CITY OF ZILLAH

WATER SYSTEM PLAN

Prepared by:

HLA
Huibregtse, Louman Associates, Inc.
Civil Engineering ◆ Land Surveying ◆ Planning

PROJECT NO. 13033

DECEMBER 2014

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INTRODUCTION AND EXECUTIVE SUMMARY

INTRODUCTION

The City of Zillah is located in the south-central portion of Washington State in Yakima County, as shown on Figure 1-1 State Vicinity Map. The City lies just north of Interstate 82, approximately 18 miles southeast of the City of Yakima. Along with increasing growth within the Yakima Valley, there has been an increase in population within the City of Zillah. A future service area for Zillah, known as the Urban Growth Area, has been established through the Growth Management Act planning process. Zillah's economy depends largely on the agricultural and wine industry. Produce and wine grapes grown throughout the Yakima Valley is processed and shipped from facilities within the area, and much of the employment in Zillah is tied directly and indirectly to these agricultural facilities.

Zillah 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. Huibregtse, Louman Associates, Inc., was authorized by the City of Zillah 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 written a planning handbook which identifies information needed to develop a "well-conceived and clearly-stated" water system plan. The planning handbook is organized into ten major chapters, with each chapter representing a basic water system plan component. The ten 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 Zillah 2014 Water System Plan update has been prepared in the format of the Department of Health's Planning Handbook dated April 1997 and the Water System Plan Checklist for Municipal Systems provided by the Department of Health, Office of Drinking Water Eastern Regional Office during the March 14, 2013 Pre-Plan Meeting.

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 twenty 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 Zillah 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 Zillah'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 Zillah water system. The City's 2010 service population was 2,964, and the future service population is projected to be 4,112 in the year 2023. Zillah's 2013 number of single family residential water services was 848, and the future number of single family residential services is projected to be 1,103 in the year 2023.

Current Water Demands (Chapter 2): Zillah's greatest year of water consumption was in 2011, when an average of 424,479 gallons of water per day was used. The maximum month water consumption was experienced in July, 2011, when the average daily use for the month was 989,991 gallons. Maximum day consumption was 1,255,000 gallons, and peak hour consumption was estimated to be 1,323 GPM.

Projected Water Demands (Chapter 2): Zillah's water demand forecast for the year 2019 and the City's current source capacity and water rights are shown below:

	Projected Year 2019 Demand	Current Source Capacity	Current Water Rights
ERUs (ADD)	2,320	5,323	3,257
Annual	165.35 MG	839.50 MG	475.091 MG
Maximum Day	1.276 MG	2.30 MG	3.672 MG
Peak Hour	1,595 GPM	1,600 GPM	2,550 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 for completion in the six year planning period. A more detailed description of these deficiencies and improvements can be found in Chapter 8 of this Plan.

SUPPLY

Protective Covenants

Deficiency – Of the City's three well sites, only WIPPCO Well (S03) has a recorded protective covenant, establishing the required 100-foot sanitary protective radius around the well. Protective covenants are required at Zillah's other two source wells.

Improvement – Protective well covenants will be created and executed for the remaining two wells owned by the City of Zillah to provide the necessary 100-foot sanitary protective radius around the wells.

Existing Source Wells

Deficiency – 3rd Avenue Well (S02) has aesthetic water quality issues related to the presence of sulfur and manganese which has limited its use.

Improvement – To determine a mitigation plan to address the water quality issue it is recommended that an initial water quality analysis, investigation and report be completed. Once completed, the recommendations of the report can be incorporated into the proposed 3rd Avenue Well Rehabilitation project to return the Well to a primary source well.

Deficiency – Rainier Well (S01) and WIPPCO Well (S03) require substantial building, mechanical and electrical upgrades and repairs to ensure their continued, reliable water production.

Additionally, neither Well is equipped with a permanent emergency power generator or well level transducer.

Improvement – Due to the extent of the recommended repairs and the condition of the existing wells and structures, it is recommended that both wells be completely reconstructed to address all deficiencies and ensure safe and reliable water production for the future.

