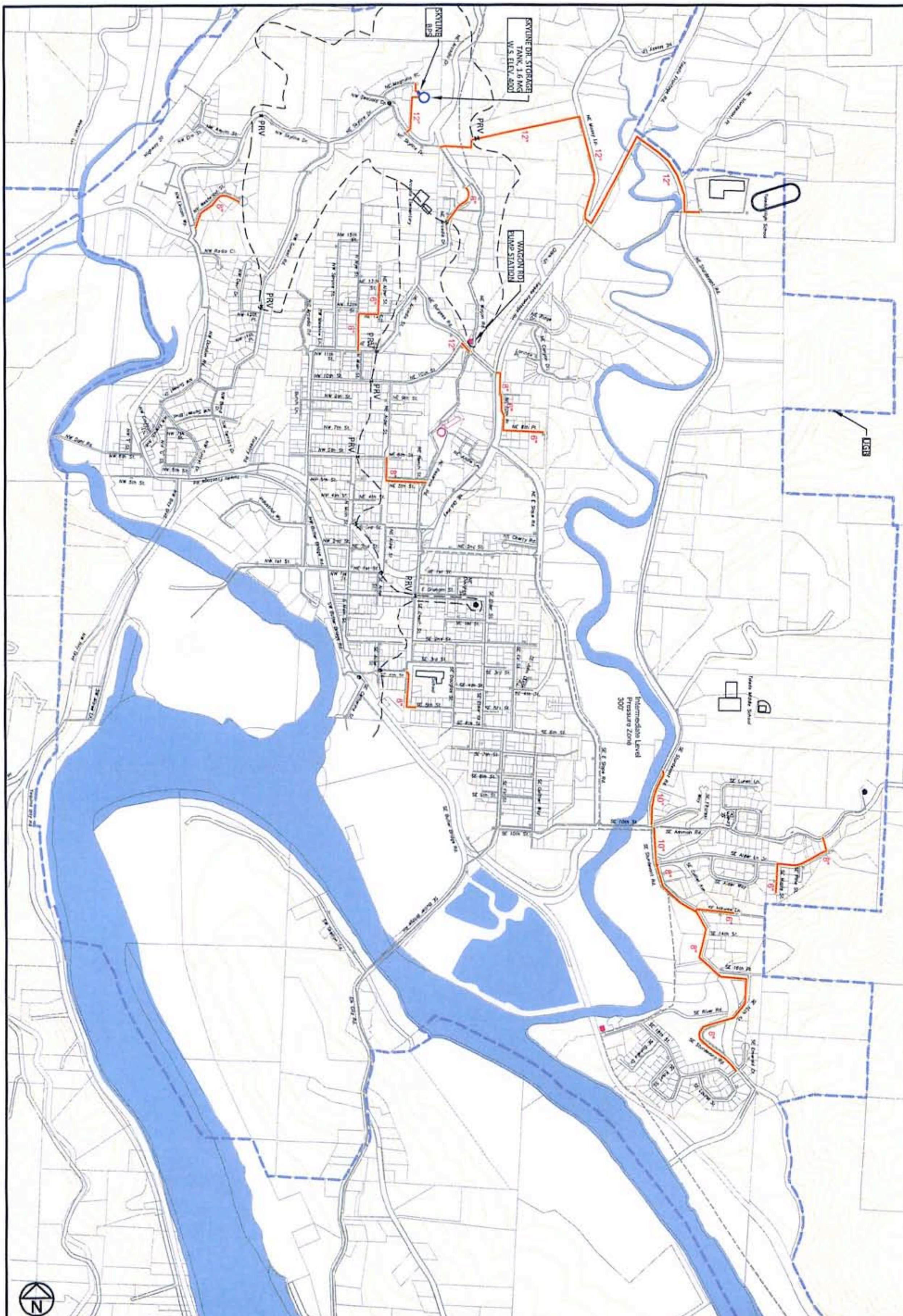


FIGURE 7.4-2

0 1"
1" = 1000 ft

DRAWN BY: REB
DATE: FEB. 4, 2010

Proposed Water System Piping Improvements

WATER SYSTEM MASTER PLAN

CITY OF TOLEDO
LINCOLN COUNTY, OREGON

Civil West Engineering Services, Inc.

