CITY OF TOPPENISH

WATER SYSTEM PLAN

Prepared by:

HLA
Engineering and Land Surveying, Inc.

PROJECT NO. 15122

August 2017

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INTRODUCTION

INTRODUCTION

The City of Toppenish is located within the eastern part of Yakima County. The City lies approximately 25 miles south of the City of Yakima, approximately 2½ miles south of Interstate 82, near the junction of State Route 97 and State Route 22. Incorporated in 1907, Toppenish lies entirely within the Yakama Nation Reservation. The City is situated on a relatively flat portion of the Yakima River flood plain, at an elevation of 740-770 feet above mean sea level. Toppenish's economy depends largely upon the agricultural industry. Produce from Yakima and the Columbia Basin is processed and shipped from facilities within Toppenish, and the City is also home to a large meat packing facility. These facilities provide much of the employment; in addition, Toppenish has a viable commercial and service business community.

Toppenish recognizes the need to improve and expand its water system if it is to meet the demands of its system users and to keep pace with other growth-oriented improvements in this vital Yakima County community. HLA Engineering and Land Surveying (HLA), was authorized by the City of Toppenish to prepare this Water System Plan, which represents the culmination of planning and data collection efforts.

PLANNING REQUIREMENTS

Water systems with 1,000 or more services are required to have a water system plan approved by the Washington State Department of Health (DOH) pursuant to the Washington Administrative Code, WAC 246-290-100 and WAC 246-291-140.

In order to assist water utilities in preparing their plans, the Department of Health has published the *Water System Planning Handbook* dated April 1997. This handbook identifies information needed to develop a "well-conceived and clearly-stated" water system plan. The handbook is organized into 10 major chapters, with each chapter representing a basic water system plan component. The 10 chapters are:

1. Description of Water System
2. Basic Planning Data and Water Demand Forecasting
3. System Analysis
4. Water Use Efficiency Program and Water Rights
5. Source Water Protection
6. Operation and Maintenance Program
7. Distribution Facilities Design and Construction Standards
8. Improvement Program
9. Financial Program
10. Miscellaneous Documents

Each chapter is divided into several sections to address specific topics in detail. The City of Toppenish *2017 Water System Plan* update has been prepared in the format of the Department of Health's *Water System Planning Handbook*.

OBJECTIVE

The principal goal of water system planning is to make efficient use of available resources. This is accomplished by making decisions about water system capital improvements and operations which are in accordance with overall system policies and directions expressed in a utility's water system plan.

An equally important reason for developing a water system plan is to assure orderly growth of the system while maintaining reliable delivery of high quality water. The plan is intended to guide water utility actions in a manner consistent with other activities taking place in the community.

The water system plan is intended to look ahead at least 20 years into the future. Development of a definite improvement schedule and financial program is required for the first six-year period, while the planning approach for the second period may be more conceptual. To continually provide adequate guidance to decision makers, the plan requires updating every six years.

Once adopted by the City of Toppenish and approved by the Department of Health (DOH), the Water System Plan is considered by DOH "to be a commitment to implement the actions identified in the improvement schedule." Future water system decisions shall be in accordance with the Water System Plan.

PROJECTED WATER DEMANDS

To plan for Toppenish's future water needs, the following items were examined:

Basic Planning Data (CHAPTER 2): Land use, future service area boundary, and population growth are used to evaluate demands on the Toppenish water system. The City's 2015 service population was estimated to be 8,965 by the Washington State Office of Financial Management (OFM), and the future population is projected to be 9,372 by the year 2023. Toppenish's 2015 number of residential water services was 2,091, and the future number of residential services is projected to be 2,185 by the year 2023.

Current Water Demands (CHAPTER 2): Toppenish's greatest year of water consumption in the last six years was in 2008 when 598.10 million gallons was consumed. The second greatest year of consumption was 2012 when 492.61 million gallons was consumed. This is equal to an average daily consumption of 3,139,150 and 2,744,168 gallons, respectively. The maximum month for year 2011 was identified as an outlier and treated as a rare event. For the purposes of this plan, the maximum month for year 2012 was used for future demand calculations. The maximum month of water consumption for year 2012 was experienced in August, when the average daily consumption for the month was 2,744,168 gallons. Maximum day consumption (based upon the maximum day of water production in the month) was calculated to be 3,146,022 gallons in August 2012, and peak hour consumption was calculated to be 4,369 GPM.

Projected Water Demands (CHAPTER 2): Toppenish's water demand forecast for the year 2023, and the City's current source capacity and water rights are below:

	Projected Year 2023 Demand	Current Source Capacity	Current Water Rights
ERUs (PHD)	3,448	- - - - - - -	- - - - - - -
Annual	585.929 MG	2,636.030 MG	1,042.65 MG
Maximum Day	3.831 MGD	7.222 MGD	6.07 MGD
Peak Hour	5,321 GPM	5,015 GPM	4,815 GPM

SUMMARY OF SYSTEM DEFICIENCIES AND RECOMMENDED IMPROVEMENTS

The following is a listing of the major water system deficiencies and recommended improvements which have been identified in the existing water system. The deficiencies have been grouped within three system categories (supply, storage, and distribution) and are generally placed in order of their importance. The deficiencies may be operational in nature (which have been identified by the City's Water Department personnel) or maintenance related, inadequate present or future capacities, and/or system hydraulics problems. A more detailed description of these deficiencies and related improvements can be found in CHAPTER 8 of this Plan.

SUPPLY

Water Quality – Toppenish currently adds chlorine for disinfection of its groundwater sources. The City's chlorination system is outdated and at many well locations the chlorine gas detector does not work. The chlorination system needs to be replaced with new chlorinators and related appurtenances, including the ability to allow variable feed rates.

Water Rights – The City's water rights status is crucial in determining the amount of possible future growth. Currently, Toppenish has adequate combined annual certificated (3,200 acre-feet) water rights and permitted instantaneous (4,815 GPM) withdrawal quantities from the Yakama Nation. The City's current permits expired in 2015 and are in the process of being renewed.

Source Well Reliability – The Department of Health's Water System Design Manual recommends on-site back-up power equipment be installed at the water system sources to improve system reliability. The City of Toppenish currently has back-up power equipment at five of its six source wells, with only Well No. 3 remaining without back-up power.

A reliable electrical and control system is critical to have a reliable source of supply to the system. Well No. 7, the City's largest source of supply at 2,200 GPM has been experiencing electrical issues, often preventing it from operating.

Well Nos. 5 and 8 each have their own lists of needed improvements, addressing issues such as sand production, motor longevity, failing fluoride pump, and inadequate facility. Scheduling periodical inspections and rehabilitations for each of the City's source wells would increase reliability and make maintenance costs more consistent.

Source Monitoring – The City currently does not take daily records of source well production. Although daily source meter readings are not required, doing so would greatly increase modeling accuracy and projected future demands on the system.

Protective Covenants – Though the City owns all of its well sites, source wells do not have a "Declarations of Covenant", establishing the required 100-foot sanitary radius of protection around the well. The City needs to execute and record "Declarations of Covenant" for each of the source wells.

STORAGE

Reservoir Cleaning and Maintenance – All four City reservoirs should be inspected and cleaned, based on a five-year maintenance cycle. Reservoir Nos. 3 and 4 were last cleaned and inspected in 2012. Reservoir No. 2 was last cleaned and inspected in 2013. Reservoir No. 5 was constructed in 2014. Reservoir No. 3 needs to be recoated.

DISTRIBUTION

Fire Flow Capacity – Figure 3-5 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, multiple locations are deficient based on the computer hydraulic model. Refer to Figure 8-1 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – A significant amount of the City's distribution system is made up of undersized and aging cast iron and asbestos cement pipes that are nearing the end of their useful life. The condition of each of these pipes is not fully known, but many are suspected to be corroded or leaking.

PROPOSED WATER SYSTEM FINANCIAL PROGRAM

Recommended system improvements are scheduled for completion in annual increments for the next six (6) years, as shown in Table 8-1 and Table 8-2 in CHAPTER 8 of this Plan. Scheduling of the remaining improvements beyond this six-year period needs to be reviewed yearly as priorities and City growth patterns change and progress. Major recommended improvements for future years (2023 through 2037) have been estimated, but have not been scheduled at this time. The estimated improvement costs are provided in Table 8-1 and Table 8-2, as well as the total projected yearly cost.

In order to fund the recommended water system improvements discussed in this Plan, a proposed financial program has been developed and is provided in Table 9-6 in CHAPTER 9 of this Plan. The proposed financial program incorporates projected operations, improvements, and loan costs for the next six-year period. Projected revenues and expenditures of the water system include growth factors and inflation rates to account for estimated growth within the City, as discussed in CHAPTER 9 of this Plan.

The City of Toppenish will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the next update of the *Water System Plan*. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

CHAPTER 1 - DESCRIPTION OF WATER SYSTEM

1.1 OWNERSHIP AND MANAGEMENT

1.1.1 Water System Ownership

The City of Toppenish, a municipal corporation located within the eastern part of Yakima County as shown in Figure 1-1 State Vicinity Map, owns and operates its own water system. Decisions regarding daily water system operations are made by the City Manager and the Public Works Director/Superintendent. Financial decisions regarding major water system improvements and establishment of water rates are made by the Toppenish City Council. The following parties are involved in the operation, maintenance, and planning for the Toppenish water production, storage and distribution facilities:

WATER SYSTEM NAME, OWNER, OPERATOR, AND IDENTIFICATION NUMBER:

City of Toppenish Water System

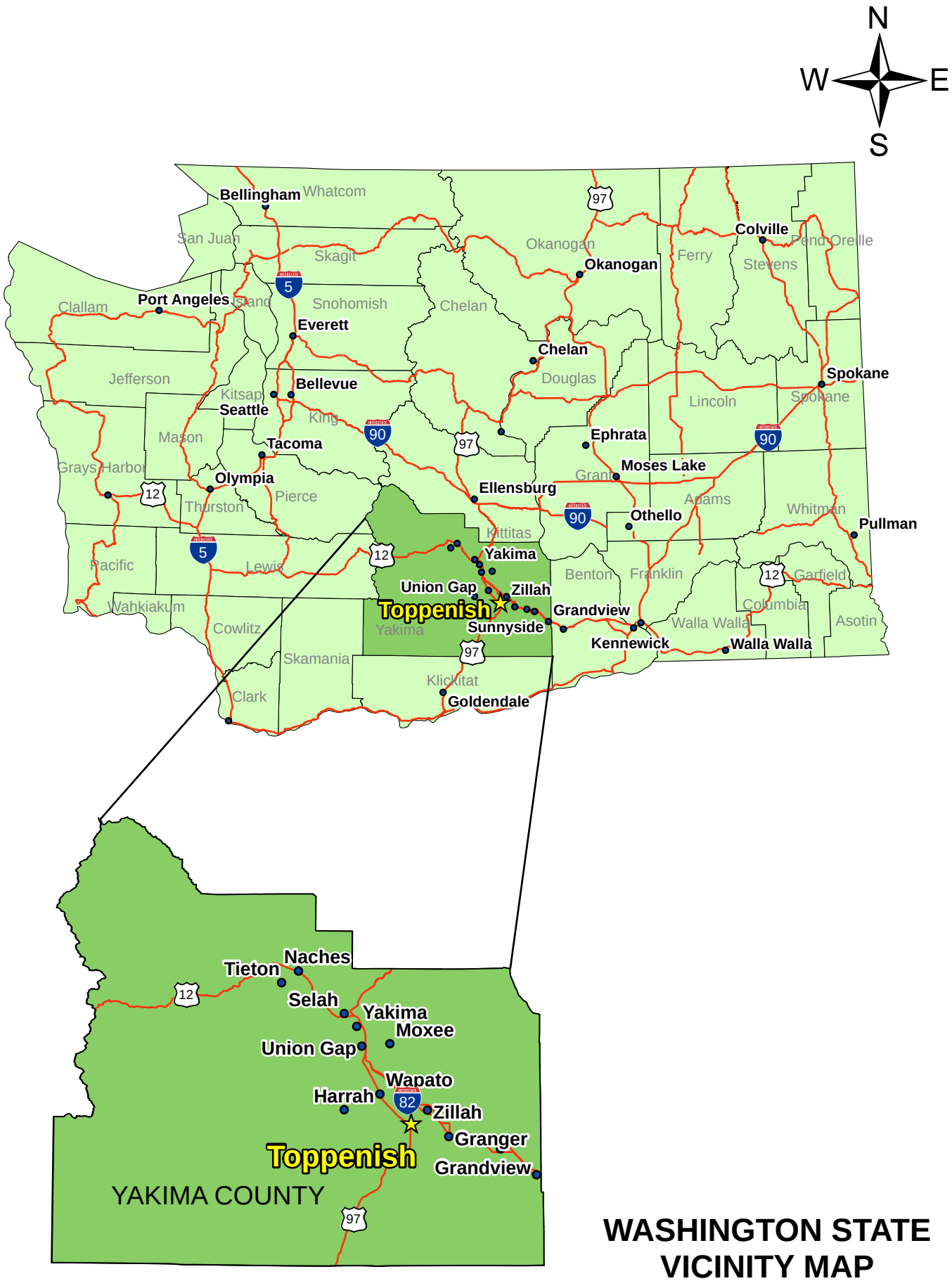
City of Toppenish
21 West First Avenue
Toppenish, WA 98948
Phone: (509) 865-2080

Mayor: Clara Jiménez
City Manager: Lance Hoyt
Public Works Director/Superintendent: Rocky Wallace
Water System Identification Number: 888503

WATER SYSTEM CONSULTING ENGINEER:

HLA Engineering and Land Surveying, Inc. (HLA)
2803 River Road
Yakima, WA 98902
Phone: (509) 966-7000
Project Engineer: Justin Bellamy, PE

A description of the City's water system management structure is presented in CHAPTER 6 of this Plan. A copy of the City's Water Facility Inventory (WFI) form is included in CHAPTER 10 of this Plan.



WASHINGTON STATE VICINITY MAP FIGURE 1-1

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1.2 SYSTEM BACKGROUND

1.2.1 History of Water System Development and Growth

Table 1-1 provides some information as to the development of Toppenish's water system.

TABLE 1-1 MAJOR WATER SYSTEM IMPROVEMENTS

Year	Improvement Description
1907	Well No. 1 constructed
1914	Reservoir No. 1 constructed (75,000 gallon elevated tank)
1923	Well No. 2 constructed
1937	Well No. 3 constructed
1937	Reservoir No. 2 constructed (200,000 gallon elevated tank)
1945	Well No. 4 constructed
1945	Well No. 1 abandoned
1952	Well No. 5 constructed
1953	Reservoir No. 3 constructed (500,000 gallon elevated tank)
1954	Well No. 5 rehabilitated
1959	Well No. 6 constructed
1965	Well No. 3 modified with new pump
1973	Well No. 7 constructed
1982	City began fluoridation at all active water sources
1983	Reservoir No. 3 repainted
1987	Emergency power generator installed at Well No. 5
1992	Well No. 3 electrical controls updated
1993	Reservoir No. 1 abandoned
1993	Reservoir No. 4 constructed (1,000,000 gallon standpipe)
1993	Telemetry system connected to all wells and reservoirs
1994	Well No. 8 constructed
1994	Well No. 3 pump house and electrical controls refurbished
1999	Well No. 5 repaired and new pump installed
2014	E. Toppenish Ave., N. 'D' St., Pearne St., N. Beech St. water main improvements completed
2014	Chehalis Ave., N. 'A' St., Maple Ct., Maple Ct. Alley water main improvements completed
2014	Well No. 9 constructed
2014	Reservoir No. 5 constructed (1,700,000 gallon standpipe)
2015	Telemetry system improvements completed
2015	Franklin Avenue water main improvements completed
2015	Lincoln Avenue water main improvements completed

Toppenish's first *Comprehensive Water System Plan (*CWP*)*, completed in 1988, provided the City with an in-depth look at its water system, deficiencies, and potential growth. Updates to the 1988 CWP were completed in 1995 and again in 2002. In 2010 the CWP was updated and renamed as the *2010 Water System Plan*. This *2016 Water System Plan* is intended to update the *2010 Water System Plan*.

TABLE 1-2 WATER SYSTEM GROWTH SUMMARY							
	Year						% Increase 1987-2015
	1987	1994	1999	2008	2012	2015	
Population*	7,126	7,734	7,940	9,140	8,950	8,965	25.8%
Total Water Services	1,920	1,971	2,028	1,935	2,326	2,422	26.1%
Total Annual Metered Consumption (MG)	625.3	700.1	663.7	507.1	492.6	481.1	-23.1%
Total Source Capacity (MGD)	4.555	5.868	5.868	5.868	7.222	7.222	58.6%
Total Storage Capacity (MG)	0.775	1.700	1.700	1.700	1.700	3.448	202.8%
* Based on Washington State Office of Financial Management (OFM) census data and estimates.							

1.2.2 Geography

The City of Toppenish and its Urban Growth Area (UGA) are located in the lower Yakima Valley, the eastern part of Yakima County, in south-central Washington State, as shown on Figure 1-1. The City lies approximately 25 miles south of the City of Yakima, approximately 2½ miles south of Interstate 82, near the junction of State Route 97 and State Route 22. The City is located entirely within the Yakama Nation Reservation. Incorporated in 1907, the City is situated on a relatively flat portion of the Yakima River flood plain, at an elevation of 740-770 feet above mean sea level. The Yakima River lies approximately a ½-mile north of the City.

Toppenish's Existing Service Area is where the water system already provides service, as shown on Figure 1-2. Also shown on Figure 1-2, the City's Retail Service Area, includes the Existing Service Area and the area that generally corresponds to the current City Limits. Toppenish's Future Service Area/Service Area corresponds to its UGA boundary, as shown on Figure 1-2. The City's Future Service Area/Service Area/UGA boundary also represents their water rights place of use.

Like the rest of the Yakima Valley, Toppenish and its UGA have a warm and dry climate. The Cascade Mountain Range acts as a barrier between Yakima County and the Pacific Ocean, keeping precipitation low and temperatures warm. The mean annual temperature range is from a low of 17.8° F to a high of 89.2° F. The median temperature is 64.7° F and the mean annual precipitation is 7.2 inches. With a warm climate and rich soils, Yakima County is a significant agricultural region as well as a recreational area.

The economy of Toppenish depends largely upon the agricultural industry. Produce grown throughout the Yakima Valley and the Columbia Basin is processed and shipped from facilities within Toppenish. The City is also home to a large meat packing facility. Much of the employment in Toppenish is tied directly to these agricultural facilities. The City also has a viable commercial and service business community.

1.2.3 Neighboring/Adjacent Purveyors

Toppenish's Existing Service Area is where the water system currently provides service and generally corresponds to the current City Limits, as shown in Figure 1-2 Existing and Future Service Areas. Toppenish's Urban Growth Area boundary (the projected future area within which the City may be able to provide and maintain services, including water service) is also shown in Figure 1-2. The City's Future Service Area/Current Service Area/UGA boundary also represents their water rights place of use.

According to Department of Health records, three small water systems are currently operating within Toppenish's Urban Growth Area. These locations are also shown in Figure 1-2. Information on these small water systems is presented in Table 1-3.

CITY OF TOPPENISH

Water System Plan Update

EXISTING AND FUTURE SERVICE AREA BOUNDARIES

N

W E

S

0 750 1,500

Feet

LEGEND

- Existing Service Area
- City Limits
- Retail Service Area
- Future Service Area/ Service Area (UGA Boundary)
- Service Area of Neighboring Community Water System

EL CORRAL MOTEL

WSDOT MAINTENANCE SITE (INACTIVE)

WASHINGTON BEEF (AB FOODS)

DEL MONTE

N Track Rd
Wierman Rd
State Route 22
Fraley Rd
Fraley Cut Off Rd
E McDonald Rd
Piscoe Ave
Klicklat St
Nation St
Chaparral St
Idaho Ave
Brooks Ln
Goldendale Ave
Berger Ln
Penny Ln
Robert Ln
Hammond Ln
Washington Ave
Adams Ave
Jefferson Ave
S Juniper St
S Lyle St
S Gardenia St
S Elm St
Buena Wy
N Hawthorne St
N Gardenia St
N Fir St
N Date St
N Chestnut St
Maple Ct
N D St
Franklin Ave
Ziltah Ave
Oakton Ave
Chehalis Ave
Bellingham Ave
N Beech St
N Alder St
Prairie St
N E St
N F St
N G St
E Lincoln Ave
Lincoln Ave
N Meyers Rd
Old McCoy Rd
Spiri Yi Lp
Ward Rd
Magnolia St
Highway 97
Wishpoosh Rd
Buster Rd
Teo Rd
Fort Rd
Rentschler Ln
King Ln
Guyette Ln
Monroe Ave
Madison Ave
S Date St
S Beech St
S Alder St
S Elm St
S Toppenish Ave
Washington Ave
Asotin Ave
N A St
N B St
N C St
N H St
N I St
N J St
N K St
N L St
E Toppenish Ave
Satus Ave
S C St
S D St
S E St
S F St
S G St
S H St
S I St
E 1st Ave
E 2nd Ave
W 1st Ave
W 2nd Ave
W 3rd Ave
W 4th Ave
W 5th Ave
W 6th Ave
Carlson Ave
E 3rd St
S Division St
Curlew Rd
Elmwood Rd
W Elmwood Ln
Wishkoski Wy
Germantown Rd
Annahat Rd
Robbins Rd
Larue Rd
Casey Rd
State Route 22
Pace Rd
E Larue Rd
S Track Rd

HLA Engineering and Land Surveying, Inc.
2803 River Road
Yakima, WA 98902
509.966.7000
Fax 509.965.3800
www.hlacivil.com

10/31/2017
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FIGURE 1-2

TABLE 1-3 NEIGHBORING SMALL WATER SYSTEMS						
Name Location	System ID No.	Group Type	Residential Population	Approved Connections	Number of Sources	Permit Status
El Corral Motel 61731 Highway 97	22596	A	3	undetermined	1	Blue
Washington Beef LLC (AB Foods) P.O. Box 832	93061	A	0	undetermined	3	Blue
Del Monte Well 6 3060 Newquist Rd.	18591	B	3	undetermined	1	N/A

Other residences currently within Toppenish's Urban Growth Area, which are not connected to the City's water system or to one of these other small systems, utilize individual wells for water supply. The Yakama Nation also has a domestic water system which serves a number of facilities, including Legends Casino, and is located to the southwest of the City of Toppenish. There is no information available at this time on the system's capacity or features.

Other municipal water systems in the area include the City of Zillah's municipal water system, located approximately 2½ miles to the northeast, the City of Wapato's municipal water system, located approximately 5¼ miles to the northwest, the Town of Harrah's municipal water system, located approximately 9¾ miles to the east, the City of Granger's municipal water system, located approximately 5¼ miles to the southeast, and the Buena water system (owned and operated by Yakima County), located approximately 1¾ miles to the north. Information on these nearby municipal water systems is provided in Table 1-4.

TABLE 1-4 NEIGHBORING MUNICIPAL SMALL WATER SYSTEMS				
Name	System ID No.	Approved Connections	Calculated Connections	Permit Status
City of Zillah	99800	Unspecified	1,148	Green
City of Wapato	92800	Unspecified	1,776	Green
Town of Harrah	31400	189	179	Green
City of Granger	29000	1,000	728	Green
Buena (Yakima Co.)	34301	278	230	Green

1.2.4 Ordinances/Bylaws

The City of Toppenish operates its water system in accordance with the following municipal code chapters and ordinance(s):

Chapter 13.02 Water Supply Regulations
Chapter 13.04 Water – Installation of Service
Chapter 13.08 Water – Service Regulations
Chapter 13.12 Water – Meters
Chapter 13.16 Water – Rates and Charges
Chapter 13.20 Water – Fire Protection Systems
Chapter 13.52 Water and Sewer Services Outside the Corporate Limits
Chapter 13.56 Utility Rate Discount for Low-Income Senior or Disabled Persons
Ordinance 2014-10 Ordinance Increasing Water Rates

Copies of these Toppenish Municipal Code chapters and ordinance(s) are included in CHAPTER 10 of this Plan.

1.3 INVENTORY OF EXISTING FACILITIES

1.3.1 General Description of Existing System Facilities and Major Components

The existing City of Toppenish water system consists of a single distribution pressure level between elevations 740 feet to 770 feet (as shown on Figure 3-1 later within this Plan), which is served by two steel elevated tank reservoirs and two standpipe reservoirs with a combined total capacity of 3.45 million gallons, 2.46 million gallons of which is usable. The static pressure within the water system ranges from 56 psi to 69 psi. In 2015, there were 2,422 total services in the Toppenish water system.

The City is supplied water from six City-owned source wells. The maximum pumping capacity of the six wells is 5,015 gallons per minute (GPM) or 7.22 million gallons per day (MGD). The City holds water use permits from the Yakama Nation for each of its source wells, with a combined total instantaneous quantity of 4,815. The City also maintains certificated water rights from the Washington Department of Ecology (DOE), totaling 2,000 GPM and 3,200 Acre-Feet per Year (1,043 Million Gallons).

The water system is primarily controlled by a comprehensive PLC (Programmable Logic Controller) based telemetry system. PLC telemetry units are located at six wells and four reservoirs, and are linked via radio communication. The telemetry system's master control station is located at the City's Public Works Shop.

The existing transmission and distribution system is looped where possible and consists of mainly 4-inch to 8-inch cast iron, ductile iron, and asbestos cement (AC) pipes. When water mains are replaced due to leaks or age, ductile iron pipe is generally used. Currently, Toppenish has no interties with neighboring water purveyors. A more detailed description of Toppenish's water system is presented in Chapter 3 of this Plan. A map of Toppenish's existing water system is enclosed as Map A in the back pocket of this Plan.

1.4 RELATED PLANS

1.4.1 Previous Comprehensive Water Plans

The City's first Comprehensive Water Plan was completed in 1988, which provided Toppenish with an in-depth look at its water system, deficiencies, and potential growth. Updates to the 1988 CWP were completed in 1995 and again in 2002. In 2010 the CWP was updated and renamed as the *2010 Water System Plan*. This *2016 Water System Plan* is intended to update the *2010 Water System Plan*.

1.4.2 Water System Plans for Adjacent Water Systems

The City of Zillah, Toppenish's nearest municipal neighbor located approximately 2½ miles to the northeast, adopted its current water system plan in 2014. The current plan for the Buena water system, located 3½ miles to the north, was adopted in 2013. The City of Granger, located approximately 5¼ miles to the southeast, adopted its current water system plan in 2010, and the City of Wapato, located approximately 5¼ miles to the northwest, adopted its current water system plan in 2005. There are currently no water service area agreements between any of these neighboring water systems and the City of Toppenish.

1.4.3 Urban Growth Area Comprehensive Plan

The City of Toppenish completed and adopted its Growth Management Act (GMA) comprehensive plan in 1995, and adopted revisions to that original GMA Plan in 2008. The GMA Plan is currently being updated and is anticipated to be complete in 2016. This Plan identifies many of the physical, environmental and economic elements within the City and its Urban Growth Area, and attempts to forecast anticipated changes within that geographical area. Understanding and predicting future changes within the City and its Urban Growth Area are critical in forecasting future demands on the City's water system. The City's existing GMA Plan, and information currently being developed for its future Plan, are important tools and have been used in developing this Comprehensive Water Plan.

1.4.4 Wellhead Protection Program

In 1997, the City of Toppenish completed its Wellhead Protection Plan. This plan identifies potential sources of contamination near ground water supplies, proposes management strategies to prevent

contamination of those supplies, and develops a contingency plan for contamination mitigation in the event that ground water becomes contaminated. The document contains the following elements:

1. Calculated fixed radius estimate of groundwater movement;
2. Delineated wellhead protection areas for each well;
3. Notification and sample letter to regulatory agencies;
4. Letter to occupants with protected area;
5. An inventory of potential ground water contaminant sources;
6. A contingency plan which includes short and long-term alternate water sources, and emergency and spill response procedures; and
7. Spill incident response planning.

A copy of the Wellhead Protection Plan is included in CHAPTER 10 of this Plan.

1.4.5 General Sewer Plans

The City of Toppenish is in the process of completing a General Sewer Plan. This plan will provide valuable information regarding future sewer services within both the City and the Urban Growth Area.

1.4.6 Watershed Plan

In 1998, the Washington State Legislature passed the Watershed Planning Act (RCW 90.82), providing a framework for developing local solutions to water issues on a watershed basis. Framed around watersheds, this voluntary comprehensive planning process was designed to allow local citizens, governments and tribes to form watershed management planning units to develop watershed management plans.

The watershed planning process consists of three phases. In Phase 1 (Organization), initiating governments (the counties, largest city, and largest water utility in the watershed) identify and appoint Watershed Planning Unit members who represent water resource interests within the watershed. Phase 1 activities also include the development of operating and decision-making structures and goals, and development of a scope of work for Phase 2.

Phase 2 (Technical Assessment), directed by the watershed planning unit, focuses on developing strategies for improving water quality, protecting or enhancing fish habitat, setting instream flow recommendations, and applies for funding for the collection, management and distribution of data. Phase 2 is considered to be at least a one-year process.

Phase 3 (Plan Development and Approval) requires actual development of the watershed plan. The plan must include water supply strategies to meet minimum flows for fish and to provide for future out-of-stream uses. Phase 3 is considered to be at least a one-year process.

The City of Toppenish is located in the Lower Yakima River Basin Watershed Planning Area (WRIA 37). In 1998, the Yakima River Basin Watershed Planning Unit was formed to develop a comprehensive watershed management plan for the entire Yakima River Basin and the Naches River Basin watersheds. In December 2002, the Watershed Planning Unit completed and approved the *Yakima River Basin Watershed Management Plan* (Phase 3 of the planning process) and forwarded the Plan to the county commissioners of Yakima, Benton, Klickitat and Kittitas Counties. In late 2005, Yakima, Benton and Klickitat Counties approved and adopted the Plan, while Kittitas County opted to withdraw from the process. The watershed plan contains no obligations for county or state agencies. There is not an operating lead agency for the purposes of adopted watershed plan implementation needs. Instead, water quantity-related plan implementation needs are being addressed by the Yakima River Basin Water Enhancement Project working group.

In 2009, Ecology and Reclamation formed the Yakima River Basin Water Enhancement Project Working Group to help develop a solution to the basin's water problems. The group includes the Yakama Nation, irrigation districts, federal, state, county, and city governments, and environmental organizations. The group developed the *Yakima River Basin Integrated Water Resource Management Plan* (YBIP). Elements of the YBIP include construction of fish passages at dams, habitat restoration, watershed protection, development of new surface water retention and groundwater storage, enhanced agricultural and municipal

water conservation programs, and more effective water banking processes. In total, approximately $3.8 billion is needed to complete the priority projects identified in the YBIP.

The *Final Programmatic Environmental Impact Statement* (FPEIS) was issued in March 2012 for the YBIP. The FPEIS evaluates two alternatives to meet the water supply and environmental needs in the Yakima River Basin; "No Action Alternative" and "Yakima River Basin Integrated Water Resource Management Plan Alternative," the latter as the preferred alternative.

In July 2013, the Legislature approved more than $130 million in state funding to advance the YBIP. The funding will purchase 50,000 acres of privately owned timber land in the Teanaway River basin, east of Cle Elum, helping to preserve the area's watershed. The City of Toppenish's *Water System Plan* is consistent with the YBIP.

1.5 SERVICE AREA AGREEMENTS

Toppenish currently has no service area agreements with the other water purveyors located within its UGA. Additionally, Toppenish currently has no water service area agreements with its nearest municipal neighbors, the City of Zillah located approximately 2½ miles to the northeast, the community of Buena approximately 3 ½ miles to the north, the City of Wapato located approximately 5¼ miles to the northwest or the City of Granger located approximately 5¼ miles to the southeast.

1.6 SERVICE AREA POLICIES

Many policies are established by a utility which affect its growth and development. Some policies deal specifically with drinking water and have a direct impact upon utility development within its future service area. The City of Toppenish has identified the following policies which directly or indirectly affect the water system:

1. The City will make every effort to provide domestic water service to new customers within Toppenish's future service area (Urban Growth Area) under the following conditions:

    - All costs associated with providing water service, e.g., extending water mains to the site, shall be the responsibility of the proponent/developer. Requirements to be met by proponents/developers when extending the City's water system are identified in "City of Toppenish Design and Construction Standards and Specifications for Public Works Improvements" which is provided in the Miscellaneous Documents (CHAPTER 10) of this Plan.
    - The City may choose to participate in such improvements through grant, loan, and/or City funding on a case-by-case basis, if it is determined that such an investment is in the interests of the community.
    - The City maintains adequate Yakama Nation well use permit capacity or DOH water rights capacity, to serve the proposed property/properties.
    - The City maintains adequate physical source and/or storage capacity to serve the proposed property/properties.
    - The proponent/developer shall transfer all potable water rights associated with the property/properties to the City.
    - The proponent/developer shall "decommission" any and all groundwater wells on the property in accordance with the applicable Washington Administrative Code (WAC) requirements unless a well is to become part of the City's water system.
    - The proponent/developer shall allow the City the opportunity to purchase any irrigation water rights/shares associated with the property/properties prior to offering said irrigation rights/shares to any other interested party.

2. The City may choose to require a water main extension to be oversized for future demand. The difference in material and construction costs between the two sizes may be paid for by the City, or it may enter into an agreement requiring those costs to be repaid by future users.

3. Service will not be provided to proposed structures which have fire flow requirements greater than the capacity of the system. The cost of upgrading the existing water system which is required by

a development to meet fire flow requirements shall be the responsibility of the developer including, but not limited to:

- Upsizing existing water mains.
- Looping the distribution system by installing new water mains.
- Increasing storage and/or pumping capacities.

4. The City will administratively assist property owners who wish to establish a Local Improvement District for the purposes of constructing water system improvements.

5. The City may wholesale water to other utilities. The terms and conditions of the service shall be negotiated and formalized in a written agreement at the time service is requested. The City's water rights will be adjusted as part of the terms and conditions of any wholesaling of water.

6. The City will not allow its mains to be used to transmit another water purveyor's water through the City's system to other non-City water users (wheeling of water).

7. The City may provide water service to properties outside the City Limits in accordance with Chapter 13.52 of the City Municipal Code, a copy of which is provided in the Miscellaneous Documents (CHAPTER 10) of this Plan. The "outside customers" will be assessed water rates which are higher than those charged to customers within the City Limits.

8. The City may choose to manage and operate, or provide specific contract services for a satellite water system outside the City Limits but within the City's service area. In making its decision, the City will take into consideration such factors as:

   - Construction materials, standards, and specifications of the satellite system;
   - Condition of the various components of the satellite system including, but not limited to, pipes, valves, pumps, reservoirs, and sources of supply;
   - Easements and access of the satellite system;
   - Fire protection capability of the satellite system;
   - Cross-connection control of the satellite system;
   - Specific operation, management or contract service responsibilities to be provided; and
   - Conditions for assuming management and operation of the satellite system.

   City operation of satellite systems will be made on a case-by-case basis. In those cases where agreements for City operation are reached between the City and the satellite system, contracts for ownership, operation, and maintenance will be developed and included within the Miscellaneous Documents (CHAPTER 10) of this Plan.

9. Newly annexed properties will transfer the balance of unused domestic and/or irrigation water rights to the City.

1.7 SATELLITE MANAGEMENT AGENCIES

As discussed previously in Section 1.6, the City of Toppenish may, in the future, choose to manage and operate a satellite water system outside the City Limits, but within the City's Urban Growth Area boundary. However, the City has no specific plans at this time to become a satellite management agency. If and when Toppenish has specific plans to manage and/or operate a satellite water system, the City will develop a Satellite Management Program.

1.8 CONDITIONS OF SERVICE

The City of Toppenish has a Water Department Work Order form, available at City Hall. Information regarding such items as water service charges, billing information, developer extension requirements, meter and material specifications, connection fee schedule, cross-connection control requirements, and latecomer payback provisions are presented to customers, builders, and developers when they apply to the City for water service.

1.9 COMPLAINTS

The Toppenish Public Works Department responds to all water system complaints. All complaints received by the City are recorded on a work order form, investigated, and resolved. A record of all complaints received and their resolution is kept by the Toppenish Public Works Department. Toppenish's complaint response program is discussed in more detail in CHAPTER 6 of this Plan.

1.10 DUTY TO SERVE

The City of Toppenish recognizes that municipal water suppliers have a duty to provide service to all new connections within their retail service area when sufficient water rights and capacity exists, when the service request is consistent with the City code, and when service can be provided in a timely and reasonable manner. Each of these factors is discussed within this *Water System Plan*.

The City of Toppenish is committed to providing water service to those persons and commercial and industrial establishments in accordance with City Code Chapter 13.02, 13.04, 13.08, 13.12, 13.16, 13.20, 13.52, and 13.56. Copies of these City codes and ordinances are included in CHAPTER 10 of this Plan.

The Public Works Department receives and reviews service requests for consistency with adopted local plans and development regulations such as the City's *Water System Plan*, *GMA Comprehensive Plan,* and the *Extension by Developers Policy*. The requested service's location is compared to the City's Retail Service Area, City Limits, and Urban Growth Area Boundary. Large water service requests (i.e. a new industry, residential development, etc.) are reviewed by the City's Engineer for consistency with water rights, pressures, and fire flows.

The following is a summary of the City's procedures for addressing requests for water service:

Service Requests – Applications for water service within the City and within the UGA are addressed in accordance with City Code Chapter 13.08.030. Applicants are required to complete a request for service form furnished by the City.

Water Rights Adequacy – Each application for water service is reviewed by the City to determine the amount of water requested, and that the City has sufficient water rights and capacity to provide service.

Conditions of a Non-Technical Nature – Conditions for connection to the City's water system are addressed in accordance with City Code Chapters 13.02, 13.04, 13.08, 13.16, 13.52, and 13.56. Copies of these City code chapters are included within the Miscellaneous Documents (CHAPTER 10) of this Plan.

Procedures for Handling Time Extensions, Disputes, and Appeals – The City currently has no procedures established for addressing denial of water service, as denials have never occurred. Such procedures will be developed as needed.

CHAPTER 2 - BASIC PLANNING DATA

2.1 EXISTING SERVICE AREA

The existing water system serves a combination of residential, commercial, industrial, and public users. The boundary of the Existing Service Area is shown in Figure 2-1. The Existing Service Area is approximately 1,291 acres, a majority of which is within the Toppenish City Limits. Figure 3-1 and Map A, provided in the back pocket of this Plan, show the existing Toppenish water system, including the general location of water mains, valves, fire hydrants, wells, and reservoirs.

The Toppenish City Limits include an area of approximately 1,336 acres, including the wastewater treatment plant area. Existing zoning within the City is presented in Table 2-1, and is shown in Figure 2-1.

TABLE 2-1 EXISTING ZONING WITHIN TOPPENISH CITY LIMITS

Land Use Category	Total Acreage*	Percent of Total
Residential (R-1)	319	23.9%
Residential (R-2)	88	6.6%
Local Business (B-1)	62	4.6%
General Business (B-2)	108	8.1%
Professional Offices (B-3)	5	0.4%
Light Industrial (M-1)	52	3.9%
Heavy Industrial (M-2)	226	16.9%
Public/Semi-Public (SP)	203	15.2%
Planned Development (PD)	8	0.6%
Right-of-Way (ROW)	4	0.3%
Not Zoned	261	19.6%
TOTAL	1,336	100.0%

* Source: Yakima County Geographic Information Services, June, 2016.

As shown in Table 2-1, Residential (R-1) is the largest zoning total within the City, comprising approximately 319 acres (23.9% of the land within the City Limits). Heavy Industrial (M-2) is the second-largest area, totaling approximately 226 acres (16.9%), which is closely followed by Public/Semi-Public (SP) totaling approximately 203 acres (15.2%).

2.2 FUTURE SERVICE AREA

The City's Future Service Area generally corresponds to the City's Urban Growth Area (UGA). The Future Service Area/UGA boundary is shown in Figure 1-2, Figure 2-1, and Figure 2-2. Future land use within the City's UGA boundary is also shown in Figure 2-2, and is consistent with existing zoning in the City Limits. The City of Toppenish UGA includes an area of approximately 3,124 acres total, 1,788 acres of which is outside the City Limits. A breakdown of future land use within the City Limits is provided in Table 2-2 and future land use within the UGA is presented in Table 2-3.

TABLE 2-2 FUTURE LAND USE WITHIN TOPPENISH CITY LIMITS*		
Land Use Category	Total Acreage*	Percent of Total
Residential	404	30.3%
Commercial	169	12.6%
Planned Development	8	0.6%
Public	217	16.2%
Industrial	268	20.0%
Yakama Nation	6	0.5%
Environmental Classification (Potential Wetlands)	35	2.7%
Not Designated	229	17.1%
TOTAL	1,336	100.0%
* Source: Yakima County Geographic Information Services, June, 2016.		

TABLE 2-3 FUTURE LAND USE WITHIN TOPPENISH UGA*		
Land Use Category	Total Acreage*	Percent of Total
Residential	878	49.1%
Commercial	20	1.1%
Planned Development	0	0.0%
Public	5	0.3%
Industrial	426	23.8%
Yakama Nation	253	14.2%
Environmental Classification (Potential Wetlands)	67	3.8%
Not Designated	139	7.8%
TOTAL	1,788	100.0%
* Source: Yakima County Geographic Information Services, June, 2016.		

As shown in Table 2-2 and Table 2-3, Residential area is the largest future land use both within and outside Toppenish's City Limits, comprising approximately 404 acres (30.3%) and 878 acres (49.1%) respectively.

CITY OF TOPPENISH

Water System Plan Update

EXISTING ZONING MAP

LEGEND

CITY ZONING

- TOPPENISH CITY LIMITS
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- Residential (R-1)
- Residential (R-2)
- Local Business (B-1)
- General Business (B-2)
- Professional Offices (B-3)
- Planned Development (PD)
- Public\Semi-Public (SP)
- Light Industrial (M-1)
- Heavy Industrial (M-2)
- Right-of-Way (ROW)

N W E S

N Meyers Rd

0 375 750 1,500 Feet

HLA Engineering and Land Surveying, Inc.
2803 River Road
Yakima, WA 98902
509.966.7000
Fax 509.965.3800
www.hlacivil.com

6-22-2016
P:\Arcview\2015\15122\Fig2-1.mxd

FIGURE 2-1

CITY OF TOPPENISH

Water System Plan Update

FUTURE LAND USE MAP

N

W E

S

0 375 750 1,500 Feet

LEGEND

- TOPPENISH CITY LIMITS
- EXISTING RETAIL SERVICE AREA BOUNDARY
- FUTURE RETAIL SERVICE AREA BOUNDARY (UGA)
- Residential
- Commercial
- Planned Development
- Public
- Industrial
- Yakama Nation
- Environmental Classification (Potential Wetlands)

HLA Engineering and Land Surveying, Inc.
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6-22-2016
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FIGURE 2-2

2.3 POPULATION

2.3.1 Current Population

According to the U.S. Census Bureau, the 2010 population of the City of Toppenish was 8,949, an increase of three people since 2000, essentially increasing 0.0%. The resulting average annual growth rate for the period 2000-2010 is approximately 0.0%. This ten-year growth rate is much lower than previous decades. Population trends in the City of Toppenish, Yakima County, and the State of Washington for the period 1910 through 2010 are presented in Table 2-4.

TABLE 2-4 POPULATION TRENDS*

Year	City of Toppenish		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
1910	1,598		41,709		1,141,990	
1920	3,120	95.2%	63,710	52.7%	1,356,621	18.8%
1930	2,774	-11.1%	77,402	21.5%	1,563,396	15.2%
1940	3,683	32.8%	99,019	27.9%	1,736,191	11.1%
1950	5,265	43.0%	135,723	37.1%	2,378,963	37.0%
1960	5,667	7.6%	145,112	6.9%	2,853,214	19.9%
1970	5,744	1.4%	145,212	0.1%	3,413,244	19.6%
1980	6,517	13.5%	172,508	18.8%	4,132,353	21.1%
1990	7,419	13.8%	188,823	9.5%	4,866,692	17.8%
2000	8,946	20.6%	222,581	17.9%	5,894,121	21.1%
2010	8,949	0.0%	243,231	9.3%	6,724,540	14.1%

* Source: U.S. Census Bureau

Every year, the Washington State Office of Financial Management (OFM) develops population estimates for the state, individual counties, and all cities. OFM population estimates for Toppenish, Yakima County, and the State of Washington for the period 2011 through 2015 are presented in Table 2-5.

TABLE 2-5 OFM POPULATION ESTIMATES*

Year	City of Toppenish		Yakima County		State of Washington	
	Population	% Change	Population	% Change	Population	% Change
2011	8,950	0.01%	244,700	0.60%	6,767,900	0.64%
2012	8,950	0.00%	246,000	0.53%	6,817,770	0.74%
2013	8,950	0.00%	247,250	0.51%	6,882,400	0.95%
2014	8,955	0.06%	248,800	0.63%	6,968,170	1.25%
2015	8,965	0.11%	249,970	0.47%	7,061,410	1.34%

* Source: Washington State Office of Financial Management (OFM)

The OFM estimated that the total population within the City of Toppenish in 2015 was 8,965, which is approximately a 0.018% annual increase over the 2010 census value.

2.3.2 Future Population

The Yakima County Planning Division has provided the County-Wide Planning Policy Committee population projections for each community within Yakima County for the years 2015 through 2040. These projections are presented in the City's GMA Plan, which is currently being updated and is anticipated to be completed in 2016.

Future population will be projected at the yearly growth rates as shown in Table 2-6 below.

