City of Molalla

Clackamas County, Oregon

WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN

MAY 2021
VOLUME 1
"ORDINANCE 2021-08, ADOPTED MAY 26, 2021"

The Dyer Partnership Engineers & Planners, Inc.

Project No. 198.16 / 18-02

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EXECUTIVE SUMMARY

SECTION 1: EXECUTIVE SUMMARY

This Water Management, Conservation and Water System Master Plan (WMCWSMP) was compiled to provide guidance to address the City of Molalla's future water needs. This Plan summarizes the components of the existing water distribution system, analyzes local water demand patterns, evaluates the performance of the water system with respect to critical service standards, and identifies the improvements necessary to remedy system deficiencies and accommodate future growth. This Plan recommends specific projects to the water distribution system for inclusion in the City of Molalla's Capital Improvement Plan (CIP). Also presented is a financing plan that will facilitate successful implementation of the recommended CIP. The water curtailment, water management and conservation plan was developed with the WMCWSMP. Shared data includes, but is not limited to; water system configuration, existing demands, projected demands, population growth rates, and allocated water rights.

1.1 Source of Raw Water Supply and Water Rights

The City of Molalla (City) has water rights from two raw water sources: the Molalla River and Trout Creek. The Trout Creek water right totals 4.0 cubic feet per second (cfs); however, the City only has the capability to utilize the Molalla River water right which totals 3.0 cfs of raw water diversion.

The City's Molalla River water right has a priority date of August 17, 1954 and is senior to instream water rights. The Trout Creek water right has a priority date of March 11, 1921; however, the infrastructure is no longer in place to draw water from the designated point of diversion at Trout Creek. The City is currently working with the Oregon Water Resources Department (WRD) to transfer the point of diversion at Trout Creek to the City's raw water intake, downstream of the creek, at the City's Molalla River intake. Natural conveyance within the Molalla River will allow for the water right to be drawn from this new location. As a requirement of this transfer, the City installed a flow monitoring station in August, 2019 on Trout Creek, just downstream of the Dickey Prairie Road Bridge. For all intents and purposes it is assumed that the Trout Creek water right transfer will be achieved.

The need to develop additional raw water resources depends on whether the City's current sources are sufficient to handle the anticipated water demand. The City has not had any difficulty in meeting its raw water supply requirements and is not projected to have any difficulties through the planning period of this Plan based on the present and projected water demands, discussed further in Section 6. This was based on the projected Maximum Daily Demand (MDD) through the Year 2040.

1.2 Existing System and Recommended Improvements

The City's water system infrastructure in operation consists of: the raw water intake, Influent Pump Station (IPS), Water Treatment Plant (WTP), two treated water storage tanks totaling 3.2 Million Gallons (MG), and approximately thirty eight miles of distribution system water main.

Raw Water Intake and Influent Pump Station

The City of Molalla's raw water intake facilities, most recently upgraded in 1996, are located at the Molalla River east of the WTP and consist of: intake screens with debris protection bars, raw water transmission mains, a grit settling chamber, and a raw water IPS. Raw water enters the system through two intake screens then flows by gravity via two 20-inch diameter pipes to a grit settling chamber. From here it continues down a 24-inch diameter pipe to the IPS. Two 100 Horsepower (HP) and one 75 HP vertical turbine pumps are utilized to then convey the water to the WTP via a 16-inch diameter pipe.

One of the primary problems identified with the Molalla River raw water intake is the organic debris buildup on the screens. The second issue is large accumulations of river rock depositing around the screens during high river flows. Both instances require manual cleaning of the screens and hand removal of large quantities of river rock that can cover the screens entirely. Recommended improvements include relocating the intake structure upstream and installing an intake screen with air burst or water wash system which has proven efficient in removing organic debris. The raw water IPSs 75 HP pump is also in need of upsizing.

Water Treatment Plant

The City's WTP was recently upgraded in the Year 2020 to a net design capacity of 4.0 Million Gallons per Day (MGD) and is utilized year-round as the sole water treatment facility for the City. The 14-inch diameter raw water pipe, prior to reaching the treatment units, is injected with coagulation polymers and flocculation-forming chemicals. The plant then utilizes two identical Trident Packaged Water Treatment Plants with up-flow clarifiers, mixed-media filtration, and chemical feed systems. Treated water from the Trident units is then pumped to the treated water storage tanks, adjacent to the WTP, which act as clearwells providing chlorine contact time.

While this WTP is in good operating condition, improvements are needed to improve its chemical bulk storage tanks. Proposed WTP improvements include the replacement of the polymer and soda ash bulk storage tanks.

Treated Water Storage

The City's water system has two prestressed concrete treated water storage tanks with storage capacities of 2.0 MG and 1.2 MG. The treated water storage tanks provide enough potential energy to gravity feed the City's distribution system.

Storage capacity of the entire water storage system within the City was evaluated and the total amount of existing storage was found to be currently sufficient. By the Year 2030, the City's storage system will be approximately 100,000 gallons deficient in storage unless new storage tanks are constructed. By the end of the planning period, 530,000 gallons of storage is needed to obtain the recommended treated water storage capacity within the City.

The proposed treated water storage improvement projects include replacement of the existing 1.2 MG treated water storage tank with a new 2.5 MG tank to handle the City's future storage requirements and reconditioning the 2.0 MG treated water storage tank which is recommended to help the tank reach its intended usable life.

Distribution System

The distribution system consists of 2-inch to 20-inch diameter Polyvinyl Chloride (PVC), Cast Iron (CI), Ductile Iron (DI), Asbestos Cement (AC), steel, and copper pipe. The most prevalent pipe size within the distribution system is 8-inch diameter pipe (36 percent). The City's distribution piping is composed of approximately 76 percent PVC, 12.3 percent steel and copper, 10.2 percent AC, 1.4 percent DI, and less than 1percent CI.

The City's water distribution system was evaluated using a hydraulic computer model, with emphasis on sustaining required fire flows and service pressures within the City. Hydraulic performance of the system is adequate in most areas due to adequate existing system pressures and a relatively well-looped and sized

distribution network. The following areas, based on the results of this model, were shown to have less than required fire flows: the Molalla Elementary School and the Molalla Wastewater Treatment Plant. The City also experiences high system water losses in conjunction to high system pressures on the west side of the City. The majority of recent water leaks in the distribution system have been observed by City Staff with AC and steel pipes.

Proposed distribution system improvements include upsizing the water main that serves the Molalla Elementary School and the Molalla Wastewater Treatment Plant to improve fire flows, replacing all AC water main and water main that has reached its usable life expectancy, and replacing deteriorating copper service laterals in the northwest side of the distribution system due to corrosive soils.

In order to limit total system losses a comprehensive leak analysis program is recommended to be initiated by the City as well as splitting the City of Molalla's water system into three pressure zones through the use of Pressure Reducing Valves (PRVs). The comprehensive leak analysis should focus on areas with known leaks, pipes that have surpassed or are approaching their usable life, and pipe material prone to leaking. This program will assist the City in prioritizing the recommended water main replacement projects. The PRVs will lower the overall system pressure will be beneficial in reducing the overall system losses.

1.3 Financing and Implementation Plan

A total of forty-five improvement projects including eight facility improvements, thirteen service improvements, and twenty-four distribution system improvements are recommended in the Capital Improvement Plan (CIP) found in Section 9. Including the future Water Master Plan update, the total estimated costs of these improvements is $40,953,400. These improvements were prioritized into three phases. Phase I projects are considered the most critical and should be undertaken as soon as funding can be made available. Phases II and III projects should be implemented as needed to address new development, population growth, annexations, and/or new regulatory requirements.

Recommended Phase I Improvements represent the highest priority projects that require addressing in order to ensure system reliability and required fire flows throughout the City. These improvements include installation of a new Molalla River intake, new 2.5 MG treated water tank, reconditioning the 2.0 MG treated water tank's exterior surface, treated water storage tank seismic valves, four pressure reducing valves, service line replacements, distribution system improvements to increase fire flows and replace aging and asbestos cement pipe, remove and replace the polymer and soda ash bulk storage tanks, and a comprehensive leak analysis program. Total estimated cost for the Phase I Improvements is $22,552,400.

Recommended Phase II Improvements represent important projects that should be initiated once Phase I Improvements have been addressed and financing is available. These projects include various service line replacements, and water distribution system improvements to replace aging and AC pipe. Total estimated cost for the Phase II Improvements is $6,592,000.

Recommended Phase III Improvements represent important projects that require addressing once Phase II Improvements have been addressed and financing is available. These projects include a transmission main reroute and replacement, service line replacements and water distribution improvements to replace aging and AC pipe. Total estimated cost for the Phase III Improvements is $11,809,000.

Various funding programs were evaluated for financing the Phase I Improvements through the use of low-interest loans. The projected monthly debt service, in dollars per Equivalent Dwelling Unit (EDU), from

viable funding options ranged from $15.46 to $25.79. Projected monthly user rates including debt reserve are estimated to be approximately $48.43 to $58.76 per EDU.

SECTION 2:

INTRODUCTION

SECTION 2: INTRODUCTION

2.1 Background

The original water distribution system for the City of Molalla was constructed in 1914 and consisted of wells with wood and steel pipes for transmission and distribution. In 1921, the City developed infrastructure to utilize water rights, 4.0 cubic feet per second from Trout Creek, a tributary of the Molalla River. The infrastructure consisted of a diversion dam which conveyed raw water by gravity through a 6-inch transmission main to a reservoir tank near where the City of Molalla's Water Treatment Plant (WTP) is located today. A new transmission line was also constructed at this time to convey the water from the reservoir tank to the City's water distribution system.

In 1954, the City acquired the water permit to the Molalla River, 3.0 cfs. An intake structure was built near the river along with a 0.6 Million Gallons (MG) reservoir tank and two new 8- and 10-inch transmission mains to connect the reservoir to the City's water distribution system. The infrastructure used for the Trout Creek water rights were abandoned.

A new 1.2 MG reservoir tank and 2.0 Million Gallons per Day (MGD) Water Treatment Plant adjacent to the existing 0.6 MG reservoir tank was constructed between 1976 and 1977. The 0.6 MG tank was put out of service and later retro-fitted in 1983. A new 14-inch transmission line was also installed in addition to the 8- and 10-inch transmission lines. These additions were based off the water system study prepared in 1973 by Clark and Groff Engineers, Inc.

In 1993, the 1954 Molalla River intake was replaced by a perforated underdrain within the river and an open channel intake on the bank of the river. This intake was relocated due to a massive flood in 1996 that severely damaged most of the intake structure components. The intake, which is now located in the river, consists of two fine screens responsible for conveying water to the pump station nearby.

In 1998, the 0.6 MG reservoir tank adjacent to the Water Treatment Plant was replaced with a new 2.0 MG reservoir tank. The filter room was expanded for the installation of a new 2.0 MGD mixed media filter with the addition of chemical feed pumps and compressors.

The Molalla WTP remains as the City's only supply of potable water and was upgraded to a capacity of 4.0 MGD in the Year 2020. The distribution and transmission system has received consistent upgrades including removing a large number of asbestos cement service mains and replacing with Polyvinyl Chloride (PVC) service mains.

After the development of the 1996 Water Master Plan (WMP) the population of Molalla has increased; however, water use per capita has seen a decrease from 180 gallons per capita per day (gpcd) in 1996 to 125 gpcd in the Year 2020. Given these evolving variables and the twenty three year period since the completion of the previous WMP, the City determined there was a need for an updated assessment of their water system. This Water Management, Conservation and Water System Master Plan (WMCWSMP) will provide an evaluation of the City's water system facilities, projected future water needs, and recommend improvements to satisfy the anticipated water demand.

2.2 Study Objective

The purpose of the Plan is to provide the City of Molalla with a comprehensive planning document to provide engineering assessment and planning guidance for the successful management of its water system over the next twenty years and beyond. This Plan satisfies the Oregon Health Authority (OHA) requirement for communities with 300 or more service connections to have a current master plan, Oregon Administrative Rules (OAR) 333-061-0060, Oregon Water Resources requirement for Water Management and Conservation Plans, OAR 690-086, and the Environmental Protection Agency (EPA) requirements for Risk Assessment and Emergency Response Plans. The principal objectives and water resources include:

- Evaluation of the existing water system components.
- Prediction of future water demands.
- Evaluation of the capability of the existing system to meet future needs.
- Recommendations for improvements needed to meet future needs and/or address deficiencies.
- To reduce usage of water resources for nonessential public purposes.
- To undertake activities consistent with laws designed to promote conservation, prevention of waste, salvage and reuse of water resources.
- To establish programs consistent with laws designed to promote conservation, prevention of waste, salvage and reuse of water resources.
- To curtail, adjust or allocate the supply of water resources for domestic, municipal and industrial use during a water curtailment.
- To regulate the times and manner in which water resources are consumed.

The Plan outlines water system improvements necessary to comply with state and federal standards and to provide for anticipated growth. The capital improvements are presented as projects with estimated costs allowing the City to plan and budget as needed. Supporting technical documentation is included to aid in grant and loan funding applications and meets the requirements of the Business Oregon, the Oregon Water Resource Department, Rural Development (RD), as well as the Oregon Health Authority (OHA).

2.3 Scope of Study

Planning Period

The planning period for this Plan is twenty years, ending in the Year 2040. The period is short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand.

Planning Area

The City's Urban Growth Boundary (UGB) with the additional limits of the system defined by raw water sources and transmission is considered the Study Area in this Plan.

Work Tasks

In compliance with Oregon Health Authority and the Oregon Water Resource Department's (WRD) plan elements and standards, this Plan provides descriptions, analysis, projections, and recommendations for the City's water system over the next twenty years. The following elements are included:

- **Executive Summary.** Provides a summary of the conclusions and recommendations from this Plan.
- **Introduction.** Provides an overview of the scope, defines objectives, and background information.
- **Study Area Characteristics.** Identifies applicable Study Area characteristics, land use, population trends, and projections.
- **Regulatory Environment.** Identifies current and future regulatory requirements and regulations affecting the planning, operation, and maintenance of community water systems.
- **Existing Water System.** Description and evaluation of the existing water system including supply, treatment, storage, and distribution.
- **Water Use and Projected Demand.** Determines the City's future water demand based on current use, projected population, and economic growth.
- **Planning and Design Criteria.** Identification and evaluation of various alternatives for the City's water system.
- **Capital Improvement Plan.** Identifies and describes a Capital Improvement Plan (CIP) for the water system with a recommended implementation schedule.
- **Analysis and Improvement Alternatives.** Identification and evaluation of various alternatives for the City's water system. Selects the most cost effective program to meet the City's water needs within the planning periods.
- **Financing Plan.** Identifies various local financing mechanisms and the most applicable funding programs. Develops a financing program for proposed improvements. The financing program will propose a monthly rate structure, implementation schedule, and System Development Charges (SDC).
- **Water Conservation.** Provides a review of the City's current water management practices in accordance with OAR 690-086.
- **Emergency Curtailment Plan.** Recommends a plan of action in regard to water curtailment and planning.

- **Risk Assessment (RA) and Emergency Response Plans (ERP).** Provides a review of the City's current risks to system components and recommended plans to mitigate the effect of these risks.

2.4 Authorization

The City of Molalla contracted with The Dyer Partnership, Engineers & Planners, Inc. on March 26, 2019 to prepare the Water Management, Conservation and Water System Master Plan which include risk assessment and emergency response plans. The scope of this Plan was based on a Scope of Engineering Services provided in the Contract with the City.

2.5 Past Studies and Reports

Documents that discuss the City's water system and facilities have been used in the preparation of and analyses in this Plan. A list of these studies and reports, with a brief summary of their conclusions, is listed below.

1. *Water System Master Plan* by EAS Engineering, Balfour Consulting, Inc., and DeHaas & Associates., December 1996

   The following is a summary of conclusions and recommendations made in this report with respect to the City's water system.

   - Construct a new well source immediately to alleviate the lack of a redundant water source for the improved water supply for the City.

   - Water Treatment Plant expansion with an additional 2 MGD package treatment unit and associated appurtenances.

   - To improve water storage remove existing 0.6 MG reservoir tank and replace with 2.0 MG reservoir tank. Construct 2.7 MG reservoir tank at location of new well field.

   - Water transmission and distribution recommendations included system water leak survey and replacement of substandard water services to reduce calculated thirty five to fifty percent water loss. Distribution system improvements to correct inadequate fire flows for commercial and industrial areas. This would allow the system to supply 3,500 gpm flows for all commercial, industrial, and schools. Construct new pump station at location of new well field and water storage facility.

   - The Capital Improvement Plan consisted of three priorities with the following estimated costs: Stage 1 included the first five years at $6.9 million, Stage 2 was for years six through ten at $2.9 million, Stage 3 comprised years eleven through twenty at $0.5 million, with an overall total for Stages 1 through 3 of at $10.3 million.

2. *Utilities Rate Study* by Donovan Enterprises, Inc., July 2017

   The following is a summary of conclusions and recommendations made in this report with respect to the City's water system.

- Out of the approximately 2,750 active water meter accounts, 94 percent are residential and small commercial customers in the fiscal year 2015 through 2016.

- Over this twenty year horizon, the City's water system Capital Improvement Plan calls for the investment of approximately $15.9 million. The first five years of investment amounting to approximately $7.0 million.

- The near-term five year forecast projected average annual increases in water system revenue requirements as 2.68 percent.

3. *Molalla Comprehensive Plan* by City of Molalla Planning Department, September 2014

   A summary of this report is given below.

   - Population growth is averaging 4.0 percent and 3.4 percent annually over the past twenty and fifty years, respectively. Building permits averaged seventy two new permits a year between the years 2000 to 2007 and only eighteen new permits for the years 2008 to 2010. The City of Molalla has a low supply of developable residential land.

   - Projected growth is estimated at 13,400 people by the Year 2035 with an Average Annual Growth Rate (AAGR) of 2.0 percent.

   - It is likely the Urban Growth Boundary (UGB) is not sufficient to accommodate the required twenty years of growth.

2.6 Acknowledgements and Community Engagement

This Plan is the result of contributions made by a number of individuals and agencies. We wish to acknowledge the efforts of Gerald Fisher, Public Works Director; Andy Peters, Public Works Supervisor; Ryan Hepler, Water Treatment Plant Operator; and the Molalla River District. The assistance of the City of Molalla's Office Staff was invaluable in compiling information on City services and the community.

Community engagement provides the opportunity for the system owners or local citizens to meaningfully participate in development and to provide guidance on the implementation and management of their water distribution system.

Goals of community engagement include:

- Develop an understanding of the environmental issues.

- Define regulatory requirements.

- Present design development information.

- Collaborate in developing solutions.

- Review funding and revenue strategies for a recommended plan.

Various community engagement opportunities occurred during the planning process to inform and receive feedback about the Plan from the public, regulatory agencies and stakeholders. The goal is to identify community issues of concerns and share information utilized to develop recommendations. Feasible feedback from the stakeholders is incorporated into the management of the water distribution system. The community engagement opportunities include:

- Local agency and jurisdictional briefings.
- WMCWSMP sections posted on the City's web page.
- Hosting a public stakeholders meeting.
- Adoption of the WMCWSMP through a Public Planning Commission meeting and City Council Meeting.

Two advisory groups, the Technical Advisory Committee (TAC) and Project Advisory Committee (PAC), were also formed to facilitate the development of the Plan and to ensure the Plan is developed in the best interests of the community. Representatives for the TAC include: Alice Cannon, City of Molalla, Andy Peters, City of Molalla, James Nusrala, Department of Human Services and Oregon Health Authority, Jennifer Donnelly, Oregon Department of Land Conservation and Development, Ryan Hepler, City of Molalla, Karen Buehrig, Clackamas County, and the Molalla Fire District. The PAC include: Elizabeth Klein, Molalla City Council and Steve Deller, Molalla Planning Commission. Assistance from these advisory groups was greatly appreciated.

SECTION 3:

STUDY AREA CHARACTERISTICS

SECTION 3: STUDY AREA CHARACTERISTICS

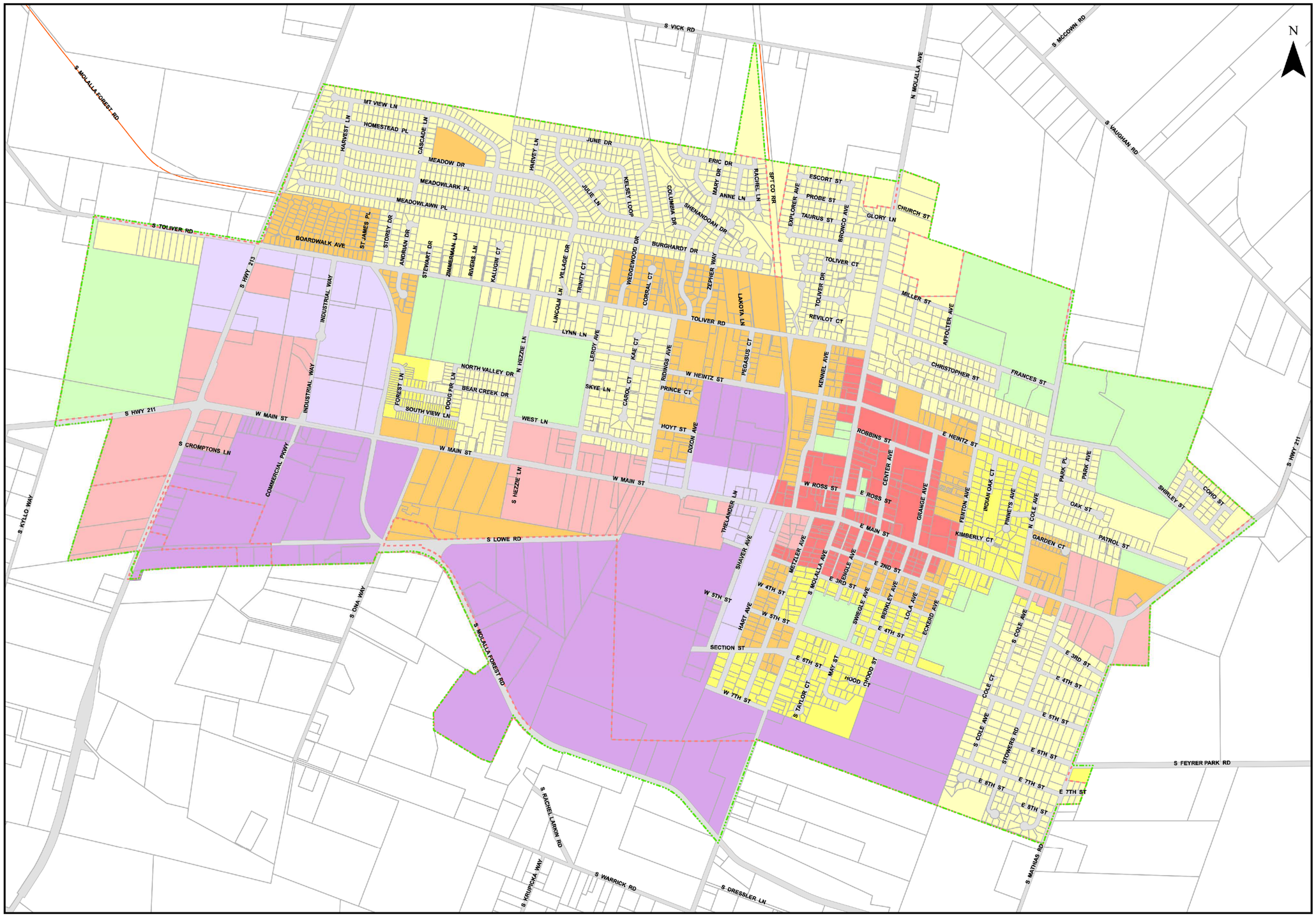
3.1 Study Area

The City of Molalla is a fast growing rural community located in the southwest section of Clackamas County. The City is approximately fourteen miles south of Oregon City via Highway 213, approximately twenty five miles northeast of Salem, and approximately twenty seven miles southeast of Portland. The surrounding area around the City of Molalla is generally used for agricultural purposes.

Highway 213 runs in a north to south direction through the western end of the City of Molalla. Highway 211 runs in an east to west direction through the midsection of the City. Overland flows begin near Creamery Creek in the agricultural areas to the east of the City, then flows toward the northwest through the City of Molalla via culverts and open channels. Bear Creek, a tributary of the Pudding River, flows west and is located immediately south of the City. The Molalla River is located about a mile east of the City's current Urban Growth Boundary (UGB). Figure 3.1.1 illustrates the location of the City.

FIGURE 3.1.1
LOCATION MAP

The City of Molalla owns and operates its own municipal water treatment, storage and distribution system. The service area for this Plan is defined by the Land Use Plan Map, as defined in the City's 2014 Comprehensive Plan. The Comprehensive Land Use Plan Map is illustrated in Figure 3.1.2. The City serves most of the constituents within the existing City Limits and does not anticipate the expansion of the City Limits. This Plan is based on 20-year population projections and realistic growth possibilities within the UGB furnished by the City.



Zoning Districts

- Central Commercial (C-1)
- General Commercial (C-2)
- Light Industrial (M-1)
- Heavy Industrial (M-2)
- Low Density Residential (R-1)
- Medium Density Residential (R-2)
- Medium-High Density Residential (R-3)
- Public and Semi Public (PSP)
- Urban Growth Boundary
- City Boundary

0 850 1,700 Feet

FIGURE NO. 3.1.2

CITY OF MOLALLA
WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN
COMPREHENSIVE PLAN ZONING MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MAY, 2021

PROJECT NO.: 198.16

3.2 Socioeconomic Environment

The future need for water service and facilities within the City of Molalla depends upon the socioeconomic conditions within the City and surrounding areas. The local economic conditions, trends, population, land use, and public facilities will be discussed hereafter.

Economic Conditions and Trends

The City of Molalla's economy was historically based on logging; but with the decline of the timber industry, the City is focusing on a strong trade-sector "industrial" job base. Major employers include Molalla River School District and Woodcraft Industries.

Despite hardships resulting from the retraction of the timber industry, the Molalla area remains an attractive location to reside. The City of Molalla is located near numerous recreational activities, and has become a bedroom community to the Portland and Salem areas. The City's policy objective is to improve its jobs to housing balance and regain its status as an independent economic region rather than a bedroom community.

The 2013 through 2017 American Community Survey 5-year Median Household Income (MHI) estimate is $57,652. The 5-year mean household income estimate is $81,283. The MHI for the State of Oregon is $56,119.

Population

An accurate population forecast is required to determine water demand projections through the end of the 20-year Plan period. Population forecasts are important in that they influence infrastructure sizing requirements. If the 20-year population forecast is severely underestimated or overestimated, the water system will struggle to perform in compliance with permit requirements. Oversized systems result in excess spending, higher operational costs, and increased oversight requirements. Undersized systems create hydraulic limitations.

The City anticipates growth consistent with historical trends. Population growth has been strong in the City of Molalla, averaging 4.0 percent annually over the last twenty years, slightly higher than the fifty year average of 3.4 percent annual growth. The population increased steadily from 1970 through 2000, averaging approximately seventy persons per year. The population increased significantly from 1990 through 2010, averaging around 200 persons per year. Based on building permit data, this increase in population growth may have been largely due to the housing boom from 2000 through 2007, with an average of 72 new permits issued each year. In the last four years, building activity declined dramatically, with an average of only eighteen new permits issued annually from 2008 to 2010. The decline may be due in part to the Great Recession that took place from 2007 to 2009 that caused the collapse of the United States housing bubble. Overall, there is a low supply of developable residential land in the City of Molalla.

Projections are generally based upon the extrapolation of past trends from an area or region. While history may not repeat itself, it serves as an initial basis for population projections. Key factors that influence population projections include: growth in surrounding communities, available developable land, and job opportunities. In general, northwest Oregon is experiencing strong growth, particularly in Portland and surrounding communities. Communities around the Portland Metro area are experiencing overflow as people seek rural living; but within a reasonable commute to Portland's economy and job opportunities. The City of Molalla is therefore positioned to experience considerable growth.

Population data derived from Portland State University (PSU) Population Research and Census Center is summarized in Table 3.2.1.

TABLE 3.2.1
CURRENT POPULATION ESTIMATE AND POPULATION PROJECTIONS

Year	2019	2020	2025	2030	2035	2040
Residential Population	9,885	10,652	11,948	13,314	14,705	16,118

Potable Water Use Population

For the calendar Year 2019, there were 3,258 total potable water connections within the City. The number of Equivalent Dwelling Units (EDUs) for these connections is 4,581; see Section 6.2 for more details. With an estimated City population of 9,885, the number of capita per EDU is 2.16. The number of capita per EDU is determined by dividing the current population by the number of connections.

In addition to the City's residents, there are a total of ten residential water connections outside the City Limits. Dingle-family dwelling, there are a total of ten EDUs outside the City, assuming each residential connection is a ¾-inch connection. Based on representative Year 2010 Census data, the number of persons per household for the City of Molalla is 2.84. Assuming 2.84 persons per EDU and 10 EDUs with water service outside the City, the estimated population of potable water users outside the City Limits is 28. The current and future total number of potable water users on the City's system is summarized in Table 3.2.2.

TABLE 3.2.2
CURRENT AND FUTURE POTABLE WATER USE POPULATION

Year	Population Projections		
	Estimated Future City Users	Existing Outside Users	Total
2019	9,885	28	9,913
2020	10,652	28	10,680
2025	11,948	28	11,976
2030	13,314	28	13,342
2035	14,705	28	14,733
2040	16,118	28	16,146

Land Use

A copy of the City's updated zoning map is included as Figure 3.1.2. The City of Molalla's most recent Comprehensive Plan was published in 2014 and is included in Appendix A. The City is primarily zoned residential, with a downtown commercial center and an industrial area to the south and southwest.

Residential Lands

City of Molalla's residential lands are throughout the community and on each side of Highway 211 or Main Street. New subdivisions are being constructed in the areas surrounding the City. Residential land use ranges from small to large lots of single family residences to manufactured dwellings in parks and on individual lots. Detailed descriptions of each residential land use zoning district is described hereafter.

- **Low Density Residential (R-1).** The R-1 zone provides for single family dwellings and duplexes at densities of four to eight dwelling units per net buildable acre. The objective is to incorporate this zoning throughout the City to provide a balance in housing options and locations. Environmental resources and community design objectives shall be enforced to provide quality and affordable housing.

- **Medium Density Residential (R-2).** The R-2 zone provides for a mix of multi-family, attached, single family housing, and manufactured dwelling parks that shall provide a density of six to twelve dwelling units per net buildable acre. The R-2 zone provides for mixed-use residential areas in close proximity to services and activity areas while ensuring that environmental resources and community design objectives. The City monitors the location, density, and design of these developments in the R-2 zone to enhance the City's livability and safety.

- **Medium-High Density Residential (R-3).** The R-3 zone provides for a mix of multi-family, attached, and single family housing at eight to twenty four dwelling units per net buildable acre. The City monitors the location, density, and design of these developments in the R-3 zone to enhance the City's livability and safety. Environmental resources and community design objectives shall be enforced to provide quality multi-family housing, which assists in buffering commercial and light industrial uses from single family residential where possible as well as providing affordable housing alternatives.

Commercial Lands

The commercial properties are clustered around Highway 211 and Molalla Avenue. Uses of acceptable Commercial activities for the Commercial zones are described below.

- **Central Commercial (C-1).** The C-1 zone is designated to provide principle shopping, business and transportation to the community and its trade area. This district allows for a broad range of uses in keeping with City of Molalla's historic commercial area.

- **General Commercial (C-2).** The C-2 zone is designated to provide retail, wholesale, transportation and service uses which, based upon traffic, size and other requirements depend upon particular locations to serve the needs of the community and its trade area.

Industrial Lands

The industrial properties are focused to the south and southwest of the City, but specifically around Highway 211 and Highway 213 otherwise known as the Cascade Highway. Industrial activities generally include manufacturing, fabrication, research and development, and transportation. Detailed descriptions of each industrial land use zoning district is described below.

- **Light Industrial District (M-1).** The M-1 zone is intended for non-polluting industries, which are generally compatible with residential and commercial activities. The light industrial concept for future development is envisioned in areas primarily west of the current City Limits. Larger parcels have been designated in this location to attract industries that require greater land areas for the operation, or for several industries to cooperatively design an industrial park. The location of the land designated for light industrial use is based on existing industrial uses, the proximity to public services, highway access and the goals and policies of the plan to utilize land for industrial use which meets the needs of those industries most likely to locate in the Molalla area.

- **Heavy Industrial District (M-2).** The M-2 zone is intended for manufacturing, fabrication and processing, bulk handling, storage, warehousing and heavy trucking. Most heavy industrial uses are incompatible with residential and commercial uses.

Public Facilities Lands

Public lands consist of those required for government offices, schools, hospital, transportation facilities, parks, recreation areas, and City owned properties such as the Water Treatment Plant or Waste Water Treatment Plant.

3.3 Physical Environment

The following provides information about the physical environment in and around the City of Molalla.

Climate

The Molalla area has a temperate maritime climate with dry, moderately warm summers and wet, mild winters. The prevailing winds are from the west and northeast in the summer and from the south and the southwest in the winter. Periods of easterly winds bring cold, clear weather in winter and exceptionally dry, hot weather in the summer. About sixty percent of the annual precipitation occurs from November through February while only about ten percent occurs from June through September. Winter temperatures below ten degrees and summer temperatures above one hundred degrees are infrequent. Snowfall records are not kept for the City of Molalla; however, Salem is the nearest City where records are kept. Salem averages 6.2 inches of snow per year.

Precipitation data was obtained from National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI). The mean annual precipitation data for the Molalla area was provided by station COOP: 357631 located in Scotts Mills, Oregon. The data ranges from 1971 to 2014 and gives an annual average precipitation of 47.41 inches. The wettest month is typically November (7.04 inches), followed closely by December (6.9 inches). Precipitation data is included in Appendix A.

Soils

There are many general classifications of surficial geologic formations found locally in the Molalla area. A map showing these formations is included in Appendix A. The formations are described as follows:

- **Aloha Series.** The Aloha series consists of very deep, poorly drained soils that formed from the stratified glaciolacustrine deposits from the Missoula Floods. Aloha soils are found on terraces and have slopes ranging from zero to eight percent.

- **Amity Series.** The Amity series consists of very deep, somewhat poorly drained soils that formed in stratified glacio lacustrine silts. Amity soils are on broad terraces and have slopes of zero to three percent.

- **Clackamas Series.** The Clackamas series consists of very deep somewhat poorly drained soils that formed in mixed alluvium. These soils are on stream terraces with slopes of zero to three percent.

- **Dayton Series.** The Dayton series consists of very deep, poorly drained soils that formed in silty and clayey glaciolacustrine deposits. Dayton soils are on terraces. Slopes are zero to two percent.

- **Huberly Series.** The Huberly series consists of very deep, poorly drained soils that formed in stratified glaciolacustrine deposits from the Missoula Floods. Huberly soils are found on concave swales of terraces and have slopes of zero to three percent.

- **Sawtell Series.** The Sawtell series consists of very deep, moderately well drained soils that formed in gravelly old alluvium. These soils are on terraces. Slopes are zero to fifteen percent.

- **Wapato Series.** The Wapato series consists of very deep, poorly drained soils that formed in loamy mixed alluvium. Wapato soils are on flood plains. Slopes are zero to three percent.

Geologic Hazards

There are several areas within the Molalla area that are susceptible to geologic hazards. These hazards include earthquakes, an active fault, and landslides. A discussion of each hazard and expected locations are discussed below. Specific hazard maps are included in Appendix A.

River Flooding

The Federal Emergency Management Agency (FEMA) has declared the City of Molalla a 'No Special Flood Hazard Area'. All areas within the UGB have been designated Zone C, areas of minimal flood hazard as shown in the (FEMA Map for 2010.

Earthquakes

Oregon is located within the circum-Pacific belt of crustal instability along with California, Washington, British Columbia and Alaska. All of these states and provinces, which border the Pacific Ocean, have received violent earthquake shocks in recent years. Since 1841, the State of Oregon has experienced 167 earthquakes and of these, 47 were centered in the Portland vicinity. The Molalla area experienced an earthquake in March of 1993 with a magnitude of 5.7 centered approximately 13 miles southwest of the City.

Based on the online interactive maps, Hazard Viewer, developed by the Oregon Department of Geology and Mineral Industries (DOGAMI), there are no liquefaction or amplification hazards within the area examined in and around the City of Molalla. Although there are no predicted hazards, there is one active fault, the Canby-Molalla Fault, running northwest through the City of Molalla. The fault move less than 0.2 millimeters (mm) per year and therefore is not deemed to be a threat.

Landslides

With respect to landslides, there exists moderate hazard risk along Bear Creek and north of Clark Park within the City of Molalla. The additional hazards of slopes at greater than twenty five percent exist to the south of the current UGB and should be considered for long range planning analyses.

Erosion

Erosion within the UGB of the City of Molalla does not present a significant geologic hazard. An escarpment south of the current UGB includes slopes of twenty five percent or greater which should be considered for long range planning analyses.

Water Resources

Water resources within the Study Area include both surface waters and groundwater. The City currently utilizes surface waters as its sole source of drinking water.

Surface Waters

The City of Molalla is located in the northern part of the Willamette Drainage Basin. Major water courses in the Study Area include Creamery Creek, Bear Creek, and the Molalla River. Major water bodies include Teasel Creek Reservoir, Kyllo Reservoir and Cedar Grove Lake. The City's primary municipal water supply comes from the Molalla River. The City also has a water permit and certificate for Trout Creek. The City is in the process of collecting data from Trout Creek in an attempt to move that water permit to the Molalla River intake. The City's water rights and withdrawals are discussed in Sections 5.1 of this Plan.

The upper Molalla River watershed is in northwest Oregon, seven miles southeast of the City of Molalla. The watershed is almost entirely contained within Clackamas County; a very small portion of the headwater of Copper Creek is in Marion County. The analysis area incorporates the entire upper watershed of the Molalla River upstream of the mouth of Cedar Creek (River Mile 24). Cedar Creek enters the Molalla River from the southwest 1.8 miles downstream from the Glen Avon Bridge near Dickey Prairie. The watershed comprises five distinct areas or sub watersheds: 1) The North Fork Molalla River, 2) Middle Table Rock Fork Molalla River, 3) South Fork Molalla/Copper Creek, 4) Upper and Lower mainstem Molalla River, and 5) Lower Molalla River drainages which consist of Pine, Trout, Horse, Gawley, Bear, Russell, Dickey, and Cedar Creek systems. The watershed is approximately 129,300 acres or 202 square miles.

Water quality within the Molalla River Drainage Basin is generally in fair condition according to a study performed by the Bureau of Land Management (BLM) in 1999, and data available on the United States Environmental Protection Agency's (EPA) website for the reporting Year of 2006. This determination has caused the City's main supply of surface water within the Study Area to be considered 'water quality limited' to some extent and is on the Oregon Department of Environmental Quality's (DEQs) 303(d). A summary of the water quality limited water bodies and water quality limited parameters within the Study Area is given in Table 3.3.1.

TABLE 3.3.1
SUMMARY OF WATER QUALITY LIMITED (303(D) LISTED)
WATER BODIES IN THE STUDY AREA

Parameter	River Segments	River Mile	Affected Uses
Molalla River			
Fecal Bacteria, Nutrients, and Sedimentation	Molalla River	0 - 25	Water Contact Recreation and Fish Rearing
Summer Temperatures	Molalla River	18.2 - 48.3	Fish Rearing
Summer Temperatures and Dissolved Oxygen	Molalla River	19.7 - 44.7	Fish Rearing
Summer Temperatures	Table Rock Fork Molalla River	0 - 12	Fish Rearing
Summer Temperatures and Dissolved Oxygen	Table Rock Fork Molalla River	0 - 8.3	Fish Rearing

The Trout Creek watershed stretches a maximum of 4.24 miles southwest to northwest encompassing approximately 9,335 acres. Many sections of Trout Creek run along freshly cut, second, and third growth forests causing temperature and sediment issues with in the creek. Trout Creek joins the Lower Molalla River near the community of Glen Avon approximately twelve miles southwest of the City of Molalla.