Capital Improvement Plan

Section 8

8.1 Capital Improvement Plan Purpose and Need

This Section summarizes the water system capital improvements needed to properly serve the community's needs over the next 20 years as determined by the detailed analyses in this Water System Master Plan. The Capital Improvement Plan (CIP) consists of various projects to maintain and protect existing water system assets, projects to correct deficiencies, and projects necessary to increase water system capacity to serve the growing population.

The water system CIP is used to help establish funding needs, user rates, system development charges (SDCs), and to plan for and prioritize various project needs. The CIP can change over time as projects are completed and/or new unforeseen needs arise and an attempt should be made to annually update the CIP and keep the list of needs current.

8.2 Capital Improvement Plan Projects

8.2.1 CIP Summary

The various raw water supply, water treatment, water storage, and water distribution system projects recommended in this Water System Master Plan for the 20-year planning period are summarized below. The table includes the replacement of the Mill Creek raw water supply system as recommended in the 2002 Raw Water Transmission System Replacement and Rehabilitation Report.

Table 8.2.1-1 CIP Project Summary

Water System Capital Improvement Needs			*Potential Cost Share Distribution*	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
WS1	Siletz River Intake and Pump Station	$2,380,000	$1,190,000	$1,190,000
WS2	Olalla Reservoir Pipeline Crossing	$1,572,500	$786,250	$786,250
WS3	Mill Creek Pump Station and Transmission Piping	$9,600,000	$4,800,000	$4,800,000
S1	Skyline Drive 1.6 MG Storage Tank	$1,596,437	$1,596,437	$0
S2	Ammon Rd. Storage Tank Refurbishment	$269,150	$269,150	$0
S3	Graham St. Storage Tank Refurbishment	$149,100	$149,100	$0
P1	Skyline Drive Booster Pump Station	$82,650	$82,650	$0
P2	Wagon Road Pump Station	$192,850	$192,850	$0
T1	Water Treatment Maintenance Improvements	$478,935	$239,468	$239,468
T2	Water Treatment Capacity Improvements	$297,250	$148,625	$148,625
D1	Phase 1 Distribution Improvements	$1,053,418	$1,053,418	$0
D2	Phase 2 Distribution Improvements	$1,057,703	$1,057,703	$0
		$18,729,992	**$11,565,650**	**$7,164,343**

An attempt was made to show the potential split in cost sharing of the various needs between the City and the Seal Rock Water District based on the historic 50/50 share. Items such as supply and treatment logically split based on water demand. Items such as the various distribution improvements within the

City and the smaller storage tank (see Section 7.3) do not directly involve service to the Seal Rock Water District and are shown with 100% cost share belonging to the City. The 50/50 sharing agreement used in the past appears reasonable as records for 2008 show a total of 49% of all water sold going to the District and 51% being used within the City.

8.2.2 CIP Phases

The cost for the water system improvement needs is great and there may be reason to prioritize the improvements or take projects on in phases. Following is a potential phased approach. Storage improvements are listed in Phase 1 due to the existing storage deficiency and the benefit of having sufficient storage already in place when potentially disrupting other water infrastructure components.

Phase 2 includes the Siletz raw water supply projects due to the extreme deterioration of the existing components and the fact that if water supply cannot be delivered to town, other improvements have little meaning.

Table 8.2.2-1 Phased CIP Projects

Water CIP - Phase 1			Potential Cost Share Distribution	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
S1	Skyline Drive 1.6 MG Storage Tank	$1,596,437	$1,596,437	$0
P1	Skyline Drive Booster Pump Station	$82,650	$82,650	$0
P2	Wagon Road Pump Station	$192,850	$192,850	$0
D1	Phase 1 Distribution Improvements	$1,053,418	$1,053,418	$0
		$2,925,355	**$2,925,355**	**$0**

Water CIP - Phase 2			Potential Cost Share Distribution	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
T1	Water Treatment Maintenance Improvements	$478,935	$239,468	$239,468
WS1	Siletz River Intake and Pump Station	$2,380,000	$1,190,000	$1,190,000
WS2	Olalla Reservoir Pipeline Crossing	$1,572,500	$786,250	$786,250
		$4,431,435	**$2,215,718**	**$2,215,718**

Water CIP - Phase 3			Potential Cost Share Distribution	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
D2	Phase 2 Distribution Improvements	$1,057,703	$1,057,703	$0
S2	Ammon Rd. Storage Tank Refurbishment	$269,150	$269,150	$0
S3	Graham St. Storage Tank Refurbishment	$149,100	$149,100	$0
T2	Water Treatment Capacity Improvements	$297,250	$148,625	$148,625
		$1,773,203	**$1,624,578**	**$148,625**