Source Capacity
Deficiency – The City's peak hour demand is expected to exceed source capacity beyond 2019.

Improvement – The City will need to provide an additional source of supply to meet future water system peak demands. The City purchased the Joseph Well property as part of the 0.6 MG storage reservoir and Cutler Way booster pump station improvement and plans to either rehabilitate the existing well or drill a new well, which will supply an additional 950 GPM of water to meet water system demand. The location of the new well will need to be coordinated with existing water rights, otherwise alternate locations may need to be evaluated.

System Chlorination
Deficiency – Not applicable

Improvement – Water system disinfection/chlorination is not a required improvement, but as the City's water system continues to grow it may become one. Chlorination is used to ensure consistent, safe water quality throughout the distribution system. To begin initial planning for this future improvement the impacts of chlorination are discussed in Chapter 3 and the estimated cost is provided in Chapter 8.

STORAGE

Reservoir Coatings
Deficiency – The City's two elevated reservoirs were last painted in 1998 and have not been inspected.

Improvement – To determine the existing condition of the interior of Reservoir No. 1 and 2 it is recommended that the City contract with certified divers to visually inspect and clean the interior of these reservoirs. If any structural or mechanical deficiencies are uncovered, they can be addressed while the reservoir is offline for re-painting. It is recommended that both reservoirs be taken offline and completely blasted and re-coated inside and out.

DISTRIBUTION

Booster Pump Station Pumps
Deficiency – Cutler Way Booster Station and Zone 2 Constant Pressure Booster Station were constructed without the designed, spare pump due to budget constraints. Without a spare pump, the booster station capacity is impacted when the primary pump is out of service due to maintenance or repairs.

Improvement – Install the third and second 1,500 GPM booster pumps at Cutler Way Booster Station and Zone 2 Constant Pressure Booster Stations respectively.

Fire Protection Water Main Upsizing and Replacement
Deficiency - A number of locations within the City were identified in Section 3.6 as having insufficient fire flow capacities. Fire flow deficiencies will require pipeline upsizing or looping in the future.

Improvements - The City will construct the following system improvements to increase fire flow capacities at key locations as shown on Figure 3-7.

- Additional 8-inch water main loop in the Alteejen Road area of Zone 2 will improve fire flow to this residential area.

- Looping the water main at the end of Schoentrup Lane to the existing standpipe reservoir (Reservoir No. 2) outlet piping will increase fire flow in this neighborhood from below 1,000 GPM to over 4,000 GPM. This improvement will also include a water main loop from the standpipe reservoir outlet piping to the 6-inch water main at the end of Reo Drive, along the SVID canal, which will also raise fire flow around Reo Drive from below 500 GPM to over 1,000 GPM.

- Installation of an 8-inch water main loop from the south end of Miles Drive to First Avenue will improve fire flow at the commercial and industrial property along First Avenue and improve fire flow to the church property on Miles Drive.

- Installation of an 8-inch water main loop from Meade Street to First Avenue will improve fire flow capacity to hydrants in this area.

- Upsizing a portion of the water main in Moritz Street and Pollock Avenue to the existing fire hydrant will improve fire flow to over 1,000 GPM.

- Additional distribution system improvements beyond 2019 as identified in Chapter 8.

Water System Hydrant and Valve Improvements
Deficiency - The 2007 Comprehensive Water Plan (CWP) identified 37 locations where main line valves need to be added for improved line control, 8 locations where fire hydrants need to be added to the distribution system to meet minimum spacing requirements, and 21 locations where hydrants needed to be replaced because they were inoperable or have inadequate pressures. Upon review of the deficient fire hydrants, only 4 deficient hydrants remain as shown in Table 3-28 due to recent system improvements and replacing aging hydrants. Therefore, approximately 37 new valves and 9 fire hydrants need to be added to the system. The other deficient fire hydrants will be addressed by related improvements discussed elsewhere.