The BLM, DEQ, and EPA have completed a number of investigations on the extent of contaminants in the Molalla River watershed. The following is a summary of the preliminary findings of these agencies.

Summer and fall water temperatures are collected at the Table Rock Fork Molalla, South Fork Molalla, Pine Creek, and two sites on the mainstem of the Molalla River. Temperatures are collected using temperature data loggers set to record hourly. Oregon Administrative Rules (OAR) 340 - 341give numeric temperature criteria where measurable increases to the stream temperatures based upon human activities are not allowed. The temperature threshold for salmonid fish rearing in the Molalla River is 17.8ºF. The temperature criteria are to protect aquatic organisms that are more susceptible to disease and other environmental stress when water temperatures are elevated over a period of time.

The levels of total coliforms, turbidity, solids, and pH increase as water moves downstream in the Molalla River. The level of fecal coliforms and *Enterococci* were statistically higher at River Mile 39 than River Mile 31 and, although the difference was relatively small, may indicate a greater input of fecal material upstream of River Mile 39 than downstream. Fecal and enteric bacteria levels appeared to be within the state standards as no samples were above 200 coliforms per milliliter.

Groundwater

Historically, groundwater has been an economic source of water supply. However, due to the characteristics of the area in and around the City of Molalla, groundwater has been an elusive and

somewhat uncertain resource. Finding groundwater is not enough; it must be found in sufficient quantity and quality to be of substantial value as a municipal water supply.

The City of Molalla lies in the northeast section of the Molalla-Salem Slope area along the eastern side of the northern Willamette Valley, and extends eastward into the foothills of the Cascade Range. The wells located in the Molalla area consist of a variety of rock units and generally yield small to modest quantities of water. Due to the composition of these formations, the water-bearing characteristics of these units vary with location.

The availability of groundwater in the Molalla area is dependent upon geologic formations, which are complex in places and thus groundwater development involves significant risk. While some wells yield water of medium to high quality; other areas yield water that is relative hard with iron and manganese. Chemical analyses of the groundwater frequently show concentrations of some elements that exceed the limits recommended by the US Public Health Service and the Oregon Health Authority.

The best source of local information available for groundwater quality and quantity comes from "well logs". Since the early 1950s, well drillers have been required to submit well logs to the office of the State Engineer. These logs are now received and cataloged by the Oregon Department of Water Resources (WRD). They contain information concerning the location of the well, depth, yield, and various geologic layers penetrated during drilling. The updated logs also contain depths of the aquifers encountered during drilling.

A review of the well logs for the area substantiates the geological findings. Most of the high yield wells in the Molalla-Salem Slope area are located approximately ten miles southwest of the City of Molalla near Mt. Angel. Wells in this area have reported yields to 700 gallons per minute (gpm). The majority of the wells in the Molalla area are low yielding, the capacities less than 90 gpm. After a close review of the well logs around the Molalla area, there are only two high capacity wells in the area producing 650 gpm or more.

The aquifer at the northwest edge of the urban area has the potential to become a secondary water source for the City, but the City would have to acquire the right from the current owner(s). A small number of wells were found to produce flows of 500 to 700 gpm with reasonable drawdown. The potential exists for more similar wells. Water can be found in this aquifer below confining layers of clay soil. This reduces the potential for surface water impacts to this source. A detailed hydrogeological investigation is needed before the City invests too deeply in the assumption that this source will meet the City's growing need for water and redundancy.

In 1998, the City contracted Staco Well Services to drill a groundwater well at the City's shop building. Oregon Water Resources Department's water supply well report shows that the well was drilled to a completed depth of 710 feet, and that the well was producing 300 plus gallons per minute. The report also shows the quality of the water as being 'salty' which would explain why the well is not used by the City as a source of water. The well has been sealed with sodium bentonite, and now serves as a test well for the City.

Property was purchased by the City, to the north of the City, for the sole purpose of creating a new well, but was later sold. After reviewing water supply well reports to the north of the City, many wells are low yielding, supplying only 30 to 60 gpm at depths between 50 to 300 feet. This may explain why the City of Molalla sold the property.

Flora and Fauna

The Study Area is in what is considered by the United States Geological Survey (USGS) as the Western Cascades Lowlands and Valleys Ecoregion. This Ecoregion is comprised of a network of steep ridges and narrow valleys on the lower slopes of the Cascade Mountains. Warm soils and a mild, wet climate promotes lush forests dominated by western hemlock and Douglas fir along with western red cedar, bigleaf maple, red alder, vine maple, salal, rhododendron, Oregon grape, huckleberry, thimbleberry, sword fern, oxalis, hazel, and blackberry. Soils are warmer here than in higher elevation ecoregions, and it is one of the most important timber production areas in the Pacific Northwest. Invasive species such as the Himalayan blackberry and Scotch broom are common.

The steep valleys trending to the west contain high and medium gradient rivers and streams that support cold water salmonids, including the threatened Chinook salmon, steelhead, and bull trout. Introduced warm water fish, including largemouth bass, black and white crappie, bluegill and yellow perch have been reported in the watershed. There is no documentation for the initial introduction of warm water game fish to the Molalla Subbasin. Stream temperatures in the area prevent these species from establishing reproducing populations.

Wetlands comprise transitions between terrestrial and aquatic areas. The wetlands ecosystem represents a richly diverse web of plants and animals interacting together. Wetlands ecosystems also exhibit great sensitivity to disturbance from outside influence, particularly by human development and environmental damage. Wetlands and floodplains provide habitat for many waterfowl including mallard, pintail, widgeon, and merganser. Mammals found in the Study Area include beaver, muskrat, river otter, and raccoon.

Riparian areas are lands that occur along water courses and water bodies. Typical examples include flood plains and streambanks. They are distinctly different from surrounding lands because of unique soil and vegetation characteristics that are strongly influenced by the presence of water. The clearing of vegetation causes considerable effect on the diversity and stability of the ecosystem of an area. Removal can also bring about the loss of a significant ecotone, the transition between water related environments and upland areas.

Rare, Threatened and Endangered Species

A number of rare, threatened and endangered species are known to reside near or within the Study Area. A list of these species is provided in Table 3.3.2. This list is based on information obtained from the Oregon Natural Heritage Information Center and the Oregon Department of Fish and Wildlife.

TABLE 3.3.2
LIST OF THREATENED AND ENDANGERED SPECIES IN THE STUDY AREA

Common Name	Scientific Name	Status (Federal/State)[1]
White rock larkspur	*Delphinium leucophaeum*	SOC/LE
Peacock larkspur	*Delphinium pavonaceum*	SOC/LE
Willamette Valley daisy	*Erigeron decumbens*	LE/LE
Howellia	*Howellia aquatilis*	LT/LT
White-topped aster	*Sericocarpus rigidus*	SOC/LT
Nelson's sidalcea	*Sidalcea nelsoniana*	LT/LT
Chinook salmon (Upper Willamette River ESU, spring run)	*Oncorhynchus tshawytscha*	LT/SC
Steelhead (Upper Willamette River ESU, winter run)	*Oncorhynchus mykiss*	LT/SC
Northern red-legged frog	*Rana aurora*	SOC/SV
Western pond turtle	*Actinemys marmorata*	SOC/SC
Northern goshawk	*Accipiter gentilis*	SOC/SV
Olive-sided flycatcher	*Contopus cooperi*	SOC/SV
Streaked horned lark	*Eremophila alpestris strigata*	LT/SC
Acorn woodpecker	*Melanerpes formicivorus*	SOC/SV
Northern spotted owl	*Strix occidentalis caurina*	LT/LT
Silver-haired bat	*Lasionycteris noctivagans*	SOC/SV

Federal: LT – listed threatened, LE – listed endangered, SOC – species of concern
State: LT – listed threatened, LE – listed threatened, SC - sensitive-critical, SV – sensitive vulnerable

White rock larkspur (*Delphinium leucophaeum*) is restricted to the northern Willamette Valley where it is found at fewer than twenty sites, and is the only other white-flowered larkspur west of the Cascades. This slender perennial species is twenty to sixty centimeters (cm) tall and grows from a cluster of tubers. It can be found on the edges of oak woodlands, dry roadside ditches, basalt cliffs, along river banks and bluffs, and moist lowland meadows. This species is under threat due to habitat loss from agricultural and urban development, invasive species, roadside maintenance, and small population sizes.

Peacock larkspur (*Delphinium pavonaceum*) is restricted to Benton, Marion and Polk Counties, but was historically known to occur in Multnomah and Clackamas Counties as well. A native, perennial forb that grows to be fifteen to thirty inches tall with flowers colored white with dark blue centers. The peacock larkspur prefers well drained prairie habitats, but will grow in areas of slightly higher topography in moist soil conditions. Agricultural and urban expansion, herbicide use, and encroachment of invasive roadside weeds currently threaten the peacock larkspur.

Willamette Valley daisy (*Erigeron decumbens*) is known only from the Willamette Valley in northwest Oregon. The Willamette daisy is the only species of *Erigeron* with pink-purple rays, and is further distinguished by its other characteristics. It inhabits both seasonally flooded bottomland prairies and well-drained upland prairies at elevations of 240 to 950 feet. This species is listed as endangered under federal status due to habitat loss from urban and agricultural development, encroachment by trees and shrubs, competition from invasive weeds, and possible inbreeding depression.

Howellia (*Howellia aquatilis*) is an annual aquatic species historically found throughout Oregon, Idaho, Washington, and California. It grows four to twenty four inches high and has extensively branched,

submerged or floating stems with narrow leaves up to two inches in length. *H. aquatilis* occurs in various wetland habitats and relies on the drying of ponds for seed germination. Variability in population size results based upon the previous season's drying. Direct threat to this species comes from urban expansion, timber harvest activities, road construction, livestock grazing, conversion of habitat to other uses, and the building of dams.

White-topped aster (*Sericocarpus rigidus*) is a perennial herb topped by a cluster of flowering heads found in the Willamette Valley in Oregon, the Puget Trough region in western Washington, and the southern portion of Vancouver Island, British Columbia, Canada. *Sericocarpus rigidus* is restricted to prairie habitats that consist primarily of gravelly, glacial outwash soils. Habitat loss caused by urban and agricultural expansion, habitat degradation caused by invasive species, and hydrologic alterations currently pose the greatest risk to the continued survival of the white-topped aster.

Nelson's sidalcea (*Sidalcea nelsoniana*) is an erect perennial arising from a stout taproot that grows to a height of 40 to 100 centimeters tall. The Willamette Valley populations are typically found in prairie remnants along the margins of sloughs, streams, ditches, roadsides, fence rows, and drainage swales. Threats to this species include habitat loss due to urban and agricultural expansion, encroachment of trees and woody shrubs, and invasive weeds. Seed survival is also limited due to predation by native, host specific weevils.

Chinook salmon, Upper Willamette River ESU, winter run (*Oncorhynchus tshawytscha*) are distributed latitudinal in the Pacific from Chukchi Sea, Alaska to Monterey Bay, California in North America and longitudinally distributed from the Anadyr River, to Hokkaido, Japan in Asia. Adult and juvenile Chinook salmon are found in the upper Willamette River watersheds. Adult Chinook salmon spend from one to seven years growing and maturing at sea before returning to their natal streams to spawn. Chinook salmon spawning is timed so that fry will emerge in the spring where they spend from a few months to two years feeding before migrating to the sea. Declines in Chinook salmon populations are due to overfishing, damming, diversion of water, habitat destruction, and introducing hatchery populations.

Steelhead, Upper Willamette River ESU, spring run (*Oncorhynchus mykiss*) occupies streams along Coastal Oregon and in the lower Columbia Basin. Adult and juvenile Oregon Coast Steelhead are found in the upper Willamette River watersheds. Winter Steelhead spend one or two years in the Pacific Ocean before returning to spawn. Most returning adults enter the river system in November through February and move quickly upstream. Most spawning takes place from March through April with fry hatching in April and May. Juveniles generally spend two years in freshwater before transitioning to smolt and migrating to the ocean. Winter Steelhead and coho salmon use many of the same stream reaches of zero to four percent gradient but at different times of the year.

Northern red-legged frog (*Rana aurora*) occupies a range from the extreme northwest of California up to the south of British Columbia on the west of the Cascade crest. Diet consists of invertebrates, small mammals and other amphibians like the small tree frog. Breeding occurs from late November to early April. Males travel in groups and mate with a female when she approaches. Females lay eggs that are fertilized externally. Eggs hatch between six and fourteen days that reach a juvenile stage at four to seven months. The northern red-legged frog is currently a species of concern due to the many different environmental factors. Overharvesting, introduction of invasive species, dam construction, loss of habitat, and pollutants have all played a role in reducing seventy five percent of the northern red-legged frogs historical range.

Western Pond Turtle (*Actinemys marmorata*) is native to the West Coast and found from Baja California, Mexico north through Klickitat County, Washington. The western pond turtle is both aquatic

and terrestrial in its habitats, and can be found in many different bodies of water. Mating occurs from May through August when the female has reached an age between eight and fourteen years old. Female adults dig a hole on land and deposit their eggs. Sex of the young is dependent on the temperature of the surrounding soil. Threats to the western pond turtle include fire, flooding, drought, upper respiratory disease, habitat destruction, and lack of genetic variation.

Northern goshawk (*Accipiter gentilis*) is found in the mountains and forests of Eurasia and North America. This carnivorous raptors diet consists of birds, mammals, invertebrates, and reptiles of moderate to large size. They are solitary hunters during the off season and become fiercely territorial during the breeding season. Breeding usually takes place once per year between early April and mid-June. Females will attract males during courtship through dramatic aerial displays and vocalizing. Clutch size is around two to four eggs with hatching taking place within twenty eight to thirty eight days of lying. Fledglings are fed by their parents for seventy days before reaching adulthood. Northern Goshawks are listed as a species of concern due to timber harvesting of mature forests. They are considered "sensitive to change" and "management indicators" in many national forests.

Olive-sided flycatcher (*Contopus cooperi*) travels vast distances to breed in northern conifer forests in the spring and winters in the tropics. It prefers a wide variety of airborne arthropods it catches by sallying from branches in the crown of trees. Female lays three eggs that she incubates, and both male and female feed the young. Young fledge at twenty one to twenty three days to enter adulthood. The olive-sided flycatcher is currently listed as a species of concern due to a decline in its population over the 20th and 21st centuries. Researchers believe that a loss in habitat at wintering grounds is causing the decline.

Streaked horned lark (*Eremophila alpestris strigata*) had a historical breeding range that extended from southern British Columbia south through the Puget lowlands and outer coast of Washington and the Willamette Valley and Rogue River Valley of Oregon. Over-wintering occurs in Oregon while nesting takes place in Washington beginning in late March and continues into June. The female commonly lays four eggs speckled with brown and incubation lasts eleven days before the young are capable of flight nine to twelve days after hatching. The biggest factor to the decline in the streaked horned lark is due to loss of native prairies and grasslands. It has been estimated that less than one percent of native savanna and grassland in Oregon remains, and only ten percent of historic prairie in Washington remains intact.

Acorn woodpecker (*Melanerpes formicivorus*) can be found from northwest Oregon, California, the American Southwest, and western Mexico through the Central American highlands and into the northern Andes of Colombia. Acorn woodpeckers prefer pine-oak woodlands where a majority of the trees are oak. Cooperative breeding takes place from late March to late June where the eggs are laid in a communal nest. Incubation averages 11.5 days and the young leave the nest between thirty to thirty two days after hatching. Acorn woodpeckers face threats from several factors. Habitat loss and degradation, overgrazing, poor regeneration of oaks, and destruction of oak and pine forests for firewood or urban development directly threaten the acorn woodpecker.

Northern spotted owl (*Strix occidentalis caurina*) listed as threatened due to timber harvest of old growth forests. Logging of old growth forests can decrease suitable habitat from fifty four to ninety nine percent. Appropriate old growth forest habitat can be reinstated forty to one hundred years after logging if snags, coarse debris, and some trees with cavities remain untouched. The northern spotted owl is found only in the old growth forests of British Columbia, Washington, Oregon, and northern California. Prey consists mostly of small mammals as well as birds, reptiles and insects. Pairs mate for life and egg lying takes place in March and April. Eggs are incubated for thirty days, and the young fledge on average thirty five days after hatching.

Silver-haired bat (*Lasionycteris noctivagans*) is found throughout most of the United States with the exception of the southeast and southwestern coasts. The silver-haired Bat is an insectivorous species with the bulk of its diet consisting of moths. It is opportunistic depending on its geographic location, and has been known to hunt prey on the ground. Mating takes place during migration with males and females being polygynandrous. A gestation period of fifty to sixty days is followed by the birth of two pups. Young will then nurse for about thirty six days after which they are independent. This species is currently listed as a species of concern due to the "white-nose syndrome" caused by a cold loving fungus, *Pseudogymnoascus destructans*, which interrupts the bats hibernation cycle.

Environmentally Sensitive Areas

The City of Molalla is located near sensitive environmental areas and affects downstream water users. Facilities planning should be considerate of the naturally beautiful surroundings of the City and within the Study Area that includes forests, pasture, and wetlands. A discussion of environmentally sensitive areas and environmental topics pertinent to public facilities planning is presented below.

Wetlands

In the City of Molalla, urban natural resources such as fish habitat, wildlife habitat, and riparian vegetation are associated with significant wetlands and stream corridors. Wetlands are one of the most biologically productive components of the environment. Their functions and value include water quality improvement, fish and wildlife habitat, flood control, point of entry for groundwater discharge, shoreline anchoring, and erosion control.

In 2001, the City completed a Local Wetland Inventory (LWI) and riparian assessment that describes and maps significant wetlands and streams within the City's UGB. The LWI was approved by the Oregon Department of State Lands (DSL) in March of 2004. Most significant wetlands are associated with the creeks and natural drainage ways described below.

As shown on LWI maps in Appendix A, the City of Molalla UGB area has three drainage basins:

1. The northeastern portion of the UGB is within the Molalla River basin. Drainage from this basin flows northeastward via a natural drainage way to the Molalla River.

2. The central portion of the UGB is within the Creamery Creek basin. Creamery Creek flows diagonally from the southeast to the northwest before reaching the Molalla River north of the UGB.

3. The southern portion of the UGB is within the Bear Creek basin. Bear Creek joins Kaiser Creek (located south of the UGB) to flow to the Pudding River many miles to the west.

Riparian Zones

The transition zone between creeks and uplands are also sensitive. They should be protected for erosion control, cover for animals, and shading for reducing water temperatures. In addition to exceeding the physical tolerance levels of fish, high temperatures lower the oxygen concentration, increase disease potential for aquatic life, and produce conditions for competing fish.

Clackamas County has adopted a River and Stream Conservation Area (RSCA) that applies to lands located near the mean high water line from the bank of all identified perennial and intermittent water courses. This ordinance (Clackamas County Zoning and Development Ordinance 704) requires all

structural development to have a setback based on the size of the structure from the adjacent water course. The purpose of Ordinance 704 is to:

- Maintain the integrity of the rivers and streams in the County by minimizing erosion, promoting bank stability, maintaining and enhancing water quality and fish and wildlife habitat, and preserving scenic quality and recreational potential;

- Maintain rivers in their natural state to the maximum extent practicable, thereby recognizing their natural, scenic, historic, economic, cultural, and recreational qualities; and

- Implement the River Design Plans set forth in Chapter 3 of the Comprehensive Plan. The Clackamas County Comprehensive Plan can be found on the County's website: https://www.clackamas.us/planning/comprehensive.html

Special Bird Habitats

The natural surroundings in Clackamas County supports a wide range of bird habitats; two of which the County Zoning and Development Ordinance last amended in 2015 have been designated as requiring special consideration including the Molalla State Park Great Blue Heron Rookery and Stevens Great Blue Heron Rookery. To assist in the protection of heron special bird habitats for activities not regulated by the Forests Practice Act (FPA), Clackamas County has applied a Special Bird Habitat Overlay Zone. Within these overlay zones; the County manages the heron special bird habitats through consultation with Oregon Department of Fish and Wildlife (ODFW).

Air Quality and Noise

Air quality within the Molalla area is excellent for a majority of the year. In recent years Oregon has become more prone to wildland fires. These fires cause a drastic increase in particulate matter leading to unhealthy air quality.

Noise levels within the area are quite low, except near Highways 211 and 213. Vehicular traffic along Highways 211 and 213 will likely be the source of any future air quality or noise problems in the City.

Energy Production and Consumption

No major energy resources have been identified in the Study Area. Energy consumption is expected to increase within the Study Area due to population growth during the planning period. Portland General Electric (PGE) is the sole provider of electrical energy to the City of Molalla.

Wild and Scenic River System

A section of the Molalla River upstream of the City of Molalla has been registered as a Wild and Scenic River System under the management of the Bureau of Land Management, Northwest Oregon District. According to the National Wild and Scenic River Systems website, the designated reach starts from the southern boundary line of T7S, R4E, Section 19, downstream to the edge of the Bureau of Land Management boundary in T6S, R3E, Section 7. An additional section includes the Table Rock Fork of the Molalla River from the easternmost Bureau of Land Management boundary line in the NE 1/4 Section 4, T7S, R4E downstream to the confluence with the Molalla River. The sections have been classified as recreational with a total distance of 21.3 miles. A copy of the Wild and Scenic River System map for Molalla is included in Appendix A.

Historic Sites

Molalla's City Limits include multiple structures listed in the National Register of Historic Places: The Horace L. Dibble House, The William Hatchette Vaughan House, and The Fred Vonder Ahe House and Summer Kitchen.

Horace L. Dibble House

Built in 1859, the Horace L. Dibble house is unusual because of its saltbox style architecture associated with Colonial-era New England. Unique features of the house include its large rooms, windows, and two fireplaces.

William Hatchett Vaughan House

The William Hatchett Vaughan House was built in 1885 with Italianate style of architecture distinct to the 19th century phase of classical architecture. This is an unusual style for a Colonial-era homestead and has such features as pediment doors and angled bay windows.

Fred Vonder Ahe House

Built in 1869, the Fred Vonder Ahe House has a vernacular interpretation of the Federal style of architecture. The house is a unique example of a two-story plank house with well-preserved interior details.

SECTION 4:

REGULATORY ENVIRONMENT

SECTION 4: REGULATORY ENVIRONMENT

4.1 Municipal Water Management Plans

The Oregon Water Resources Department (WRD) has developed rules that govern water management planning (Water Management and Conservation Plans; Oregon Administrative Rules (OAR) Chapter 690, Division 86). Included in these rules are groundwater management, hydroelectric power development, instream flow protection, interstate cooperation, water resources protection on public riparian lands, conservation and efficient water use, water allocation, and water storage. The Water Resources Commission has adopted a statewide policy on Conservation and Efficient Water Use (Statewide Water Resource Management; OAR 690-410). The policy requires major water users and suppliers to prepare water management plans. Municipal water suppliers are encouraged to prepare water management plans, and are required to do so if a plan is prescribed by a condition of a water use permit. The following elements are to be included in the plan; a description of the water system, a water conservation element, a water curtailment element, and a long range water supply element.

A Water Curtailment, Management, and Conservation Plan meeting all requirements of OAR 690-086-0125 to 0150 has been developed as part of this Water Management, Conservation and System Master Plan (WMCWSMP).

Description of the Water System

The Curtailment, Management, and Conservation Plan shall include sources of water, storage and regulation facilities, transfer and exchange agreements, and intergovernmental cooperation agreements. System capacity, limitations, and opportunities for expansion under existing water rights are to be included. Water use shall be discussed including current average annual water use, peak seasonal demand, average and peak day demands, and quantities of water used from a source. Customer information is required such as estimated numbers and general water use characteristics of residential, commercial, industrial, and other users. Also required is a schematic of the system which shows the sources of water, storage facilities, treatment facilities, major transmission and distribution lines, pump stations, interconnections with other municipal supply systems, and the service area.

4.2 Public Water System Regulations

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. Since its inception, the SDWA and associated regulations have been amended a number of times, with the most recent amendments in January of 2018.

One of the main elements of these drinking water regulations is the establishment of Maximum Contaminant Levels (MCLs) for inorganic, organic, microbiological, and radionuclide contaminants and turbidity. A MCL is the maximum allowable level of a contaminant in water delivered to the users of a public water system. Concentrations above the MCL for a contaminant are considered violations and require the water supplier to perform immediate corrective action and notify the public of such violations.

Surface Water Treatment Rule (SWTR)

The Surface Water Treatment Rule (SWTR) is one amendment to the Safe Drinking Water Act (SDWA). This rule affects all public water systems using surface water sources and established that water must be treated through filtration and disinfection, among other requirements. This rule is required for all water providers using a surface water source unless certain water quality criteria and site-specific requirements are met. Treatment requirements, performance standards, and MCLs are generally summarized as follows (excluding MCLs for inorganic materials, radioactive substances, and secondary contaminants) for a water system:

- For conventional filtration treatment, the turbidity level of representative samples of filtered water must at no time exceed 1 Nephelometric Turbidity Units (NTU), measured as specified in OAR 333-061-0030(3)(b). That is to say, zero percent of the turbidity measurements can exceed 1 NTU. Turbidity is monitored continuously with results reported every four hours.

- For conventional filtration treatment, the turbidity level of representative samples of filtered water must be less than or equal to 0.3 NTU in at least 95 percent of the measurements taken each month, measured as specified in OAR 333-061-0030(3)(b). That is to say, the turbidity levels can rise above 0.3 NTU no more than five percent of the time.

- Total coliform-positive (coliform present) samples shall not exceed more than one sample collected during a month. Ten monthly samples are required. A set of at least three repeat samples is required for each positive sample. Repeat sampling continues until a set of repeat samples with negative results (coliform absent) is obtained and MCL achieved. Confirmed presence of fecal coliform or *E. coli* requires immediate notification of the public. Investigations are required for more than one total coliform-positive distribution sample in a month.

- At least 99.9 percent (3-log) inactivation and/or removal of *Giardia lamblia* cysts at a point downstream at or before the first customer.

- At least 99.99 percent (4-log) inactivation and/or removal of viruses at a point downstream at or before the first customer.

- A free chlorine residual of 0.2 milligrams per liter (mg/l) after 30 minutes of contact time shall be achieved under all flow conditions before the first customer as specified in OAR 333-061-0050(5)(c)(B).

- The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide must be detectable in more than five percent of the samples each month, for any two consecutive months, as specified in OAR 333-061-0032(3)(d).

The adoption of the 1989 SWTR has improved the quality of drinking water and greatly reduced the number of infections caused by water borne pathogens. The SWTR set standards to reduce water concentration of *Giardia* and viruses, with a goal to reduce the risk of infection to less than one in 10,000 people per year. However, some water sources have a high concentration of pathogens that, even when treated to the levels required by the rule, do not meet the health goal. Specifically, the rule does not specifically control the protozoan *Cryptosporidium*, which has been linked to at least 50 deaths of *Cryptosporidium* caused illness outbreaks in Wisconsin, Nevada, Oregon, and Georgia. Although the public health benefits of disinfection are significant and well recognized, it has been found that the disinfection byproducts also pose health risks at certain levels. The SDWA amendments, signed in

August of 1996, mandated the establishment of a series of new drinking water regulations in response to these and other concerns. Since the enactment of the amendments, the EPA has been busy developing, proposing, and finalizing regulatory actions. Some of the recent regulatory actions are summarized below.

Long Term 1 Enhanced Surface Water Treatment Rule

One of the first rules developed by EPA under the SDWA amendments was the Interim Enhanced Surface Water Treatment Rule (IESWTR). The IESWTR was promulgated to address health risks from microbial contaminants without significantly increasing the potential risks from chemical contaminants. This rule applies to public water systems that use surface water or Ground Water Under the Direct Influence of Surface Water (GWUDI) and serve at least 10,000 people. For water systems with a population of less than 10,000, the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was adopted. This rule was adopted in January 2002 and includes the following provisions:

- Maximum Contaminant Level Goal (MCLG) is set at zero.
- Filtered systems must comply with strengthened Combined Filter Effluent (CFE) turbidity performance requirements to assure 2-log removal of *Cryptosporidium*.
- Conventional and direct filtration systems must continuously monitor the turbidity of individual filters and comply with follow up activities based on this monitoring.
- Specific Combined Filter Effluent (CFE) turbidity requirements depend on the type of filtration. For conventional and direct filtration, the CFE shall be less than 0.3 NTU 95 percent of the time, and at no time higher than 1 NTU.
- Perform CFE turbidity monitoring at least every four hours; record continuous Individual Turbidity Effluent (IFE) measurements (at least every 15 minutes).
- Disinfection profiling and benchmarking provisions to ensure continued microbial protection.
- Requirements for covers on new finished water reservoirs.

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)

The Long Term 2 Enhances Surface Water Treatment Rule (LT2ESWTR) was proposed and reviewed by a Federal Advisory Committee at the same time as the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR). The requirements of this rule would pertain to all public water systems that use surface waters or GWUDI. The rule would incorporate system specific treatment requirements for one of four categories or "bins" depending upon the results of source water *Cryptosporidium* monitoring. Treatment requirements for each system would depend on the system's existing treatment equipment and removal capabilities. To comply with additional treatment requirements, water providers would choose technologies from a "toolbox" of options. Proposed treatment requirements for average *Cryptosporidium* are presented in Table 4.2.1.

TABLE 4.2.1
PROPOSED TREATMENT REQUIREMENTS FOR AVERAGE
***CRYPTOSPORIDIUM* CONCENTRATIONS**

Bin. No.	Avg. Cryptosporidium Concentration	Additional Treatment Requirements [1]
1	< 0.075/liter	No action
2	0.075/liter < x < 1.0/liter	1-log treatment (any technology or technologies)
3	1.0/liter < x < 3.0/liter	2.0-log treatment (must achieve at least 1-log of treatment using specific technology) [2]
4	> 3.0/liter	2.5-log treatment (must achieve at least 1-log of treatment using specific technology) [2]

[1] For systems with conventional treatment that are in full compliance with IESWTR.
[2] Acceptable technologies include ozone, chlorine dioxide, ultraviolet (UV), membranes, bag/cartridge filters, or in-bank filtration.

Monitoring requirements for small systems serving less than 10,000 people, it is anticipated that source water *E. coli* concentrations would be utilized for *Cryptosporidium* monitoring. Observed *E. coli* concentrations above certain levels would trigger *Cryptosporidium* monitoring. The recommended *E. coli* monitoring for small systems would begin 2.5 years after rule promulgation and would include twenty six samples over one year. After six years of the system characterization, a second round of monitoring is proposed.

Monitoring *Cryptosporidium* only applies to public water systems serving populations greater than 10,000; therefore, the City of Molalla is not currently required to monitor *Cryptosporidium*. In the future, this rule may expand its reach and begin to impact City of Molalla's existing treatment and monitoring processes.

In summary, the rules are getting tougher with increased treatment standards, lower MCLs, and more regulated substances. Water suppliers must stay informed of upcoming standards and requirements to ensure that their system will stay in compliance. Proper preparation is critical. When upcoming MCLs are established, a supplier should begin to test for these materials to determine if compliance will be a problem. Advanced planning will allow a utility more time to make necessary modifications to treatment techniques.

Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR)

Stage 1 Disinfectants and Disinfection Byproducts Rule (DBPR) was published along with the IESWTR to control disinfectants and formation of their harmful byproducts. This rule establishes Maximum Residual Disinfectant Level Goals (MRDLGs) and Maximum Residual Disinfectant Levels (MRDLs) for three disinfectants: chlorine (4.0 mg/l), chloramines (4.0 mg/l), and chlorine dioxide (0.8 mg/l). The rule also establishes Maximum Contaminant Level Goals (MCLGs) and Maximum Contaminant Levels (MCLs) for specific disinfection byproducts as given in Table 4.2.2.

TABLE 4.2.2
MCLGS AND MCLS FOR STAGE 1 DISINFECTANTS

Disinfection Byproduct	MCLG (mg/l)	MCL (mg/l)	Time Period
Total trihalomethanes	N/A	0.08	Annual Average
Bromodichloromethane	0	0.08	Annual Average
Dibromochloromethane	0.06	0.08	Annual Average
Bromoform	0	0.08	Annual Average
Haloacectic acids (HAA5)	N/A	0.06	Annual Average
Dichloroacetic acid	0	0.06	Annual Average
Trichloroacetic acid	0.02	0.06	Annual Average
Chlorite	0.8	1	Monthly Average
Bromate	0	0.01	Annual Average

Water system providers must monitor and control the use of disinfectants, and meet the requirements for total trihalomethanes (TTHM) and the sum of five Haloacetic Acids (HAA5). In addition, water systems that use surface water or GWUDI and use conventional filtration treatment are required to also remove a specified percentage of organic materials, measured as Total Organic Carbon (TOC), which may react with disinfectants to form disinfection byproducts.

Furthermore, Oregon's decision to join the States of Utah, Washington, and EPA Region 10 in participation in the Area Wide Optimization Program (AWOP) is anticipated to create more stringent treatment standards performance goals as listed below in Table 4.2.3.

TABLE 4.2.3
AWOP PERFORMANCE GOALS

Turbidity	Criteria
Sedimentation	
Less than 2 NTU, 95% of the time	Avg. annual raw water turbidity > 10 NTU
Less than 1 NTU, 95% of the time	Avg. annual raw water turbidity <= 10 NTU
Filtration	
< 0.1 NTU, 95% of the time	Based on 4-hour incremental max values
	(15 min. period following backwash excluded)
Max. 0.3 NTU following backwash	Return to < 0.1 NTU < 15 minute of backwash

The objective of the AWOP is to achieve “performance goals” without major capital expenditures. While these goals are not currently tied to regulatory compliance requirements, it is anticipated that they will be in time. Statements by the state such as “to achieve optimized treatment and provide maximum protection of public health, you must achieve the described AWOP performance goals” suggests that these goals would better protect the public, and therefore should be adhered to.

Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR)

Effective March 6, 2006, the Stage 2 Disinfectants and Disinfection Byproducts Rule (DBPR) is being promulgated to address concerns about risk tradeoffs between pathogens and Disinfection Byproducts

(DBPs). Stage 2 DBPR builds upon the Stage 1 DBPR to address higher risk public water systems for protection measures beyond those required for existing regulations. These rules strengthen protection against microbial contaminants, especially *Cryptosporidium*, and at the same time, reduce potential health risks of DBPs. Stage 2 DBPR contains maximum contaminant level goals for chloroform, monochloroacetic acid, Total Trihalomethanes (TTHM), and Haloacetic Acids (HAA5). This document also specifies the best available technologies for the final MCLs. The EPA is approving additional analytical methods for the determination of disinfectants and DBPs in drinking water. The Stage 2 DBPR rule is intended to reduce potential cancer and reproductive and developmental health risks from DBPs in drinking water. The requirements of this rule apply to community water systems and non-transient, non-community water systems that add and/or deliver water that is treated with a primary or residual disinfectant other than UV.

For public water systems serving fewer than 10,000 people, subpart V (Stage 2) compliance monitoring began October 1, 2013, with an additional two-year extension available to systems requiring capital improvements.

An Initial Distribution System Evaluation (IDSE), conducted by the water provider, is intended to select new compliance monitoring sites that reflect locations with system high TTHM and HAA5 concentrations. Water providers would recommend new or revised monitoring sites based on their IDSE study. The results from the IDSE study would not be used for compliance purposes. For surface water systems with less than 10,000 people, water providers must monitor either quarterly (population from 500 to 9,999) or semi-annually (population less than 500) for one year at two distribution system sites per plant. These sites must be in addition to the Stage 1 DBPR compliance monitoring sites. Water providers that certify to the state that all samples taken in the last two years were below 40 mg/l TTHM and 30 mg/l HAA5 are not required to conduct the IDSE.

For long term compliance monitoring, the principles of reduced compliance monitoring strategy (for very low DBP levels) utilized in Stage 1 DBPR would continue in the Stage 2 DBPR. Water providers would collect paired samples (TTHM and HAA5) at the site representing the highest TTHM and the highest HAA5 locations in the distribution system, as identified under the IDSE. If the highest levels of TTHM and HAA5 are observed at the same location, then only one sample would be needed. Monitoring would be either quarterly (population from 500 to 9,999) or annually (population less than 500). The Federal Advisory Committee also recommended that EPA propose that all wholesale and consecutive systems comply with the provisions of the Stage 2 DBPR on the same schedule of the system serving the largest population in the combined distribution system. Additional information on this regulation can be found at https://www.epa.gov/dwreginfo/stage-1-and-stage-2-disinfectants-and-disinfection-byproducts-rules

Filter Backwash Recycle Rule

The Environmental Protection Agency is required to regulate the recycling of filter backwash within the treatment process of a public water system. The filter backwash recycle rule provisions impact all conventional and direct filtration systems which recycle filter backwash and use surface water or GWUDI. Under the rule, the following provisions will be required.

- Recycle water from filter backwash, supernatant from sludge thickening, and liquids from sludge dewatering must pass through all filtration processes for treatment.

Specific information on the regulations concerning public water systems may be found in the Oregon Administrative Rules (OAR), Chapter 333, Division 61. More information on these rules can be found at http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/Rules/Documents/pwsrules.pdf

Arsenic and Clarifications to Compliance and New Source Monitoring Rule

In January 2001, the Arsenic and Clarifications to Compliance and New Source Monitoring Rule was enacted. The major features of this rule included the following:

- Include health effects statements in Consumer Confidence Reports for arsenic levels from 5 to 50 micrograms per liter (ug/l) and when systems are in violation of the arsenic MCL of 10 ug/l (effective January 2006).

- One sample must be taken and analyzed after effective date of MCL. Surface water systems must take annual samples.

- A system with a sampling point result above the MCL must collect quarterly samples at that sampling point, until the system is reliably and consistently below the MCL.

- All new systems or sources must collect initial monitoring samples for all Inorganic Contaminants (IOCs), Synthetic Organic Contaminants (SOCs), and Volatile Organic Contaminants (VOCs).

America's Water Infrastructure Act (AWIA)

Effective October 23, 2018, America's Water Infrastructure Act (AWIA) Section 2013 requires communities serving more than 3,300 people to develop or update a risk assessments and Emergency Response Plan (ERP). For populations of 3,301 to 49,999 people, deadlines for submittal are June 30, 2021 for the risk and resilience assessment. Six months after submittal of the risk and resilience, the emergency response plan is due.

The risk and resilience assessment of the system should include: risk from criminal acts and natural hazards; resilience of the system components and associated appurtenances; monitoring practices of the system; financial infrastructure of the system; chemical storage, use, and handling; and operation and maintenance of the system. The ERP should incorporate: physical and cyber security; plans and procedures in case of an event that threatens the water supply; options to limit the effect of such an event; and ways to detect these events. The City of Molalla ERP and Risk Assessment (RA) are completed in conjunction with this Water Management, Conservation and Water System Master Plan.

4.3 Responsibilities as a Water Supplier

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

- Routinely collecting and submitting water samples for laboratory analyses at the frequencies prescribed by OAR 333-061-0036.

- Taking 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 as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels have not been exceeded.

- Notifying all customers of the water system and the general public in the service area, as prescribed by OAR 333-061-0042, when the maximum contaminant levels have been exceeded.

- Notifying all customers served by the water system, as prescribed by OAR 333-061-0042, when reporting requirements are not being met, 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.