TABLE 2-6 CITY POPULATION PROJECTIONS

Year	Future Population	% Increase from Previous Year	Year	Future Population	% Increase from Previous Year
2016	9,004	0.44%	2027	9,532	0.40%
2017	9,053	0.54%	2028	9,570	0.40%
2018	9,101	0.53%	2029	9,607	0.39%
2019	9,148	0.52%	2030	9,642	0.36%
2020	9,195	0.51%	2031	9,677	0.36%
2021	9,286	0.49%	2032	9,711	0.35%
2022	9,330	0.47%	2033	9,745	0.35%
2023	9,372	0.45%	2034	9,778	0.34%
2024	9,414	0.45%	2035	9,810	0.33%
2025	9,454	0.42%	2036	9,841	0.32%
2026	9,494	0.42%	2037	9,871	0.30%

2.4 CURRENT AND FUTURE WATER SERVICES

2.4.1 Current Water Services

The location and user category of each water service is a critical component in assessing water system demands throughout a water system. In addition to determining population locations and related residential water services, it is important to understand the location of all other water service users. Water services are divided into user categories as shown in Table 2-7.

2.4.2 Future Water Services

The number of residential water services within the City Limits is anticipated to increase consistent with the population growth rate projections shown in Table 2-6. Typically, locations of increasing population will vary depending on the availability of undeveloped land, and potential for new construction. In Toppenish's case, population can be assumed to grow evenly across City Limits because the growth rate is relatively small and the likely areas of development are scattered vacant lots throughout the City.

It is difficult to predict how population increases within the City and the UGA will affect increases in other user categories. The water service totals in remaining user categories were projected to increase at a rate equal to the population growth rate. The future service locations were determined based on the existing zoning and future land uses within the City. Future water services by user category for the years 2017, 2023, 2027, and 2037 are shown in Table 2-7.

TABLE 2-7 FUTURE WATER SERVICES BY USER CATEGORY				
User Category	Year 2017 Total	Year 2023 Total	Year 2027 Total	Year 2037 Total
Residential	2,013	2,083	2,119	2,194
Duplex	43	45	46	47
Apartment	56	57	58	61
Commercial	255	264	269	279
Public Authority	25	26	27	28
City Property	46	48	49	51
Silgan Containers (Industrial)	2	2	2	2
Washington Beef (Industrial)	2	2	2	2
Del Monte (Industrial)	3	3	3	3
Total	2,446	2,532	2,575	2,667

2.5 CURRENT WATER CONSUMPTION AND PRODUCTION

Current and historical metered water consumption and production data records are the preferred method for determining demand trends and establishing a basis for forecasting future demand. All water system sources and services in the City of Toppenish are metered. Production and consumption meters are recorded monthly.

2.5.1 Current Water Consumption

Currently, water consumption data is maintained by a computer database at Toppenish Public Works. Services are divided and billed based upon meter size, user category, and consumption. The City also issues higher rates for services outside the City Limits and discounts for qualified low-income senior or disabled persons.

The number of metered water services by user category for the period 2010 through 2015 is presented in Table 2-8.

TABLE 2-8 AVERAGE METERED WATER SYSTEM SERVICES BY USER CATEGORY 2010-2015

User Category	2010	2011	2012	2013	2014	2015	Average
Residential	1,874	1,898	1,922	1,945	1,969	1,993	1,934
Duplex	42	42	43	43	43	43	43
Apartment	48	50	51	52	54	55	52
Commercial	231	235	240	244	249	253	242
Public Authority	24	24	25	25	25	25	25
City Property	37	39	41	42	44	46	42
Silgan Containers (Industrial)	2	2	2	2	2	2	2
Washington Beef (Industrial)	2	2	2	2	2	2	2
Del Monte (Industrial)	1	2	2	2	3	3	2
TOTAL	2,261	2,294	2,328	2,357	2,391	2,422	2,344

The annual volume of water consumed (in million gallons per year) by user category for the period 2010 through 2015 is presented in Table 2-9, including six-year averages.

TABLE 2-9 ANNUAL WATER CONSUMPTION BY USER CATEGORY 2010-2015
(values are in million gallons per year)

User Category	2010	2011	2012	2013	2014	2015	2010-2015 Avg.
Residential	298.16	294.15	310.16	296.62	292.39	300.54	298.67
Duplex	9.69	10.06	11.52	10.50	10.07	10.36	10.37
Apartment	26.95	26.12	27.54	28.38	29.13	29.96	28.01
Commercial	72.35	127.70	75.99	78.00	83.75	84.67	87.08
Public Authority	20.29	21.85	18.38	18.86	19.78	20.05	19.87
City Property	23.22	33.85	31.23	21.60	21.00	21.56	25.41
Silgan Containers (Industrial)	0.61	0.62	1.22	0.87	0.79	0.77	0.81
Washington Beef (Industrial)	0.02	0.01	0.01	0.02	1.15	0.68	0.32
Del Monte (Industrial)	9.98	11.73	16.57	17.41	15.73	12.46	13.98
TOTAL	461.26	526.09	492.62	472.26	473.79	481.05	484.52

During the period 2010 through 2015, the total number of services increased from 2,261 to 2,422 (a 7.1% increase), and the volume of water consumption increased from 461.28 MG to 481.07 MG (a 4.3% increase).

The average day water consumption per service by user category (in gallons per service per day) for the period 2010 through 2015 including averages is presented in Table 2-10. It can be seen from Table 2-10 that the average day consumption per service has generally decreased from 2010 to 2015 for Residential services, City Property services, and Del Monte. Average day consumption of other user categories is too inconsistent to determine a trend.

From Table 2-9 and Table 2-10 it can be seen that Washington Beef (also referred to as AB Foods) demand is relatively low for an industrial user. However, in the past Washington Beef has had to rely on the City for water, and their demand is considerably high. In 2006, Washington Beef was served water by the City for five months and consumed nearly 25 million gallons during that time, and there was one month in 2003 where Washington Beef consumed over 7,900,000 gallons. More discussion on Washington Beef's consumption is given in Section 2.6.3.

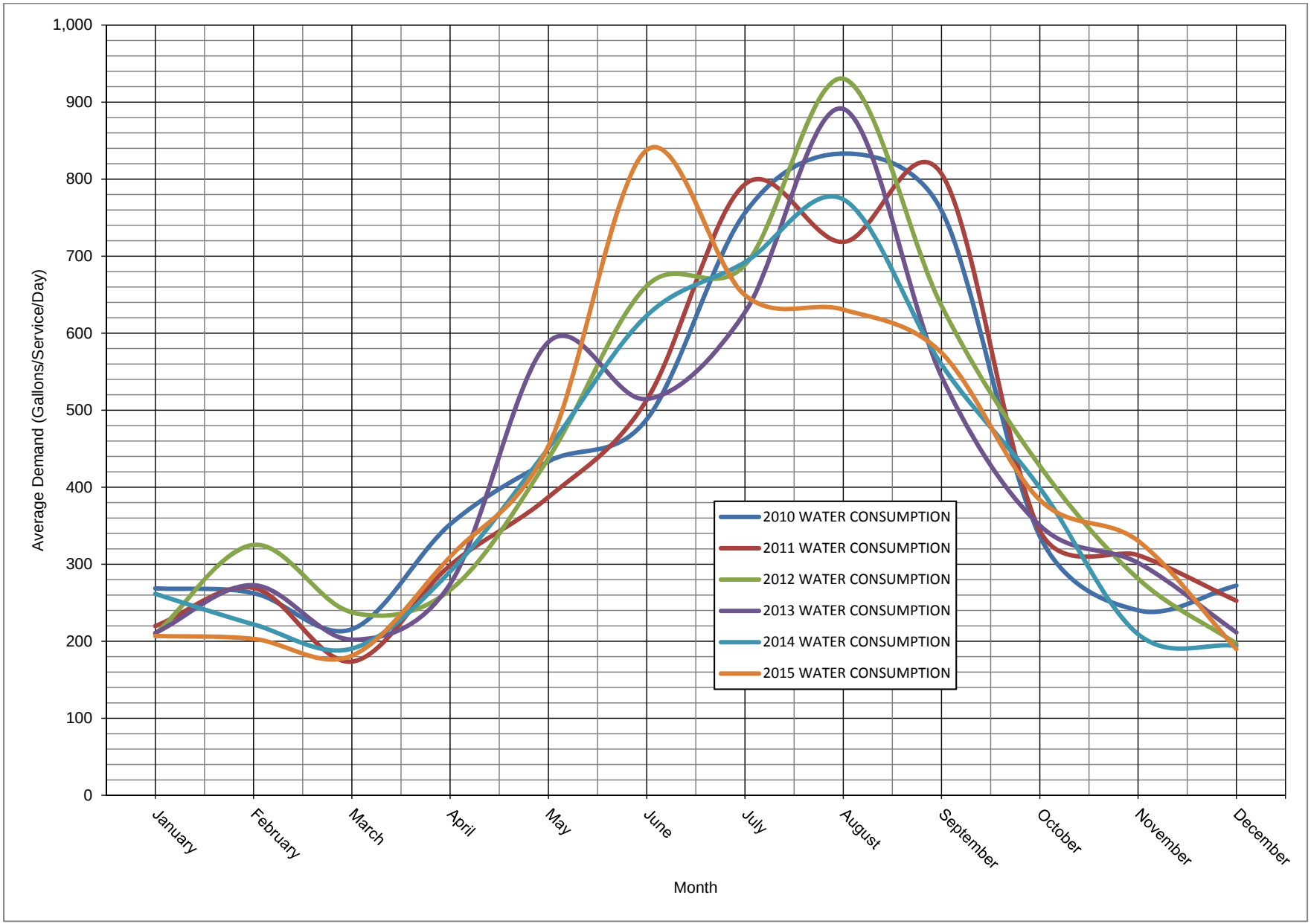
TABLE 2-10 AVERAGE DAY WATER CONSUMPTION BY USER CATEGORY 2010-2015
(values are in gallons per service per day)

User Category	2010	2011	2012	2013	2014	2015	2010-2015 Avg.
Residential	436	425	442	417	407	413	423
Duplex	630	651	743	672	644	660	667
Apartment	1,528	1,441	1,480	1,482	1,487	1,493	1,485
Commercial	860	1,489	869	873	923	917	989
Public Authority	2,301	2,461	2,055	2,089	2,182	2,198	2,214
City Property	1,727	2,399	2,112	1,394	1,303	1,284	1,703
Silgan Containers (Industrial)	835	850	1,667	1,190	1,083	1,061	1,114
Washington Beef (Industrial)	34	9	10	28	1,581	937	433
Del Monte (Industrial)	20,498	19,289	22,702	20,391	16,163	11,381	18,404

2.5.2 Seasonal Water Consumption

Water consumption in the City of Toppenish varies throughout the year with the seasons, primarily due to irrigation use in the summer months. Services within the City of Toppenish do not have separate irrigation systems, so domestic water is used for irrigation. As shown in Figure 2-3, peak consumption months are June through September. Figure 2-3 shows the seasonal change in residential consumption per service from 2010 through 2015.

FIGURE 2-3 RESIDENTIAL SEASONAL CONSUMPTION



2.5.3 Maximum and Peak Consumption

Between the years 2010 and 2015, the largest annual consumption took place in 2011, with a total measured consumption of 526.10 million gallons (MG). The second largest annual consumption took place in 2012, with a measured consumption of 492.61 MG. Annual consumption for 2010 through 2015 were all below 500 MG except for in 2011. October was the highest month of water consumption in the maximum year of 2011, when 97.31 MG was consumed. The consumption for October 2011 was considered an outlier. The reason for the unusually high consumption is unknown, but can be assumed to be a rare event and was not considered in calculating maximum day and peak hour demands. August 2012 was the second highest month of water consumption in the given six-year period. A breakdown of water consumption by user category for August 2012 is shown in Table 2-11.

TABLE 2-11 MAXIMUM MONTH WATER CONSUMPTION, AUGUST 2012

User Category	No. of Services	Maximum Month Consumption (gallons)	Average Day Consumption (gallons)	Maximum Month Consumption per Service (gallons)	Average Day Consumption per Service (gallons)
Residential	1,922	55,422,192	1,787,813	28,843	930
Duplex	43	1,739,960	56,128	40,940	1,321
Apartment	51	4,390,393	141,626	86,086	2,777
Commercial	240	11,731,789	378,445	48,985	1,580
Public Authority	25	3,628,137	117,037	148,087	4,777
City Property	41	5,284,740	170,475	130,487	4,209
Silgan Containers (Industrial)	2	178,420	5,755	89,210	2,878
Washington Beef (Industrial)	2	187	6	94	3
Del Monte (Industrial)	2	2,693,398	86,884	1,346,699	43,442
TOTAL	2,328	85,069,217	2,744,168	36,581	1,180

The maximum day of water production within the maximum month was calculated to be 3.146 MG by multiplying the maximum month average day demand by 1.3, as recommended in the Water Design Manual for Cities that do not have daily production data, and subtracting out distribution system leakage (DSL). Utilizing the percentage breakdown of demand per user category from the August 2012 consumption data, maximum day demand (MDD) was calculated as shown in Table 2-12.

Peak hour demand (PHD), also shown in Table 2-12, was calculated by multiplying the maximum day demand by a factor of 2.0 and dividing by 1,440 minutes per day. A peaking factor of 2.0 is considered reasonably conservative, and is consistent with the *2009 Water System Design Manual (WSDM),* Equation 5-1. Using the maximum day of water production to calculate the MDD and PHD for projection of future system demand will account for the highest possible demand on the system, based upon available historical data.

$$PHD = (MDD_{ERU}/1440)[C * N + F] + 18$$ *(WSDM, Equation 5-1)*

C = 1.6, Coefficient associated with range of ERUs, *(WSDM, Table 5-1 >500 ERUs)*
N = 2,950, Number of ERUs (ERUs for the maximum month)
F = 225, Factor associated with range of ERUs, *(WSDM, Table 5-1 >500 ERUs)*
MDD_{ERU} = 1,066 gpd/ERU, Maximum Day Demand, *(3.146 MG / 2,950 ERUs)*

PHD = 3,680 gpm
Peaking Factor = PHD / MDD_{gpm} => 3,680 gpm / 2,185 gpm = 1.68

For calculations a peaking factor of 2.0 is used.

TABLE 2-12 MAXIMUM DAY AND PEAK HOUR WATER CONSUMPTION, AUGUST 2012					
User Category	No. of Services	Maximum Day Demand (gallons)	Maximum Day Demand per Service (gallons)	Peak Hour Demand (GPM)	Peak Hour Demand per Service (GPM)
Residential	1,922	2,049,618	1,066	2,847	1.48
Duplex	43	64,347	1,496	89	2.08
Apartment	51	162,365	3,184	226	4.42
Commercial	240	433,864	1,808	603	2.51
Public Authority	25	134,175	5,367	186	7.45
City Property	41	195,440	4,767	271	6.62
Silgan Containers (Industrial)	2	6,598	3,299	9	4.58
Washington Beef (Industrial)	2	7	3	0	0.0
Del Monte (Industrial)	2	99,607	49,804	138	69.17
TOTAL	2,328	3,146,022*	1,351	4,369	1.88
* 3,567,419 gallons production less 11.81% DSL (2012 average DSL) to arrive at a maximum daily consumption of 3,146,022 gallons.					

2.5.4 Water Production

Annual water production by source well for the period 2010 through 2015 is presented in Table 2-13. As can be seen from this table, the City has six active wells.

TABLE 2-13 TOPPENISH ANNUAL WATER PRODUCTION 2010-2015 (values are in million gallons)						
Source	2010	2011	2012	2013	2014	2015
Well No. 3 (S03)	164.11	158.28	160.32	152.79	87.41	35.00
Well No. 5 (S05)	128.24	136.31	99.92	49.66	31.10	94.31
Well No. 6 (S06)	85.55	69.13	52.06	48.56	48.97	59.44
Well No. 7 (S07)	21.69	22.33	59.84	111.83	27.78	0.41
Well No. 8 (S08)	178.44	174.80	186.46	187.55	172.02	118.96
Well No. 9 (S09)	0.00	0.00	0.00	0.00	182.46	229.78
TOTAL	578.03	560.85	558.60	550.39	549.74	537.90

2.5.5 Distribution System Leakage (DSL)

Table 2-14 shows annual water production, annual metered water consumption, and the difference between production and total consumption (DSL), including the DSL percentage. Water production from Toppenish's source wells for the period 2010 through 2015 totaled 3,335.5 MG. Metered consumption during that same time period totaled 2,907.1 MG. Estimated unmetered consumption includes water usage for hydrant flushing, waterline breaks, and other related activities. The difference between production and metered consumption for that period was 428.4 MG, or 12.84% of total water production for the period. The average DSL for the past three years (2013-2015) is nearly the same at 12.87%.

TABLE 2-14 TOPPENISH WATER PRODUCTION AND CONSUMPTION 2010-2015				
Year	Production	Consumption	DSL	% DSL
2010	578,029,108	461,282,504	116,746,604	20.20%
2011	560,847,354	526,096,188	34,751,166	6.20%
2012	558,596,685	492,613,172	65,983,513	11.81%
2013	550,391,635	472,265,014	78,126,621	14.19%
2014	549,744,150	473,806,276	75,937,874	13.81%
2015	537,899,487	481,067,359	56,832,128	10.57%
TOTAL	3,335,508,419	2,907,130,514	428,377,905	12.84%
3-Year Average	546,011,757	475,712,883	70,298,874	12.87%

The City will continue to track the difference between production and total authorized consumption, and will work towards further reducing the volume of DSL through the implementation of supply-related water use efficiency measures. Water use efficiency measures are discussed in further detail in CHAPTER 4 of this Plan.

2.5.6 Current Equivalent Residential Units

An Equivalent Residential Unit (ERU) is defined as the amount of water consumed by a typical full-time single-family residence. The actual quantity of water represented by an ERU is related to the type of demand (average day or peak) being considered. As discussed previously, maximum day and peak hour demands were calculated from the second highest maximum month of production for the period between 2010 and 2015, while average day demand (ADD) is an actual measurement for a specified time period. As a result, the peaking factor from an average day demand (ADD) to a maximum day demand (MDD) is not the same for all service categories. Therefore, ERU values for ADD, MDD, and PHD have been calculated as shown in Table 2-15. This ERU information is useful for forecasting and analyzing future water system demand.

Residential ADD per service values from the 2010 through 2015 period vary from a low of 407 gallons per service per day to a high of 442 gallons per service per day. Similar variation in consumption per service occurs in the other user categories. The City has generally seen consistent demands over the past six years, providing a suitable representation of existing conditions. The average ADD from each user category for the 6-year period 2010 through 2015, as shown in Table 2-10, used in producing Table 2-15.

The maximum day demand per service and peak hour demand per service provided in Table 2-15 is based upon calculated demand from the maximum day demand in August 2012, which was the second highest maximum month of consumption from 2010 through 2015.

TABLE 2-15 EQUIVALENT RESIDENTIAL UNIT FACTORS (ERUS)						
User Category	ADD (2010-2015)		MDD (August 2012)		PHD (August 2012)	
	GPD/ Service[a]	ERUs	GPD/ Service[b]	ERUs	GPM/ Service[b]	ERUs
Residential	423	1.0	1,066	1.0	1.48	1.0
Duplex	667	1.6	1,496	1.4	2.08	1.4
Apartment	1,485	3.5	3,184	3.0	4.42	3.0
Commercial	989	2.3	1,808	1.7	2.51	1.7
Public Authority	2,214	5.2	5,367	5.0	7.45	5.0
City Property	1,703	4.0	4,767	4.5	6.62	4.5
Silgan Containers (Industrial)	1,114	2.6	3,299	3.1	4.58	3.1
Washington Beef (Industrial)	433	1.0	3	0.0	0.00	0.0
Del Monte (Industrial)	18,404	43.5	49,804	46.7	69.17	46.7

[a] ADD values based upon 2010 through 2015 average.
[b] Peak Day Demand is based upon calculated demand for August 2012 as provided in Table 2-12.

2.6 FORECAST OF FUTURE WATER DEMAND

Water use is contingent upon a number of varying and uncertain factors, which makes forecasting future demand difficult. Of primary importance are the following factors:

1. Population;
2. Type of residential development (i.e., single-family, multi-family, rural, large or small lot);
3. Per capita income;
4. Types of commercial and industrial enterprises;
5. Climate;
6. Irrigation use of water; and
7. Price charged for water and type of rate structure (i.e. the base water quantity and cost for individual service meters).

Forecasting future system demands is based upon the projected number of water services for each user category, and the annual average day, maximum day, and peak hour water demand.

As discussed previously in this chapter, the population projections for the City of Toppenish are estimated from historical population trends and Yakima County population projections, with annual growth rates as shown in Table 2-6. Future water services are based upon the projected population growth within the City. However, because future water demand impacts Toppenish's existing well, water rights, and reservoir storage capacity, the City has established policies to only provide water service to new customers within their UGA under specific conditions (previously specified within this Plan).

Other factors such as income, climate, and water cost will be assumed to remain consistent with current trends. Climate does have a major influence on Toppenish's water consumption during summer months due to use of domestic water supply for irrigation purposes. However, the area's climate has generally remained consistent with historical averages.

2.6.1 Future ERUs and ADD

The projected number of water system services, ERUs, and ADD, are calculated from the current water services by user category as shown in Table 2-7, and the average 2010 through 2015 demand per service for each user category, provided in Table 2-15.

The calculated future number of services, ERUs, and projected ADD for years 2023, 2027, and 2037 are presented in Table 2-16, Table 2-17, and Table 2-18, respectively. To accommodate for uncertainties in projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the ADD projections, as shown.

TABLE 2-16 YEAR 2023 ERU AND ADD					
User Category	No. of Services	ERUs/Service*	ADD/Service (gallons)	Total ERUs*	Total ADD (gallons)
Residential	2,083	1.00	423	2,083.48	881,799
Duplex	45	1.58	667	70.81	29,968
Apartment	57	3.51	1,485	201.73	85,379
Commercial	264	2.34	989	617.81	261,477
Public Authority	26	5.23	2,214	136.73	57,868
City Property	48	4.02	1,703	193.52	81,905
Silgan Containers (Industrial)	2	2.63	1,114	5.51	2,330
Washington Beef (Industrial)	2	1.02	433	2.14	906
Del Monte (Industrial)	3	43.48	18,404	136.37	57,718
Subtotal	2,532			3,448.10	1,459,350
10% Contingency					145,935
TOTAL	2,532			3,448.10	1,605,285

* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.

TABLE 2-17 YEAR 2027 ERU AND ADD					
User Category	No. of Services	ERUs/Service*	ADD/Service (gallons)	Total ERUs*	Total ADD (gallons)
Residential	2,119	1.00	423	2,119.05	896,853
Duplex	46	1.58	667	72.02	30,480
Apartment	58	3.51	1,485	205.17	86,836
Commercial	269	2.34	989	628.36	265,941
Public Authority	27	5.23	2,214	139.06	58,856
City Property	49	4.02	1,703	196.83	83,303
Silgan Containers (Industrial)	2	2.63	1,114	5.60	2,370
Washington Beef (Industrial)	2	1.02	433	2.18	921
Del Monte (Industrial)	3	43.48	18,404	138.70	58,704
Subtotal	2,575			3,506.96	1,484,264
10% Contingency					148,426
TOTAL	2,575			3,506.96	1,632,691

* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.

TABLE 2-18 YEAR 2037 ERU AND ADD					
User Category	No. of Services	ERUs/Service*	ADD/Service (gallons)	Total ERUs*	Total ADD (gallons)
Residential	2,194	1.00	423	2,194.41	928,749
Duplex	47	1.58	667	74.58	31,564
Apartment	61	3.51	1,485	212.47	89,925
Commercial	279	2.34	989	650.70	275,399
Public Authority	28	5.23	2,214	144.01	60,950
City Property	51	4.02	1,703	203.83	86,266
Silgan Containers (Industrial)	2	2.63	1,114	5.80	2,454
Washington Beef (Industrial)	2	1.02	433	2.25	954
Del Monte (Industrial)	3	43.48	18,404	143.64	60,791
Subtotal	2,667			3,631.69	1,537,051
10% Contingency					153,705
TOTAL	2,667			3,631.69	1,690,757
* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.					

2.6.2 Future MDD and PHD

Future Maximum Day Demand (MDD) and Peak Hour Demand (PHD) on the water system were calculated for the years 2023, 2027, and 2037 using the projected number of services for each user category and the calculated MDD per service for August 2012 as discussed in Section 2.5.3. Calculated future MDD and PHD values for 2023, 2027, and 2037 are presented in Table 2-19, Table 2-20, and Table 2-21, respectively. To accommodate for uncertainties in projecting future water demand and to account for system losses, a 10% contingency factor has been applied to the MDD and PHD projections, as shown.

TABLE 2-19 YEAR 2023 MDD AND PHD							
User Category	No. of Services	ERUs/ Service*	Total ERUs*	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)*	PHD/ Service (GPM)*
Residential	2,083	1.00	2,083.48	1,066	2,221,820	1.48	3,085.86
Duplex	45	1.40	63.08	1,496	67,268	2.08	93.43
Apartment	57	2.99	171.65	3,184	183,049	4.42	254.23
Commercial	264	1.70	448.36	1,808	478,129	2.51	664.07
Public Authority	26	5.03	131.53	5,367	140,267	7.45	194.82
City Property	48	4.47	214.96	4,767	229,229	6.62	318.37
Silgan Containers (Industrial)	2	3.09	6.47	3,299	6,898	4.58	9.58
Washington Beef (Industrial)	2	0.00	0.01	3	7	0.0	0.01
Del Monte (Industrial)	3	46.70	146.47	49,804	156,194	69.17	216.94
Subtotal	2,532		3,266.00		3,482,860		4,837
10% Contingency					348,286		484
TOTAL	2,532		3,266.00		3,831,146		5,321
* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.							

TABLE 2-20 YEAR 2027 MDD AND PHD

User Category	No. of Services	ERUs/ Service*	Total ERUs*	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)*	PHD/ Service (GPM)*
Residential	2,119	1.00	2,119.05	1,066	2,259,751	1.48	3,138.54
Duplex	46	1.40	64.16	1,496	68,417	2.08	95.02
Apartment	58	2.99	174.58	3,184	186,174	4.42	258.57
Commercial	269	1.70	456.01	1,808	486,291	2.51	675.40
Public Authority	27	5.03	133.78	5,367	142,661	7.45	198.14
City Property	49	4.47	218.63	4,767	233,142	6.62	323.81
Silgan Containers (Industrial)	2	3.09	6.58	3,299	7,016	4.58	9.74
Washington Beef (Industrial)	2	0.00	0.01	3	7	0.0	0.01
Del Monte (Industrial)	3	46.70	148.97	49,804	158,860	69.17	220.64
Subtotal	2,575		3,321.76		3,542,320		4,920
10% Contingency					354,232		492
TOTAL	2,575		3,321.76		3,896,552		5,412

* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.

TABLE 2-21 YEAR 2037 MDD AND PHD

User Category	No. of Services	ERUs/ Service*	Total ERUs*	MDD/ Service (gallons)	Total MDD (gallons)	Total PHD (GPM)*	PHD/ Service (GPM)*
Residential	2,194	1.00	2,194.41	1,066	2,340,118	1.48	3,250.16
Duplex	47	1.40	66.44	1,496	70,850	2.08	98.40
Apartment	61	2.99	180.79	3,184	192,795	4.42	267.77
Commercial	279	1.70	472.23	1,808	503,586	2.51	699.43
Public Authority	28	5.03	138.54	5,367	147,735	7.45	205.19
City Property	51	4.47	226.40	4,767	241,434	6.62	335.32
Silgan Containers (Industrial)	2	3.09	6.81	3,299	7,265	4.58	10.09
Washington Beef (Industrial)	2	0.00	0.01	3	8	0.0	0.01
Del Monte (Industrial)	3	46.70	154.27	49,804	164,510	69.17	228.49
Subtotal	2,667		3,439.90		3,668,301		5,095
10% Contingency					366,830		509
TOTAL	2,667		3,439.90		4,035,131		5,604

* For simplicity, decimals are only carried out to the hundredths place. Differences in hand calculations using these numbers will result from rounding.

2.6.3 Future Washington Beef Demand

Washington Beef uses their own private well sources for their water needs, but occasionally they will rely on the City to supplement their demands. While Toppenish currently does not fully serve Washington Beef, it is beneficial to evaluate the impact of their demand on the City's system if they become a full-time user in the future. Washington Beef's ADD, MDD, and PHD are summarized below in Table 2-22.

TABLE 2-22 WASHINGTON BEEF ADD, MDD & PHD*					
ADD ERUs	ADD (gallons)	Annual Demand (MG)	MDD ERUs	MDD (gallons)	PHD (GPM)
1,615	683,202	249.37	940	1,001,721	1,391
* Demands and ERUs are calculated from year 2015 Washington Beef consumption data.					

Because Washington Beef's water consumption is fairly consistent throughout the year, their ADD is not much different than their MDD. The MDD value shown in Table 2-22 includes the peaking factor of 1.3 recommended in the Water Design Manual, although it would be much more conservative in this case. The contrast between ADD and MDD is much larger with a single-family service than with Washington Beef, causing the ADD ERUs to be higher than the MDD ERUs for Washington Beef. Discussion on the City's ability to fully serve Washington Beef is provided in Section 3.4.

2.6.4 Future Demand Summary and ERU/Physical Capacity

Table 2-23 summarizes the projected year 2017, six-year, 10-year, and 20-year water demands for the City of Toppenish, and compares the future demand to the City's year 2017 and future source capacity, and instantaneous and annual water rights.

TABLE 2-23 CURRENT AND FUTURE DEMAND, SOURCE CAPACITY AND WATER RIGHTS SUMMARY

Year	System Water Demand					Existing Source Capacity		Existing Water Rights*		
	# of ERUs (ADD)	Total Annual Demand	ADD	MDD	PHD	Max. Day Capacity	Pumping Capacity	Water Rights (Q_i)		Water Rights (Q_a)
		MG/Year	MGD	MGD	GPM	MGD	GPM	GPM	MGD	MG/Year
2017	3,331	514.521	1.410	3.364	4,673	7.222	5,015	4,815	6.934	2,531
2023	3,448	585.929	1.605	3.831	5,321	7.222	5,015	4,815	6.934	2,531
2027	3,507	595.932	1.633	3.897	5,412	7.222	5,015	4,815	6.934	2,531
2037	3,632	617.126	1.691	4.035	5,604	7.222	5,015	4,815	6.934	2,531

* Refer to CHAPTER 4 for further discussion of existing water right capacity and water use permits.

The system's current and future physical capacity (ERUs), in terms of water rights, source capacity, and storage capacity is summarized in Table 2-24. Further information on current water rights and source and reservoir capacities are provided in CHAPTER 3 and CHAPTER 4 of this Plan.

The physical supply capacity water rights in Table 2-24 is based upon comparing the ADD per ERU to the current and/or future total annual (Q_a) water right quantity and the MDD per ERU to the current and/or future total instantaneous (Q_i) water right quantity. Similarly, source physical capacity is based upon comparison of the MDD per ERU to the current and/or future well pumping capacity. At a minimum, the total source capacity should be able to replenish depleted fire suppression storage in 72 hours while supplying system MDD in order to eliminate the need for excessive equalizing storage capacity. The water sources should also be able to supply ADD with the largest source of supply out of service.

The storage physical capacity in Table 2-24 is based on two of the primary storage components, equalizing storage (ES) and standby storage (SB). Physical capacity of the City's reservoirs is not based upon operational storage (OS) or fire suppression storage (FSS) because these normally do not change with the number of ERUs. The Department of Health (DOH) equations for determining storage physical capacity were simplified, based upon the characteristics of metered and calculated annual and peak demands for the City of Toppenish. Therefore, current and future equalizing and standby storage capacities were calculated from the following equations:

$$ES = (150 \text{ min.})[PHD(N) - Q_s]$$ (*2009 Water System Design Manual*, Page 117)

Where,
ES = Equalizing Storage (gallons)
PHD = Peak Hourly Demand per ERU (GPM) = 1.5 GPM from Table 2-12
N = Number of ERUs
Q_s = Total flow of all permanent sources (GPM)

$$SB = (200 \text{ gallons})(N)$$ (*2009 Water System Design Manual*, Page 117)

Where,
SB = Standby Storage (gallons), minimum recommended
N = Number of ADD ERUs

Since N and ES are unknown, the above equations were rearranged and the equation for total storage (TS = OS+ES+SB+FSS) and a value of 1.5 GPM per ERU for PHD were used to yield the following equation which solves for the existing and/or future ERU capacity (N):

$$N = \frac{TS - OS + 150Q_s - FSS}{425}$$

Where,
TS = Total Storage (gallons)
OS = Operational Storage (gallons)
FSS = Fire Suppression Storage (gallons)
N = Number of ERUs
Q_s = Total flow of all permanent sources (GPM)

Water systems can exclude the SB or FSS component, whichever is smaller, from a water system's total storage requirement if the local fire authority approves "nesting," and Toppenish's fire department has elected to do so. The City's SB volume is larger than their FSS volume, therefore the FSS component will be nested within the SB volume.

When nesting the FSS volume within SB volume ($SB + FSS = SB$), the ERU capacity equation is reduced to the following:

$$N = \frac{TS - OS + 150Q_s}{425}$$

Table 2-24 summarizes the water system capacity, in ERUs, based on current supply (water rights), source, and storage capacity. Projected system demands and calculated system capacities shown in other tables of this Plan are based on demand per service and do not directly correlate to the calculated demand per ERU for all service categories under different demand conditions (e.g. ADD, MDD, PHD). Values shown in Table 2-24 are therefore, only estimates based upon calculated demands per ERU for ADD, MDD, and PHD from historical source and supply meter records. Further system analysis should be performed to determine the system's available capacity with regard to proposed development type (i.e. type of service category) to account for variations in average and peak demands of individual service categories.

TABLE 2-24 SUMMARY OF CURRENT AND FUTURE PHYSICAL CAPACITY (ERUS)

System Component	Current Capacity	Demand/ ERU[a]	ERU Capacity	Year 2017 Available ERU Capacity[b]	Year 2037 Available ERU Capacity[c]
Supply, Water Rights					
Annual (Q_a)[d]	1,043 MG	0.15 MG	6,749	3,419	3,118
Instantaneous (Q_i)[d]	4,815 GPM	0.74 GPM	6,502	3,347	3,062
Source					
ADD	2,815 GPM	0.29 GPM	9,578	6,247	5,949
MDD	5,015 GPM	0.74 GPM	6,772	3,617	3,332
Storage (Effective)					
Equalizing	2.457 MG	Varies	9,267	6,113	5,827
Standby	2.457 MG	200 Gal			

[a] Reference Table 2-16 and Table 2-19.
[b] Year 2017 available ERU capacity equals Year 2017 ERU capacity minus the Year 2017 number of ERUs.
[c] Year 2037 available ERU capacity equals Year 2037 ERU capacity minus the Year 2037 number of ERUs.
[d] Annual demand is based on average day demand per ERU and instantaneous demand is based on maximum day demand per ERU.

It can be seen from Table 2-24 that all three of the existing system components are adequate to meet ERU capacity for the 20-year projection. Based on future available ERU capacity, the City's water system would be physically able to serve Washington Beef demand if needed. Refer to Table 2-22 to compare Washington Beef's ERUs with the available ERU capacity in Table 2-24. If population growth increases above projections, or if water use permits from the Yakama Nation change, future physical system capacity should be reevaluated.

CHAPTER 3 - SYSTEM ANALYSIS

3.1 SYSTEM DESIGN STANDARDS

Standardized performance and design criteria are essential for the efficient evaluation, construction and operation of a water utility. Establishing minimum criteria assures a base level of system reliability and enhances the utility's ability to assess system deficiencies and to plan for future improvements.

The City of Toppenish has established the following performance and design criteria for their water system:

1. Water Quality – The quality of water supplied to the system shall meet or exceed the requirements of the latest edition of the Department of Health (DOH) publication 331-010, Chapter 246-290 WAC *Group A Water Supplies*.

2. Average Daily Demand (ADD) – This demand shall be equivalent to the daily consumption per service in a user category averaged for the period 2010-2015, except as otherwise adjusted to account for recent changes in demand trends as discussed in CHAPTER 2 of this Plan. The ADD values for Toppenish are presented in Table 2-10.

3. Maximum Daily Demand (MDD) – This demand shall be equivalent to the maximum day of consumption per service in a user category, as calculated using a peaking factor of 1.3 multiplied by the average day demand of the maximum month of production as described in CHAPTER 2. The MDD values are presented in Table 2-12.

4. Peak Hour Demand (PHD) – This demand shall be equivalent to the peak hour consumption per service in a user category, as calculated using a conservative estimate of 2.0 times the MDD as shown in Table 2-12.

5. Storage Requirements – Storage requirements shall be based on providing minimum operational, equalizing, standby, and fire suppression storage for the entire water system as calculated using the *DOH Water System Design Manual* equations. The specific storage requirements for the City of Toppenish are presented later in this chapter.

6. Flow Rates and Velocities – Pipelines shall be sized for a maximum allowable water flow velocity of seven feet per second (fps) for system demands, which equals the maximum instantaneous demand (PHD). Pipeline velocities for fire flow conditions shall be permitted to exceed seven fps. The basis for pipe size design shall be per computer model analysis.

7. Multiple Sources – The City of Toppenish currently has six source wells in service. The City will apply for new well use permits and develop new sources as demand requires.

8. Fire Suppression Storage Requirements – Storage requirements for fire flow shall be based on providing 3,000 gallons per minute for a 3-hour duration, which equals 540,000 gallons, as established by the City of Toppenish Fire Department. Additional fire suppression storage and fire flow capacity requirements are discussed later in this Chapter.

9. System Pressures – The City of Toppenish water system currently serves a single pressure zone. The minimum service pressure under maximum instantaneous domestic demand conditions shall be 30 pounds per square inch (psi), as specified in WAC 246-290-230(5). Under fire flow conditions, the minimum system pressure shall be 20 psi. Additional information regarding system pressure requirements under specific hydraulic analysis scenarios is presented later in this chapter.

10. Minimum Pipe Sizes - The minimum pipe size allowed within the system shall be eight-inch diameter. Where fire flow requirements exceed 1,000 GPM, the minimum pipeline size shall be determined by hydraulic analysis.

Standards for water main construction in the City of Toppenish are included in CHAPTER 10 of this Plan.

3.2 WATER QUALITY

A public water utility must supply safe and aesthetically pleasing water to its customers. However, source waters of most water utilities vary in the types and amounts of impurities which have been acquired during their passage through atmosphere, ground surfaces, or underground strata. To assure that all drinking waters maintain a standard level of quality, acceptable limits of contaminants have been established in WAC Chapter 246-290, *Group A Public Water Supplies*, March 30, 2012, specifically WAC 246-290-310 effective January 4, 2010.

These standards of acceptability establish "maximum contaminant levels" (MCLs) and "Maximum Residual Disinfectant Levels" (MRDLs) for bacteriological, inorganic chemical and physical, and other elements. The Regulations also set forth procedures to be followed if the MCL limits are exceeded.

The City of Toppenish monitors its system's water quality in accordance with the requirements of WAC 246-290-300, and 246-290-310. Follow-up action, if required, is completed in accordance with the requirements of WAC 246-290-320 and the Groundwater Rule (GWR). Bacteriological monitoring is performed at ten (10) locations within the water system in accordance with the City's *Coliform Monitoring Plan*. Lead and copper distribution system monitoring is completed in accordance with the City's lead and copper monitoring program. Inorganic chemical (IOC), volatile organic chemical (VOC), synthetic organic chemical (SOC), and radionuclide testing are performed on the City's source wells. Chlorination is performed in accordance with the City's Disinfection Byproducts Monitoring Plan, included in CHAPTER 10.

Since 1982 Toppenish has used fluoridation at all their source wells. Fluoridation is performed in accordance to WAC 246-290-460. More information on fluoridation monitoring is provided in Section 3.2.2.

Toppenish flushes Reservoir No. 4 annually, as described in Wapato Irrigation Project Permits included in CHAPTER 10 of this Plan.

3.2.1 Water Source Sampling and Testing

Inorganic Chemical (IOC) Monitoring: Water quality monitoring for primary IOCs, secondary IOCs and physical parameters is required from each source generally once every compliance cycle. Compliance cycles are nine years, per 40 CFR 141.23. Toppenish collects water samples for IOCs and physical parameters prior to introduction into the distribution system, chlorination, or fluoridation at each well.

Certain chemical characteristics must be monitored more frequently than the general monitoring requirements. For example, Nitrate and Nitrite must be monitored annually. Other chemical characteristics monitoring requirements may be waived by the Department of Health.

Results of Toppenish's latest source IOC and physical analysis, summarized in Table 3-1 and Table 3-2, show the City to be in compliance with State standards, with the exception of fluoride at Well No. 3 and manganese at Well No. 6 and Well No. 7. Currently, additional compliance monitoring is required for Well No. 7. These incompliances will continue to be monitored according to the Water Quality Monitoring Schedule provided in CHAPTER 10 of this Plan. Copies of the most recent test results for the source wells are also provided in the CHAPTER 10 of this Plan, and are shown in Table 3-3 through Table 3-8. The results indicate that water quality in each of the wells has not significantly changed over time.

TABLE 3-1 INORGANIC (PRIMARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY							
Chemical or Physical Property	MCL (mg/l)	Well No. 3 7/9/2010	Well No. 5 10/9/2007	Well No. 6 10/9/2007	Well No. 7 10/9/2007	Well No. 8 10/9/2007	Well No. 9 1/16/2013
Antimony (Sb)	0.006	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.006
Arsenic (As)	0.010	0.002	<0.0020	<0.0020	<0.0020	<0.0020	0.003
Barium (Ba)	2.0	0.007	0.0070	0.0310	0.0490	0.0040	0.4
Beryllium (Be)	0.004	0.0002	<0.0003	<0.0002	<0.0002	<0.0002	0.0006
Cadmium (Cd)	0.005	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.002
Chromium (Cr)	0.100	0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.020
Copper (Cu)*	1.3	0.0099	<0.0026	<0.0020	<0.0020	<0.0020	0.020
Cyanide (HCN)	0.200	0.0100	<0.0100	<0.0100	<0.0100	<0.0100	<0.0100
Fluoride (F)	4.0	7.7400	0.1300	0.57	0.7800	0.1300	0.565
Lead (Pb)*	0.015	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0012
Mercury (Hg)	0.002	0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.0004
Nickel (Ni)	0.10	0.01	<0.0100	<0.0100	<0.0100	<0.0100	0.10
Nitrate (as N)	10.0	1.34	1.4000	<0.0500	<0.0500	0.3800	1.08
Nitrite (as N)	1.0	0.05	<0.0500	<0.0500	<0.0500	<0.0500	0.20
Selenium (Se)	0.05	0.005	<0.0050	<0.0050	<0.0050	<0.0050	0.0022
Sodium (Na)*	20	16.90	8.2000	19.2000	24.4000	6.9500	11.4
Thallium (Tl)	0.002	0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.0016

* No DOH Established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-2 INORGANIC (SECONDARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY							
Chemical or Physical Property	MCL (mg/l)	Well No. 3 7/9/2010	Well No. 5 10/9/2007	Well No. 6 10/9/2007	Well No. 7 10/9/2007	Well No. 8 10/9/2007	Well No. 9 1/16/2013
Chloride (Cl)	250.0	6.16	4.3800	1.7800	2.2800	1.2200	20
Fluoride (F)	2.0	7.7400	0.1300	0.57	0.7800	0.1300	0.565
Iron (Fe)	0.3	0.0097	0.0172	0.0499	0.0620	0.0213	0.1
Manganese (Mn)	0.05	0.002	<0.0020	0.0905	0.1120	<0.0020	0.0109
Silver (Ag)	0.1	0.0047	<0.0047	<0.0047	<0.0047	<0.0047	0.1
Sulfate (SO_4)	250.0	8.52	8.0400	<0.1000	<0.1000	3.1400	12
Zinc (Zn)	5.0	0.008	<0.0200	<0.0200	<0.0200	<0.0200	0.2
Color	15 Color Units	4	<4.0000	<4.0000	<4.0000	<4.0000	1
Specific Conductivity	700 umhos/cm	241	80.6000	38.6000	52.3000	44.8000	214
Total Dissolved Solids (TDS)	500	148	201.0000	162.0000	207.0000	119.0000	116

Table 3-3 through Table 3-8 present both the latest, and previously conducted IOC analysis test results for each primary source well.