Improvement – 9 fire hydrants and 37 valves need to be added to the distribution system or replaced. This improvement will increase fire protection by providing additional fire hydrants and replacing inoperable hydrants. The hydrants identified in Section 3.7 as having pressure deficiencies will be improved by other recommended system improvements. The addition of main line valves where there are none will improve system control and reliability.

Service Meters
Deficiency - Approximately 400 service meters have to be manually read and do not work with the current touch-read equipment.

Improvement – Approximately 30 service meters will be replaced annually with new radio-read meters to improve service meter accuracy and reduce the time necessary to read meters.

PROPOSED WATER SYSTEM FINANCIAL PROGRAM

Recommended system improvements are scheduled for completion in annual increments for the next six years, as shown on 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 (2019 through 2033) 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 9-4 (Operating Fund) and Table 9-5 (Reserve Fund) 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, in addition to the recommended rate increases, to account for estimated growth within the City, as discussed in Chapter 9 of this Plan.

As discussed in Chapter 4 of this plan, the City of Zillah owns and maintains its own irrigation system that serves a portion of irrigation water users within the City's current service area. Projected irrigation revenues and expenditures have been included in Table 9-4 and Table 9-5 because they are currently part of the City's water system fund balances. The irrigation revenue was estimated to increase approximately one percent per year, but no analysis of the irrigation department rate structure or financial viability were conducted as part of this report.

The City of Zillah 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 2020. 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 Zillah, a municipal corporation located within the eastern part of Yakima County as shown on Figure 1-1 State Vicinity Map, owns and operates its own water system. Decisions regarding daily water system operations are made by the Water System Manager and the Public Works Director. Financial decisions regarding major water system improvements and establishment of water rates are made by the Zillah City Council. The following parties are involved in the operation, maintenance, and planning for the Zillah water production, storage and distribution facilities:

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

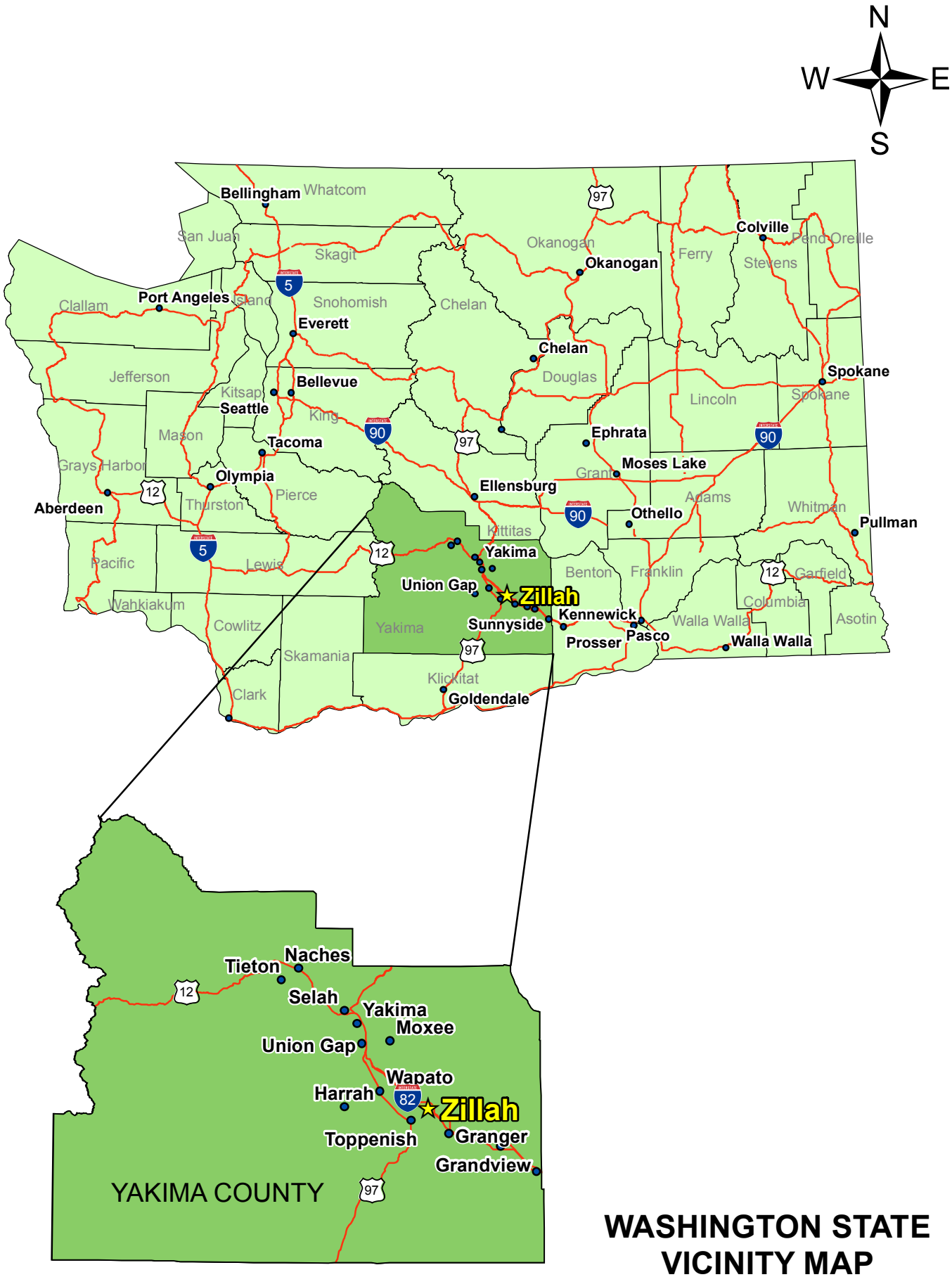
City of Zillah Water System
City of Zillah
503 First Avenue
Zillah, WA 98953
Phone: (509) 829-5151