- Maintaining monitoring and operating records and making these records available for review when the system is inspected.

- Maintaining a pressure of at least 20 pounds per square inch (psi) at all service connections at all times.

- Following up on complaints relating to water quality from users and maintaining records and reports on actions undertaken.

- Conducting an active program for systematically identifying and controlling cross connections.

- Submitting, to the Oregon Health Authority, 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.

- Assuring that the water system is in compliance with OAR 333-061-0032 relating to water treatment.

- Assuring that the water system is in compliance with OAR 333-061-0210 through OAR 333-061-0272 relating to certification of water system Operators.

- Assuring that transient non-community water systems utilizing surface water sources or groundwater sources under the influence of surface water are in compliance with OAR 333-061-0065(2)(c) relating to required special training.

SECTION 5:

EXISTING WATER SYSTEM

SECTION 5: EXISTING WATER SYSTEM

The City of Molalla's existing water system consists of a raw water intake, raw water Influent Pump Station (IPS), a treatment plant facility, treated water storage reservoirs, a treated water transmission, and distribution system. These components are discussed in detail below.

The City of Molalla operates and maintains its system in compliance with the regulatory requirements outlined in Section 12.

5.1 Water Rights and Raw Water Supply

The nature and status of existing raw water supplies and water rights is crucial to the formulation of a successful long range plan for the City. The following is a discussion of the sources, availability, and reliability of the City's raw water sources.

Raw Water Sources

Presently, the City of Molalla has two available sources of raw water: the Molalla River and Trout Creek.

Molalla River

The first and primary raw water source is the Molalla River; approximately two miles south east of the City. The Molalla River source is generally of excellent water quality and is used throughout the year although the turbidity can be high (greater than 500 Nephelometric Turbidity Units (NTUs)) for short periods of time during large rainfall events causing excessive runoff to enter the river. Raw water quality is presented in Table 5.1.1.

TABLE 5.1.1
RAW WATER QUALITY SUMMARY

Item	Average Values	High	Low
Temperature, °F	55.4	72.7	43.0
pH	7.77	8.10	6.98
Turbidity, NTU(1)	2.57	150	0.95
TOC	0.77	2.33	0.55
Alkalinity, mg/L	23	29	13

(1) Larger turbidity spikes may occur during storm events especially after logging operations.

Trout Creek

The second source is Trout Creek, a tributary of the Molalla River which converges approximately seven miles southeast of the City and upriver of the City's Molalla River intake. The City has a water right for Trout Creek. The City no longer has the infrastructure in place to draw water from the designated point of diversion on the creek. At the time this Plan was written, the City was working with Oregon Water Resources Department (WRD) to transfer the point of diversion for this water right to the Molalla River. Natural conveyance within the Molalla River will allow for Trout Creek water rights to be drawn from the existing Molalla River intake. As a requirement of this transfer, the City installed a flow monitoring station in August of 2019 on Trout Creek; just downstream of the Dickey Prairie Road Bridge.

Water Rights

All water in Oregon is publicly owned. Based on this public ownership, a water right is generally required for anyone to use water, whether it originates from surface or underground sources. Oregon's water laws are based on the principal of prior application. That is, if a person obtains a water right on a particular source before someone else, the person would then possess a "senior" water right that would permit them first use of the water during times of lower flows or droughts. A "junior" water right is one that is obtained after other water rights for a particular source have been assigned. A water right may be both senior to some and junior to others. During periods of low water availability, a water right holder may use as much water as their water right allows as long as the use is truly beneficial and all senior water rights are satisfied. This method of resource appropriation governs all water used until the water is exhausted.

The City holds surface water right certificates and permits on the Molalla River and Trout Creek totaling 7.0 cubic feet per second (cfs) or approximately 4.5 Million Gallons per Day (MGD).

A brief summary of each listed water right is given below in Table 5.1.2. For more water right information, please see Sections 11 and 12.

TABLE 5.1.2
WATER RIGHTS DOCUMENTATION SUMMARY

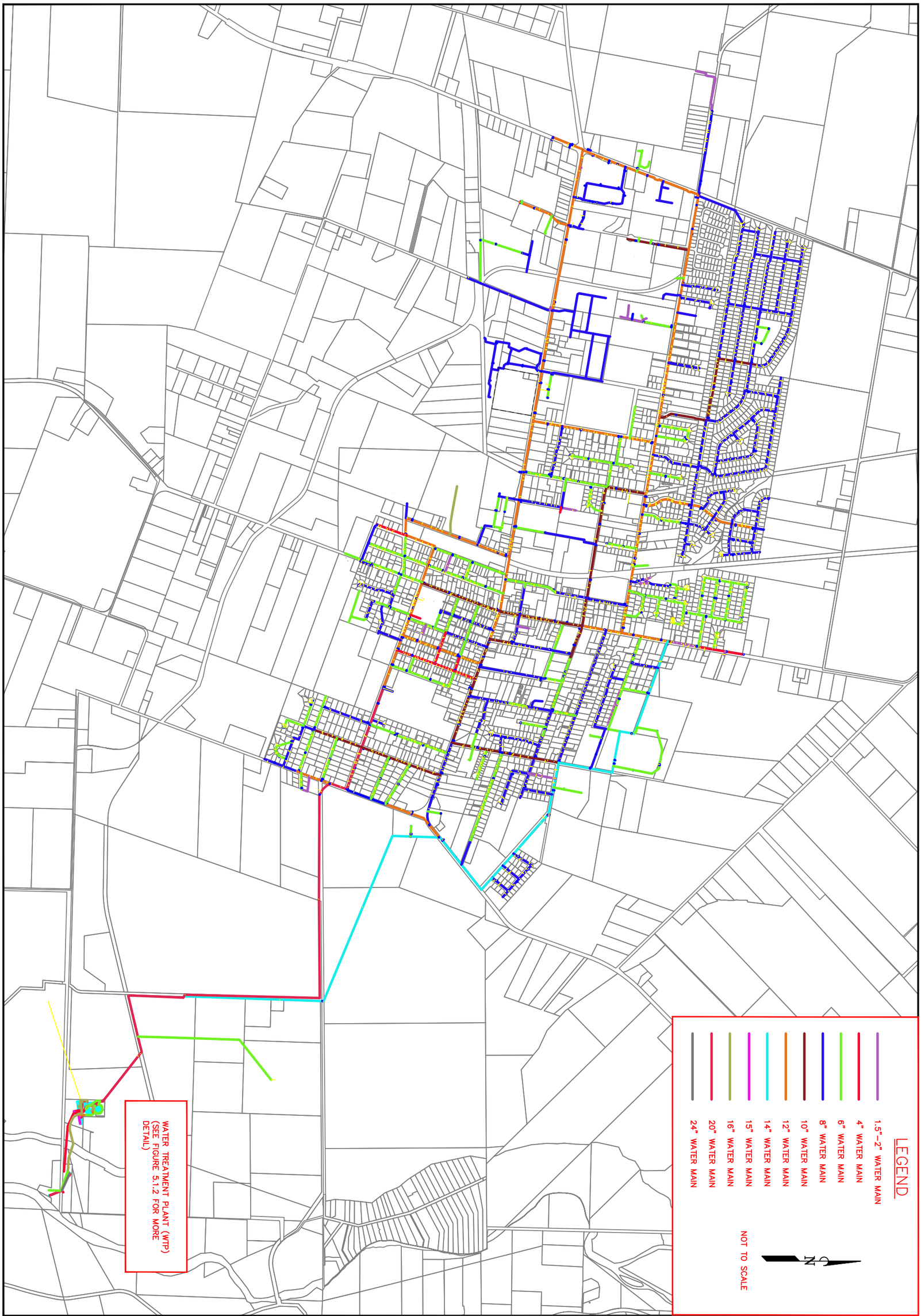
App. No.	Permit No.	Priority Date	Certificate No.	Transfer No.	Source	Use	Allowed Rate (cfs)
S 7783	S 4980	11-Mar-21	NA	T6319 (Confirming)	Trout Creek	Municipal	4.0
S 29401	S 23158	17-Aug-54	91537	NA	Molalla River	Municipal	3.0

Table 5.1.2 Continued	Application No.	Actual Diversion				Authorized Completion Date	Notes/ Environmental*
		Maximum Instantaneous Rate Diverted to Date (cfs)	Maximum Annual Quantity Diverted to Date (MG)	Average Monthly Diversion (MG)	Average Daily Diversion (Gallons)		
	S 7783	6.17**	2.144**	0.179**	5,875**	1-Oct-22	The Claim of Beneficial Use for Transfer New POD is in review by the OWRD. Potential summer water curtailment.
	S 29401	6.17	742.728	61.894	2,063,133	Completed	NA

* The Molalla River is Water Limited and the water quality parameters for the listing can be found in Table 3.3.1. A list of threatened and endangered species found in the Study Area is provided in Table 3.3.2. Of the species listed, the stream-flow dependent species found in the Molalla River include the Chinook Salmon and Steelhead.

**The S2401 (Trout Creek) water right is used only to meet peak demands and is pending a Point of Diversion Transfer Claim of Beneficial Use. Currently the primary municipal water right is the S 29401 (Molalla River) water right. The values in Figure 5.1.2 are from the reference water year 2019.

An overall map of the Molalla water system and Water Treatment Plant (WTP) system are displayed in Figure 5.1.1 and 5.1.2, respectively.



THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MAY, 2021 PROJECT NO.: 198.16	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN** **EXISTING DISTRIBUTION SYSTEM**	FIGURE NO. **5.1.1**

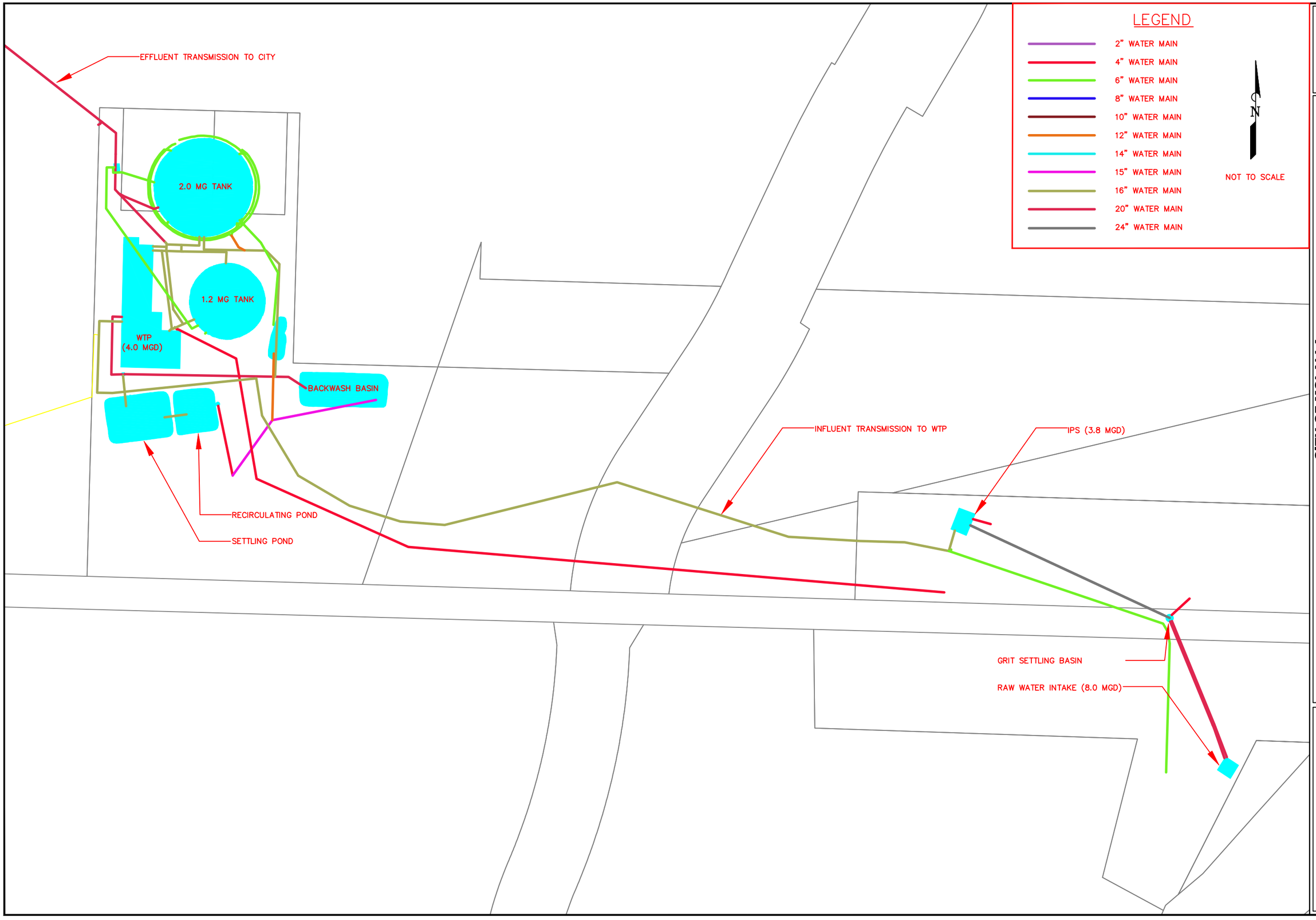


FIGURE NO. 5.1.2

CITY OF MOLALLA
WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN
EXISTING FACILITY SYSTEM

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MAY, 2021

PROJECT NO.: 198.16

Molalla River

A total of approximately 30.0 cfs of water rights allocated on the Molalla River are municipal rights. The City of Molalla's water rights are the most senior to all other municipal rights, with a priority date of August 17, 1954. The majority of the remaining water rights are for irrigation. Minimum instream flows for the Molalla River were first established by the state with a priority date of June 22, 1964 as an attempt to maintain minimum flows necessary of supporting aquatic life. The City's water rights are however senior to these minimum instream flows but junior to approximately 70 cfs of other, year round, water rights obtained before the priority date.

Oregon State University's technique for streamflow evaluation and flow duration analysis was performed to fully understand long term flow statistics and probability for the Molalla River. The probability of exceedance shows the percent of time that the flow in the river is likely to equal or exceed the respective monthly flows.

TABLE 5.1.3
HISTORICAL PROBABILITY OF FLOW AND MINIMUM INSTREAM FLOWS

Month	Flow (cfs) / Probability of Exceedance					
	90%	80%	70%	60%	50%	40%
January	719	824	1,030	1,290	1,620	2,600
February	633	738	928	1,120	1,350	2,030
March	749	831	1,000	1,190	1,410	2,000
April	784	877	1,050	1,190	1,340	1,690
May	472	534	666	811	968	1,310
June	233	263	316	380	464	688
July	91.4	100	119	138	158	214
August	54.6	58.8	66.2	73.5	80.9	101
September	54.2	57.2	63.4	70.8	79.5	113
October	74.9	86.4	111	133	170	326
November	242	312	467	649	858	1,620
December	527	661	929	1,190	1,520	2,440

There is less than a forty percent probability of the streamflow in the Molalla River not being able to meet the water rights allocated for the City (3.0 cfs) and senior to the City's water rights (approximately 70 cfs) in September and October based on United States Geological Survey (USGS) historical streamflow data. In other words, during less than four out of ten years for the months of September and October, the County Watermaster would have the authority to enforce minimum instream flow requirements and restrict any water rights junior to the instream requirements.

The City of Molalla's water right on the Molalla River is senior to the minimum instream flows. For planning purposes, it will be assumed for this Plan that the City's water rights on the Molalla River are only impacted by other more senior water rights.

Trout Creek

Four cubic feet per second (4.0 cfs) is allocated for the water rights on Trout Creek. This is the most senior right on the creek, with a priority date of March 11, 1921. The City was required to install a monitoring station on Trout Creek which was completed in August of 2019. Consequently, if the

streamflow drops below the water rights allocated, 4.0 cfs, the City must limit it's intake at the Molalla River respectively. The flow duration analysis for Trout Creek is shown in Table 5.1.4.

TABLE 5.1.4
HISTORICAL PROBABILITY OF FLOW FOR TROUT CREEK [(1)]

Month	Flow (cfs) / Probability of Exceedance					
	90%	80%	70%	60%	50%	40%
May	12	13	14	14.9	15.9	17.2
June	3.66	4.57	5.41	9.85	10.7	11.6
July	4.74	5.31	5.65	5.99	7.25	8.55
August	4.62	4.86	5.09	5.33	5.56	5.87
September	5.29	5.49	6.37	6.86	7.39	7.95
October	4.24	5.2	5.79	7.03	9.15	10.5

(1) Data is limited to the Trout Creek monitoring station June 9, 1992 to September 30, 1995.

There is less than a twenty percent probability of the streamflow in Trout Creek not being able to meet the water rights' allocation of 4.0 cfs in June, based on USGS historical probability data. In other words, during less than two out of ten years for the month of June, the County Watermaster would have the authority to enforce an intake restriction.

Diverted Water

The City utilizes the Molalla River intake as its primary source year-round. The City's flowmeters on the raw water intake dictate the amount of water diverted from the river. This amount for the years 2016 to 2019 is presented in Table 5.1.5.

TABLE 5.1.5
HISTORICAL WATER DIVERSION 2016 – 2019

Parameter	2016	2017	2018	2019
Average Annual, MG	389	396	412	450
Avg. Daily, cfs	1.65	1.68	1.75	1.91
Max. Month, cfs	2.46	2.64	2.74	2.74
Total Water Rights, cfs	3			

Watershed for Raw Water Sources

The City's Molalla River watershed, based on the intake location, extends approximately twenty miles in the southeast direction and encompasses approximately 130 square miles. The area within the watershed includes the Molalla River and the following tributaries: Trout, Dicky, Cedar, Russell, Shotgun, Pine, and Image Creeks. The predominant use of land within the Molalla River watershed consists of privately owned forestry and agricultural lands. Potential contamination sources identified in this watershed include: rural homesteads, managed forestlands, logging activity, clear cuts, areas of slope instability, grazing animals, and stream crossings.

The City of Molalla does not have adequate flows to sustain any additional water rights according to the Oregon Water Resources Department's water availability analysis of the Molalla River near the City of Molalla.

Other Water Sources

The City of Molalla does not currently have any other raw or treated water sources available. The City does not have any exchange agreements, intergovernmental cooperation agreements, water supply or delivery contracts in place.

5.2 Raw Water Facilities

The raw water facilities are located down a gravel river access road from the Molalla WTP. The facilities consist of intake screens with debris protection bars, raw water transmission mains, a grit settling chamber, and an Influent Pump Station. These facilities are discussed in detail below.

Molalla River Intake

The current access to the Molalla River water rights is through the City owned intake structure on the River. An 8.0 MGD intake was constructed in 1996 due to extensive damage to the existing intake during a flood in February of 1996. The current intake consists of two screens that are oriented parallel with the river flow. The screens are designated as "fish friendly" with minimal intake slot velocity to help reduce fish entrapment per National Marine Fisheries requirements. These screens are used to reduce the amount of solids entering the raw water transmission main. The screens are equipped to combat clogs with an air scour system powered by a 10 Horsepower (HP) 80 gallon (gal) compressor installed in Year 2019. When the river "flushes" during the beginning of the rainy season is when the worst screen build-up occurs. Five galvanized steel posts protect the screens up river from large debris; however, gravel buildup around the screens has been a continuing issue. Manual removal of this gravel is performed on an annual basis and greatly decreases the reliability of the screens. The infiltration prone Reinforced Concrete Pipe (RCP) located adjacent to the Influent Pump Station (IPS) is used instead of the river intake, during heavy rainfall events when the turbidity of the creek water is high. The lower pH of this raw water is adjusted accordingly at the plant. When turbidity levels recede the intake is changed back to the Molalla River screens.

Upon passing the screens, raw water flows by gravity via two 20-inch, 220 foot, Ductile Iron (DI) pipes to a grit settling chamber, then continues down a 24-inch, 300-foot, DI pipe to the Influent Pump Station's wet well. The grit settling chamber's settled material is pumped to waste for five minutes every morning and cleaned every year.

Influent Pump Station

The raw water wet well under the IPS is located approximately 520 feet northwest of the Molalla River intake structure. The IPS wet well is a 29.7 feet deep with a12 foot diameter concrete structure. Two 100 and one 75 HP vertical turbine pumps are utilized to convey the water to the treatment plant via a 16-inch diameter pipe. Telemetry is provided by an approximately 1,600 feet of fiber line installed in Year 2020; from the Influent Pump Station telemetry panel to the WTP Supervisory Control and Data Acquisition (SCADA) computer located in the lab. The IPS wet well's settled material is pumped to waste for five minutes every morning and cleaned every year.

An Automatic Transfer Switch (ATS), located within the IPS, automatically transfers electrical service to a backup generator in the event of a power outage. The generator is located on the north side of the Influent Pump Station.

Operation and Maintenance Issues

The City of Molalla's raw water facilities are the City's only source of raw water. Overall, the raw water facilities are in good condition and operate smoothly besides the operation and maintenance issues outlined below.

IPS

Pump #3, the northern most pump, needs rebuilding having half the run time hours as the identical Pump #1. Grit accumulation on the northern side of the wet well was observed by the Operator. Pump #3 is sitting lower than the adjacent pumps.

Raw Water Intake

The screens have a tendency to accumulate organic debris. The debris is not easily removed by air scour alone. Large river rock accumulation occurs; at times covering the screens entirely. Both instances require manual cleaning of debris from the intake screens.

5.3 Water Treatment Facility

City of Molalla's Water Treatment Plant

The City of Molalla has one potable Water Treatment Plant located approximately 0.4 miles west of the raw water intake structure, which is utilized year-round. The plant was just recently upgraded in Year 2020 to a net design capacity of 4 MGD. This plant utilizes two identical Trident Packaged Water Treatment Plants with up-flow clarifiers, mixed-media filtration, and chemical feed systems. The WTP design data is shown in Table 5.3.1 and includes a summary of the design capacity of the selected hydraulic and process equipment. A site map of the Molalla Water Treatment Facility is presented in Figure 5.3.1.

The Aluminum Chlorohydrate (ACH) (Isopac 840) and filter aid polymer Nalclear (8170 PULV) is injected near the inlet of the treatment units. Prior to treatment, the Operator has the option of adding sodium hypochlorite if pre-chlorination is needed, and soda ash if pH or alkalinity needs adjusting. The ACH coagulant feed pump for the treatment unit, installed in 1998, was replaced with a duplex metering pump skid during the Year 2020 upgrades that serves both treatment units. A new forty gallon polyethylene day tank and scale was also installed in Year 2020. The existing ACH chemical feed lines, 250 gallon storage tote, and ACH pump that feeds the new forty gallon day tank were installed in 1996.

Sodium hypoclorite and soda ash are injected on the effluent line after the filter units. The ACH dosing is adjusted based on a setpoint on the streaming current detector and flow is adjusted via the aquaritrol controller. The soda ash, filter aid polymer and chlorine is adjusted by the Operator at the pump by adjusting pump stroke and/or speed.

The soda ash and polymer pumps were replaced in the Year 2020 upgrades.

The three sodium hypochlorite bulk tanks and accessories were replaced with 400 gallon high density cross-linked polyethylene tanks in the Year 2020 upgrades.

Two treated water storage tanks are located on the WTP site. The tanks are used for storage, as discussed in Section 5.4, but also serve as a clearwell providing the required chlorine contact time.
Chlorine residual monitoring is accomplished inside the re-chlorination, "first user", building.

TABLE 5.3.1
WTP EXISTING DESIGN DATA

Design flows, gpm (per filter)	Variable 700 - 1,400
Tanks	
Number	2
Connection, inches	
Raw water	12
Finished water	16
Waste/overflow	20
Air @ up-flow clarifier	6
Air @ filter	8
Up-Flow Clarifiers (per filter)	
Total area, sq. ft.	140
Loading rate, gpm / sq. ft	10
Flush average volume per cycle, gal	14,000
Air scour rate, scfm / basin	475
Mixed-Media Filters (per filter)	
Total area, sq. ft.	280
Loading rate, gpm / sq. ft.	5
Filter media, type / depth - inches	
Anthracite coal, sg 1.6	18
Silica sand, sg 2.6	9
Garnet sand, sg 4.0	3
Backwash rate, gpm / sq. ft. @ 60˚F	15
Backwash average volume per cycle, gal	28,000
Air scour rate, scfm / basin	950
Air Scour System	
Regenerative Blowers	
Number	2
Capacity, scfm	475 @ 5psi
Motor horsepower, max	25
Finished Water Pump	
Number	2
Capacity, gpm / TDH	1,400 / 24
Power, volt	460 / 3-phase

FIGURE 5.3.1
WTP EXISTING SITE

Plant Operation

Raw water is delivered to the WTP from the IPS via a 16-inch diameter water main entering the WTP then transitions to a 14-inch line. Prior to treatment, raw water is injected with coagulation polymers and flocculation forming chemicals. The polymer is injected to bind particles together, better enabling the up-flow clarifier and filter to remove particles and attached contaminants.

The raw water metering is accomplished through two flow meters located on both sides of the 14-inch raw water tee that splits flow between treatment units. Raw water flow has the ability to be isolated immediately after the flow meters through two actuated butterfly values. An influent pressure gauge is located adjacent to the flow meters.

There are two filter units, each of which has anthracite coal, silica sand, and garnet sand as media. The clarified water travels through the filters. Treated water from the treatment units is pumped to the treated water storage reservoir tanks which act as a clearwell providing chlorine contact time. The City's reservoir tanks then provide adequate pressure for distribution. Turbidity of the filtered water is measured off the effluent from each filter unit.

When design terminal headloss in the filter and clarifier is reached the fully automated treatment units will backwash and flush the unit. The backwash wastewater is sent via a 20-inch pipe to the backwash basin located just east of the WTP building. The backwash flow is measured with a 16-inch flowmeter shared by both treatment units.

Ultimately, treated water production is controlled by the City's water demand through the water level in the onsite treated water reservoir tanks. When the water level in these tanks drops to 17.0 feet, the treated water pumps located adjacent to the filtration units start and convey water to the reservoirs via a 14-inch treated water pipe. The pumps stop when reservoirs reach 19.3 feet. Treated water from the upflow clarifier will flow to the filters and the plant will operate until shut down by the following: high level

switch from the filter's clearwell, automatic call for backwash, or manual shutdown by the Operator. The treated water metering is accomplished through a flowmeter located in the "first user" building.

Water Production and Backwash

The City of Molalla's Water Treatment Plant treated water pumps are piped to feed the City's water demands by filling the treated water storage tanks which gravity feeds the distribution system. The WTP pumps fill the tanks based on level sensors. A historical representation of backwash flows cannot be used conclusively due to the recent upgrades to the City of Molalla's WTP.

Operation and Maintenance Issues

The City of Molalla's WTP is the City's only source of potable water. Overall, this WTP is in good condition and operates smoothly, due to the recent upgrade early in the Year 2020. There are no deficiencies related to general condition or faulty equipment after the upgrades in Year 2020. Although, all systems are operating as designed without error, there is one issue that was brought about by the WTP Staff. This issue is discussed below.

Chemical Storage

The polymer and soda ash storage tanks need replacement in the next one to two years based on age. These chemical storage tanks were not included in the scope of work under the Year 2020 WTP Upgrade.

5.4 Treated Water Storage

The purpose of treated water storage reservoirs or tanks is to provide a sufficient amount of water to equalize the system's daily demand, adequate pressures throughout the system, sufficient storage for fire flows demand, and reserve storage for periods when the City is without a water supply. The City's water system has two storage tanks providing a nominal capacity of 3.2 million gallons of storage. A brief description of each tank is provided below along with a summary of the site observations made during inspection and comments from City Staff.

2.0 MG Tank

Built in 1998, this prestressed concrete reservoir tank provides a total of two Million Gallons (MG) of storage. The bottom elevation is 547.39 feet and overflow elevation at 566.4 feet. Overflow protection is provided though an 18-inch overflow bell which allows water to exit the tank in case of submersible level transducer failure. There is an air vent located on the top of the approximately 130 foot free-spanning dome roof. Security for this tank is provided by a double locking hatch and the WTP fencing.

1.2 MG Tank

Built by CROM Prestressing, Inc in 1976, this prestressed concrete reservoir provides a total of 1,200,000 gallons of storage. Overflow protection is provided though a 24-inch overflow bell which allows water to exit the reservoir in case of submersible level transducer or telemetry failure. The bottom elevation is 546.0 feet and the overflow elevation is at 566.4 feet. There is a 30-inch vent located on the top of the approximately 100 foot free-spanning dome roof. The reservoir is approximately twenty one feet high. Security for this tank is provided by the WTP fencing and a hinged plate over the ladder.

The 1.2 MG tank was inspected by DN Tanks on January 26, 2017, which focused on areas of concern regarding delaminating gunite and corroding prestressing wires on the exterior of the tank. LiquiVision

Technology Diving Services inspected the interior of the tank on April 13, 2018, which focused on, but not limited to, the previously reported areas of concern.

Issues found for the 1.2 MG tank include, but are not limited to: minor corrosion and moderate calcification on interior ladder, minor floor pitting, and moderate corrosion. The following items have moderate corrosion: 24-inch overflow pipe, 30-inch inlet / outlet pipe, man way cover, and on the level sensing float base. The tank does not have a sub-drain or leak detection system. Gunite delamination was found, with two locations having large and complete delamination and corrosion of the exposed prestressing wires. The dome roof has large circumferential and radial cracks averaging 1/8-inch to ¼-inch wide.

Operation and Maintenance Issues

Overall, the City's water storage tanks appear to be in fair and poor condition with not enough information to make a useable life assessment on the 1.2 MG tank. This 1.2 MG tank's most concerning item is gunite delamination where exposed prestressing wires are corroded. This is a structural concern for the status of the steel diaphragm within the wall. These issues are discussed below.

2.0 MG Tank

Crack sealing and exterior paint is needed to reach the tank's intended usable life.

1.2 MG Tank

The tank has passed its usable life and is in need of repair or replacement.

5.5 Water Distribution System

The City of Molalla's water distribution system is comprised of various pipe materials and sizes. Conveyance from the Water Treatment Plant (WTP) to the City is accomplished by a 20-inch and then 14-inch steel transmission main that extends west along E 5th St. and northwest along Woodburn-Estacada Hwy and Shirley St., respectively upon entering City Limits. The steel line is equipped with a cathodic protection system to mitigate external corrosion. The cathodic protection system was damaged and repaired in 2019. Following the repairs, the system was checked and found to provide adequate protection to the pipe.

The most prevalent pipe size within the distribution system (36 percent) consists of 8-inch diameter pipe. In addition to varying by diameter, the water distribution system is also composed of a variety of pipe materials. The materials that were used to construct water lines over the years depended primarily on the accepted and available materials of the time. In the 1940s and 1950s, cast iron, steel, galvanized piping, and concrete cylinder pipe were commonly used. Later, Asbestos Cement (AC) piping was utilized for water main construction in the 1970s. Today ductile iron, PVC and Polyethylene (PE) pipe materials are used almost exclusively in the construction of new water lines. The City's piping consists primarily of PVC and galvanized steel for mains and laterals and copper and polyethylene pipe for service lines. A summary of the distribution system pipe size and material inventory (not including service lines) is given in Table 5.5.1. Current materials of choice for replacement are C900/C905 PVC or Ductile Iron (DI) pipe for transmission and distribution mains and laterals 2-inches and larger.

TABLE 5.5.1
DISTRIBUTION SYSTEM SIZE AND MATERIAL INVENTORY

Pipe Diameter, in	Materials of Construction						
	PVC	Cast Iron	Ductile Iron	Asbestos-Cement	Steel/ Copper	Total	% of Total
2	1,293	-	-	-	1,518	2,811	1.4%
4	1,023	248	-	-	3,052	4,323	2.2%
6	23,093	-	-	18,264	6,386	47,743	23.8%
8	66,969	-	2,628	1,608	809	72,014	35.9%
10	15,736	-	91	572	-	16,399	8.2%
12	32,759	-	79	-	-	32,838	16.4%
14	-	-	-	-	12,896	12,896	6.4%
16	793	-	-	-	-	793	0.4%
20	10,762	-	-	-	-	10,762	5.4%
Total	15,2428	248	2,798	20,444	24,661	200,579	100%
% of Total	76.0%	0.1%	1.4%	10.2%	12.3%	100%	-

The existing condition of the distribution system depends greatly on the materials that were used to construct the system as well as the level of workmanship at the time of construction. Although a historical log of distribution system repairs has not been maintained, City Staff believes that the majority of recent leaks in the distribution system have been observed with Asbestos-Cement (AC) and steel pipes.

In addition to the leakage observed in the areas previously described, areas where cast iron pipe are still in service should be investigated to determine reliability. If they are found to be leaking, these mains should be abandoned and replaced.

Computer modeling was conducted to analyze the performance of the existing City of Molalla water system. Hydraulic analysis software called WaterCAD by Haestad Methods was used to perform the complex calculations necessary to analyze the water system. The diameter and materials of each pipeline section was input in the computer model. A discussion on the computer modeling results of the distribution system is presented in Section 8.

The system is well metered, with water meters at each service and at all sources. The City has a primary meter to measure flows supplied to the system located prior to the tank effluent exiting the WTP site. These flows were used to calculate total system loss which is discussed in more detail within Section 6. The City uses blue or clear potable water Wirsbo PEX as their standard service pipe with ProPEX fittings for ¾-inch to 2-inch services. Services greater than 2-inches are specified to be C-900 pipe.

The City has implemented an annual flushing program to help maintain the adequate operation of the distribution system. The distribution system is divided into four quadrants and each quadrant is flushed annually as described in Table 5.5.2. A map showing the four quadrants and the fire hydrants used is included in Figure 5.5.1.

TABLE 5.5.2
ANNUAL FLUSHING PROGRAM

Quadrant	Work Order Initiated	Work Order Completion Date
Southeast	October 1st	October 31st
Northeast	December 1st	December 31st
Northwest	February 1st	February 28th
Southwest	April 1st	April 30th

Operation and Maintenance Issues

The City of Molalla's water distribution system has been diligently upgraded since the previous Water Master Plan (WMP); however, deficiencies related to general condition, and faulty equipment do exist. The Operation and Maintenance (O&M) concerns related to the distribution system are discussed below.

Distribution

General leaking problems with AC and steel mains have been observed by the City Staff.

Services

The Big Meadow neighborhood has consistently shown deteriorating copper service lines. The first radio reading meters installed throughout the City are reaching their life span and need replacing.

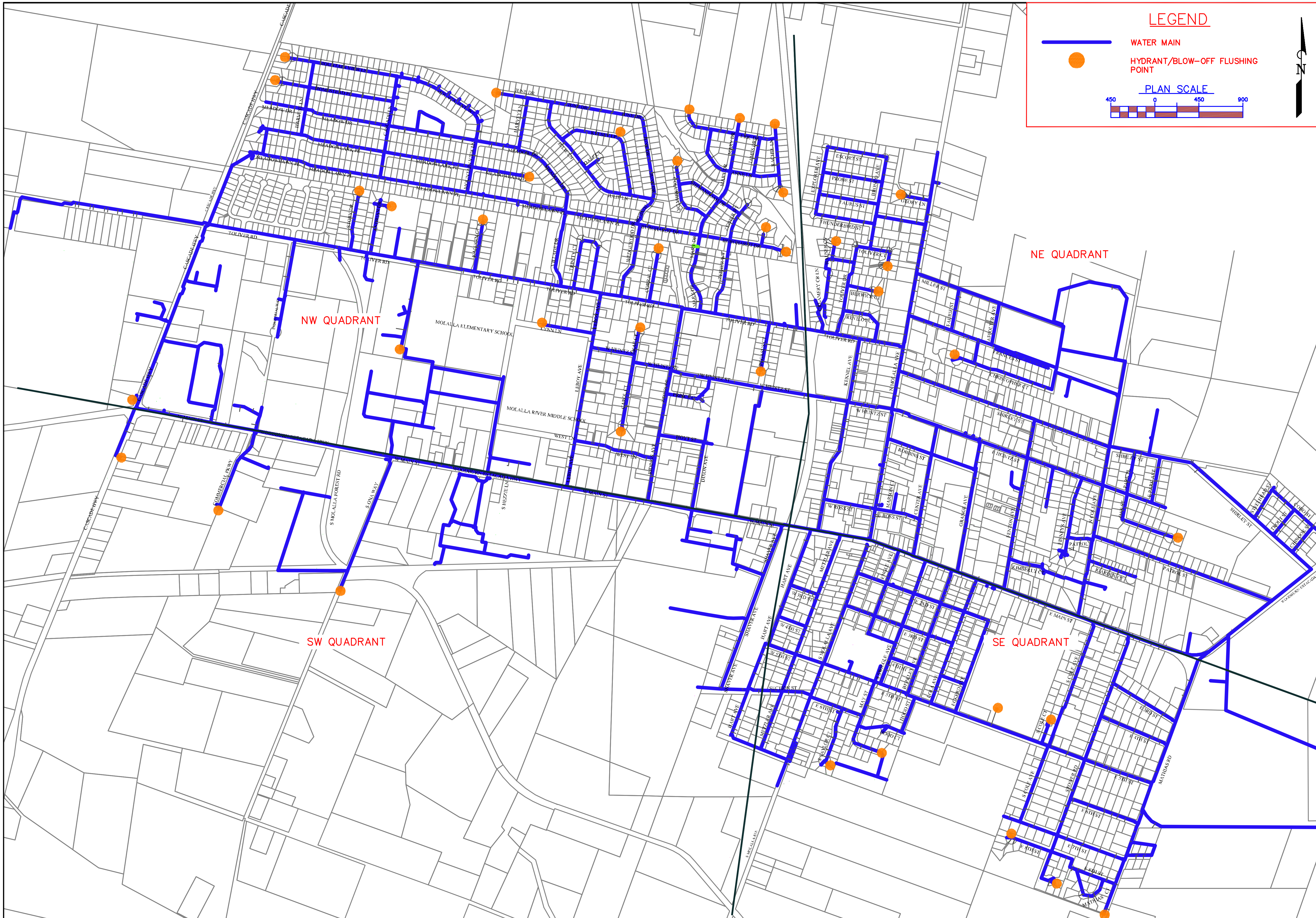


FIGURE NO. 5.5.1

WATER FACILITY AND DISTRIBUTION SYSTEM MASTER PLAN
CITY OF MOLALLA, CLACKAMAS COUNTY, OREGON

DISTRIBUTION SYSTEM FLUSHING MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MAY, 2021

PROJECT NO.: 198.16

SECTION 6:

WATER USE AND PROJECTED DEMANDS

SECTION 6: WATER USE AND PROJECTED DEMANDS

6.1 Description and Definitions

Water demand can be defined as the quantity of water delivered to the system over a period of time to meet the needs of consumers, provide filter backwashing water, and to supply the needs of firefighting and system flushing. In addition, virtually all systems have an amount of leakage or loss that cannot be feasibly or economically reduced or eliminated. Total demand, therefore, includes all consumption and lost 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 with higher usage occurring during the morning and early evening periods and lowest usage 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.

- **Dry Season Daily Demand (DDD).** The gallons per day average during the months of June through October.

- **Maximum Monthly 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 seven day average demand that occurs in a year. Expressed in gallons per day.

- **Maximum Day Demand (MDD).** The largest volume of water delivered to the system in a single day expressed in gallons per day. The MDD is commonly used to size facilities to provide capacity for periods of high demand. The MDD usually occurs during the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest and, commonly, associated with holidays such as Fourth of July or during community events like a County Fair.