TABLE 3-3 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 3 (S03)				
Chemical or Physical Characteristics	MCL (mg/l)	7/9/2010	7/24/2007	8/5/2003
Primary Substances				
Antimony (Sb)	0.0060	0.005	<0.0050	<0.0050
Arsenic (As)	0.0104	0.002	<0.0020	<0.0020
Barium (Ba)	2.0	0.007	0.0070	0.0050
Beryllium (Be)	0.0040	0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.0050	0.0003	<0.0003	<0.0003
Chromium (Cr)	0.1000	0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	0.0099	0.0182	0.2750
Cyanide (HCN)	0.2000	0.0100	<0.0100	<0.0100
Fluoride (F)	4.0	7.7400	1.1300	4.1900
Lead (Pb)*	0.015	0.0005	<0.0005	0.0028
Mercury (Hg)	0.0020	0.0003	<0.0003	<0.0003
Nickel (Ni)	0.10	0.01	<0.0100	<0.0100
Nitrate (as N)	10.0	1.34	1.5800	0.5900
Nitrite (as N)	1.0	0.05	<0.0500	<0.0700
Selenium (Se)	0.05	0.005	<0.0050	<0.0050
Sodium (Na)*	20	16.90	9.0500	10.4000
Thallium (Tl)	0.002	0.001	<0.0010	<0.0010
Secondary Substances				
Chloride (Cl)	250.0	6.16	4.6100	4.0000
Fluoride (F)	2.0	7.7400	1.1300	4.1900
Iron (Fe)	0.3	0.0097	0.0128	0.5840
Manganese (Mn)	0.05	0.002	<0.0020	0.0133
Silver (Ag)	0.1	0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250.0	8.52	8.4800	9.1000
Zinc (Zn)	5.0	0.008	<0.0200	0.4000
Color	15 Color Units	4	<4.0000	25.0000
Specific Conductivity	700 umhos/cm	241	90.7000	85.9000
Total Dissolved Solids (TDS)	500	148	222.0000	223.0000

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-4 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 5 (S05)				
Chemical or Physical Characteristics	MCL (mg/l)	10/9/2007	6/07/2000	06/11/1997
Primary Substances				
Antimony (Sb)	0.006	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.0104	<0.0020	<0.0100	<0.0100
Barium (Ba)	2.0	0.0070	<0.1000	<0.1000
Beryllium (Be)	0.004	<0.0003	<0.0030	<0.0020
Cadmium (Cd)	0.005	<0.0003	<0.0020	<0.0020
Chromium (Cr)	0.1	<0.0047	<0.0100	<0.0100
Copper (Cu)*	1.3	<0.0026	<0.2000	<0.0200
Cyanide (HCN)	0.2	<0.0100	<0.0500	<0.1000
Fluoride (F)	4.0	0.1300	0.8000	0.9000
Lead (Pb)*	0.015	<0.0005	<0.0020	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0005	<0.0005
Nickel (Ni)	0.10	<0.0100	<0.0400	<0.0400
Nitrate (as N)	10.0	1.4000	1.20000	2.4000
Nitrite (as N)	1.0	<0.0500	-	-
Selenium (Se)	0.05	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	8.2000	7.8000	8.0000
Thallium (Tl)	0.002	<0.0010	<0.0020	<0.0010
Secondary Substances				
Chloride (Cl)	250.0	4.3800	<20.0000	-
Fluoride (F)	2.0	0.1300	0.8000	0.9000
Iron (Fe)	0.3	0.0172	<0.1000	<0.0500
Manganese (Mn)	0.05	<0.0020	<0.0100	<0.0100
Silver (Ag)	0.1	<0.0047	<0.0100	<0.0100
Sulfate (SO_4)	250.0	8.0400	<10.0000	<10.0000
Zinc (Zn)	5.0	<0.0200	<0.2000	0.1000
Color	15 Color Units	<4.0000	<5.0000	-
Specific Conductivity	700 umhos/cm	80.6000	75.0000	90.0000
Total Dissolved Solids (TDS)	500	201.0000	200.0000	-

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-5 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 6 (S06)					
Chemical or Physical Characteristics	MCL (mg/l)	10/13/2016	10/9/2007	6/07/2000	06/04/1997
Primary Substances					
Antimony (Sb)	0.006	<0.0060	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.0104	0.0034	<0.0020	<0.0100	<0.0100
Barium (Ba)	2.0	<0.4000	0.0310	<0.1000	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0002	<0.0030	<0.0020
Cadmium (Cd)	0.005	<0.0020	<0.0003	<0.0020	<0.0020
Chromium (Cr)	0.1	<0.0200	<0.0047	<0.0100	<0.0100
Copper (Cu)*	1.3	<0.0200	<0.0020	<0.2000	<0.0200
Cyanide (HCN)	0.2	<0.0100	<0.0100	<0.0500	<0.1000
Fluoride (F)	4.0	-	0.57	0.9000	0.9000
Lead (Pb)*	0.015	<0.0010	<0.0005	<0.0020	<0.0020
Mercury (Hg)	0.0020	-	<0.0003	<0.0005	<0.0005
Nickel (Ni)	0.10	<0.1000	<0.0100	<0.0400	<0.0400
Nitrate (as N)	10.0	<0.2000	<0.0500	<0.5000	<0.5000
Nitrite (as N)	1.0	<0.2000	<0.0500	<0.5000	-
Selenium (Se)	0.05	<0.0100	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	16.8000	19.2000	10.0000	10.0000
Thallium (Tl)	0.002	0.0011	<0.0010	<0.0020	<0.0010
Secondary Substances					
Chloride (Cl)	250.0	-	1.7800	<20.0000	-
Fluoride (F)	2.0	-	0.57	0.9000	0.9000
Iron (Fe)	0.3	<0.1000	0.0499	<0.1000	<0.0500
Manganese (Mn)	0.05	<0.0100	0.0905	0.0290	0.0280
Silver (Ag)	0.1	<0.1000	<0.0047	<0.0100	<0.0100
Sulfate (SO_4)	250.0	-	<0.1000	<10.0000	<10.0000
Zinc (Zn)	5.0	-	<0.0200	<0.2000	<0.0500
Color	15 Color Units	-	<4.0000	5.0000	-
Specific Conductivity	700 umhos/cm	-	38.6000	41.0000	42.0000
Total Dissolved Solids (TDS)	500	-	162.0000	140.0000	-

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-6 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 7 (S07)					
Chemical or Physical Characteristics	MCL (mg/l)	10/13/2016	10/9/2007	6/07/2000	06/17/1997
Primary Substances					
Antimony (Sb)	0.006	<0.0060	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.0104	0.0037	<0.0020	<0.0100	<0.0100
Barium (Ba)	2.0	<0.4000	0.0490	<0.1000	<0.1000
Beryllium (Be)	0.004	<0.0008	<0.0002	<0.0030	<0.0020
Cadmium (Cd)	0.005	<0.0020	<0.0003	<0.0020	<0.0020
Chromium (Cr)	0.1	<0.0200	<0.0047	<0.0100	<0.0100
Copper (Cu)*	1.3	<0.0200	<0.0020	<0.2000	<0.0200
Cyanide (HCN)	0.2	<0.0100	<0.0100	<0.0500	<0.1000
Fluoride (F)	4.0	-	0.7800	0.7000	1.0000
Lead (Pb)*	0.015	0.0014	<0.0005	<0.0020	<0.0020
Mercury (Hg)	0.0020	-	<0.0003	<0.0005	<0.0005
Nickel (Ni)	0.10	<0.1000	<0.0100	<0.0400	<0.0400
Nitrate (as N)	10.0	<0.2000	<0.0500	<0.5000	<0.5000
Nitrite (as N)	1.0	<0.2000	<0.0500	<0.5000	-
Selenium (Se)	0.05	<0.0100	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	22.5000	24.4000	23.0000	23.0000
Thallium (Tl)	0.002	0.0018	<0.0010	<0.0020	<0.0010
Secondary Substances					
Chloride (Cl)	250.0	-	2.2800	<20.0000	-
Fluoride (F)	2.0	-	0.7800	0.7000	1.0000
Iron (Fe)	0.3	0.1200	0.0620	0.1300	<0.0500
Manganese (Mn)	0.05	<0.0100	0.1120	0.1200	0.1200
Silver (Ag)	0.1	<0.1000	<0.0047	<0.0100	<0.0100
Sulfate (SO_4)	250.0	-	<0.1000	<10.0000	<10.0000
Zinc (Zn)	5.0	-	<0.0200	<0.2000	<0.0500
Color	15 Color Units	-	<4.0000	<5.0000	-
Specific Conductivity	700 umhos/cm	-	52.3000	54.0000	54.0000
Total Dissolved Solids (TDS)	500	-	207.0000	220.0000	-

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-7 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 8 (S08)			
Chemical or Physical Characteristics	MCL (mg/l)	10/9/2007	6/07/2000
Primary Substances			
Antimony (Sb)	0.006	<0.0050	<0.0050
Arsenic (As)	0.0104	<0.0020	<0.0100
Barium (Ba)	2.0	0.0040	<0.1000
Beryllium (Be)	0.004	<0.0002	<0.0030
Cadmium (Cd)	0.005	<0.0003	<0.0020
Chromium (Cr)	0.1	<0.0047	<0.0100
Copper (Cu)*	1.3	<0.0020	<0.2000
Cyanide (HCN)	0.2	<0.0100	<0.0500
Fluoride (F)	4.0	0.1300	0.8000
Lead (Pb)*	0.015	<0.0005	<0.0020
Mercury (Hg)	0.0020	<0.0003	<0.0005
Nickel (Ni)	0.10	<0.0100	<0.0400
Nitrate (as N)	10.0	0.3800	<0.5000
Nitrite (as N)	1.0	<0.0500	<0.5000
Selenium (Se)	0.05	<0.0050	<0.0050
Sodium (Na)*	20	6.9500	10.0000
Thallium (Tl)	0.002	<0.0010	<0.0020
Secondary Substances			
Chloride (Cl)	250.0	1.2200	<20.0000
Fluoride (F)	2.0	0.1300	0.8000
Iron (Fe)	0.3	0.0213	<0.1000
Manganese (Mn)	0.05	<0.0020	0.0280
Silver (Ag)	0.1	<0.0047	<0.0100
Sulfate (SO_4)	250.0	3.1400	<10.0000
Zinc (Zn)	5.0	<0.0200	<0.2000
Color	15 Color Units	<4.0000	7.5000
Specific Conductivity	700 umhos/cm	44.8000	41.0000
Total Dissolved Solids (TDS)	500	119.0000	140.0000

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.

TABLE 3-8 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WELL NO. 9 (S09)		
Chemical or Physical Characteristics	MCL (mg/l)	1/16/2013
Primary Substances		
Antimony (Sb)	0.006	0.006
Arsenic (As)	0.0104	0.003
Barium (Ba)	2.0	0.4
Beryllium (Be)	0.004	0.0006
Cadmium (Cd)	0.005	0.002
Chromium (Cr)	0.1	0.020
Copper (Cu)*	1.3	0.020
Cyanide (HCN)	0.2	<0.0100
Fluoride (F)	4.0	0.565
Lead (Pb)*	0.015	0.0012
Mercury (Hg)	0.0020	0.0004
Nickel (Ni)	0.10	0.10
Nitrate (as N)	10.0	1.08
Nitrite (as N)	1.0	0.20
Selenium (Se)	0.05	0.0022
Sodium (Na)*	20	11.4
Thallium (Tl)	0.002	0.0016
Secondary Substances		
Chloride (Cl)	250.0	20
Fluoride (F)	2.0	0.565
Iron (Fe)	0.3	0.1
Manganese (Mn)	0.05	0.0109
Silver (Ag)	0.1	0.1
Sulfate (SO_4)	250.0	12
Zinc (Zn)	5.0	0.2
Color	15 Color Units	1
Specific Conductivity	700 umhos/cm	214
Total Dissolved Solids (TDS)	500	116
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.		

Nitrate/Nitrite Monitoring: The City of Toppenish conducts annual monitoring for Nitrate and Nitrite on all well sources. The MCL for Nitrate and Nitrite are 10.0 mg/l and 1.0 mg/l, respectively. Nitrates exceeding this concentration in drinking water can be a health hazard, especially to infants below six months of age.

Test results for the period 2011 through 2015, summarized in Table 3-9, show the City to be in compliance with State standards. A copy of Nitrate/Nitrite analysis test results are provided in the CHAPTER 10 of this Plan.

TABLE 3-9 NITRATE / NITRITE CHEMICAL ANALYSIS RESULTS					
	2015	2014	2013	2012	2011
Well No. 3 (S03)					
Nitrate (NO_3-N)	2.33	2.59	1.88	1.74	2.05
Nitrite (NO_2-N)	0.07	0.05	0.05	0.05	0.05
Total Nitrate/Nitrite	2.33	2.59	1.88	1.74	2.05
Well No. 5 (S05)					
Nitrate (NO_3-N)	2.03	---	1.34	1.46	0.20
Nitrite (NO_2-N)	0.05	---	0.07	0.05	0.20
Total Nitrate/Nitrite	2.03	---	1.34	1.46	0.50
Well No. 6 (S06)					
Nitrate (NO_3-N)	0.05	0.05	0.05	0.05	0.05
Nitrite (NO_2-N)	0.05	0.05	0.05	0.05	0.05
Total Nitrate/Nitrite	0.50	0.50	0.50	0.50	0.50
Well No. 7 (S07)					
Nitrate (NO_3-N)	0.05	0.05	0.07	0.05	0.05
Nitrite (NO_2-N)	0.05	0.05	0.07	0.05	0.05
Total Nitrate/Nitrite	0.50	0.50	0.50	0.50	0.50
Well No. 8 (S08)					
Nitrate (NO_3-N)	0.50	0.46	0.48	0.44	0.50
Nitrite (NO_2-N)	0.05	0.05	0.07	0.05	0.05
Total Nitrate/Nitrite	0.50	0.46	0.48	0.44	0.50
Well No. 9 (S09)					
Nitrate (NO_3-N)	1.16	---	---	---	---
Nitrite (NO_2-N)	0.05	---	---	---	---
Total Nitrate/Nitrite	1.16	---	---	---	---

Volatile Organic Chemical Monitoring: Volatile Organic Chemical (VOC) monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no VOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The compliance period for Toppenish's VOC testing is six years, except for Well No. 9 which is quarterly. The Department of Health may grant waivers for monitoring requirements. Toppenish conducted VOC testing on its source wells as shown in Table 3-10.

TABLE 3-10 SOURCE WELL VOC TESTING			
Source	Month/Year		
Well No. 3 (S03)	07/2010	07/2006	08/2003
Well No. 5 (S05)	05/2012	04/2006	06/2001
Well No. 6 (S06)	03/2015	03/2009	08/2003
Well No. 7 (S06)	03/2015	03/2009	08/2003
Well No. 8 (S08)	04/2015	03/2009	08/2003
Well No. 9 (S09)	10/2015	01/2013	02/2012

Test results show the City to be in compliance with State standards. The City tests for trihalomethanes (TTHM) along with VOC testing, and test results showed no presence of any of these substances in the water from the City's wells. Copies of the VOC and trihalomethanes test results are provided in CHAPTER 10 of this Plan.

Synthetic Organic Chemical (SOC) Monitoring: SOC monitoring is required once every year for the first three years of sampling, per 40 CFR 141.24. Samples are to be taken following water treatment. If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every compliance period. The Department of Health may grant waivers for monitoring requirements. Toppenish conducted SOC testing on its source wells as shown in Table 3-11.

TABLE 3-11 SOURCE WELL SOC TESTING			
Source	Month/Year		
Well No. 3 (S03)	04/2009	12/2001	08/1998
Well No. 5 (S05)	04/2012	06/2001	07/2000
Well No. 6 (S06)	05/2009		
Well No. 7 (S06)	04/2009		
Well No. 8 (S08)	04/2009		
Well No. 9 (S09)	01/2013	02/2012	

Test results show the City to be in compliance with State standards, and showed no presence of any of these substances in the water from the City's wells. A copy of the SOC analysis test results is provided in CHAPTER 10 of this Plan.

Radionuclide Monitoring: For the City of Toppenish, radionuclide sampling from each source is generally required once every three years. However, the Department of Health may reduce monitoring requirements to once every six or nine years based on criteria set forth in 40 CFR 141.26. Toppenish has completed radionuclide testing on its source wells every six years, as shown in Table 3-12.

TABLE 3-12 SOURCE WELL RADIONUCLIDE TESTING			
Source	Month/Year		
Well No. 3 (S03)	08/2015	08/2009	12/2005
Well No. 5 (S05)	09/2015	09/2009	09/2005
Well No. 6 (S06)	10/2015	10/2009	09/2007
Well No. 7 (S06)	11/2015	11/2009	12/2005
Well No. 8 (S08)	12/2015	12/2009	09/2007
Well No. 9 (S09)	01/2013	02/2012	

Test results show the City to be in compliance with State standards. A copy of the radionuclide analysis test results is provided in CHAPTER 10 of this Plan.

3.2.2 Distribution System Sampling and Testing

Bacteriological: Drinking water samples are required to be collected monthly at various locations throughout the water distribution system for bacteriological analysis in accordance with the City's *Coliform Monitoring Plan*. The minimum number of samples required for collection by a water utility is based on the population served. The Department of Health regulations require water systems serving a population of 8,501 to 12,900 to take a minimum of ten (10) samples per month when no samples with a coliform presence are collected previous month. The City of Toppenish is required to sample a minimum of ten (10) locations within the distribution system. The *Coliform Monitoring Plan* and representative copies of bacteriological analysis results are provided in CHAPTER 10 of this Plan.

Disinfection Byproducts (DBPs): Toppenish adds chlorine to its drinking water to kill or inactivate harmful organisms that may cause various diseases, and this process is known as disinfection. However, chlorine is a very active substance and it reacts with naturally occurring substances to form compounds known as disinfection byproducts. The most common disinfection byproducts formed when chlorine is used are trihalomethanes (TTHMs) and haloacetic acids (HAA5).

In 2006, EPA enacted new rules for disinfection byproducts monitoring, known as the Stage 2 Rule. Under the Stage 2 Rule, water systems must monitor at locations with the highest averages of total trihalomethanes (TTHMs) and haloacetic acids (HAA5). To determine these locations, the Stage 2 Rule required many systems to complete an Initial Distribution System Evaluation (IDSE). Two dual sample sets of TTHM and HAA5 samples are required annually to meet Stage 2 Rule standards. The City has identified the sampling locations and schedules in the *Stage 2 DBP Monitoring Plan* provided in CHAPTER 10 of this Plan. The compliance determination for the Stage 2 Rule is based on a locational running annual average (LRAA), meaning compliance must be met at each monitoring location instead of the system-wide running annual average (RAA) used under the Stage 1 Rule.

Results from the latest (2015) monitoring indicated that none of the samples exceeded the federal action levels of 0.080 mg/l for TTHMs and 0.060 mg/l for HAA5 under the Stage 2 DBP Rule. Table 3-13 provides a summary of the 2015 and 2014 TTHMs and HAA5 monitoring results, which are also provided in CHAPTER 10 of this Plan.

TABLE 3-13 TTHM AND HAA5 PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Year	Sample Locations	TTHM	HAA5
2015	713 S. Division Road	0.0009	0.0150
	509 Buena Way	0.0069	0.0150
	141 Ward Road	0.0017	0.0150
	501 Annalat Road	ND	0.0150
2014	501 Annalat Road	0.0030	0.0150

* ND means not detected

Lead and Copper: Lead and copper sampling is required once every three years as approved by the Department of Health, per 40 CFR 141.86. In 1997, Toppenish began a tap water lead and copper monitoring program to determine the lead and copper concentrations in drinking water to which its customers may be exposed. In 2015, twenty-one (21) samples were collected from various locations throughout the water system and tested for concentrations of lead and copper. Results from the latest (2015) monitoring indicated that none of the samples exceeded the federal action levels of 1.3 mg/l for copper and 0.015 mg/l for lead. Table 3-14 provides a summary of the 2015 copper and lead monitoring results, which are also provided in CHAPTER 10 of this Plan.

TABLE 3-14 LEAD AND COPPER MONITORING PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Sample Number	Sample Location	Year 2015	
		Copper (Federal Action Level 1.3 mg/l)	Lead (Federal Action Level 0.015 mg/l)
1	615 Jefferson Avenue	0.1120	0.0053
2	720 East Toppenish Avenue	0.0645	0.0014
3	308 North D Street	0.0153	0.0003
4	804 Adams Avenue	0.1200	0.0003
5	1118 Washington Avenue	0.1630	0.0003
6	516 West Third Avenue	0.5580	0.0002
7	36 North H Street	0.3880	0.0001
8	419½ North Elm Street	0.0279	0.0029
9	110 North Elm Street	0.0276	0.0006
10	41xxxxxxxxxct	0.0723	0.0004
11	309 Bergen Lane	0.4450	0.0014
12	112 South K Street	0.1390	0.0005
13	106 South Fir Street	0.0209	0.0002
14	604 Bolin Drive	0.0290	0.0006
15	203 South Chestnut Street	0.0224	0.0014
16	517 North Elm Street	0.0315	0.0002
17	519 West Third Avenue	0.0163	0.0015
18	33 North D Street	0.0364	0.0002
19	522 North Elm Street	0.0316	0.0004
20	210 Dayton Avenue	0.0273	0.0004
21	215 Pearne Street	0.0151	0.0002

Asbestos Monitoring: Distribution system monitoring for asbestos is required in accordance with 40 CFR 141.23(b), when a system is vulnerable to asbestos contamination due to corrosion of asbestos-cement (AC) pipe. Toppenish has nearly 30 percent AC pipe, therefore, one sample at a tap served by AC pipe is required during the first 3-year compliance period of each nine-year compliance cycle. If the maximum contaminant levels (MCLs) are exceeded samples shall be taken quarterly, or as directed by the DOH, until samples are reliably and consistently below the MCLs, as determined by the DOH.

Fluoride Monitoring: The optimal fluoride concentration is 0.7 mg/L. The City is required to collect routine monitoring samples downstream from each fluoride injection point at the first sample tap where adequate mixing has occurred each business day. Once every month The City is required to collect a split sample, testing one half of the sample and submitting the other half of the sample for analysis to a drinking water certified laboratory. This monthly sample is intended to check the City's equipment or testing procedures for accuracy and consistency. The operating tolerance allows the range of 0.5 to 0.9 mg/L. The City may be required to increase the frequency, or change the location of sampling to ensure adequacy and consistency of fluoridation.

3.2.3 Future Source Water and Distribution System Sampling and Testing

A summary of future source and distribution system monitoring requirement frequencies, dates and sample status, as provided in the City's *Water Quality Monitoring Schedule* (WQMS), is provided below in Table 3-15 and Table 3-16, respectively. A copy of the City's WQMS is provided in CHAPTER 10 of this Plan.

TABLE 3-15 FUTURE SOURCE WATER SAMPLING REQUIREMENTS

Sample Type	Frequency	Last Sample	Next Sample	Status
Well No. 3 (S03)				
Nitrate/Nitrite	Once/Year	July 2015	July 2016	Within MCLs
Inorganic Chemicals (IOCs) Iron	Once/9 years Once/3 Years	July 2010 May 2015	July 2019 May 2018	Fluoride and Iron Exceedances
Volatile Organic Chemicals (VOCs)	Once/6 Years	July 2010	July 2016	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	April 2009	April 2018	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	August 2015	August 2021	Within MCLs
Well No. 5 (S05)				
Nitrate/Nitrite	Once/Year	March 2015	March 2016	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	October 2007	October 2016	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 Years	May 2012	May 2018	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	April 2012	April 2021	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	September 2015	September 2021	Within MCLs
Well No. 6 (S06)				
Nitrate/Nitrite	Once/Year	September 2015	September 2016	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	October 2007	October 2016	Manganese Exceedance
Volatile Organic Chemicals (VOCs)	Once/6 Years	March 2015	March 2021	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	May 2009	May 2018	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	October 2015	October 2021	Within MCLs
Well No. 7 (S07)				
Nitrate/Nitrite	Once/Year	May 2015	July 2016	Within MCLs
Inorganic Chemicals (IOCs) Manganese	Once/9 years Once/3 Years	October 2007 July 2015	October 2016 July 2018	Manganese Exceedance
Volatile Organic Chemicals (VOCs)	Once/6 Years	March 2015	March 2021	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	April 2009	April 2018	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	November 2015	November 2021	Within MCLs
Well No. 8 (S08)				
Nitrate/Nitrite	Once/Year	May 2015	May 2016	Within MCLs
Inorganic Chemicals (IOCs)	Once/9 years	October 2007	October 2016	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/6 years	April 2015	April 2021	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	April 2009	April 2018	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	December 2015	December 2021	Within MCLs
Well No. 9 (S09)				
Nitrate/Nitrite	Once/Year	October 2015	October 2016	Within MCLs
Inorganic Chemicals (IOCs)	Once/3 years	January 2013	August 2016	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/quarter	Ongoing	Ongoing	Within MCLs
Synthetic Organic Compounds (SOCs, Herbicideds/Pesticides)	Once/9 Years	January 2013	February 2022	Within MCLs
Radionuclides (Gross Alpha, Radium 228)	Once/6 Years	January 2013	January 2019	Within MCLs

TABLE 3-16 FUTURE DISTRIBUTION SYSTEM SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
Coliform Bacteria	10/Year	Ongoing	Ongoing	Within MCLs
Disinfection Byproducts*	1 dual sample set/Year	July 2015	July 2018	Within MCLs
Lead & Copper	1 set of 20 samples/3 Years	July 2015	July 2018	No Exceedance
Asbestos	1/9 Years	July 2009	July 2018	Within MCLs
* One dual sample set of TTHM and HAA5 samples are required annually, Stage 2 Rule.				

Future sampling requirements are discussed further in CHAPTER 6 of this Plan. The City's 2015 and future WQMRs should be consulted regarding the dates for future testing.

3.3 SYSTEM DESCRIPTION AND ANALYSIS

The existing City of Toppenish domestic water system consists of one distribution pressure zone, as shown in Figure 3-1, which provides a range of pressures from 56 psi to 69 psi to all services under normal operating conditions. In Figure 3-1, the maximum and minimum service elevation contours reflect the existing maximum and minimum elevation of customers being served by the City. The maximum service elevation that can be provided the minimum required 30 psi with Toppenish's existing storage requirements is 811 feet, which is above the UGA limits. Information on Toppenish's pressure zone, including the service elevations and pressure ranges is also provided in Figure 3-1.

The City is supplied water from six source wells, with a maximum combined pumping capacity of 5,015 gallons per minute (GPM) or 7.22 million gallons per day (MGD). The City has water use permits from Yakama Nation for all source wells. The City also maintains a certificated water right for Well No. 6 from the Department of Ecology (DOE) with an instantaneous and annual capacity of 2,000 GPM and 3,200 acre-feet per year, respectively. Further discussion on the City's existing well use permits and water rights is provided in CHAPTER 4 of this Plan.

Toppenish's water storage is provided by four reservoirs with a total storage capacity of 3.448 MG and usable storage capacity of 2.457 MG. During normal operation, static pressures throughout the existing water distribution system range from a low of 56 psi to a high of 69 psi, based upon the reservoir overflow elevations and well telemetry controls.

The entire water system is controlled by a comprehensive PLC (Programmable Logic Controller) based telemetry system. PLC telemetry units are located at six system wells and four reservoirs, and are linked via radio communication. The telemetry system's master control station is located at the City's Public Works Shop.

Toppenish's water transmission and distribution system is comprised of over 195,000 linear feet of pipe, ranging in diameter from 3-inch to 16-inch. The system is looped where possible, and a majority of the material is 6-inch or larger ductile iron, cast iron pipe, and asbestos cement pipe. The layout of Toppenish's water distribution system, including pipe sizes, valve, hydrant, and reservoir locations is shown in Figure 3-1. The maximum water service elevation of the system is also indicated in Figure 3-1. An enlarged map (Map A) of the water system is included in CHAPTER 10 of this Plan. Figure 3-2 Water System Major Components Map shows the location of major water system components, including reservoirs, wells, and large diameter pipe lines. Well depth information is also included in this figure.

CITY OF TOPPENISH

Water System Plan Update

WATER SYSTEM SERVICE AREA/ELEVATIONS MAP

MAXIMUM SERVICE ELEVATION STATIC PRESSURE = 56 PSI

RESERVOIR NO. 5 (1.7 MG)

RESERVOIR NO. 2 (0.2 MG)

RESERVOIR NO. 4 (1.0 MG)

RESERVOIR NO. 3 (0.5 MG)

MINIMUM SERVICE ELEVATION STATIC PRESSURE = 69 PSI

770

760

750

740

N W E S

0 750 1500

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- 700 SERVICE ELEVATION CONTOUR
- WATER MAINS
- RESERVOIR
- 760 YAKIMA COUNTY 10' CONTOURS
- HYDRANTS
- VALVES
- SERVICE AREA ABOVE ELEVATION 770 FT.
- SERVICE AREA BELOW ELEVATION 740 FT.

HLA Engineering and Land Surveying, Inc.
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Yakima, WA 98902
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3/29/2016
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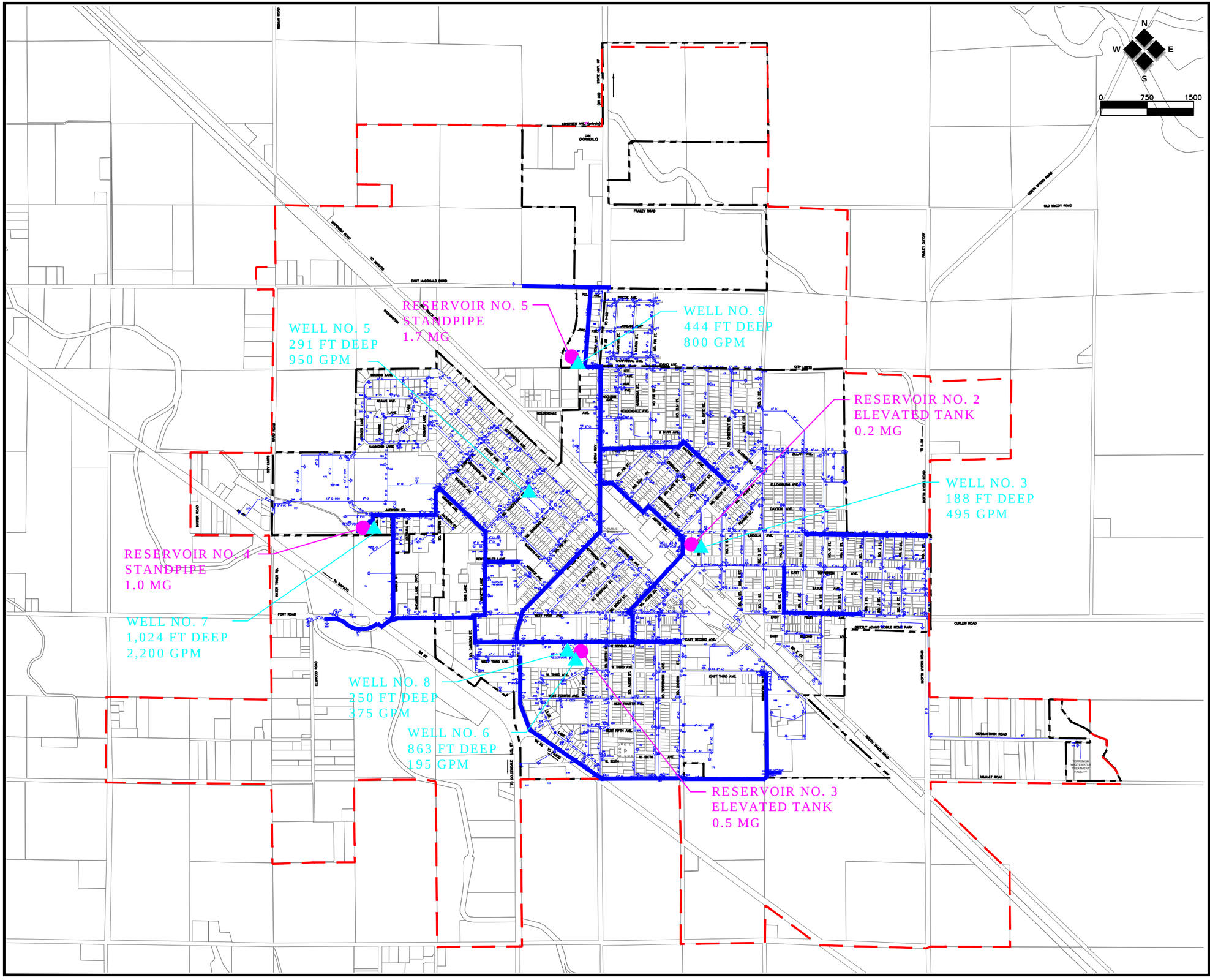
FIGURE 3-1



CITY OF TOPPENISH

Water System Plan Update

WATER SYSTEM MAJOR COMPONENTS MAP

LEGEND

- CITY LIMITS
- FUTURE SERVICE AREA
- STORAGE RESERVOIR
- GROUNDWATER WELL
- WATER MAINS
- WATER MAINS (10" AND LARGER)
- HYDRANTS
- VALVES

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FIGURE 3-2

3.3.1 Water Sources

Toppenish has six source wells, all located on City-owned properties, as shown in Figure 3-1 and Map A, enclosed in the back of this Plan. The following are descriptions of the City's wells and pump installations.

Well No. 3 (S03):

The well house is on the right, fluoridation and chlorination building on the left, and Reservoir No. 2 in the background.

Well No. 3 is located next to Reservoir No. 2 in the City's Swimming Pool Park, near the intersection of Asotin Avenue and South Alder Street, as shown in Figure 3-1. The well was constructed in 1937 to a depth of 188 feet. When last measured in May 2016, the static water level within the well was 14 feet 0 inches below the ground surface (BGS).

Water is withdrawn from Well No. 3 with a Johnston vertical line-shaft turbine pump (Model No. GD 1203) that was installed in 1994. The pump is powered by a 50 horsepower, 220/440 volt, 3-phase, U.S. Electric Hollowshaft motor. The well originally produced 700 GPM, and in 1970 it pumped 650 GPM. The current well capacity is approximately 495 GPM.

The well and pump are housed in a stucco building that is heated and ventilated. A Water Specialties flow meter, installed in the discharge line, is located in a concrete vault adjacent to the well building. The pump controls, disinfection equipment (a Wallace & Tiernan V-100 automatic gas chlorinator and a Scaletron scale) and fluoridation equipment are located in a second building next to the well and pump building. Information regarding Well No. 3 is summarized on Table 3-17 below.

TABLE 3-17 TOPPENISH WELL NO. 3 INFORMATION

Date Constructed	1937
Well Depth	188 feet
Casing Depth/Diameter	0 to 187 feet/16-inch
Casing Perforation/Screen Depth	50 to 180 feet
Static Water Level	2016: 14'-0" BGS
Pump Information Manufacturer Type Model No. Year Installed No. of Stages	 Johnston Line Shaft Turbine GD 1203 1994 6
Motor Information Manufacturer Horsepower Voltage / Phase RPM	 U.S. Electric Hollowshaft High Thrust 50 440 V / 3-phase 1,800
Current Well Capacity	495 GPM

Well No. 5 (S05):

The larger room on the right houses the well pump and related appurtenances, and the smaller room on the left houses the power generator. The rooms are open to each other.

Well No. 5 is located in Olney Park near the intersection of Adams Avenue and South Hawthrone Street, as shown on Figure 3-1. The well was drilled in 1952 to a depth of 291 feet and was then rehabilitated in 1954. Water is withdrawn from the well using a Berkely pump, powered by a 75 horsepower, 440 volt, 3 phase, 1,800 RPM U.S. Electric motor. A 10-inch McCrometer flow meter was installed in 2015, and is located in a vault adjacent to the well building. Well No. 5 is the City's only well that feeds directly into the water distribution system. The well was cleaned in 2015 and currently produces 950 GPM. The static water level of this well was measured at 14 feet 0 inches BGS in May 2016.

The pump is housed in a concrete block building that is heated and ventilated. The building has a separate chlorine room, which is accessed from the outside and houses a Wallace & Tiernan V-100 automatic gas chlorinator and a Scaletron scale. The chlorine room currently does not have a heater to prevent freezing during the winter months. The fluoride injector is located in the pump room. Backup power to the well is supplied by a Manga Max 192 horsepower, 143 kilowatt diesel engine generator located in the well building adjacent to the well pump. Information regarding Well No. 5 is summarized on Table 3-18 below.

TABLE 3-18 TOPPENISH WELL NO. 5 INFORMATION

Date Constructed	1952
Well Depth	291 feet
Casing Depth/Diameter	0 to 240 feet/16-inch
Casing Perforation/Screen Depth	50 to 180 feet
Static Water Level	2016: 14'-0" BGS
Pump Information Manufacturer Type Model No. Year Installed No. of Stages	 Berkley Line Shaft Turbine 1004H-5 1999 Unknown
Motor Information Manufacturer Horsepower Voltage / Phase RPM	 U.S. Motor 75 440 V / 3-phase 1,800
Current Well Capacity	950 GPM
Standby Engine Generator Manufacturer / Type Size	 Manga Max / diesel 143 kW

Well No. 6 (S06):

The power generator is to the left outside the frame of the photo, and Well No. 8 is located just outside the frame to the right.

Constructed in 1959 to a depth of 863 feet, Well No. 6 is located in Pioneer Park by Reservoir No. 3 and Well No. 8, as shown on Figure 3-1. Water is withdrawn from the well using a vertical line-shaft turbine pump, powered by a 10 horsepower, 460 volt, 3 phase, 1,740 RPM U.S. Electric motor. When constructed, the well produced 1,000 GPM, but produced a significant amount of sand. The well currently produces 195 GPM to limit sand and manganese problems. This well was under 12 psi artesian pressure in May 2016.

The pump is housed in a concrete block building that is heated and ventilated. A Water Specialties flow meter, installed in the discharge line, is located under the concrete floor of the pump house. Within this pump house is a separate chlorine room which houses a Wallace & Tiernan V-100 automatic gas chlorinator and a Scaletron scale. The fluoridation equipment is also housed within a separate room in the pump house. The chlorination and fluoridation equipment located in this building serves both Well No. 6 and nearby Well No. 8. Well No. 6 and Well No. 8 are also both supplied backup power from the same Generac diesel engine generator, which is housed in an outdoor enclosure adjacent to the Well No. 6 building. Information regarding Well No. 6 is summarized on Table 3-19 below.

TABLE 3-19 TOPPENISH WELL NO. 6 INFORMATION

Date Constructed	1959
Well Depth	863 feet
Casing Depth/Diameter	0 to 783 feet/16-inch 763 to 803 feet/10-inch riser pipe
Casing Perforation/Screen Depth	803 to 863 feet/12-inch well screen
Static Water Level	Artesian (12 psi)
Pump Information Manufacturer Type Model No. Year Installed No. of Stages	 Unknown Line Shaft Turbine Unknown 1959 Unknown
Motor Information Manufacturer Horsepower Voltage / Phase RPM	 U.S. Electric 10 460 V / 3-phase 1740
Current Well Capacity	195 GPM
Standby Engine Generator Manufacturer / Type Size	 Generac / diesel Unknown

Well No. 7 (S07):

The building on the left is the well house, the building on the right is the electrical and fluoridation/chlorination building, the power generator is shown next to the electrical building, and Reservoir No. 4 is shown behind the well house.

Well No. 7 is located on the west side of Magnolia Street, south of the intersection with Jackson Street, near Reservoir No. 4, as shown on Figure 3-1. The well was drilled in 1973 to a depth of 1,024 feet. Water is withdrawn from the well using an Aurora Vertiline six-stage pump, powered by a 300 horsepower, 460 volt, 3 phase, 1,770 RPM General Electric motor. The well currently produces 2,200 GPM. This well was under 12 psi artesian pressure in May 2016.

The well and pump are housed in a sheet metal building, which is built to slide away from the well for maintenance. A Sparling flow meter, installed in the discharge line, is located in a concrete vault adjacent to the well building. Electrical controls for the pump motor, disinfection equipment, fluoride feed equipment, and pump control valve are located in a nearby masonry block building. The disinfection equipment is a Wallace & Tiernan V-100 automatic gas chlorinator, a Scaletron scale, and a Capital Controls Model 1610 gas detector. The well is equipped with an Aptech 387 horsepower diesel engine generator located adjacent to the electrical control building. Both the pump building and electrical control building are heated and ventilated. Information regarding Well No. 7 is summarized on Table 3-20 below.

TABLE 3-20 TOPPENISH WELL NO. 7 INFORMATION

Date Constructed	1973
Well Depth	1,024 feet
Casing Depth/Diameter	0 to 102 feet/30-inch 0 to 303 feet/24-inch 0 to 810 feet/20-inch 810 to 1,022 feet/10-inch
Casing Perforation/Screen Depth	810 to 1,022 feet
Static Water Level	Artesian (12 psi)
Pump Information Manufacturer Type Model No. Year Installed No. of Stages Design Point	 Aurora Vertiline Line Shaft Turbine (14RL-M) V75-70649 1973 6 2,000 GPM at 465 ft. TDH
Motor Information Manufacturer Model No. Horsepower Voltage / Phase RPM	 General Electric 5K6287XH16B 300 460 V / 3-phase 1775
Current Well Capacity	2,200 GPM
Standby Engine Generator Manufacturer / Type Size	 Aptech / diesel 289 kW

Well No. 8 (S08):

The building on the right is the Well No. 8 well house, pictured to the left is the Well No. 6 well house, and Reservoir No. 3 is further to the left.

Well No. 8 is located in Pioneer Park by Reservoir No. 3 and Well No. 6, as shown on Figure 3-1. The well was drilled in 1994 to a depth of 250 feet. Water is withdrawn from the well using a Floway 10-stage vertical line-shaft turbine pump, powered by a 40 horsepower, 460 volt, 3 phase, 1,775 RPM U.S. Electrical motor. The well currently produces 375 GPM. The static water level of this well was measured at 15 feet 0 inches BGS in May 2016.

The pump is housed in a concrete block building that is heated and ventilated. A Water Specialties flow meter, installed in the discharge line, is located under the concrete floor of the nearby Well No. 6 pump house. As discussed previously, Well No. 8 shares both chlorination and fluoridation equipment with Well No. 6. The treatment equipment is located in the Well No. 6 building. Backup power is supplied to Well No. 6 by the Generac diesel engine generator located on the Well No. 6 and Well No. 8 site. Information regarding Well No. 8 is summarized on Table 3-21 below.

TABLE 3-21 TOPPENISH WELL NO. 8 INFORMATION

Date Constructed	1994
Well Depth	250 feet
Casing Depth/Diameter	0 to 152 feet/20-inch 0- 239 feet/16-inch
Casing Perforation/Screen Depth	138 to 228 feet
Static Water Level	2016: 15'-0" BGS
Pump Information Manufacturer Type Model No. Year Installed No. of Stages Design Point	 Floway Line Shaft turbine 8JKH 1994 10 350 GPM at 225 ft. TDH
Motor Information Manufacturer Horsepower Voltage / Phase RPM	 U.S. Electrical High Thrust 40 460 V / 3-phase 1775
Current Well Capacity	375 GPM

Well No. 9 (S09):

Well No. 9, its power generator, electrical room, and fluoridation/chlorination room are all within the building shown, and in separate rooms. Reservoir No. 5 is pictured here.

Well No. 9 is located at the west end of Idaho Street, off of Buena way on the north side of Toppenish, and adjacent to Reservoir No. 5, as shown on Figure 3-1. The well was drilled in 2013 to a depth of 444 feet, and the well facility was constructed in 2014. Water is withdrawn from the well using a Flowserve 10EHM vertical line-shaft turbine pump, powered by a 75 horsepower, 460 volt, 3 phase, 1,780 RPM U.S. Electrical motor. The well currently produces 800 GPM. The static water level of this well was measured at 20 feet BGS in May 2016.

The pump is housed in a concrete block building that is heated and ventilated. A Water Specialties flow meter is installed in the discharge line in the same room as the well pump and motor. The chlorination and fluoridation equipment is located in an adjacent room within the Well No. 9 building. Well No. 9 is also equipped with a residual analyzer and level transducer. Backup power is supplied to Well No. 9 by the Caterpillar 100 kW diesel engine generator located in an adjacent room in the well building. Information regarding Well No. 9 is summarized on Table 3-22 below.

TABLE 3-22 TOPPENISH WELL NO. 9 INFORMATION

Date Constructed	2014
Well Depth	444 feet
Casing Depth/Diameter	+2.5 to 327 feet/12-inch
Casing Perforation/Screen Depth	334 to 424 feet
Static Water Level	2016: 20' BGS
Pump Information Manufacturer Type Model No. Year Installed No. of Stages Design Point	 Flowserve Line Shaft turbine 10 EHM 2014 Unknown 800 GPM at 216 ft. TDH
Motor Information Manufacturer Horsepower Voltage / Phase RPM	 U.S. Electrical Motors 75 460 V / 3-phase 1780
Current Well Capacity	800 GPM
Standby Engine Generator Manufacturer / Type Size	 Caterpillar / diesel 100 kW

A summary of Toppenish's source wells, including well depth, current static water levels, and capacity is provided in Table 3-23 below.

TABLE 3-23 TOPPENISH SOURCE WELL INFORMATION SUMMARY						
	Well No. 3	Well No. 5	Well No. 6	Well No. 7	Well No. 8	Well No. 9
Source No.	S03	S05	S06	S07	S08	S09
Well ID No.	ABR866	AFL867	AFL805	AFL806	AFL807	BIB506
Date Drilled	1937	1952/1954	1959	1973	1994	2013
Well Depth	188 feet	291 feet	863 feet	1,024 feet	250 feet	444 feet
Casing Depth	187 feet	240 feet	863 feet	1,022 feet	239 feet	327 feet
Static Water Level	14'-2"	14'-0"	Artesian	Artesian	15'-0"	20'-0"
Current Capacity	495 GPM	950 GPM	195 GPM	2,200 GPM	375 GPM	800 GPM

The physical capacity of the City's source wells are analyzed in CHAPTER 2 for the total capacity related to existing and projected demand growth. However, it is critical to also analyze existing and future source capacity against DOH reliability criteria. In particular, the *2009 Water System Design Manual* (Page 42) lists the following applicable water system reliability recommendations for sources:

1. Two or more supply sources are available with a capability to replenish depleted fire suppression storage within 72-hours while concurrently supplying the MDD for the water system.

2. Combined source capacity for the water system is enough to provide the MDD in a period of 18 hours or less of pumping.

3. With the largest source out of service, the remaining source(s) can provide a minimum of ADD for the water system.

4. Pump stations have power connections to two independent primary public power sources, or have portable or in-place auxiliary power available.

A summary of the City's well source capacity compared to the DOH reliability recommendations is provided in Table 3-24 below.