Mayor: Gary Clark
Public Works Director: Tim Tilley
Water System Manager: Tim Tilley
Water System Identification Number: 99800W

WATER SYSTEM CONSULTING ENGINEER:

Huibregtse, Louman Associates, Inc.
2803 River Road
Yakima, WA 98902
Phone: (509) 966-7000
Project Engineer: Dustin L. Posten, 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 the Miscellaneous Documents Chapter (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

The City of Zillah was incorporated in 1911, after its population grew due to agricultural development with the construction of the Sunnyside canal in the 1890's. The City's water system was first constructed in 1908, when the Third Avenue well was drilled. Table 1-1 provides some information as to the development of Zillah's water system.

TABLE 1-1 MAJOR WATER SYSTEM IMPROVEMENTS

Year	Improvement Description
1908	Zillah water system constructed
1928	75,000 gallon elevated reservoir constructed
1958	Third Avenue Well re-drilled
1958	Rainier Well constructed
1962	75,000 gallon elevated reservoir repaired and repainted
1965	783,000 gallon standpipe reservoir constructed
1986	Third Avenue Well repaired
1987	WIPPCO Well acquired
1991	75,000 gallon elevated reservoir repainted
1998	783,000 gallon standpipe reservoir repainted
2000	Comprehensive Water Plan completed
2002	12-Inch water main to High School completed
2009	Cutler Way 613,000 gallon reservoir constructed
2010	Cutler Way and Zone 2 booster pump stations constructed

Zillah's first Comprehensive Water Plan, completed in 2000, provided the City with an in-depth look at its water system, deficiencies, and potential growth. A Comprehensive Water Plan Update was completed in 2006 in accordance with DOH requirements. This 2014 Water System Plan is intended to update the 2006 Comprehensive Water Plan.

A summary of the growth of Zillah's water system is provided in Table 1-2.

TABLE 1-2 WATER SYSTEM GROWTH SUMMARY

	Year 1993	Year 1997	Year 2005	Year 2013	Percent Increase 1993-2013
Population*	2,129	2,409	2,724*	3,161*	48.5%
Total Water Services		876	962	1,077	- - - -
Total Yearly Metered Consumption	80.4 MG	102.7 MG	127.3 MG	149.06 MG	85.4%
Total Source Capacity	2.30 MGD	2.30 MGD	2.30 MGD	2.30 MGD	0.00%
Total Storage Capacity	0.858 MG	0.858 MG	0.858 MG	1.461 MG	70.28%

* Based on Washington State Office of Financial Management estimates and service to 14 residential customers outside the City Limits with an estimated population of 46.