- **Peak Hourly Demand (PHD).** The maximum volume of water delivered to the system in a single hour expressed in gallons per day. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, storage reservoirs supply the demand in excess of the maximum day demand. Peak hour demand is commonly experienced during the early morning hours when many water users are bathing, cooking, and engaging in other activities that require widespread water use.

Demands described above, expressed in gallons per day (gpd), can be divided by the population served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per

day (gpcd). Per capita demands can be multiplied by future population projections to determine future water demands.

In addition to water demand parameters, various terms are used and values calculated that are related to water conservation. These water conservation terms are described below.

- **Loss/Lost Water.** Metered source water less revenue producing water and authorized unmetered water uses.

- **Nonaccount Water.** Metered supply water less metered consumption.

- **Unaccounted for Water.** The amount of nonaccount water less known or estimated losses and leaks.

For most communities, the known or estimated losses and leaks within a water system are not known. Rather the amount of system lost or leakage is estimated based on an audit of water usage within the system. To the extent possible, Dyer will utilize the above water conservation terms in this Plan.

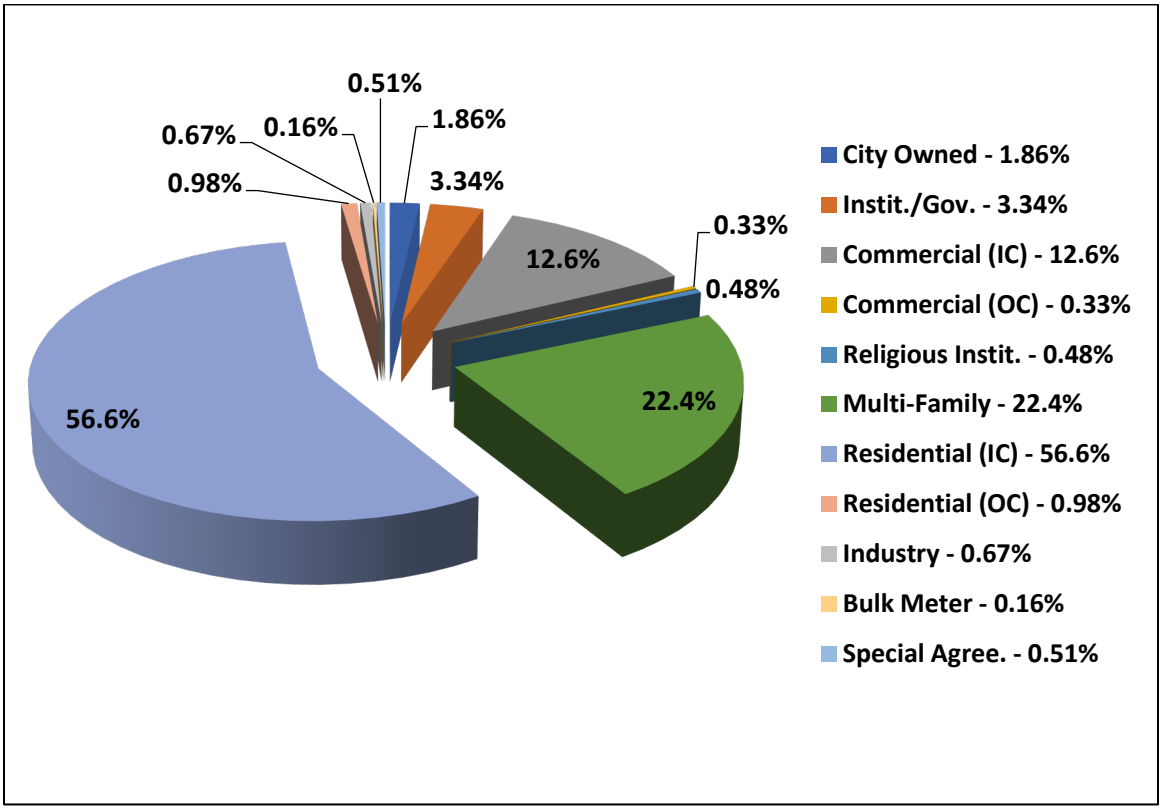
6.2 Current Water Demand

For the purposes of this Plan, current water demand was evaluated from three different perspectives: water consumption, water treated, and water diverted. These different water demands are discussed in detail below.

Water Consumption

Water consumption or sales records allow for determination of actual water consumption by the City's water users, calculation of an Equivalent Dwelling Unit (EDU), and provide measurement of nonaccount water when compared with plant production records. Figure 6.2.1 shows the average percentage of water consumed by category for the City of Molalla in the Year 2019. A detailed description of each category will be provided within this Section.

FIGURE 6.2.1
AVERAGE CONSUMPTION PER USER TYPE

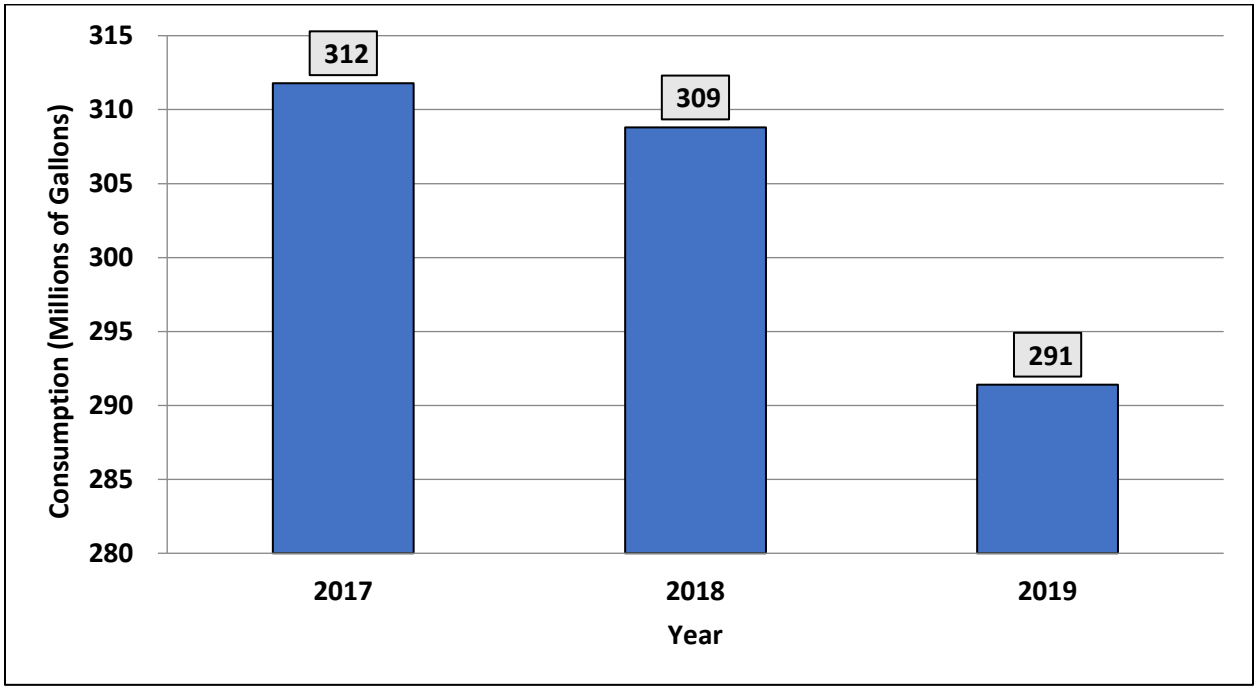


Residential and multi-family sources account for approximately eighty percent of all water consumed within the City. The remaining system users (e.g. commercial, industrial, institutional / government, religious institutions) utilize twenty percent of the metered water. Users within the City account for approximately ninety nine percent of the water consumed; approximately one percent of the water users are outside the City Limits.

Water Sales

For this Plan, water consumption is based on the City's water consumption records for the Years 2017 through 2019. A graph of the total annual amount of water sold to customers, including bulk water sales, is presented in Figure 6.2.2.

FIGURE 6.2.2
TOTAL METERED CONSUMPTION 2017 – 2019



The largest amount of water consumed was in the Year 2017. The amount of water consumed by different users (residential, commercial, etc.) within the distribution system is discussed hereafter.

Equivalent Dwelling Units (EDUs)

The number of Equivalent Dwelling Units (EDUs) or residential housing units within a system is determined to calculate the average cost for water services to a typical residence. The average cost per residential connection is not only used to inform the system users but is also used by regulatory and funding agencies for comparing costs with other communities.

The different sources or sectors within the City are divided into the following categories:

- Residential – Inside City (e.g. single family dwellings inside of the UGB)
- Residential – Outside City (e.g. single family dwellings outside of the UGB)
- Multi-Family (e.g. Arbor Terrace Apartments, Twin Fir Mobile Court, Rose Rentals)
- Commercial – Inside City (e.g. businesses inside of the UGB)
- Commercial – Outside City (e.g. businesses outside of the UGB)
- Institutional/Government (e.g. City of Molalla property, Molalla River School District)
- Industry (e.g. Evergreen Restoration, Molalla Car Wash)

- Religious Institutions (e.g. United Methodist Church, St James Church)
- Special Agreement (e.g. Molalla Buckaroo Association)
- Bulk Meter (e.g. Sawyer's Truck Repair, Kerr Contractors, North Sky Communications)

First, the total water consumption data for users within the City is compiled over a period of time (typically a year). Residential usage is determined by subtracting commercial and industrial contributions from the total water usage. The average monthly water usage per ¾-inch residential connection is calculated by dividing the total monthly usage by the total number of connections. The average monthly residential water usage per ¾-inch connection was determined to be 4,728 gallons.

Then, the average cost per residential ¾-inch connection is determined based off the City's monthly usage fees for the average monthly water usage calculated above. The average monthly cost per ¾-inch residential connection was determined to be $32.97.

Estimated EDUs for the other connection types are then determined by dividing their respective average cost per month by the average cost per residential ¾-inch connection and then multiplying by the number of connections within that respective connection type. For example, if religious ¾-inch connections on average cost $38.82 per month per connection, then the total estimated EDUs for all religious ¾-inch connections would be 12 ($38.82 divided by $32.97 then multiplied by 10 connections).

Equivalent Dwelling Units for Funding Purposes

Many funding agencies do not see the usage per EDU to be unique to the specific planning area, but rather employ the use of a more generalized usage rate per EDU. The usage assumed by many of these agencies is 7,500 gallons per month (90,000 gallons per year) per dwelling unit, except when calculating residential services which bases the EDU calculation off the number of connections.

The estimated number of EDUs is summarized in Table 6.2.1.

TABLE 6.2.1
ESTIMATED EDUS

Connection Type	Number of Accounts	Usage		EDU	EDU (FUNDING)
		Annual, gpy	ADD, gpd		
Residential (Inside City)					
Residential Services - 3/4" Connection	2,870	162,821,859	446,087	2,870	2,870
Residential Services - 1" Connection	12	1,378,480	3,777	23	23
Residential Service - 1-1/2" Connection	4	539,345	1,478	11	11
Residential Service - 3" Connection	2	155,071	425	11	11
Total Residential (Inside City)	2,888	164,894,756	451,766	2,915	2,915
Residential (Outside City)					
Residential Services - 3/4" Connection	9	563,238	1,543	11	6
Residential Services - 1" Connection	1	2,303,626	6,311	25	26
Total Residential (Outside City)	10	2,866,864	7,854	36	32
Multi-Family					

Multi-Family - 3/4" Connection	77	31,420,174	86,083	354	349
Multi-Family - 1" Connection	6	871,698	2,388	13	10
Multi-Family - 1-1/2" Connection	6	4,136,915	11,334	51	46
Multi-Family - 2" Connection	10	5,262,396	14,418	76	58
Multi-Family - 3" Connection	16	23,692,153	64,910	321	263
Total Multi-Family	115	65,383,335	179,132	815	726
Institutional/Government					
Instit./Gov. - 3/4" Connection	6	1,727,402	4,733	20	19
Instit./Gov. - 1-1/2" Connection	2	168,012	460	5	2
Instit./Gov. - 2" Connection	2	101,436	278	6	1
Instit./Gov. - 3" Connection	4	4,179,352	11,450	62	46
Instit./Gov. - 4" Connection	2	3,543,358	9,708	53	39
Total Institutional/Government	16	9,719,559	26,629	146	108
Religious Institutions					
Religious Instit. - 3/4" Connection	10	740,586	2,029	12	8
Religious Instit. - 1" Connection	3	153,994	422	4	2
Religious Instit. - 1-1/2" Connection	3	515,333	1,412	9	6
Total Religious Institutions	16	1,409,913	3,863	25	16
Industry					
Industry - 3/4" Connection	1	123,862	339	2	1
Industry - 1-1/2" Connection	1	1,028,205	2,817	12	11
Industry - 3" Connection	1	788,566	2,160	13	9
Total Industry	3	1,940,634	5,317	27	22
Commercial (Inside City)					
Commercial - 3/4" Connection	145	11,278,604	30,900	177	125
Commercial - 1" Connection	18	3,060,617	8,385	44	34
Commercial - 1-1/2" Connection	20	7,168,784	19,641	101	80
Commercial - 2" Connection	8	15,332,470	42,007	175	170
Total Commercial (Inside City)	191	36,840,476	100,933	497	409
Commercial (Outside City)					
Commercial - 3/4" Connection	2	963,267	2,639	11	11
Total Commercial (Outside City)	2	963,267	2,639	11	11
City Owned					
City Owned - 3/4" Connection	5	625,596	1,714	9	7
City Owned - 2" Connection	1	0	0	0	0
City Owned - 3" Connection	1	4,573,814	12,531	52	51
City Owned - 4" Connection	1	221,498	607	11	2
Total City Owned	8	5,420,908	14,852	72	60
Bulk Meter					
Bulk Meter - 3/4" Connection	2	345,376	946	4	4
Bulk Meter - 3" Connection	2	126,653	347	11	1
Total Bulk Meter	4	472,028	1,293	15	5

Special Agreement					
Special Agree. - 3/4" Connection	2	58,872	161	1	1
Special Agree. - 2" Connection	3	1,435,661	3,933	21	16
Total Special Agreement	5	1,494,533	4,095	22	17
Total	3,258	291,406,275	798,373	4,581	4,321

Water Treated

For planning purposes, demand projections and unit design factors for water consumption should be based on the City's yearly water production data rather than historical customer water consumption records (meter readings). This methodology incorporates all system losses and unmetered usage in the projected water requirements developed later in this Section. The amounts of treated water produced, delivered to the City for consumption, and utilized for backwash are discussed below.

Water Treatment Plant Production

The amount of water produced at the Water Treatment Plant (WTP) and sent to the City for consumption is based on daily records maintained by the City Staff. The amount of treated water produced at the WTP is typically equal to the sum of the amount of water sent to the City for consumption plus the amount of water used for backwash and miscellaneous water usage at the WTP (e.g. for pump seals, sanitary usage). The City does not currently record miscellaneous water usage at the WTP therefore, miscellaneous usage is not known. For this Plan, Water Treatment Plant production will be based on the metered sum of water delivered to the City for consumption and the metered sum of water used for backwash.

Water production rates were derived from the plant data for Average Annual Demand (AAD), Average Daily Demand (ADD), Dry Season Daily Demand (DDD), Maximum Monthly Demand (MMD), Peak Weekly Demand (PWD), and Maximum Daily Demand (MDD). A definition of each of these water demand parameters was previously given in Section 6.1. A summary of the compiled water demand parameters for the Years 2015 to 2019 is presented in Table 6.2.2. The maximum water production for the time periods reviewed was observed in the Year 2019.

TABLE 6.2.2
ANNUAL, MONTHLY, AND WEEKLY RAW WATER DEMAND

Year	AAD (gpy)	ADD (gpd)	DDD (gpd)	MMD (gpd)	PWD (gpd)	MDD (gpd)
2015	383,156,900	1,049,745	1,324,923	1,646,777	1,804,100	2,026,100
2016	388,830,500	1,065,289	1,258,017	1,589,739	1,702,429	1,869,000
2017	396,426,500	1,086,100	1,342,454	1,706,994	1,908,471	2,092,800
2018	412,663,200	1,130,584	1,410,282	1,773,297	1,933,229	1,990,800
2019	450,964,300	1,235,625	1,492,635	1,769,415	2,006,655	2,283,435
Average	406,408,280	1,113,469	1,365,662	1,697,244	1,870,977	2,052,427

- **AAD/ADD.** Over the past four years, the overall annual average water production has ranged from 383 to 451 Million Gallons (MG) per year or approximately 1.05 to 1.24 Million Gallons per Day (MGD). The average water production over this period was 1.11 MGD or approximately 406 MG per year. The highest water production was observed in the Year 2019.

- **DDD.** The DDD value represents the daily water production during the dry season months of June through October, which includes the highest water demand months usually July or August. Although this value is not typically calculated for water systems, it is presented in this Plan to allow a comparison of dry season production with available water to be diverted from the City's raw water source. The DDD over the time period reviewed averaged approximately 1.36 MGD with a maximum flow of 1.49 MGD observed in Year 2019.

- **MMD.** The MMD represents the highest flow produced over a month. For the City of Molalla, the MMD typically occurs in the months of July or August. From the Year 2015 to 2019, the MMD ranged from approximately 1.59 to 1.77 MGD. The average MMD flow for this period was 1.70 MGD.

- **PWD.** The PWD is the peak water production over a week. This flow usually occurs during the month of the highest water production of July or August. The PWD over the last five years has ranged from 1.70 to 2.01 MGD and averaged 1.87 MGD.

- **MDD.** The MDD values given in Table 6.2.2 are the highest daily water production rates for the given time periods. The MDD typically occurs the month and peak week of maximum water production. Over the last five years, the MDD has ranged from approximately 1.87 to 2.28 MGD. The average MDD over this time period was approximately 2.05 MGD.

Peaking factors are commonly used to develop relationships between the ADD and the other planning criteria. These factors are used primarily for calculating future water demand. Peaking factors tend to be consistent from one water system to another. Typically, MMD is approximately 1.5 times the ADD while the PWD is generally between 1.5 and 2.0 times the ADD. Peaking factors between 2 and 2.5 are commonly used for MDD. As the DDD is a unique value for this Plan, there are no typical peaking values for comparison. A summary of the calculated flow peaking factors is presented in Table 6.2.3.

TABLE 6.2.3
SUMMARY OF RAW WATER DEMAND PEAKING FACTORS WITH BACKWASH

Year	DDD/ADD	MMD/ADD	PWD/ADD	MDD/ADD
2015	1.26	1.57	1.72	1.93
2016	1.18	1.49	1.60	1.75
2017	1.24	1.57	1.76	1.93
2018	1.25	1.57	1.71	1.76
2019	1.21	1.43	1.62	1.85

Water Delivered to the City for Consumption

The water delivered to the City for consumption represents the amount of water leaving the WTP and conveyed to the City. This value does not take into account water utilized at the WTP (e.g. backwash and miscellaneous water usage) and is measured through an effluent flow meter at the WTP.

The amount of water delivered to the City was derived from the plant data for Average Annual Demand (AAD), Average Daily Demand (ADD), Maximum Monthly Demand (MMD), Peak Weekly Demand (PWD), and Maximum Daily Demand (MDD). A summary of the compiled water demand parameters for water delivered to the City (Years 2015 to 2019) is presented in Table 6.2.4.

TABLE 6.2.4
ANNUAL, MONTHLY, WEEKLY AND DAILY WATER DELIVERED TO THE CITY

Year	AAD (gpy)	ADD (gpd)	DDD (gpd)	MMD (gpd)	PWD (gpd)	MDD (gpd)
2015	373,245,900	1,022,592	1,291,801	1,604,777	1,758,957	2,009,100
2016	378,001,500	1,035,621	1,228,173	1,553,384	1,662,143	1,834,000
2017	385,773,500	1,056,914	1,307,709	1,663,929	1,868,329	2,092,800
2018	401,891,200	1,101,072	1,374,317	1,727,942	1,877,943	1,955,800
2019	439,781,300	1,205,970	1,443,210	1,700,220	1,779,300	2,046,195
Average	395,738,680	1,084,434	1,329,042	1,650,050	1,789,334	1,987,579

The Peak Hourly Demand (PHD) is often used in the computer modeling process to ensure that the storage and distribution system will continue to function during short, peak demand situations. This value may be calculated by plotting the probability of occurrence of demand versus the various water demand values. From this logarithmic plot, the PHD value can be extrapolated.

The PHD was estimated by means of an extrapolation based on probability. Such a projection is based on the principle that an average monthly flow is likely to occur 6/12 of the time or fifty percent, and a peak monthly flow occurs 1/12 of the time or 8.3 percent. Likewise, peak weekly flow will take place 1/52 of the time or 1.9 percent. Peak daily flow occurs once in 365 days or 0.27 percent, a peak hour flow happens once in 8,760 hours or .011 percent. Using this method and the flow data for the Year 2019 (MDD = 2.04 MGD; PWD = 1.78 MGD; MMD = 1.59 MGD; ADD = 1.20 MGD), the PHD for the City of Molalla was estimated to be 2.65 MGD. The calculated peaking factor (PHD/ADD) is 2.2, which is less than the range of peak factors of 3 to 5 commonly used for PHD. A summary of the calculated flow peaking factors is presented in Table 6.2.5.

TABLE 6.2.5
SUMMARY OF TREATED WATER DELIVERED TO CITY FLOW PEAKING FACTORS

Year	DDD/ADD	MMD/ADD	PWD/ADD	MDD/ADD
2015	1.26	1.57	1.72	1.96
2016	1.19	1.50	1.60	1.77
2017	1.24	1.57	1.77	1.98
2018	1.25	1.57	1.71	1.78
2019	1.20	1.41	1.48	1.70

Nonaccount Water

Water sold is typically less than the amount of water produced at the plant due to system leaks, unmetered use at the WTP (backwash water, turbid meter water, wash down, etc.), unmetered use within the distribution system, inaccuracies in customer meters, and other unmetered use such as fire flows and system flushing. A comparison of the amount of water treated (sum of water delivered to the City and backwash), and the amount of water consumed is given in Table 6.2.6.

TABLE 6.2.6
COMPARISON OF WATER PRODUCED, PLANT USE, DELIVERED, AND CONSUMED

Time Period	Water Produced	Plant Use[(1)]	Water Delivered	Water Consumed	% Nonaccount
2017	454,733,000	68,959,500	385,773,500	311,791,021	19.2
2018	463,236,000	61,344,800	401,891,200	308,799,088	23.2
2019	451,845,000	12,063,700	439,781,300	291,406,275	33.7
Average	456,604,667	47,456,000	409,148,667	303,998,795	25

(1) Backwash, flush, and plant use water.

Over the last three years, the average amount of nonaccount water delivered to the City is approximately 25 percent. Previously, the percent average of nonaccount water within the City has been reported as 36.9 percent in 1996. The source or sources of significant loss are relatively unknown, but are mostly attributed to old water lines that were installed prior to 1950. One such line was discovered to be leaking at 545 W. Main St. and was repaired. Other potential sources of lost treated water include the following:

- Inaccurate water meters.
- Unauthorized use or connections without meters
- Unmetered water for firefighting and operations such as street cleaning, water main flushing and testing.

The Oregon Administrative Rules (OAR) Section 690-86, states that all water systems should work to reduce system leakage levels to fifteen percent or less. If the reduction of system leakage to fifteen percent is found to be feasible, the water provider should work to reduce system leakage to ten percent. With the amount of nonaccount water within its system, the City has not met regulatory standards and requirements. The City should strive to account and maintain the nonaccount water. Reductions in lost water can result in increased revenues, reduced expenses, and improved water system performance.

Water Diverted

As part of the auditing process, the City must account for all water diverted from each source. This is typically accomplished through a metering device at or near the point of diversion. OAR 690-085-0015 requires that, "Where practical, water use shall be measured at each point of diversion." However, the rule also states that:

"…measurements may be taken at a reasonable distance from the point of diversion if the following conditions are met:

- *The measured flow shall be corrected to reflect the flow at the point of diversion. The correction will be based on periodic flow measurements at the point of diversion taken in conjunction with flow measurements at the usual measuring point;*
- *If the measured flow includes flow contributions from more than one point of diversion, the measured flow shall be proportioned to reflect the flow at each point of diversion using the method prescribed subsection (a) of this section;*

- *A description of the correction method shall be submitted with the annual report the first time it is used and any time it is changed, or once every five years, whichever is shorter."*

If the point of diversion is relatively close to the Water Treatment Plant, it is common for many communities to use a single influent meter at the water plant to measure the amount of water that is diverted.

For this Plan, historical data was used from three separate water meters located at the WTP. These meters record water diverted for the raw water intake, backwash water, and water leaving the storage tanks.

Summary

The current raw water demand parameters for water production and water delivered to the City were compiled and are provided in Tables 6.2.7 and 6.2.8. These parameters were based on the water demand data for Year 2019. This water demand criteria will serve as the basis for the planning criteria of this Plan.

TABLE 6.2.7
SUMMARY OF CURRENT RAW WATER DEMAND

Demand Parameter	Total, GPD	Peaking Factor	Per Capita Demand, gpcd[(1)]
Average Daily Demand, ADD	1,235,625	1.00	125
Dry Season Daily Demand, DDD	1,492,635	1.21	151
Maximum Monthly Demand, MMD	1,769,415	1.43	179
Peak Weekly Demand, PWD	2,006,655	1.62	203
Maximum Daily Demand, MDD	2,283,435	1.85	231

(1) Based on population of 9,885 in Year 2019.

TABLE 6.2.8
SUMMARY OF CURRENT DEMAND OF WATER DELIVERED TO THE CITY

Demand Parameter	Total, GPD	Peaking Factor	Per Capita Demand, gpcd[(1)]
Average Daily Demand, ADD	1,205,970	1.00	122
Dry Season Daily Demand, DDD	1,443,210	1.20	146
Maximum Monthly Demand, MMD	1,700,220	1.41	172
Peak Weekly Demand, PWD	1,779,300	1.48	180
Maximum Daily Demand, MDD	2,046,195	1.70	207
Peak Hourly Demand, PHD	2,649,180	2.20	268

(1) Based on population of 9,885 in Year 2019.

6.3 Projected Water Demand

Water demands are projected into the future using the past records of water produced and water sold along with projected population estimates and anticipated additional water demand (e.g. industry). The goal of projecting future water demand is not to build larger facilities to accommodate excessive water consumption, but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be

projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

There is a degree of uncertainty associated with future water demand projections for any community. Uncertainties in projections exist because of the estimates used to define the community's current water use and the built-in assumptions made with respect to anticipated growth in a community. The impact of water conservation measures on a community's future water consumption also is difficult to predict.

Future per Capita Water Usage and Growth

Based on raw water diversion records, the average per capita use in the City of Molalla is 125 gpcd. The average includes all domestic, commercial, and City use divided by population. For this Plan, future water demand for water delivered to the City will be based on the current water delivered parameters (per capita usage), projected growth within the City (see Section 3.3), and anticipated unaccounted water. The methodology assumes that water demand characteristics within the City will basically remain the same as the existing per capita basis with consideration for changes in anticipated nonaccount water. Future anticipated nonaccount water is discussed below.

Anticipated Lost Water

Responsible water planning should not include the propagation of high lost water levels into water demand projections. A water system should endeavor to reduce system leakage to fifteen percent or less of the total water diverted from their raw water sources. As developed previously in this Section, the nonaccount water within the City is above fifteen percent. The City is not in compliance with OAR Division 86 therefore, the City is required to reduce their level of nonaccount water. For the demand projections, the level of nonaccount water is reduced by two percent within the first year followed by a reduction of five percent every five years until compliance is met in Year 2040. Due to the high level of lost water, impacts on the demand projections are expected.

Summary of Future Water Demand

The ADD projections were calculated by multiplying the projected population by the per capita usage of 125 gpcd for raw demand and 122 gpcd for the City's demand. Water distribution improvement projects will decrease the raw and City demand over time, as well as improve the nonaccount water losses lowering gpcd for both categories of 101 gpcd for raw demand and 99 gpcd for the City's projected demand in the Year 2040. The DDD, MMD, MWD, and PWD were then determined by multiplying the ADD by their respective peaking factors and adjusted to account for improvements to the City's nonaccount water over time. A summary of the water production and water delivered demand projections is presented in Table 6.3.1 and 6.3.2, respectively.

TABLE 6.3.1
FUTURE WATER PRODUCTION DEMAND

Future Raw Water Demand						
Parameter/Year	**2019**	**2020**	**2025**	**2030**	**2035**	**2040**
Total Population	9,885	10,652	11,948	13,314	14,705	16,118
% Nonaccount Water	34%	32%	27%	22%	17%	15%
Water Demand						
ADD, gpd	1,235,625	1,304,870	1,388,955	1,464,540	1,525,644	1,631,948
DDD, gpd	1,492,635	1,576,283	1,677,858	1,769,164	1,842,978	1,971,393
MMD, gpd	1,769,415	1,868,574	1,988,984	2,097,221	2,184,722	2,336,949
PWD, gpd	2,006,655	2,119,109	2,255,663	2,378,413	2,477,645	2,650,283
MDD, gpd	2,283,435	2,411,400	2,566,789	2,706,470	2,819,390	3,015,839

TABLE 6.3.2
FUTURE WATER DELIVERED TO CITY DEMAND

Future City Demand						
Parameter/Year	**2019**	**2020**	**2025**	**2030**	**2035**	**2040**
Total Population	9,885	10,652	11,948	13,314	14,705	16,118
% Nonaccount Water	34%	32%	27%	22%	17%	15%
Water Demand						
ADD, gpd	1,205,970	1,273,553	1,355,620	1,429,391	1,489,028	1,592,781
DDD, gpd	1,443,210	1,524,088	1,622,299	1,710,583	1,781,952	1,906,115
MMD, gpd	1,700,220	1,795,501	1,911,202	2,015,207	2,099,286	2,245,560
PWD, gpd	1,779,300	1,879,013	2,000,095	2,108,938	2,196,927	2,350,004
MDD, gpd	2,046,195	2,160,865	2,300,109	2,425,278	2,526,466	2,702,505
PHD, gpd	2,649,180	2,797,641	2,977,920	3,139,974	3,270,980	3,498,895

SECTION 7:

PLANNING AND DESIGN CRITERIA

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7.1 Basis for Cost Estimates

The cost estimates presented in this Plan will typically include four components: construction cost, engineering cost, contingency, and legal and administrative costs. Each of the cost components are discussed in this Section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Plan. As projects proceed and as site-specific information becomes available, the estimates may require updating.

Construction Costs

The estimated construction costs in this Plan are based on actual construction bidding results from similar work, published cost guides, other construction cost experience, and material prices. Reference was made to the as-built drawings and system maps of the existing facilities to determine construction quantities, elevations of the reservoirs and major components, and locations of distribution lines. Where required, estimates will be based on preliminary layouts of the proposed improvements.

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 is most commonly used. This index is based on the value of 100 for the Year 1913. Average yearly values for the past nine years are summarized in Table 7.1.1.

TABLE 7.1.1
ENR CONSTRUCTION COST INDEX – 2010 TO 2019 (1)

Year	Index	Annual Increase	Increase to Present
2019	11268	1.47%	1.47%
2018	11069	1.77%	3.21%
2017	10703	3.31%	6.41%
2016	10337	3.42%	9.61%
2015	10039	2.88%	12.22%
2014	9800	2.38%	14.31%
2013	9542	2.63%	16.56%
2012	9291	2.63%	18.76%
2011	9053	2.56%	20.84%
2010	8805	2.74%	23.01%

(1) Index based on June of each year at 20-community average labor rates and material prices.

Cost estimates presented in this Plan for construction performed are projected in accordance with the percentages listed above. Future yearly ENR indices can be used to calculate the cost of projects for their construction year based on the annual growth in the ENR Index.

It is recommended that in the event other public works projects are being performed in the same location, (e.g. sewer, street, storm), planning priority be given to combining these water projects with the projects at hand. By proceeding in this manner, the City will save money by eliminating repetitive mobilization, demolition, and road patching for the same locations.

Contingencies

A planning level contingency equal to approximately twenty five percent of the estimated construction cost has been added. 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.

Engineering

The cost of engineering services for major projects typically includes special investigations, a predesign report, surveying, foundation exploration, preparation of contract drawings and specifications, bidding services, and construction staking. Depending on the size and type of project, engineering costs may range from ten to fifteen percent 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, complicated projects. For the purpose of estimating, a total engineering cost percentage of fifteen percent was used in the cost estimates. Additional engineering services may be required for specialized projects. This could include geotechnical evaluations, environmental reports, structural evaluations, and other specialized consulting activities.

Construction Management

An allowance of ten percent of construction costs has been added for construction management services. This allowance is intended to include inspection, start-up services and preparation of Operation and Maintenance (O&M) manuals and other related expenses in the construction phases of the projects.

Legal and Administrative

An allowance of three percent of construction costs has been added for legal and administrative services. This allowance is intended to include internal project planning and budgeting, grant administration, liaison, interest on interim loan financing, legal services, review fees, legal advertising, and other related expenses associated with the project.

Land Acquisition

Some projects may require the acquisition of additional right-of-way or property 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. Efforts were made to include costs for land acquisition, where expected, within the cost estimates included in this Plan.

Environmental Review

In order for a project to be eligible for federal and/or state grants and loans, a review of anticipated environmental impacts of the proposed improvements is required. The primary goal of the environmental review is to help public officials make decisions that are based on the understanding and consideration of

the environmental consequences of their actions; and to take actions that protect, restore, and enhance the environment. To accomplish these tasks, the National Environmental Policy Act (NEPA) was promulgated. The NEPA requires federal agencies or monies originating from federal programs to either prepare or have prepared written assessments or statements that describe the:

- Effected environment and environmental consequences of a proposed project.
- Reasonable or practicable alternatives to the proposed project.
- Any mitigation measures necessary to avoid or minimize adverse environmental effects.

The environmental review will include one of the following four levels in the order of increasing complexity.

- Determination of categorical exclusion without an environmental impact or assessment report.
- Determination of categorical exclusion with an environmental impact or assessment report.
- Preparation of an environmental impact or assessment report.
- Preparation of an environmental impact statement.

Within this Plan, the cost for performing the anticipated environmental review was estimated for the projects to be financed with publicly financed grants and loans. The cost for the environmental review will be based on previous experience in preparing the required documents. If funding is obtained from a public funding agency, then the City will likely be required to submit some form of environmental report that examines the potential impact of the proposed improvements on local habitat and species. Review and approval by the affected agencies could take up to twelve months or more.

Permitting

Permitting is important because many activities associated with constructing and maintaining the water system requires permits to comply with state and federal requirements for work within wetland areas or waterways. Typically, Oregon Division of State Lands (DSL) and US Corps of Engineers (USACE) are required in these instances. Compliance with storm water, erosion control, flood plain, and other various environmental requirements are often involved with the construction of transmission lines, raw water intakes, discharge facilities, raw and finished water reservoirs, and other items. Permits with various road system agencies may be necessary to install water lines within a road right-of-way. For the cost estimates prepared in this Plan, it was assumed that the General Contractor would bear the cost of all permitting. Therefore, no permitting costs are included in these estimations.

7.2 Sources of Supply

Raw water sources such as rivers and reservoirs must be capable of meeting Maximum Daily Demand (MDD) of the system over a period of many years. The selection of a source is a long term commitment that cannot be easily changed. Water rights are becoming more critical as Oregon's population and water demand increases while the number of viable water sources remains constant. Typically, water sources and reservoirs are evaluated to ensure there is enough water to meet the MDD for twenty years into the future. In the City of Molalla's case, the water sources need to be sufficient to handle the water demand during the dry season months of June through October. The appropriate design parameter for this dry

season evaluation would be the MDD. The City holds surface water right certificates and permits on the Molalla River and Trout Creek totaling 7.0 cubic feet per second (cfs), or approximately 4.5 Million Gallons per Day (MGD). The projected MDD for the planning year of 2040 was calculated to be 3.72 MGD.

Raw Water Source

Molalla River

The City of Molalla has historically relied on the Molalla River to provide consumers with safe drinking water year-round. The Molalla River is the largest free flowing tributary of the Willamette River; unblocked by dams and fifty one miles in length. The headwaters of the Molalla River are located near the Table Rock Wilderness Area in Clackamas County, and generally flow north-northwest from the Cascades.

Recently, the Molalla River experienced low of flows that amounted to ten percent of the sixty four year median average. This occurrence took place in late November of the Year 2019, well outside the typical dry season. On the opposite end of the spectrum, Molalla Rivers levels were so high during the floods of 1996 the City's raw water intake was severely damaged. The damages included most of the intake structure components. Historical drought and flooding events should be taken into account when evaluating adequacy of water supply sources; and it is clear that these events can happen at any time. In order to meet the projected MDD during such events, the City should identify and move toward a secondary source of water to act as a backup.

Groundwater

The City of Molalla currently relies on only surface water diversifying intake source. An additional type or source would be beneficial to the City; in the event one source becomes unavailable or runs dry.

In recent years, the City explored the option of constructing a well in the northwest portion of the Molalla area, just off of Toliver Rd. The well was to serve as a secondary water source for the City. The well was determined to be unsuccessful source because during drilling unsuitable water was discovered. The contractor mistakenly poured sodium bentonite down the shaft, and eliminated the possibility of usable water from becoming available at alternate depths; this well now only serves as a monitoring well. A different property was purchased north of the City that was intended to be used as a secondary raw water source with construction of a well. The property was sold for reasons unbeknownst to the City.

An extensive groundwater availability study was included within the scope of the 1996 Water Master Plan. The study assessed an area located at Township 5 South, Range 2 East, in which the City is centrally located. Existing ground water rights were examined and generated the following results:

- "Groundwater is generally available in quantities ranging from 45 gpm to approximately 900 gpm."

- "The aquifer south of the City has been identified by the OWRD as a Groundwater Limited Area, and water rights are no longer available. Regardless, based on water rights research for this area, groundwater yields are typically small, ranging from 0.1 to 0.38 cfs per well, which is not enough to supply the City's needs without a large well field."

- "The aquifer north and west of the City would produce the highest yields. Based on the water rights survey, and discussions with a local well driller, yields range from 300 gpm to almost 900 gpm per well."

The aforementioned aquifer located northwest of the City was explored further through analysis of well logs on file with Oregon Water Resources Department (WRD), and consulting of a well driller who offered expertise with local groundwater yield and quality. Approximately fifty five more well logs have been recorded in Township 5 South, Range 2 East, and Sections 4 through 8 which represent the land northwest of the developing City. The average drill depth to first contact of groundwater is 80 ft by comparing relatively current well logs to information dating back to 1955. Maximum groundwater yields measured a range from 8 to 810 gallons per minute (gpm), with an average of 56 gpm and median of 30 gpm. An extensive hydrogeological investigation is needed before the City can conclude that there are viable groundwater sources that can act as a secondary water source and help meet the City's growing demand.

Imported Water

Although it is desirable to rely on nearby water sources to supply customers, potable water can be transported to the City from outside sources in large tankard trucks for short periods of time. Imported water would likely be trucked in and distributed directly into one of the City's storage reservoirs. Drinking water should be contained by tanks previously used exclusively for hauling water or food grade materials, and should not be hauled in tanks previously containing fuels or other harmful materials to avoid contamination. Oregon Health Authority (OHA) recommends maintaining a free chlorine residual concentration of 1parts per million (ppm) (milligrams per liter (mg/L)) to act as a disinfecting agent during transportation. This option is generally reserved for emergency situations and is likely the most expensive water procurement alternative for a City the size of Molalla. This alternative will be considered unfeasible based upon costs and will not be explored further within this Plan outside of emergency use.

7.3 Sizing and Capacity

Demand projections presented in Section 6.3 are based on population projections offered in Section 3. The projections assume an average annual growth rate of 2.62 percent until the Year 2040.