TABLE 3-24 SOURCE WELL CAPACITY VS. DOH RELIABILITY RECOMMENDATIONS					
DOH Reliability Recommendation No. and Description		2017	2023	2027	2037
1	MDD + FSS in 72-hours (GPM)	2,461	2,786	2,831	2,927
	Source Well Capacity (GPM) Existing	5,015	5,015	5,015	5,015
	Meets Reliability Recommendation (Yes/No)	Yes	Yes	Yes	Yes
2	MDD in 18 hours (GPM)	3,115	3,547	3,608	3,736
	Source Well Capacity (GPM) Existing	5,015	5,015	5,015	5,015
	Meets Reliability Recommendation (Yes/No)	Yes	Yes	Yes	Yes
3	ADD (GPM)	979	1,115	1,134	1,174
	Ex. Source Capacity without Well No. 7 (GPM)	2,815	2,815	2,815	2,815
	Meets Reliability Recommendation (Yes/No)	Yes	Yes	Yes	Yes
4	Wells 5, 6, 7, 8, and 9 are equipped with auxiliary power generators.				

As shown on the table above, the City's water system is considered reliable by DOH's standards.

3.3.2 Water Treatment

Water supplied from all of Toppenish's source wells is treated through both disinfection and fluoridation. Disinfection of the City's water is accomplished through chlorination of the water as it enters the City's distribution system. Each City well is equipped with a gas chlorinator which injects chlorine into the discharge piping. Information on each chlorinator is included in Section 3.3.1, along with the descriptions of each well.

Fluoridation of the City's water is provided as a preventative for tooth decay and is accomplished through the use of upflow saturators and metering pumps. Dry sodium fluoride is added to the water as it enters the City's distribution system using saturators. As fluoride does not dissolve completely in hard water, a water softener is added to the saturator stream flow at Well Nos. 3, 6, 8, and 9 to allow the fluoride to dissolve before the treated water enters the distribution system. Fluoridation is a relatively labor-intensive process, and daily inspection of the equipment in addition to daily laboratory testing, to ensure proper dosage rates are being maintained, is required. Information on each fluoridation system is provided with the descriptions of each well.

3.3.3 Storage Facilities

The City's water storage facilities consist of four active reservoirs and one inactive reservoir (Reservoir No. 1) taken off-line in 1993. The total capacity of the four active reservoirs is approximately 3.448 million gallons. However, the total storage capacity under normal operating conditions is only 2.457 million gallons. This is due to a normal pump-off elevation of approximately 898 feet to prevent overfilling the reservoirs; also, a minimum of 20 psi must be provided to the highest service elevation of 770 feet, which corresponds to a hydraulic grade line of approximately 816 feet. Reservoir Nos. 4 and 5 are standpipe, so the bottom 56 feet (400,000 gallons) is not useable and is considered dead storage. Provided in Table 3-25 is a summary of data for the City's four water storage reservoirs.

TABLE 3-25 TOPPENISH RESERVOIR INFORMATION SUMMARY

	Reservoir No. 1 *	Reservoir No. 2	Reservoir No. 3	Reservoir No. 4	Reservoir No. 5
Date Constructed	1914	1937	1953	1993	2014
Type	Elevated Tank	Elevated Tank	Elevated Tank	Standpipe	Standpipe
Ground Elevation (feet above msl)	755	757	757	760	771
Base Elevation (feet above msl)	881	863	863	760	771
Top Elevation (feet above msl)	902	902	902	902	906.5
Overflow Elevation (feet above msl)	900	900	900	900	903.5
Height (feet)	21	39	39	142	135.5
Height to Overflow (feet)	19	37	37	140	132.5
Diameter (feet)	26	32	50	35	47
Total Capacity (gallons)	75,000	223,000	543,000	1,008,000	1,674,000
Available Capacity (gallons above minimum 20 psi pressure level)	75,000	223,000	543,000	603,000	1,088,000

* Reservoir No. 1 has been offline since 1993.

Reservoir No. 1: Reservoir No. 1 is a 75,000 gallon, steel elevated tank reservoir located near the Public Works shop at the intersection of Buena Way and Washington Avenue as shown on Figure 3-1. The reservoir was originally constructed in 1914 and was closed in August 1993 after being in service for nearly 80 years. At its time of closing, the reservoir leaked in several locations, and it was reported that ice build-

up was a problem in some areas of the fill pipe during cold weather. In addition, the reservoir did not have safety ladders equipped with fall protection and was in need of other costly repairs.

Reservoir No. 2:

Reservoir No. 2 is located near Well No. 3 in the City's Swimming Pool Park, near the intersection of Asotin Avenue and South Alder Street, as shown on Figure 3-1. Constructed in 1937, Reservoir No. 2 is a steel elevated tank, 32 feet in diameter, with a height of 39 feet and total capacity of about 223,000 gallons.

Reservoir No. 3:

Reservoir No. 3 is located in Pioneer Park near Well Nos. 6 and 8, and the City's Fire Station, as shown on Figure 3-1. Constructed in 1953, Reservoir No. 3 is also a steel elevated tank with a 50-foot diameter, and height of 39 feet. The capacity of the reservoir is approximately 543,000 gallons, and the reservoir's overflow elevation is 900 feet above sea level.

Reservoir No. 4:

Reservoir No. 4 is located on the west side of Magnolia Street and South Jackson Street, near Well No. 7, as shown on Figure 3-1. Constructed in 1993, Reservoir No. 4 is a 140-foot tall, 35-foot diameter welded steel standpipe. The total capacity of the reservoir is approximately 1.0 million gallons, but the useable capacity above the minimum 20 psi service elevation is only 603,000 gallons as described above. The reservoir's overflow elevation is approximately 900 feet above sea level.

Reservoir No. 5:

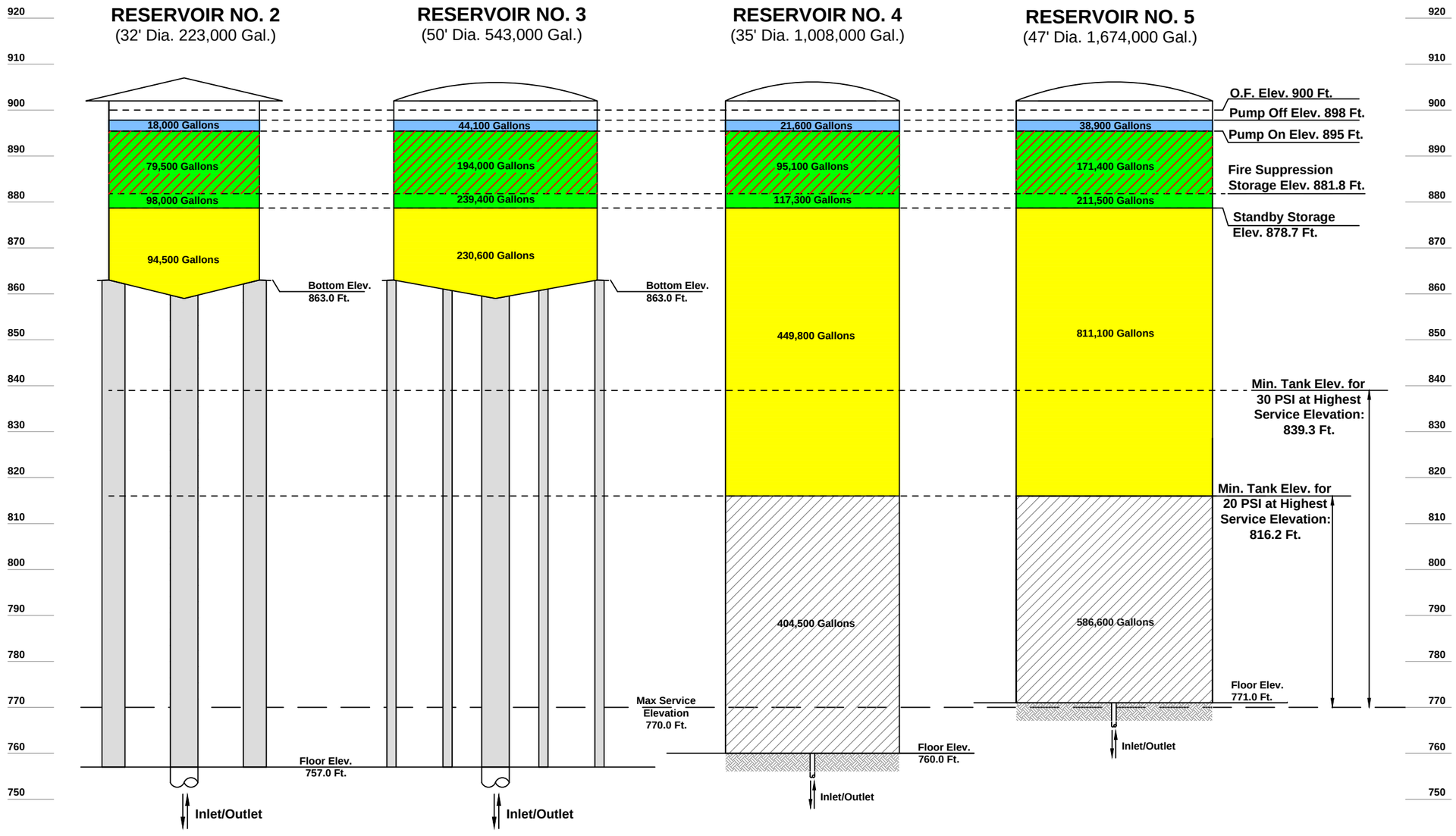
Reservoir No. 5 is located on the west end of Idaho Street, off of Buena way on the north side of Toppenish, and adjacent to Well No. 9, as shown on Figure 3-1. Constructed in 2014, Reservoir No. 5 is a 135.5-foot tall, 47-foot diameter welded steel standpipe. The total capacity of the reservoir is approximately 1.7 million gallons, but the useable capacity above the minimum 20 psi service elevation is only 1,088,000 gallons as described above. The reservoir's overflow elevation is approximately 906.5 feet above sea level. This reservoir is equipped with a submersible mixer.

Figure 3-3 and Figure 3-4 show a schematic representation of reservoir storage level elevations for the year 2017 and those anticipated for 2037, respectively.

CITY OF TOPPENISH

Water System Plan Update

YEAR 2017 RESERVOIR STORAGE LEVELS



LEGEND

- OPERATIONAL STORAGE (122,600 Gal.)
- EQUALIZING STORAGE (0 Gal.)
- STANDBY STORAGE (666,200 Gal.)
- FIRE SUPPRESSION STORAGE (NESTED WITHIN STANDBY STORAGE, 540,000 Gal.)
- AVAILABLE STORAGE (1,586,000 Gal.)
- DEAD STORAGE (991,100 Gal.)

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6/7/2016
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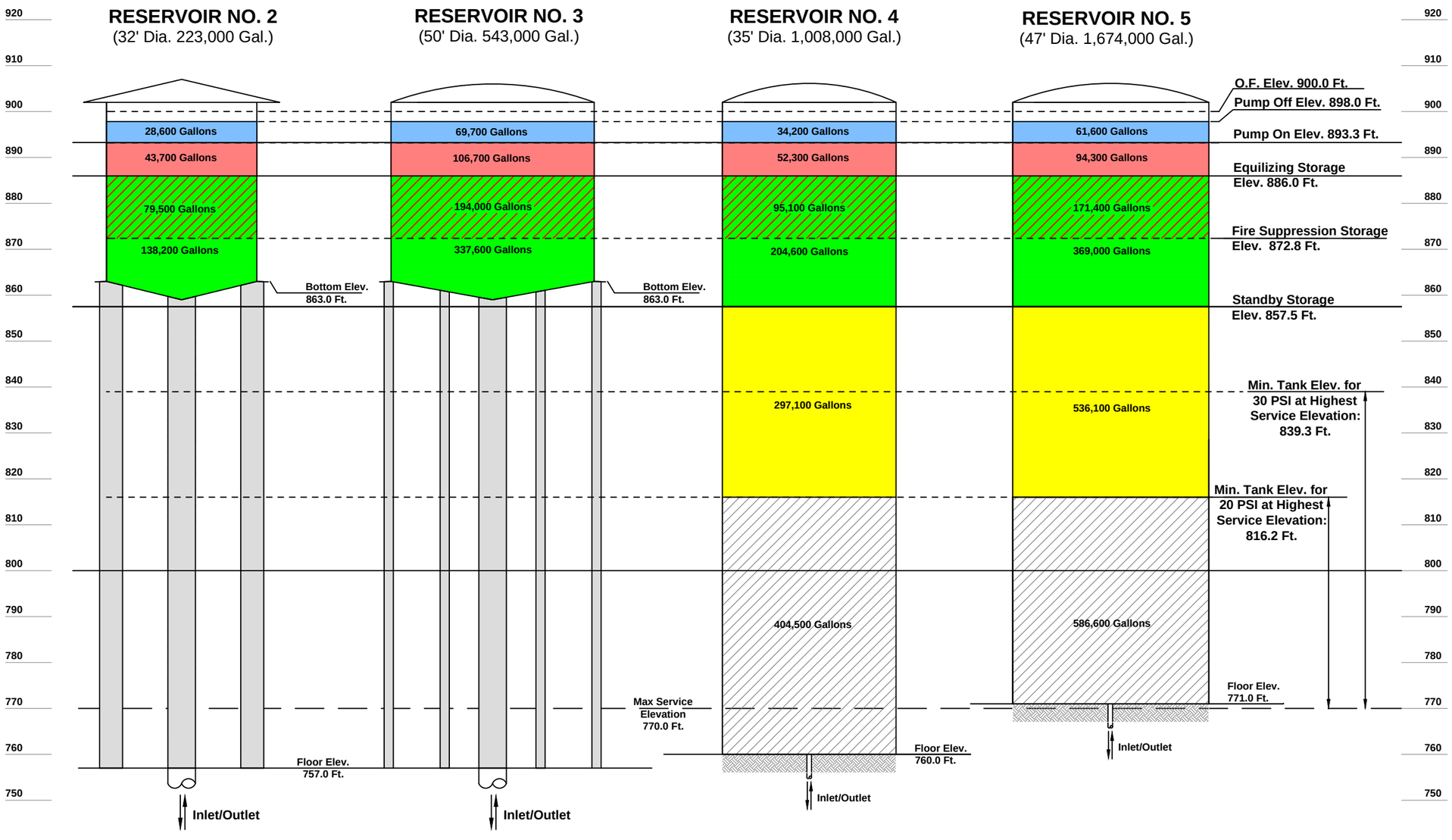
FIGURE 3-3

CITY OF TOPPENISH

Water System Plan Update

YEAR 2037 RESERVOIR STORAGE LEVELS WITH WASHINGTON BEEF DEMANDS



LEGEND

- OPERATIONAL STORAGE (194,100 Gal.)
- EQUALIZING STORAGE (297,000 Gal.)
- STANDBY STORAGE (1,049,400 Gal.)
- FIRE SUPPRESSION STORAGE (NESTED WITHIN STANDBY STORAGE, 540,000 Gal.)
- AVAILABLE STORAGE (833,200 Gal.)
- DEAD STORAGE (991,100 Gal.)

Note: Future storage levels in this figure reflect the City fully serving Washington Beef.

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FIGURE 3-4

3.3.4 Telemetry Control System

Toppenish's telemetry control system was upgraded in 2015 and exercises supervisory control, data collection, and monitoring of water system operation from a computer located in the Public Works shop. The HMI software used for Toppenish's telemetry system is Wonderware Intouch, with WIN911 for annunciating alarms. Data is monitored by Allen Bradley Micrologix 1400 PLCs at each site and sent to the telemetry system computer by means of Ethernet radio communication with FGR2-PE radios. The system monitors source production, reservoir level information, and issues commands to start and stop well pumps. The reservoir water levels are sensed by pressure transmitters and source production is measured by flow meters at each of the six source wells.

The source pumps are controlled by the water level in the operator-selected reservoir. The telemetry control settings for turning the various well source pumps on and off, based upon water levels in Reservoir No. 3, are shown in Table 3-26. The reference reservoir base elevation for the levels provided in Table 3-25 is equal to 760 feet above mean sea level, as provided in the telemetry system O&M manual.

TABLE 3-26 EXISTING TELEMETRY CONTROL SETTINGS*

Source Well	Pump On	Pump Off
Well No. 3	130.0 feet	133.0 feet
Well No. 5	131.0 feet	134.0 feet
Well No. 6	132.0 feet	136.0 feet
Well No. 7	128.0 feet	131.0 feet
Well No. 8	132.0 feet	136.0 feet
Well No. 9	135.0 feet	138.0 feet
Reservoir	Low Level Alarm	High Level Alarm

* Settings are based upon levels in Reservoir No. 3 and reflect normal system operation. The reference reservoir base elevation is equal to 760 feet.

It can also be seen from Table 3-26 that based upon the normal operating levels, Well No. 9 is the first well called and the last well to shut off. The call order of the wells can be adjusted by the operator, based upon system supply and demand requirements. Well No. 7 is typically the last well called and serves the system only in peak demand periods, due to its production of manganese and sand.

Should any equipment fail to respond as ordered (on or off), or a high or low water condition exist in either reservoir, an alarm is sounded at the Public Works shop and through the City's answering service. An automatic telephone dialer (WIN 911) is also activated, which then proceeds to contact preprogrammed telephone numbers of key personnel until the alarm is properly acknowledged.

The telemetry control system also monitors source well building temperature and chlorine levels for disinfection, and sends an alarm to notify the operator of these conditions.

3.3.5 Transmission and Distribution Systems

The City's existing transmission and distribution system along with water main sizes, valve, and fire hydrant locations are shown on Figure 3-1 and Map A, enclosed in the back pocket of this Plan. Most pipe sizes within the system are from four to 12 inches in diameter. The majority of the City's water mains are constructed of either cast iron, asbestos cement, or ductile iron pipes, and most are looped. An inventory of Toppenish's water distribution system is presented in Table 3-27 and Table 3-28, listing total length for each type of pipe by material and diameter, respectively.

TABLE 3-27 WATER DISTRIBUTION SYSTEM PIPE MATERIAL SUMMARY		
Pipe Material	Length (feet)	Percent of Total
Cast Iron	92,432	47.2%
Asbestos Cement	57,145	29.2%
Ductile Iron	44,109	22.5%
PVC	1,978	1.0%
TOTAL	195,664	100.0%

TABLE 3-28 TOPPENISH WATER SYSTEM PIPE SIZE SUMMARY		
Pipe Diameter (inches)	Length (feet)	Percent of Total
3	498	0.3%
4	31,792	16.2%
6	51,543	26.3%
8	69,309	35.4%
10	12,083	6.2%
12	27,260	13.9%
16	3,179	1.6%
TOTAL	195,664	100.0%

3.4 STORAGE ANALYSIS

Reservoir facilities are necessary in a water utility's system in order to provide required storage in three critical areas:

1. Standby Storage: Adequate water reserves need to be maintained to meet the system's average daily demand in the event the largest water supply source is out of service. Standby storage may be "nested" within the fire suppression storage volume.

2. Fire Suppression Storage: Adequate water reserves need to be maintained to meet the system's highest fire flow requirement with no assistance from existing water supply sources and at a minimum pressure of 20 psi throughout the distribution system. Fire suppression storage may be "nested" within the standby storage volume.

3. Equalizing Storage: Adequate water reserves need to be maintained to meet that portion of the system's maximum instantaneous demand (peak hour), which exceeds the existing water supply source capacity. Equalizing storage must be available to all service connections at a minimum pressure of 30 psi.

Storage facilities also provide a volume of water for supply to the system between source pumping operations. This "operational" volume is established by each utility and is generally based on limiting, as much as practical, the number of pump cycles per hour.

3.4.1 System Storage Analysis

Operational Storage: The Department of Health (DOH) defines operational storage as the volume of distribution storage associated with source or booster pump normal cycling times under normal operating conditions and is additive to the equalizing and standby storage components, and to fire flow storage if this storage component exists for any given tank. Currently, the City of Toppenish operates its lead source within the upper three feet of the water level in the reservoirs. This corresponds to a volume of approximately 122,600 gallons, or 37 gallons per ERU (3,331 ERUs for year 2017) for normal operational storage. The operational storage volume required to avoid excessive pump cycling only needs to be enough to limit the number of pump starts to six per hour. Under year 2017 MDD the source pumps would

turn on only once every 52 minutes, and also once every 125 minutes during ADD. The same operational storage levels will be sufficient to meet 20-year MDD projections, while keeping source pump start cycles within an appropriate range of approximately 44 minutes.

If Toppenish were to fully serve Washington Beef, and we assume the same 37 gallons per ERU for operational storage, the future year 2037 total operational storage would increase to 194,139 gallons (3,632 + 1,615 ERU's).

Equalizing Storage: The Department of Health (DOH) defines equalizing storage as the volume of storage needed to supplement supply to consumers when the peak hourly demand exceeds the total source pumping capacity. The DOH design method for calculating equalizing storage is 150 times the difference between the system's peak hour demand (PHD) in GPM and the total source production rate in GPM. Based on this method, the current and future equalizing storage requirements for Toppenish are as shown in Table 3-29.

TABLE 3-29 YEAR 2017 AND FUTURE EQUALIZING STORAGE REQUIREMENTS

	Year 2017	Year 2023	Year 2027	Year 2037	Year 2037 w/ WA Beef*
Peak Hour Demand	4,673 GPM	5,321 GPM	5,412 GPM	5,604 GPM	6,995 GPM
- Total Source Capacity	- 5,015 GPM	- 5,015 GPM	- 5,015 GPM	- 5,015 GPM	- 5,015 GPM
Subtotal	< 0 GPM	306 GPM	397 GPM	589 GPM	1,980 GPM
DOH Multiplier	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM
Total Equalizing Storage Required	0.000 MG	0.046 MG	0.060 MG	0.088 MG	0.297 MG

* Storage requirements if Washington Beef is fully served by Toppenish.

Standby Storage: The purpose of standby storage is to provide a measure of reliability should sources fail or unusual conditions impose higher demands than anticipated. The Department of Health (DOH) defines standby storage as the volume of stored water available for use during a loss of source capacity, power, or similar short-term emergency.

For communities with multiple sources of supply such as the City of Toppenish, the Department of Health's (DOH) 2009 *Water System Design Manual* recommends the volume of standby storage should be calculated based upon the following equation:

$$SBTMS = (2\ \text{days})[(ADD)(N) - t_m\ (Q_S - Q_L)]$$ (*2009 Water System Design Manual*, Page 103)

Where:
SBTMS = Total standby storage component for a multiple source water system (gallons)
ADD = Average day demand for the design year (GPD/ERUs)
N = Number of equivalent residential users (ERUs)
Q_S = The sum of the source capacities continuously available to the water system (GPM)
Q_L = The largest capacity source available to the water system (GPM)
t_m = Time the remaining sources are pumped on the day when the largest source is not available (minutes). Unless restricted otherwise, assume 1,440 minutes

At no time, however, shall standby storage be less than 200 gallons times the number of equivalent residential users (*2009 Water System Design Manual*, Page 103).

When the above standby storage is applied to the existing and projected average day demand (ADD) and ERUs, the resulting standby storage requirements are as shown in Table 3-30.

TABLE 3-30 YEAR 2017 AND FUTURE STANDBY STORAGE REQUIREMENTS					
	Year 2017	Year 2023	Year 2027	Year 2037	Year 2037 w/ WA Beef[b]
ADD x 2 Days Storage Subtotal	1.410 MGD x 2 Days 2.82 MG	1.605 MGD x 2 Days 3.210 MG	1.633 MGD x 2 Days 3.266 MG	1.691 MGD x 2 Days 3.782 MG	1.691 MGD x 2 Days 4.748 MG
(Source Supply – Largest Source) x 1440 minutes Supply Subtotal	2,815 GPM[a] x 1440 min 4.054 MG	2,815 GPM[a] x 1440 min 4.054 MG	2,815 GPM[a] x 1440 min 4.054 MG	2,815 GPM[a] x 1440 min 4.054 MG	2,815 GPM[a] x 1440 min 4.054 MG
Total Standby Storage Required	less than 0	less than 0	less than 0	less than 0	0.694 MG
Equivalent Residential Units (ERUs) x Min. 200 gal Storage Minimum	3,331 x 200 gal 0.666 MG	3,448 x 200 gal 0.690 MG	3,507 x 200 gal 0.701 MG	3,632 x 200 gal 0.726 MG	5,247 x 200 gal 1.049 MG
Minimum Required Standby Storage	0.666 MG	0.690 MG	0.701 MG	0.726 MG	1.049 MG

[a] Existing total source pumping capacity minus Well No. 7 (largest source).
[b] Storage requirements if Washington Beef is fully served by Toppenish.

Fire Suppression Storage: The Department of Health (DOH) defines fire suppression storage as the volume of stored water available during fire suppression activities to satisfy minimum pressure requirements per WAC 246-290-230. A volume of storage for fire suppression has been established by the Toppenish Fire Department based on fire flow ratings of various structures within Toppenish. The largest required fire flow capacity throughout the City is 3,000 GPM for a 3-hour duration at the Toppenish High School. The storage required to meet this demand is 540,000 gallons. The City of Toppenish has chosen to nest the fire suppression storage within the standby storage volume. A letter from the Toppenish Fire Chief approving nesting and required storage is provided in CHAPTER 10.

Total Storage: Table 3-31 summarizes the year 2017 and future storage requirements for the water system. The City's existing storage capacity is sufficient to meet projected storage requirements through year 2036 for both pressure requirements as shown in Table 3-31.

TABLE 3-31 YEAR 2017 AND FUTURE TOTAL STORAGE REQUIREMENTS (all storage values are in million gallons)					
	Year 2017	Year 2023	Year 2027	Year 2037	Year 2037 w/ WA Beef[c]
Number of ERUs	3,331	3,448	3,507	3,632	1,615
Number of Connections	2,446	2,532	2,575	2,667	1
Operational Storage Requirements[a]	0.123	0.123	0.123	0.123	0.194
Equalizing Storage Requirements	0.000	0.046	0.060	0.088	0.297
Standby Storage Requirements[b]	0.666	0.690	0.701	0.726	1.049
Fire Suppression Storage Requirements[b]	0.540	0.540	0.540	0.540	0.540
Total Storage Required	0.789	0.859	0.884	0.937	2.080
Total Storage Capacity	3.448	3.448	3.448	3.448	3.448
Storage Capacity Above Minimum 30 psi Service					
Available	1.991	1.991	1.991	1.991	1.991
- Required	- 0.123	- 0.169	- 0.183	- 0.211	- 0.479
Excess (Deficit)	1.868	1.822	1.808	1.780	1.512
Storage Capacity Above Minimum 20 psi Service					
Available	2.457	2.457	2.457	2.457	2.457
- Required	- 0.789	- 0.859	- 0.884	- 0.937	- 1.540
Excess (Deficit)	1.668	1.598	1.573	1.520	0.917

[a] Future operational storage is based upon maintaining a 3-foot operating range.
[b] Fire suppression is nested within standby storage. Standby Storage is the controlling required volume.
[c] Storage requirements if Washington Beef is fully served by Toppenish.

It can be seen from Table 3-31 storage capacity is adequate to meet the City's future needs, even if Washington Beef needs to fully rely on the City's water system to meet their demands. However, additional storage may be necessary closer to the WA Beef site to supplement their peak demands, or to provide additional fire suppression storage if required by the Toppenish Fire Department. Further evaluation of storage is recommended in the future to determine when/if additional volume is required.

3.5 FIRE FLOW

The demand fire flows place upon a water system is typically the most significant element when analyzing the piping network. Every water system which is required to have a Water System Plan must address fire flow. At a minimum, a water utility must comply with fire flow standards shown in Table 3-32, established by the Department of Health (DOH). A community may, however, develop its own standards as long as they exceed the DOH minimum requirements.

TABLE 3-32 DOH MINIMUM FIRE FLOW REQUIREMENTS	
Land Use Type	Flow Requirement
Residential	500 GPM for 30 minutes
Commercial and Multi-Family	750 GPM for 60 minutes
Industrial	1,000 GPM for 60 minutes
Source: *WAC 246-293-640*	

The City of Toppenish Fire Department has developed a list of minimum fire flow capacities required for many structures throughout the City. These fire flow capacities, provided in the 2009 Water System Plan

Update and in Chapter 10 of this Plan, were used to develop Figure 3-5, which shows areas of required minimum fire flow and the actual calculated fire flow capacity at selected locations within those areas. All areas that do not have a specified minimum fire flow range are required to have a minimum fire flow capacity of 1,000 GPM.

A computer hydraulic analysis was used to determine the existing fire flow capacities at certain locations shown in Figure 3-5. The hydraulic analysis parameters are discussed later in Section 3.6. As can be seen in Figure 3-5, the greatest fire flow requirements are within the industrially and commercially-zoned areas and at public schools. It can be seen in Figure 3-5 that most locations throughout the distribution system are able to provide the required minimum fire flow capacities, however, several locations remain deficient. Recommended system improvements to correct fire flow deficiencies are discussed further in CHAPTER 8.

3.6 HYDRAULIC ANALYSIS

A hydraulic analysis of a water utility system is a method of calculating pressures and flows throughout the distribution network under various conditions of demand at a given instant. Since the advent of personal computers, hydraulic analyses are typically performed by utilizing computer programs which model the piping, reservoir, pumps and specialty valves of a given water system.

Numerous computer programs have been developed for performing network analyses. The program utilized for the modeling and analysis of the City of Toppenish water system is called WaterCAD (Version 8i), distributed by Bentley Systems, Inc. WaterCAD can perform instantaneous and extended period simulations of complete distribution networks including reservoirs, source pumps, booster pumps, pressure reducing valves, pressure sustaining valves, check valves, flow control valves, pressure switches, and up to 1,000 pipes and 1,000 nodes (pipe junctions).

The program utilizes Genetic Algorithm calculations (Darwin modules) to solve the pressure networks. All water system components are entered into the computer, supply rates and user demands input, and reservoir water levels are established. Once this base information has been loaded, various options such as increasing system demand, lowering reservoir levels, shutting off source pumps, adding system improvements, and simulating fire flow conditions can be analyzed for their impact on the system.

3.6.1 Assumptions

In order to analyze the water system at a given moment in time, it is necessary to assume certain existing conditions and to program the status of key system components. The following general assumptions have been made for the hydraulic analysis of the City of Toppenish water system:

- Roughness coefficients (C values) for most eight-inch or larger pipes were assumed to be 120. Pipes six-inch or smaller were assumed to have a C value equal to 110. Known old or poor condition pipes were assumed to have a C value equal to 100.
- Nominal pipe diameters were input for inside pipe diameters.
- Node elevations are based on available contour and topographic survey elevations.

Table 3-33 identifies the specific parameters used in the hydraulic analysis performed for existing and future peak hour demand (PHD) and for existing and future fire flow capacities at 20 psi residual pressure during maximum day demand (MDD) conditions. The PHD hydraulic analysis assumes that all primary source wells are operating and the equalizing storage volume has been depleted from all tanks. The fire flow analysis, during MDD, assumes that the starting elevation in all tanks is with equalizing and fire suppression storage depleted. The fire flow analysis also assumes that all source wells are operating.

Initial elevations for the hydraulic analysis are calculated from the current and future reservoir pump-off elevations to represent current and future maximum storage conditions. The operational storage range and volume can be operator-adjusted based upon current demand, but the elevations (volumes) used represent normal operating conditions. Lower or higher initial water elevations could affect the calculated results provided in this Plan.

CITY OF TOPPENISH

Water System Plan Update

YEAR 2017 MAX DAY DEMAND FIRE FLOW CAPACITIES MAP

N
W E
S

0 300 600 1200

LEGEND

CITY LIMITS

FUTURE SERVICE AREA

FIRE FLOW RANGE	FIRE DEPT. REQUESTED FLOW CAPACITIES
>1000 GPM	MINIMUM 1000 GPM
1000-1500 GPM	
1500-2000 GPM	
2000-2500 GPM	
2500-3000 GPM	
3000-3500 GPM	
>3500 GPM	

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FIGURE 3-5

TABLE 3-33 HYDRAULIC ANALYSIS PARAMETERS

Water System Feature	Hydraulic Analysis Scenario: Year 2017 Fire Flow w/MDD [a] (2,336 GPM)	Year 2017 Peak Hour Demand [b] (4,673 GPM)	Year 2037 Fire Flow w/MDD [a] (2,802 GPM)	Year 2037 Peak Hour Demand [b] (5,604 GPM)
Reservoir No. 2 Levels				
Maximum Elevation	900.0 Ft.	900.0 Ft.	900.0 Ft.	900.0 Ft.
Initial Elevation	886.8 Ft.	900.0 Ft.	880.1 Ft.	897.8 Ft.
Floor / Minimum Elevation	863.0 Ft.	863.0 Ft.	863.0 Ft.	863.0 Ft.
Reservoir No. 3 Levels				
Maximum Elevation	900.0 Ft.	900.0 Ft.	900.0 Ft.	900.0 Ft.
Initial Elevation	886.8 Ft.	900.0 Ft.	880.1 Ft.	897.8 Ft.
Floor / Minimum Elevation	863.0 Ft.	863.0 Ft.	863.0 Ft.	863.0 Ft.
Reservoir No. 4 Levels				
Maximum Elevation	900.0 Ft.	900.0 Ft.	900.0 Ft.	900.0 Ft.
Initial Elevation	886.8 Ft.	900.0 Ft.	880.1 Ft.	897.8 Ft.
Floor / Minimum Elevation	760.0 Ft.	760.0 Ft.	760.0 Ft.	760.0 Ft.
Reservoir No. 5 Levels				
Maximum Elevation	900.0 Ft.	900.0 Ft.	900.0 Ft.	900.0 Ft.
Initial Elevation	886.8 Ft.	900.0 Ft.	880.1 Ft.	897.8 Ft.
Floor / Minimum Elevation	771.0 Ft.	771.0 Ft.	771.0 Ft.	771.0 Ft.
Source Well Status				
Well No. 3 (S03)	495 GPM	495 GPM	495 GPM	495 GPM
Well No. 5 (S05)	950 GPM	950 GPM	950 GPM	950 GPM
Well No. 6 (S06)	195 GPM	195 GPM	195 GPM	195 GPM
Well No. 7 (S07)	2,200 GPM	2,200 GPM	2,200 GPM	2,200 GPM
Well No. 8 (S08)	375 GPM	375 GPM	375 GPM	375 GPM
Well No. 9 (S09)	800 GPM	800 GPM	800 GPM	800 GPM
Total Supply	5,015 GPM	5,015 GPM	5,015 GPM	5,015 GPM

[a] Equalizing and Fire Suppression Storage depleted.
[b] Equalizing Storage depleted.

3.6.2 Analysis Scenarios

The year 2017 water system was first analyzed considering a year 2017 peak hour demand of 4,673 GPM, based on the total calculated peak hourly flow from August 2012. All nodes providing domestic service within the system did so with a minimum residual pressure of 30 psi or greater with all source pumps in operation. Pipe velocities remained below the seven (7) feet per second (FPS) maximum velocity design parameter. A copy of the computer printouts of this scenario and all other hydraulic analyses results discussed in this section are provided in CHAPTER 10 of this Plan. Map B in the back of this Plan shows the computer model with the pipe and node numbers for identification.

A future PHD analysis was run on the system using the PHD for the year 2037 of 5,604 GPM. This scenario was conducted with the year 2037 equalizing storage volume depleted. All service pressures were greater than 30 psi and pipe velocities were below seven (7) FPS with all source pumps in operation.

Fire flows were considered at all hydrant locations throughout the pipe network while assuming a year 2017 system consumptive demand of 2,336 GPM, based on the total calculated MDD from August 2012. The computer hydraulic model was used to calculate the maximum flow attainable at designated hydrant nodes while providing a positive pressure of 20 psi. Equalizing and fire suppression storage were depleted at the start of the fire flow analysis. The resulting fire flow capacities are shown in Figure 3-5, along with the fire district requested fire flow capacities as previously discussed. Several locations were calculated to be deficient in meeting the specified fire flow capacities, as shown in Figure 3-5.

A future fire flow analysis was performed on the system with future improvements modeled, and with the 2037 maximum day demands to verify adequate fire flow capacity is available once the improvements are in place. After future improvements are in place there are no fire flow deficiencies within the system. Recommended future improvements will increase fire flow capacities in some areas as shown on Figure 3-6.

3.6.3 Model Calibration

In the past, Toppenish has performed pressure testing on hydrants within the water system. However, there are no records of recent hydrant testing. To ensure accuracy of the water system model, model elements were carefully set to match records of the actual elements' physical properties. For example, each pipe in the City's water system is recorded by material and size, and the age is known to some degree, enabling roughness factors to be adjusted to resemble actual pipe performance. Node elevations and reservoir settings were adjusted to best represent the system in a similar way.

It is recommended that updated pressure and flow tests be conducted in the future by the City Fire Department at representative locations throughout the distribution system including noting reservoir levels, to more accurately calibrate future system models and provide updated system information for fire flow analysis.

3.7 SUMMARY OF SYSTEM DEFICIENCIES

The following is a listing and brief description of deficiencies which have been identified in the present water system. The deficiencies have been grouped within three system categories (supply, storage, and distribution) and are generally placed in order of their importance. The deficiencies may be operational in nature (which have been identified by the City's Water Department personnel) or maintenance related, inadequate present or future capacities, and/or system hydraulics problems.

3.7.1 Supply

Water Quality – Toppenish currently adds chlorine for treatment of its groundwater sources. The City's chlorination system is outdated and at many well locations the chlorine gas detector does not work. The chlorination system needs to be replaced with new chlorinators and related appurtenances, including the ability to allow variable feed rates.

Well No. 6 and Well No. 7 in recent water quality tests have exceeded the maximum contaminant levels for manganese.

Water Rights – The City's water rights status is crucial in determining the amount of possible future growth. Currently, Toppenish has adequate combined permitted withdrawal quantities (4,815 GPM) from the Yakama Nation. The City's current permits expired in 2015 and are in the process of being renewed.

Source Well Reliability – The Department of Health's Water System Design Manual recommends on-site back-up power equipment be installed at the water system sources to improve system reliability. The City of Toppenish currently has back-up power equipment at five of its six source wells, with only Well No. 3 remaining without back-up power.

A reliable electrical and control system is critical to have a reliable source of supply to the system. Well No. 7, the City's largest source of supply at 2,200 GPM has been experiencing electrical issues, often preventing it from operating. Additionally, Well No. 7 exceeds the MCL for manganese, a secondary contaminant.

Well Nos. 5 and 8 each have their own lists of needed improvements, addressing issues such as sand production, motor longevity, failing fluoride pump, and inadequate facility. Scheduling periodical inspections and rehabilitations for each of the City's source wells will increase reliability and make maintenance costs more consistent.

Protective Covenants – Though the City owns all of its well sites, source wells do not have a "Declarations of Covenant", establishing the required 100-foot sanitary radius of protection around the well. The City needs to execute and record "Declarations of Covenant" for each of the source wells.

CITY OF TOPPENISH

Water System Plan Update

FIRE FLOW CAPACITY IMPROVEMENT MAP

LEGEND

- CITY LIMITS
- FUTURE SERVICE AREA
- WATER MAINS
- HYDRANTS
- VALVES
- IMPROVEMENTS

N W E S

0 600 1200

LOCATION 15
EXIST. 2,290 GPM
IMPR. > 5,000 GPM
REQ. 2,500 GPM

LOCATION 16
EXIST. 780 GPM
IMPR. 1,470 GPM
REQ. 1,000 GPM

LOCATION 17
EXIST. 700 GPM
IMPR. 2,930 GPM
REQ. 1,000 GPM

LOCATION 20
EXIST. 1,840 GPM
IMPR. 3,790 GPM
REQ. 2,500

LOCATION 2
EXIST. 840 GPM
IMPR. 2,720 GPM
REQ. 1,000 GPM

LOCATION 12
EXIST. 890 GPM
IMPR. 2,580 GPM
REQ. 1,000 GPM

LOCATION 3
EXIST. 670 GPM
IMPR. 4,060 GPM
REQ. 1,000 GPM

LOCATION 21
EXIST. 2,490 GPM
IMPR. 4,310 GPM
REQ. 2,500 GPM

LOCATION 4
EXIST. 820 GPM
IMPR. 4,690 GPM
REQ. 1,000 GPM

LOCATION 13
EXIST. 740 & 640 GPM
IMPR. 3,320 & 2,960 GPM
REQ. 1,000 GPM

LOCATION 18
EXIST. 810 GPM
IMPR. 2,460 GPM
REQ. 1,000 GPM

HLA Engineering and Land Surveying, Inc.
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Yakima, WA 98902
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www.hlacivil.com

10/7/2016
P:\Projects\2015\15122\WSP-Figures.dwg

FIGURE 3-6

3.7.2 Storage

Reservoir Cleaning and Maintenance – All four City reservoirs should be inspected and cleaned, based on a five-year maintenance cycle. Reservoir Nos. 3 and 4 were last cleaned and inspected in 2012. Reservoir No. 2 was last cleaned and inspected in 2013. Reservoir No. 5 was constructed in 2014. Reservoir No. 3 and Reservoir No. 4 received an extensive list of recommendations from their latest inspection reports.

3.7.3 Distribution

Fire Flow Capacity – Figure 3-5 identifies existing system fire flow capacities along with the minimum fire flow requirements for regions within the City. As shown on the figure, multiple locations are deficient based on the computer hydraulic model. Refer to Figure 8-1 for suggested improvements to address deficiencies.

Water Main Upsizing and Replacement – A significant amount of the City's distribution system is made up of undersized and aging cast iron and asbestos cement pipes that are nearing the end of their useful life. The condition of each of these pipes is not fully known, but many are suspected to be corroded or leaking.

3.8 SELECTION AND JUSTIFICATION OF PROPOSED IMPROVEMENT PROJECTS

The following discussion identifies recommended system improvements proposed to eliminate or reduce deficiencies described in the previous section. References to prioritized improvements specified in Section 8.2 and Section 8.3 of this Plan are provided. Further description of the water system improvements is provided in CHAPTER 8 of the Plan.

3.8.1 Supply

Source Well Reliability – All of the City's source wells are equipped with an onsite power generator except for Well No. 3. Installing an onsite power generator at Well No. 3 will further increase the systems reliability, allowing the system to operate at full capacity in the event of a city-wide power outage. **[Capital Improvement No. 8]**

Unknown electrical issues at times prevents Well No. 7 from operating. Inspecting and correcting the electrical systems will greatly improve the reliability of Well No. 7. **[Capital Improvement No. 7]**

Well Nos. 5 and 8 need extensive improvements to remain in service. Making these improvements along with scheduling period inspections and rehabilitation of all source wells will improve reliability, maintenance costs, and help maintain existing source capacities. **[Capital Improvement No. 1 and 15, and O&M Improvement Nos. 1, 5, 8, and 11 through 13]**

Water Quality – Installing filtration systems at Well No. 6 and Well. No. 7 will improve the manganese problems at those wells. Replacing the existing chlorination equipment with new, up-to-date equipment will improve safety and the consistency of chlorine dosage, thereby enhancing water quality. Installing chlorine gas handling and storage equipment will also greatly improve operation safety. **[Capital Improvement Nos. 14 and 16]**

Protective Covenants – Establishing a 100-foot sanitary radius of protection around each source well by obtaining "Declarations of Covenant" will help preserve water quality. **[O&M Improvement No. 2]**

3.8.2 Storage

Reservoir Cleaning, Maintenance, and Improvements – Routine cleaning and inspection of the City's water storage reservoirs are necessary to maintain water quality and monitor structural integrity. Reservoir Nos. 2, 3, and 4 have had inspections in 2012 and 2013, recommending major work for Reservoir No. 3. Reservoir No. 3 needs extensive improvements to maintain its structural and functional integrity. **[Capital Improvement Nos. 5 and 9, and O&M Improvement Nos. 3, 7, 9, and 10]**

3.8.3 Distribution

Water Main Upsizing and Replacement – As shown in Figure 3-5, there are multiple locations where the required fire flow is not met. Upsizing water mains in some of these locations will improve fire flow and water pressure. Although there are several additional locations in the City in need of water main replacements due to leakage and corrosion, the improvement locations were limited to critical improvements for fire flow requirements. **[Capital Improvement Nos. 3, 4, 19, and 25]**

Water Main Looping – As shown in Figure 3-5, there are multiple locations where the required fire flow is not met. Looping water mains at dead ends in these locations will improve fire flow and water quality. **[Capital Improvement Nos. 2, 6, 7, 11, 12, 17, 18, and 20 through 25]**

CHAPTER 4 - WATER RESOURCE ANALYSIS & WATER USE EFFICIENCY (WUE)

4.1 WATER USE EFFICIENCY PROGRAM (WUE)

4.1.1 Planning Requirements

In 2003, the Washington State Legislature passed the Municipal Water Supply-Efficiency Requirements Act (commonly called the Municipal Water Law) as part of a multi-year effort to reform the state's water laws. The act requires all municipal water suppliers to use water more efficiently in exchange for water right certainty and flexibility to meet future water demands. The Legislature directed the Department of Health to adopt a rule that establishes water use efficiency requirements for all municipal suppliers. The Water Use Efficiency (WUE) Rule, which became effective on January 22, 2007, includes the following key items:

- WUE Program – This element of the rule requires the collection of water production and consumption data, forecast of future water demands, evaluation of system leakage, evaluation of water rate structures, and the implementation of WUE measures. This Program is a required element of all Water System Plans prepared after January 22, 2008.

- Distribution System Leakage (DSL) Standard – Municipal water suppliers with 1,000 or more connections are required to satisfy a DSL standard equal to 10% or less of total production by July 1, 2010.