Water CIP - Phase 4			Potential Cost Share Distribution	
Item	*Description*	*Opinion of Probable Project Cost*	*Toledo Share*	*Seal Rock Share*
WS3	Mill Creek Pump Station and Transmission Piping	$9,600,000	$4,800,000	$4,800,000
		$9,600,000	**$4,800,000**	**$4,800,000**

The various phases may be altered over time as needs and funding options change. It may be prudent to construct more than one phase at any given time or even to construct all phases at once.

9.1 Existing Water Rates and Charges

9.1.1 Existing Rate Structure

The City of Toledo last adjusted water rates in June of 2009. The adjustments included a 4% increase on the facilities charge, a 4.8% increase in the service charge, and a 3.9% increase in the use charge per 1000 gallons of water. The current rate structure has an increasing facilities charge based on the size of water meter installed and has fixed service and use charges regardless of the amount of water used. The current rate structure is shown in Table 9.1.1-1.

Table 9.1.1-1 – Current Water Rate Structure

Water Meter Size (in)	Capacity Factor	Facilities Charge	Service Charge	Use Charge (per 1000 gal)
5/8	1.0	$6.50	$2.20	$2.13
3/4	1.5	$9.75	$2.20	$2.13
1	2.6	$16.90	$2.20	$2.13
1-1/4	4.1	$26.65	$2.20	$2.13
1-1/2	5.9	$38.35	$2.20	$2.13
2	10.5	$68.25	$2.20	$2.13
3	23.6	$153.40	$2.20	$2.13
4	41.9	$272.35	$2.20	$2.13
6	94.3	$612.95	$2.20	$2.13
8	167.5	$1,088.75	$2.20	$2.13
10	261.0	$1,696.50	$2.20	$2.13
12	377.0	$2,450.50	$2.20	$2.13

The current rate structure results in an average monthly water bill of $20.10 with an average residential water use of 5,350 gallons per month (see Section 3.2.6) per typical single-family dwelling. When using the statewide typical consumption of 7500 gallons per month per household as often cited by funding agencies as the "average residential water bill", the monthly charge is $24.68 ($0.0033/gallon).

The City has an agreement with the Seal Rock Water District whereby the District pays the City for the treatment and delivery of water at a rate equivalent to the residential usage charge ($0.00213/gallon). The Seal Rock charge equates to $15.98 for 7500 gallons.

Based on the audit report from fiscal year ending June 2009, water sales revenue within the City was $492,066 with an additional $252,793 in revenue from wholesale water sales to the Seal Rock Water District. Based on this data, the average monthly bill to Seal Rock is $21,066.

9.1.2 Connection Charges and System Development Charges

Like most communities, a connection fee is charged when a new water service is installed within the service boundary where no previous connection existed. The connection fee varies by meter size and is meant to match the actual cost of labor, equipment, and material furnished by the City as required to provide and install the service line and meter. Typical connection charges for small residential service connections are $300 to $400.

The City also has a water System Development Charge (SDC) in place established by ordinance and based upon a written methodology developed with past engineering analysis and costs estimates together with an economic and financial analysis of the system. The current SDC for a new basic residential water connection is $1,472 including $180 as a reimbursement fee and $1,292 as the improvement fee. The SDC charge increases as the size of water meter required increases as shown in Table 9.1.2-1.

Table 9.1.2-1 – Current Water SDC

Water Meter Size (in)	5/8-inch Equivalents	Reimbursement SDC	Improvement SDC	Total SDC
5/8	1.0	$180	$1,292	$1,472
3/4	1.5	$270	$1,938	$2,208
1	2.6	$468	$3,359	$3,827
1-1/4	4.1	$738	$5,297	$6,035
1-1/2	5.9	$1,062	$7,623	$8,685
2	10.5	$1,890	$13,566	$15,456
3	23.6	$4,248	$30,491	$34,739
4	41.9	$7,542	$54,135	$61,677
6	94.3	$16,974	$121,836	$138,810
8	167.5	$30,150	$216,410	$246,560
10	261.0	$46,980	$337,212	$384,192
12	377.0	$67,860	$487,084	$554,944

- *Amounts vary slightly from Ordinance due to round off differences*

The current SDC Methodology written in 1994 also includes an analysis of SDC fees applicable to the Seal Rock Water District as a wholesale customer. The analysis concludes that the Improvement SDC applicable to the District is $939 for a new 5/8-inch meter customer. The methodology is unclear as to the exact Reimbursement SDC applicable to Seal Rock however it notes that this fee should be equal to or less than 25% of the Reimbursement SDC fee applicable to City residents. Total SDC charges averaged approximately $14,000 per year for the four year period from 2007 to 2009.