Accurately predicting growth is difficult, especially beyond twenty years into the future. As time progresses, all of the projections should be updated to reflect actual population and demand. The analysis and presentation of recommended improvement alternatives can be found in Section 8.

Intake and Pumping Facilities

Intake piping and wet wells are not easily expanded and should be sized to meet the anticipated maximum day demand well into the future. A design life of fifty years is common for such facilities.

Pumps and other mechanical equipment can be expected to last no more than twenty years under normal conditions before extensive maintenance or replacement is necessary. Commonly, two pumps are installed in a pumping station, each having capacity equal to the capacity of a Water Treatment Plant (WTP)or the MDD predicted within a planning period. Duplex pumping systems can be designed to alternate after each cycle to extend the life of the equipment. If future demands increase beyond the ability of a single pump, the second pump can serve as a lag pump in parallel to sustain higher flow rates during peak demand times.

Transmission Piping

The long distances and high replacement cost of the transmission lines warrant an analysis for demand beyond the normal 20-year period. The existing transmission lines must have the ability to handle at least the 20-year MDD. The capacity of the raw water and treated water transmission piping will be evaluated against the 20-year MDD.

Water Treatment Facility

Water Treatment Plants are typically designed to handle the 20-year MDD flow since these facilities can be expanded and typically have an overall design life of around twenty years. The existing treatment plant components will be evaluated against the 20-year MDD flow.

The existing treatment plant utilizes two identical Trident Packaged Water Treatment Plants along with up-flow clarifiers, mixed-media filtration, and a chemical feed system. Table 7.3.1 displays the major WTP components along with their installation date, useful life, and estimated date of replacement.

TABLE 7.3.1
MAJOR WTP COMPONENT REMAINING LIFESPANS

Component	Installation Date	Useful Life	Replacement Date
Packaged Treatment Tank No. 1	1998	25	2023
Packaged Treatment Tank No. 2	2020	25	2045
Chemical Feed System	2020	15	2035
Polyethylene Tanks	2020	10	2030
1.2 MG Reservoir/Clearwell	1976	50	2026
2.0 MG Reservoir/Clearwell	1998	50	2048
Finished Water Pump No. 1	1998	20	2018
Finished Water Pump No. 2	2020	20	2040

In early the Year 2020, the second packaged treatment unit was installed adjacent to the existing treatment unit already in use. Older treatment units and a flocculation tank that were used prior to the installation of the second packaged treatment plant were removed as part of the Year 2020 upgrade. This demolition of unused treatment units freed up a considerable amount of space within the housing structure built in 1977. Additional treatment units can now be added without the need for additional building expansion; should the City need to further increase its raw water treatment capacity.

The treated water metering is accomplished through a flowmeter located in the re-chlorination building east of the 2.0 Million Gallons (MG) reservoir.

7.4 Storage and Distribution

Treated Water Storage

Distribution storage tanks should have a design life of fifty to sixty years for steel construction to seventy to eighty years for concrete and welded steel construction. Steel tanks with a glass-fused coating can have a design life similar to concrete construction. Actual design 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.

Total storage capacity must include reserve storage for emergency and fire reserve. An alternative method to analyzing the treated water storage requirements suggests itemizing the potential requirements for treated water within the system. A discussion of these various needs follows.

Emergency Storage

To protect against a total loss of water supply that could occur with a broken transmission main, a prolonged electrical outage, treatment plant breakdown, or source contamination, emergency storage is required. The emergency storage reserve is set at one MDD. With one MDD storage criteria, it is assumed that supply disruption will occur on a day of maximum demand and be corrected within twenty four hours. The City currently operates with two reservoirs totaling 3.2 million gallons in storage capacity. The projected MDD for the Year 2040 is 2.77 MGD.

The existing reservoirs have overflow elevations of 566.4 feet. The new storage reservoir would need to match the overflow elevation in order to supply water with similar static head pressure within the distribution system. Additionally, the reservoir itself does not necessarily need to be directly tied to the WTP; it can store potable water to be specifically used for emergency supply.

Fire Reserve Storage

To provide sufficient water for fire suppression in the water system fire reserve storage is utilized. The amount of fire reserve is based on the maximum flow and duration of flow needed to confine a major fire. Guidelines for determining the required fire flow and duration are generally determined using the Fire Suppression Rating Schedule by the Insurance Services Office (ISO) and/or the International Fire Code adopted by the State of Oregon. The needed fire flow and associated fire reserve storage dictated by these two methods can vary considerably.

The ISO needed fire flow is calculated using factors related to type of construction, type of occupancy, exposure to connected buildings, and building affective area. A single wood framed dwelling totaling 2,400 square feet would require approximately 1,000 gpm for two hours, using their formula.

The 2014 Oregon Fire Code recommends fire flows of 1,000 gpm for a minimum of one hour for one or two family dwellings not exceeding two stories in height or 3,600 square feet. Generally for rural residential dwellings, 500 gpm is utilized as a basis for fire flow suppression. Most residences within the City of Molalla are less than 3,600 square feet.

Commercial, industrial, and institutional buildings typically require higher fire flows with longer durations. Determination of these flows are unique to each building under consideration and will depend upon such factors as the square footage of the floor area and the type of construction based on the International Building Codes (IBC) classifications.

All of the above criteria will be used to evaluate the adequacy of existing storage and the need for future additional storage in Section 8.4.

Distribution

Hydraulic modeling of the distribution system was performed to evaluate system pressures, recommended improvements, problem areas, available fire flow, and flow capacities. Figure 7.4.1 displays the available fire flows throughout the distribution system using Water CAD modeling software. The adequacy of existing system pressures will be evaluated further in Section 8.5 after system improvement implementations.

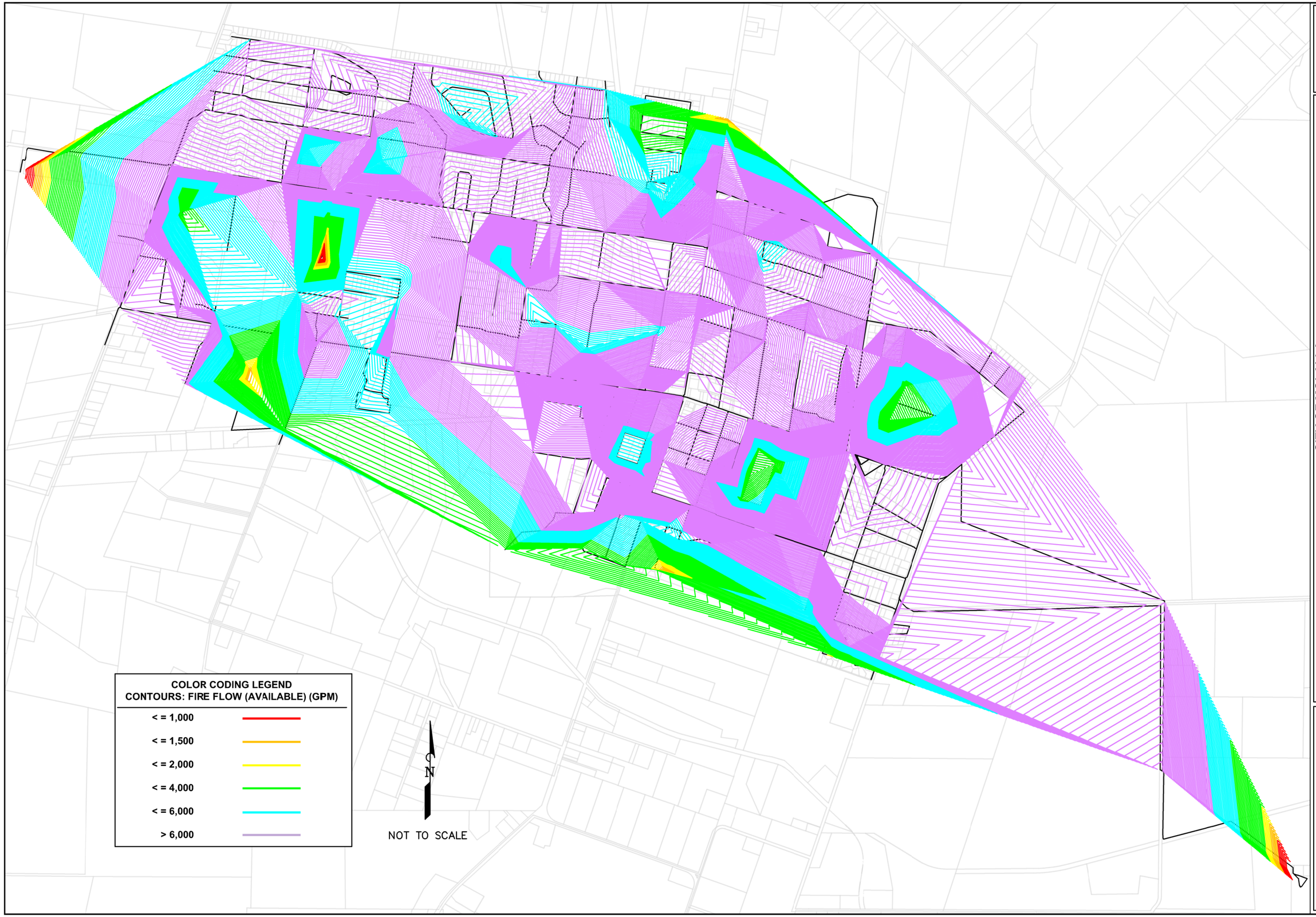


FIGURE NO. 7.4.1

CITY OF MOLALLA
WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN

AVAILABLE FIRE FLOWS

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MAY, 2021

PROJECT NO.: 198.16

7.5 Seismic Analysis

The Oregon Administrative Rules (OAR) 333-061-0060-5-J states a seismic risk assessment and mitigation plan for water systems fully or partially located in areas identified as VII to X using the Map of Earthquake and Tsunami Damage Potential for a Simulated Magnitude 9 Cascadia Earthquake. The City lies in a level VI area and therefore is not required to develop this documentation. Although currently this is not required, seismic risk and mitigation should be kept in mind when planning critical facilities in the event the reach of this requirement expands in the future.

The primary seismic threat in this region is the Cascadia Subduction Zone. This is a 680-mile long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American Continent at a rate of four centimeters per year. Over the last 5,400 years numerous large earthquakes have occurred within this zone the average interval is 500 years. The last recorded event was 1700 AD. If the next large scale earthquake occurs within the average interval, another large scale event is expected by 2200 AD.

Critical facilities are structures of great importance therefore, if compromised and/or physically damaged, can have drastic negative impacts on cities and other facilities. Typical critical facilities include but are not limited to the City's treatment and distribution facilities, fire stations, police stations, schools, and hospitals. It is best practice to avoid construction of critical facilities within a floodplain, but can be accommodated by providing a raised foundation that supports the facility above the Federal Emergency Management Agency (FEMA) flood levels. Special and more stringent building codes and regulations are applied to structures designated as critical facilities to minimize the risk of failure during flooding, storm, and earthquake events.

The Seismic risk assessment must:

- Identify critical facilities capable of supplying key community needs including; fire suppression, health and emergency response, and community drinking water supply points.
- Identify and evaluate the likelihood and consequences of seismic failures for each critical facility.

The mitigation plan may:

- Encompass a 50-year planning horizon.
- Include recommendations to minimize water loss from each critical facility, capital improvements, or recommendations for further study or analysis.

Currently, the City has limited information on the ability of their system to withstand a large seismic event. More evaluations need to be completed before the City can develop a refined plan to mitigate all the known threats within their system that will determine: all structural failure points, the potential for these failures to occur, and the structural improvements that would minimize any impacts due to a large-scale seismic event. It is recommended that the City develop a schedule for the evaluations of their critical facilities. The critical facilities to be evaluated should include the water storage reservoir that is not scheduled for replacement.

SECTION 8:

ANALYSIS AND IMPROVEMENT ALTERNATIVES

SECTION 8: ANALYSIS AND IMPROVEMENT ALTERNATIVES

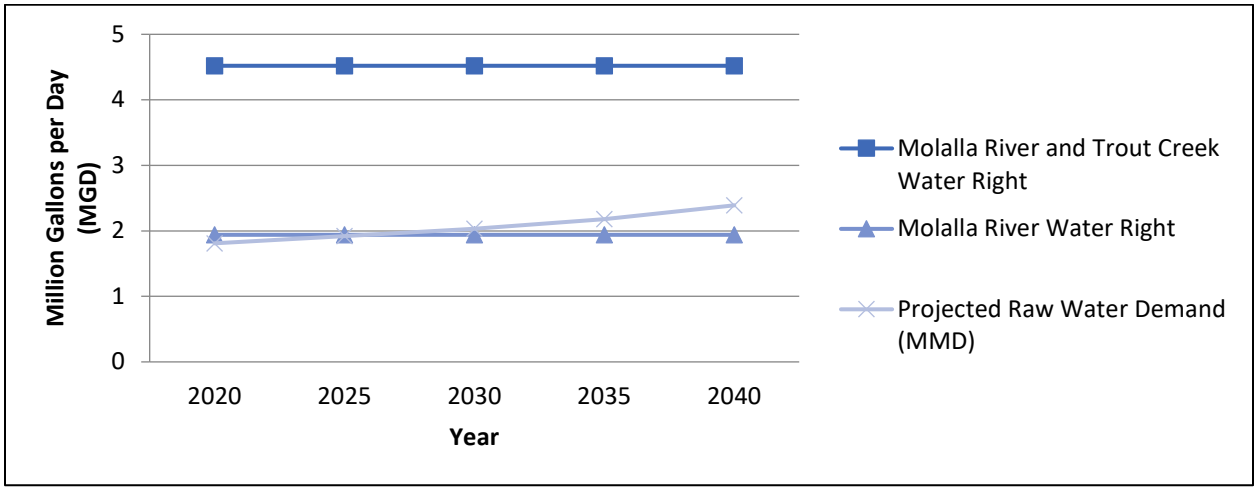
This Section of the Water Management, Conservation and Water System Master Plan presents detailed analyses of each component within the system and, where appropriate, provides an evaluation of proposed alternatives and recommended option(s). Preliminary cost estimates and suggested phasing for the recommended improvements are given in the Capital Improvement Plan (CIP), Section 9. Potential improvement impacts to ratepayers are discussed in Section 10.

8.1 Raw Water Sources and Water Rights

As presented in Section 5.1, the City of Molalla has water rights for 3.0 cubic feet per second (cfs) on the Molalla River. The City is in the process of transferring a 4.0 cfs water right from Trout Creek to the Molalla River intake.

The need to develop additional raw water resources will depend on whether the current City sources are sufficient to handle the anticipated water demand. Based on the present and projected water demands discussed in Sections 6.2 and 6.3, the City has not had any difficulty in meeting its raw water supply requirements. A plot of projected raw water demand, allocated water rights, and expected future water rights versus time is presented in Figure 8.1.1.

FIGURE 8.1.1
RAW WATER MAXIMUM MONTHLY DEMAND (MMD) AND CITY WATER RIGHTS



Based on the projected Maximum Monthly Demand (MMD), the City's existing water rights on the Molalla River and the additional Trout Creek water right should be sufficient to meet the City's demand through the end of the planning period of this Plan, Year 2040.

The City will fully exercise their Molalla River Water Right in 2030, when projected demand exceeds 2.0 MGD. Based on current population growth, the City will reach a projected demand that exceeds a combination of both water rights in 2073. However, the use of the Trout Creek water right is based on available flow in Trout Creek, so there may be years where demand matches the available water from both the Molalla River water right and Trout Creek water right.

Additional Raw Water Resources

Due to the limited historical flow data for Trout Creek and possibility of low flows limiting the City's rate of withdraw, it is recommended that the City begin examining and pursuing additional water rights or the development of a redundant water source.

Based on the geographical location of the City of Molalla, an interconnection with another municipal water supply system is not feasible.

Molalla River Watershed Water Rights

The City is pursuing additional Molalla River watershed water rights as the most economical option in accommodating the need for additional raw water demand. This is based upon the City having existing infrastructure already in place capable of conveying and treating additional flows from the river.

Wells

The City has explored the option of adding a groundwater well as a backup water source in the past but, at this time, is not actively searching for a possible groundwater source. As discussed in Section 7.1, an extensive hydrogeological investigation is needed before the City can conclude that there are viable groundwater sources available to the City as a secondary water source.

Water Conservation

The future water demand projections, shown in Tables 6.3.1 and 6.3.2, account for a reduction of nonaccount water by about one percent every year over the study period, and for fifteen percent nonaccount water in Year 2040. The Year 2040 projected raw water MMD is 2.34 MGD. Should the City reduce nonaccount water to ten percent in the next couple of years, the projected MMD for Year 2040 drops to approximately 2.20 MGD. These projections show the need for the City to utilize both of their existing water rights; but conservation measures will reduce the need to have a third water right in place by the end of the planning period.

Through the implementation of water conservation measures discussed in Section 11, specifically the replacement of water lines identified by a leak detection program and rate study that will be the first step in implementing a tiered water rate structure, the City can reduce the immediate need and cost to pursue additional water rights. In the long term, however, additional water rights may be needed if population and water demand exceed the projections discussed in Section 6 or if the permitted water from Trout Creek is reduced or becomes unviable due to low creek flow.

8.2 Raw Water Improvements

Molalla River Intake

One of the primary problems with the Molalla River raw water intake is the organic debris buildup on the existing intake screens. The second issue is large accumulations of river rock deposits around the screens during high flows. Both instances require manual cleaning of the screens and hand removal of large quantities of river rock that can cover the screens entirely.

Recommendations

Construction of New Intake

Reduction in the manual cleaning of the screens can be accomplished by relocating the Molalla River intake and installing a more effective screen and screen cleaning system. It is recommended to install an intake screen with air burst or water wash system which have shown to be extremely effective in removing organic debris.

Large river rock accumulations occur around the intake at times covering the intake entirely. This limits the amount of water flowing by the intake and requires the rock to be manually moved aside every year. Currently, the intake screens are located on an actively forming gravel bar approximately eighty-five feet downstream of the old intake structure which is surrounded by a deep pool. It is recommended to relocate the Molalla River intake approximately ten feet downriver of this structure and approximately seventy-five feet upstream of the existing intake location.

New piping will be required, due to the relocation of the intake, to convey the raw water by gravity from the intake to the grit chamber. This new pipe will extend from the grit chamber to the new intake location which will allow the intake screens to be set to as low of an elevation as possible.

As part of the new intake system, the existing underdrain system will be replaced in order to maintain a back-up supply of water during low flow or high turbidity in the river.

Influent Pump Station

Due to the premature failures of Pump #1 in the Influent Pump Station (IPS), it is recommended to further examine the following: slope of the bottom of the wet well; grit pump cycle frequency and duration; and pump intake elevations. Replacement of the 75 Horsepower (HP) is also recommended based on discussions with City Staff due to it being undersized for the new Trident water treatment unit installed in the Year 2020.

8.3 Water Treatment Facility

The City of Molalla's Water Treatment Plant (WTP) supplies all of the treated water to the City. The plant is functioning as planned after recent upgrades as described in Section 5 and has the production capacity to meet future water demands as shown in Table 8.3.1.

TABLE 8.3.1
SYSTEM ASSESSMENT – WATER TREATMENT PLANT CAPACITY

Parameter/Year	2019	2020	2025	2030	2035	2040
Water Demand (MGD)						
MDD (Delivered to City)	2.05	2.16	2.30	2.43	2.53	2.70
Water Treatment Plant Capacity (MGD)						
WTP Production Capacity	4.00	4.00	4.00	4.00	4.00	4.00
Surplus Production Capacity Available	1.95	1.91	1.70	1.57	1.47	1.3

In order to ensure that the treatment plant continues to operate and deliver high quality water to the City's customers, improvements must be made to the plant to reach the planning period goal of the Year 2040.

The current Operations and Maintenance (O&M) issues at the WTP were outlined in Section 5.3. The following improvements were developed to address these highlighted deficiencies.

Recommendations

Chemical Storage Tanks

The polymer and soda ash storage tanks need replacement in the next one to two years. These chemical storage tanks were not included in the scope of work under the 2020 Water Treatment Facility Improvement project. Cost estimates can be found in Section 9.

8.4 Treated Water Storage

The City currently has a total treated water storage capacity of 3.2 Million Gallons (MG) provided by two storage tanks. Regular inspection and maintenance of each tank is recommended to extend the infrastructure to its intended useful life.

Tank Inspection

Like water quality monitoring, tank inspections provide information used to identify and evaluate current and potential water quality problems. Both interior and exterior inspections are employed to assure the tank's physical integrity, security, and high water quality. Inspection type and frequency are driven by many factors specific to each storage facility including: the type, vandalism potential, age, condition, cleaning program or maintenance history, water quality history, funding, staffing, and other utility criteria.

The Environmental Protection Agency (EPA) recommends periodic inspections of treated water reservoir tanks to be conducted every one to four months. The purpose of these inspections is to review areas of the facility not normally accessed routinely. This often requires climbing tank ladders to visually inspect.

Comprehensive inspections are recommended by the EPA to occur once every three to five years. The City is scheduled to perform this task every five years. A comprehensive inspection typically requires draining of the tank or inspection via scuba diving. The interior of each tank is inspected and deficiencies repaired as required.

Design Storage Capacity

As discussed in Section 7.3, total storage capacity must include reserve storage for emergency and fire reserve to meet requirements of a given water system. Emergency storage was set at one Maximum Daily Demand (MDD) of treated water delivered to the City. The fire storage must match the largest fire flow demand within the given service area. Based on comments from the Molalla Fire Department's Fire Marshal, the fire flow demand for the overall system storage analysis was set at 4,000 gallons per minute (gpm) with duration of four hours. The treated water storage analysis involved an evaluation of the entire system as shown in Table 8.4.1.

TABLE 8.4.1
SYSTEM ASSESSMENT - DESIGN TREATED WATER STORAGE

Parameter/Year	2019	2020	2025	2030	2035	2040
Water Demand (MGD)						
MDD (Delivered to City)	2.05	2.16	2.30	2.43	2.53	2.70
Necessary Storage (MG)						
Emergency Storage (1 x MDD)	2.05	2.16	2.30	2.43	2.53	2.70
Fire Reserve (4,000 gpm @ 4 hours)	0.96	0.96	0.96	0.96	0.96	0.96
Total Required Storage	3.01	3.12	3.26	3.39	3.49	3.66
Storage Assessment (MG)						
Existing Storage	3.2	3.2	3.2	3.2	3.2	3.2
Insufficient (-)/Surplus Storage	0.19	0.08	-0.06	-0.19	-0.29	-0.46

A number of issues should be considered when sizing new treated water reserve components. The above analyses can be used to develop the requirements for the treated water reserve system both now and at the end of the planning period based on current and projected system demands.

New Treated Water Tanks

The City of Molalla's storage system currently has a surplus storage of 190,000 gallons based on the above recommended storage capacity. By the end of the planning period, 530,000 gallons of storage is needed to obtain the recommended treated water storage capacity within the City. Design criteria addressing tank construction and location are discussed below.

Tank Construction

Tanks for storage of treated water are usually constructed with one of the following materials: wood, concrete, or steel. Each type of tank material has advantages and disadvantages.

Wood tanks have historically been associated with smaller water systems such as campgrounds, parks, and small communities. These tanks are usually constructed of redwood are less expensive than concrete or steel and are typically found in sizes of 100,000 gallons or less. Wood tanks usually have a concrete base, circular steel hoops for perimeter support, and use the natural swelling of wet wood to provide a near watertight seal. Leakage and the tendency of wood reservoirs to encourage the growth of bacteria, especially *Klebsiella*, are some of the disadvantages of this type of tank. The Oregon Health Authority (OHA) rules require that redwood tanks be provided with a separate inlet and outlet and are continuously chlorinated.

There are a number of different designs and methods of constructing a concrete tank. Some tanks use reinforced concrete while others use a prestressed, post-tensioned design. Tanks can also be constructed with poured-in-place concrete or utilize precast concrete. The advantages of concrete tanks include the ability to withstand seismic forces, fully or partially backfill against the tank, and require less maintenance. The disadvantages of concrete tanks include costs and the greater load this type of tank applies to the underlying soil.

Steel tanks are constructed with structural steel that is either welded or bolted together. Typically, the steel is manufactured offsite then delivered and assembled onsite. To protect against corrosion, a coating is applied to both the exterior and interior of the tank. Interiors of steel tanks are typically coated with an

epoxy or enamel type finish that have a typical life expectancy of approximately twenty years with proper care and maintenance. One type of tank that has been popular in recent years is glass-fused-to-steel bolted tanks. Glass-fused-to-steel has a 10 to14 mil glass coating is applied to the interior of the steel tank to provide a protective coating. Life expectancy of this type of tank has been estimated to be over fifty years. The main advantage of steel tanks is they typically have lower construction and installation costs than concrete. The primary disadvantage of steel tanks is the associated maintenance. Cathodic protection and periodic refurbishing of the steel tank surfaces are required. While the glass-fused-to-steel bolted tanks do not need periodic refurbishing of the tank walls, these types of tanks generally cost more than epoxy coated bolted tanks. For smaller size tanks, less than 60,000 gallons, stainless steel may be a viable option.

Tank Location

Site selection for treated water tanks is based on a number of factors, the most important of which are as follows.

Elevation
There generally is an optimum preferred elevation for a reservoir. Ideally, reservoirs should be located at similar elevations to allow hydraulic balance within the distribution system. The need for altitude valves, check valves, Pressure Reducing Valves (PRVs), booster pumps, pumper trucks for extracting fire flows, and other control devices is reduced within a given service area when a consistent water surface elevation is maintained in all reservoirs. 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 pressure range in the system should stay within the range of 25 to 100 pounds per square inch (psi) and never drop below 20 psi at any usage rate. In the City of Molalla's case, the optimum tank elevation for the majority of the City would be to match the overflow elevation of the 2.0 MG reservoir tank that services the City. This elevation is 566.4 feet.

Topography
The optimum site is flat or gently sloping. Steep topography or areas susceptible to landslides are not desirable since such sites require extensive earthwork and associated costs. Locating tanks on cut or fill sections will require additional geotechnical investigations and site work to avoid differential settlement. Generally, the site should accommodate the tank (plus room for another tank), a perimeter access road with a minimum 15 feet width, and space to store the materials to build the tank.

Proximity to Other Land Uses
Locating a tank in close proximity to other types of land use, including residential areas is considered acceptable. Paint color, reservoir height, and landscaping are all considerations for sites within residential areas.

Location Relative to Service Areas or Other Tanks
Tank sites located long distances from the primary demand centers are not favored. Generally, system hydraulics and water main costs can be minimized by the utilization of a site close to the areas of maximum water demand. In addition, the relative location of the existing treated water tanks should also be considered. While it is typically more cost-effective to construct a new tank adjacent to an existing one.

Recommendations

The previous site design criteria and conversations with the City Staff was utilized to provide the following recommendations that maintain the required treated water storage for the entire planning period.

New 2.0 MG Tank

Adjacent to the water treatment facility there is land available that has potential to hold a 2.0 MG storage tank. This location should allow the construction of a new tank while being able to match the 2.0 MG tank's overflow elevation; however, a site survey will be required to ensure site constraints will accommodate land development for the new tank.

The 1.2 MG reservoir, as described in Section 5.4, is approaching its design life and should be decommissioned and demolished. It is recommended, due to the limited supply of treated water storage, that the new tank be constructed prior to demolition of the existing tank. Upon project completion, the increase of 0.8 million gallons of treated water storage capacity will sustain the City through the planning period of the Year 2040.

2.0 MG Tank Maintenance

The existing 2.0 MG reservoir tank, as discussed in Section 5.4, is in need of crack sealing and exterior paint to help the tank reach its intended usable life.

8.5 Distribution System

A hydraulic model was utilized to assist in evaluating the capability of the City's existing water system in providing proper water flows, primarily fire flow, throughout the City. The basis for and results from the hydraulic model along with proposed water distribution system improvements and a comprehensive leak analysis program are discussed below.

Hydraulic Modeling

Computer hydraulic models can analyze an entire municipal water system mathematically with respect to existing hydraulic characteristics and "what if" scenarios. The mapping, calibration, and analysis of the City's water distribution system using a computer hydraulic model are discussed below.

Mapping

The City provided a map of the existing distribution system in GIS format. In addition to the City's GIS data, as-builts for water improvements and the City's water treatment facility plans were also consulted and utilized in developing an overall and accurate model. The City also reviewed the maps for accuracy purposes.

Calibration of Computer Model

The hydraulic model was evaluated using WaterCAD software by Haestad Methods. WaterCAD is a state-of-the art software tool primarily used in the analysis and modeling of water distribution systems. This program employs mathematical algorithms based on hydraulic principles to predict system pressures and flow rates within a water system. Fire flows are of particular interest since the magnitude of these flows dictates the necessary hydraulic capacity of the water system.

Information on the current operating parameters was entered into the computer model. The input parameters included daily system flows and operating pressures at the Water Treatment Plant. Generally, user demand was allocated evenly to each node of the existing system. A more refined allocation of the demand is not necessary as the projected user demand, even at peak flows, is substantially less than fire flow requirements.

Hydraulic Analysis of the Existing System

The hydraulic model included current piping, water storage tanks, and the Water Treatment Plant. Hydraulic performance of the system is adequate in most areas, based upon adequate system pressures and a relatively well-looped and sized distribution network. Residual pressures of 20 psi were used as a constraint on the system in accordance with the Oregon Health Authority requirement. Greater fire flows may be attained due to the lack of this constraint in the physical system.

Performance of the distribution system with respect to maximum available fire flow capabilities was examined Citywide. Fire flow requirements were determined using the 2014 Oregon Fire Code and discussions with the Molalla Fire Department. The 2014 Oregon Fire Code recommends fire flows of 1,000 gpm for a minimum of one hour for one or two family dwellings not exceeding two stories in height or 3,600 square feet. Generally for rural residential dwellings, 500 gpm is utilized as a basis for fire flow suppression. Most residences within the City of Molalla are less than 3,600 square feet.

The fire flow model was run with the requirement of maintaining minimum residual pressures of 20 psi throughout the system during a fire flow event. A map displaying improved fire flows throughout the City is shown in Figure 8.5.1.

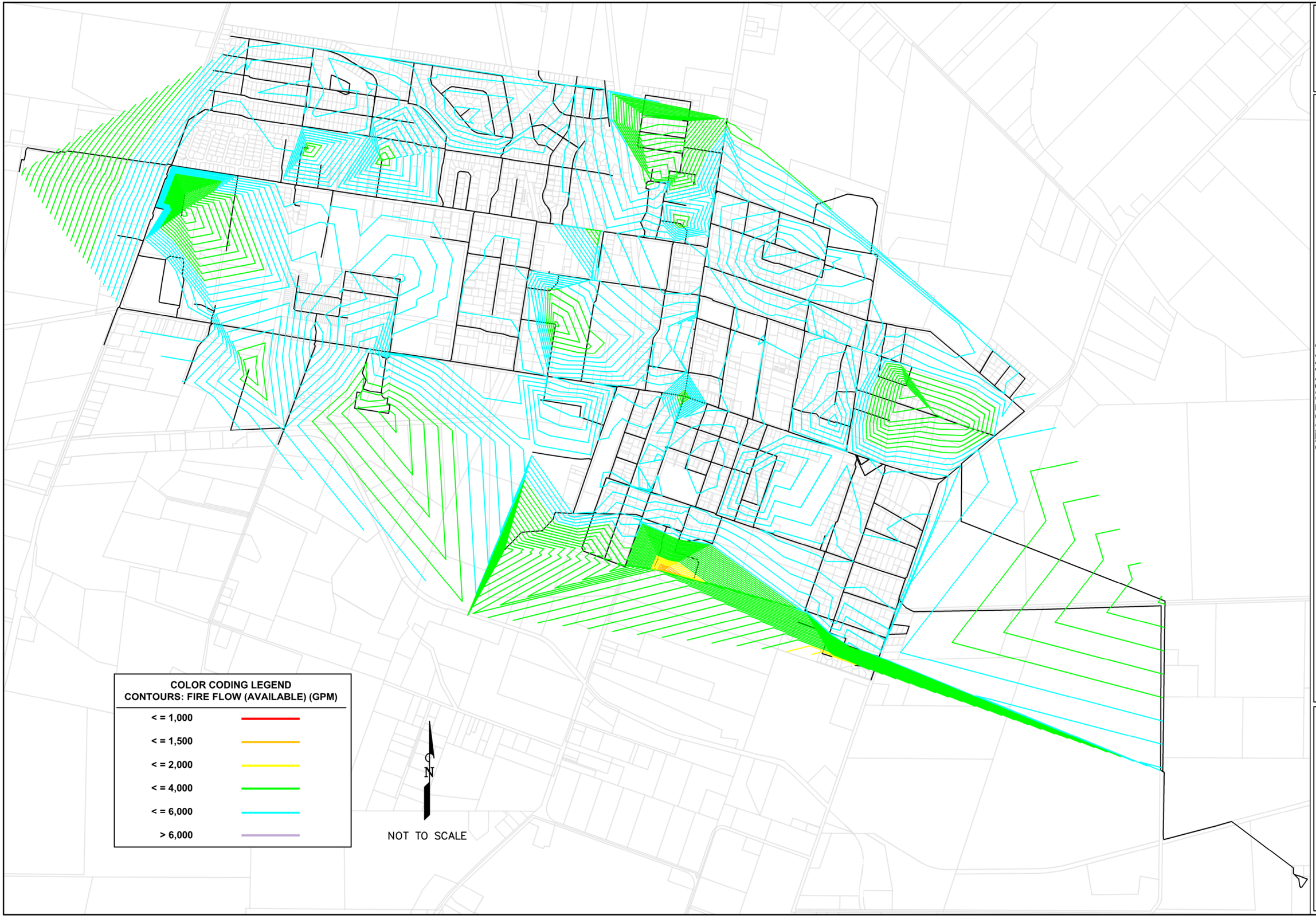


FIGURE NO. 8.5.1

CITY OF MOLALLA

WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN

POST IMPROVEMENT FIRE FLOW MAP

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

DATE: MAY, 2021

PROJECT NO.: 198.16

Recommendations

Water Main Improvements

The 6-inch water main that serves the Molalla Elementary School and 4-inch water main that serves the Molalla Wastewater Treatment Plant should be upsized to an 8-inch water main for fire flow purposes. It is also recommended to replace all asbestos cement pipe that is still in service and pipe that has reached its usable life expectancy. Recommended replacement material is PVC C900 and minimum sizing of 8-inch diameter pipe to accommodate expected City expansion and not limit future flows.

Service Line Improvements

Improvements to service lines are needed in the northwest region of the City of Molalla's distribution system to replace deteriorating copper services based on the discussions with City Staff. The service lines have been experiencing exterior corrosion in this part of the City. Copper is almost totally elusive to corrosion however faulty design, poor workmanship, and electrical current in the soil (electrochemical, DC, and AC) all have the ability to cause exterior corrosion on copper pipes buried in the soil. These improvements are more cost effectively preformed at a larger scale and aimed at reducing system loss. The copper services will be replaced with PEX pipe to eliminate the issue from reoccurring. City standards have begun to address the issue with installation of only PEX service lines moving forward. The services in need of replacement are north of Toliver Road and west of North Molalla Avenue, based on City Staff comments. Phasing is suggested and presented in Section 9.2 based upon these improvements encompassing a large amount of services.

Based on the soil conditions discussed in Section 3.3, it is recommended to begin Phase I of service replacements in the west region and move east with the subsequent phases. West of Mountain View Lane and North of Toliver Road consists of two unique soil types not found in the rest of the City, Aloha series and Dayton series. Both of these types of soils are poorly draining and a possible source to the widespread corrosion.

Comprehensive Leak Analysis Program

In order to limit total system losses a comprehensive leak analysis program is recommended to be initiated by the City. This analysis should focus on areas with known leaks, pipes that have surpassed or are approaching their usable life, and pipe material prone to leaking as discussed in Section 5.5.

Pressure Reducing Valve Stations

It is recommended to split the City of Molalla's water system into three pressure zones through the use of four Pressure Reducing Valve (PRV) stations. Aging pipelines, joints, flanges, and shifting ground all contribute to unseen and unmeasured water loss when high pressure forces water though existing cracks and fissures in the system. High pressure is also the leading contributor to pipe breaks.

The City experiences high water pressure zones on the west side of the City along with a high percentage of nonaccount water as previously discussed; which is why it would be beneficial to reduce the pressures in this area. The new PRV stations are recommended near the intersections of West Main Street and Dixon Avenue; to the west of West Heintz Street and Creamery Creek Lane; Toliver Road and Pegasus Court; and to the east of South Feyrer Park Road and Mathias Road.

Distribution System Flushing and Valve Exercising

It is recommended that the City continue annual distribution system flushing as described in Section 5.5. The exercising of all mainline valves should occur on the same schedule as the water line flushing, for each of the four water system quadrants.

SECTION 9:

CAPITAL IMPROVEMENT PLAN

SECTION 9: CAPITAL IMPROVEMENT PLAN

9.1 Background

A Capital Improvement Plan (CIP) is a long term program for replacement of existing or installation of new infrastructure required to improve a system's function or maintenance. The Capital Improvement Plan for water provides the City Council, Staff, and residents with a systematic approach to dealing with its short term and long term infrastructure needs and demands.

Under Oregon Revised Statutes (ORS) 223.309 (1), a Capital Improvement Plan, public facilities plan, Water Master Plan, or comparable plan must be prepared before the adoption of System Development Charges (SDCs). This Plan must list the capital improvements that may be funded with improvement fee revenues and include the estimated cost and timing of each improvement. Oregon Revised Statutes discuss which improvements may be funded by SDC revenues (ORS 223.307) and what types of projects qualify for credit purposes. The Capital Improvement Plan may be modified at any time pursuant to ORS 223.309 (2).

Water system improvements recommended for the City of Molalla are provided in this Plan along with associated costs. The recommended improvements for the City's Capital Improvement Plan were derived from the analysis presented in Section 8.

9.2 Project Phasing

To assist the City in its planning efforts, the proposed capital improvements have been assigned into one of three phases. Phase I projects will be completed in the next five years, Phase II projects will be completed in year six to ten years, and Phase III projects will be scheduled to occur in years eleven to twenty. A brief description of each phase and the types of projects within that phase is provided below. Costs associated with each project are presented in Year 2020 dollars.

Phase I

Phase I projects are considered the most critical and should be undertaken as soon as funding can be made available. These projects include improvements that are considered to maintain the quality of the system, maintain health guidelines, bring the system into regulatory compliance, and increase fire flow and storage capacity.

Phases II and III

Phases II and III projects should be implemented as needed to address new development, population growth, annexations, development of water rights, and/or new regulatory requirements. The projects include improvements that may not be considered critical but improve system efficiency and operation. Additionally, this Plan should be evaluated and updated prior to the start of Phase I and III projects.

The estimates presented are preliminary and are based on the level and detail of planning presented in this Plan. As projects proceed and as site specific information becomes available, the estimates may require updating. Detailed cost estimates for the CIP project can be found in the Appendix D.

Phase I Improvements

Phase I Improvements represent the highest priority projects that require addressing in order to ensure the effective treatment and distribution of water for the City's residents and customers. These improvements include installation of a new Molalla River intake, maintenance of an existing tank, a new tank, and distribution system improvements. A description of each project is provided hereafter.