- WUE Goal Setting and Performance Reporting – Municipal water suppliers are required to set WUE goals through a public process and report annually on their performance to customers and to DOH. For water systems with 1,000 or more connections, the deadline for establishing systems goals was July 1, 2009. WUE goals must be established through a public process for a six-year period, and should be re-evaluated each cycle.

The rule requirements and compliance deadlines are shown in Table 4-1.

TABLE 4-1 WATER USE EFFICIENCY RULE REQUIREMENTS

Requirement	Deadlines	
	1,000 or more Connections	Under 1,000 Connections
Begin Production & Consumption Data Collection	January 1, 2007	January 1, 2008
Establish WUE Goals	July 1, 2009	July 1, 2010
Include WUE Program in Planning Documents	January 22, 2008	January 22, 2008
Submit First Annual Performance Report	July 1, 2008	July 1, 2009
Submit Service Meter Installation Schedule	July 1, 2008	July 1, 2009
Meet DSL Standard	July 1, 2010	July 1, 2011
Complete Installation of all Service Meters	January 22, 2017	January 22, 2017

A WUE Program is one requirement of the WUE Rule. All Water System Plans submitted to the Department of Health after January 22, 2008, are required to include a WUE Program. WAC 246-290-810(4) requires municipal water suppliers to include the following items in their WUE program:

- Description of the current water conservation program including an estimation of water saved through program implementation over the last six years;

- Description of the chosen WUE goals;

- Evaluation and implementation of WUE measures;

- Projected water savings;

- Customer education;

- WUE program effectiveness; and
- DSL evaluation.

4.1.2 Current Water Use Efficiency Program

Toppenish's current Water Use Efficiency (WUE) Program was completed in November 2009 as part of the *Water System Plan*. The City's current WUE Program consists of the following elements:

- Water Use Efficiency Goals
- Evaluation and Implementation of Water Use Efficiency Measures
- WUE Measure Implementation
- Customer Education
- Water Use Efficiency Program Effectiveness
- Distribution System Leakage (DSL) Evaluation

Provided in Table 4-2 is a summary of the population, number of water services, water consumption, and per capita water consumption from 2010 to 2015. Further information on historical water use is provided in CHAPTER 2 of this Plan. Since 2010, annual water consumption has been reduced by approximately 7%. Annual residential demand per service per day has also decreased by approximately 4% since 2010.

TABLE 4-2 WATER CONSUMPTION INFORMATION 2010-2015

Year	Population*	Total Water Services	Annual Water Production (MG)	Annual Water Consumption (MG)	Annual Residential Consumption (MG)	Residential Water Services	Residential Avg. Day Consumption per service (gal/service/day)
2010	8,949	2,261	578.03	461.28	334.80	1,964	467
2011	8,950	2,293	560.85	526.10	330.33	1,990	455
2012	8,950	2,326	558.60	492.61	349.22	2,015	475
2013	8,950	2,358	550.39	472.27	335.49	2,040	449
2014	8,955	2,390	549.74	473.81	331.60	2,066	440
2015	8,965	2,422	537.90	481.07	340.86	2,091	447

Note: Residential water services represents Residential, Duplex, and Apartment user categories.
* From Washington State OFM population estimates.

The City's 2009 *Water Use Efficiency Program* included a goal to reduce single-family residential and multi-family residential water consumption by 25 gallons per day per connection by December 31, 2015. The City reduced the average residential consumption per service by 20 gallons per service per day from 2010 through 2015, but the 25 gallons per service per day goal was not met.

The WUE Program goals and measures have been updated with this 2017 Water System Plan, and a public forum is scheduled for September 2017 to adopt the updates into the WUE.

4.1.3 Water Use Efficiency Goals

WUE goals are an integral component of the WUE program, setting the ground work for more efficient use of water. The City of Toppenish has observed reductions in residential consumption per service through past conservation measures, resulting in less production. Therefore, the City of Toppenish has proposed the following WUE goals for their water system:

1. The City of Toppenish will reduce the distribution system leakage (DSL) to at least 10%.
2. The City of Toppenish will reduce the water consumption of single-family and multi-family residences by 15 gallons per day per connection by December 31, 2023.

The WUE goals were presented to the public for review May 1, 2017. The WUE goals are scheduled to be adopted by the City council in September 2017. A copy of the public forum handout information is provided in CHAPTER 10 of this Plan.

4.1.4 Evaluation and Implementation of Water Use Efficiency Measures

Water use efficiency (WUE) measures are necessary actions taken to attain a water system's established efficiency goals. Measures are intended to support the WUE program and should address both supply and demand efficiencies. For this reason, the WUE measures that have been evaluated and/or implemented are separated into two primary categories, demand side and supply side measures. All of the selected WUE measures pertaining to Toppenish's WUE goals are scheduled to be presented to the public as part of the goal setting process.

Demand Side Measures

Municipal water systems are required to evaluate or implement a specified number of demand side water use efficiency (WUE) measures based upon the size of the water system. Table 4-3 shows the minimum number of measures required to be evaluated or implemented by the City of Toppenish.

TABLE 4-3 WATER USE EFFICIENCY MEASURES

Number of Service Connections	Number of Water Use Efficiency Measures to be Evaluated
Less than 500	1
500 - 999	4
1,000 – 2,499	5
2,500 – 9,999	6 (Toppenish's current requirement)
10,000 – 49,999	9
Greater than 50,000	12

A discussion of the demand side measures that the City of Toppenish has evaluated to achieve its specified efficiency goal are provided below, along with the estimated costs to implement the measures and the projected water savings. Evaluation of the following measures for cost-effectiveness is primarily based upon the overall implementation costs as compared to the amount of potential water savings.

Public School Outreach Program – The City will implement a modified outreach program to local public schools starting in 2018. Age-appropriate packets containing water conservation information and tools (such as rain gauges) and will be delivered to elementary, middle, and/or high schools; school staff will distribute these packets to students. By providing youth with fun conservation activities, the City hopes to have both an immediate and long term impact on their water-use practices.

WUE Measure Cost Estimate: $500 per year for printing curriculum materials.

Estimated Water Savings: Unknown.

WUE Measure Action Status: Implement in 2018.

Water Bill Leaflets – The City will include a leaflet addressing consumer leak detection with water bills once a year starting in 2018. The purpose of the leaflet is to increase awareness of at-home leak detection and to educate water customers by providing leak-detection techniques as well as some solutions and resources for fixing leaks. People often underestimate the amount of water wasted by a leak and delay in fixing small leaks. The City hopes that the annual mailing will encourage water customers to take the time to survey their home for leaks at least once a year. The leaflet will remain the same every year and will not increase the cost of sending out bills.

WUE Measure Cost Estimate: $1,000/year for reproduction of bill inserts.

Estimated Water Savings: Unknown

WUE Measure Action Status: Implement in 2018.

Livestock Fair Booth and Literature – Starting in 2018, the City will set up a booth at the annual Mural a Day Fair and hand out appropriate literature on conservation. City representatives will be available to answer questions and give away vouchers for free water conservation items. Water customers will be able to redeem the vouchers at the Public Works office during normal office hours after the Fair. By setting up a booth at the Mural A Day Fair, the City hopes to reach a widespread audience that uses water for different needs. The literature handed out at the Fair will address conserving water for specific uses. The literature available at the fair will be the same every year and gathered from free public educational materials from the Washington State DOH and the Environmental Protection Agency's WaterSense Program. The free conservational items will made available at Public Works, ensuring that only local residents redeem the vouchers. The City has not decided which water conservation items to give away, but most likely they will be sink aerators or rain gauges which are less than $2.00 each. We expect that around 50 items will be given away.

WUE Measure Cost Estimate: $5,000 for printing materials

Estimated Water Savings: Unknown

WUE Measure Action Status: Implement in 2018.

Low-Flow Showerheads – The City will have low-flow showerheads available at the Public Works office for residential water customers starting in 2019. We will notify the customers of the availability of the showerheads by putting a note on the water bills. Switching to a low-flow showerhead is a convenient and relatively inexpensive way to conserve water. Low-flow showerheads are a proven method for saving water and can save 2 to 3 gallons every minute when compared to a regular showerhead. If each member of a family of four takes one fifteen minute shower a day, switching to a low-flow showerhead could save at least 120 gallons per day! The City can purchase bulk quantities of showerheads for around $3.00 each. We will keep approximately 50 in stock for residents. This is the most costly measure but switching to a low-flow showerhead has a tremendous impact on water usage. By having the showerheads available to water customers instead of delivering them, we can ensure that the customers who make the effort to come to the Public Works office will actually install them.

WUE Measure Cost Estimate: $20,000 for purchase and distribution of low-flow showerheads.

Estimated Water Savings: 50 GPD/service reduction in MDD

WUE Measure Action Status: Implement in 2019.

Newspaper Articles – The City will run two articles per year on water conservation information and tips in the local newspapers starting in 2019. The spring article will focus on outdoor conservation tips and the fall article on indoor conservation. The City feels that by providing water customers with season-appropriate water conservation tips, they will be more likely to use them and change their water usage habits. The cost to run articles will be of no charge to the City and water conservation tips are freely available from a number of government and educational resources.

WUE Measure Cost Estimate: No cost.

Estimated Water Savings: Unknown.

WUE Measure Action Status: Implement in 2019.

Conservation Material to Non-Billed Services – There are certain homes that use City water but do not receive individual-use water bills, such as apartments and retirement homes. The City of Toppenish will provide these residents with all of the conservation literature to be included in the water bills, including the water conservation tips, leak detection leaflets, and information on picking up a showerhead at Public Works. It is important that all residential water consumers receive this conservation information, regardless of whether they pay the City for their water usage. These consumers may have less financial incentive to conserve water, so it is especially important to remind them of the environmental impact of their consumption. The multi-family residences are all structured differently, but in general the City would provide the apartment or facility management with the conservation material and have them distribute it to the residents. It is in the management's best interest to conserve water, so they will have financial incentive to provide residents with the materials.

WUE Measure Cost Estimate: Cost is included in above measures.

Estimated Water Savings: Included in above measures.

WUE Measure Action Status: Active.

It should be noted that water savings attributable to public information activities are difficult to quantify because they are not directly linked to physically saving water. Although these measures cannot be specifically quantified, they are an integral part of the WUE Program, raising awareness of the importance of water conservation and increasing community participation in other conservation activities.

A summary of the estimated costs to implement the selected measures, their estimated water savings, and overall cost-effectiveness are provided in Table 4-4.

TABLE 4-4 SUMMARY OF DEMAND SIDE WUE MEASURES

Measure Description	Implementation Cost	Action Status	Estimated Water Savings, 6-year period, MG
Public School Outreach Program	$3,000	Implement in 2018	Unknown
Water Bill Leaflets	$6,000	Implement in 2018	Unknown
Livestock Fair Booth and Literature	$5,000	Implement in 2018	Unknown
Low-Flow Showerheads	$20,000	Implement in 2019	106,000 GPD
Newspaper Articles	No Cost	Implement in 2019	Unknown
Conservation Material to Non-Billed Services	N/A	Active	Unknown

The above measures planned to be implemented as shown in Table 4-6. The City has reevaluated the effectiveness of the measures to determine measure updates worth considering. Costs to implement or continue these measures are included in the City's water operations budget.

Supply Side Measures

Supply side measures are essential to control distribution system leakage (DSL), improve supply efficiency, and overall system performance. The following discusses the supply side WUE measure that has already been implemented to reduce the system's current DSL percentage and satisfies the City's WUE Program objective.

Leak Detection Program – The City implemented and continues to maintain an ongoing leak detection program. Leak detection equipment has been purchased. The City surveys 20% of the distribution system every year, thereby surveying the entire system once every 5 years.

WUE Measure Cost Estimate: None.

Estimated Water Savings: Unknown.

WUE Measure Action Status: Active.

The following Table 4-5 is a summary of supply side measures implemented by the City.

TABLE 4-5 SUMMARY OF SUPPLY SIDE WUE MEASURES

Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Leak Detection Program	None	Active	Unknown

4.1.5 WUE Measure Implementation

A summary of the WUE program measures that are in place or planned for implementation are provided in Table 4-6, including measure description, implementation cost, and status/year of implementation. All of the implemented measures support the system's WUE goals to reduce distribution system leakage and residential water consumption.

TABLE 4-6 SUMMARY AND PROJECTED SAVINGS OF WATER USE EFFICIENCY MEASURES

Measure Description	Implementation Cost	Action Status/ Year of Implementation	Projected Water Savings
Public School Outreach Program	$3,000	Implement in 2018	Unknown
Water Bill Leaflets	$6,000	Implement in 2018	Unknown
Livestock Fair Booth and Literature	$5,000	Implement in 2018	Unknown
Low-Flow Showerheads	$20,000	Implement in 2019	106,000 GPD
Newspaper Articles	No Cost	Implement in 2019	Unknown
Conservation Material to Non-Billed Services	N/A	Active	Unknown
Leak Detection Program	None	Active	Unknown

The City plans to budget funds each year for the next six-year period to fund the WUE measures listed above in Table 4-6. These budget amounts are reflected in the proposed City of Toppenish financial plan in CHAPTER 9 of this Plan as part of the general operational budget and/or O&M improvement costs.

4.1.6 Customer Education

Customer education is intended to inform citizens about the need for, and the methods to achieve water conservation. Customer education involves publicizing and promoting the need for water conservation to all classes of customers. The City of Toppenish currently educates its customers through their annual Water Quality Report/Consumer Confidence Report (CCR), a copy of which is provided in CHAPTER 10 of this Plan. The annual report discusses the importance of using water more wisely and the City's plans for more efficient use of water, providing a source of information for customers and promoting water conservation ideas.

Beyond educating customers through the annual Water Quality Report, the City of Toppenish has evaluated and plans to implement several other educational programs that include a public school outreach program, providing water bill leaflets, preparing an educational booth and literature for the annual livestock fair and issuing of newspaper articles. Each of these additional education programs is discussed in more detail, including their cost for implementation, in Section 4.1.4 above.

4.1.7 Water Use Efficiency Program Effectiveness

The Water Use Efficiency Rule requires the completion of annual performance reporting to system customers and to the Department of Health (DOH). The City will use preparation of the Annual WUE Performance Report as an opportunity to review the effectiveness of the WUE measures, and determine if established goals require revision. The annual effectiveness evaluation and the Annual WUE Performance Report will include the following elements:

- Calculation of distribution system leakage in terms of volume and percent of total water production;
- Identification of WUE goals;
- Evaluation of established WUE goals, including estimating water savings achieved through implemented measures and progress towards satisfying goals.

Toppenish will submit its Annual WUE Performance Report to DOH by July 1st of each year. Information contained in the Annual WUE Performance Report will also be included in the City's *Water Quality Report*, which will be published on the City's website. WUE Program effectiveness will also be evaluated every six years when the Water System Plan is updated again. At this time both goals and measures will be reevaluated to determine the most cost-effective method to achieve the updated goals.

4.2 DISTRIBUTION SYSTEM LEAKAGE (DSL)

The distribution leakage standard is a significant element of the WUE requirements. This standard requires that all water systems monitor total water consumption by all services. The difference between water consumption and water production is considered DSL. DSL includes meter inaccuracies, water theft, leaking water mains, and reservoir overflows. DSL may also include un-metered uses such as hydrant use for firefighting, and water used for distribution system flushing (if these uses are un-metered or un-estimated). The WUE Rule requires water distribution leakage to be 10% or less of total production based on a three-year rolling average.

All of Toppenish's water sources are metered, and these source meters are read Monthly. All services in Toppenish's distribution system are metered and read monthly. Table 4-7 presents Toppenish's water production and water consumption values for the six-year period, 2010 through 2015, and the three-year average (2013 through 2015).

TABLE 4-7 WATER PRODUCTION, CONSUMPTION, AND DSL				
Year	Production	Consumption	DSL	% DSL
2010	578,029,108	461,282,504	116,746,604	20.20%
2011	560,847,354	526,096,188	34,751,166	6.20%
2012	558,596,685	492,613,172	65,983,513	11.81%
2013	550,391,635	472,265,014	78,126,621	14.19%
2014	549,744,150	473,806,276	75,937,874	13.81%
2015	537,899,487	481,067,359	56,832,128	10.57%
TOTAL	3,335,508,419	2,907,130,514	428,377,905	12.84%
3-Year Average (2013-2015)	546,011,757	475,712,883	70,298,874	12.87%

The City of Toppenish currently does not meet the 10% DSL standard. There does not appear to be a trend in DSL percentage considering the six-year period shown above, although the latest three years appear to be decreasing in DSL. The City plans to continue making repairs to or replacing potential leaking system components such as service lines, old service meters, and aging and leaking main line water valves to further reduce the DSL percentage.

In 2015, Toppenish's telemetry system was upgraded. As part of the system upgrade source meters were either replaced or recalibrated.

4.3 WATER LOSS CONTROL ACTION PLAN

The City's current three-year average DSL percentage exceeds the 10% threshold by DOH. Therefore, the City is required to develop a Water Loss Control Action Plan (WLCAP) to achieve the primary objective of reducing DSL to meet the 10% standard.

As discussed in Section 4.1.4, the City will continue their leak detection program to reduce the DSL. Previous WUE measures have been effective in reducing DSL since year 2010. Taking advantage of the free leak detection service offered by ERWoW will allow the City to thoroughly test the entire system over the course of five years for leaks. As leaks are discovered and corrected, the DSL is expected to drop significantly.

The City will also continue their annually scheduled reservoir cleaning and inspection to check for leaks, as well as continuously calibrating source and service meters. These actions have helped reduce the amount of DLS over the past six years.

4.4 SOURCE OF SUPPLY ANALYSIS

If 20-year water use projections forecast that demand will exceed existing water rights, the purveyor is required to conduct a *Source of Supply Analysis*. The purpose of the *Source of Supply Analysis* is to evaluate opportunities to obtain or optimize the use of existing sources already developed and to evaluate other innovative methods to meet water needs. Toppenish's 20-year water demand projections will not exceed their existing certified and permitted authorizations, but the following *Source of Supply Analysis* may be valuable in the future as projected growth occurs or if the water use agreement with the Yakama Nation changes. A *Source of Supply Analysis* for the City of Toppenish is presented below.

The *Source of Supply Analysis* includes evaluation and discussion of the following items:

1. Water Rights Changes
2. Interties
3. Artificial Recharge
4. Water Reclamation / Reuse Opportunities
5. Treatment

4.4.1 Water Rights Changes

This measure involves examining opportunities to utilize existing water rights via change(s) in water right parameters (change in place of use, change in purpose of use, change in point of diversion or additional points of diversion or withdrawal).

As Toppenish continues to grow and serve areas within their future service area, they will pursue the acquisition of the water rights/permitted uses associated with each newly annexed property. In some cases, the City may need to apply for a change in type of use, or change in point of use of the particular water right. These acquisitions may include:

- Permitted domestic or industrial ground or surface water rights associated with the annexed property;
- Permitted irrigation ground or surface water rights associated with the annexed property (these may include those portions supplied by an irrigation district or company); and
- Ground water rights associated with individual residential property (the domestic exemption water rights).

In addition, residential areas currently served by existing small water systems within Toppenish's Urban Growth Area may, in the future, become annexed by the City. Toppenish should acquire the water rights associated with those existing water systems if they become annexed. These include:

- El Corral Motel
- Washington Beef LLC
- Del Monte

4.4.2 Interties

Currently, Toppenish has no interties with any neighboring water systems. The most likely future intertie between the City of Toppenish and other water systems would be between Washington Beef or the Yakama Nation, as discussed previously in this Plan. Washington Beef is currently an industrial service customer of the City. Some preliminary discussions have occurred between the City and Washington Beef; however, development of an intertie agreement has not begun. Given the unreliable demand history from Washington Beef, it may be advantageous for both systems to develop an agreement in the future.

If a future intertie is proposed, it will require a detailed study of the proposed usage, physical capacity, source water quality and costs to determine its feasibility. The City will need to evaluate any proposed interties and develop an agreement with the other purveyor, obtain approval of the intertie from the Department of Health and the Department of Ecology, modify appropriate water rights to reflect the intertie, and incorporate the intertie into the Water System Plan. The intertie agreement would likely include the following elements:

- A discussion on the place of use as authorized in appropriate water rights documents;
- Identification of the specific time period(s) in which water will be provided;
- Quantification of the amount of water available for use;
- A discussion on seasonal or other restrictions on water availability; and
- A discussion of how water conservation programs, data collection, and other operational matters will be conducted and coordinated.

4.4.3 Artificial Recharge

Artificial recharge is the injection or infiltration of available surface water (usually from high winter flows) or other available water into an aquifer and its subsequent withdrawal. However, Toppenish has no surface water right to use for artificial recharge. Toppenish may acquire a surface water right through some future annexation, but the City would most likely put such a right to direct use rather than using it for artificial recharge.

4.4.4 Water Reclamation / Reuse Opportunities

This measure involves exploring opportunities for reclaimed water, reuse, non-potable water, and greywater as an approach to providing additional water supply. Toppenish's sole source of reclaimed or re-used water is the City's wastewater treatment facility.

Reclaim and re-use of wastewater from Toppenish's wastewater treatment plant would involve identification of nearby facilities that could utilize the reclaimed water such as:

- Areas suitable for irrigation (cropland, parks, golf courses, freeway landscapes, school yards, and cemeteries);
- Wetland enhancement; and
- Groundwater recharge areas.

The most logical and practical reuse of reclaimed water from the Toppenish wastewater treatment facility would be to develop the infrastructure necessary to pump the reclaimed water back to the City for use in irrigating parks. This would require upgrading Toppenish's wastewater treatment facility to Class A reclaimed water standards and constructing a separate reclaimed water distribution system (pumps and pipeline) to deliver the reclaimed water to the various parks throughout the City. Irrigation of parks, although seasonal, would reduce annual water demand and lower demand during the critical summer period. However, at this time the costs associated with these improvements would be prohibitive compared to the benefit of using the reclaimed water.

4.4.5 Treatment

For Toppenish, water treatment sources are the same as previously discussed in water reuse and reclamation, such as the Toppenish wastewater treatment plant.

4.5 WATER RIGHT STATUS SUMMARY

The City of Toppenish lies entirely within the jurisdictional boundaries of the Yakama Nation reservation, and therefore, applies for and maintains 10-year renewable existing use permits with the Yakama Nation Water Code Administration for each of its wells. The Yakama Nation is the sole entity for enforcing, administering, and adjudicating water resources within the external boundaries of the Reservation. Most recently in 2015, the City of Toppenish applied for and received 10-year renewable existing use permits for Well No. 3, Well No. 5, Well No. 6, Well No. 7, and Well No. 8. The existing use permit for Well No. 9 was applied for in 2010. Provided below in Table 4-8 is a summary of the permitted flow rates for each well.

TABLE 4-8 SUMMARY OF YAKAMA NATION 10-YEAR RENEWABLE EXISTING USE PERMITS

Source	Permit Number	Permit Expiration Date	Instantaneous Quantity
Well No. 3	2005-27	January 25, 2015	495 gpm
Well No. 5	2005-27-A	January 25, 2015	950 gpm
Well No. 6	2005-27-B	January 25, 2015	195 gpm
Well No. 7	2005-27-C	January 25, 2015	2,200 gpm
Well No. 8	2005-27-D	January 25, 2015	375 gpm
Well No. 9	2005-11	January 1, 2020	600 gpm
		TOTAL	4,815 gpm

Most of the permitted flow rates match the current well capacities with the exception of Well No. 5, which was granted a higher instantaneous quantity. Each of these permits expires in 2015, as shown in Table 4-8, requiring the City to renew the permits with the Yakama Nation at that time. Permits for proposed future wells will also have to be obtained from the Yakama Nation.

The City also maintains a Washington Stated Department of Ecology (DOE) Certificate of Ground Water Right (3681-A) for Well No. 6, which has a priority date of November 25, 1958 and authorizes a maximum instantaneous withdrawal of 2,000 GPM and annual volume of 3,200 acre feet. Well No. 6 is the only well with a water right certificate, issued by DOE.

Three groundwater applications have been filed by the City with DOE. Application G3-20191 was for Well Nos. 2, 3, 4, 5 and 6, with a priority of May 12, 1972, and a combined total annual volume of 3,800 acre-feet from all five wells. The application provides individual instantaneous flow rates for each well equal to 440, 800, 225, 950, and 1,500 gpm from Well Nos. 2, 3, 4, 5, and 6, respectively. Application G3-20192, for Well No. 7, was submitted on the same date as application G3-20191 and therefore, has the same priority date. This application was for a maximum annual volume of 2,400 acre-feet and maximum instantaneous flow rate of 3,000 gpm. Application G4-31201 was for Well No. 8, with a priority date of March 20, 1992. The maximum withdrawal rate under this Application is equal to 1,200 gpm, but there was no annual volume provided. Processing of these applications has stopped, and to this date, none of the applications have been converted to a permit and/or certificated right.

Copies of all the City of Toppenish 10-year renewable existing use permits issued by the Yakama Nation, and DOE water right certificates and applications are provided in CHAPTER 10 of this Plan.

The status of Toppenish's DOE issued water rights, as compared to their current and future water system demand, is provided in Table 4-9, Table 4-10, and Table 4-11 for reference. The excess and/or deficiencies in the City's current and projected future water demands compared to their existing and applied for water rights are also shown in these tables. As shown, the current water right status for the City is adequate to meet projected 20-year demand.

TABLE 4-9 WATER RIGHTS SELF ASSESSMENT – EXISTING WATER RIGHT(S) STATUS (YEAR 2016)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date (list oldest first)	Source Name/Number	Primary or Supplemental	Existing Water Rights		Existing Water Consumption		Existing Water Right Status Excess (Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)
Permit/Certificates										
1. 3681-A	City of Toppenish	11/25/1958	Well No. 6, S06	Primary	2,000	3,200	195	1579[a]	1,805	2,918.1
Claims										
1.										
TOTAL					2,000	3,200	195[b]	1579[a]	1,805	2,918.1

Intertie Name - Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Existing Consumption Through Intertie		Existing Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)
1.							
TOTAL							

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G3-20191	City of Toppenish	May 12, 1972	Primary	Well No. 2: 440 gpm Well No. 3: 800 gpm Well No. 4: 225 gpm Well No. 5: 950 gpm Well No. 6: 1,500 gpm	3,800 acre-feet
2. G3-20192	City of Toppenish	May 12, 1972	Primary	Well No. 7: 3,000 gpm	2,400 acre-feet
3. G4-31201	City of Toppenish	March 20, 1992	Primary	Well No. 8: 1,200 gpm	NA

[a] Represents the maximum annual volume from entire system, although this permit only applies to Well No. 6.
[b] Refer to Table 4-8 for total Yakama Nation permitted quantities for Well No. 6 and other City wells.

TABLE 4-10 WATER RIGHTS SELF ASSESSMENT – SIX YEAR WATER RIGHT(S) STATUS SUMMARY (YEAR 2023)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date (list oldest first)	Source Name/Number	Primary or Supplemental	Existing Water Rights		Existing Water Consumption		Existing Water Right Status Excess (Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)
Permit/Certificates										
1. 3681-A	City of Toppenish	11/25/1958	Well No. 6, S06	Primary	2,000	3,200	195	1,798[a]	1,805	2,918.1
Claims										
1.										
TOTAL					2,000	3,200	195[b]	1,798[a]	1,805	2,918.1

Intertie Name - Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Existing Consumption Through Intertie		Existing Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)
1.							
TOTAL							

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G3-20191	City of Toppenish	May 12, 1972	Primary	Well No. 2: 440 gpm Well No. 3: 800 gpm Well No. 4: 225 gpm Well No. 5: 950 gpm Well No. 6: 1,500 gpm	3,800 acre-feet
2. G3-20192	City of Toppenish	May 12, 1972	Primary	Well No. 7: 3,000 gpm	2,400 acre-feet
3. G4-31201	City of Toppenish	March 20, 1992	Primary	Well No. 8: 1,200 gpm	NA

[a] Represents the maximum annual volume from entire system, although this permit only applies to Well No. 6.
[b] Refer to Table 4-8 for total Yakama Nation permitted quantities for Well No. 6 and other City wells.

TABLE 4-11 WATER RIGHTS SELF ASSESSMENT – TWENTY YEAR WATER RIGHT(S) STATUS SUMMARY (YEAR 2037)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date (list oldest first)	Source Name/Number	Primary or Supplemental	Existing Water Rights		Existing Water Consumption		Existing Water Right Status Excess (Deficiency)	
					Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)	Maximum Instantaneous Flow Rate (Q_i) (gpm)	Maximum Annual Volume (Q_a) (acre-feet)
Permit/Certificates										
1. 3681-A	City of Toppenish	11/25/1958	Well No. 6, S06	Primary	2,000	3,200	195	1,893[a]	1,805	2,918.1
Claims										
1.										
TOTAL					2,000	3,200	195[b]	1,893[a]	1,805	2,918.1

Intertie Name - Identifier	Name of Purveyor Providing Water	Existing Limits on Intertie Use		Existing Consumption Through Intertie		Existing Intertie Supply Status (Excess/ Deficiency)	
		Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)	Maximum Instantaneous Flow Rate (Qi) (gpm)	Maximum Annual Volume (Qa) (acre-feet)
1.							
TOTAL							

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Q_i) REQUESTED	Maximum Annual Volume (Q_a) REQUESTED
1. G3-20191	City of Toppenish	May 12, 1972	Primary	Well No. 2: 440 gpm Well No. 3: 800 gpm Well No. 4: 225 gpm Well No. 5: 950 gpm Well No. 6: 1,500 gpm	3,800 acre-feet
2. G3-20192	City of Toppenish	May 12, 1972	Primary	Well No. 7: 3,000 gpm	2,400 acre-feet
3. G4-31201	City of Toppenish	March 20, 1992	Primary	Well No. 8: 1,200 gpm	NA

[a] Represents the maximum annual volume from entire system, although this permit only applies to Well No. 6.
[b] Refer to Table 4-8 for total Yakama Nation permitted quantities for Well No. 6 and other City wells.

4.6 WATER SUPPLY RELIABILITY ANALYSIS

4.6.1 Source Reliability

The single most important aspect of a water utility is its domestic water supply source. The City of Toppenish's water supply is dependent on ground water sources. As previously discussed in this Plan, the City utilizes six source wells. The locations of these wells within the water system are shown in Map A, enclosed in the back of this Plan. All six City wells are located on property owned by the City. Copies of the property deeds well are provided in CHAPTER 10 of this Plan.

As discussed in CHAPTER 3 of this Plan, there has been no significant change in source well water quality from any of Toppenish's wells as demonstrated by inorganic chemical and volatile organic chemical monitoring over time.

Toppenish has taken steps to protect its aquifers through completion and implementation of a *Wellhead Protection Program*. Completed in 1997, the program is intended to protect Toppenish's aquifers through a combination of regulatory measures, best management practices, and public education and awareness. Details of Toppenish's *Wellhead Protection Program* are provided in CHAPTER 5 of this Plan.

Based upon their recorded depths and available well log information, it is likely that all of Toppenish's wells withdraw water from either the Ellensburg Formation of the Overburden Unit or the Saddle Mountain formation. Although no well log is available for Well No. 3, it probably draws water from the Ellensburg Formation, because of its relatively shallow depth. The Overburden and Saddle Mountain hydrogeologic units are part of the Columbia River Basalt Group that underlies much of south-central Washington. This geologic formation consists of four distinct hydrogeologic units. Starting with the oldest, these four units are known as the Grande Ronde, Wanapum, Saddle Mountain (made up primarily of basalts of the same name, but also include sedimentary interbeds), and the Overburden Unit. The Grande Ronde, Wanapum, and Saddle Mountain Units vary in thickness in South-Central Washington. Each unit is composed of numerous to several hundred individual basalt flows, which can range in thickness from a few inches to more than 300 feet, with sedimentary interbeds. Distinct, thick sedimentary interbeds separate the Grande Ronde, Wanapum, and Saddle Mountain Units.

Irrigation wells for agricultural use also penetrate and withdraw from the above described Formations. Consequently, many of the Yakima area communities have experienced diminishing capacities and/or lowering drawdown levels in their source wells over years. Trends in groundwater levels are one of several factors important in determining source reliability. The United States Geological Survey (USGS) recently completed reports determining and analyzing such trends. The *Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho* (Scientific Investigations Report 2012-5261), published in 2012 by USGS, concluded that groundwater levels in the aquifer have risen since the 1950s in areas heavily irrigated with surface water and have declined since the 1970s in areas irrigated with groundwater. For wells examined in the Report, typical rises in water level under surface-water irrigation areas were 50 feet. Declines of 200 feet or greater were common in areas where pumping groundwater is the dominant source of irrigation water. The USGS Report concluded that 72% of the wells within the aquifer experienced declines over the study period, 1968-2009. Furthermore, the trends for all wells within the aquifer declined at a mean rate of 1.9 ft/year. Further information on the geologic formations and groundwater status in the area can be found in the *USGS Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho*. This study is provided in CHAPTER 10 for reference.

Source wells within Toppenish were not directly involved with the USGS studies and reports. Because of this exclusion, an accurate determination of diminished capacities and lower drawdown cannot be concluded for the City's source wells. The City has not noticed a significant decline in well capacity as a result of declining groundwater levels. However, the City will continue to track static and drawdown water levels in the future as wells are rehabilitated to establish a record of water levels and have the ability to anticipate any potential source deficiencies.

Provided below in Table 4-12 is a brief description of each of the six Toppenish wells. Copies of the well logs, susceptibility assessment surveys, and property deeds are included in CHAPTER 10 of this Plan.

TABLE 4-12 TOPPENISH SOURCE WELL INFORMATION SUMMARY						
	Well No. 3	Well No. 5	Well No. 6	Well No. 7	Well No. 8	Well No. 9
Source No.	S03	S05	S06	S07	S08	S09
Date Drilled	1937	1952/1954	1959	1973	1994	2013
Well Depth	188 feet	291 feet	863 feet	1,024 feet	250 feet	444 feet
Casing Depth	187 feet	240 feet	863 feet	1,022 feet	239 feet	327 feet
Static Water Level	14'-2"	14'-0"	Artesian	Artesian	15'-0"	20'-0"
Current Capacity	495 GPM	950 GPM	195 GPM	2,200 GPM	375 GPM	800 GPM

4.6.2 Water Right Adequacy

Toppenish's current Yakama Nation permitted quantities of 4,815 GPM and certificated water rights of 2,000 GPM and 3,200 acre-feet per year, discussed earlier in this chapter, are adequate to satisfy the current and future maximum annual and instantaneous demand. Toppenish will pursue water conservation measures, continue its annual review of water production and consumption data, and evaluate construction of additional supply sources or larger capacity of existing sources to perfect current water rights and meet growing demands.

4.6.3 Facility Reliability

Toppenish's major water system components have been properly operated and maintained. Table 4-13 provides a list of the City's wells and reservoirs, their age, and year they were constructed.

TABLE 4-13 WELL AND RESERVOIR AGE SUMMARY		
Water System Component	Year Constructed	Component Age (From 2017)
Well No. 3	1937	80 years
Well No. 5	1952/1954	65/63 years
Well No. 6	1959	58 years
Well No. 7	1973	44 years
Well No. 8	1994	23 years
Well No. 9	2014	3 years
Reservoir No. 2	1937	80 years
Reservoir No. 3	1953	64 years
Reservoir No. 4	1993	24 years
Reservoir No. 5	2014	3 years

Pumps will continue to be maintained as discussed in CHAPTER 6. Recommended O&M improvements related to well pump rehabilitation and replacement will be as described in CHAPTER 8.

Power outages in Toppenish are rare, and when they occur their duration is generally brief. To provide an additional measure of reliability, five out of six of Toppenish's source wells, including the City's largest source well, Well No. 7 (2,200 GPM), are currently outfitted with permanent engine generators that provide adequate power to run the well pumps and treatment equipment if there is a failure in the normal power supply.

4.6.4 Water Shortage Response Planning

The City currently has restrictive water usage as part of the City Water Code. Code Chapter 13.08.110 limits or forbids the use of water for irrigation, sprinkling, or sluicing upon such times, limits or conditions as the City council may determine following the publishing of a public notice in the legal newspaper of the City. During short-term water shortages, the City will also implement the following additional conservation measures:

- City restrictions on irrigation of parks;
- City curtailment of pool use;
- City restrictions on water main and hydrant flushing; and
- Requesting curtailment on non-essential commercial water use.

4.6.5 Evaluation of Implementing Water Use Efficiency-Based Rate Structure

The City's current rate structure is an inclining block rate, where the charge per unit of water increases with higher use. This rate structure allows Toppenish to be competitive in attracting large consumption industries. While bringing jobs and revenue to the City is desirable, it does not promote water conservation under the existing rate structure.

A more conservative water rate most fitting for Toppenish would be a uniform block rate. Uniform block rates do not change based on total consumption. After the base rate (a fixed monthly minimum charge, which includes the first 600 cubic feet of water), the first cubic foot of water costs the same as the hundred-thousandth cubic foot.

For industrial customers, the cost of production may go up significantly, potentially creating hardships on high-consumption industries or costing jobs. Toppenish's largest consistent industry, Del Monte, averaged over two million cubic feet of water per year from 2013 to 2015, correlating to an average monthly bill increase of 38% under a uniform block rate. The uniform block rate would only encourage water conservation habits from those industrial users, because residential services do not use enough water to see a difference. The City would experience an increase in revenue until users begin consuming less, since the uniform block rate promotes water conservation. If the changed rate structure is successful to the point of reducing the City's water production, the new reservoir project listed in CHAPTER 8 could be delayed.

For the City to adopt a uniform block rate, there would be a public hearing at a Council meeting, with the decision ultimately coming from the Council members.

4.6.6 Evaluation of Water Reclamation / Reuse Opportunities

This measure involves exploring opportunities for reclaimed water, reuse, non-potable water, and greywater as an approach to providing additional water supply. Union Gap's sources of reclaimed or reused water are the few industrial entities located within the City. It may be possible to reuse cooling waters from industrial entities for other industrial uses, or for irrigation of City parks. Irrigation of parks, although seasonal, would reduce annual water demand and lower demand during the critical summer period. Industrial cooling waters are the property of those individual industries, and using these waters for irrigation will require solving political, technical, environmental, legal, and economic issues. The City does not have a wastewater treatment facility or other potential major source of reclaimed water that would provide possible reclamation/reuse opportunities.

CHAPTER 5 - SOURCE WATER PROTECTION

5.1 WELLHEAD PROTECTION PROGRAM

In 1997, Toppenish completed and implemented a wellhead protection plan. The purpose of the plan was to:

- Identify the zones of groundwater contribution to the municipal wells;
- Determine the susceptibility of the aquifers to contamination;
- Identify potential sources of contamination that may threaten the integrity of the City's ground water supplies;
- Develop a contingency plan to be implemented in the event of a contaminant release results in the loss of a well due to contamination;
- Provide preliminary recommendations for alternative water supply sources; and
- Establish management procedures to help protect the water supplies from contamination.

The City of Toppenish's Wellhead Protection Plan, prepared in accordance with the Department of Health's requirements, contains the following elements:

- A water system overview;
- A well susceptibility determination for each well;
- A wellhead protection area determination for each well;
- An inventory of potential contamination sources;
- A contingency plan, which includes an analysis of source capacity, reliability, and water rights, short- and long-term alternate water sources, and emergency and spill response procedures; and
- A wellhead protection management plan which details regional and local management efforts to protect the City's ground water supplies.

The City of Toppenish's *Wellhead Protection Plan* is considered a companion document to the City's *Water System Plan*, and should be consulted for specific details and information regarding Toppenish's wellhead protection program.

5.2 EXEMPT WELLS

The City of Toppenish allows drilling and use of exempt wells within its service area only if the property to be served is located outside of the existing area served by the City's water system. Exempt wells are defined in state law (RCW 90.44.050) as:

> "*. . . any withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for a single or group domestic uses in the amount not exceeding five thousand gallons a day, or for an industrial purpose in the amount not exceeding five thousand gallons a day, is and shall be exempt from the provisions of this section . . .*"

The City requires those areas served by exempt wells to connect to the City's water system when it extends to the property. At that time, any exempt wells on the property shall either be decommissioned in accordance with the applicable Washington Administrative Code (WAC) requirements, or taken over by the City to become part of the City's water system.

5.3 UPDATES AND MODIFICATIONS TO THE WELLHEAD PROTECTION PLAN

The Potential Contaminant Source and Notification List, originally developed in 1997, has been updated as part of this Water System Plan.

Potential Contaminant Source List

Well No. 3

One Year Time of Travel Zone	
Swimming Pool Park	20 Asotin Avenue
Toppenish 50 Meter Pool	20 Asotin Avenue
Riojas Trucking	11 Asotin Avenue
Spirit Mart	102 East Toppenish Avenue
Five Year Time of Travel Zone	
Ruggles Auto Repair	112 Washington Avenue
Coco's Hair Salon	502 East Toppenish Avenue
YVR Depot	10 South Asotin Avenue
Crop Production Services	310½ Washington Avenue
Railroad Park	14 South Asotin Avenue
Robierts Denture	7B South Toppenish Avenue
Slick's Barber Shop	12 South Toppenish Avenue
Ortega Auto Sales & Repair	202 East Toppenish Avenue
Janet's Salon	206 South Toppenish Avenue
Carmona Auto Sales	301 South Toppenish Avenue
Lopez Auto Sales	302 South Toppenish Avenue
Raymonds Upholstery	214 East Toppenish Avenue
US Mex Auto Sales	218 East Toppenish Avenue
Michoacan's Auto Sales	301 East Toppenish Avneue
Lincoln Park	101 North D Street
Anthony's Car Wash	315 East Toppenish Avenue
Lovely You Hair Salon	9 South Alder
Aqua Blast Car Wash	111 Washington Avenue
Gibbons Pharmacy	117 South Toppenish Avenue
Bleyhl's Farm Service	201 – 205 Asotin Avenue
Raymonds Iron Works	214 East Toppenish Avenue
Hair Salon	216 East Toppenish Avenue
OK Muffler	211 East Toppenish Avenue
Hair Fashions	17 South Alder
Bio Twine	101 East Second Avenue
Mercada Gudaljara	10 Washington Avenue
Rathbun Iron Works	202 Washington Avenue
Blue Sky market	111 Chehalis Avenue
Folklore Foods	9 North B Street
Toppenish Police Department	1 West First Avenue
Toppenish City Hall	21 West First Avenue
Ten Year Time of Travel Zone	
Lincoln Elementary School	301 – 315 North Alder Street
John Boy's Auto Wrecking	320 East First Avenue
Bleyhl's Cenex Fuel	19 East Second Avenue
Valley View Elementary School	515 Zillah Avenue

Well No. 5

One Year Time of Travel Zone	
Olney Park	717 Adams Avenue
BNSF Railroad Tracks	
Five Year Time of Travel Zone	
Toppenish Public Works Shop	8 Buena Way

Toppenish School District Bus Shop	401 – 403 Asotin Avenue
Toppenish Middle School	101 Buena Way
Yakima Co. Fire District Station	9 Buena Way
Toppenish Library	1 South Elm Street
Huyler Construction	12 South Fir Street
Garfield School	505 Madison Avenue
Woodbridge Chiropractic Center	308 Monroe Avenue

Ten Year Time of Travel Zone
SP Farms

Well Nos. 6 & 8

One Year Time of Travel Zone

Mt. Adams Auto Parts	302 West First Avenue
First Choice Physical Therapy	206 West First Avenue
Napa Auto Parts	508 West First Avenue
Roadrunner Store	502 West First Avenue
EZ Buy Auto	408 West First Avenue
Pioneer Park	510 West Second Avenue
YVFW Clinic	518 West First Avenue
Market Place	512 West First Avenue
Toppenish City Fire Department	514 West Second Avenue
General Store Conoco	505 West First Avenue
YIN Management	Highway 97
Auto Zone	610 West First Avenue

Five Year Time of Travel Zone

L and L Salon	212 West First Avenue
Salon West	305 West First Avenue
AMR Ambulance	500 West Fourth Avenue
Toppenish Community Hospital	502 – 504 West Fourth Avenue
Dentist	604 West Fourth Avenue
Chiropractor	604 West Fourth Avenue
Roberto's Hair Design	221 South Toppenish Avenue
Professional Images	305 West First Avenue
McClavey's Barber Shop	709 West Third Avenue
Valley Rehab Center	802 West Third Avenue
Barbara's Beauty Salon	408 West Third Avenue
TNG Heating & Refrigeration	9 West Second Avenue
Albrecht Auto Glass	310 South Toppenish Avenue
Colonial Funeral Home	230 South Alder
K & M Auto Lube	302 South Toppenish Avenue
Charlie's Auto Sales	3 North Elm Street
Patterson Park	210 South Elm Street
Kukui Mart	401 South Elm Street
Ideal Lumber	827 West First Avenue
7-11 Store	611 WestFirst Avenue
Western Quick Lube	310 South Elm Street
Texaco Station	321 South Elm Street
Mid-Valley Produce	811 West First Avenue
Howard's OK Tires / Car Wash	710 West First Avenue
Safeway Store	711 West First Avenue
Mr. T's Auto	401 South Elm Street
Courtesy Coin Op	695 Guyette

Ten Year Time of Travel Zone

Silgan Container Corp	45 East Third Avenue
Auto Boneyard	405 South Division
Schutz Painting	608 South Toppenish Avenue
Chandler Distributing	810 West First Avenue
AC Auto Sales	812 West First Avenue

Well No. 7

One Year Time of Travel Zone

Toppenish High School	141 Ward Road
Wa State Migrant & Eagle Alt School	1200 – 1210 Jackson
Kirkwood School	403 South Juniper
Wapato Irrigation District	Ward Road to Linden Street

Five Year Time of Travel Zone

Smartlowitt School – Tribal School	Linden Street
Toppenish High School	141 Ward Road
Kirkwood School	403 South Juniper

Ten Year Time of Travel Zone

Toppenish High School	141 Ward Road
WSDOT Maintenance Shop	231 Fort Road
Wapato Irrigation District	Ward Road to Linden Street
SP Farms	

CHAPTER 6 - OPERATION AND MAINTENANCE PROGRAM

6.1 WATER SYSTEM MANAGEMENT AND PERSONNEL

The purpose of this section is to identify personnel responsible for the day-to-day operation of the water system and those positions responsible for development and/or approval of the operating budget and capital improvement program.