1.2.2 Geography

The City of Zillah and its Urban Growth Area are located in the Lower Yakima Valley, the eastern part of Yakima County, in the south-central portion of Washington State, as shown on Figure 1-1 State Vicinity Map. The City lies approximately 18 miles southeast of the City of Yakima, just north of Interstate 82. The City is situated at an elevation of 760 - 870 feet above mean sea level. The Yakima River lies just south of the City, and most of the older part of the City is situated on a bench separated from the Yakima River flood plain by a steep bluff.

Zillah's existing and retail water service area boundaries generally corresponds to the current City Limits. Zillah's future retail service area boundary corresponds to its Urban Growth Area Boundary, and is shown on Figure 1-2 Existing and Future Service Area Boundaries.

Like the rest of the Yakima Valley, Zillah and its Urban Growth Area has 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 mean annual precipitation is 7.2 inches. With a warm climate and rich volcanic soils, Yakima County is a significant agricultural region, as well as a recreational area.

Zillah's economy depends largely on the agricultural and wine industry. The City also has a viable commercial and service business community.

1.2.3 Neighboring/Adjacent Purveyors

Residences currently within Zillah's Urban Growth Area, which are not connected to the City's water system, generally utilize individual wells for water supply. Other municipal water systems in the area include the City of Toppenish's municipal water system, located approximately three miles to the southwest, the City of Granger municipal water system, located approximately six miles to the southeast, and the Buena water system (owned and operated by Yakima County), located approximately three miles to the northwest, but directly abutting the City Limits and UGA.

Two parcels within Zillah's Urban Growth Area are also identified in Buena's Water Service Area. Currently the parcel at the southeast corner of Yakima Valley Highway and Buena Road is served by the Buena System. The City of Zillah water system does not extend to these two parcels.

Due to the proximity of the Buena and Zillah water systems to one another, the 2011 Buena Water System Plan noted the possibility of constructing an emergency intertie between the systems including a pressure reducing and metering station. As the Zillah Lakes development expands towards Buena the cost of completing this improvement would be reduced. An intertie would provide emergency service for the Buena system but due to the difference in overflow elevations between the systems (972.6 feet in Zillah vs. 914.5 feet in Buena) the intertie provides limited benefit to the City. Therefore this intertie is not a planned or future improvement in this Plan. Although it is not a planned improvement, it is recommended that the City work with the County should the emergency intertie become a need for the Buena Water System. During planning for an intertie, the Zillah system capacity would need to be evaluated to ensure that the system can support a new emergency demand not currently anticipated. See Section 4.4 of this Plan for additional information.

CITY OF ZILLAH

Water System Plan Update

EXISTING AND FUTURE SERVICE AREA BOUNDARIES

N
W E
S

0 400 800 1,600
Feet

LEGEND

- Zillah City Limits
- Zillah Existing Service Area*
- Zillah Retail Service Area
- Future Service Area (UGA)*
- Future Service Area* (Proposed UGA)
- Toppenish City Limits
- Toppenish UGA Boundary
- Buena - Yakima County Future Service Area
- Buena - Yakima County Rural Settlement Boundary