Facility Improvements

1. **New Molalla River Intake (Estimated Project Cost: $2,946,000)**
   The improvements recommended for the Molalla River intake were developed to eliminate the risks associated with having intake screens on a shallow gravel bar. Relocating the intake just downstream of the 1996 intake structure will eliminate the majority of manual labor associated with the current intake. It is recommended to install an intake screen with air burst or water wash system which have shown to be extremely effective in removing organic debris buildup the City Staff experiences. Recommended location of the new intake is approximately seventy five feet upriver of the existing intake screens. Although the recommended location for the intake is a feasible option, it is recommended that a study be completed verifying that it is the optimal location for all those with vested interest in the project site. The project also includes the replacement of the 75 Horsepower (HP) raw water intake pump. The estimated project cost includes an upgrade to the existing infiltration gallery located near the intake, contingency, engineering, legal and administration, and geotechnical investigation expenses.

2. **New 2.0 MG Treated Water Tank with Land Acquisition (Estimated Project Cost: $6,550,000)**
   Adjacent to the water treatment facility there is land available that has potential to hold a 2.0 Million Gallons (MG) storage tank. Cost for acquisition of this land is included in the cost estimate. The estimated cost for this tank is based on a glass-fused-to-steel tank with an aluminum dome roof construction and demolition of the existing 1.2 MG tank. Cost estimate includes lead abatement as required for demolition, seismic valves, associated seismic piping, and a new effluent flow meter. A site survey will be required to ensure site constraints will accommodate the tank. Estimated project costs include anticipated contingency, engineering, legal and administration, geotechnical investigation expenses and seismic evaluation of existing tank to remain in service.

3. **2.0 MG Tank Exterior Resurfacing (Estimated Project Cost: $1,830,000)**
   While the 2.0 MG treated water tank is in fair condition, resurfacing the exterior coating is needed to ensure it reaches the intended useful lifespan. Cost estimate includes lead abatement for the removal of existing lead based paint required for surface preparation.

4. **Pressure Reducing Valves (Estimated Project Cost: $1,040,000)**
   The improvements recommended for splitting the Molalla water system into three pressure zones include the installation of four Pressure Reducing Valves (PRVs). This project will require coordination with system users during design to accommodate existing fire suppression systems. Estimated project costs include anticipated contingency, engineering, legal, and administration.

5. **Remove and Replace Polymer and Soda Ash Bulk Storage Tanks (Estimated Project Cost: $120,000)**
   The improvements recommended for both the polymer and soda ash bulk storage tanks were developed due to the age of the existing tanks. Estimated project costs include anticipated contingency, engineering, legal, and administration.

6. **Comprehensive Leak Analysis Program (Estimated Project Cost: $42,400)**
   In order to limit total system losses a comprehensive leak analysis program is recommended to be initiated by the City. This analysis should focus on areas with known leaks, pipes that have surpassed or are approaching their usable life, and pipe material prone to leaking as discussed in Section 5.5. The CIP is recommended to be adjusted accordingly following the leak analysis program.

7. **Treated Water Storage Seismic Valves (Estimated Project Cost: $381,000)**
   The improvements recommended protect the City from seismic events that can damage transmission and distribution system components; resulting in the treated water storage tanks draining in an emergency situation. Cost estimates include installation of two seismic valves and associated seismic piping between the seismic valves and tanks.

8. **Water Treatment Plant Tracer Study (Estimated Project Cost: $50,000)**
   In order to maintain adequate chlorine contact time within the storage reservoirs, it is recommended that the City review and update their current Disinfection Contact Time Tracer Study.

Service Line Replacements

1. **Service Line Replacements – Phase I (Estimated Project Cost: $807,000)**

Distribution System Improvements

1. **Eckerd Avenue and East 2nd Street Water Line Improvements (Estimated Project Cost: $687,000)**
   The improvements recommended include the replacement of approximately 900 feet of 6-inch asbestos cement water main along with approximately 300 feet of 4-inch cast iron water main installed in 1975 with 8-inch water main.

2. **Lola Avenue Water Line Improvements (Estimated Project Cost: $840,000)**
   The improvements recommended include the replacement of approximately 1,400 feet of 4-inch steel water main installed in 1954 with 8-inch water main.

3. **Swiegle Avenue Water Line Improvements (Estimated Project Cost: $347,000)**
   The improvements recommended include the replacement of approximately 450 feet of 6-inch steel water main installed in 1954 with 8-inch water main along with the installation of an additional 300 feet of 8-inch water main to loop a dead end section of water main.

4. **Metzler Avenue, West 3rd Street, and West 4th Street Water Line Improvements (Estimated Project Cost: $1,528,000)**
   The improvements recommended include the replacement of approximately 1,000 feet of 6-inch asbestos cement water main installed in 1954 along with approximately 900 feet of 6-inch and 2-inch steel water main also installed in 1954 with 8-inch water main. Metzler Avenue water main between West Main Street and 7th Street is recommended for replacement however high priority should be given to the water main between 5th Street and 7th Street.

5. **Hart Street and Section Street Water Line Improvements (Estimated Project Cost: $992,000)**
   The improvements recommended include the replacement of approximately 300 feet of 8-inch asbestos cement water main installed in 1954 along with approximately 1,700 feet of 4-inch and 6-inch steel water main also installed in 1954 with 8-inch water main.

6. **South Molalla Avenue, East 6th Street, and May Street Water Line Improvements (Estimated Project Cost: $1,099,000)**
   The improvements recommended include the replacement of approximately 700 feet of 6-inch and 8-inch asbestos cement water main installed in 1954 along with approximately 1,400 feet of 6-inch steel water main also installed in 1954 with 8-inch water main.

7. **East 6th, East 7th Street, and South Cole Avenue Water Line Improvements (Estimated Project Cost: $1,750,000)**
   The improvements recommended include the replacement of approximately 2,800 feet of 6-inch and 8-inch asbestos cement water main installed in 1969 with 8-inch water main.

8. **East 3rd Street, East 4th Street, and Stowers Road Water Line Improvements (Estimated Project Cost: $833,000)**
   The improvements recommended include the replacement of approximately 1,400 feet of 6-inch asbestos cement water main installed in 1969 with 8-inch water main.

9. **Molalla Elementary School and Public Works Shops Water Line Improvements (Estimated Project Cost: $710,000)**
   The improvements recommended include the replacement of approximately 700 feet of 6-inch asbestos cement water main, approximately 300 feet of 2-inch and 6-inch water for fire flow purposes with 8-inch water main and the installation of an additional 550 feet of 8-inch water main to loop a dead end section of water main.

TABLE 9.2.1
PHASE I IMPROVEMENTS SUMMARY

City of Molalla		**Phase I Improvements**	
Project No.	**Location**	**Total Project Cost**	
	Facility Improvements		
1	New Molalla Intake	$	2,946,000
2	New 2.0 MG Treated Water Tank with Land Acquisition	$	6,550,000
3	2.0 MG Tank Exterior Resurfacing	$	1,830,000
4	Pressure Reducing Valves	$	1,040,000
5	Remove and Replace Polymer and Soda Ash Buk Storage Tanks	$	120,000
6	Comprehensive Leak Analysis Program	$	42,400
7	Treated Water Storage Seismic Valves	$	381,000
8	Disinfection Contact Time Tracer Study	$	50,000
	Service Line Replacements		
1	Service Line Replacements	$	807,000
	Distribution System Improvements		
1	Eckerd Ave. and E 2nd St.	$	687,000
2	Lola Ave.	$	840,000
3	Swiegle Ave.	$	347,000
4	Metzler Ave., West 3rd St., and West 4th St.	$	1,528,000
5	Hart St. and Section St.	$	992,000
6	South Molalla Ave., E 6th St., and May St.	$	1,099,000
7	E 6th, E 7th St., and South Cole Ave.	$	1,750,000
8	E 3rd St., E 4th St., and Stowers Rd.	$	833,000
9	Molalla Elem. School and PW Shops	$	710,000
	Total	**$**	**22,552,400**

Phase II Improvements

Phase II Improvements of this CIP represent important projects that require addressing once Phase I Improvements have been addressed and financing is available. These projects include various water distribution system improvements.

Water Master Plan Update

1. **Review and Update of the Water Master Plan – Phase II (Estimated Project Cost: $200,000)**

Service Line Replacements

1. **Service Line Replacements – Phase II (Estimated Project Cost: $832,000)**

Distribution System Improvements

10. **North Cole Avenue Water Line Improvements (Estimated Project Cost: $317,000)**
    The improvements recommended include the replacement of approximately 600 feet of 10-inch asbestos cement water main with 10-inch water main.

11. **Toliver Drive, Kennel Street, West Ross Street, Revilot, and Berwick Water Line Improvements (Estimated Project Cost: $1,222,000)**
    The improvements recommended include the replacement of approximately 2,300 feet of 6-inch asbestos cement water main installed between 1968 and 1975 with 8-inch water main.

12. **West Heintz Street Water Line Improvements (Estimated Project Cost: $1,004,000)**
    The improvements recommended include the replacement of approximately 1,900 feet of 6-inch asbestos cement water main installed in 1972 with 8-inch water main.

13. **Robbins Street and Fenton Avenue Water Line Improvements (Estimated Project Cost: $1,030,000)**
    The improvements recommended include the replacement of approximately 1,700 feet of 6-inch asbestos cement water main installed in 1954 along with approximately 300 feet of 6-inch steel water main also installed in 1954. 8-inch water main will be used for replacement.

14. **Ridings Avenue Water Line Improvements (Estimated Project Cost: $1,032,000)**
    The improvements recommended include the replacement of approximately 1,500 feet of 6-inch asbestos cement water main installed in 1954 with 8-inch water main.

15. **Toliver Road Water Line Improvements (Estimated Project Cost: $620,000)**
    The improvements recommended include the replacement of approximately 1,100 feet of water main with 8-inch water main for fire flow purposes.

16. **W. 7th St. Water Line Improvements (Estimated Project Cost: $335,000)**
    The improvements recommended include the replacement of approximately 700 feet of water 8-inch, Class 200 water main with 8-inch C-900 PVC water main.

TABLE 9.2.2
PHASE II IMPROVEMENTS SUMMARY

City of Molalla		Phase II Improvements	
Project No.	**Location**	**Total Project Cost**	
	Water Master Plan Update		
1	Water Master Plan Update	$	200,000
	Service Line Replacements		
1	Service Line Replacements	$	832,000
	Distribution System Improvements		
10	North Cole Ave.	$	317,000
11	Toliver Dr., Kennel St., & West Ross St.	$	1,222,000
12	West Heintz St.	$	1,004,000
13	Robbins St. and Fenton Ave.	$	1,030,000
14	Ridings Ave.	$	1,032,000
15	Toliver Rd.	$	620,000
16	W. 7th St.	$	335,000
	Total	**$**	**6,592,000**

Phase III Improvements

Phase III Improvements of this CIP represent important projects that require addressing once Phase II Improvements have been addressed and financing is available. These projects include a transmission main reroute and replacement along with various water distribution improvements.

Service Line Replacements

1. **Service Line Replacements – Phase III (Estimated Project Cost: $543,000)**

Distribution System Improvements

17. **Frances Street Water Line Improvements (Estimated Project Cost: $720,000)**
    The improvements recommended include the replacement of approximately 500 feet of 6-inch asbestos cement water main installed in 1962 along with approximately 500 feet of 6-inch steel water main also installed in 1962; 8-inch water main will be used for replacement.

18. **Shirley Street Water Line Improvements (Estimated Project Cost: $1,914,000)**
    The improvements recommended include the replacement of approximately 3,600 feet of 14-inch steel water main installed in 1976 with 8-inch water main.

19. **Miller Street and North Cole Avenue Water Line Improvements (Estimated Project Cost: $1,751,000)**
    The improvements recommended include the replacement of approximately 3,500 feet of 14-inch steel water main installed in 1976 with 8-inch water main.

20. **South Molalla Forest Road to South Molalla Avenue Water Line Improvements (Estimated Project Cost: $3,715,000)**

The improvements recommended include the installation of a new 12-inch water main that will run along South Molalla Forest Road connecting South Molalla Avenue to South Ona Way. The cost for the improvement is based on a 12-inch PVC main with a total length of 7,400 feet. Cost includes a PRV station in conjunction with the proposed Phase I Pressure Reducing Valves (PRV) project.

21. **Transmission Main Reroute and Replacement (Estimated Project Cost: $3,166,000)**
The existing 14-inch steel transmission main currently running from South Feyrer Park Road to East Main Street is scheduled for replacement in the near future. The new proposed main would run from the existing steel main at the intersection of South Feyrer Park Road and South Adams Cemetery Road and reconnect at the intersection of East Main Street and Mathias Road. To meet future projected demand an 18-inch main is recommended. The replacement of the main would result in a more even distribution of flows throughout the City of Molalla's water system. The cost for the reroute and replacement is based on an 18-inch PVC main with a total length of 5,500 feet.

22. **South Molalla Forest Road Water Line Improvements (To Be Completed as Development Occurs)**
The improvements recommended include the replacement of approximately 2,200 feet of 6-inch asbestos cement water main with 8-inch water main.

23. **North Molalla Avenue Water Line Improvements (To Be Completed as Development Occurs)**
The improvements recommended include the replacement of approximately 500 feet of 4-inch steel water main installed in 1954 with 8-inch water main.

24. **545 W. Main St. Water Line Improvements (To Be Completed as Development Occurs)**
The improvements recommended include the replacement of approximately 500 feet of 6-inch steel water main installed in 1975 with 8-inch water main.

TABLE 9.2.3
PHASE III IMPROVEMENTS SUMMARY

City of Molalla		**Phase III Improvements**
Project No.	**Location**	**Total Project Cost**
	Service Line Replacements	
1	Service Line Replacements	$ 543,000
	Distribution System Improvements	
17	Frances St.	$ 720,000
18	Shirley St.	$ 1,914,000
19	Miller St. and North Cole Ave.	$ 1,751,000
20	South Molalla Forest Rd. to South Molalla Ave.	$ 3,715,000
21	Transmission Main Reroute and Replacement	$ 3,166,000
22	South Molalla Forest Road Water Line Improvements	TBD
23	North Molalla Avenue Water Line Improvements	TBD
24	545 W. Main St. Water Line Improvements	TBD
	Total	**$ 11,809,000**

9.3 Summary of Phased Improvements

A summary of all the costs of the recommended capital improvements is provided in Tables 9.3.1 through 9.3.3.

TABLE 9.3.1
IMPROVEMENT PHASING AND COSTS – SERVICE LINE PROJECTS

City of Molalla			**Service Improvements Summary**
Phase	**No. of Services**	**Construction Cost**	**Total Project Cost**
1	64	$ 106,000	$ 163,000
1	63	$ 104,000	$ 161,000
1	63	$ 104,000	$ 161,000
1	63	$ 104,000	$ 161,000
1	63	$ 104,000	$ 161,000
Subtotal Phase I		**$ 522,000**	**$ 807,000**
2	66	$ 109,000	$ 168,000
2	65	$ 108,000	$ 166,000
2	65	$ 108,000	$ 166,000
2	65	$ 108,000	$ 166,000
2	65	$ 108,000	$ 166,000
Subtotal Phase II		**$ 541,000**	**$ 832,000**
3	71	$ 118,000	$ 181,000
3	71	$ 118,000	$ 181,000
3	71	$ 118,000	$ 181,000
Subtotal Phase III		**$ 354,000**	**$ 543,000**
Total		**$ 1,417,000**	**$ 2,182,000**

TABLE 9.3.2
IMPROVEMENT PHASING AND COSTS – DISTRIBUTION SYSTEM PROJECTS

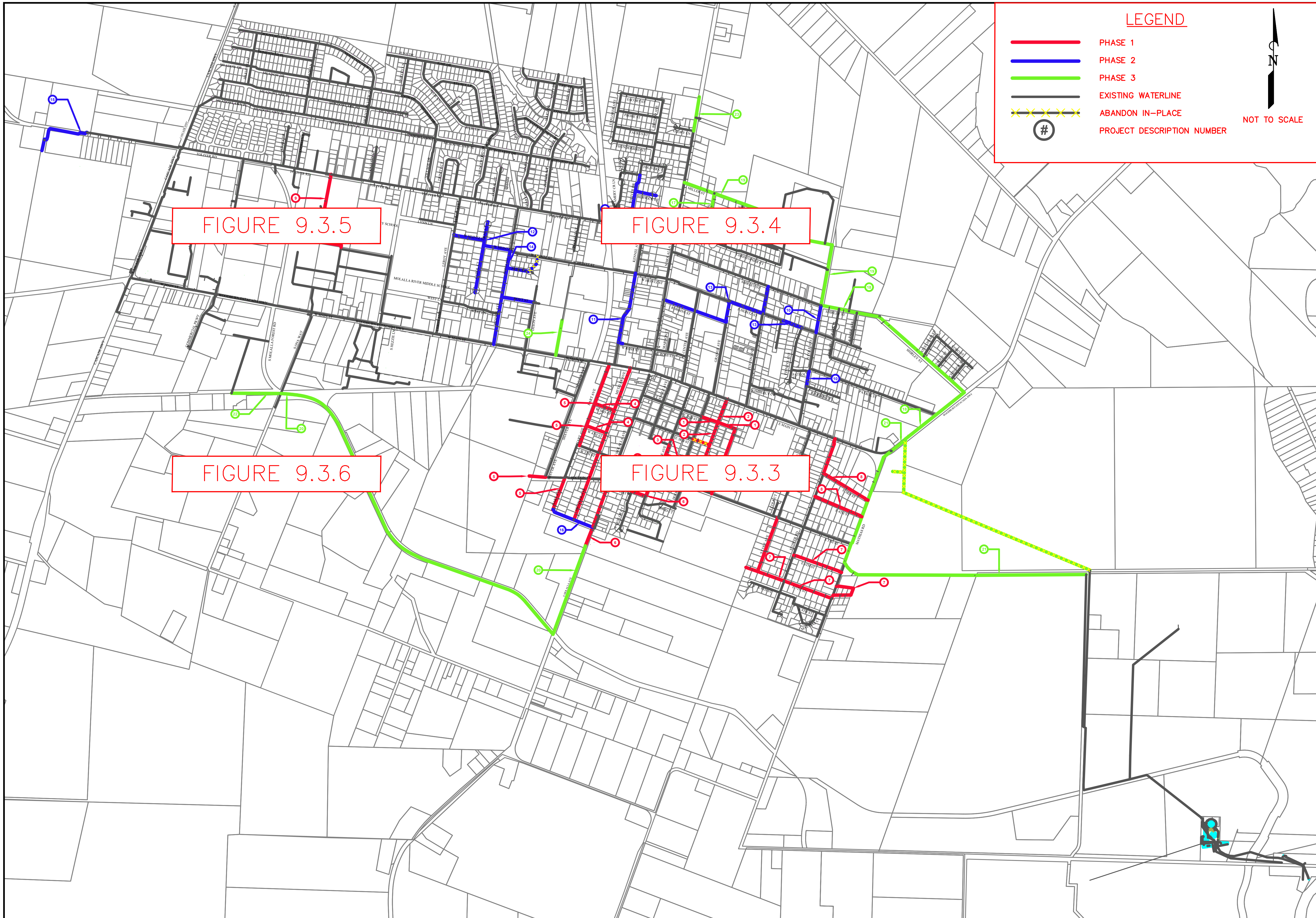
City of Molalla				**Distribution System Improvements Summary**	
Project No.	**Location**	**Phase**	**Approx. Length (ft)**	**Construction Cost**	**Total Project Cost**
1	Eckerd Ave. and E 2nd St.	1	1,400	$ 448,000	$ 687,000
2	Lola Ave.	1	1,400	$ 548,000	$ 840,000
3	Swiegle Ave.	1	750	$ 226,000	$ 347,000
4	Metzler Ave., West 3rd St., and West 4th St.	1	2,900	$ 998,000	$ 1,528,000
5	Hart St. and Section St.	1	2,000	$ 647,000	$ 992,000
6	South Molalla Ave., E 6th St., and May St.	1	2,100	$ 717,000	$ 1,099,000
7	E 6th, E 7th St., and South Cole Ave.	1	3,400	$ 1,142,000	$ 1,750,000
8	E 3rd St., E 4th St., and Stowers Rd.	1	1,400	$ 543,000	$ 833,000
9	Molalla Elem. School and PW Shops	1	1,550	$ 463,000	$ 710,000
			Subtotal Phase I	**$ 5,732,000**	**$ 8,786,000**
10	North Cole Ave.	2	600	$ 206,000	$ 317,000
11	Toliver Dr., Kennel St., & West Ross St.	2	2,300	$ 798,000	$ 1,222,000
12	West Heintz St.	2	1,900	$ 655,000	$ 1,004,000
13	Robbins St. and Fenton Ave.	2	2,000	$ 672,000	$ 1,030,000
14	Ridings Ave.	2	2,100	$ 673,000	$ 1,032,000
15	Toliver Rd.	2	1,100	$ 404,000	$ 620,000
16	W. 7th St.	2	700	$ 218,000	$ 335,000
			Subtotal Phase II	**$ 3,626,000**	**$ 5,560,000**
17	Frances St.	3	1,400	$ 469,000	$ 720,000
18	Shirley St.	3	3,600	$ 1,250,000	$ 1,914,000
19	Miller St. and North Cole Ave.	3	3,500	$ 1,143,000	$ 1,751,000
20	South Molalla Forest Rd. to South Molalla Ave.	3	7,400	$ 2,427,000	$ 3,715,000
21	Transmission Main Reroute and Replacement	3	5,500	$ 2,068,000	$ 3,166,000
22	South Molalla Forest Road Water Line Improvements	3	2,200	TBD	TBD
23	North Molalla Avenue Water Line Improvements	3	500	TBD	TBD
24	545 W. Main Street Water Line Improvements	3	500	TBD	TBD
			Subtotal Phase III	**$ 7,357,000**	**$ 11,266,000**
			Total	**$ 16,715,000**	**$ 25,612,000**

TABLE 9.3.3
IMPROVEMENT PHASING AND COSTS – SUMMARY

City of Molalla		**Improvement Projects Summary**	
Location	**Phase**	**Construction Cost**	**Total Project Cost**
Distribution System Improvements	1	$ 5,732,000	$ 8,786,000
Service Improvements	1	$ 522,000	$ 807,000
New Molalla River Intake	1	$ 1,872,000	$ 2,946,000
New 2.0 MG Treated Water Reservoir with Land Acquisition	1	$ 4,160,000	$ 6,550,000
2.0 MG Tank Maintenance	1	$ 1,195,000	$ 1,830,000
Pressure Reducing Valves	1	$ 679,000	$ 1,040,000
Remove and Replace Polymer and Soda Ash Bulk Storage Tanks	1	$ 78,000	$ 120,000
Comprehensive Leak Analysis Program	1	$ 26,000	$ 42,400
Treated Water Storage Tank Seismic Valves	1	$ 248,000	$ 381,000
Disinfection Contact Time Tracer Study	1	-	$ 50,000
Subtotal Phase I		**$ 14,512,000**	**$ 22,552,400**
Water Master Plan Update	2	-	$ 200,000
Distribution System Improvements	2	$ 3,626,000	$ 5,560,000
Service Improvements	2	$ 541,000	$ 832,000
Subtotal Phase II		**$ 4,167,000**	**$ 6,592,000**
Distribution System Improvements	3	$ 7,357,000	$ 11,266,000
Service Improvements	3	$ 354,000	$ 543,000
Subtotal Phase III		**$ 7,711,000**	**$ 11,809,000**
Total		**$ 26,390,000**	**$ 40,953,400**

A map showing the distribution and service line improvements is given in Figures 9.3.1 through 9.3.6.

THE DYER PARTNERSHIP ENGINEERS & PLANNERS	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN**	FIGURE NO.
DATE: MAY, 2021	**SERVICE IMPROVEMENT PROJECTS**	**9.3.1**
PROJECT NO.: 198.16		



CITY OF MOLALLA
WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN

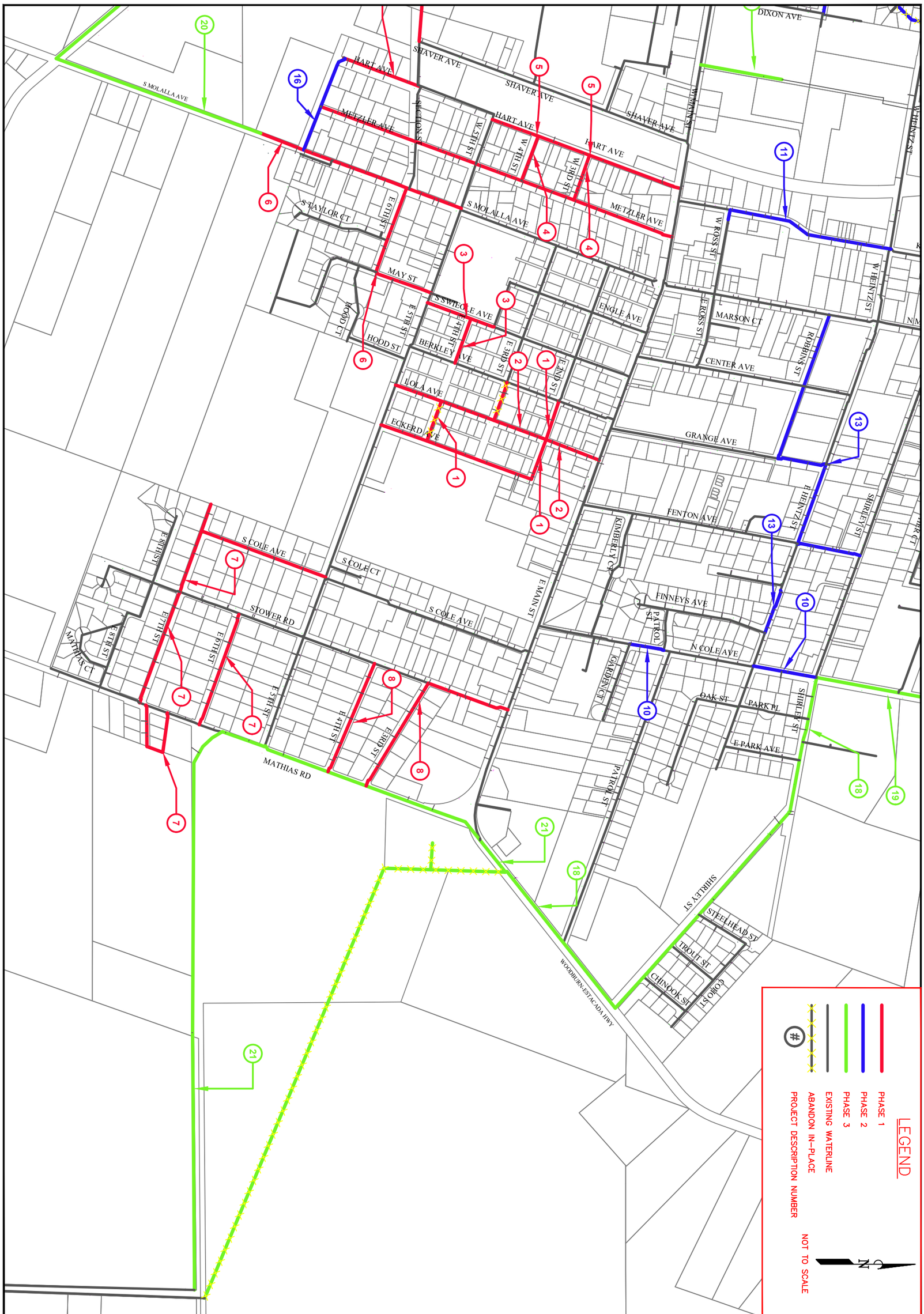
DISTRIBUTION SYSTEM IMPROVEMENT PROJECTS

FIGURE NO. 9.3.2

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS

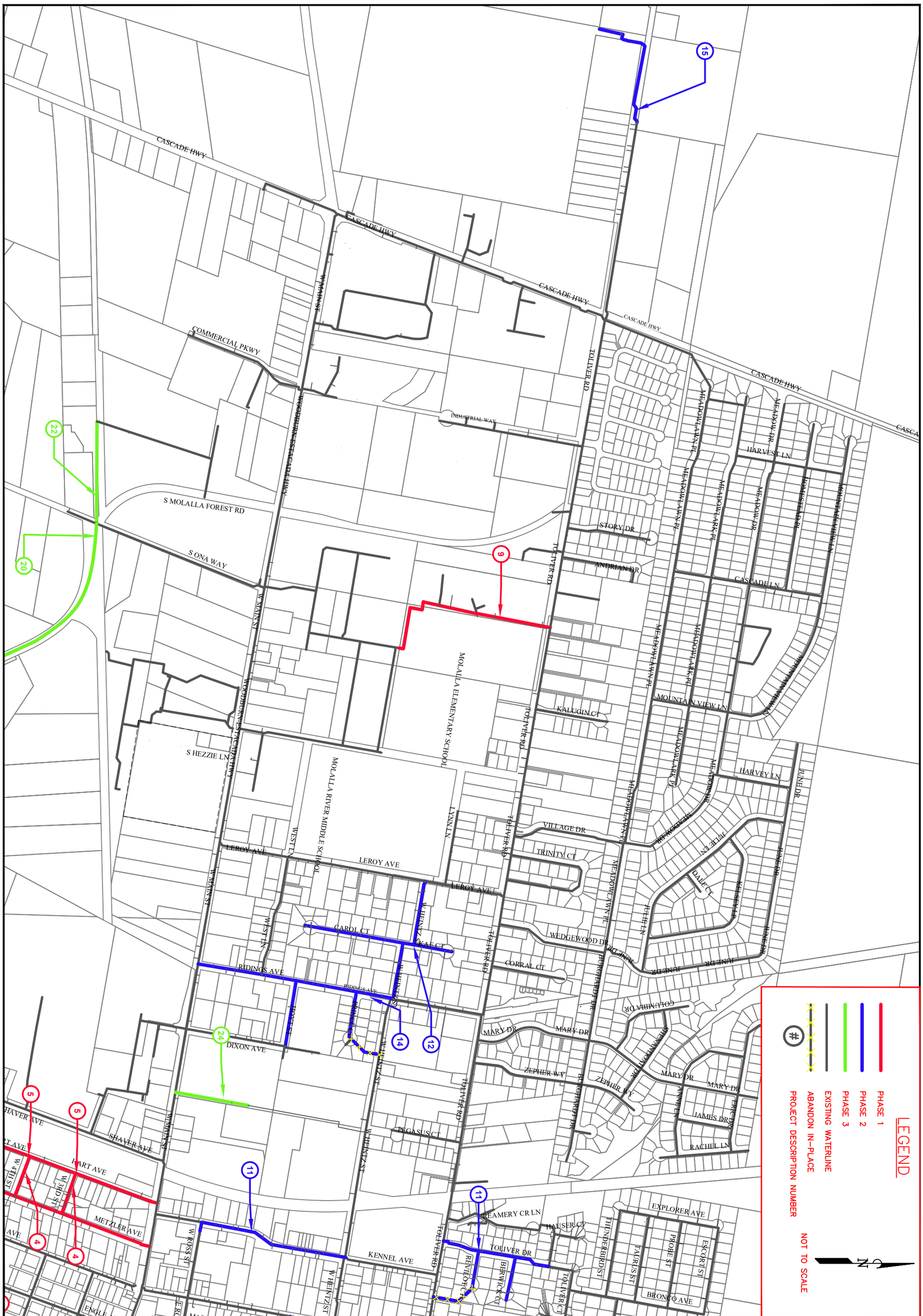
DATE: MAY, 2021

PROJECT NO.: 198.16

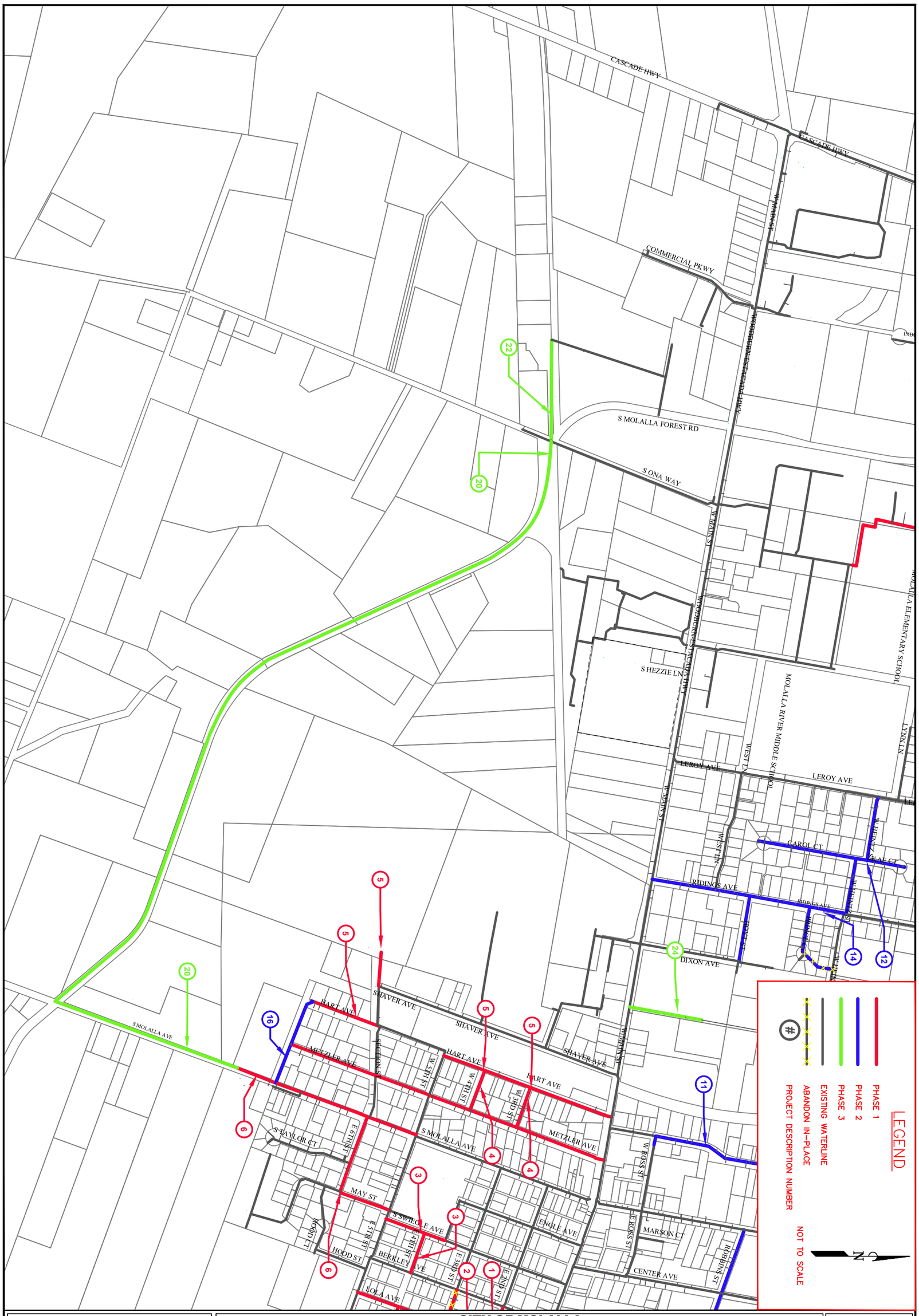


THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MAY, 2021 PROJECT NO.: 198.16	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN** **DISTRIBUTION SYSTEM IMPROVEMENT PROJECTS**	FIGURE NO. **9.3.3**

THE DYER PARTNERSHIP ENGINEERS & PLANNERS DATE: MAY, 2021 PROJECT NO.: 198.16	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN** **DISTRIBUTION SYSTEM IMPROVEMENT PROJECTS**	FIGURE NO. **9.3.4**



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN**	FIGURE NO.
DATE: MAY, 2021	**DISTRIBUTION SYSTEM IMPROVEMENT PROJECTS**	**9.3.5**
PROJECT NO.: 198.16		



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	**CITY OF MOLALLA** **WATER MANAGEMENT, CONSERVATION AND WATER SYSTEM MASTER PLAN**	FIGURE NO.
DATE: MAY, 2021	**DISTRIBUTION SYSTEM IMPROVEMENT PROJECTS**	**9.3.6**
PROJECT NO.: 198.16		

SECTION 10:

FINANCING PLAN

SECTION 10: FINANCING PLAN

10.1 Grant and Loan Programs

Some level of outside funding assistance in the form of grants or low interest loans may be necessary to make the proposed improvement projects affordable for the City of Molalla and its residents. The amount and types of outside funding will dictate the amount of local funding that the City must secure. In evaluating grant and local programs, the major objective is to select a program, or a combination of programs, which are most applicable and available for the intended project.

A brief description of the major federal and state funding programs that are typically utilized to assist qualifying communities in the financing of infrastructure improvement programs is given below. Each of the government assistance programs have particular prerequisites and requirements. These assistance programs promote such goals as aiding economic development, benefiting areas of low to moderate income families, and providing for specific community improvement projects. Each program has specific requirements, therefore not all communities or projects may qualify for each of these programs.

Economic Development Administration Public Works Grant Program

The Economic Development Administration (EDA) Public Works Grant Program, administered by the US Department of Commerce, is aimed at projects which directly create permanent jobs or remove impediments to job creation in the project area. Thus, to be eligible for this grant, a community must be able to demonstrate the potential to create jobs from the project. Potential job creation is assessed with a survey of businesses to demonstrate the prospective number of jobs that might be created if the proposed project were completed.

Proposed projects must be located within an EDA designated Economic Development District. Priority consideration is given to projects that improve opportunities for the establishment or expansion of industry and that creates or retain private sector jobs in both the near term and long term. Communities that can demonstrate that the existing system is at capacity (e.g. moratorium on new connections) have a greater chance of being awarded this type of grant. The EDA grants are usually in the range of fifty to eighty percent of the project cost; therefore, some type of local funding is also required. Grants typically do not exceed one million dollars.

Water and Waste Disposal Loans and Grants (Rural Development)

The Rural Development Administration (Rural Development) manages the loans and grants for water and wastewater programs that used to be overseen by the Farmers Home Administration. While these programs are administered by a new agency, the program requirements are essentially the same. The Rural Utilities Service (RUS) is one of three entities that comprise the US Department of Agriculture's (USDA) Rural Development mission area. The RUS supports various programs that provide financial and technical assistance for development and operation of safe and affordable water and sewer systems.

Rural Development has the authority to make loans to public bodies and non-profit corporations to construct or improve essential community facilities. Grants are also available to applicants who meet the median household income requirements. Eligible applicants must have a population of less than 10,000 though priority is given to public entities with populations smaller than 5,500.

In addition, borrowers must meet the following stipulations:

- Be unable to obtain needed funds from other sources at reasonable rates and terms.
- Legal capacity to borrow and repay loans, to pledge security for loans, and to operate and maintain the facilities or services.
- Financially sound facility based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay all facility costs including operation and maintenance and to retire the indebtedness and maintain a reserve.
- Water systems must be consistent with any development plans of state, multi-jurisdictional area, county, or municipality in which the proposed project is located. All facilities must comply with federal, state, and local laws including those concerned with zoning regulations, health and sanitation standards, and the control of water pollution.

Loan and grant funds may be used for the following types of improvements:

- Drinking water sourcing, treatment, storage, and distribution.

In some cases, funding may also be available for related activities such as:

- Legal and engineering costs connected with the development of facilities.
- Land acquisition, water and land rights, permits, and equipment.
- Start-up operations and maintenance.
- Purchase of facilities to improve service or prevent loss of service.

Interim commercial financing will normally be used during construction and Rural Development funds will be available when the project is completed. If interim financing is not available or if the project cost is less than $50,000, multiple advances of Rural Development funds may be made as construction progresses.