The water SDC is due for an update. The improvement needs and associated costs developed in this Master Plan should be used as the basis for establishing updated SDC fees.

9.1.3 Water Fund Budget

Table 9.1.3-1 – Water Fund Budget 2007/2008

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET ASSETS - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2008

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual Budget Basis	Actual Adjustments	Actual GAAP Basis
Operating revenues					
Water sales	$ 452,750	$ 29,769	$ 482,519	$ -	$ 482,519
Water sales - Seal Rock	259,000	(11,902)	247,098	-	247,098
Fees and charges	18,500	7,325	25,825	-	25,825
Rents and leases	6,480	1,080	7,560	-	7,560
Total operating revenues	736,730	26,272	763,002	-	763,002
Operating expenses					
Water plant	336,807	(8,829)	327,978	(104,541)	223,437
Water distribution	439,924	(79,681)	360,243	(196,182)	164,061
Total operating expenses	776,731	(88,510)	688,221	(300,723)	387,498
Operating income (loss)	(40,001)	114,782	74,781	300,723	375,504
Nonoperating revenues (expenses)					
Investment earnings	1,500	1,178	2,678	-	2,678
Miscellaneous	1,000	(141)	859	-	859
Total nonoperating revenues (expenses)	2,500	1,037	3,537	-	3,537
Income (loss) before contributions and transfers	(37,501)	115,819	78,318	300,723	379,041
Capital contributions	-	-	-	96,447	96,447
Transfers out	-	-	-	(416,923)	(416,923)
Change in net assets	(37,501)	115,819	78,318	(19,753)	58,565
Total net assets - beginning, as restated	37,501	63,099	100,600	1,513,904	1,614,504
Total net assets - ending	$ -	$ 178,918	$ 178,918	$ 1,494,151	$ 1,673,069

Table 9.1.3-2 – Water Fund Budget 2008/2009

CITY OF TOLEDO
Lincoln County, Oregon

SCHEDULE OF REVENUES, EXPENSES, AND CHANGES IN FUND NET ASSETS - BUDGET AND ACTUAL

WATER FUND

For the Year Ended June 30, 2009

	Original and Final Budget	Variance with Final Budget Over (Under)	Actual Budget Basis	Actual Adjustments	Actual GAAP Basis
REVENUES					
Water sales	$ 495,000	$ (2,934)	$ 492,066	$ -	$ 492,066
Water sales - Seal Rock	254,000	(1,207)	252,793	-	252,793
Fees and charges	22,000	(5,819)	16,181	-	16,181
Rents and leases	7,775	1	7,776	-	7,776
Investment earnings	2,000	8	2,008	-	2,008
Miscellaneous	1,000	327	1,327	-	1,327
Total revenues	781,775	(9,624)	772,151	-	772,151
EXPENSES					
Water plant	394,938	(11,334)	383,604	(107,333)	276,271
Water distribution	449,037	(22,396)	426,641	(105,240)	321,401
Depreciation	-	-	-	112,420	112,420
Contingency	(60,000)	60,000	-	-	-
Total expenses	783,975	26,270	810,245	(100,153)	710,092
Excess (deficiency) of revenues over (under) expenses	(2,200)	(35,894)	(38,094)	100,153	62,059
OTHER FINANCING SOURCES (USES)					
Capital contributions	-	-	-	148,679	148,679
Transfers out	-	-	-	(209,335)	(209,335)
Total other financing sources (uses)	-	-	-	(60,656)	(60,656)
Change in net assets	(2,200)	(35,894)	(38,094)	39,497	1,403
Net assets - beginning	122,200	56,718	178,918	1,494,151	1,673,069
Net assets - ending	$ 120,000	$ 20,824	$ 140,824	$ 1,533,648	$ 1,674,472

Approximately 66% of sales revenue comes from within the City while 33% comes from wholesale water sales to the Seal Rock Water District. For 2008 a total of $729,617 ($482,519 + $247,098) was generated from sales of 249.6 million gallons of water with an average cost per gallon of $0.0029. The $247,098 from Seal Rock resulted from sales of 120.9 million gallons for at an average cost per gallon of $0.0020. The $482,519 from customers within the City resulted from sales of 128.8 million gallons for a cost per gallon of $0.0037.