* WATER RIGHTS PLACE OF USE MATCHES THE EXISTING AND FUTURE SERVICE AREA IN ACCORDANCE WITH RCW 90.03.386

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FIGURE 1-2

1.2.4 Ordinances/Bylaws

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

1. Chapter 13.08 - Water Systems
2. Chapter 13.18 - Utility Standards for Urban Growth Areas
3. Chapter 13.28 - Reduction in Water Billings Due to Leaks
4. Chapter 13.30 - Utility Reimbursement Agreements
5. Chapter 13.34 - Utility Tax Discount
6. Chapter 13.38 - Infrastructure Improvement Program
7. Ordinance 635 - Cross Connections
8. Ordinance 913 - Utility Reimbursement Agreements
9. Ordinance 916 - Cross Connection Control manual
10. Ordinance 946 - Charges for Water Service
11. Ordinance 1045 - Water System Connection Within the Urban Growth Area
12. Ordinance 1060 - Utilization of Temporary Water Meters During Construction
13. Ordinance 1077 - Water Service, Sewer Service, and Garbage Service Tax Rates
14. Ordinance 1084 - Water Connections
15. Ordinance 1162 - Water Service Improvement Capital Cost Recovery Areas
16. Ordinance 1284 - Water Rates

Copies of these Zillah City Code chapters and of the resolutions are included in the Miscellaneous Documents Chapter (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 Zillah domestic water system consists of two distribution pressure zones between elevations 760 feet to 920 feet (as shown on Figure 3-1 later within this Plan) which is served by an elevated steel storage tank, a steel standpipe, a ground level standpipe, and the Zone 2 constant pressure booster station. The combined nominal capacity of the three reservoirs is 1,471,000 gallons. Static service pressures within the water system, under normal operating conditions, range from a minimum of 42 psi to a maximum of 92 psi in pressure Zone 1 and a minimum of 50 psi in pressure Zone 2. In 2013, there were 1,077 total services in the Zillah water system.

The City is supplied water from three City-owned source wells. The maximum pumping capacity of the three wells is 1,600 gallons per minute (GPM) or 2.30 million gallons per day (MGD). The City's current telemetry system controls the activity of the wells based on the water level in the steel standpipe.

The existing transmission and distribution system is looped where possible and consists of mainly 6-inch and 8-inch PVC, asbestos-cement, or galvanized iron pipes. Currently, Zillah has no interties with neighboring water purveyors. A more detailed description of Zillah's water system is presented in Chapter 3 of this Plan. A map of Zillah'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 2000, which provided Zillah with the most current in-depth look at its water system, deficiencies, and potential growth. An Update of the 2000 Comprehensive Water Plan was completed in 2006.

1.4.2 Water System Plans for Adjacent Water Systems

The City of Granger, Zillah's municipal neighbor located six miles southeast of Zillah, adopted its current water system plan in 2010, the City of Toppenish, located three miles to the southwest, adopted its current water system plan in 2011, and the community of Buena (owned and operated by Yakima County) located approximately three miles to the northwest, adopted its current water system plan in 2013. There are currently no water service area agreements between any of these neighboring communities and the City of Zillah.

1.4.3 Urban Growth Area Comprehensive Plan

The City of Zillah completed and adopted its Growth Management Act Comprehensive Plan in 2006. 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.

In its Urban Growth Area Comprehensive Plan, the City of Zillah updated its Urban Growth Area with a proposed new boundary. This proposed area is located northeast of the existing UGA and extends out to the Yakima Valley Highway. The City of Zillah has the ability to serve this proposed area and has considered expanding its existing UGA to the proposed UGA boundary to accommodate the expected growth of the City. Designation of land uses are also discussed in the Plan and the results are reflected in the City's future zoning.

1.4.4 Wellhead Protection Program

In 2000, the City of Zillah 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. Identification of the wellhead protection areas for each well;
2. An inventory of potential ground water contaminant sources;
3. A contingency plan which includes short and long-term alternate water sources, and emergency and spill response procedures; and
4. A local wellhead protection management plan.

1.4.5 General Sewer Plans

In 2012, the City of Zillah completed a General Sewer Plan for the City and its Urban Growth Area. This document:

1. Describes the existing and future sewer service areas (Urban Growth Area);
2. Describes existing conditions including the condition and location of existing trunk and interceptor sewers, pumping stations, the collection system, current system operation and maintenance, problem areas, and evaluates the existing system using a computer model;
3. Forecasts future wastewater loadings based upon growth projections;
4. Recommends a wastewater system improvement plan and a financial plan; and
5. Includes design standards for recommended wastewater collection system improvements.