The maximum term on all loans is forty years. However, no repayment period will exceed any statutory limitation on the organization's borrowing authority or the useful life of the improvement of the facility to be financed. Interest rates are set quarterly and are based on current market yields for municipal obligations. Current interest rates may be obtained from any Rural Development office.

The following rates currently apply for the Rural Development program (July 2020):

Market rate. Those applicants pay the market rate whose median household income of the service area is more than the $52,855 (Oregon non-metropolitan median household income). The market rate is currently 1.875 percent.

Intermediate rate. The intermediate rate is paid by those applicants whose median household income of the service area is less than $52,855. The intermediate rate is currently 1.50 percent.

Poverty line rate. Those applicants whose median household income of the service area is below $42,284 (80 percent of the state median household income) and the project must also be required

by a governing agency to correct a regulatory violation or health risk. The current poverty line rate is 1.125 percent.

Maximum grant amounts, based on Median Household Income (MHI), are provided in Table 10.1.1. The grants are calculated on the basis of eligible costs that do not include the costs attributable to reserve capacity or interim financing. In addition, grant funds cannot be used to reduce total user costs below that of comparable communities funded by RUS.

TABLE 10.1.1
MAXIMUM RURAL DEVELOPMENT GRANT FUNDS AND INTEREST RATES

Median Household Income	Maximum Grant
<$42,284	75%[(1)]
$42,284 - $52,855	45%
>$52,855	0%

[(1)] MHI<42,284 may be considered for a grant up to 75% of eligible project cost if the project is needed to alleviate a health or sanitary problem.

The 2014 to 2018 American Community Survey (ACS) 5-Year MHI estimate for the City of Molalla is $61,185 (± $5,516). At this MHI, the City is eligible for the market rate of 1.875 percent and is not eligible for a grant.

There are other restrictions and requirements associated with these loans and grants. If the City becomes eligible for grant assistance, the grant will apply only to eligible project costs. Additionally, grant funds are only available after the City has incurred long term debt resulting in an annual debt service obligation equal to 0.5 percent of the MHI. In addition, an annual funding allocation limits the Rural Development funds. To receive a Rural Development loan, the City must secure bonding authority, usually in the form of General Obligation or Revenue Bonds.

Applications for financial assistance are made at area offices of Rural Development. For additional information on Rural Development loans and grant programs, call 866-923-5626 Ext. 1 or visit the RUS website at: https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program The Oregon Rural Development website is: https://www.rd.usda.gov/or

Technical Assistance and Training Grants

Available through the USDA Rural Utilities Service (RUS) as part of Water and Waste Disposal programs, Technical Assistance and Training (TAT) Grants are intended to provide technical assistance and training to associations on a wide range of issues relating to the delivery of water services.

Rural communities with populations of less than 10,000 persons are eligible along with private, nonprofit organizations that have been granted tax-exempt status by the Internal Revenue Service (IRS). TAT funds may be used for the following activities:

- Identify and evaluate solutions to water related problems of associations in rural areas.
- Assist entities with preparation of applications for Water and Waste Disposal loans and grants.
- Provide training to association personnel in order to improve the management, Operation and Maintenance (O&M) of water facilities.

- Pay expenses related to providing the technical assistance and/or training.

Grants may be made for up to one hundred percent, not to exceed $30,000, of the eligible project costs. Applications are filed with any USDA Rural Development office. For additional information on Rural Development loans and grant programs, call 866-923-5626 Ext. 1 or visit the RUS website at: https://www.rd.usda.gov/programs-services/community-facilities-technical-assistance-and-training-grant

(Oregon) Community Development Block Grant Program

The Community Development Block Grant Program (CDBG) section of the Infrastructure Finance Authority (IFA) administers the CDBG Program. Grants and technical assistance are available to develop livable urban communities for persons of low and moderate incomes by expanding economic opportunities and providing housing and suitable living environments.

Non-metropolitan cities and counties can apply for and receive grants. Oregon tribes, urban cities (Ashland, Bend, Corvallis, Eugene, Gresham, Hillsboro, Medford, Portland, Salem and Springfield) and counties (Clackamas, Multnomah, Washington) receive funds directly from Housing and Urban Development (HUD).

All projects must meet one of three national objectives:

- The proposed activities must benefit low and moderate income individuals.
- The activities must aid in the prevention or elimination of slums or blight.
- There must be an urgent need that poses a serious and immediate threat to the health or welfare of the community.

Funding amounts are based on:

- The applicant's need;
- The availability of funds; and
- Other restrictions defined in the program's guidelines.

The following are the maximum grants possible for any individual project, by category:

- Economic Development: $750,000
- Microenterprise: $100,000
- Public Works
    - Water Improvements: $2,500,000 except preliminary/engineering planning grants: $150,000
    - Downtown Revitalization: $400,000
    - Offsite Infrastructure: $225,000
- Community/Public Facilities: $1,500,000

- Community Capacity/Technical Assistance: no specific per-award-limit but limited overall funds
- Emergency Grants: $500,000
- Regional Housing Rehabilitation: $400,000
- Emergency Projects: $500,000

Interested applicants should contact Business Oregon prior to submitting an application. For additional information on the CDBG programs, call 503-346-8620 or visit the IFA website at: http://www.orinfrastructure.org/Infrastructure-Programs/CDBG/

Oregon Special Public Works Fund

The Special Public Works Fund (SPWF) provides funds for publically owned facilities that support economic and community development in Oregon**.** Special Public Works Funds provide funding for construction and/or improvement of infrastructure needed to support industrial, manufacturing, and certain types of commercial development.

Funds are available to public entities for:

- Planning;
- Designing;
- Purchasing;
- Improving and constructing publically owned facilities;
- Replacing publically owned essential community facilities; and
- Emergency projects as a result of a disaster.

Public agencies that are eligible to apply for funding are:

- Cities;
- Counties;
- County service districts (organized under Oregon Revised Statues (ORS) Chapter 451);
- Tribal councils;
- Ports;
- Districts as defined in ORS 198.010; and
- Airport districts (ORS 838).

Loans
Loans for development (construction) projects range from less than $100,000 to $10 million. The Infrastructure Finance Authority offers very attractive interest rates that reflect tax-exempt market rates for highly qualified borrowers. Initial loan terms can be up to thirty years or the useful life of the project, whichever is less at 2.19 percent interest (July 2020).

Grants
Grants are available for construction projects that create or retain trade sector jobs. They are limited to $500,000 or eighty five percent of the project cost, whichever is less, and are based on up to $5,000 per eligible job created or retained. Limited grants are available to plan industrial site development for publically owned sites and for feasibility studies.

For additional information on IFA programs, call 503-983-8857 or visit the IFA website at: https://www.orinfrastructure.org/Infrastructure-Programs/SPWF/

Water/Wastewater Financing Program

Water/wastewater financing is available for construction and/or improvement of water systems to meet state and federal standards. This loan program funds the design and construction of public infrastructure needed to ensure compliance with the Clean Water Act (CWA).

The public entities that are eligible to apply for the program are:

- Cities;
- Counties;
- County service districts (organized under ORS Chapter 451);
- Tribal councils;
- Ports; and
- Special districts as defined in ORS 198.010.

The proposed project must be owned and operated by a public entity as listed above. Allowable funded project activities may include:

- Reasonable costs for construction improvement or expansion of drinking water system;
- Water source, treatment, storage and distribution;
- Purchase of rights-of-way and easements necessary for construction;
- Design and construction engineering; or
- Planning/technical assistance for small communities.

To be eligible for funding:

- A system must have received, or is likely to soon receive, a Notice of Non-Compliance by the appropriate regulatory agency or be in need of a facility plan or study required by a regulatory agency; and

- A registered Professional Engineer will be responsible for the design and construction of the project.

Funding and Uses
Loan and grant amounts are determined by a financial analysis of the applicant's ability to afford a loan (debt capacity, repayment sources, and other factors).

Loans
Program guidelines, project administration, loan terms, and interest rates are similar to the Special Public Works Fund program. The maximum loan term is thirty years or the useful life of the infrastructure financed, whichever is less. The maximum loan amount is $10 million per project through a combination of direct and/or bond funded loans. Recently IFA is offering lower, reduced interest rates for municipalities whose household income is less than the statewide median income. The current terms of this loan are for thirty years at 2.19 percent interest (July 2020).

Loans are generally repaid with utility revenues or voter approved bond issues. A limited tax general obligation pledge also may be required. "Creditworthy" borrowers may be funded through the sale of state Revenue Bonds.

Grants
Grant awards up to $750,000 may be awarded based on a financial review.

An applicant is not eligible for grant funds if the applicant's annual MHI is equal or greater than one hundred percent of the state average MHI for the same year.

Funding for Technical Assistance
The Infrastructure Finance Authority offers technical assistance with financing for municipalities with populations of less than 15,000. The funds may be used to finance preliminary planning, engineering studies, and economic investigations.

Technical assistance projects must be in preparation for a construction project that is eligible and meets the established criteria.

- Grants up to $20,000 may be awarded per project.

- Loans up to $60,000 may be awarded per project.

Applications are accepted year-round. For additional information on this IFA program, call 503-983-8857 or visit the IFA website at: https://www.orinfrastructure.org/Infrastructure-Programs/WW/

Safe Drinking Water Revolving Loan Fund

Each year the Oregon Health Authority receives an allotment from the federal government for the Safe Drinking Water Revolving Loan Fund (SDWRLF). The funds along with a twenty percent state match are used to make low interest loans to finance needed drinking water system improvements.

Funds may be used for the following types of activities:

- Master plans, pilot studies, and feasibility studies that are part of compliance related construction projects.
- Preliminary and final engineering and design including: surveying, legal review, preparation of engineering drawings, and specifications for construction. Also, costs necessary for recipients to contract environmental review services.
- Construction costs including all aspects of a public water system.
- Source water protection as part of a source water management plan for a watershed or a delineated source water protection area for a well.
- Property acquisition directly related to or necessary for the proposed project including right-of-ways, easements, and facility sites.

While many activities are eligible for SDWRLF financing, the following activities are considered ineligible activities. These activities include dams or rehabilitation of dams, purchase of water rights unless owned on a system that is being purchased through a consolidation project, finished water reservoirs, administrative costs, operation and maintenance expenses, and projects primarily intended to supply or attract future growth.

The program's financing is available to all sizes of water systems. Municipal, nonprofit, and privately owned community water systems are eligible as well as nonprofit non-community systems. Terms of the loan are 20-years at as low as sixty percent of the state and/or local bond rate. This rate is currently 1.75 percent (July 2020). Financially disadvantaged applicants can get up to a thirty year loan at an interest rate of one percent, as well as the possibility of some principal forgiveness.

The Oregon Health Authority and Business Oregon rate proposed projects. Highest ratings are given to projects that present the following:

- Addresses the most serious risk to human health.
- Necessary to ensure Safe Drinking Water Act compliance.
- Applicant has the greatest financial need, on a per household basis, according to affordability criteria.

Applications are accepted year-round. For additional information on this IFA program, call 503-983-8857 or visit the IFA website at: https://www.orinfrastructure.org/Infrastructure-Programs/SDW/

Small Scale Energy Loan Program

The Oregon Department of Energy's Small Scale Energy Loan Program (SELP) program offers loans to projects whose purpose is to promote energy conservation and renewable energy resource development. Eligible applicants include cities, counties, special districts, individuals, and non-profit groups. Loans will cover up to 100 percent of construction costs, including engineering, fees, and studies. The finished project must at least break even in power costs.

The program offers low interest loans for projects that:

- Conserve natural gas, electricity, oil, or other source of energy.
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat.
- Use recycled materials to create products.

Interested parties should contact the Oregon Office of Energy for details. For additional information on the Office of Energy programs, call 503-378-4040 or visit the Office of Energy website at: http://oregon.gov/ENERGY/

10.2 Local Funding Sources

The amount and type of local funding obligations for infrastructure improvements will depend, in part, on the amount of grant funding anticipated and the requirements of potential loan funding. Local revenue sources for capital expenditures include *ad valorem* taxes, various types of bonds, user charges, connection fees, and system development charges. Local revenue sources for operating costs include *ad valorem* taxes and user charges. Local funding sources and financing mechanisms that are most common and appropriate for the improvements identified in this Plan are provided below.

General Obligation Bonds

A General Obligation Bond is backed by the full faith and credit of the issuer. For payment of the principal and interest on the bond, the issuer may levy *ad valorem* general property taxes. Such taxes are not needed if revenue from assessments, user charges, or other sources is sufficient to cover debt service.

Oregon Revised Statutes limit the maximum term to forty years for cities. Except in the event that Rural Development Administration will purchase the bonds, the realistic term for which General Obligation Bonds should be issued is fifteen to twenty years. Under the present economic climate, the lower interest rates will be associated with the shorter terms.

Financing of water system improvements by General Obligation Bonds is usually accomplished by the following procedure:

- Determination of the capital costs required for the improvement.
- An election authorizing the sale of General Obligation Bonds.
- Following voter approval, the bonds are offered for sale.
- The revenue from the bond sale is used to pay the capital costs associated with the projects.

From a fundraising viewpoint, General Obligation Bonds are preferable to Revenue Bonds in matters of simplicity and cost of issuance. Since the bonds are secured by the power to tax, these bonds usually command a lower interest rate than other types of bonds. General Obligation Bonds lend themselves readily to competitive public sale at a reasonable interest rate because of their high degree of security, their tax-exempt status, and their general acceptance.

These bonds can be revenue supported, wherein a portion of the user fee is pledged toward payment of the debt service. Using this method, the need to collect additional property taxes to retire the obligated bonds is eliminated. Such revenue supported General Obligation Bonds have most of the advantages of Revenue Bonds, but also maintain the lower interest rate and ready marketability of General Obligation Bonds. Since the users of the water system pay their share of the debt load based on their water usage rates, the share of that debt is distributed in a fair and equitable manner.

Advantages of General Obligation Bonds over other types of bonds include:

- The laws authorizing General Obligation Bonds are less restrictive than those governing other types of bonds.
- By the levying of taxes, the debt is repaid by all property benefited and not just the system users.
- Taxes paid in the retirement of these bonds are IRS deductible.
- General Obligation Bonds offer flexibility to retire the bonds by tax levy and/or user charge revenue.

The disadvantage of General Obligation Bond debt is that it is often added to the debt ratios of the underlying municipality, thereby restricting the flexibility of the municipality to issue debt for other purposes. Furthermore, General Obligation Bonds are normally associated with the financing of facilities that benefit an entire community and must be approved by a majority vote and often necessitate extensive public information programs. A majority vote often requires waiting for a general election in order to obtain an adequate voter turnout. Waiting for a general election may take years and too often a project needs to be undertaken in a much shorter amount of time.

Revenue Bonds

Revenue Bonds offer some advantages over General Obligation Bonds and are becoming a more frequently used option. Revenue Bonds are payable solely from charges made for the services provided. These bonds cannot be paid from tax levies or special assessments; their only security is the borrower's promise to operate the system in a way that will provide sufficient net revenue to meet the debt service and other obligations of the bond issued.

Many communities prefer Revenue Bonding, as opposed to General Obligation Bonding, because it insures that no tax will be levied. In addition, debt obligation will be limited to system users since repayment is derived from user fees. Another advantage of Revenue Bonds is that they do not count against a municipality's direct debt, but instead are considered "overlapping debt." This feature can be a crucial advantage for a municipality near its debt limit or for the rating agencies, which consider very closely the amount of direct debt when assigning credit ratings. Revenue Bonds also may be used in financing projects extending beyond normal municipal boundaries. These bonds may be supported by a pledge of revenues received in any legitimate and ongoing area of operation, within or outside the geographical boundaries of the issuer.

Successful issuance of Revenue Bonds depends on the bond market evaluation of the revenue pledged. Revenue Bonds are most commonly retired with revenue from user fees. Recent legislation has eliminated the requirement that the revenues pledged to bond payment have a direct relationship to the services financed by Revenue Bonds. Revenue Bonds may be paid with all or any portion of revenues derived by a public body or any other legally available monies. In addition, if additional security to finance Revenue

Bonds is needed, a public body may mortgage grant security and interests in facilities, projects, utilities or systems owned or operated by a public body.

Normally, there are no legal limitations on the amount of Revenue Bonds to be issued, but excessive issue amounts are generally unattractive to bond buyers because they represent high investment risks. In rating Revenue Bonds, buyers consider the economic justification for the project, reputation of the borrower, methods and effectiveness for billing and collecting, rate structures, provision for rate increases as needed to meet debt service requirements, track record in obtaining rate increases historically, adequacy of reserve funds provided in the bond documents, supporting covenants to protect projected revenues, and the degree to which forecasts of net revenues are considered sound and economical.

Municipalities may elect to issue Revenue Bonds for revenue producing facilities without a vote of the electorate (ORS 288.805-288.945). In this case, certain notice and posting requirements must be met and a 60-day waiting period is mandatory. A petition signed by five percent of the municipality's registered voters may cause the issue to be referred to an election.

Improvement Bonds

Bancroft Improvement Bonds can be issued under an Oregon law called the Bancroft Act. These bonds are an intermediate form of financing that is less than full-fledged General Obligation or Revenue Bonds. This type of bond is quite useful, especially for smaller issuers or for limited purposes.

An Improvement Bond is payable only from the receipts of special benefit assessments, not from general tax revenues. Such bonds are issued only where certain properties are recipients of special benefits not accruing to other properties. For a specific improvement, all property within the improvement area is assessed on an equal basis, regardless of whether it is developed or undeveloped. The assessment is designed to apportion the cost of improvements, approximately in proportion to the afforded direct or indirect benefits, among the benefited property owners. This assessment becomes a direct lien against the property, and owners have the option of either paying the assessment in cash or applying for Improvement Bonds. If the Improvement Bond option is taken, the City sells Bancroft Improvement Bonds to finance the construction, and the assessment is paid over twenty years in forty semi-annual installments with interest. Cities and special districts are limited to Improvement Bonds not exceeding three percent of true cash value.

With Improvement Bond financing, an improvement district is formed, the boundaries are established, and the benefited properties and property owners are determined. The Engineer usually determines an approximate assessment, either on a square foot or a front-foot basis. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for the purpose of making monthly payments to the Contractor. Therefore, some method of interim financing must be arranged, or a pre-assessment program, based on the estimated total costs, must be adopted. Commonly, warrants are issued to cover debts, with the warrants to be paid when the project is complete.
The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value at least equal to fifty percent of the total assessments to be levied. As a result, owners of undeveloped property usually require a substantial cash payment. In addition, the development of an assessment district is very cumbersome and expensive when facilities for an entire community are contemplated. In comparison, General Obligation Bonds can be issued in lieu of Improvement Bonds, and are usually more favorable.

Capital Construction (Sinking) Fund

Sinking Funds are often established by budgeting for a particular construction purpose. Budgeted amounts from each annual budget are carried in a Sinking Fund until sufficient revenues are available for the needed project. Such funds can also be developed with revenue derived from System Development Charges (SDCs) or serial levies.
The disadvantage of a Sinking Fund is that it is usually too small to undertake any significant projects. Also, setting aside money generated from user fees without a designated and specified need is not generally accepted in a municipal budgeting process.

Connection Fees

Most cities charge connection fees to cover the cost of connecting new development to water systems. Based on recent legislation, connection fees can no longer be programmed to cover a portion of capital improvement costs.

System Development Charges

A System Development Charge (SDC) is essentially a fee collected as each piece of property is developed, and which is used to finance the necessary capital improvements and municipal services required by the development. Such a fee can only be used to recover the capital costs of infrastructure. Operating, maintenance, and replacement costs cannot be financed through system development charges.

Two types of charges are permitted under the Oregon Systems Development Charges Act; improvement fees and reimbursement fees. The SDCs charged before construction are considered improvement fees and are used to finance capital improvements to be constructed. After construction, SDCs are considered reimbursement fees and are collected to recapture the costs associated with capital improvements already constructed or under construction. A reimbursement fee represents a charge for utilizing excess capacity in an existing facility paid for by others. The revenue generated by this fee is typically used to pay back existing loans for improvements.

Under the Oregon SDC Act, methodologies for deriving improvement and reimbursement fees must be documented and available for review by the public. A Capital Improvement Plan (CIP) must also be prepared which lists the capital improvements that may be funded with improvement fee revenues and the estimated cost and timing of each improvement. Thus, revenue from the collection of SDCs can only be used to finance specific items listed in a Capital Improvement Plan. In addition, SDCs cannot be assessed on portions of the project paid for with grant funding.

Local Improvement District (LID)

Improvement Bonds issued for Local Improvement Districts (LIDs) are used to administer special assessments for financing local improvements in cities, counties, and some special districts. Common improvements financed through a LID include storm and sanitary sewers, street paving, curbs, sidewalks, water mains, recreational facilities, street lighting, and off-street parking. The basic principle of special assessment is that it is a charge imposed upon property owners who receive special benefits from an improvement beyond the general benefits received by all citizens in the community. A public agency should consider three “principles of benefit” when deciding to use special assessment: 1) direct service; 2) obligation to others; and 3) equal sharing/basis. Cities are limited to Improvement Bonds not exceeding three percent of true cash value.

The Oregon Legislature has provided cities with a procedure for special assessment financing (ORS 223.387-399), which applies when city charter or ordinance provisions do not specify otherwise. To establish a LID, an improvement district is formed, the boundaries are established, and the benefited properties and property owners are determined. An approximate assessment to each property is determined based on the above three principles of benefit and is documented in a written report. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for the purpose of making monthly payments to the Contractor. Therefore, some method of interim financing must be arranged based on the estimated total costs.

The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value at least equal to fifty percent of the total assessments to be levied. As a result, owners of undeveloped property usually require a substantial cash payment. In addition, the development of an assessment district is very cumbersome and expensive.

Ad Valorem Taxes

Ad valorem property taxes are often used as a revenue source for utility improvements. Property taxes may be levied on real estate, personal property or both. Historically, *ad valorem* taxes were the traditional means of obtaining revenue to support all local governmental functions.

A marked advantage of these taxes is the simplicity of the system; it requires no monitoring program for developing charges, additional accounting and billing work is minimal, and default on payments is rare. In addition, *ad valorem* taxation provides a means of financing that reaches all property owners that benefit from a water system, whether a property is developed or not. The construction costs for the project are shared proportionally among all property owners based on the assessed value of each property.

Ad valorem taxation, however, is less likely to result in individual users paying their proportionate share of the costs as compared to their benefits. Public hearings and election with voter approval would be required to implement *ad valorem* taxation.

User Fees

User fees can be used to retire General Obligation Bonds, and are commonly the sole source of revenue to retire Revenue Bonds and to finance operation and maintenance. User fees represent monthly charges of all residences, businesses, and other users that are connected to the water system. These fees are established by resolution and may be modified, as needed, to account for increased or decreased operating and maintenance costs. User fees may be based on a metered volume of water consumption and/or on the type of user (e.g. residential, commercial, schools).

Assessments

Under special circumstances, the beneficiary of a public works improvement may be assessed for the cost of a project. For example, the City may provide some improvements or services that directly benefit a particular development. The City may choose to assess the industrial or commercial developer to provide up-front capital to pay for the administered improvements.

10.3 Financing Strategy

A financing strategy or plan must provide a mechanism to generate capital funds in sufficient amounts to pay for the proposed improvements over the relatively short duration in design and construction, generally two years. The financing strategy must also identify the manner in which annual revenue will be generated to cover the expense for long term debt repayment and the on-going operation and maintenance of the system.

The objectives of a financial strategy include the following:

- Identify the capital improvement cost for the project and the estimated expense for operation and maintenance.
- Evaluate the potential funding sources and select the most viable program.
- Determine the availability of outside funding sources and identify the local cost share.
- Determine the cost to system users to finance the local share and the annual cost for operation and maintenance.

A financial strategy to address financing of the Phase I Improvements within the Capital Improvement Plan is discussed below.

Funding Sources

With any of the proposed funding sources within the financial strategy, the City is advised to confirm specific funding amounts with the appropriate agencies prior to making local financing arrangements. A "One-Stop" meeting with funding agencies is recommended as soon as the City has made a firm commitment to the extent and schedule of capital improvements.

Loans

Three types of project funding were identified as viable for funding the City's proposed Phase I Improvements: 1) Rural Development Water and Wastewater Financing Program, 2) Business Oregon Water/Wastewater Financing Program, and 3) Business Oregon Drinking Water State Revolving Fund. Based on these funding programs, three alternative funding packages were compiled and evaluated. A summary of the funding alternatives for these improvements is given in Table 10.3.1.

TABLE 10.3.1
FUNDING SCENARIOS FOR PHASE I IMPROVEMENTS

Funding Scenario		Loan Amount	Loan Term, yrs	Interest Rate	Projected Monthly Rate Increase per EDU [1]	Projected New Average Monthly Rate [1] [2]
1	USDA - W/WW Financing Program	$22,552,400	40	1.875%	$15.46	$48.43
2	BizOR - W/WW Financing Program	$22,552,400	30	2.19%	$19.79	$52.76
3	BizOR - SDWRLF	$22,552,400	20	1.75%	$25.79	$58.76

[1] 4,321 EDUs per Section 6.2.
[2] Average monthly rate for a 3/4-inch residential connection of $32.97 per Section 6.2.

The projected rate increases anticipated from the funding options range from $15.46 to $25.79 per Equivalent Dwelling Units (EDU) per month. For the purposes of this financing plan, further evaluation will be made with the most conservative value, which is $25.79 per EDU per month. Note that this is strictly for preliminary purposes and does not reflect the outcome of a "One-Stop" meeting. Additionally, terms and rates may change from this time. For all intents and purposes, Phase I Improvement projects are grouped together for projected rate increase calculations although maximum loan amounts may require projects to be funded individually or in smaller groups.

The projected new average monthly cost per EDU is anticipated to be approximately $58.32. With this increase in cost, changes to the City's rate structure will be necessary. For this increase to be properly implemented it is recommended that the City revise its rate study.

System Development Charges

In addition to the proposed financing strategy consisting of low interest loans, the City should revise its System Development Charges (SDC) to assist in financing necessary capital improvements to the water system required by growth and development.

The SDCs may be developed and assessed as reimbursement and/or improvement fees. The reimbursement fee approach is based on the premise that new customers are entitled to water service at the same cost as existing customers. Consequently, the reimbursement SDC is calculated as the average water system investment per customer. Calculation of a reimbursement SDC is beyond the scope of this Plan as research and documentation is needed to determine the total investment made to the City's water system, contributed capital, and debt service payments.

Affordability

One major consideration in deciding on any proposed capital improvements is the user's ability to support the full cost, including debt repayment of utility services. Several measures of household affordability or ability-to-pay have been proposed or are currently being utilized.

The majority of affordability indicators are largely a function of income and rates. One of the most common affordability indicators is the ratio of annual user charges to the MHI. The threshold of affordability for this ratio varies from 1.0 to 2.5 percent of MHI.

Affordability of rates and projected rate increases are also factors when bond rating agencies determine credit quality. Fitch Ratings generally considers combined water and sewer service rates higher than two percent of MHI (or one percent for individual water and wastewater utilities) to be financially taxing based upon the Water and Sewer Revenue Bond Rating Guidelines by Fitch Ratings on September 3, 2015.

A summary of affordability measures and thresholds from selected studies is provided in Table 10.3.2.

TABLE 10.3.2
SUMMARY OF AFFORDABILITY MEASURES AND THRESHOLDS

Source	Indicator(s)	Threshold
Future Investment in Drinking Water & Wastewater Infrastructure (2002)	Ratio of annual user charge & MHI	2.5% of MHI
Rural Utilities Service Water & Waste Disposal Loans & Grants	Debt service portion of annual user charge & MHI	>0.5% & MHI below poverty or >1.0% & MHI between 80 and 100% of statewide non-metropolitan MHI
Department of Housing & Urban Development	Ratio of water & sewer bills with household income	1.3 to 1.4%
National Consumer Law Center "The Poor and the Elderly - Drowning in the High Cost of Water" (1991)	Ratio of sum of water & sewer bills with household income	>2.0%
EPA Economic Guidance for Water Quality Standards Workbook (1995)	Ratio of annual user charge & MHI	<1.0% no hardship expected 1.0 - 2.0% mid-range >2.0% may be unreasonable burden
Affordability Criteria For Small Drinking Water Systems: An EPA Science Advisory Board Report (2002)	Discussion of affordability threshold, expenditure baselines, and differences in cost, income, and benefits	>1.0% must provide additional security >2.5% system probably cannot issue debt
State of Oregon Assessment Tools for SRF Loans	Ratio of annual user charge & MHI	1.5% MHI

One limitation of using the ratio of annual user charges to the MHI is the determination of a representative income for a community. Currently, most funding agencies still utilize the 2010 Census data for making this determination. As mentioned in Section 10.1, we have chosen to use the 2014 to 2018 American Community Survey (ACS) 5-Year MHI estimate for the City which is $61,185 (± $5,516). The basis for this decision is to better relate to the 2020 Census data which will be utilized by the funding agencies when the new Census data is released.

The affordability of existing and future water rates within the City of Molalla is summarized in Table 10.3.3.

TABLE 10.3.3
AFFORDABILITY OF WATER USER COSTS

Affordability Calculations	
Estimated MHI	$61,185
Current Rates	
Average Monthly User Charge per EDU	$32.97
Annual User Charge / MHI	0.65%
Projected Rates	
Average Monthly User Charge per EDU	$58.32
Annual User Charge / MHI	1.14%

10.4 Recommendations

The following recommendations are made to the City Council to implement the elements of this Plan.

TABLE 10.4.1
RECOMMENDED IMPLEMENTATION SCHEDULE

	Activity	Implementation Date
1	Submit Plan to the Oregon Health Authority (OHA) and Department of Water Resources (OWRD) for review and approval.	December 29, 2020
2	Address OHA and/or OWRD review comments and submit for final approval.	February 12, 2021
3	Receive Final Approval from OHA and OWRD.	February 26, 2021
4	Notify DLCD of Planning Commission Meeting.	March 1,2021
5	Planning Commission Meeting.	May 5, 2021
6	Hold City Council Meeting and adopt the Plan.	May 26, 2021
7	Conduct Water Rate and SDC Study.	July 30, 2021
8	Schedule and attend “One-Stop” meeting to discuss financing options for the proposed Phase I Improvement projects.	June 1, 2022
9	Submit funding agency applications and receive approval for financing of Phase I.	June 29, 2022
10	Authorize detailed design of recommended improvements and preparation of plans, specifications and contract for the Phase I Improvements. Secure the necessary special use permits for construction.	June 29, 2022
11	Submit plans and specifications to the Oregon Health Authority for review and approval.	April 1, 2023
12	Advertise for Phase I construction bids and award construction contract.	May 2, 2023
13	Start Phase I construction.	June 6, 2023

SECTION 11:

WATER CONSERVATION

SECTION 11: WATER CONSERVATION

11.1 Background

Water conservation consists of any beneficial reduction in water losses, waste, or consumption. As water providers face growing demands for limited resources, conservation planning is playing an increasingly important role in management practices. Water that is conserved, in effect, becomes a new and relatively inexpensive source of water for the utility provider.

Conservation can result in water providers downsizing, avoiding, or postponing water expansion projects. Capital, maintenance, financing costs and many other expenses may be reduced by effectively practicing conservation within the water system. Environmental benefits are also gained, which include restoring stream flows to support aquatic life, preserving recreational opportunities, and maintaining water quality. Investments in conservation planning yield savings that can be measured in terms of reclaimed water, resources, and related operating dollars.

A Water Conservation Plan is a long term program intended to reduce the average per capita water consumption, thus diminishing the overall demand placed on a water system and its resources. The Oregon Department of Water Resources (WRD) reviews municipal water management and conservation plans based on the requirements found in the Oregon Administrative Rules (OAR) Division 86. A standard Water Master Plan (WMP) provides many of the requirements of a conservation plan since several requirements overlap. The conservation and curtailment elements however, are typically not included. Sections 11 and 12 have been specifically prepared to satisfy the additional requirements as outlined in the OARs relating to conservation and curtailment.

A summary of where specific OAR requirements are addressed in this Plan is presented in Table 11.1.1.

TABLE 11.1.1
OREGON ADMINISTRATIVE RULES REFERENCE

Description	OAR Reference	Plan Section
Water Supplier Description		
Description of suppliers sources	690-086-0140(1)	5.1
Delineation of current service area	690-086-0140(2)	Figure 3.1.2
Assessment of adequacy and reliability of existing supplies	690-086-0140(3)	5.1
Quantification of present and historic use	690-086-0140(4)	6.2
Summary of water rights held	690-086-0140(5)	5.1
Description of customers served and water use summary	690-086-0140(6)	6.2
Identification of interconnections with other suppliers	690-086-0140(7)	n/a
System schematic	690-086-0140(8)	Figures 5.1.1 & 5.1.2
Quantification of system leakage	690-086-0140(9)	Table 6.2.6
Water Conservation Element		
Full metering of systems	690-086-0150(4)(b)	11.2
Meter testing and maintenance program	690-086-0150(4)(c)	11.2
Annual water audit	690-086-0150(4)(a)	11.2
Leak detection program	690-086-0150(4)(e)	11.2
Rate structure based on quantity of water metered	690-086-0150(4)(d)	11.2
Rate structure and billing practices that encourage conservation	690-086-0150(6)(d)	11.2
Public education program	690-086-0150(4)(f)	11.2
Progress report on previous WMCP	690-086-0150(1)	n/a
Documentation of water use measurement and reporting	690-086-0150(2)	11.2
List of measures already implemented or required under contract	690-086-0150(3)	11.2
Water Curtailment Element		
Assessing water supply	690-086-0160(1)	5.1 & 12.2
Stages of alert	690-086-0160(2)	Table 12.6.1
Triggers for each stage of alert	690-086-0160(3)	Table 12.6.1
Curtailment actions	690-086-0160(4)	Table 12.6.1
Water Supply Element		
Delineation of current and future service areas	690-086-0170(1)	Figure 3.1.2
Population projections for service area	690-086-0170(1)	3.2
Prepare schedule to fully exercise each permit	690-086-0170(2)	8.1
Prepare demand forecast	690-086-0170(3)	6.3
Comparison of projected needs and available sources	690-086-0170(4)	8.1
Other Items		
Date for submittal of next update	690-086-0125(6)	11.3

11.2 Current Conservation Measures

Municipal water providers are in the service of providing potable drinking water to their customers. The sale of that water allows the utility to pay expenses, retire debts for system development loans, and plan for future water production facilities. Some providers may view conservation as an activity that may jeopardize the financial survival of their water system. However, practically every water system is capable of making changes in their operation that will result in reducing "lost" or "nonaccount" water and lowering production costs. Conservation often results in an increase of operating revenues and a decrease in unnecessary and wasteful expenses. Responsible water management also includes educating the public about wasteful water use practices and the City continuing to enforce the Oregon Specialty Codes which emphasize water conservation. This Section addresses current water conservation measures that the City has implemented, and where applicable, how they might be improved upon. Section 11.3 addresses additional water conservation measures that are recommended for the City's implementation.

Water Use Measurement and Reporting

Reporting

The City of Molalla complies with OAR Chapter 690, Division 85 by recording monthly water production at their source intake on the Molalla River and submitting this information to the Oregon Water Resources Department. The City submits the data via the department's online form the first week of October each year for the previous water year, October 1 through September 30. The City's water use records can be found on the WRD website at: https://apps.wrd.state.or.us/apps/wr/wateruse_query/wr_wur_entity_report.aspx?directory_id=106140&start_year=&end_year=

Water Auditing

The purpose of a water audit is to track the efficiency of the system, monitor water consumption levels, determine effectiveness of conservation measures, and gather system performance data. The OARs require determination of the level of water loss as communities seek to reach efficiency goals of ninety percent or greater. The City should compile an annual water audit of its system as it currently does not perform one routinely. Previous audits were performed by consulting engineers in conjunction with water master planning.

In addition to an annual audit, the City should implement more frequent water audit for the raw and treated water systems. These audits will assist in detecting irregular water use patterns that may be attributable to leaks, malfunctions, and other system problems. Currently the City has staffing to perform this audit semi-annually. Results of this semi-annual audit will provide the City with additional feedback on the performance of its system and the effectiveness of specific repairs or improvements that have been recently developed.

The City should also develop estimates of known uses and losses on a monthly basis and maintain records of this water use. Known uses and losses will include estimating quantities of water used for flushing mains, water lost due to major leaks or water main replacement, and water utilized through hydrant meters. In addition, the City will need to implement a system to track water used for fire suppression and training through its hydrants. This auditing should be implemented as soon as possible even though all of the components may not be in place.

During the development of this Plan, the City installed water meters on all unmetered water services that were known to be unmetered and purchased the *AWWA M36 – Water Audits and Loss Control Programs* manual. The City is currently using the manual as a guide to develop City procedures for the

implementation of a Water Audit and Loss Control program. Full implementation of this program will be completed by the end of the year 2023.

Meter Testing and Maintenance

The City of Molalla's water system is fully metered. All individual water services are read and recorded on a monthly basis. All new connections to the City's water supply require water meters to be provided and installed by the City at the cost of the developer per the City of Molalla's *Public Works Design Standards.* The original radio reading meters installed throughout the City are reaching their designed usable life and need replacing. The City has been and will continue to proactively replace these meters.

Raw water metering is accomplished by use of two flowmeters located on both sides of the 14-inch raw water tee which splits flow prior to the treatment units. Backwash metering is accomplished by use of a 16-inch flowmeter shared by both treatment units. Treated water metering is accomplished by use of a flowmeter located in the "first user" building located west of the two million gallon treated water storage tank. The operation of the City's flowmeters located at the water treatment facility was reviewed with the City personnel. Calibration was recently completed to ensure they are maintaining two percent accuracy of true flow as specified.

The City does not have a specific meter testing plan in place for its service or Water Treatment Plant (WTP) facility meters; however, City personnel are diligent in testing and performing maintenance, or replacing meters that show abnormal readings.

As part of the completion of this Plan and the development of a Water Audit and Loss Control program, the City of Molalla will implement a meter testing, maintenance and replacement program for the City's water system meters. The testing interval and replacement schedule will be established based on the specific meter manufacturer's recommendations. The full implementation of the testing program will be completed by the end of the year 2023.

Rate Structure and Billing

The City utilizes a rate structure that attempts to create awareness that usage directly correlates with the user's monthly bills, which encourages customers to conserve water to save money. Meter readings are conducted monthly and bills showing quantity of water used are sent out promptly at the beginning of each month. Therefore, customers receive bills relatively close to the time water was consumed, providing a time price signal to the customer. The *Utility Rate Study* by Donovan Enterprises, Inc. prompted the current rate schedule effective as of July 1, 2019 and is shown in Table 11.2.1.

Billings for customers include two components: a fixed rate (demand charge) and a volume rate (commodity charge). The two components are added together to compute an invoice for each customer. The fixed rates are charged per connection to the water system. They are based on costs associated with operation and maintenance, reading meters, debt service, and billing expenses. Volume rates are based on the customer class for each 100 cubic feet of water and increase by $3.03 for every 100 cubic feet of water used. The City's current water rate methodology is sound, conforms to industry practice, and promotes conservation.

TABLE 11.2.1
JULY 2019 RATE SCHEDULE

Meter Size (inch)	Rate	Use Charge (per 100 cubic feet)
3/4	$13.82	$3.03
1	$23.17	$3.03
1-1/2	$46.10	$3.03
2	$74.07	$3.03
3	$161.32	$3.03
4	$276.54	$3.03
6	$576.10	$3.03
8	$829.60	$3.03

The City will continue to bill customers on a monthly basis and use the fixed rate plus volume rate system of billing based on the size of their water meter and the volume of water consumed. To assist the City with long term project planning and to review the effectiveness of the current structure, it would be beneficial for the City to update the July 2017 *Utility Rate Study* every five years. Rate studies typically review revenue requirements, funding options, analysis of alternate rate structures, and rates and fees by customer class. The City will continue to implement recommendations from the 2017 *Utility Rate Study*.