Water System Management Structure

Figure 6-1 Water System Organizational Chart, is a flow chart which depicts the management hierarchy of Toppenish's water system. Brief descriptions of the general responsibilities of each position identified in Figure 6-1 are listed below:

Mayor and City Council: Responsible for establishing all water system policies, including service area boundaries, user rate structures, water system personnel salaries, water department budget, and capital improvements.

City Manager: Reviews all water system policy changes and expenditures, approves all personnel hiring, and advises Public Works Director/Superintendent on general water department operation.

Public Works Director/Superintendent: Responsible for the direct management of all day-to-day water system operation and maintenance tasks. Reports on the status and needs of the water system to the Mayor, City Council, and City Manager. Prepares annual water department budget. Reviews all water system policy changes and expenditures. Establishes staff job descriptions and requirements, and recommends hiring of personnel. Serves as public and press contact regarding water system information.

Finance Director: Responsible for budget development and preparation, for supervision of utility billings, and for allocation of funds for approved expenditures.

Utility Billing Clerk: Responsible for entering water meter reading data into the computer, generating monthly water billings, and maintaining water consumption records.

Consulting Engineer: Assists City in long-range planning, aids Public Works Director/Superintendent in technical aspects of water system, and provides design engineering and construction services for capital improvements.

Public Works Supervisor: Responsible for managing and assisting in the operation, maintenance, and preventive maintenance of water system facilities; providing supportive recommendations for policies, procedures, and improvements to the department, budget preparation, and future facilities; and, training subordinate employees in aspects and functions of field operations. Must be capable of operating or learning to operate every tool, piece of machinery, and equipment within the Water Department and must have a working knowledge of all types of materials, i.e., pipes, valves, and pumps. Must have a High School Diploma, and a minimum of five years experience in the public works field with three years in a supervisory position. Must maintain a valid Class II or better Washington State Water Distribution Manger Certificate.

Water System Manager: Responsible for operation, maintenance, and preventive maintenance of water system facilities; supervising subordinate field personnel; providing supportive recommendations for policies, procedures, and improvements to the department, personnel issues, and future facilities; and, training subordinate employees in aspects and functions of field operations. Must be capable of operating or learning to operate every tool, piece of machinery, and equipment within the Utility Department and must have a working knowledge of all types of materials, i.e., pipes, valves, and pumps. Must have a High School Diploma, a minimum of three years experience in the public works field. Must maintain a valid Class II, or better, Washington State Water Distribution Manager Certificate.

Maintenance Technician: Responsible for knowledge of all aspects of the operation, maintenance, preventive maintenance, procedures, and safety aspects of water system facilities. Must be capable of performing duties of maintenance and / or repair of water distribution system.

6.2 OPERATOR CERTIFICATION

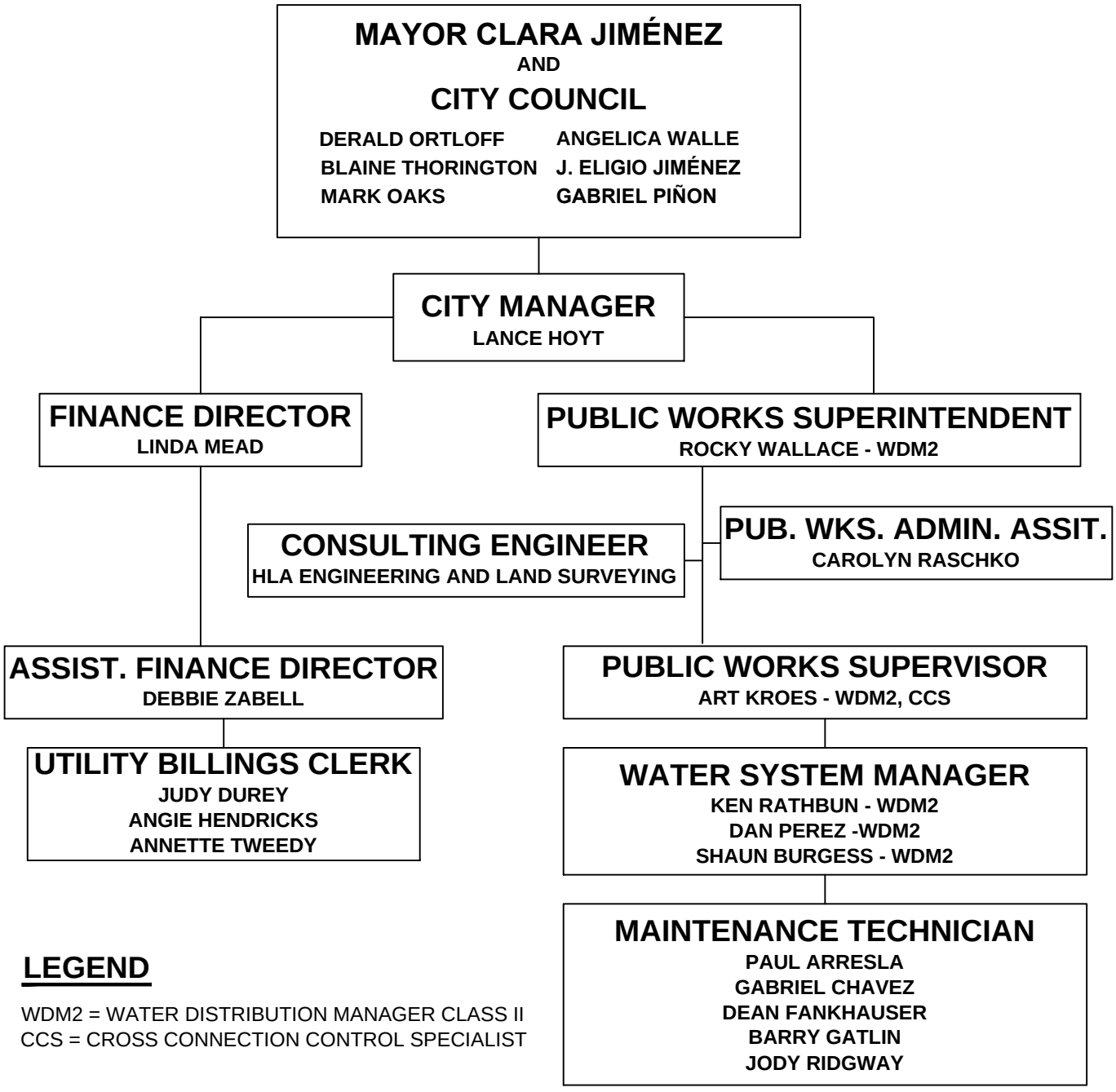
All Group A water systems within the State of Washington are classified according to the population they serve and are required by state regulation to have a certified operator in charge of system operation. Operators are required to be certified at or above the certification level of the distribution system. Toppenish's water distribution system, which serves between 1,501 and 15,000 persons, is classified as a Group 2 system and is, therefore, required to have a Class 2 (or greater) Water Distribution Manager (WDM) responsible for system operation. Toppenish is also required to have a Cross-connection Control Specialist (CCS) responsible for the systems cross-connection control program.

Included within Figure 6-1 are the water certifications of the various public works employees responsible for the operation and maintenance of Toppenish's water system. Toppenish currently has five employees with Water Distribution Manager II certification. Toppenish also has one employee with a Cross-connection Control Specialist certification. Figure 6-1 provides the current certifications of all of Toppenish's water system employees who work in and have water system responsibilities.

CITY OF TOPPENISH

Water System Plan Update

WATER SYSTEM ORGANIZATIONAL CHART



LEGEND

WDM2 = WATER DISTRIBUTION MANAGER CLASS II
CCS = CROSS CONNECTION CONTROL SPECIALIST

HLA Engineering and Land Surveying, Inc.
2803 River Road
Yakima, WA 98902
509.966.7000
Fax 509.965.3800
www.hlacivil.com

10/6/2016
P:\Projects\2015\15122\WSP-Figures.dwg

FIGURE 6-1

6.3 SYSTEM OPERATION AND CONTROL

Section 3.3 System Description and Analysis, provides a detailed description of the various water system components and their interrelationship. This interrelationship is depicted in Figure 3-1 and Map A in the back of this Plan. It is important that water department personnel fully understand the system in order to evaluate its operation and maintenance requirements.

Routine System Operation and Preventative Maintenance

An outline of routine operational tasks for the various major system components is provided below:

A. Source Wells and Pumps

1. Daily Tasks
   a. Check all well facilities visually.
   b. Visually inspect pump packing.
   c. Maintain oil levels in well pumps.
   d. Check telemetry system.
   e. Record flow meter totalizer readings.
   f. Check chlorination and fluoridation systems.
   g. Conduct fluoride tests at each well site.
   h. Inspect pump calibration levels at each operating well site.

2. Monthly Tasks
   a. Check and grease well pump packing and lubrication points.
   b. Check oil level in pump bearing reservoir and fill, if necessary.
   c. Check floor drains and clean, if necessary.
   d. Clean pumphouse floors.
   e. Operate emergency power supply equipment.

3. Seasonal Tasks
   a. Winterize or de-winterize pumphouse facilities.
   b. Check heating equipment and thermostats.
   c. Monitor and record well levels from ground level to the static water level during low (winter) demand and high (summer) demand periods.

4. Yearly Tasks
   a. Summarize flow meter totalizer records.
   b. Take sample of raw water from each well and submit to a certified laboratory for a Nitrate / Nitrite Analysis.

5. Every Three Years Tasks
   a. Take sample of raw water from each well and submit to a certified laboratory for an Inorganic Chemical and Physical Analysis (IOC), for Volatile Organic Chemical (VOC) Analysis, and for Synthetic Organic Chemical (SOC) analysis, unless sources have been granted a waiver under the susceptibility waiver program.
   b. Lead and Copper - sample as directed by the Washington State Department of Health.
   c. Conduct sampling for required radionuclides testing and submit to the Department of Health Lab.

B. Reservoirs

1. Daily Tasks
   a. Visually check reservoirs.

2. Yearly Tasks
   a. Visually inspect reservoir exteriors.
   b. Flush and inspect reservoir interior.

3. As Required Tasks
    a. Inspect and video record reservoir interior using diver, and remove (vacuum) remove accumulated debris.

D. Distribution System

1. Daily Tasks
    a. Conduct free and total chlorine tests, and fluoride tests at random sites within the distribution system.

2. Monthly Tasks
    a. Take required number of water samples from various representative sites within the distribution system and submit them for bacteriological analysis in accordance with the Coliform Monitoring Plan.
    b. Read and record service meters.
    c. Submit Chlorination and Fluoridation reports to the Department of Health.

4. Seasonal Tasks
    a. Winterize or de-winterize service meters.

5. Yearly Tasks
    a. Locate and operate all valves through their full range (one-half of distribution system done annually) and listen for leaks.
    b. Operate and perform necessary maintenance activities on all fire hydrants.
    c. Lubricate hydrant caps and threads. Touch-up paint as required.
    d. Test all City-owned cross-connection control devices.
    e. Flush low velocity water mains to remove sedimentation.
    f. Take required number of water samples from various representative sites within the distribution system and submit them for disinfection byproducts analysis in accordance with the Disinfection Byproducts Monitoring Plan.

6. As Required Tasks
    a. Review plans for installation of cross-connection control devices on proposed new construction.
    b. Inspect installation of required devices on new construction.
    c. Repair and / or replace service meters as necessary.

E. Telemetry System

1. Daily Tasks
    a. Observe telemetry system operation.

2. Monthly Tasks
    a. Check telemetry system alarms.

4. As Required Tasks
    a. Make any required changes to pump start / stop settings.
    b. Replace printer paper.
    c. Replace printer cartridge.

6.4 SAFETY PROCEDURES

All City personnel are instructed to exercise the utmost care when working on any water system facility. Safety of City staff and the public is the number one priority. Provided below is an outline of safety procedures to be followed when working on water system facilities:

A. Pumping Equipment

1. Removing Pumps

a. All work conducted within confined spaces shall be done in accordance with the procedures specified in the City's Confined Space Entry Safety Program.
b. Close valves.
c. Shut off power to the pump, use lockout, tagout policy and procedures.
d. Ensure power is disconnected and then remove electrical cables.
e. Lift pump with proper equipment.

2. Installing Pump
a. All work conducted within confined spaces shall be done in accordance with the procedures specified in the City's Confined Space Entry Safety Program.
b. Lift pump with proper equipment.
c. Ensure all pipe connections are properly installed and tightened.
d. Employ an electrician to properly connect power cables.
e. Check pump rotation.
f. Open valves.
g. Ensure pump control valve (if present) is operating properly.
h. Turn on power to the pump and remove lockout, tagout tag.

B. Reservoirs

1. Interior Inspection
a. All work conducted within confined spaces shall be done in accordance with the procedures specified in the City's Confined Space Entry Safety Program.
b. Inspection to be conducted by a minimum of two workers, one worker to stay outside the reservoir.
c. Ensure the reservoir interior is properly ventilated and illuminated.
d. Properly set and secure ladder before climbing into reservoir.

C. Distribution System

1. Pipeline Installation
a. All construction work requiring excavation, trenching, and shoring shall be conducted in accordance with the Department of Labor and Industries Safety Standards for Construction Work.
b. Close all valves connecting to pipe segment.
c. Properly set traffic control signing, barricades and cones.
d. Install shoring or cribbing in all trenches over 48 inches in depth.
e. Construct thrust blocking, if required.

6.5 SERVICE AND SUPPLY REPRESENTATIVES

Provided below is a list of service and supply representative for the various system components:

A. Pipe, Valves, and Fittings

1. H.D. Fowler Co.
1100 River Road
Yakima, WA 98902
Phone: 509-248-8400
Contact: Sean Heary - 509-302-8346

B. Water Service Materials – Muller/Ford

1. H.D. Fowler Co.
1100 River Road
Yakima, WA 98902
Phone: 509-248-8400
Contact: Sean Heary - 509-302-8346

2. Ferguson

19 West Mead Avenue
Yakima, WA 98902
Phone: 509-575-7585

C. Service Meters

1. Master Meters
101 Regency Parkway
Mansfield, TX 76063
Phone: 1-800-765-6518
Phone: 1-817-842-8000

D. Chlorination Equipment

1. Correct Equipment
14576 NE 95th Street
Redmond, Wa 98052
Phone 425-869-1233

2. TMG-Bryan Yarnell
3216 E. Portland Ave.
Tacoma, WA 98404
Phone: 1-253-779-4160

E. Chlorine Gas

1. Oxarc
750 W. Valley Mall Blvd.
Union Gap, WA 98903
Phone: 509-575-0323

F. Water Main Tapping

1. City of Toppenish
8 Buena Way
Toppenish, WA 98948
Phone: 865-4500

2. Spear Taps, Inc.
309 NE 159th Street
Seattle, WA 98155
Phone: 1-206-363-8053

G. Electrical

1. Hutchinson Electric
400 Concord St.
Zillah, WA 98953
Phone: 728-2055 Max
Phone: 391-0770 Ron

H. Pumps

1. Picatti Brothers
2309 South Third Avenue
Yakima, WA 98903
Phone: 248-2540

2. 4 Rivers Pump
3510 Sterman Avenue

Pasco, WA 99302
Phone: 509-547-5042

3. Ackland Pump & Irrigation Co.
3701 Fruitvale Blvd.
Yakima, WA 98902
Phone: 425-7867

I. Telemetry System

1. Conley Engineering, Inc.
205 North 40th Avenue, Suite 201
Yakima, WA 98902
Phone: 509-965-9872

J. Pump and Motor Oil – Chevron AW ISO 68 or Mobile DTE 25
(All pump bearing oils used in vertical turbine pumps must be "H-1" oil.)

1. Chandler Distributing Co.
810 West First Avenue
Toppenish, WA 98948
Phone: 865-2550

K. Bearing Grease/Food Grade Only

1. Chandler Distributing Co.
810 West First Avenue
Toppenish, WA 98948
Phone: 865-2550

6.6 COMPREHENSIVE MONITORING PLAN

WACs 246-290-300, 246-290-310 and 246-290-320, which are included in the Department of Health (DOH) publication Drinking Water Regulations, define the minimum monitoring requirements, maximum contaminant levels (MCL), and follow-up action requirements for public water systems. The following summarizes the requirements as they pertain to the City of Toppenish:

6.6.1 Monitoring Requirements, Location, and Frequency

A. Bacteriological Analysis - Required of all public water systems.

1. Bacteriological analysis will be conducted in accordance with the procedures and locations specified in Toppenish's Coliform Monitoring Plan, a copy of which is provided in CHAPTER 10 of this Plan. The minimum number of bacteriological samples required per month within the distribution system is based upon the population served and is shown in part on Table 6-1 below:

TABLE 6-1 MINIMUM MONTHLY COLIFORM SAMPLING REQUIREMENTS	
Permanent Population Served	Minimum Number of Samples per Month
4,901 - 5,800	6
5,801 - 6,700	7
6,701 - 7,600	8
7,601 - 8,500	9
8,501 - 12,900	10 (Toppenish's current requirement)
12,901 - 17,200	15
17,201 - 21,500	20
21,501 - 25,000	25

B. Disinfection Byproducts - Required of all public water systems.

1. Samples are to be collected from one location within the distribution system as identified in the City's Disinfection Byproducts Monitoring Plan and as directed by the City's current Water Quality Monitoring Report issued by the Department of Health.

C. Inorganic Chemical and Physical Analysis - Required of all public water systems.

1. A minimum of one sample every thirty-six (36) months from each source well is required. The sample shall be collected as near to the source as possible and before any treatment.

D. Radionuclides - Required of all public water systems.

1. Radionuclide samples from each source are required twice every three years. The samples shall be collected as near to the source as possible and before any treatment.

E. Volatile Organic Chemicals (VOCs) - Required of all public water systems.

1. During the first 12 months of VOC monitoring, samples shall be taken at each source once every 3 months, or as directed by the Department of Health. If no VOCs are detected in the first sample from a ground water source, only one additional sample will be required during the 12 month period.

2. If no VOCs are verified after the initial 12 months of monitoring, the water system shall monitor each source at least every 36 months.

F. Synthetic Organic Chemicals (SOCs) - Required of all public water systems.

1. During the first 12 months of SOC monitoring, samples shall be taken at each source once every 3 months, or as directed by the Department of Health. If no SOCs are detected in the first sample from a ground water source, only one additional sample will be required during the 12-month period.

2. If no SOCs are verified after the initial 12 months of monitoring, the water system shall monitor each source at least twice every three years.

G. Lead and Copper - Required of all public water systems.

H. Other Substances - As required by the Department of Health.

6.6.2 Testing Laboratories

Samples which have been collected must be transported and analyzed in accordance with Department of Health requirements. The analyses must be done by a state public health laboratory or a state certified private laboratory.

The City of Toppenish routinely delivers bacteriological samples to Lab Test on the same day they are taken. Sample bottles are obtained from the laboratory.

Samples for other required tests, e.g., Inorganic Chemical and Physical Analysis, are delivered to Cascade Analytical, Inc., of Union Gap, WA on the same day they are taken. As with the bacteriological samples, sample bottles are obtained from the laboratory.

6.6.3 Violation Procedures

The City of Toppenish is responsible for complying with the standards of water quality identified in WAC 246-290-310. If any substance exceeds its maximum contaminant level (MCL) and/or maximum residual disinfectant levels (MRDLs), the City shall take follow-up action as outlined under WAC 246-290-320.

Maximum Contaminant Levels (MCLs) and Maximum Residual Disinfectant Levels (MRDLs)

Bacteriological – If any coliform bacteria are present in any sample, follow-up action as described under WAC 246-290-320(2) shall be taken in accordance with the City's Coliform Monitoring Plan and the Groundwater Rule (GWR) requirements.

Disinfection Byproducts (DBPs) and Residuals – MCLs and MRDLs for disinfection byproducts and residuals are as shown in Table 6-2.

TABLE 6-2 DISINFECTION BYPRODUCTS AND RESIDUALS

DISINFECTION BYPRODUCT	MCL (mg/l)
Total Trihalomethanes (TTHMs)	0.080
Haloacetic acids (HAA5)	0.060
Bromate	0.010
Chlorite	1.0
DISINFECTION RESIDUAL	**MRDL (mg/l)**
Chlorine	4.0 (as $C1_2$)
Chloramines	4.0 (as $C1_2$)
Chlorine Dioxide	0.8 (as $C1O_2$)

Inorganic Chemical and Physical (IOC) – MCLs for inorganic chemical and physical properties are as shown in Table 6-3.

TABLE 6-3 INORGANIC CHEMICAL MCLS	
Chemical or Physical Characteristics	MCL (mg/l)
Primary Substances	
Antimony (Sb)	0.006
Arsenic (As)	0.010
Asbestos	7 million fibers/liter
Barium (Ba)	2.0
Beryllium (Be)	0.004
Cadmium (Cd)	0.005
Chromium (Cr)	0.1
Copper (Cu)*	1.3
Cyanide (HCN)	0.2
Fluoride (F)	4.0
Lead (Pb)*	0.015
Mercury (Hg)	0.0020
Nickel (Ni)	0.10
Nitrate (as N)	10.0
Nitrite (as N)	1.0
Selenium (Se)	0.05
Sodium (Na)*	20
Thallium (Tl)	0.002
Secondary Substances	
Chloride (Cl)	250.0
Fluoride (F)	2.0
Iron (Fe)	0.3
Manganese (Mn)	0.05
Silver (Ag)	0.1
Sulfate (SO_4)	250.0
Zinc (Zn)	5.0
Color	15 Color Units
Specific Conductivity	700 umhos/cm
Total Dissolved Solids (TDS)	500
* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.	

Radionuclides – MCLs for Radionuclides are as shown in Table 6-4.

TABLE 6-4 RADIONUCLIDE MCLS	
RADIONUCLIDE	MCL
Combined Radium-226 and Radium-228	5 pCi/l
Gross alpha particle activity (excluding uranium and radon)	15 pCi/l
Beta particle and photon radioactivity	4 mrem/year
Uranium	30 µg/l

Volatile Organic Chemicals (VOCs) – MCLs for VOCs are as shown in Table 6-5.

TABLE 6-5 VOLATILE ORGANIC CHEMICAL MCLS	
VOLATILE ORGANIC CHEMICAL	MCL (mg/l)
Benzene	0.005
Carbon Tetrachloride	0.005
para-Dichlorobenzene	0.075
Trichloroethylene	0.005
Vinyl Chloride	0.002
1,1,1-Trichloroethane	0.2
1,1-Dichloroethylene	0.007
1,2 Dichloroethane	0.005
cis-1,2-Dichloroethylene	0.07
Ethylbenzene	0.7
Monochlorobenzene	0.1
o-Dichlorobenzene	0.6
Styrene	0.1
Tetrachloroethylene	0.005
Toluene	1
Trans-1,2-Dichloroethylene	0.1
Xylenes	10
1,2-Dichloropropane	0.005
Dichloromethane	0.005
1,1,2-Trichloroethane	0.005
1,2,4-Trichlorobenzene	0.07

Synthetic Organic Chemicals (SOCs) – MCLs for SOCs are as shown in Table 6-6.

TABLE 6-6 SYNTHETIC ORGANIC CHEMICAL MCLS	
SYNTHETIC ORGANIC CHEMICAL	MCL (mg/l)
Alachlor	0.002
Atrazine	0.003
Carbofuran	0.04
Chlordane	0.002
EDB	0
DBCP	0.0002
Heptachlor	0.0004
Heptachlor Epoxide	0.0002
Lindane	0.0002
Methoxychlor	0.04
Toxaphene	0.0003
PCBs	0.0005
Pentachlorophenol	0.001
2,4-D	0.07
2,4,5-TP	0.05
PAHs (Benzo(a)pyrene)	0.0002
Dalapon	0.2
Di(ethylhexyl)-Adipate	0.4
Di(ethylhexyl)-Phthalate	0.006
Dinoseb	0.007
Diquat	0.1
Endothall	0.1
Endrin	0.002
Glyphosate	0.7
Hexachlorobenzene	0.001
Hexachlorocyclo-Pentadiene	0.05
Oxymal	0.2
Picloram	0.5
Simazine	0.004
2,3,7,8-TCDD (Dioxin)	0

6.6.4 Follow-up Action

1. General:

    a. If water quality exceeds any MCLs listed in WAC 246-290-310, the purveyor shall notify the Department and take follow-up action as described in this section.
    b. When a primary MCL violation occurs, the purveyor shall:
        i. Notify the Department within 48 hours in accordance with WAC 246-290-480;
        ii. Notify the public according to the procedures outlined under WAC 246-290-71001;
        iii. Determine the cause of the contamination; and
        iv. Take corrective action as required by the Department.
    c. When a secondary MCL violation occurs, the purveyor shall notify the Department and take corrective action as directed by the Department.

2. Bacteriological:

a. When coliform bacteria are present in any sample and the sample is not invalidated under (e) of this subsection, the purveyor shall ensure the following actions are taken:
   i. The sample is analyzed for fecal coliform or E.coli. When a sample with a coliform presence is not analyzed for E.coli or fecal coliforms, the sample shall be considered as having a fecal coliform presence for MCL compliance purposes;
   ii. Repeat samples are collected in accordance with (b) of this subsection;
   iii. Collect triggered source samples in accordance with (c) of this subsection and have them tested for E. coli.
   iv. The Department is notified in accordance with WAC 246-290-480; and
   v. The cause of the coliform presence is determined and corrected.

b. Repeat samples:
   i. The purveyor shall collect and submit for analysis a set of repeat samples for every sample in which the presence of coliforms is detected. A set of repeat coliform samples consists of:
      (a) Four repeat samples for Group A systems collecting one routine coliform sample each month;
      (b) Three repeat samples for all Group A systems collecting more than one routine coliform sample each month; and
      (c) Two repeat samples for Group B systems.
   ii. The purveyor shall collect repeat sample sets according to Table 6-7;
   iii. The purveyor shall collect one set of repeat samples for each sample with a coliform presence as follows:
      (a) For Group A systems, all samples in a set of repeat samples shall be collected on the same day and submitted for analysis within 24 hours after notification by the laboratory of a coliform presence. If the purveyor can demonstrate to the satisfaction of the Department that logistical problems beyond the purveyor's control make analysis of the samples in the repeat sample set impractical because the time between sample collection and analysis will exceed 30 hours, then the purveyor shall collect the required set of repeat samples as directed by the Department; and
      (b) For Group B systems, as soon as possible after the notification by the laboratory of a sample with a coliform presence.
   iv. When repeat samples have coliform presence, the purveyor shall:
      (a) Contact the Department and collect a minimum of one additional set of repeat samples as directed by the Department; or
      (b) Collect one additional set of repeat samples for each sample where coliform presence was detected.
   v. The purveyor of a system providing water to consumers via a single service shall collect repeat samples from the same location as the sample with a coliform presence. The set of repeat samples shall be collected:
      (a) On the same collection date; or
      (b) Over consecutive days with one sample collected each day until the required samples in the set of repeat samples are collected.
   vi. If a sample with a coliform presence was collected from the first two or last two active services, the purveyor shall monitor as directed by the Department;
   vii. The purveyor may change a previously submitted routine sample to a sample in a set of repeat samples when the purveyor:
      (a) Collects the sample within five adjacent service connections of the location from which the initial sample with a coliform presence was collected;
      (b) Collects the sample after the initial sample with a coliform presence was submitted for analysis;
      (c) Collects the sample on the same day as other samples in the set of repeat samples, except under (b)(viii) of this subsection; and
      (d) Notifies the Department of the change.
   viii. The Department may waive the requirement to collect sets of repeat samples under this subsection during a month when a non-acute coliform MCL violation is determined for the system.

c. Triggered Source Sampling: In accordance with the Groundwater Rule (GWR) requirements, triggered source samples must be collected and tested for E. coli, when coliform bacteria are

present in any routine distribution sample. Triggered source sampling shall be conducted as follows:

i. Triggered source samples must be collected within 24 hours of notification of the total coliform positive result.

ii. Each source that was in operation at the time of the routine sample was collected must be tested prior to treatment.

iii. If one of the triggered source samples is E. coli positive, corrective action shall be taken as directed by the DOH, or five additional source samples must be taken within 24 hours.

iv. If any of the five additional source samples is E. coli positive, one or more of the following corrective actions may need to be taken, as directed by the DOH:
   (a) Provide an alternate source of water.
   (b) Eliminate the source of contamination.
   (c) Provide 4-log treatment.

v. Customers must be notified within 24 hours of receiving an E. coli positive triggered source sample.

d. Monitoring frequency following a coliform presence: Group A systems having one or more coliform presence samples that were not invalidated during the previous month shall collect and submit for analysis the minimum number of routine samples shown in the last column in A - Bacteriological Analysis, subsection 1.

i. The Department may waive the monitoring frequency requirement when one or more samples with a coliform presence were collected during the previous month, if the purveyor proves to the satisfaction of the Department:
   (a) The cause of the sample with a coliform presence; and
   (b) The problem is corrected before the end of the next month the system provides water to the public.

ii. If the Department waives this monitoring frequency requirement:
   (a) The purveyor shall collect and submit at least the minimum number of samples required when no samples with a coliform presence were collected during the previous month; and
   (b) The Department shall make available a written description explaining:
      (i) The specific cause of the coliform presence; and
      (ii) Action taken by the purveyor to correct the cause of coliform presence.

e. Invalid samples.

i. The Department shall consider coliform samples with no coliform presence detected invalid when:
   (a) Multiple tube technique cultures are turbid without appropriate gas production;
   (b) Presence-Absence technique cultures are turbid in the absence of an acid reaction;
   (c) There are confluent growth patterns or growth of TNTC (too numerous to count) colonies without a surface sheen using a membrane filter analytic technique; or
   (d) There is excess debris in the sample.

ii. The Department may invalidate a coliform sample when:
   (a) The analyzing laboratory establishes that improper sample analysis occurred;
   (b) The Department determines a domestic or nondistribution system problem is indicated by:
      (i) All samples in the set of repeat samples collected at the same location as the original coliform presence sample also are coliform presence; and
      (ii) All other samples in the set of repeat samples are free of coliform.
   (c) The Department determines a coliform presence result is due to a circumstance or condition which does not reflect water quality in the distribution system. In this case, when the Department invalidates a sample:
      (i) The purveyor shall collect a set of repeat samples following the sample invalidation in accordance with Table 6-7; and
      (ii) The Department's rationale for invalidating the sample shall be documented in writing and made available to the public. The

documentation shall state the specific cause of the coliform presence and what action the purveyor has taken or will take.

iii. When a coliform sample is determined invalid, the purveyor shall collect and submit for analysis:
   (a) An additional coliform sample from the same location as each invalid sample within 24 hours of notification of the invalid sample; or
   (b) Additional coliform samples as directed by the Department.

iv. When the Department or laboratory invalidates a sample, the sample shall not count towards the purveyor's minimum coliform monitoring requirements.

TABLE 6-7 REPEAT SAMPLE REQUIREMENTS

SYSTEM GROUP (# of Routine Samples Collected Each Month)	NUMBER OF SAMPLES IN A SET OF REPEAT SAMPLES	LOCATIONS FOR REPEAT SAMPLES (Collect at Least One Sample per Site)
GROUP A (1 routine sample each month)	4	* Site of previous sample with a coliform presence * Within 5 active services upstream of site of sample with a coliform presence * Within 5 active services downstream of site of sample with a coliform presence * At any other active service
GROUP A (more than 1 routine sample each month)	3	* Site of previous sample with a coliform presence * Within 5 active services upstream of site of sample with a coliform presence * Within 5 active services downstream of site of sample with a coliform presence
GROUP B	2	* Site of the previous sample with a coliform presence * From active service other than the site of the previous sample with a coliform presence

3. Inorganic chemical and physical: When an initial analysis of any substance exceeds the MCL, the purveyor shall take the following action:

   a. For asbestos, samples shall be taken quarterly beginning the next quarter after the violation and continue until reduced by the Department of Health.
   b. For nitrate, immediately take one additional sample from the same sampling point. If the average of the two samples exceeds the MCL, a violation is confirmed, or
   c. For all other inorganic chemical and physical substances, within 30 days take three additional samples from the same sample point. If the average of all four samples exceeds the MCL, a violation is confirmed.

4. Volatile Organic Chemicals (VOCs): The purveyor shall be responsible for the following follow-up actions:

   a. After the purveyor's receipt of the first VOC analysis results from the laboratory, the purveyor shall provide notice to persons served by the system as described under WAC 246-290-71001.
   b. When a List 1 VOC is verified at a concentration above the detection limit, the purveyor shall, at a minimum:
      i. Sample the source once every three months for at least three years; and
      ii. Make analysis results available to consumers within three months of receipt from the laboratory as described under WAC 246-290-71006.
   c. When a List 1 VOC is verified at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL, the purveyor shall repeat sample the source as soon as possible. If a concentration greater than an MCL is confirmed, the purveyor shall:
      i. Notify the Department within seven days of receipt of the repeat sample analysis results;
      ii. Provide consumer information in accordance with WAC 246-290-71006;

iii. Submit documentation to the Department describing the water system's strategy for gathering and analyzing additional data, and identify plans for keeping the public informed; and

iv. Sample the source a minimum of once every three months for at least three years.

d. When the running annual average of a List 1 VOC is greater than an MCL, or one sample analysis result causes the annual average to exceed an MCL, the purveyor shall:

i. Notify the Department within seven days of receipt of analysis results;

ii. Notify the public as described under WAC 246-920-71006, including mandatory health effects language;

iii. Submit an action plan to the Department for approval addressing follow-up activities, including corrective action. The purveyor shall submit the action plan within four months of receipt of Department notice that the annual average exceeds the MCL. The purveyor's action plan shall, at a minimum, contain:

(a) Tabulation of VOC sample analysis results, including the location where VOCs were detected;

(b) Description of monitoring plans for system sources;

(c) Strategy for informing the public of monitoring results and investigations; and

(d) Description of short and long-term plans to minimize exposure and/or eliminate the source of contamination.

iv. Implement the action plan within one year of the Department's approval. The Department may require the purveyor's earlier compliance, if necessary, to eliminate an immediate health threat, or may require a revision of the action plan based upon additional sample results. The Department may extend the purveyor's period of compliance when the Department determines:

(a) Substantial construction is required; and

(b) The purveyor has taken all appropriate measures to protect the health of consumers served by the public water system. If the Department grants the purveyor an extension, the purveyor shall issue a notice identifying the MCL exceeded and the amount by which the repeat sample analysis results exceeded the MCL. The purveyor shall include the notice in all bills mailed to affected customers until the Department determines that the purveyor complies with the MCL.

v. Sample the source a minimum of once every three months for at least three years.

e. When a List 2 or List 3 VOC is verified at a concentration above the detection limit, the purveyor shall:

i. Submit the sample analysis results to the Department within seven days of receipt from the laboratory; and

ii. Sample the source a minimum of once every three months for one year, and then annually thereafter during the three-month period when the highest previous measurement occurred.

f. If the Department determines that a List 2 or List 3 VOC is verified at a level greater than a state advisory level (SAL), the Department shall notify the purveyor in writing. The purveyor shall repeat sample the source as soon as possible after initial Department notice that an SAL has been exceeded. The purveyor shall submit the analysis results to the Department within seven days of receipt from the laboratory. If any repeat sample confirms that an SAL has been exceeded, the purveyor shall:

i. Provide consumer information in accordance with WAC 246-290-71006;

ii. Sample the source a minimum of once every three months for at least three years; and

iii. Submit documentation to the Department listing VOC analysis results, describing the water system's strategy for gathering and analyzing additional data, and identifying plans for keeping the public informed. The purveyor shall submit this information to the Department within six months of the date of the first notice from the Department that an SAL has been exceeded.

g. The Department may reduce the purveyor's monitoring requirement for a source detecting a List 1 VOC if, after three years of quarterly monitoring, all analysis results are less than the MCL. The purveyor's reduced monitoring frequency shall be no less than one sample per year.

h. The Department may reduce the purveyor's monitoring requirement for a source detecting a List 2 or List 3 VOC if the source has been monitored annually for at least three years, and all analysis results are less than the SAL.

i. In establishing SAL's for List 2 and List 3 VOCs, the Department shall use the most recent edition of the Department document titled "Procedures and References for Determination of State Advisory Levels for Drinking Water Contaminants" which has been approved by the State Board of Health. Copies are available from the Department upon request.
j. When List 1, List 2 (exclusive of THMs) or List 3 VOCs are verified in well fields, the purveyor shall repeat sample individual wells within the well field.
k. When the sum of all trihalomethanes detected exceeds 0.100 mg/L, the purveyor shall sample within three months for total trihalomethanes as required under WAC 246-290-300(5).
l. The Department may collect samples from a water system or may require that specified quality assurance techniques be used to collect samples.

5. Follow-up action shall be determined by the Department when the MCL for any additional substance is exceeded.

6.6.5 Public Notification

1. Responsibility: The purveyor of a Group A water system shall notify the water system users and the Department for any of the following conditions:

- Exceedances of maximum contaminant levels (MCLs) or maximum residual disinfectant levels (MRDLs);
- Violation of treatment techniques;
- Monitoring and testing procedure violations;
- Failure to comply with the schedule of a variance or exemption;
- Operation under a variance or exemption;
- Occurrence of a waterborne disease outbreak or other waterborne emergency;
- Exceedance of the secondary maximum contaminant level for fluoride; and
- Availability of unregulated contaminant monitoring results.

These conditions are grouped into three categories, and require public notification in English and in Spanish within different time periods as described below:

a. Tier 1 Conditions require public notification within 24 hours. Such conditions include:
   i. Violation of the MCL for total coliform, when fecal coliform or E. coli are present in the water distribution system, or failure to test for fecal coliform or E. coli when any repeat sample tests positive for coliform;
   ii. An E. coli positive groundwater source sample;
   iii. Violation of the MCL for nitrate, nitrite, or total nitrate and nitrite; or when a confirmation sample is not taken within 24 hours of the system's receipt of the first sample showing exceedance of the nitrate or nitrite MCL;
   iv. Violation of the turbidity MCL of 5 NTU, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not occur in 24 hours after the system learns of violation;
   v. Violation of the treatment technique requirement resulting from a single exceedance of the maximum allowable turbidity limit, where the primary agency determines after consultation that a Tier 1 notice is required or where consultation does not take place in 24 hours after the system learns of violation;
   vi. Occurrence of a waterborne disease outbreak, as defined in 40 CFR 141.2, or other waterborne emergency; and
   vii. Other violations or situations with significant potential to have serious adverse effects on human health as a result of short term exposure, as determined by the primary agency, either in its regulations or on a case-by-case basis.

b. Tier 2 conditions require public notification within 30 days. Such conditions include:
   i. All violations of the MCL, MRDL, and treatment technique requirements except where Tier 1 notice is required;
   ii. Violations of the monitoring requirements where the primary agency determines that a Tier 2 public notice is required, taking into account potential health impacts and persistence of the violation; and
   ii. Failure to comply with the terms and conditions of any variance or exemption in place.

c. Tier 3 conditions require public notification within 1 year. Such conditions include:
   i. Monitoring violations, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
   ii. Failure to comply with an established testing procedure, except where Tier 1 notice is required or the primary agency determines that the violation requires a Tier 2 notice;
   iii. Operation under variance granted under §1415 or exemption granted under §1416 of the Safe Drinking Water Act;
   iv. Availability of unregulated contaminant monitoring results; and
   v. Exceedance of the secondary maximum contaminant level for fluoride.

2. Content. Notices in English and in Spanish shall provide:

   a. A clear, concise, and simple explanation of the violation;
   b. Discussion of any potential adverse health effects and any segment of the population which may be at higher risk;
   c. Mandatory health effects information in accordance with subsection (4) of this section;
   d. A list of steps the purveyor has taken or is planning to take to remedy the situation;
   e. A list of steps the consumer should take including advice on seeking an alternative water supply if necessary; and
   f. The purveyor's name and phone number.

   The purveyor may provide additional information to further explain the situation.

3. Distribution.

   a. Public notice of a Tier 1 condition shall occur within 24 hours after learning of the condition by placing notices on the front door of every system user. The public notice shall be written in both English and in Spanish.
   b. Public notice of a Tier 2 condition shall occur within 30 days after learning of the condition and shall be provided in both English and in Spanish.
   c. Public notice of a Tier 3 condition shall occur within 1 year after learning of the condition and shall be provided in both English and in Spanish.
   d. The purveyor of a COMMUNITY water system shall give a copy of the most recent public notice for all outstanding violations to all new billing units or new hookups before or at the time water service begins.
   e. The purveyor shall provide the Department with a copy of the public notification at the time the purveyor notifies the public.

4. Mandatory Language.

   a. The purveyor shall provide specific health effects language in English and Spanish in the notice when a violation involves:
      i. A primary VOC MCL;
      ii. A secondary fluoride MCL;
      iii. An acute coliform MCL;
      iv. A non-acute coliform MCL;
      v. Granting or continuation of exemption or variance; or
      vi. Failure to comply with a variance or exemption schedule.
   b. Required specific language is contained in the Department guideline titled "Health Effects Language for Drinking Water Public Notification."

5. VOC Notification Procedure.

   a. Availability of results: After receipt of the first analysis results, the purveyor of a COMMUNITY or NTNC water system shall notify persons served by the system of the availability of results and shall supply the name and telephone number of a contact person.
      i. The purveyor shall initiate notification within three months of the purveyor's receipt of the first VOC analysis results. This notification is only required one time.
      ii. Notification shall occur by:
         (a) Inclusion in the first set of water bills issued after receipt of the results;

(b) Newspaper notice which shall run at least one day each month for three consecutive months;
(c) Direct mail;
(d) Posting if NTNC system; or
(e) Any other method approved by the Department.

iii. Within three months of receipt of analysis results, purveyors selling water to other public water systems shall provide copies of the analysis results to the purchasing system.

iv. Within 30 days of receipt of analysis results, purveyors purchasing water shall make results available to their customers. The purveyor's notification shall occur by the method outlined under (a)(i) of this subsection.

b. Consumer information.

i. The purveyor shall provide consumer information within 21 days of receipt of confirmation sample results when:
(a) A List 1 VOC is confirmed at a concentration greater than an MCL, and the level will not cause the running annual average to exceed the MCL; or
(b) The Department determines a List 2 or List 3 VOC is confirmed at a level greater than an SAL.

ii. Consumer information shall include:
(a) Name and level of VOC detected;
(b) Location where the VOC was detected;
(c) Any health effects the VOC could cause at its present concentration;
(d) Plans for follow-up activities; and
(e) Phone number to call for further information.

iii. Consumer information shall be distributed by any of the following methods:
(a) Notice placed in the major newspaper in the affected area;
(b) Direct mail to customers;
(c) Posting if NTNC system; or
(d) Any other method approved by the Department.

6. Fluoride Notification Procedure. When a secondary MCL violation occurs, the purveyor of a COMMUNITY water system shall send notice to:

a. The Department annually;
b. Water system users annually; and
c. New billing units added while the violation exists.

7. When circumstances dictate the purveyor give a broader or more immediate notice to protect public health, the Department may require the purveyor's notification by whatever means necessary.

8. When the State Board of Health grants a public water system a waiver, the purveyor shall notify customers and new billing units or new hookups before water service begins. The purveyor shall provide a notice annually and send a copy to the Department.

9. The Department may give notice to the water system users as required by this section on behalf of the water purveyor. However, the purveyor remains responsible for ensuring the Department's requirements are met.

6.7 EMERGENCY RESPONSE PROGRAM

In 2004, the City of Toppenish developed an Emergency Response Plan addressing the City's response to and operation of the water system during unplanned emergency events. Based upon its vulnerability assessment, Toppenish's Emergency Response Plan consists of elements:

- Emergency Contact Information
- Inventory of Critical Equipment and Customers
- Chain of Command
- Response Procedures, Plans & Actions
- Coordination Activities
- Notification List
- Local Emergency Planning Committee

Toppenish's Emergency Response Plan was reviewed as part of the Water System Plan Update. The 2004 Emergency Response Plan has been updated with the following emergency response phone numbers:

City of Toppenish Public Works Department	(509) 865-4500
City of Toppenish Police Department	(509) 865-4355
City of Toppenish Fire Department	(509) 865-3111
24-Hour Emergency / Spill Response	911
Department of Ecology Regional Spill Response	(509) 575-2490
National Response Center	(509) 574-1900
Washington Department of Emergency Response	(800) 258-5990

A copy of the 2004 Toppenish Emergency Response Plan, updated in 2016, is included within CHAPTER 10 of this Plan.

6.8 CROSS-CONNECTION CONTROL PROGRAM

In 1975, Toppenish developed a cross-connection control program intended to protect the City's water distribution system from the possibility of contamination due to existing or potential cross-connections. Toppenish currently operates a combination cross-connection control program, one that relies on both premises isolation and in-premises protection. Toppenish's cross-connection program includes the following elements:

1. Adoption of a cross-connection control program (City Code Chapter 13.02);

2. Identification of a staff position delegated for organization and implementation of the cross-connection control program, and the qualifications required of personnel working in the cross-connection control program;

3. Detailed procedures for conducting surveys of new and existing facilities to identify all existing and potential cross-connections;

4. A list of approved backflow assemblies;

5. A procedure to ensure all required backflow assemblies are tested upon installation, after a repair or relocation, and on a routine basis as established by State regulation; and

6. A record system which includes a list identifying the location of all required cross-connection control devices, the type of device, the testing schedule, the performance results, a description of repairs and/or repair recommendations, the tester's name and certification number.