9.2 Revenue Increase Needed

9.2.1 Capital Improvement Costs

The Capital Improvement Plan (CIP) listed in Section 8 has a total estimated cost of $18.7 million dollars. Approximately $11.6 million of the cost is considered the City's portion while $7.1 million is the Seal Rock Water District's share based on a 50/50 split of the cost for improvements jointly necessary.

9.2.2 Additional Annual Revenue Required

The following table shows potential revenue increases needed to fund the CIP based on average standard funding terms including a 3.5% interest rate and a 20-year payback.

Table 9.2.2-1 – Potential Revenue Increases Required

Cost per EDU	Full CIP	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost	$18,729,992	$2,925,355	$4,431,435	$1,773,203	$9,600,000
Loan Needed	$18,729,992	$2,925,355	$4,431,435	$1,773,203	$9,600,000
Interest rate	3.50%	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20	20
Annual Annuity	$1,317,862.41	$205,831.09	$311,800.54	$124,764.44	$675,466.34
Monthly Income Required	$109,821.87	$17,152.59	$25,983.38	$10,397.04	$56,288.86

9.3 Potential Grant and Loan Sources

9.3.1 Background Data for Funding

Funding for municipal water system capital improvements occurs with loans, grants, principal forgiveness, bonds, or a combination thereof. Parameters such as the local and State median household income (MHI), existing debt service, water use rates, low/moderate income level percentages, financial stability, and project need are used by funding agencies to evaluate the types and levels of funding assistance that can be received by a community.

According to the 2000 US Census, the MHI in Toledo is $34,503 (1999 dollars). The State MHI is $40,916 and the Toledo MHI is 84.3% of the State MHI. According to the Proposed 2010 Method of Distribution document for CDBG, Toledo has 41.0% low/moderate income persons.

The average residential water bill in Toledo is currently $24.68 per month or $296.16 annually (based on 7500 gallons use per month) which equals 0.86% of the local MHI. Toledo's water rates are lower than many similar communities and significantly lower than other small communities faced with large capital improvement needs. Many funding sources require user rates to be high enough to meet a certain "threshold rate" or "affordability rate" which is expressed at a percentage of the local MHI. For example in 2009 for the Community Development Block Grant (CDBG) program, water rates had to be at least 1.48% of the local MHI to qualify for grant assistance. In Toledo, this threshold rate would be $42.55 per month meaning that only loans would be available until such time as the rate would need to be above $42.55 in order to generate enough revenue to cover the loan payment. After the threshold rate is met, grants and principal forgiveness may be available.

The calculation for the water user rate can incorporate, when applicable, fee-equivalents derived from other local funding sources that are or will be used to pay for the water system, including any special levy on taxable property within the system's territory.

9.3.2 Infrastructure Finance Authority (IFA)

Recent restructuring in the State has resulted in the creation of the Oregon Business Development Department (OBDD) / Infrastructure Finance Authority (IFA) from what previously was the Oregon Economic and Community Development Department.

IFA administers resources aimed at community development activities primarily in the water and wastewater infrastructure areas. The IFA Regional Coordinator for Lincoln County is Louise Birk (503-986-0130) and any application process should begin by contacting her. The funding programs through IFA include:

- Community Development Block Grants (CDBG)
- Safe Drinking Water Revolving Loan Fund (SDWRLF)
- Special Public Works Funds
- Water/Wastewater Financing

Block Grant assistance for Toledo is highly unlikely due to the existing low water rates and inability to meet the national objectives for low- and moderate income persons.

The SDWRLF generally must be used to address a health or compliance issue and could potentially provide a loan up to $6 million per project. To receive a loan the project must be ranked high enough on the Project Priority List in the Intended Use Plan developed by the State. A Letter of Interest (LOI) must be submitted before a project can be listed in the Intended Use Plan. The LOIs are accepted annually. 2010 LOI was due in October of 2009 so it is likely that the 2011 LOI will be due sometime in the summer or fall of 2010. Loan terms are typically 3-4% interest for 20 years however "Disadvantaged Communities" can potentially qualify for 1% loans for 30 years as well as some principal forgiveness. To be considered a Disadvantaged Community the average residential water rate must be at or above the threshold rate (~$42.55 per month in Toledo) and the area MHI must be less that the State MHI.