An escalating rate structure based on user consumption tiers is growing in popularity for the purpose of promoting water conservation. It can also recover capital costs that tend to increase with excessive user demand. For these reasons it is recommended that the City pursue this alternate rate structure during their rate study update.

City Staff will also continue to provide an account review and offer advice on ways to conserve water whenever a customer expresses interest. When the City suspects that a customer has a leak, the City will continue to notify the customer about the high water usage or continuous flow at the meter, and suggests that the customer check for a leak. The City provides tips for lowering water use to promote water conservation.

Public Education Program

The City's current public education program provides a Water Conservation Tip Sheet that is available to water consumers on the City's website. The Water Conservation Tip Sheet offers water saving methods for both indoor and outdoor use along with external links to the Home Water Works and the Environmental Protection Agency (EPA) websites for further water consumption recommendations. These water conservation tools can be found via the City's online webpage at: https://www.cityofmolalla.com/publicworks/page/water-conservation-tip-sheet

The City will implement the distribution of water conservation flyers at City Hall, the local library, local businesses, social media and the City's newletter showing water saving tips and methods just prior to the heavy consumption during the summer months. The flyer will be displayed and available to citizens at the Molalla's City Hall and on the City's website year round.

The public education program will aim to address homeowners general disconnect from their outdoor water use. Alliance for Water Efficiency (AEQ), a nonprofit organization, conducted a recent study which found most homeowners believe they use ten to thirty percent of their overall water outdoors, when in fact thirty to sixty percent is used outdoors. Outdoor water use efficiency programs for single family customers have achieved average savings of a seven to thirty nine percent reduction in water use. The

research, conducted over a year period, included fourteen community driven programs, including incentives for efficient irrigation technologies, free distribution of mulch, turf-removal and water-wise re-landscaping, and customer site audits.

The City will begin to provide customers with comparisons of current use with the previous year's use as well as individual use versus the system's average use to promote water conservation. See Section 11.3, Technical and Financial Assistance Programs, for more information regarding City benchmarks addressing efficiency programs.

Reuse, Recycling, and Non-potable Water Opportunities

The City's Recycled Water Use Plan is currently based around the City of Molalla's Wastewater Treatment Plant's (WWTP) effluent disposal needs. Disinfected effluent flows by gravity to the effluent pump station, where it can be land applied and beneficially reused for irrigation from May through October. The City has a total recycled water capacity at the land application sites of 201.4 million gallons. The recycled water capacity for each site is based upon amended land application plans as originally presented in the *Consolidated Recycled Water Use Plan* prepared by Brown and Caldwell in July of 2015. Land application sites for irrigation include Coleman Ranch, Adam's Cemetery, and at the WWTP. The City's *Recycled Water Use Plan* by The Dyer Partnership, Engineers & Planners, Inc. in September of 2018 provides additional details for plans to extend and increase the use of recycled water from the WWTP. A copy of the WRD approval of land application is included in Appendix A.

The City will continue to recycle and reuse water where practical. Additionally, the City's WTP uses a backwash basin which is located just east of the WTP building; however, backwash water is often too turbid to be returned to the system. The City will begin to explore reuse and recycling of backwash water at the WTP and at public facilities.

11.3 Additional Conservation Measures

The OAR 690-086-0150(6) requires municipal water suppliers that serve a population greater than 7,500, to provide a description of the specific conservation activities and a five-year schedule for implementing additional conservation measures. The City's population served is currently estimated to be 9,885 therefore the City must adhere to these requirements.

The City does not have a previously approved plan so a progress report for previously implemented conservation measures is not required. Section 11.2 describes the City's existing conservation measures and how the can be improved upon. The City will provide a progress report after an update to this Water Conservation Plan in five years.

Technical and Financial Assistance Programs

The City does not currently have any technical or financial assistance programs to aid customers in implementation of conservation measures. However, with the adoption of this Plan the City will rewrite their water code to allow for financial assistance by adjusting utility billing to reduce charges resulting from verified water leaks. The City will monitor water accounts and notify residents of potential leaks based on abnormal water use readings and verify the leak with the property owner.

The City will also develop a program over the next five years to promote technical assistance through education on water conservation. Using the City's website and current water conservation tip sheet and associated interactive links for technical assistance, the City will implement this program by 2026.

Through the education program, the City will promote the use of water conservation kits and replacement of existing inefficient water fixtures. To assist with this, The City will supply a limited number of water efficient fixtures, on a first come, first served basis, to water system customers.

Leak Detection Program

In accordance to the OAR requirements, the City is required to implement a system-wide leak repair program to reduce system leakage to fifteen percent, and if feasible to ten percent. The City's nonaccount water delivered to the City from the years of 2017 to 2019 averaged approximately twenty five percent as described in Section 6.2 of this Water Management, Conservation and Water System Master Plan (WMCWSMP). As required, the City will initiate a comprehensive leak detection and repair program to identify points of leakage and estimate the costs and benefits of reducing leakage to fifteen percent or less. A leak detection program is listed as a Phase I project in Section 9 – Capital Improvement Plan of this Plan. The leak detection program will be developed as part of the City's Water Audit and Loss Control program, which is currently under development. The leak detection component of the program will be implemented by June, 2023.

The leak detection program will provide a description and analysis that identifies potential factors for water loss. This analysis will facilitate the prioritization of capital improvement projects, eliminate leaks as the cause of water loss, and assist the City with correcting leaks when they are detected. We recommend an initial leak detection survey be completed after the approval of this Plan and every five years thereafter.

The City will begin to conduct leak surveys as part of its leak detection program. The City will continue to budget for replacement of high priority aging infrastructure and continue to perform comprehensive inspections, every five years, of the treated water storage tanks.

Other Conservation Measures

The City of Molalla does not currently have any other conservation measures in place. With the implementation of this first Water Management and Conservation Plan, the City will begin evaluating potential measures for implementation. The future update of this Plan will include a discussion on any measures the City has undertaken.

11.4 Summary

This Plan is the first Water Conservation and Management Plan for the City of Molalla. The City currently has a few conservation actions in place, as discussed in Section 11.2, which will be improved upon where applicable. Additional conservation measures, as discussed in Section 11.3, will further extend the City's conservation effort. Over the next five years, the City intends to use this Plan as a guide to implement conservation techniques. The City's conservation techniques upon acceptance of this Plan include: instituting meter testing, maintenance and replacement program; regularly scheduled water audits; an update to the *Utility Rate Study*; and a leak detection program. The City will also begin to access a public education program, and technical and financial assistance programs.

All of the actions or "benchmarks" that the City plans to implement during the years of 2020 to 2025 are presented in Table 11.4.1. The City anticipates submitting an updated Water Management and Conservation Plan in 2026 with conservation actions for the time after 2025 based on the experience gained under the first Water Conservation and Management Plan.

TABLE 11.4.1
SUMMARY OF CONSERVATION BENCHMARKS

Benchmark	Start Date	Frequency or Completion
Water Use Measurement and Reporting		
Develop procedure for implementing annual and monthly audits.	2021	2023
Continued collection and recording of monthly meter readings.	2021	Monthly
Perform semi-annual water audit.	2023	Semi-Annually
Perform annual water audit.	2023	Annually
Meter testing and maintenance program implementation.	2023	2023
Continued replacement of radio meters reaching their usable life.	2020	2025
Preform rate study update and adoption, if accepted.	2021	2022
Public Education		
Provide a Water Conservation Tip Sheet at City Hall, the local Library, local businesses and through social media.	2021	Ongoing
Publish water conservation articles in the City's newsletter.	2023	Ongoing
Reuse, Recycling & Non-Potable Water Opportunities		
Evaluate whether reuse and recycling of backwash water is feasible at the WTP or at other public facilities.	2021	2023
Technical & Financial Assistance		
Rewrite water code to allow for financial assistance by adjusting utility billing to reduce charges resulting from verified water leaks.	2021	2023
Create education program that promotes the use of water conservation kits and replacement of existing inefficient water fixtures. Supply a limited number of water efficient fixtures, on a first come, first served basis, to water system customers.	2025	2026
Leak Detection Program		
Implement a leak detection program. Provide description and analysis identifying potential factors for the water loss and the selected action for remedy.	June, 2023	Ongoing
Design and construct desired Capital Improvement Plan (CIP) water line replacement as prioritized by the aforementioned leak detection program.	2023	Ongoing
Continue performing periodic and comprehensive inspections of the treated water storage tanks.	2023	Quarterly / Annually

SECTION 12:

EMERGENCY CURTAILMENT PLAN

SECTION 12: EMERGENCY CURTAILMENT PLAN

12.1 Background

A Water Curtailment Plan is defined as a short-term, mandatory program intended to drastically reduce water consumption as a result of an emergency, catastrophic event, or serious water shortage. A water provider is to develop a Water Curtailment Plan that would provide planning criteria, specific operating guidelines, and the enforcement measures that may be required in the event of a serious emergency or water shortage Oregon Administrative Rules (OAR) 690-86-160.

Most water systems have critical components, which if damaged, destroyed or contaminated, could cripple or prevent delivery of potable water to consumers. Such crises may last from a few hours to days, weeks, and/or months. As part of a comprehensive water management and conservation plan, a Curtailment Plan would assist the City in managing a short-term supply deficiency crisis.

In addition to a Water Curtailment Plan, the City should have an ordinance in place for declaration of an emergency and implementation of the Curtailment Plan in the event of an emergency water shortage. Once the water shortage is over, the City would return to providing normal water service to its customers.

The City of Molalla's Municipal Code Chapter 13.04 addresses the City's ability to interrupt service and to furnish water at economical service pressures which essentially gives the City Council the authority to limit water use. The ordinance falls short of meeting the requirements of OAR Chapter 690 Division 86 by not giving specific triggers for action or detailed actions; the ordinance does provide the Council general power to restrict the use of water.

As part of this Plan the City is working to update the ordinance to include the triggers and actions discussed below.

12.2 Assessing Water Supply and Storage

A history of supply deficiencies or emergency water conditions would suggest the need to prepare for future water supply deficiencies. If drought, contamination, system breakdown, or some other event has interrupted or hampered water supply efforts in the past, they are likely to hamper water supply efforts in the future. The severity of historical events can also suggest the relative importance of planning for future events.

A water provider should be prepared for periods of supply deficiency. The development of policy, ordinances, and other measures should not wait until the provider is in the midst of a water shortage. Knowledge of the past deficiencies and information about the causes and indicators of future water supply emergencies will aide water suppliers in providing a consistent and reliable product to the consumers.

No major emergencies have affected the City's ability to supply water over the past ten years.

The capacity of the system is limited to the production of the Molalla River intake located 0.4 miles east of the Water Treatment Plant (WTP). As discussed in Section 5, the Molalla River and Trout Creek water rights are sufficient for now to supply the City's needs; however, no source redundancy exists. Pursuing an emergency backup water supply or source is recommended should the primary source have issues supplying the City's needs.

The City also has two reservoir tanks totaling 3.2 Million Gallons (MG), which they can rely on for short term outages. The WTP and Influent Pump Station (IPS) are set to run on level demand in the reservoir

tanks so the full storage capacity is maintained. This gives the City 1.5 days of peak daily demand available for water supply should all source production completely stop.

12.3 Stages of Alert

Curtailment Plans typically contain both voluntary and mandatory water use restrictions. These restrictions become more numerous and severe in nature as water shortage become more pressing. In the early stages of a shortage, Curtailment Plans usually rely on public education and customers implementing voluntary curtailment actions. Specific and mandatory measures are reserved for when the shortage situation becomes increasingly dire.

Water shortage emergencies may occur suddenly or gradually over time. Short-term emergency water supply shortage can come in the form of sudden interruptions, such as loss of power, mechanical and /or equipment failures, pipeline failures, contamination of the water supply or distribution system, natural disasters (e.g. earthquakes, high winds), and man-made disasters. For immediate shortages, specific measures need to be implemented quickly to reduce water demand and avert a more critical situation. Other shortages, such as supply shortages, may be more gradual in nature, as in the case of a drought. In these circumstances, curtailment measures can be gradually implemented to correspond with the progression of the shortage.

A Water Curtailment Plan should contain at least three levels or stages of alertness or restrictions. The levels should range from an initial level of concern to a severe level-of-alertness to a final critical level. Each level should include predetermined indicators that will invoke a specific level-of-alertness requiring predetermined actions and an associated list of recommended curtailment measures.

As mentioned above, City Municipal Code Chapter 13.04 does not provide specific stages for alert in order to implement water use restrictions. The following are the proposed stages that will be included in the revised ordinance.

Alert Stage No. 1: Water Alert Status

Alert Stage No. 1, Water Alert is primarily used as a means to inform and educate the public that there is a potential water supply problem. While the supply problem may not yet warrant mandatory water conservation, voluntary conservation by the water users is recommended to reduce the water supply demand and lessen or possibly eliminate the imposition of more advanced Alert Stage levels. If the public is aware of the potential for problems, they will be more likely to accept and adhere to more serious requirements should the alert status be increased.

This level-of-alert could be declared if a water shortage or equipment failure poses a potential threat to the ability of the water system to meet the demands of its customers. It may also be appropriate to declare this Alert Stage during major construction or maintenance of existing water system components. One possible scenario would include taking one reservoir temporary off-line for painting, cleaning, or performing minor maintenance activities.

Alert Stage No. 2: Water Warning Status

Alert Stage No. 2, Water Warning is Level 1 of action for the City to enact mandatory water use requirements within the water system. This level would include all planned activities requiring temporary conservation including construction and maintenance activities as well as preparing for expected drought conditions.

This level-of-alert could be declared if a water shortage or equipment failure poses a serious threat to the ability of the water system to meet the fire flow and use demands of its customers. It may also be appropriate to declare this Alert Stage if a component within the water system breaks down or is taken off-line for an extended period of time. This would include major repairs or renovations within the Water Treatment Plant, major renovation of a reservoir, or another major improvement project.

Scenarios that would require this level-of-alert would typically be those that could be planned and prepared for. This Alert Stage could be instituted as a follow-up status to Alert Stage No.1 after the public has been informed of potential problems and given an opportunity to carry out voluntary conservation activities.

Alert Stage No. 3: Water Emergency Status

Alert Stage No. 3 Water Emergency is imposed when water supply conditions raise the alert status from a warning to an emergency status. A wider range of water use activities is affected. This stage contains the most restrictive level of mandatory water conservation activities with higher penalties to enforce the curtailment status.

This level-of-alert could be declared if a water shortage or equipment failure poses a severe and immediate threat to the ability of the water system to meet the fire flow and use demands of its customers. Indicators may include an eminent loss of a portion or total source of supply. Other indicators could include a chemical spill in a water supply, severe equipment failure, and other severe water supply issues.

Alert Stage No. 4: Critical Water Emergency Status

Alert Stage No. 4 Critical Water Emergency is to provide the minimum amount of water necessary for existing water users to sustain life. This extreme level-of-alert is reserved for extreme water supply problems and would likely include severe measures, such as terminating water service from the City's distribution system and water rationing.

This final level-of-alert is necessary if scenarios from Level 3 result in disaster conditions that make it impossible for the water system to continue functioning under normal parameters. Indicators of this level include the inability of the Water Treatment Plant to produce additional water or the distribution system to deliver potable water to the consumers. This status is only for the most extreme cases where resources must by managed carefully and water rationed to consumers for the purpose of sustaining life.

See Section 12.5 for a discussion of the possible actions required of both the City and of the water users for each Alert Stage.

12.4 Indicators of Water Shortage Severity

A Water Curtailment Plan should include a list of predetermined levels of severity or indicators that would invoke or "trigger" a predefined level of water curtailment alert. Triggers provide the City an ability to legally impose restrictions once the emergency conditions of the trigger have been satisfied. In addition, triggers are predetermined reference points that can avoid any guesswork about when to impose restrictions during an emergency.

For most Alert Stages, one or more indicators are incorporated into a plan to serve as potential triggers for implementation of an Alert Stage of a Curtailment Plan. In some cases, one trigger may be sufficient to implement a curtailment alert phase. In other instances, multiple triggers in the form of an "and/or" approach provides the City with the reference points in assessing an emergency and the flexibility in determining the most appropriate response to a particular water shortages crisis.

A number of different potential indicators may be utilized for determination of water storage severity and the appropriate Alert Stage. For the City of Molalla, potential water shortage indicators include Palmer Drought Index, Surface Water Supply Index, stream and/or diverted water flow, and elevation or capacity of the City's finished water storage tanks. The suitability of these potential indicators of water storage severity are evaluated and discussed below.

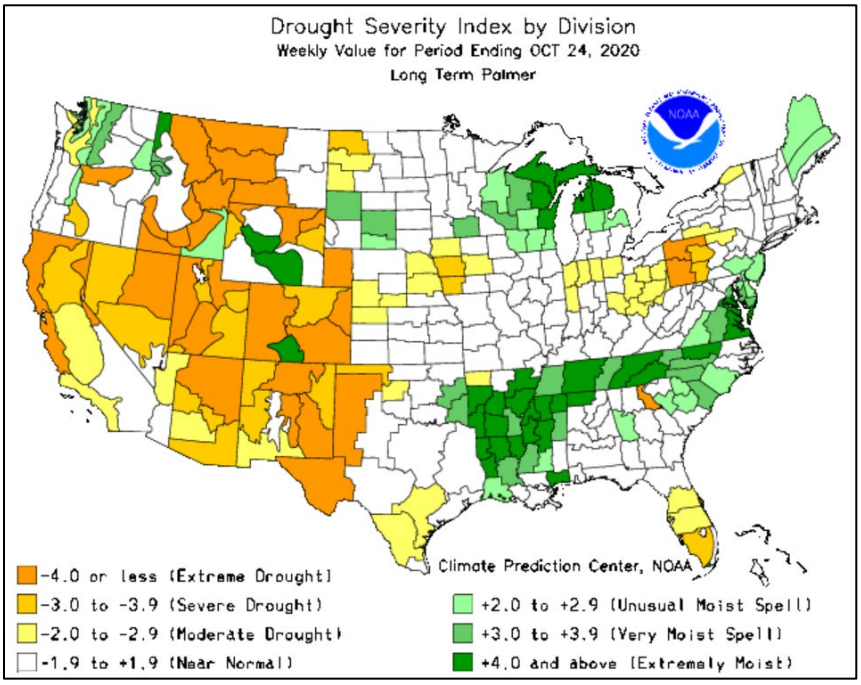
Palmer Drought Index

The Palmer Drought Index (PI) is a widely used scale for measuring drought conditions. This index uses long term records of temperature and precipitation to determine dryness and is tabulated by the National Weather Service on a weekly basis. The PI calculations are made for 350 climate divisions in the United States and posted on the National Oceanic and Atmospheric Administration (NOAA) and National Weather Service websites. The PI is updated weekly and is easily accessible at the following website: https://www.cpc.ncep.noaa.gov/products/monitoring_and_data/drought.shtml

A PI of zero is representative of normal weather in all seasons and in any climactic region. Droughts are depicted as negative index values while wet periods are shown with positive values. Consecutive negative values from week to week can provide initial warning of an impending drought. The magnitude of long term negative values can assist the City in determining the severity of the drought condition. A copy of the PI for October 24, 2020 is shown in Figure 12.4.1. For this time period, the City of Molalla is in the white band (near normal conditions). Even though the PI is not necessarily supply specific, this index can provide valuable information to forecast and assess the severity of a potential or actual water supply crisis.

For the City's Water Curtailment Plan, the City would be interested in the negative or drought index regime. Conveniently, the negative PI regime is divided into three drought levels: moderate drought (-2.0 to -2.9), severe drought (-3.0 to -3.9), and extreme drought (-4.0 or less). These three tiers of the negative PI are recommended as triggers for the first three levels of the Curtailment Plan.

FIGURE 12.4.1
ILLUSTRATION OF PALMER DROUGHT INDEX



Surface Water Supply Index

The Surface Water Supply Index (SWSI) is an index that describes the current state of water resources within the major river basins in the State of Oregon. Calculated monthly by the National Resource Conservation Service (NRCS), the SWSI can be used to identify which river basins are above, below, or at the normal surface water supplies. The SWSI for Oregon is updated monthly.

For the purposes of curtailment triggers, the range of interest is between –1.5 and –4. A recommended division of this range of interest for the first three Alert Stage levels may be as given in Table 12.4.1.

TABLE 12.4.1
RECOMMENDED SWSI VALUES FOR ALERT STAGE LEVELS

Alert Stage	SWSI
No. 1: Water Alert	-1.5 to -2.5
No. 2: Water Warning	-2.5 to -3.25
No. 3: Water Emergency	-3.25 to -4.0

Combining information from the PI and the SWSI will provide valuable insight to both the "big picture" and the local conditions based on readily available and accepted information.

Stream and/or Diverted Flow

Stream flow and/or the amount of water taken from the point of diversion are potential indicators of water severity. During a drought, the City may be restricted in the amount of water that can be diverted from the Molalla River due to the current location of the raw water intake. Large gravel accumulations and heavy organic debris build-up on and around the screens occurs annually; though it is unsure at which river level the City may experience limited intake capabilities. The City's water rights are senior to instream water rights; therefore, not restricting the City's ability to divert raw water for their full certificated amount.

Level in Finished Water Tanks / Disruption of Water Production & Delivery

Treated water storage tanks are designed to provide equalization storage, emergency storage, and reserves for fire suppression. In the event that the potable water from the WTP is not available, the City's treated water tanks would become the source of water for the community. There are a number of situations that would potentially affect the Water Treatment Plant's ability to supply water to the City's distribution system, including the following:

- A break in the City's treated water transmission main.
- A mechanical breakdown at the WTP.
- Scheduled maintenance at the WTP.
- Contamination of raw or treated water by pesticide, chemical spills, sabotage, etc.
- Extended power outage.
- Inability to obtain raw water for basic service due to extreme drought conditions.

If anticipated delivery of treated water to the distribution system is to be disturbed for a period more than twenty four hours, the City may wish to initiate the Curtailment Plan. However, the decision to initiate the Plan and selection of the most appropriate Alert Stage will depend upon a combination of such factors as the available storage in the treated water tanks, time of year or seasonal usage, and the anticipated length of the outage or disruption in water production. Consequently, the decision to initiate a specific Alert Stage would depend on how long the existing water storage would satisfy recent water demand and whether water delivery would be restored in this time period.

Curtailment of Diversions by Governmental Agencies during Drought Conditions

Another recommend stage activation indicator is the Governor's declaration that a severe, continuing drought exists in Clackamas County. Such a declaration is a public acknowledgement by the state that a severe drought is affecting the health and welfare of the County. Depending on its water supply and diversions, the City should utilize the Governor's declaration to activate or advance an Alert Stage. The Governor also has the authority to order individual state agencies and political subdivisions to implement a water conservation or Curtailment Plan Oregon Revised Statutes (ORS) 536.720(2). With a Governor's order, the City would be required to implement one of the Alert Stages of its adopted Curtailment Plan.

Staff Assessment

While an endless number of indicators can be compiled and inserted into a Curtailment Plan, it is impossible to account for every possible water supply crisis that may occur. For the unknown or uncertainty of a crisis, a water provider relies on the judgment of its Operators and system manager in handling a potential or real emergency. Few will know more about the viability and condition of the City's water supply and system than the City Staff. While the City's consulting engineer and state agency representatives may understand how the system works, they do not have the Staff's day-to-day experience and "feel" of the system's operation. It is therefore recommended that the Curtailment Plan and ordinance provide the City's Staff the ability and autonomy to invoke Alert Stages as needed to maintain adequate water service within the City's system.

12.5 Water Use Curtailment Actions

Each level-of-alert should include a description of conservation measures appropriate to that level. These measures should provide guidelines, define acceptable and prohibited water usage, and describe the penalties for not abiding by the declaration of water curtailment. A description of potential water curtailment actions that may be employed by the City is described below. Recommended curtailment actions for implementation by the City is presented in Section 12.6.

City's Public Informational Measures

To successfully implement and achieve substantial water-use reductions within the community, the public must be involved, informed and willing to participate with the proposed curtailment measures. An effective public outreach program should be developed to accomplish the following four results.

- Keep the public informed about the supply situation.
- Inform the community what actions are being proposed and being taken.
- Describe how those actions will mitigate the water severity situation.
- Determine how well the public is doing in terms of meeting the plan's goals.

Information measures to be implemented will depend upon the severity, Alert Stage, and anticipated duration of the water curtailment. The following discussion provides suggestions for informing the public, dealing with the media, and presentation. Portions of this discussion originated from *Drought Management Planning* by the American Water Works Association (AWWA) in 1992.

Potential Options for Informing and Educating the Public

Each community will have to tailor its public outreach to the specific needs and special requirements of its residents. The City may wish to implement one or more of the following suggestions for reaching out to the public during a water curtailment situation.

- Construct and erect a sign indicating the current status of the City's water system by Alert Stage. The City may wish to use a different color and brief description for each Alert Stage. The sign should be on display in a non-hazardous location that would be easily visible to the public. A potential location would be in front of City Hall.

- Provide periodic notices at various Alert Stages to the keep the public informed in a timely manner. These notices should specify such information as when Alert Stages are triggered or terminated, and what actions should be taken or discontinued. The City may wish to use a newsletter type notice that is printed on distinguishable color paper for added recognition. The notices can accompany bills or be distributed by hand.

- Write a fact sheet describing the situation, anticipated time duration of any measures, and actions that the water users can take to help bring relief. The recommended actions for the users should describe the appropriate curtailment measures and also suitable water conservation measures and/or devices. This sheet could be distributed to both the media and the public.

- Conduct public meetings as needed to convey information and enhance the community's participation in dealing with the situation. The City may wish to schedule these meetings at times other than the regularly scheduled times in order to provide enough time for discussion of the water situation.

- Public service advertising should be utilized where possible. Take advantage of large group gatherings in your community (e.g. high school football games, church services) to relay the City's message. It may also be advantageous for the City to use its Staff and/or volunteers to conduct personal visits to residences to discuss water conservation measures and general concerns of the public.

Dealing with the Media

The media can be a great asset in promoting and informing the public in a water crisis. The easiest way to utilize the media is to keep them informed. When dealing with the media, the City should have one person speak for the City and remain as the contact during the entire water crisis in order to prevent inconsistencies in communicating information.

Media inquiries should be responded to immediately to maintain communication and to avoid the media from seeking information from less informed sources. The City may wish to compile a fact sheet or press packet prior to implementing a water curtailment. Scheduling regular press briefings should be implemented once a Curtailment Plan is put into place. Effective communication with the media provides the City an opportunity to present an accurate account of the water crisis.

Presentation

It is critical that the City maintain a credible public image at all times, but especially during a water crisis. The kind of information that is released and to whom it is released should be unbiased. Information that is embarrassing or detrimental to the City should be presented openly and frankly just as favorable and supportive information. The City should strive to be the best, most complete and reliable source of information during a water crisis. The City should not withhold information or keep it "confidential".

It is important for the City to communicate precisely and not exaggerate the serious nature of the situation. The City's water users must understand what events will trigger various responses and how their actions can aid themselves and the community to deal with the water crisis.

Non-Essential-Use Restrictions and Bans

Non-essential-use restrictions and bans are used to eliminate or restrict some uses of waters. Examples of non-essential-use restrictions and bans include the following:

- Restaurants discontinue routinely offering water to customers unless specifically requested.
- Prohibiting the use of water for scenic and recreational fountains, ponds and lakes; except for the minimum amount required to support fish.
- Prohibiting the use of water from hydrants for construction purposes including: dust control, fire drills, line flushing, or any purpose other than firefighting.
- Prohibiting the use of water to a wash any motor vehicle, motorbike, boat, trailer, airplane, or other vehicle, except at a commercial fixed washing facility.
- Prohibiting the use of water to wash down any sidewalks, walkways, driveways, parking lots, streets, other hard surfaced areas, buildings, or structures. Prohibition of water to run to waste in any gutters or drains.
- Restricting the type and time of watering lawns, bushes, shrubs, trees, vegetable or flower gardens, and fruit trees. Type of watering may be restricted to by hand using either a hose with self-closing nozzle, a container such as a bucket or sprinkler can, or a drip irrigation system. The time of watering may be limited by the hours of the day (e.g. 9 p.m. to 7 a.m.) or by the day of the week (e.g. even numbered addresses on even days, odd numbered addressed on odd days).
- Prohibiting the use of water to fill, refill, or add to any indoor or outdoor swimming pool, hot tub, Jacuzzi pools unless the use of the pool is required by a medical doctor's prescription.
- Prohibiting and/or restricting the use of water for irrigation of public parks and cemeteries.
- Prohibiting new hook-ups to the City's water system.
- Restricting or prohibiting the use of water for revegetation unless required under an approved erosion and sediment control plan pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No. 1200-C.

The suitability of a particular measure for a specific alert level will depend on such criteria as anticipated water-use reduction, user acceptance, equity, cost, sustainability, legal and contractual issues, and ease of implementation.

As the water provider, the City should take the lead in reducing its water usage by either modifying or eliminating non-critical water use activities until the curtailment event has passed.

Rationing

Rationing measures can be an effective means of reducing water demand during a crisis if it provides equity among the users. Sometimes percentage reductions or seasonal use allocations are utilized for rationing. The pitfalls of these forms of rationing include favoring historical heavy water users, penalizing customers that have conserved in the past, and additional Staff time to research each user's previous water usage. An alternative rationing method is to set fixed allocations per household or capita, or per connection.

For residential users, communities have utilized both the percentage reduction and fixed allocation rationing methods to reduce water usage. The water allotment with the percentage reduction method is generally seventy to eighty percent of the previous year's non-drought year monthly account. With the fixed allotment method, the allotted water typically ranged from 200 to 400 gallons per day, with an average of approximately 250 gallons per day according to the AWWA in 1992.

Pricing

Rate structures that encourage conservation are helpful, whether or not a water provider is in a water crisis. Pricing structures that can be beneficial during a water crisis include seasonal rates, curtailment water rates, excess-use surcharges, and penalties for wasting water. Some communities utilize seasonal rates that are higher in the summer months to promote water conservation during peak usage. For most communities with a drought management plan examined by the AWWA in 1992, a surcharging pricing structure was used to penalize users who exceed their designated allotment. A "stepped" approach was typically used with increasing charges per gallon for incrementally larger amounts of used over the designated allocation. The use of penalties for wasting water will be discussed below.

Enforcement Measures

The enforcement of mandatory water curtailment measures and water rationing must have a legal basis for implementation. For the City, the legal basis would be an ordinance addressing water curtailment. The ordinance empowers the City to implement surcharges and delegates authority to City Staff to issue citations for noncompliance. Most water providers employ some sort of punishment for water waste or violation of prohibited practices. Penalties for non-compliance should be spelled out in the ordinance. Generally, most Curtailment Plans utilize a penalty fee and/or disconnection is used to penalize violators. The actual penalty for each violation would be decided upon by the City Council and incorporated into the ordinance.

Penalties with progressively more stringent consequences are employed for successive violations of water waste or prohibited practices. A response to a first violation may range from a warning with conservation education materials or retrofit kit to a nominal fine. In the case of a second offense, a nominal fee is typically imposed through a citation applied in the customer's bill. Other penalties that have been used for a second offense include installation of a flow restrictor and a 48-hour shutoff period. For a third offense, the penalties may include: 1) steeper fines, 2) installation of low-flow restrictors, and 3) cutting off the water supply to a user with charges for disconnection and reconnection of the service. Based on a survey of West Coast suppliers by the AWWA in 1992, a warning was usually sufficient to stop water waste. Second offenses were extremely rarely observed and third offenses were almost unheard of.

Most Curtailment Plans contain provisions for penalty variances for unusual or emergency circumstances. Granting a temporary variance for prospective uses of water otherwise prohibited should be determined

based upon unusual circumstances. Failure to grant such variances may cause an emergency condition affecting health, sanitation, or fire protection of the applicant or public. It is recommended that the ordinance contain language stating that variance requests must be received by the implementing agency within a certain time period following notification of the violation (e.g. five working days).

Monitoring

If non-essential water use restrictions and bans are implemented, then active enforcement will likely be necessary to substantially decrease water demand. The City may choose to utilize reactive enforcement, which relies on customers reporting violations. Next, City Staff would be dispatched to respond to the complaint. The benefits of this type of monitoring include reduced personnel expense, participation of the entire customer base, and placement of the water provider one step removed from the negative customer contact.

The other general method of monitoring is proactive enforcement. This form of enforcement utilizes designated Staff to actively patrol the service area and to issue warnings or citations when they discover a violation or prohibited use. The primary benefit of this type of enforcement is active enforcement of the Curtailment Plan and opportunities for conservation education. The disadvantages of proactive enforcement are the associated cost and potentially negative image with the public.

The City as Molalla will most likely utilize both types of enforcement. Although a City Staff member would probably not be dedicated to proactive enforcement, Staff will likely discover and issue penalties to violators in the course of performing their normal public works functions. The City would also rely on reactive enforcement to also enforce the enacted curtailment measures.

12.6 Recommended Curtailment Strategy

The OAR 690, Division 86 rules require that all public water suppliers have an Emergency Water Curtailment Plan. While the water supply for the City has been historically reliable, the City recognizes the need to be prepared for a decrease in available water supply. To address a decrease in the water supply, the City will update City Municipal Code Chapter 13.04 to include the curtailment triggers and actions covered in this Section.

The recommended Water Curtailment Plan for the City of Molalla is summarized in Table 12.6.1. Suggested Public Notice Texts for Water Alerts can be found in Table 12.6.2.

TABLE 12.6.1
SUMMARY OF RECOMMENDED WATER CURTAILMENT PLAN

Alert Stage	Stage Activation	Action Measures
No. 1: Water Alert	1. PI (-2 to -3) and/or 2. SWSI (-1.5 to -2.5) and/or 3. Water use reaches 90% capacity for 3 days and/or 4. Staff assessment.	1. Water status sign will indicate Water Alert Stage No. 1. 2. Call for voluntary reduction in all water use or mandates for watering. 3. Prohibit outside watering only between 7 a.m. to 9 p.m. 4. Restrict outside watering for even addresses on even numbered days & odd addresses on odd numbered days. No outside watering on Sundays. 5. Prohibit water wasted down gutters or streets & wash down of paved surfaces, streets, & structures. 6. Water use for wash down of paved surfaces & structures only for health & safety purposes. 7. Public outreach promoting conservation. 8. Implement watering citations. 9. Cease sale of water for construction purposes. 10. Prohibit new hook-ups to the City's water system. 11. Prohibit water to be used by Fire Department for drills or truck washing.
No. 2: Water Warning	1. PI (-3 to -4) and/or 2. SWSI (-2.5 to -3.25) and/or 3. Water use reaches 90% capacity for 2 days and/or 4. Staff assessment.	1. Water status sign will indicate Water Warning Stage No. 2. 2. All Stage No. 1 prohibited activities are also forbidden under Stage No. 2. 3. Curtailment citations and penalties remain in-place. 4. Continue public outreach to community. 5. Watering of any lawn, landscaping bushes, shrubs & trees is prohibited. 6. Watering of any vegetables or fruits are restricted to watering by hand using either a hose with self-closing nozzle, a container (e.g. bucket), or a drip irrigation system. 7. Prohibit washing of any vehicle, except at a commercial fixed washing facility. 8. Prohibit water for the use of scenic / recreational fountains, ponds & lakes except required to support fish. 9. Prohibit use of water in any air conditioner or air-cooling mechanism, except at a commercial business. 10. Prohibit adding water to any swimming pool.
No. 3: Water Emergency	1. PI (-4 and lower) and/or 2. SWSI (-3.25 to -4.0) and/or 3. Water use reaches 95% capacity and/or 4. Staff assessment.	1. Water status sign will indicate Water Emergency Stage No. 3. 2. All previously prohibited activities are also forbidden under Stage No. 3. 3. Curtailment citations and penalties remain in-place. 4. Continue public outreach to community. 5. 70% of previous month water consumption. Billing for overage usage will notify users that residential customers are allotted 50 gallons/capita/day based on the number of persons living at each household and that a billing penalty and surcharges will be adjusted or removed if 70% of previous month usage results in allocation less than 50 gallons/capita/day. Aggrieved customer to provide proof of residency for persons claimed for higher allocation to receive refund or penalty adjustment. 6. Commercial & industrial users will be restricted to the 85% volume of water used in prior month or same month in prior year, whichever is greater. 7. Restaurants discontinue routinely offering water to customers unless specifically requested. 8. Implement a surcharge pricing structure for water use over the allotted use. Recommend double the consumption rate charge for all usage over water allocation amount and $10 base penalty surcharge for residential customers and $40 for commercial and industrial users.
No. 4: Critical Water Emergency	1. Water use reaches 100% intake or treatment capacity and/or 2. Total loss of intake or treatment capacity and/or 3. Staff assessment.	1. Water status sign will indicate Critical Water Emergency Stage No. 4. 2. City may discontinue water service through its normal distribution system. 3. If water remains in the City's finished water tanks, water may be provided in small quantities to residents in their containers either directly from a designated tank or location within the City. 4. If water is not available in the City's finished water tanks, the City would locate a source of potable water & have it delivered to the City. Small quantities of potable water would be provided to residents, at no cost, in their containers.

TABLE 12.6.2
SUGGESTED PUBLIC NOTICE TEXTS FOR WATER ALERTS

Alert Stage	Text Alert
No. 1: Water Alert	As of _____ , until further notice, the City of Molalla has issued a Stage 1 Water Shortage Alert for its customers due to _____ . The City requests voluntary reduction of all water use. Outside watering will only be permitted for even addresses on even dates and odd addresses on odd dates with no Sunday watering and no watering between the hours of 7 a.m. and 9 p.m. Washing of paved surfaces is prohibited except for health and safety purposes. Other restrictions apply. Further information is available _____ .
No. 2: Water Warning	As of _____ , until further notice, the City of Molalla has issued a Stage 2 Water Shortage Warning Notice for its customers due to _____ . The City requests voluntary reduction of all water use. All outside watering is prohibited except for vegetables or fruits which are restricted to hand watering. Washing vehicles or paved surfaces is prohibited except for health and safety purposes. Water use for scenic ponds, fountains, or lakes is prohibited except as required to support fish. The filling of swimming pools is prohibited. Other restrictions apply. Further information is available _____ .
No. 3: Water Emergency	As of _____ , until further notice, the City of Molalla has issued a Stage 3 Water Emergency Notice for its customers due to _____ . Penalties and surcharges are in effect for residential water use exceeding 70% of the previous month's usage and for commercial or industrial use exceeding 85% of the previous month's usage or same month's usage in previous year. Outside watering is prohibited except for vegetables or fruits which are restricted to hand watering. Washing vehicles or paved surfaces is prohibited except for health and safety purposes. Water use for scenic ponds, fountains, or lakes is prohibited except as required to support fish. The filling of swimming pools is prohibited. Other restrictions apply. Further information is available _____ .
No. 4: Critical Water Emergency	As of _____ , until further notice, the City of Molalla has issued a Stage 4 Critical Water Emergency Notice for its customers due to _____. The City has discontinued water service. Upon resumption of service a boil order may be in effect. Drinking water will be provided to customers in quantities of up to _____ gallons in customer's own containers at the following locations: _____ . Further information is available _____ .
Alert Cancellation or Downgrade	As of _____ , the City of Molalla has (cancelled/reduced) the Stage _____ Alert Notice for its customers due to _____ . The alert status is currently (normal / Stage _____). (Insert current alert description or special instructions). Further information is available _____.