Toppenish currently contracts with private certified individuals for testing of required backflow assembly devices. Within the next six-year period, the City intends to operate its Cross-Connection Control Program using City personnel.

Copies of Toppenish's Cross-Connection Control Program Summary Report for 2015 and their Public Water System Cross-Connection Control Activities Annual Summary Report for 2015 are included in CHAPTER 10 of this Plan.

6.9 CUSTOMER COMPLAINT RESPONSE PROGRAM

Toppenish currently receives, records, tracks, responds to, and resolves complaints regarding its water system through a Water System Complaint Response Program. Water system complaints typically include taste, color, or odor conditions, low or excessive pressure, leaks in meter boxes, hydrants, or pipes, and dirt or sand in water pipes.

Complaints received by the City are routed to the Public Works Department, where the information is recorded onto a City of Toppenish Complaint or Request for Service form. The complaint information and form are routed to the Public Works staff who investigate and resolve the problem. Actions taken to resolve

the problem are recorded on the form and kept on file by the Public Works Department. A copy of the City of Toppenish Complaint or Request for Service form is included in CHAPTER 10 of this Plan.

The number of water system complaints recorded by City during the period 2010 through 2015 by year and by category are presented on Table 6-8.

TABLE 6-8 TOPPENISH WATER SYSTEM COMPLAINTS 2010 - 2015

Year	Low/High Pressure	Leaks in Meter Box	Taste, Color, Odor	Broken Pipes	Leaking Hydrant	Dirt/Sand In Pipes	General Leaks	TOTAL
2010	0	2	1	20	2	1	2	28
2011	2	2	0	25	0	1	2	32
2012	1	1	1	30	2	0	1	36
2013	2	4	2	18	0	0	2	28
2014	2	4	2	41	0	3	2	54
2015	1	2	5	22	0	2	3	35
TOTAL	8	15	11	156	4	7	12	213

6.10 RECORD KEEPING AND REPORTING

The City of Toppenish keeps and maintains records on its water system as shown in Table 6-9.

TABLE 6-9 TOPPENISH WATER SYSTEM RECORDS

Record Type	Location of Records	Retained For:
Water Consumption (by user category)	City Hall	7 Years
Water Production (by well)	Public Works Department	7 Years
Water Quality Testing Results	Public Works Department	7 Years
Equipment Maintenance	Public Works Department	7 Years
Water System Complaints	Public Works Department	5 Years
Backflow Assembly Testing	Public Works Department	5 Years

Water quality monitoring results are reported to the Department of Health as required.

6.11 O&M IMPROVEMENTS

Improvements required for operation of the existing water system, including routine sanitary surveys by the DOH, planning document updates, and other miscellaneous operational improvements are discussed in CHAPTER 8 of this Plan. System operational costs associated with water quality testing and administrative tasks are included in the City's general water operational budget and have not been identified or estimated separately.

Recommended improvements necessary for maintenance of the existing system, such as well rehabilitation, reservoir cleaning and inspection, and other miscellaneous maintenance related improvements, are also discussed in detail in CHAPTER 8 of this Plan. CHAPTER 8 also includes a schedule for completion of both routine and individual O&M improvements, including their estimated costs.

CHAPTER 7 - DISTRIBUTION FACILITIES DESIGN AND CONSTRUCTION STANDARDS

7.1 PROJECT REVIEW PROCEDURES

The City of Toppenish requires that all water system improvements proposed by others (e.g., developers, industries, etc.) be designed and appropriate construction documents prepared by a professional engineer licensed to practice in the State of Washington. The City may require a project report prior to design and document preparation if the proposed work includes pumps, reservoirs, and/or other unique characteristics.

Project reports and/or construction plans and specifications for water distribution main improvements shall be submitted to the City for review. Review of said documents is undertaken by the City's Public Works Department, Fire District, and engineering consultant under the provisions of WAC 246-290-125(2). Comments and/or required changes are then forwarded to the proponent. Resubmittal of the revised documents, review and City approval are required before construction may proceed. Following completion of construction and acceptance by the City, a completed DOH Construction Completion Report form shall be submitted to the City.

In addition to being reviewed and approved by the City Public Works Department, City Fire Department, and engineering consultant, project design reports and/or construction plans and documents for all projects with the exception of distribution-related projects, as defined in WAC 246-290-010, must be submitted to and approved by the Department of Health as specified in WAC 246-290-120 before construction may proceed. Required documents shall be submitted by the proponent to the following address:

Washington State Department of Health
Office of Drinking Water
Eastern Drinking Water Operations
16201 East Indiana Avenue, Suite #1500
Spokane Valley, WA 99216

7.2 POLICIES AND REQUIREMENTS FOR OUTSIDE PARTIES

Toppenish will provide water service to properties outside the City Limits (Retail Service Area Boundary) in accordance with City Code Chapter 13.52, a copy of which is provided in CHAPTER 10 of this Plan. Extensions of water mains outside the City Limits will only be made after approval by the City Council. Customers outside the City Limits will be assessed water rates which are higher than those charged to customers within the City Limits per the rate schedule provided in City Code Chapter 13.16. A copy of the City's Municipal Code is provided in CHAPTER 10 of this Plan.

All costs associated with extending water mains to unimproved properties are the responsibility of the developer, including any required inspection fees by the City. Requirements to be met by developers when extending the City's water system are identified in City Code Chapter 13.52. A copy of this chapter is provided in CHAPTER 10 of this plan.

7.3 DESIGN STANDARDS AND CONSTRUCTION STANDARDS

All water system improvements must conform to Toppenish's most current design and construction standards, *City of Toppenish Design and Construction Standards and Specifications for Public Works Improvements*. A copy of the design and construction standards is provided in CHAPTER 10 of this Plan.

7.4 CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES

Toppenish confirms that water system extensions are constructed in accordance with City requirements through construction inspection by City Public Works staff and observation of pressure testing of new water lines by the developer. Construction inspection procedures are addressed in the *City of Toppenish Design and Construction Standards and Specifications for Public Works Improvements* as provided in CHAPTER 10 of this Plan. The City may reject construction for which it has not had ample opportunity for inspection.

CHAPTER 8 - IMPROVEMENT PROGRAM

8.1 IMPROVEMENT PROGRAM OBJECTIVE

The development of a water system improvement program is a primary goal of this Water System Plan. Through the analysis of existing system demands, capabilities and deficiencies, and by projecting future system growth, improvements have been identified throughout the Plan.

In previous sections of this Plan, deficiencies in the existing City of Toppenish water system have been identified and specific improvements have been recommended. The costs of such improvements often prohibit their completion within a short time period without seriously impacting budgets and user rates. It is prudent, therefore, to group improvements so they might be reasonably accomplished over a number of years.

Recommended system improvements have been categorized into two main categories: 1) Operational and Maintenance (O&M) Improvements, and 2) Major Capital Improvements. The O&M improvements are necessary for system operation and maintenance of existing facilities, including well and reservoir rehabilitation, water use efficiency (WUE) measure implementation, and other miscellaneous improvements. Major capital improvements are those necessary to improve a system deficiency such as fire flow, source and/or storage capacity, water quality, or replacement of aging and/or undersized system components.

In each improvement category section includes a prioritized listing of the recommended system improvements, together with a brief description of the need, anticipated construction elements, and estimated project costs (based on 2017 construction costs). Actual costs will vary from those shown in the following estimates because of changes in the construction industry, the competitive bid process, the availability of materials and equipment, and the timing of the improvements. The estimated improvement costs should be increased by the rate of inflation for each subsequent year after 2017.

8.2 OPERATIONAL AND MAINTENANCE (O&M) IMPROVEMENTS

The following is a prioritized listing of the required and/or recommended O&M improvements, including a brief description of the need for each improvement. A ten-year schedule for completion of the recommended O&M improvements is provided at the end of this Section, in Table 8-1. The estimated improvement costs are also provided in Table 8-1. The estimated costs in Table 8-1 have been inflated for each year after 2017 to reflect the possible future costs, based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2027 have been inflated to reflect year 2028 costs, although some of these improvements may take place after the year 2028.

1. WELL NO. 8 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. Well No. 8 last had its pump and motor rebuilt in 2005. It is unknown when the well was last inspected and rehabilitated. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$8,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$30,000
Rebuild Well Pump and Motor, Complete	LS	–	–	$20,000

Construction Cost Subtotal	$80,000
Tero (3%)	$2,400
Sales Tax (7.9%)	$6,500
Subtotal	$88,900
Contingency (15%)	$13,300
Subtotal	$102,200
Engineering & Administration (15%)	$15,300
Construction Engineering (15%)	$15,300
TOTAL ESTIMATED COST	$132,800

2. SOURCE WELLS PROTECTIVE COVENANTS

The City of Toppenish owns all of its well sites, but none of them appear have a recorded protective covenant establishing a 100-foot radius of sanitary protection, in accordance with Department of Health requirements, for source wells. The City plans to execute and file a "Declaration of Covenant" for their five source wells with the Yakima County Auditor's Office. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Survey of Well Locations	LS	–	–	$5,000
Legal Description Preparation	LS	–	–	$10,000
Covenant Preparation and Filing	LS	–	–	$2,500

TOTAL ESTIMATED COST	**$17,500**

3. RESERVOIR NO. 5 CLEANING AND INSPECTION

Reservoir No. 5 was constructed in 2014. It is recommended reservoirs be inspected and cleaned every five years. The estimated cost for cleaning and inspecting the reservoir is approximately $6,000. This estimate does not include structural or mechanical repairs to the reservoir, which are anticipated to be minimal because it is a new reservoir.

4. WATER SYSTEM GIS MAPPING

The City of Toppenish would like to have water system components, such as water valves and fire hydrants, have their locations mapped in GIS. Doing so will make locating these components in the field quicker and easier. The estimated cost to have these components mapped throughout the entire system is approximately $25,000.

5. WELL NO. 3 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$30,000
Rebuild Well Pump and Motor, Complete	LS	–	–	$30,000

Construction Cost Subtotal	$92,000
Tero (3%)	$2,760
Sales Tax (7.9%)	$7,500
Subtotal	$102,260
Contingency (15%)	$15,300
Subtotal	$117,560
Engineering & Administration (15%)	$17,600
Construction Engineering (15%)	$17,600
TOTAL ESTIMATED COST	$152,760

6. WATER SYSTEM PLAN UPDATE

The Department of Health requires Water System Plans to be reviewed and updated every ten years. The estimated cost to update the Water System Plan is approximately $100,000.

7. RESERVOIR NO. 3 CLEANING AND INSPECTION

It is recommended reservoirs be inspected and cleaned every five years. The estimated cost for cleaning and inspecting the reservoir is approximately $6,000. This estimate does not include structural or mechanical repairs to the reservoir, which are anticipated to be minimal because it is a new reservoir.

8. WELL NO. 9 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. Well No. 9 was constructed in 2014. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$30,000
Rebuild Well Pump and Motor, Complete	LS	–	–	$30,000

Construction Cost Subtotal	$92,000
Tero (3%)	$2,760
Sales Tax (7.9%)	$7,500
Subtotal	$102,260
Contingency (15%)	$15,300
Subtotal	$117,560
Engineering & Administration (15%)	$17,600
Construction Engineering (15%)	$17,600
TOTAL ESTIMATED COST	$152,760

9. RESERVOIR NO. 2 CLEANING AND INSPECTION

It is recommended reservoirs be inspected and cleaned every five years. The estimated cost for cleaning and inspecting the reservoir is approximately $6,000. This estimate does not include structural or mechanical repairs to the reservoir, which are anticipated to be minimal because it is a new reservoir.

10. RESERVOIR NO. 4 CLEANING AND INSPECTION

It is recommended reservoirs be inspected and cleaned every five years. The estimated cost for cleaning and inspecting the reservoir is approximately $6,000. This estimate does not include structural or mechanical repairs to the reservoir, which are anticipated to be minimal because it is a new reservoir.

11. WELL NO. 6 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended that source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. Well No. 6 had a new pump installed and bearings in the motor replaced in 2015. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$60,000
Rebuild Well Pump and Motor	LS	–	–	$30,000

Construction Cost Subtotal	$122,000
Tero (3%)	$3,660
Sales Tax (7.9%)	$9,900
Subtotal	$135,560
Contingency (15%)	$20,300
Subtotal	$155,860
Engineering & Administration (15%)	$23,400
Construction Engineering (15%)	$23,400
TOTAL ESTIMATED COST	$202,660

12. WELL NO. 7 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$16,000
Well Pump Testing, Complete	LS	–	–	$30,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$80,000
Rebuild Well Pump and Motor, Complete	LS	–	–	$50,000

Construction Cost Subtotal	$178,000
Tero (3%)	$5,340
Sales Tax (7.9%)	$14,500
Subtotal	$197,840
Contingency (15%)	$29,700
Subtotal	$227,540
Engineering & Administration (15%)	$34,100
Construction Engineering (15%)	$34,100
TOTAL ESTIMATED COST	$295,740

13. WELL NO. 5 INSPECTION AND REHABILITATION

Periodically, source wells should be inspected and rehabilitated to maintain source capacity and reduce the chance of source well failure. It is recommended source wells be inspected and rehabilitated every 10 years or when a 20% loss in specific capacity is observed. The estimated cost to inspect and rehabilitate this source well is provided below:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Well Pump Testing, Complete	LS	–	–	$20,000
Well Video Inspections, Complete	LS	–	–	$2,000
Well Cleaning and Redevelopment, Complete	LS	–	–	$30,000
Rebuild Well Pump and Motor, Complete	LS	–	–	$30,000

Construction Cost Subtotal	$92,000
Tero (3%)	$2,760
Sales Tax (7.9%)	$7,500
Subtotal	$102,260
Contingency (15%)	$15,300
Subtotal	$117,560
Engineering & Administration (15%)	$17,600
Construction Engineering (15%)	$17,600
TOTAL ESTIMATED COST	$152,760

14. WASHINGTON BEEF CONSOLIDATION

This improvement would use the Small System Consolidation Grant to consolidate Washington Beef's water system with Toppenish's. The City has discussed the consolidation project with Washington Beef, and those discussions are still developing. This project would provide the City with more consistent demands from Washington Beef, allowing better planning ability and increase in water rights. Depending on the final terms of the future agreement, the City may acquire maintenance responsibility for Washington Beef's wells and distribution system.

8.2.1 Major Capital Improvement Schedule

Table 8-1 provides a ten-year schedule for completion of some of the recommended major capital improvements. Scheduling of the remaining improvements beyond this ten-year period should be reviewed yearly as priorities and City growth patterns change and progress. The estimated improvement costs are provided in Table 8-1, as well as the total projected yearly cost. The estimated costs in Table 8-1 have been inflated for each year after 2017 to reflect the possible future costs based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2027 have been inflated to reflect year 2028 costs although many of these improvements will take place after the year 2028.

TABLE 8-1 SCHEDULE OF RECOMMENDED O&M IMPROVEMENTS

Priority No.	Improvement Description	Estimated Cost in 2017 Dollars	Completion Year											Funding Source
			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028 to 2037	
1	Well No. 8 Inspection and Rehabilitation	132,800		136,784											City
2	Source Wells Protective Covenants	17,500			18,566										City
3	Reservoir No. 5 Cleaning and Inspection	6,000				6,556									City
4	Water System GIS Mapping	25,000					28,138								City
5	Well No. 3 Inspection and Rehabilitation	152,760						177,091							City
6	Water System Plan Update	100,000										130,477			City
7	Reservoir No. 3 Cleaning and Inspection	6,000								7,379					City
8	Well No. 9 Inspection and Rehabilitation	152,760												199,317	City
9	Reservoir No. 2 Cleaning and Inspection	6,000												8,063	City
10	Reservoir No. 4 Cleaning and Inspection	6,000												8,063	City
11	Well No. 6 Inspection and Rehabilitation	202,660												272,358	City
12	Well No. 7 Inspection and Rehabilitation	295,740												397,450	City
13	Well No. 5 Inspection and Rehabilitation	152,760												205,297	City
14	Washington Beef Consolidation	0			0									0	Grant
	TOTAL COSTS	1,255,980	0	136,784	18,566	6,556	28,138	177,091	0	7,379	0	130,477	0	1,090,548	

Note: Improvement costs for years following 2017 include 3% inflation per year.

8.3 MAJOR CAPITAL IMPROVEMENTS

The following listing of recommended major capital improvements has been sub-divided into two categories: 1) year 2017 through year 2022 prioritized improvements and 2) year 2023 through year 2037 prioritized improvements, since not all of the recommended improvements can be completed within the next six years. The recommended improvements from both categories are identified in Figure 8-1.

8.3.1 Year 2017 through Year 2022 Prioritized Improvements

1. WELL NO. 5 IMPROVEMENTS

The City's Well No. 5 is in need of substantial improvements to increase system reliability and safe production of drinking water. Well No. 5 is one of the City's largest sources of supply, and a loss of its production capacity would have a serious impact on the City's ability to satisfy peak demands. This well is in need of substantial repair and reconstruction to address a variety of deficiencies, and to reliably provide the required source capacity. The proposed improvements will provide separate rooms for the well and piping, chlorine equipment, flouridation equipment, generator, and electrical gear. All areas will be properly ventilated, safety and reliability will be improved, and the risk of well contamination will be reduced. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$75,000
Existing Building Demolition	LS	–	–	$30,000
New Well Building	LS	–	–	$250,000
Chemical Feed Equipment	LS	–	–	$100,000
Electrical and Control System	LS	–	–	$160,000
Engine Generator and Transfer Switch	LS	–	–	$80,000
Site Piping	LS	–	–	$50,000
Surfacing	LS	–	–	$30,000
Fencing and Gates	LS	–	–	$10,000
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$800,000
Tero(3%)	$24,000
Sales Tax (7.9%)	$65,096
Contingency (15%)	$133,400
Subtotal	$1,022,496
Design Engineering (15%)	$153,370
Construction Engineering (15%)	$153,370
Telemetry System Programming	$15,000
TOTAL ESTIMATED COST	**$1,344,236**

2. SATUS AVENUE 8-INCH WATER MAIN LOOP

This improvement project will include the construction of a new 8-inch water main loop in Satus Avenue, from E Street to I Street and tying in the intersecting 4-inch water mains in F Street, G Street, and H Street. Looping these water mains will significantly increase fire flow in this area from 840 to 1,720 GPM. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$16,000
Temporary Traffic Control	LS	–	–	$17,500
HMA Surface Repair	SY	900	$55.00	$49,500
Shoring or Extra Excavation	LF	1,300	$1.00	$1,300
Select Backfill	CY	50	$30	$1,500
D.I. Pipe for Water Main 8 In. Diam.	LF	1,300	$55	$71,500
Butterfly Valve 10 In.	EA	2	$1,600	$3,200
Hydrant Assembly	EA	16	$1,200	$19,200
Gate Valve 8 In.	EA	3	$4,500.00	$13,500
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$198,200
Tero (3%)	$5,946
Sales Tax (7.9%)	$16,128
Contingency (15%)	$33,000
Subtotal	$253,274
Design Engineering (12%)	$30,390
Construction Engineering (13%)	$32,930
TOTAL ESTIMATED COST	**$316,594**

3. SOUTH DATE STREET WATER MAIN UPSIZE

This improvement project will replace the existing 4-inch cast iron pipeline in South Date Street, from West First Avenue to Washington Avenue. The improvement will replace undersized and aging cast iron pipelines, improving both fire flow capacity (from 670 to 3,340 GPM) and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$22,000
Temporary Traffic Control	LS	–	–	$20,000
HMA Surface Repair	SY	1100	$55.00	$60,500
Shoring or Extra Excavation	LF	1,550	$1.00	$1,550
Select Backfill	CY	50	$30	$1,500
D.I. Pipe for Water Main 8 In. Diam.	LF	1,550	$55	$85,250
Gate Valve 8 In.	EA	6	$1,200	$7,200
Hydrant Assembly	EA	4	$4,500.00	$18,000
Service Connection 3/4 In. Diam.	EA	35	$1,200.00	$42,000
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$263,000
Tero (3%)	$7,890
Sales Tax (7.9%)	$21,400
Contingency (15%)	$43,800
Subtotal	$336,090
Design Engineering (12%)	$40,330
Construction Engineering (13%)	$43,690
TOTAL ESTIMATED COST	**$420,110**

4. SOUTH CHESTNUT STREET WATER MAIN UPSIZE

This improvement project will replace the existing 4-inch cast iron pipeline in South Chestnut Street, from West First Avenue to Washington Avenue. The improvement will replace undersized and aging cast iron pipelines, improving both fire flow capacity (from 820 to 3,990 GPM) and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$17,000
Temporary Traffic Control	LS	–	–	$17,500
HMA Surface Repair	SY	850	$55	$46,750
Shoring or Extra Excavation	LF	1,250	$1	$1,250
Select Backfill	CY	50	$30	$1,500
D.I. Pipe for Water Main 8 In. Diam.	LF	1,250	$55	$68,750
Gate Valve 8 In.	EA	6	$1,200	$7,200
Hydrant Assembly	EA	3	$4,500	$13,500
Service Connection 3/4 In. Diam.	EA	26	$1,200	$31,200
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$209,650
Tero (3%)	$6,290
Sales Tax (7.9%)	$17,059
Contingency (15%)	$34,900
Subtotal	$267,899
Design Engineering (12%)	$32,150
Construction Engineering (13%)	$34,830
TOTAL ESTIMATED COST	**$334,879**

5. RESERVOIR NO. 3 REHABILITATION AND RECOATING

Reservoir No. 3 was last cleaned and inspected in 2012. The inspection report recommended commercial blast cleaning and applying a multi-coating system to the exterior and interior of the tank. Other recommendations include; installing a bolted riser manway and vent, repairing the float system, extending the overflow to ground level and installing a screen and flapper, seal weld holes on top of tank, secure dome ladder to tank and install a flex cable safety climb fall arrest system, remove all ladder cages, and bottom 12' of access ladder and install standard ladder gate, and reinstalling antennas and cables in a structurally sound way. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$50,000
Reservoir Improvements	LS	–	–	$500,000
Minor Change	LS	–	–	$15,000

Construction Cost Subtotal	$565,000
Tero (3%)	$16,950
Sales Tax (7.9%)	$46,000
Subtotal	$627,950
Contingency (15%)	$94,200
Subtotal	$722,150
Engineering & Administration (15%)	$108,300
Construction Engineering (15%)	$108,300
TOTAL ESTIMATED COST	$938,750

6. 2ND AVE. RAILROAD CROSSING WATER MAIN LOOP

The City is planning to work with Bio Twine and Silgan, two industries, to provide improved fire flow capacity as well as create a loop within the water system. This improvement is the first of three phases to improve water quality and quantity within the industrial area in the center of the City. The new water main would cross under the railroad tracks along E. 2nd Street. Improvement number 6 is also part of this phase, but will be paid for by private funds.

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$4,000
HMA Surface Repair	SY	340	$55.00	$18,700
Shoring or Extra Excavation	LF	500	$1.00	$500
D.I. Pipe for Water Main 12 In. Diam.	LF	500	$70	$35,000
Butterfly Valve 12 In.	EA	2	$2,500	$5,000
Hydrant Assembly	EA	2	$4,500	$9,000
Select Backfill, In Place	CY	40	$30.00	$1,200
Jack/Bore Steel Casing 20 In. Diam.	LF	100	$450.00	$45,000
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$138,400
Tero (3%)	$4,152
Sales Tax (7.9%)	$11,300
Subtotal	$153,852
Contingency (15%)	$23,100
Subtotal	$176,952
Engineering & Administration (30%)	$53,090
TOTAL ESTIMATED COST	**$230,042**

7. BIO TWINE – SILGAN WATER MAIN LOOP

The City is working with Bio Twine and Silgan, two industries, to provide improved fire flow capacity as well as create a loop within the water system. This improvement would connect Bio Twine's 8-inch private water main to Silgan Container's private water system. This portion of the project will be paid for by private funds.

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Temporary Traffic Control	LS	–	–	$8,000
HMA Surface Repair	SY	20	$55.00	$1,100
Gravel Surface Repair	SY	950	$35.00	$33,250
Shoring or Extra Excavation	LF	1,450	$1	$1,450
D.I. Pipe for Water Main 12 In. Diam.	LF	1,450	$60	$87,000
Butterfly Valve 12 In.	EA	5	$2,500	$12,500
Select Backfill, In Place	CY	40	$30.00	$1,200
Jack/Bore Steel Casing 20 In. Diam.	LF	40	$450.00	$18,000
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$187,500
Tero (3%)	$5,625
Sales Tax (7.9%)	$15,300
Subtotal	$208,425
Contingency (15%)	$31,300
Subtotal	$239,725
Engineering & Administration (30%)	$71,920
TOTAL ESTIMATED COST	**$311,645**

8. WELL NO. 3 GENERATOR

Well No. 3 is the only source well within the City's water system not equipped with backup power. Installing a power generator at Well No. 3 will further increase the system's reliability, allowing the City's entire water system to continue operating in the event of a power outage. This improvement would consist of a new power generator and a separate building to house it near the well building. The estimated cost is approximately $100,000.

9. RESERVOIRS NO. 2 AND NO. 4 REHABILITATION AND RECOATING

Reservoir No. 2 was last cleaned and inspected in 2013. The inspection report recommended an over-coat system, to replace the roof vent with a new vent/hatch, and to repair areas on the balcony. Reservoir No. 4 was last cleaned and inspected in 2012. The inspection report recommended pressure cleaning and applying a two coats of overcoat to the exterior and interior of the tank. Other recommendations include; install frost proof vent with screen, repair float system, remove ladder cages, gate and notched rail, install access ladder flex safety climb, and install standard ladder gate. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$50,000
Reservoir Improvements	LS	–	–	$500,000
Minor Change	LS	–	–	$15,000

Construction Cost Subtotal	$565,000
Tero (3%)	$16,950
Sales Tax (7.9%)	$46,000
Subtotal	$627,950
Contingency (15%)	$94,200
Subtotal	$722,150
Engineering & Administration (15%)	$108,300
Construction Engineering (15%)	$108,300
TOTAL ESTIMATED COST	$938,750

10. WELL NO. 7 ELECTRICAL IMPROVEMENTS

Well No. 7 has been experiencing some electrical issues that could affect the performance and reliability of the City's largest source of supply. The electrical systems will be inspected and corrections will be made as required. The City estimates this inspection and repairs to cost approximately $310,000.

11. INDUSTRIAL WATER MAIN PH. 2

This project is the second phase mentioned in the description for project number 5. Phase 2 will place 12-inch water main through an industrial zoned area from Bio Twine's 8-inch private water main to a 12-inch water main on the northeast side of Toppenish Avenue. Provided below are the estimated costs of this project:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$8,000
HMA Surface Repair	SY	250	$55.00	$13,750
Gravel Surface Repair	SY	1,320	$35.00	$46,200
Shoring or Extra Excavation	LF	850	$1	$850
D.I. Pipe for Water Main 12 In. Diam.	LF	850	$60	$51,000
Butterfly Valve 12 In.	EA	4	$2,500	$10,000
Select Backfill, In Place	CY	130	$30.00	$3,900
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$153,700
Tero (3%)	$4,600
Sales Tax (7.9%)	$12,500
Subtotal	$170,800
Contingency (15%)	$25,600
Subtotal	$196,400
Engineering & Administration (30%)	$58,920
TOTAL ESTIMATED COST	**$255,320**

12. INDUSTRIAL WATER MAIN PH. 3

This project is the third phase mentioned in the description for project number 5. Phase 3 will further place 12-inch water main through an industrial area from the 12-inch water main northeast of Toppenish Avenue to Elm Street/SR-22. These three phases will greatly increase Toppenish's ability to serve industrial services in this broad area, as well as the residential area to the west. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Temporary Traffic Control	LS	–	–	$3,000
HMA Surface Repair	SY	15	$55.00	$825
Gravel Surface Repair	SY	890	$35.00	$31,150
Shoring or Extra Excavation	LF	1,350	$1	$1,350
D.I. Pipe for Water Main 12 In. Diam.	LF	1,350	$60	$81,000
Butterfly Valve 12 In.	EA	3	$2,500	$7,500
Select Backfill, In Place	CY	25	$30.00	$750
Jack/Bore Steel Casing 20 In. Diam.	LF	40	$450.00	$18,000
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$168,575
Tero (3%)	$5,057
Sales Tax (7.9%)	$13,700
Subtotal	$187,332
Contingency (15%)	$28,100
Subtotal	$215,432
Engineering & Administration (30%)	$64,630
TOTAL ESTIMATED COST	**$280,062**

13. WELL NO. 3 IMPROVEMENTS

Well No. 3 is in need of a new well building and chlorination equipment. The City would like to add a new well building (600 sq. ft.), including electrical and chemical feed equipment, and site work. Provided below are the estimated costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$50,000
Filtration and Chemical Feed Building (600 SF)	LS	–	–	$150,000
Chemical Feed Equipment	LS	–	–	$100,000
Electrical and Control	LS	–	–	$120,000
Site Piping	LS	–	–	$50,000
Site Grading, Drainage, Final Surfacing	LS	–	–	$30,000
Site Fencing	LS	–	–	$10,000
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$525,000
Tero (3%)	$15,800
Sales Tax (7.9%)	$42,700
Subtotal	$583,500
Contingency (15%)	$87,500
Subtotal	$671,000
Engineering & Administration (30%)	$201,000
TOTAL ESTIMATED COST	**$872,000**

14. WELL NO. 7 MANGANESE TREATMENT/REMOVAL IMPROVEMENTS

Well No. 7 has consistently had electrical issues and iron and manganese issues. The City would like to add a new filtration building (1,730 sq. ft.), including electrical and chemical feed equipment, and site work. Provided below are the estimated costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$120,000
Filtration and Chemical Feed Building (1,730 SF)	LS	–	–	$430,000
Manganese Filtration Equipment	LS	–	–	$420,000
Chemical Feed Equipment	LS	–	–	$100,000
Electrical and Control	LS	–	–	$200,000
Site Piping	LS	–	–	$100,000
Site Grading, Drainage, Final Surfacing	LS	–	–	$50,000
Minor Change	FA	–	–	$25,000

Construction Cost Subtotal	$1,445,000
Tero (3%)	$43,400
Sales Tax (7.9%)	$118,000
Subtotal	$1,606,400
Contingency (15%)	$241,000
Subtotal	$1,847,400
Engineering & Administration (25%)	$462,000
TOTAL ESTIMATED COST	**$2,309,400**

15. WELL NO. 8 IMPROVEMENTS

Well No. 8 has had problems with sand production. Cleaning and rehabilitating the well may improve or absolve the sand production issues. If this is not effective, installation of a sand separation unit is recommended. This improvement also includes replacement of the existing, aging well control building, electrical, and chemical feed equipment, including the chemical feed equipment for Well No. 6. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$50,000
Well Control and Chemical FeedFeed Building (600 sq. ft.)	LS	–	–	$150,000
Sand Separator Equipment	LS	–	–	$120,000
Chem. Feed Equip. (Incl. Well No. 6)	LS	–	–	$120,000
Electrical and Control	LS	–	–	$120,000
Site Piping	LS	–	–	$50,000
Site Grading, Drainage, Final Surfacing	LS	–	–	$30,000
Minor Change	LS	–	–	$15,000

Construction Cost Subtotal	$655,000
Tero (3%)	$19,650
Sales Tax (7.9%)	$53,300
Subtotal	$727,950
Contingency (15%)	$109,200
Subtotal	$837,150
Engineering & Administration (15%)	$125,600
Construction Engineering (15%)	$125,600
TOTAL ESTIMATED COST	$1,088,350

16. WELL NO. 6 MANGANESE TREATMENT/REMOVAL IMPROVEMENTS

Well No. 6 has had problems with sand production and iron and manganese. The City would like to pump a higher capacity from this well without producing sand, and without iron or manganese problems, as well as upgrade the site, building, and electrical. Provided below are the estimated costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$40,000
Filtration and Chemical Feed Building (600 SF)	LS	–	–	$150,000
Manganese Filtration Equipment	LS	–	–	$60,000
Chemical Feed Equipment	LS	–	–	$30,000
Electrical and Control	LS	–	–	$80,000
Site Piping	LS	–	–	$50,000
Site Grading, Drainage, Final Surfacing	LS	–	–	$30,000
Site Fencing	LS	–	–	$10,000
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$465,000
Tero (3%)	$14,000
Sales Tax (7.9%)	$37,800
Subtotal	$516,800
Contingency (15%)	$77,500
Subtotal	$594,300
Engineering & Administration (30%)	$178,000
TOTAL ESTIMATED COST	**$772,300**

17. SOUTH F STREET 8-INCH WATER MAIN LOOP

This improvement project will loop the existing 10-inch cast iron water main in East First Avenue to the 4-inch cast iron water main in East Second Avenue, along South F Street. The proposed 8-inch water main will be located within the roadway on South F Street. Looping these water mains will increase fire flow from 890 to 1,690 GPM. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$4,000
Select Backfill, In Place	CY	45	$30.00	$1,350
8-Inch Water Main	LF	380	$55.00	$20,900
10-Inch Gate Valve	EA	2	$2,000	$4,000
8-Inch Gate Valve	EA	2	$1,500	$3,000
Fire Hydrant Assembly	EA	1	$4,500	$4,500
HMA Surface Repair	SY	260	$55.00	$14,300
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$67,050
Tero (3%)	$2,000
Sales Tax (7.9%)	$5,450
Subtotal	$74,500
Contingency (15%)	$11,200
Subtotal	$85,700
Engineering & Administration (30%)	$25,710
TOTAL ESTIMATED COST	**$111,410**

18. WEST THIRD AND WEST FIFTH AVENUE WATER MAIN LOOPS

The improvement project will loop the existing 4-inch cast iron water main to the 8-inch ductile iron water main in South Toppenish Avenue at West Third Avenue and at West Fifth Avenue. The proposed 8-inch water main will be located within the roadway on both West Third Avenue and West Fifth Avenue. Looping the water mains will increase fire flow from 740 to 1,652 GPM at West Third Avenue and from 640 to 1,640 GPM at West Fifth Avenue. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$2,000
Select Backfill, In Place	CY	100	$30.00	$3,000
8-Inch Water Main	LF	140	$55.00	$7,700
8-Inch Gate Valve	EA	12	$1,500	$18,000
HMA Surface Repair	SY	100	$65.00	$6,500
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$47,200
Tero (3%)	$1,400
Sales Tax (7.9%)	$3,840
Subtotal	$51,040
Contingency (15%)	$7,660
Subtotal	$58,700
Engineering & Administration (30%)	$17,610
TOTAL ESTIMATED COST	**$76,310**

19. S. BEECH ST. WATER MAIN UPSIZE

This improvement project will replace the existing 4-inch cast iron pipeline in South Beech Street, from West First Avenue to Washington Avenue. The improvement will replace undersized and aging cast iron pipelines, improving both fire flow capacity (from 3,310 to 3,610 GPM) and system reliability in this residential area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$2,000
Select Backfill, In Place	CY	190	$30.00	$5,700
Shoring or Extra Excavation	LF	930	$1.00	$930
8-Inch Water Main	LF	930	$55.00	$51,150
8-Inch Gate Valve	EA	2	$1,500	$3,000
HMA Surface Repair	SY	620	$65.00	$40,300
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$123,080
Tero (3%)	$3,700
Sales Tax (7.9%)	$10,000
Subtotal	$136,780
Contingency (15%)	$20,500
Subtotal	$157,280
Engineering & Administration (30%)	$47,180
TOTAL ESTIMATED COST	**$204,460**

20. GOLDENDALE AVENUE WATER MAIN UPSIZE AND LOOPING

This improvement project will loop the existing 10-inch cast iron water main in Beuna Way to the 6-inch cast iron water main in North Fir Street, within Goldendale Avenue. The proposed 8-inch water main will be located on the south edge of Goldendale Avenue in the gravel shoulder and will replace the existing 6-inch cast iron water main in Goldendale Avenue. Looping these water mains will significantly increase fire flow capacity from 2,290 to 5,427 GPM in this area. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Temporary Traffic Control	LS	–	–	$8,000
Select Backfill, In Place	CY	60	$30.00	$1,800
8-Inch Water Main	LF	880	$55.00	$48,400
10-Inch Gate Valve	EA	2	$2,000	$4,000
8-Inch Gate Valve	EA	7	$1,500	$10,500
HMA Surface Repair	SY	590	$65.00	$38,350
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$136,050
Tero (3%)	$4,100
Sales Tax (7.9%)	$11,000
Subtotal	$151,150
Contingency (15%)	$22,700
Subtotal	$173,850
Engineering & Administration (30%)	$52,160
TOTAL ESTIMATED COST	**$226,010**

21. BELLINGHAM AVENUE 8-INCH WATER MAIN LOOP

This improvement project will loop the existing 4-inch cast iron water main in North Elm Street to the 4-inch cast iron water main in North Date Street, along Bellingham Avenue. The proposed 8-inch water main will be located on the south edge of Bellingham Avenue in the gravel shoulder. Looping these water mains will significantly increase fire flow from 480 to 1,470 GPM. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$2,000
Select Backfill, In Place	CY	70	$30.00	$2,100
8-Inch Water Main	LF	320	$55.00	$17,600
8-Inch Gate Valve	EA	6	$1,500	$9,000
Fire Hydrant Assembly	EA	1	$4,500	$4,500
HMA Surface Repair	SY	220	$65.00	$14,300
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$69,500
Tero (3%)	$2,100
Sales Tax (7.9%)	$5,660
Subtotal	$77,260
Contingency (15%)	$11,600
Subtotal	$88,860
Engineering & Administration (30%)	$26,700
TOTAL ESTIMATED COST	**$115,560**

22. ELLENSBURG AVENUE 8-INCH WATER MAIN LOOP

This improvement project will loop the existing 4-inch cast iron water main in North Chestnut Street to the 4-inch cast iron and 8-inch ductile iron water mains in North Beech Street. The proposed 8-inch water main will be located on the south edge of Ellensburg Avenue in the gravel shoulder. Looping these water mains will significantly increase fire flow from 710 to 1,566 GPM. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$4,000
Select Backfill, In Place	CY	60	$30.00	$1,800
8-Inch Water Main	LF	330	$55.00	$18,150
8-Inch Gate Valve	EA	6	$1,500	$9,000
HMA Surface Repair	SY	230	$65.00	$14,950
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$62,900
Tero (3%)	$1,900
Sales Tax (7.9%)	$5,120
Subtotal	$69,920
Contingency (15%)	$10,500
Subtotal	$80,420
Engineering & Administration (30%)	$24,130
TOTAL ESTIMATED COST	**$104,550**

23. TOPPENISH WASTEWATER TREATMENT FACILITY 12-INCH WATER MAIN LOOP

This improvement project will loop the existing 12-inch PVC water main stub near Wishkoski Way to the 8-inch ductile iron water main in Germantown Road at North Myers Road, and at the dead-end 8-inch water main near the wastewater treatment facility. The proposed 12-inch water main will primarily be located outside of the roadway along Anahat Road in the gravel shoulder. Looping these water mains will significantly increase fire flow from 810 to 2,530 GPM near the wastewater treatment facility. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$110,000
Temporary Traffic Control	LS	–	–	$20,000
Select Backfill, In Place	CY	40	$30.00	$1,200
Jack/Bore 24-Inch Steel Casing	LF	600	$500	$300,000
12-Inch Water Main	LF	5,500	$60.00	$330,000
8-Inch Water Main	LF	720	$55.00	$39,600
12-Inch Butterfly Valve	EA	3	$2,500	$7,500
8-Inch Gate Valve	EA	4	$1,500	$6,000
Fire Hydrant Assembly	EA	6	$4,500	$27,000
HMA Surface Repair	SY	3,800	$65.00	$247,000
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$1,103,300
Tero (3%)	$33,100
Sales Tax (7.9%)	$89,800
Subtotal	$1,226,200
Contingency (15%)	$184,000
Subtotal	$1,410,200
Engineering & Administration (30%)	$423,100
TOTAL ESTIMATED COST	**$1,833,300**

24. KATSURA STREET 8-INCH WATER MAIN LOOP

This improvement project will loop the existing 12-inch AC water main in Jackson Street to the 8-inch AC water main extending from South Juniper Street. The proposed 8-inch water main will be located within the roadway along Katsura Street. Looping these water mains will significantly increase fire flow from 1,840 to 4,500 GPM. This project will also provide an additional measure of reliability to the system as valves will be added allowing isolation for maintenance and/or repairs. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$4,000
8-Inch Water Main	LF	420	$55.00	$23,100
12-Inch Butterfly Valve	EA	2	$2,500	$5,000
8-Inch Gate Valve	EA	3	$1,500	$4,500
Service Connection, 3/4 In. Diam.	EA	7	$1,200	$8,400
HMA Surface Repair	SY	290	$65.00	$18,850
Minor Change	FA	–	–	$10,000

Construction Cost Subtotal	$83,850
Tero (3%)	$2,500
Sales Tax (7.9%)	$6,820
Subtotal	$93,170
Contingency (15%)	$14,000
Subtotal	$107,170
Engineering & Administration (30%)	$32,150
TOTAL ESTIMATED COST	**$139,320**

25. SOUTH CARLSON STREET WATER MAIN UPSIZE

This improvement project will replace the existing 6-inch PVC pipeline in South Carlson Street, from West Third Avenue to the south. The improvement will replace undersized pipe, improving both fire flow capacity (from 2,490 to 4,520 GPM) and system reliability in this commercial area. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$2,000
8-Inch Water Main	LF	230	$55.00	$12,650
8-Inch Gate Valve	EA	3	$1,500	$4,500
Service Connection, 3/4 In. Diam.	EA	3	$1,200	$3,600
Gravel Surfacing Repair	SY	180	$40.00	$7,200
Minor Change	FA	–	–	$5,000

Construction Cost Subtotal	$39,950
Tero (3%)	$1,200
Sales Tax (7.9%)	$3,250
Subtotal	$44,400
Contingency (15%)	$6,660
Subtotal	$51,060
Engineering & Administration (30%)	$15,300
TOTAL ESTIMATED COST	**$66,360**

26. 1.01 MG RESERVOIR AND TRANSMISSION MAIN

This improvement will provide additional water storage near Washington Beef, and 4,250 LF of 16-inch transmission main to connect to the existing system. This improvement will aid in meeting the demands of Washington Beef if they become fully reliant on the City's water system, as well as increase reliability of the system overall. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$183,000
Temporary Traffic Control	LS	–	–	$25,000
Clearing and Grubbing	LS	–	–	$10,000
Unclassified Excavation Incl. Haul	CY	300	$40.00	$12,000
Crushed Surfacing Base Course	TON	600	$25.00	$15,000
Crushed Surfacing Top Course	TON	300	$30.00	$9,000
HMA	TON	325	$125.00	$40,625
Shoring or Extra Excavation	LF	4500	$1.00	$4,500
Select Backfill	CY	3500	$30.00	$105,000
1.01 MG Reservoir Construction	LS	–	–	$1,000,000
Hydrodynamic Mixing System	LS	–	–	$50,000
Submersible Mixer	LS	–	–	$45,000
Inlet/Outlet Valve Vault and Site Piping	LS	–	–	$125,000
Electrical, Telemetry and Control System	LS	–	–	$75,000
Landscape and Irrigation	LS	–	–	$10,000
D.I. Pipe for Water Main 16-Inch	LF	4250	$75.00	$318,750
D.I. Pipe for Water Main 6-Inch	LF	250	$55.00	$13,750
Butterfly Valve 16-Inch	EA	7	$3,000.00	$21,000
Comb. Air Valve Assembly 4-Inch	EA	1	$3,500.00	$3,500
Hydrant Assembly	EA	14	$4,500.00	$63,000
Service Connection, 1-inch Diameter	EA	20	$1,200	$24,000
Boring and Casing Pipe	LF	100	$450	$45,000
Pavement Markings	LS	–	–	$1,500
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$2,214,625
Sales Tax (7.9%)	$175,000
Subtotal	$2,389,625
Contingency (15%)	$358,000
Subtotal	$2,747,625
Engineering & Administration (30%)	$824,000
TOTAL ESTIMATED COST	**$3,571,625**

27. TRANSMISSION MAIN LOOP TO EAST TOPPENISH

This improvement project will loop the proposed 16-inch transmission main (Capital Improvement Project 26), to the 12-inch water main in SR-22. The proposed 16-inch transmission main will provide better water quality and flow to the southeast part of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$61,000
Clearing and Grubbing	LS	–	–	$15,000
Crushed Surfacing Base Course	TON	110	$25.00	$2,750
Crushed Surfacing Top Course	TON	55	$30.00	$1,650
HMA	TON	65	$125.00	$8,125
Shoring or Extra Excavation	LF	3625	$1.00	$3,625
Select Backfill	CY	2750	$30.00	$82,500
D.I. Pipe for Water Main 16-Inch	LF	3500	$75.00	$262,500
D.I. Pipe for Water Main 6-Inch	LF	125	$55.00	$6,875
Butterfly Valve 16-Inch	EA	6	$3,000.00	$18,000
Comb. Air Valve Assembly 4-Inch	EA	1	$3,500.00	$3,500
Hydrant Assembly	EA	12	$4,500.00	$54,000
Boring and Casing Pipe	LF	450	$450	$202,500
Pavement Markings	LS	–	–	$1,000
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$738,025
Sales Tax (7.9%)	$58,300
Subtotal	$796,325
Contingency (15%)	$119,000
Subtotal	$915,325
Engineering & Administration (30%)	$275,000
Right of Way Acquisition	$150,000
WSDOT Permitting	$5,000
TOTAL ESTIMATED COST	**$1,345,325**

28. ELMWOOD LN. 8-INCH WATER MAIN EXTENSION

This improvement project will extend 8-inch water main to provide service to the southeast part of the City UGA. This improvement project would be in tandem with a new road planned to be built. Water service is necessary for development take place. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$38,000
Temporary Traffic Control	LS	–	–	$10,000
Clearing and Grubbing	LS	–	–	$10,000
Crushed Surfacing Base Course	TON	50	$25.00	$1,250
Crushed Surfacing Top Course	TON	25	$30.00	$750
HMA	TON	30	$125.00	$3,750
Shoring or Extra Excavation	LF	3475	$1.00	$3,475
Select Backfill	CY	2500	$30.00	$75,000
D.I. Pipe for Water Main 8-Inch	LF	3350	$60.00	$201,000
D.I. Pipe for Water Main 6-Inch	LF	125	$55.00	$6,875
Gate Valve 8-Inch	EA	6	$1,300.00	$7,800
Comb. Air Valve Assembly 4-Inch	EA	1	$2,500.00	$2,500
Hydrant Assembly	EA	11	$4,500.00	$49,500
Service Connection, 1-Inch	EA	26	$1,200.00	$31,200
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$456,100
Sales Tax (7.9%)	$36,000
Subtotal	$492,100
Contingency (15%)	$73,800
Subtotal	$565,900
Engineering & Administration (30%)	$170,000
Right of Way Acquisition	$60,000
TOTAL ESTIMATED COST	**$795,900**

29. TRANSMISSION MAIN LOOP TO WEST TOPPENISH

This improvement project will loop the proposed 16-inch transmission main (Capital Improvement Project 26), to the existing water main in Ward Road. The proposed 16-inch transmission main will provide better water quality and flow to the northwest part of the City. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$46,000
Temporary Traffic Control	LS	–	–	$15,000
Clearing and Grubbing	LS	–	–	$10,000
Unclassified Excavation Incl. Haul	CY	160	$40.00	$6,400
Crushed Surfacing Base Course	TON	300	$25.00	$7,500
Crushed Surfacing Top Course	TON	150	$30.00	$4,500
HMA	TON	160	$125.00	$20,000
Shoring or Extra Excavation	LF	2640	$1.00	$2,640
Select Backfill	CY	700	$30.00	$21,000
D.I. Pipe for Water Main 16-Inch	LF	2500	$75.00	$187,500
D.I. Pipe for Water Main 6-Inch	LF	140	$55.00	$7,700
Butterfly Valve 16-Inch	EA	5	$3,000.00	$15,000
Comb. Air Valve Assembly 4-Inch	EA	2	$3,500.00	$7,000
Hydrant Assembly	EA	9	$4,500.00	$40,500
Service Connection, 1-Inch Diam.	EA	15	$1,200.00	$18,000
Boring and Casing Pipe	LF	300	$450	$135,000
Pavement Markings	LS	–	–	$1,500
Minor Change	FA	–	–	$15,000

Construction Cost Subtotal	$560,240
Sales Tax (7.9%)	$44,300
Subtotal	$604,540
Contingency (15%)	$90,700
Subtotal	$695,240
Engineering & Administration (30%)	$209,000
WSDOT Permitting	$5,000
TOTAL ESTIMATED COST	**$909,240**

CITY OF TOPPENISH

Water System Plan Update

RECOMMENDED WATER SYSTEM CAPITAL IMPROVEMENTS

LEGEND

CITY LIMITS

FUTURE SERVICE AREA (URBAN GROWTH AREA)

YEARS 2017 - 2022 IMPROVEMENTS

1. WELL NO. 5 IMPROVEMENTS
2. SATUS AVE. 8-INCH WATER MAIN LOOP
3. S. DATE ST. WATER MAIN UPSIZE
4. S. CHESTNUT ST. WATER MAIN UPSIZE
5. RESERVOIR NO. 3 REHABILITATION AND RECOATING
6. 2ND AVE. RAILROAD CROSSING WATER MAIN LOOP
7. BIO TWINE - SILGAN WATER MAIN LOOP
8. WELL NO. 3 GENERATOR
9. RESERVOIR NO. 2 AND 4 REHABILITATION AND RECOATING
10. WELL NO. 7 ELECTRICAL IMPROVEMENTS

YEARS 2023 - 2037 IMPROVEMENTS

11. INDUSTRIAL WATER MAIN PH. 2
12. INDUSTRIAL WATER MAIN PH. 3
13. WELL NO. 3 IMPROVEMENTS
14. WELL NO. 7 MANGANESE TREATMENT / REMOVAL IMPROVEMENTS
15. WELL NO. 8 IMPROVEMENTS
16. WELL NO. 6 MANGANESE TREATMENT / REMOVAL IMPROVEMENTS
17. S. F ST. 8-INCH WATER MAIN LOOP
18. W. THIRD AND W. FIFTH AVE. WATER MAIN LOOPS
19. S. BEECH ST. WATER MAIN UPSIZE
20. GOLDENDALE AVE. WATER MAIN UPSIZE & LOOP
21. BELLINGHAM AVE. 8-INCH WATER MAIN LOOP
22. ELLENSBURG AVE. 8-INCH WATER MAIN LOOP
23. TOPPENISH WWTP 12-INCH WATER MAIN LOOP
24. KATSURA ST. 8-INCH WATER MAIN LOOP
25. SOUTH CARLSON ST. WATER MAIN UPSIZE
26. 1.01 MG RESERVOIR AND TRANSMISSION MAIN
27. TRANSMISSION MAIN LOOP TO EAST TOPPENISH
28. ELMWOOD LN. 8-INCH WATER MAIN EXTENSION
29. TRANSMISSION MAIN TO LOOP WEST TOPPENISH

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FIGURE 8-1

8.3.2 Major Capital Improvement Schedule

Table 8-2 provides a ten-year schedule for completion of some of the recommended major capital improvements. Scheduling of the remaining improvements beyond this ten-year period should be reviewed yearly as priorities and City growth patterns change and progress. The estimated improvement costs are provided in Table 8-2, as well as the total projected yearly cost. The estimated costs in Table 8-2 have been inflated for each year after 2017 to reflect the possible future costs based upon the projected year the improvement will be completed. Improvements that are projected to take place after year 2027 have been inflated to reflect year 2028 costs although many of these improvements will take place after the year 2028.