All recipients of SDWRLF awards need to complete an environmental review on every project in accordance with the State Environmental Review Process (SERP), pursuant to federal and state environmental laws. The Environmental Report typically required can cost $25,000 to $75,000 depending on the specific biological, cultural, waterway, and wetland issues that arise.

Loans and grants are available through the Special Public Works Funds and Water/Wastewater Financing depending on need and financial reviews by IFA.

9.3.3 Rural Development / Rural Utilities Service (RUS)

The United States Department of Agriculture (USDA) Rural Utilities Service (RUS) has a Water Programs Division which provides loans, guaranteed loans, and grants for water infrastructure projects for towns of less than 10,000 persons. Grants are only available when necessary to keep user costs to reasonable levels (very similar to IFA threshold rate). Loans can be made with repayment periods up to 40 years. Interest rates vary but often are around 4% for design/construction loans. Environmental reporting is required similar to that for the SDWRLF but with slightly different criteria.

9.4 Potential Water Rate Increases

Because of the various options in funding programs and requirements for contact and communication with the Regional Coordinators prior to applications, the recommended first step in exploring funding options is to attend a "One-Stop" financing meeting. The One-Stop meeting is held in Salem once a month with the goal of gathering the State and federal funding agencies together at one time and one place to discuss all potential funding possibilities and issues. No funding commitments are made at the meeting, but probable funding sources and details are provided to enable the City to choose the best alternatives possible at that time and to initiate funding application steps.

Since the current user rates are generally too low for Toledo to qualify for grant assistance, it is likely that only loan assistance will be possible for at least the first two phases of improvements. Based on the funding agency average of 7500 gallons per month per EDU, there are 3309 total EDUs (1434 in Seal Rock and 1875 in Toledo). The following Table shows a possible scenario with the needed increase in revenue spread evenly over all 3309 EDUs, including EDUs in Seal Rock. It can be seen that even at the end of Phase 3, the potential user rate just meets the 2009 threshold rate of approximately $42 per month.

Table 9.4.1-1 – Potential System-Wide Rate Increases, No Grants

Cost per EDU - System Wide	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost	$2,925,355	$4,431,435	$1,773,203	$9,600,000
Loan Needed	$2,925,355	$4,431,435	$1,773,203	$9,600,000
Interest rate	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20
Annual Annuity	$205,831.09	$311,800.54	$124,764.44	$675,466.34
Monthly Income Required	$17,152.59	$25,983.38	$10,397.04	$56,288.86
Monthly Income Reqd' w / 10% reserve	$18,867.85	$28,581.72	$11,436.74	$61,917.75
Number of EDUs (7500 gal/mo.)	3309	3309	3309	3615
Monthly Cost per EDU	**$5.70**	**$8.64**	**$3.46**	**$17.13**

Previous Water Bill, 7500 gal.	$24.68	$30.38	$39.02	$42.48
New Water Bill, 7500 gal.	**$30.38**	**$39.02**	**$42.48**	**$59.60**

The above scenario shows the overall increase needed per EDU but would place a higher percentage of the increase on the Seal Rock Water District. A more equitable approach may be to place the rate increase burden on each entity separately according to the project cost share as shown in Section 8.2.2. The Seal Rock Water District currently pays around $250,000 per year for approximately 120 million gallons of treated water at a cost of $2.13 per 1000 gallons. The table below shows the additional annual revenue needed from Seal Rock to accomplish the project portions attributable to Seal Rock based on typical loan scenarios.

Table 9.4.1-2 – Potential Seal Rock Revenue Increase Needed

Cost per EDU - Seal Rock	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost (Seal Rock Share Only)	$0	$2,215,718	$148,625	$4,800,000
Loan Needed	$0	$2,215,718	$148,625	$4,800,000
Interest rate	3.50%	3.50%	3.50%	1.00%
Loan Period (yrs)	20	20	20	30
Annual Annuity	$0.00	$155,900.27	$10,457.42	$185,990.94
Monthly Income Required	$0.00	$12,991.69	$871.45	$15,499.25
Monthly Income Reqd' w / 10% reserve	$0.00	$14,290.86	$958.60	$17,049.17

To complete Phase 1 requires no additional revenue from Seal Rock since the Phase 1 projects are for the City alone. To complete Phase 2 requires $152,008 per year from Seal Rock and $152,008 per year from Toledo. Phase 3 requires only $10,457 per year from Seal Rock and $104,454 per year from Toledo. Phase 4 requires $337,733 per year each.

Based on this scenario, if Phase 1 through Phase 3 projects were undertaken within the next few years, an additional $166,300 in annual revenue would be needed from Seal Rock and $476,000 in annual revenue needed from within the City. To generate the additional Seal Rock revenue would require an adjustment in the wholesale rate for 1000 gallons from $2.13 to approximately $3.50 based on current average volumes of water sold. For each of the approximate 2400 metered connections in the Seal Rock Water District, this increase would equal an additional $5.65 per month.

Table 9.4.1-3 – Potential Toledo Revenue/Rate Increase Needed

Cost per EDU - Toledo	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost (Toledo Share Only)	$2,925,355	$2,215,718	$1,624,578	$4,800,000
Loan Needed	$2,925,355	$2,215,718	$1,624,578	$4,800,000
Interest rate	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20
Annual Annuity	$205,831.09	$155,900.27	$114,307.02	$337,733.17
Monthly Income Required	$17,152.59	$12,991.69	$9,525.59	$28,144.43
Monthly Income Reqd' w / 10% reserve	$18,867.85	$14,290.86	$10,478.14	$30,958.87
Number of EDUs (Toledo EDU Only)	1875	1875	1875	2050
Monthly Cost per EDU	**$10.06**	**$7.62**	**$5.59**	**$15.10**

Previous Water Bill, 7500 gal.	$24.68	$34.74	$42.36	$47.95
New Water Bill, 7500 gal.	**$34.74**	**$42.36**	**$47.95**	**$63.05**

To generate the additional revenue within the City would require adjustments such that the average residential water bill (based on 7500 gallons) increased from $24.68 to $47.95 or up to an average of $6.39 per 1000 gallons. Since Phase 3 and Phase 4 begin to require water rates above the threshold rate, it might be possible to receive grant assistance for these phases. A possible scenario with 25% grant money received for Phase 3 and 4 is shown below.

Table 9.4.1-4 – Potential Toledo Revenue/Rate Increase Needed, Grants for Phase 3 and 4

Cost per EDU - Toledo	Phase 1	Phase 2	Phase 3, 25% Grant	Phase 4, 25% Grant
Capital Cost (Toledo Share Only)	$2,925,355	$2,215,718	$1,624,578	$4,800,000
Loan Needed	$2,925,355	$2,215,718	$1,218,433	$3,600,000
Interest rate	3.50%	3.50%	3.50%	1.00%
Loan Period (yrs)	20	20	20	30
Annual Annuity	$205,831.09	$155,900.27	$85,730.27	$139,493.21
Monthly Income Required	$17,152.59	$12,991.69	$7,144.19	$11,624.43
Monthly Income Reqd' w / 10% reserve	$18,867.85	$14,290.86	$7,858.61	$12,786.88
Number of EDUs (Toledo EDU Only)	1875	1875	1875	2050
Monthly Cost per EDU	**$10.06**	**$7.62**	**$4.19**	**$6.24**

Previous Water Bill, 7500 gal.	$24.68	$34.74	$42.36	$46.56
New Water Bill, 7500 gal.	**$34.74**	**$42.36**	**$46.56**	**$52.79**

9.5 Rate Impact Summary

The current rate structure generates approximately $62,000 per month in water sales revenue metered through around 1375 meters.

A potential source of revenue that should be considered as well is a timber harvest in the City-owned Mill Creek watershed. Care would need to be taken not to degrade the water quality in the stream. Depending on the then current value of timber, up to one million dollars or more could be generated. If $1.5 million in timber harvest dollars was received, the City could accomplish Phases 1 through 3 while maintaining rates at around $42 per month.