TABLE 8-2 SCHEDULE OF RECOMMENDED MAJOR CAPITAL IMPROVEMENTS

Priority No.	Improvement Description	Estimated Cost in 2017 Dollars	Completion Year												Funding Source
			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028 to 2037	
1	Well No. 5 Improvements	1,344,236	1,344,236												SRF Loan/City
2	Satus Ave. 8-Inch Water Main Loop	316,594	316,594												SRF Loan/City
3	S. Date St. Water Main Upsize	420,110	420,110												SRF Loan/City
4	S. Chestnut St. Water Main Upsize	334,879	334,879												SRF Loan/City
5	Reservoir No. 3 Rehabilitation and Recoating	938,750		966,913											SRF Loan/City
6	2nd Ave. Railroad Crossing Water Main Loop	230,042		236,943											SRF Loan/City
7	Bio Twine – Silgan Water Main Loop	311,645		320,994											Private
8	Well No. 3 Generator	100,000			106,090										SRF Loan/City
9	Reservoirs No. 2 and 4 Rehabilitation and Recoating	938,750						1,088,269							SRF Loan/City
10	Well No. 7 Electrical Improvements	310,000						359,375							SRF Loan/City
11	Industrial Water Main Ph. 2	255,310												353,408	SRF Loan/City
12	Industrial Water Main Ph. 3	280,062												387,671	SRF Loan/City
13	Well No. 3 Improvements	872,000												1,207,052	SRF Loan/City
14	Well No. 7 Manganese Treatment/ Removal Improvements	2,309,400												3,196,749	SRF Loan/City
15	Well No. 8 Improvements	1,088,350												2,537,716	SRF Loan/City
16	Well No. 6 Manganese Treatment/ Removal Improvements	772,300												1,069,044	SRF Loan/City
17	S. F St. 8-Inch Water Main Loop	111,410												154,218	SRF Loan/City
18	W. Third & W. Fifth Ave. Water Main Loops	76,310												105,631	SRF Loan/City
19	S. Beech St. Water Main Upsize	204,460												283,020	SRF Loan/City
20	Goldendale Ave. Water Main Upsize & Loop	226,010												312,851	SRF Loan/City
21	Bellingham Ave. 8-Inch Water Main Loop	115,560												150,779	SRF Loan/City
22	Ellensburg Ave. 8-Inch Water Main Loop	104,550												144,721	SRF Loan/City
23	Toppenish WWTP 12-Inch Water Main Loop	1,833,300												128,538	SRF Loan/City
24	Katsura St. 8-Inch Water Main Loop	139,320												192,851	SRF Loan/City
25	S. Carlson St. Water Main Upsize	66,360												91,857	SRF Loan/City
26	1.01 MG Reservoir and Transmission Main	3,571,625												4,943,964	SRF Loan/City
27	Transmission Main Loop to East Toppenish	1,345,325												1,862,244	SRF Loan/City
28	Elmwood Ln. 8-Inch Water Main Extension	795,900												1,101,712	SRF Loan/City
29	Transmission Main to Loop West Toppenish	909,240												1,258,601	SRF Loan/City
	TOTAL COSTS	20,321,798	2,415,819	1,524,850	106,090	0	0	1,447,644	0	0	0	0	0	19,482,627	

Note: Improvement costs for years following 2017 include 3% inflation per year.

8.4 FUTURE MAJOR CAPITAL IMPROVEMENTS (PLANNING)

A general plan for future major capital improvements that would be a result of system expansion is shown on Figure 8-2. Recommended major capital improvements discussed in Section 8.3 are also shown on Figure 8-2 for reference. This plan represents the projected water mains/structures, including estimated sizes, required as development expands beyond what the existing system serves within the City's current and future service area boundaries. Although conditions and circumstances in the City's water system may change the exact location and/or configuration of needed improvements, the general plan shown on Figure 8-2 allows the City to review proposed development with respect to system expansion. Also, as new development is proposed and/or occurs, the City will need to further evaluate the improvement required and review the effects that the system expansion plans will have on the existing distribution system.

CITY OF TOPPENISH

Water System Plan Update

FUTURE MAJOR IMPROVEMENTS MAP

N W E S

0 750 1500

MAXIMUM SERVICE ELEVATION STATIC PRESSURE = 56 PSI

MAXIMUM SERVICE ELEVATION STATIC PRESSURE = 69 PSI

PRV

BPS

RESERVOIR NO. 5 (1.7 MG)

RESERVOIR NO. 2 (0.2 MG)

RESERVOIR NO. 4 (1.0 MG)

RESERVOIR NO. 3 (0.5 MG)

RESERVOIR

16"

770

760

750

740

LEGEND

- RETAIL SERVICE AREA (CITY LIMITS)
- FUTURE SERVICE AREA (URBAN GROWTH AREA)
- 700 — SERVICE ELEVATION CONTOUR
- WATER MAINS
- RESERVOIR
- 760 — YAKIMA COUNTY 10' CONTOURS
- HYDRANTS
- VALVES
- SERVICE AREA ABOVE ELEVATION 770 FT.
- SERVICE AREA BELOW ELEVATION 740 FT.
- 20-YEAR MAJOR RECOMMENDED CAPITAL IMPROVEMENTS (SEE FIGURE 8-1)
- PROJECTED FUTURE MAJOR IMPROVEMENTS

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FIGURE 8-2

CHAPTER 9 - FINANCIAL PROGRAM

9.1 PAST AND PRESENT FINANCIAL STATUS

Development of a comprehensive financial program requires an understanding of the water system's current financial status and past budgetary trends. The beginning and ending fund balance histories for the six-year period, 2010 through 2015, are presented below in Table 9-1 for the City's Water Operating Fund (401) and in Table 9-2 for City's Water Capital Fund (410).

TABLE 9-1 WATER OPERATING FUND (401) BALANCES

Year	2010	2011	2012	2013	2014	2015
Beginning Fund Balance	$929,219	$1,078,615	$1,177,914	$1,354,646	$1,695,319	$1,879,708
Ending Fund Balance	$1,078,615	$1,177,914	$1,348,954	$1,695,319	$1,879,708	$1,845,577
Net Increase (Decrease)	$149,396	$99,299	$171,040	$340,674	$184,389	($34,131)

TABLE 9-2 WATER CAPITAL FUND (410) BALANCES

Year	2010	2011	2012	2013	2014	2015
Beginning Fund Balance	$311,503	$448,796	$467,904	$471,555	$432,569	$483,045
Ending Fund Balance	$448,796	$467,904	$471,555	$432,569	$483,045	$569,525
Net Increase (Decrease)	$137,293	$19,108	$77,583	($46,205)	$50,476	$86,480

Presented below in Table 9-3 is a summary of the City's Water Operating Fund (401) actual revenues and expenditures history for the six-year period, 2010 through 2015. In Table 9-2 is a summary of the City's Water Capital Fund (410) actual revenues and expenditures for the same six-year period. The proposed financial plan to fund recommended improvements is presented later in Table 9-6.

TABLE 9-3 WATER OPERATING FUND (401) REVENUES AND EXPENDITURES						
Year Ending	2010	2011	2012	2013	2014	2015
REVENUES						
Water Sales Residential	1,001,228	1,007,911	1,060,704	1,124,322	1,128,832	1,152,981
Water Sales Commercial	171,995	174,065	195,052	201,368	202,035	207,973
Water Sales Other	65,199	67,386	67,192	71,140	75,876	530,407
Connection and Turn Off Fees	23,630	22,339	20,653	19,160	24,906	22,585
Space and Facilites Leases	55,798	56,010	58,936	58,797	54,560	50,596
Other Miscelaneous Revenue	14,626	8,028	3,095	4,135	8,325	8,032
Subtotal Operating Revenues	1,332,476	1,335,739	1,405,632	1,478,922	1,494,534	1,972,574
Water Fund Non-Revenues	34,596	0	0	0	0	0
TOTAL - REVENUES	1,367,072	1,335,739	1,405,632	1,478,922	1,494,534	1,972,574
EXPENDITURES						
Administration						
Salaries and Wages	73,605	76,228	76,897	76,750	73,735	63,124
Benefits	32,697	32,986	34,406	35,413	36,449	30,590
Supplies	2,453	211	488	427	357	444
Other Serivces and Charges	7,694	6,501	5,042	6,021	6,487	5,349
Subtotal - Water Operations	116,449	115,926	116,833	118,611	117,028	99,507
Maintenance						
Salaries and Wages	71,058	74,548	75,644	69,563	57,719	65,370
Benefits	36,638	46,467	46,950	41,915	37,517	39,377
Supplies	42,447	38,320	14,680	14,339	13,252	9,974
Other Serivces and Charges	1,835	547	235	965	3,327	385
Subtotal - Maintenance	151,978	159,882	137,509	126,782	111,815	115,106
General Operations						
Salaries and Wages	69,354	73,360	83,758	88,688	89,411	94,462
Benefits	40,452	41,667	49,754	52,704	56,818	57,811
Supplies	27,643	38,292	61,881	54,071	65,722	60,365
Other Serivces and Charges	300,907	602,609	588,854	468,040	496,195	986,890
Subtotal - General Operations	438,356	755,928	784,247	663,503	708,146	1,199,528
Interfund Loans	680	660	660	660	1,430	0
Capital Purchases	11,064	2,769	0	0	6,580	0
Transfer-Out to 410 Capital Water	82,214	82,281	75,831	83,619	83,500	70,000
Transfer-Out to Other Funds	272,100	0	0	11,915	73,017	311,838
Intergovernmental Loans						
Local Loan	49,219	49,219	49,218	49,218	49,219	49,218
PWTF #1	46,284	0	0	0	0	0
PWTF #6	42,232	42,443	0	0	0	0
PWTF #8	7,100	7,597	7,561	7,526	7,490	7,455
PWTF #9	0	19,735	62,733	76,414	151,920	154,055
DWSRF #10	0	0	0	0	0	0
DWSRF #11	0	0	0	0	0	0
Subtotal - Debt Service	144,835	118,994	119,512	133,158	208,629	210,728
TOTAL - EXPENDITURES	1,217,676	1,236,440	1,234,592	1,138,248	1,310,145	2,006,707

TABLE 9-4 WATER CAPITAL FUND (410) REVENUES AND EXPENDITURES						
Year Ending	2010	2011	2012	2013	2014	2015
REVENUES						
Investment Interest	976	694	757	637	451	808
General Facility Fee - Water	4,000	4,800	5,200	8,000	6,000	6,000
Transfer-In from 401 Water	82,214	82,281	75,831	76,401	83,500	83,972
Transfer-In Other	0	0	0	0	0	140,108
PWTF #6	92,840	0	0	0	0	0
Well No. 9 Project	92,840	770,201	63,675	649,892	573,043	0
DWSRF #10	0	0	0	1,070,304	117,948	0
DWSRF #11	0	0	0	854,820	2,353,037	310,277
DWSRF #12	0	0	0	0	62,136	305,537
CDBG 2014 Water Main	0	0	0	0	0	351,140
TIB - 2014 Water Main Project	0	0	0	0	0	15,925
TOTAL - REVENUES	272,870	857,976	145,463	2,660,054	3,196,115	1,213,767
EXPENDITURES						
Transfer-Out	32,370	32,600	18,190	22,770	15,360	0
2009 Water System Plan Update	17,812	5,795	0	0	0	0
Well No. 9 Project	85,395	786,417	38,269	675,348	575,646	0
Decommision Well Nos. 1, 2, & 4	0	0	5,421	0	0	0
Pull & Inspect Well No. 8 Pump	0	14,056	0	0	0	15,702
Water Reservoir Inspections	0	0	6,000	3,500	0	0
DWSRF #10	0	0	0	1,143,649	44,603	0
DWSRF #11	0	0	0	854,820	2,389,570	288,818
DWSRF #12	0	0	0	0	72,970	822,767
Well No. 5 Rehabilitation	0	0	0	6,172	47,490	0
TOTAL - EXPENDITURES	135,577	838,868	67,880	2,706,259	3,145,639	1,127,287

9.2 AVAILABLE REVENUE SOURCE

Recommended system improvements are scheduled for completion in annual increments for the next six years. In addition, as areas outside the current service area develop, extension of the City's water system will be necessary. Future transmission mains, sources of supply, and reservoirs will undoubtedly require major local bond funding and/or outside funding participation to offset the high costs of the improvements.

There are five basic categories of potential financing for domestic water-related improvements:

1. Local Public Enterprise Funds
2. Use of Local Public Powers
3. State Assisted or Guaranteed Resources
4. Federally Assisted or Guaranteed Resources
5. Private Development

Current availability of funding is limited with a number of the sources within these categories. Many also restrict the use of funds to certain projects and others limit their participation to a percentage of the total cost. Each of these categories is described briefly below.

1. Local Public Enterprise Funds

   Reserves in the Enterprise Fund are accumulated from available revenues from water user fees. The amount of the reserves will depend on the balance of operation and maintenance costs of the system versus total revenue generated by the fees. These reserves may be used to finance any water system related project allocated by the City Council.

Funds for future projects may be generated by increases in user fees, thus building the reserves in the Enterprise Fund. With this method of financing, often called the "pay-as-you-go" approach, the City is collecting interest on the reserves as opposed to paying interest on a loan balance. One method used by some communities to accumulate reserves is through the development of a capital recovery charge system. This approach is similar to assessing connection fees, except the amount is based on the capital costs of constructing collection system trunk lines and treatment facilities, and the collected funds are usually set aside as capital reserves for future projects.

2. Use of Local Public Powers

In this section, three primary bonding techniques will be presented: general obligation bonds, revenue bonds, and special assessment bonds. There are advantages and disadvantages to each. The type of bond issued to finance a community improvement depends in part on custom and in part on the circumstances of a particular offering. General information about the three principal types of municipal bonds follows.

General Obligation Bonds: These bonds pledge the unlimited taxing power and the full faith and credit of the issuing government to meet the required principal and interest payments.

Special Assessment Bonds (LID Bonds): LID bonds are used to finance improvements where the property specially benefited can be identified. Special assessment bonds are frequently used to make capital improvements in a particular neighborhood. Principal and interest payments for these bonds are made by special assessment on the property benefiting from the improvement. Before special assessment bonds are issued, estimated costs are mailed to property owners, a public hearing is held to allow the affected property owners to say whether or not they want the improvement, and a 30-day protest period elapses during which property owners may protest the improvements prior to City Council action formally establishing the project. Debt financed by special assessment bonds is not subject to debt limitations.

Revenue Bonds: Revenue bonds are frequently used to finance City-owned utilities, industrial parks, and other municipal public facilities. The bonds pledge the revenue from a particular revenue source to meet the principal and interest payments. Revenue bonds are appropriate debt instruments when the enterprise fund can be expected to generate sufficient revenue to meet both operating and debt service cost. Revenue bonds generally do not become a general obligation of the government issuing them. Communities may have to pay higher rates of interest on these bonds than on general obligation bonds, because revenue bonds are considered less secure. But, revenue bonds also have an important advantage over general obligation bonds in that the amount of the revenue bonds is not included in the amount of indebtedness subject to state debt limitations. The legal requirements for issuing revenue bonds are more complex than those for issuing general obligation bonds. When revenue bonds are issued, a special authority (Water Fund) operates the facility and a special revenue fund receives and disburses all funds. A trust agreement to provide for the monthly reimbursement of revenues and containing provisions to protect the bond holders must be formulated.

3. State Assisted or Guaranteed Resources

Public Works Trust Fund (PWTF): This fund was created in 1985 to provide loans for replacement of public works facilities. Applications for construction funds may be submitted once each year (in May), and applications for pre-construction funds (for such items as engineering design, bid document preparation, right of way acquisition and environmental studies) may be submitted once each month. Projects are evaluated based on:

a. Merits of the project as to need;
b. Degree of capital improvement planning;
c. Adequacy of existing rate structure;
d. Degree of local participation in financing project; and
e. Whether the area is economically distressed.

Current allocations of funds have been allowed for a wide variety of projects, including domestic water system replacement projects. The interest rates on PWTF loans generally range from 0.5% to 2% depending on the amount of matching money provided by the City.

PWTF loans have recently become less reliable due to legislative transfers from the PWTF into the general fund as a result of budget deficits.

Drinking Water State Revolving Fund (DWSRF): This fund provides low-interest loans to publicly and privately owned water systems for projects which improve water systems and ensure public health. Up to 100% of eligible project costs are fundable through this program with a typical 20-year repayment schedule. Applications are generally accepted once a year and managed through the Washington State Department of Health and Department of Commerce. Projects that are primarily for fire protection or to serve future population growth are not eligible for funding through the DWSRF program. Up to 50 percent principal forgiveness is available for communities with high affordability index numbers and water system restructuring/ consolidation projects.

Funds are also available through the DWSRF program for preconstruction and consolidation grants and loans to prepare water systems for infrastructure construction projects. The preconstruction loan program targets small to medium sized systems that do not have up-front capital to pay for needed preconstruction activities to improve their project readiness. Preconstruction grants help small public water systems (serving population of less than 10,000) evaluate the feasibility of applying for a construction loan and to meet readiness to proceed criteria. Consolidation grants help small systems (typically fewer than 500 connections) that have water quality, monitoring, treatment technique violations, or similar deficiencies consolidate with another system, restructure (transfer) ownership to another larger utility, or secure a regional water supply.

Community Economic Revitalization Board (CERB): CERB is a state board focused on economic development through job creation in partnership with local governments. The Board has the authority to finance public infrastructure improvements that encourage new private business development and expansion. However, by law CERB may only fund construction projects which can demonstrate that either significant private job creation or significant private investment will occur as a result of the public project. CERB is primarily a loan program with grants awarded on a case-by-case basis. The interest rates on CERB loans are 2.5% for distressed areas and 3.0% for non-distressed areas. Applications are accepted year around, while the Board considers applications every two months.

4. Federally Assisted or Guaranteed Resources

Three federally financed funding sources are available for domestic water system construction: 1) the USDA's Rural Development, Rural Utilities Service (RUS) Program; 2) the Economic Development Administration's (EDA) Public Works Grants and Loans Program; and 3) the Department of Housing and Urban Development's (HUD) Community Development Block Grants administered by the State Department of Community Planning and Development.

Rural Utilities Service Water & Waste Disposal Direct Loans and Grants Program: This program is one of several programs established by the USDA to provide public works assistance to small communities in rural areas. Public entities such as municipalities, counties, special purpose districts or authorities, Indian tribes, and nonprofit corporations or cooperatives are eligible in areas with a population under 10,000. Priority will be given to public entities in areas smaller than 5,500 people to restore a deteriorating water supply, or to improve, enlarge, or modify a water facility. Preference will also be given to requests which involve the merging of small facilities and those serving low-income communities. Loans and grant funds may be used to construct, repair, improve, expand, or otherwise modify rural water supply and distribution, including reservoirs, pipelines, wells, and pumping stations. Targeted at the neediest communities, grants are designed to keep costs economical. Grants are limited to reducing the facility per user costs for debt service to a minimum of 1% of the area's family income. Loans in the past have also been available at a 5% interest rate for the useful life of the facility, or the statutory limit on the applicant's borrowing authority, or for a maximum of 40 years.

Public Works Grants and Loans Program: This program is funded by the Economic Development Administration (EDA) and is used to encourage long-range development gains in jurisdictions where economic growth is lagging, or where the economic base is shifting. The program provides public works and development facilities needed to attract new industry and provide business expansion. Financial aid may be used to acquire and develop land and improvements for public works, and to acquire, construct, rehabilitate, alter, expand or improve such facilities, including related machinery and equipment. When completed, such projects are expected to bring additional private investment to the area.

U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant Program: This program is administered by the State Department of Community Development. Communities with a population under 50,000 can apply for grants to undertake activities in providing adequate housing, expanded economic opportunities, and correcting deficiencies in public facilities which affect public safety and health of an area or community of residents. The program is designed to aid low and moderate income people and is also directed to have a maximum impact on stated community problems. Its primary focus is to assist blighted communities, or communities suffering a particular community or economic development problem.

5. Private Development

   Expansion of domestic water facilities to newly developing areas outside the existing service area is a common requirement of the private developer. Installation of public utilities within housing subdivisions is normally financed entirely by the developer. The City may participate by paying the cost of over-sizing the water main for possible extension at a later time.

Although funding has been curtailed in a number of programs within the last few years, projects are still receiving financing statewide. Competition for available funds, however, has increased significantly. Projects which show the greatest need and have the largest local funding participation or benefit to low-income families are receiving the majority of financing from these programs. Careful planning and packaging of the project is necessary so that the most effective dollar use, including local participation, may obtain the maximum benefit for the greatest number of people.

Table 9-5 provides a summary of funding sources and projects which are eligible under each program.

TABLE 9-5 FUNDING SOURCE SUMMARY	
FUNDING SOURCE	ELIGIBLE PROJECTS
Domestic Water Enterprise Fund	All water system projects
General Obligation Bond	All water system projects
Revenue Bond	All water system projects
Special Assessment Bond	Local Improvement District projects
Public Works Trust Fund	Replacement of existing water system facilities
Drinking Water State Revolving Fund (DWSRF) Construction and Preconstruction Loans	All water system projects except those primarily for fire protection or to serve future population growth.
Drinking Water State Revolving Fund (DWSRF) Preconstruction and Consolidation Grants	Water systems with fewer than 10,000 population.
Community Economic Revitalization Board (CERB)	All water system projects demonstrating job creation or private investment
USDA RUS Rural Water Grant	All water system projects
USDA RUS Rural Water Loan	All water system projects
EDA Public Works Grant	Water system projects to attract new industries and provide for business expansion
EDA Public Works Loan	Water system projects to attract new industries and provide for business expansion
HUD Community Development Block Grant	Water system projects which directly benefit low and moderate-income families
Private Development	All water system projects necessary for new housing and / or commercial developments

9.3 RECOMMENDED FINANCING STRATEGY

Provided in Table 9-6 is a financial program for the City's Water Operating Fund, which incorporates projected water service fees, operating costs, improvements, and loan costs for the next ten-year period. The values for year 2016 are the budgeted figures used by the City.

The projected water department revenue from water service fees after 2016 includes additional revenue from a combination of projected increases in the number of services and rate increases at the beginning of the year. These projected revenue increases are necessary to complete the recommended system improvements, while maintaining a positive balance in the water fund. If conditions change that reduce the projected future revenue or increase future water department expenses, the financial program shown in Table 9-6 should be revised to account for the reduced revenue, or modifications to successive year rate increases will have to be made. Project financing methods presented are subject to change based on availability of funding programs, criteria of those programs, and funding limits. Financing strategies for each project will be sought at least one year prior to the project implementation year listed in the capital improvement program. Should financing options become unavailable, the City will consider raising rates or postponing projects to future years.

Future water department expenses were estimated based upon an average inflation rate of 2% per year, as shown in Table 9-6.

The City of Toppenish will continue annual reviews of the water system's financial program during their budget preparation process. The financial program will also be reviewed and revised as needed during the *Water System Plan* update in 2026. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

TABLE 9-6 PROPOSED WATER OPERATING FUND (401) FINANCIAL PROGRAM

Year Ending	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Beginning Fund Balance	1,496,594	1,412,325	1,374,208	1,223,187	1,047,678	929,956	873,318	842,461	745,528	672,833	624,989	602,627
REVENUES												
Water Sales Residential	1,205,400	1,265,670	1,328,954	1,395,401	1,465,171	1,538,430	1,584,583	1,632,120	1,681,084	1,731,516	1,783,462	1,836,966
Water Sales Commercial	207,270	217,634	228,515	239,941	251,938	264,535	272,471	280,645	289,064	297,736	306,668	315,868
Water Sales Other	77,410	81,281	85,345	89,612	94,092	98,797	101,761	104,814	107,958	111,197	114,533	117,969
Connection and Turn Off Fees	22,000	23,100	24,255	25,468	26,741	28,078	28,921	29,788	30,682	31,602	32,550	33,527
Space and Facilites Leases	38,500	38,500	38,501	38,502	38,503	38,504	38,505	38,506	38,507	38,508	38,509	38,510
Other Miscelaneous Revenue	7,483	7,857	8,250	8,663	9,096	9,550	9,837	10,132	10,436	10,749	11,072	11,404
Subtotal Operating Revenues	1,558,063	1,634,041	1,713,819	1,797,586	1,885,541	1,977,894	2,036,077	2,096,005	2,157,731	2,221,309	2,286,794	2,354,243
Water Fund Non-Revenues	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL - REVENUES	1,558,063	1,634,041	1,713,819	1,797,586	1,885,541	1,977,894	2,036,077	2,096,005	2,157,731	2,221,309	2,286,794	2,354,243
EXPENDITURES												
Administration												
Salaries and Wages	71,310	73,449	75,653	77,922	80,260	82,668	85,148	87,702	90,333	93,043	95,835	98,710
Benefits	41,220	42,457	43,730	45,042	46,393	47,785	49,219	50,695	52,216	53,783	55,396	57,058
Supplies	600	618	637	656	675	696	716	738	760	783	806	831
Other Services and Charges	7,100	7,313	7,532	7,758	7,991	8,231	8,478	8,732	8,994	9,264	9,542	9,828
Subtotal - Water Operations	120,230	123,837	127,552	131,379	135,320	139,380	143,561	147,868	152,304	156,873	161,579	166,426
Maintenance												
Salaries and Wages	78,750	81,113	83,546	86,052	88,634	91,293	94,032	96,853	99,758	102,751	105,833	109,008
Benefits	52,460	54,034	55,655	57,324	59,044	60,816	62,640	64,519	66,455	68,448	70,502	72,617
Supplies	16,800	17,304	17,823	18,358	18,909	19,476	20,060	20,662	21,282	21,920	22,578	23,255
Other Services and Charges	10,200	10,506	10,821	11,146	11,480	11,825	12,179	12,545	12,921	13,309	13,708	14,119
Subtotal - Maintenance	158,210	162,956	167,845	172,880	178,067	183,409	188,911	194,578	200,416	206,428	212,621	219,000
General Operations												
Salaries and Wages	102,130	105,194	108,350	111,600	114,948	118,397	121,949	125,607	129,375	133,256	137,254	141,372
Benefits	61,850	63,706	65,617	67,585	69,613	71,701	73,852	76,068	78,350	80,700	83,121	85,615
Supplies	68,345	70,395	72,507	74,682	76,923	79,231	81,608	84,056	86,577	89,175	91,850	94,605
Other Services and Charges	608,106	626,349	645,140	664,494	684,429	704,962	726,110	747,894	770,330	793,440	817,244	841,761
Subtotal - General Operations	840,431	865,644	891,613	918,362	945,912	974,290	1,003,519	1,033,624	1,064,633	1,096,572	1,129,469	1,163,353
Interfund Loans	0	0	0	0	0	0	0	0	0	0	0	0
Capital Purchases	0	0	0	0	0	0	0	0	0	0	0	0
Transfer-Out to 410 Capital Water	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900
Transfer-Out to Other Funds	0	0	0	0	0	0	0	0	0	0	0	0
Intergovernmental Loans												
PWTF #8	7,419	7,384	7,348	7,313	7,277	7,242	7,206	7,206	7,206	7,206	7,206	7,206
PWTF #9	152,708	151,357	150,005	148,654	147,303	145,951	144,600	144,600	144,600	144,600	144,600	144,600
DWSRF #10	70,116	69,521	68,927	68,333	67,739	67,145	66,550	66,550	66,550	66,550	66,550	66,550
DWSRF #11	209,318	207,559	205,800	204,041	202,283	200,524	198,765	198,765	198,765	198,765	198,765	198,765
Fut. Cap. Improvements 1 - 4	0	0	161,850	159,983	158,115	156,248	154,380	152,513	150,645	148,778	146,910	145,043
Fut. Cap. Improvements 5, 6, and 7	0	0	0	78,251	77,348	76,445	75,542	74,639	73,736	72,833	71,930	71,028
Fut. Cap. Improvements 9 and 10	0	0	0	0	0	0	0	88,695	87,672	86,648	85,625	84,602
Subtotal - Debt Service	439,561	435,821	593,930	666,574	660,065	653,554	647,043	732,968	729,174	725,380	721,586	717,793
TOTAL - EXPENDITURES	1,642,332	1,672,158	1,864,840	1,973,095	2,003,264	2,034,532	2,066,933	2,192,938	2,230,426	2,269,153	2,309,155	2,350,472
Ending Fund Balance	1,412,325	1,374,208	1,223,187	1,047,678	929,956	873,318	842,461	745,528	672,833	624,989	602,627	606,399
NET INCREASE (DECREASE)	(84,269)	(38,117)	(151,021)	(175,509)	(117,723)	(56,638)	(30,857)	(96,933)	(72,695)	(47,844)	(22,362)	3,772
Projected Revenue Annual Increase	5.0%	5.0%	5.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%

TABLE 9-7 PROPOSED WATER CAPITAL FUND (410) FINANCIAL PROGRAM

Year Ending	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Beginning Fund Balance	311,503	277,803	319,103	233,619	160,263	205,007	228,169	102,378	153,678	197,599	118,422	137,122
REVENUES												
Investment Interest	0	0	0	0	0	0	0	0	0	0	0	0
General Facility Fee - Water	0	0	0	0	0	0	0	0	0	0	0	0
Transfer-In from 401 Water	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900	83,900
Loan - Fut. Cap. Improvements 1 - 4	0	2,492,497	0	0	0	0	0	0	0	0	0	0
Loan - Fut. Cap. Improvements 5, 6, and 7	0	0	1,203,856	0	0	0	0	0	0	0	0	0
Loan - Fut. Cap. Improvements 9 and 10	0	0	0	0	1,364,542	0	0	0	0	0	0	0
TOTAL - REVENUES	83,900	2,576,397	1,287,756	83,900	1,448,442	83,900	83,900	83,900	83,900	83,900	83,900	83,900
EXPENDITURES												
Transfer-Out	32,600	32,600	32,600	32,600	32,600	32,600	32,600	32,600	32,600	32,600	32,600	32,600
2017 Water System Plan Update	85,000	10,000	0	0	0	0	0	0	0	130,477	0	0
O&M Improvements			136,784	18,566	6,556	28,138	177,091	0	7,379	0	0	0
Fut. Cap Improvements 1 - 4	0	2,492,497	0	0	0	0	0	0	0	0	0	0
Fut. Cap. Improvements 5, 6, and 7	0	0	1,203,856	0	0	0	0	0	0	0	0	0
Fut. Cap. Improvement 8	0	0	0	106,090	0	0	0	0	0	0	0	0
Well No. 5 Rehabilitation	0	0	0	0	0	0	0	0	0	0	32,600	0
TOTAL - EXPENDITURES	117,600	2,535,097	1,373,240	157,256	1,403,698	60,738	209,691	32,600	39,979	163,077	65,200	32,600
Ending Fund Balance	277,803	319,103	233,619	160,263	205,007	228,169	102,378	153,678	197,599	118,422	137,122	188,422
NET INCREASE (DECREASE)	(33,700)	41,300	(85,484)	(73,356)	44,744	23,162	(125,791)	51,300	43,921	(79,177)	18,700	51,300

9.4 WATER RATES

Toppenish's current water rates and rate structure were adopted in 2014 and are based on a flat rate for the monthly service charge, which includes the first 600 cubic feet, and then a declining block rate for usage charges over the first 600 cubic feet. The charge per each additional 100 cubic feet of usage is the same for all meter sizes and declines in blocks of 400, 1,000 and 2,000 cubic feet. Alternatively, use of water may be furnished and measured by meter, and sold at bulk rates per 1,000 gallons, plus a setup charge. A summary of the 2017 water rates for services within the city limits is provided below in Table 9-8. The complete list of the City's current water rates is provided in Ordinance No. 2014-10, which amends Chapter 13.16.040 of the City's municipal code. A copy of Ordinance No. 2014-10 and Chapter 13.16.040 are provided in CHAPTER 10 of this Plan.

TABLE 9-8 SUMMARY OF YEAR 2017 WATER RATES

Meter Size (Inches)	Monthly Base Charge
3/4	$31.47
1	$53.49
1-1/2	$103.83
2	$103.83
3	$166.74
4	$166.74
6	$336.63
8	$525.37
Per 100 cubic feet for the next 400 cubic feet	$1.34
Per 100 cubic feet for next 1,000 cubic feet	$0.90
Per 100 cubic feet for over 2,000 cubic feet	$0.70
Bulk rate per 1,000 gallons, plus setup charge of $23.00	$9.38
Note: Base charge includes first 600 cubic feet of water.	

Based on the above rates, the typical monthly charge for a Single-Family residential customer (3/4" meter) that uses 1,000 cubic feet of water in a month would be equal to $36.83. This monthly service charge is reasonable, compared with neighboring cities of a similar size and amount of water use.

The City's current rates (or total revenue) will need to be increased in order to maintain a positive operating fund balance and fund necessary improvement projects. The proposed rate increase of 5% per year for the next six years will have a minimal impact on residential customers. In addition to funding recommended system improvements, annual increases in the future rates will be necessary to pay for rising O&M costs and to make the necessary debt service payments for prior and future improvement projects.

A more detailed rate analysis will be necessary in the future to determine the rate structure required to achieve the recommended revenue increases as shown in the financial plan in Section 9.3. Following the proposed rate analysis, annual review of the proposed rates and revenue increases will be necessary to determine required adjustments to either base rates, usage charges, or both.

Toppenish's current water rate structure is not set up to promote water conservation. The City's current rate structure is set in manner that water in excess of the base amount is supplied at a reduced cost and does not increase as additional use increases. An example of a conservation base rate structure would be to have the usage charges increase for every 100 cubic feet of consumption in excess of the base amount. This kind of rate structure would penalize services that use excessive amounts of water and encourage more efficient use of water. Further investigation of the City's water rate structure will be considered in the future to promote water conservation, reduce per service water consumption, and achieve the City's proposed water use efficiency goals, as discussed in CHAPTER 4 of this plan.

CHAPTER 10 - MISCELLANEOUS DOCUMENTS

10.1 MISCELLANEOUS DOCUMENTS INDEX

1. State Environmental Policy Act (SEPA) Checklist
2. SEPA Determination of Non-Significance (DNS)
3. 2016 Water Facility Inventory
4. Consumer Meeting & Water System Plan Adoption
5. Local Government Consistency Review Checklist(s)
6. Water Use Efficiency Program and Goal Adoption Process Documentation
7. City of Toppenish Municipal Code and Ordinances
   - Chapter 13.02 Water Supply Regulations
   - Chapter 13.04 Water – Installation of Service
   - Chapter 13.08 Water – Service Regulations
   - Chapter 13.12 Water – Meters
   - Chapter 13.16 Water – Rates and Charges
   - Chapter 13.20 Water – Fire Protection Systems
   - Chapter 13.52 Water and Sewer Services Outside the Corporate Limits
   - Chapter 13.56 Utility Rate Discount for Low-Income Senior or Disabled Persons
   - Ordinance 2014-10 Ordinance Increasing Water Rates
8. Water Rights Certificate Well No. 6
9. Water Rights Applications
   - Well No. 3
   - Well No. 5
   - Well No. 6
   - Well No. 7
   - Well No. 8
10. Yakama Nation Existing Use / Renewal Well Permit
    - Well No. 3
    - Well No. 5
    - Well No. 6
    - Well No. 7
    - Well No. 8
    - Well No. 9
11. Well Logs
    - Well No. 3
    - Well No. 5
    - Well No. 6
    - Well No. 7
    - Well No. 8
    - Well No. 9
12. Property Deeds and Descriptions
    - Well No. 3
    - Well No. 5
    - Well No. 6
    - Well No. 7
    - Well No. 8
    - Well No. 9
13. Susceptibility Assessment Survey
    - Well No. 3
    - Well No. 5
    - Well No. 6
    - Well No. 7
    - Well No. 8
    - Well No. 9
14. USGS Groundwater Status and Trends for the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho
15. Coliform Monitoring Plan
16. Disinfection Byproducts Monitoring Plan
17. 2015 Cross-Connection Control Program Summary Report and Annual Summary Report
18. 2015 Consumer Confidence Report
19. Water Quality Monitoring Schedule

20. Wellhead Protection Program
21. Emergency Response Plan
22. Well No. 3 (S03) Chemical Analysis
    - Inorganic Chemical Analysis – 7/9/2010; 7/24/2007
    - VOC Chemical Analysis – 7/28/2010; 7/9/2010; 7/12/2006
    - SOC Chemical Analysis – 4/21/2009
    - Nitrate/Nitrite Chemical Analysis – 7/6/2015; 7/7/2014; 7/9/2013; 7/12/2012; 7/7/2011
    - Radionuclide Chemical Analysis – 8/26/2015; 8/19/2009; 12/2/2005
23. Well No. 5 (S05) Chemical Analysis
    - Inorganic Chemical Analysis – 10/9/2007
    - VOC Chemical Analysis – 5/5/2012
    - SOC Chemical Analysis – 4/4/2012
    - Nitrate/Nitrite Chemical Analysis – 3/9/2015; 4/8/2013; 4/4/2012; 3/21/2011
    - Radionuclide Chemical Analysis – 9/25/2015; 9/3/2009
24. Well No. 6 (S06) Chemical Analysis
    - Inorganic Chemical Analysis – 10/9/2007
    - VOC Chemical Analysis – 3/9/2015; 3/30/2009
    - SOC Chemical Analysis – 5/7/2009, 4/21/2009
    - Nitrate/Nitrite Chemical Analysis – 9/25/2015; 9/24/2014; 9/5/2013; 9/6/2012; 9/7/2011
    - Radionuclide Chemical Analysis – 10/20/2015; 10/5/2009; 9/11/2007
25. Well No. 7 (S07) Chemical Analysis
    - Inorganic Chemical Analysis – 10/9/2007
    - VOC Chemical Analysis – 3/9/2015; 3/30/2009
    - SOC Chemical Analysis – 4/21/2009
    - Nitrate/Nitrite Chemical Analysis – 5/20/2015; 5/22/2014; 4/8/2013; 4/4/2012; 3/21/2011
    - Radionuclide Chemical Analysis – 11/4/2015; 11/3/2009; 12/2/2005
26. Well No. 8 (S08) Chemical Analysis
    - Inorganic Chemical Analysis – 10/9/2007
    - VOC Chemical Analysis – 4/1/2015; 3/9/2015; 3/30/2009
    - SOC Chemical Analysis – 4/21/2009
    - Nitrate/Nitrite Chemical Analysis – 5/20/2015; 5/22/2014; 4/8/2013; 4/4/2012; 4/25/2011
    - Radionuclide Chemical Analysis – 12/4/2015; 12/3/2015; 12/1/2009; 9/11/2007; 3/19/2007
27. Well No. 9 (S09) Chemical Analysis
    - Inorganic Chemical Analysis – 1/16/2013
    - VOC Chemical Analysis – 10/21/2015; 1/16/2013; 2/24/2012
    - SOC Chemical Analysis – 1/16/2013; 2/24/2012
    - Nitrate/Nitrite Chemical Analysis – 10/20/2015
    - Radionuclide Chemical Analysis – 1/16/2013; 2/24/2012
28. Lead & Copper Chemical Analysis
29. Disinfection Byproducts Chemical Analysis
30. Bacteriological Analysis
31. Computer Printout of Hydraulic Analysis Results
32. Telemetry Control System Screen Print-Outs
33. City of Toppenish Construction Standards
34. Complaint or Request for Services Form
35. Local Fire Authority Storage and Nesting Approval Letter
36. Wapato Irrigation Project Permits

Map A - Existing Water System
Map B - Hydraulic Analysis Nodes and Pipes