9.5.1 Phase 1 Improvements

To complete Phase 1 Improvements, a loan is assumed with a 20-year payback at 3.5%. An additional $19,000 per month is needed to pay back the potential loan (with 10% additional fund cushion). None of the Phase 1 Improvement cost should be attributed to Seal Rock. To generate the increased revenue, an effective rate increase of $10 per EDU is required based on 1 EDU=7500 gallons per month. An increase in the charge within the City per 1000 gallons from $2.13 to $3.50 could accomplish the necessary revenue increase. Alternatively, a $5 increase per month on the "Facilities Charge" for each of the 1375 connections, plus an increase in the usage charge to $2.80 per 1000 gallons may generate the necessary revenue.

The average monthly water bill for a household using 7500 gallons would effectively increase from $24.68 per month to just under $35 per month. The average cost per gallon for an EDU becomes $0.0047.

9.5.2 Phase 2 Improvements

Phase 2 Improvements would potentially be a 50/50 cost share between the City and the Seal Rock Water District. To complete Phase 2 Improvements, a loan is assumed with a 20-year payback at 3.5%. An additional $28,000 per month is needed to pay back the potential loan. To generate the $14,000 per month increased revenue within the City, an effective rate increase of $7.60 per EDU is required based on 1 EDU=7500 gallons per month. An increase in the use charge within the City per 1000 gallons to $4.50 could accomplish the necessary revenue increase if no increases in the facilities or service charges occur. Alternatively, increasing the fixed charges by $10 (over current for 5/8-inch meter) and increasing the use charge to $3.20 per 1000 would generate the necessary revenue.

The average monthly water bill for a household using 7500 gallons would effectively increase from $35 per month (after Phase 1 Improvements) to just over $42 per month within the City. The average cost per gallon for an EDU becomes $0.0056 in Toledo.

The monthly water bill for the Seal Rock Water District would need to effectively increase from the current $21,000 per month (based on approximately 10 million gallons per month) to $35,000 per month to generate the extra $14,000 per month for the District's share. This would require the wholesale cost per gallon charge to increase by $0.0014 per gallon to a total of $3.53 per 1000 gallons. The average cost per gallon for an EDU (7500 gallon) becomes $0.00353 for wholesale water to Seal Rock.

9.5.3 Phase 3 Improvements

Phase 3 Improvements would potentially be a 91/9 cost share between the City and the Seal Rock Water District respectively. To complete Phase 3 Improvements, a loan is assumed with a 20-year payback at 3.5%. An additional $11,400 per month is needed to pay back the potential loan. To generate the $10,500 per month increased revenue within the City, an effective rate increase of $5.60 per EDU is required based on 1 EDU=7500 gallons per month and existing number of EDU. An increase in the charge within the City per 1000 gallons to $5.30 could accomplish the necessary revenue increase if no increases in the facilities or service charges occur. Alternatively, increasing the fixed charges by $10 (over current for 5/8-inch meter) and increasing the use charge to $3.90 per 1000 would generate the necessary revenue.

The average monthly water bill for a household using 7500 gallons would effectively increase from $42 per month (after Phase 1 and 2 Improvements) to about $48 per month within the City. The average cost per gallon for an EDU becomes $0.0064 in Toledo.

The monthly water bill for the Seal Rock Water District would need to effectively increase another $1,000 per month (based on approximately 10 million gallons per month) to $36,000 per month. This would require the wholesale cost per gallon charge to increase to $3.60 per 1000 gallons. The average cost per gallon for an EDU (7500 gallon) becomes $0.0036 for wholesale water to Seal Rock.

If 25% grant could be received for Phase 3, the typical residential rates in Toledo (for a 5/8-inch meter using 7500 gallons per month) would need to be around $46.60 rather than $48.

9.5.4 Phase 4 Improvements

Phase 4 Improvements would potentially be a 50/50 cost share between the City and the Seal Rock Water District. To complete Phase 4 Improvements with only loan funds (20-year payback at 3.5%), an additional $62,000 per month would needed to pay back the potential loan. If 25% grant assistance could be obtained, an additional $46,000 per month would be needed for the remaining loan. If 25% grant with the remaining portion a loan for 30 years at 1% could be obtained, only an additional $26,000 per month would be needed.

Assuming 25% grant and a 1%, 30-year loan; and assuming EDU numbers projected in the year 2015; Phase 4 Improvements could be accomplished by raising rates another $6.24 per month per EDU up to a total of just over $52 per month for the residential user of 7500 gallons.

The monthly water bill for the Seal Rock Water District would need to effectively increase from $36,000 per month (based on completion of Phase 3) to $49,000 per month to generate the extra $13,000 per month for the District's share.