The General Sewer Plan provides Zillah with one component of its Capital Improvement Plan for providing future services within both the City and the Urban Growth Area, and is the wastewater counterpart to the Water System Plan.

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 is 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 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 Zillah 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* (Plan). Elements of the Plan 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 Plan.

The *Final Programmatic Environmental impact Statement* (FPEIS) was issued in March 2012 for the Plan. 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 *Yakima River Basin Integrated Water Plan*. 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.

This City of Zillah Water System Plan is consistent with the Yakima River Basin Watershed Management Plan.

1.5 SERVICE AREA AGREEMENTS

There are currently no other water purveyors within Zillah's UGA with the exception of the two parcels in Buena's water service area as discussed in Section 1.2.3. Zillah currently has no water service area agreements with its nearest municipal neighbors, the City of Granger, located six miles to the southeast, or with the City of Toppenish, located three miles to the southwest, or with Yakima County's Buena water system, located three miles to the northwest.

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 Zillah 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 their Future Service Area (Urban Growth Area) under the following conditions:

    a. 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 "Extension by Developers" which is provided in the Miscellaneous Documents Chapter (Chapter 10) of this Plan.
    b. 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.
    c. The City maintains adequate water rights capacity per DOH's required "water rights self-assessment" to serve the proposed property/properties.
    d. The City maintains adequate physical source and/or storage capacity to serve the proposed property/properties.
    e. The proponent/developer shall transfer all potable water rights associated with the property/properties to the City.
    f. 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.
    g. 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 the 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:

    a. Upsizing existing water mains.
    b. Looping of the distribution system by installing new water mains.
    c. 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, as long as the facilities do not extend outside the City's established service area.

5. The City has established a process for the administration of reimbursement agreements for developers using private funds to construct a public utility and/or street improvement, as described in Ordinance No. 913. Under this ordinance the developer may apply to the City for a reimbursement agreement in order to recover/share the construction costs with other property owners later benefiting from the improvements.

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 will not wholesale water to other utilities.

8. The City may provide water service to properties outside the City Limits in accordance with Chapter 13.08.065 of the Zillah Municipal Code and Ordinance 1284. A copy of these documents is provided in the Miscellaneous Documents Chapter (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. (Ordinance No. 1284, provided in the Miscellaneous Documents Chapter [Chapter 10] of this Plan establishes rates for services both within and outside the City Limits).

9. 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 factors such as:

    a. Possibility of extending water service to the area and annexing the property;
    b. Construction materials, standards, and specifications of the satellite system;
    c. Condition of the various components of the satellite system including, but not limited to, pipes, valves, pumps, reservoirs, and sources of supply;
    d. Easements and access of the satellite system;
    e. Fire protection capability of the satellite system;
    f. Cross-connection control of the satellite system;
    g. Specific operation, management or contract service responsibilities to be provided; and
    h. 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 in the Water System Plan.

10. 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 Zillah 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. However, the City has no specific plans at this time to become a satellite management agency. If and when Zillah 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

Persons requesting water service shall complete a utility connect order form 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

Zillah operates and maintains a written record of water system complaints. This system is administered by the City's Public Works Department. Zillah's complaint response program is discussed in more detail in Chapter 6 of this Plan.

1.10 DUTY TO SERVE

The City of Zillah is committed to providing water service to those persons and commercial and industrial establishments in accordance with City Code Chapter 13.08, 13.18, 13.28, 13.30, 13.34 and 13.38. Copies of these City codes are included within the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

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

1. Service Requests – Applications for water service within the City and within the UGA are addressed in accordance with City Code Chapter 13.18. Applicants are required to complete a City of Zillah Utility Connect Order form. A copy of this form is included within the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

2. 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 to provide service.

3. Conditions of a Non-Technical Nature – Conditions for connection to the City's water system are addressed in accordance with City Code Chapter 13.08, 13.18, 13.28, 13.30, and 13.34. Copies of these City code chapters are included within the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

4. 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 AND WATER DEMAND FORECASTING

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 as shown on Figure 1-2. The Existing Service Area is approximately 1,315 acres, most of which is within the City Limits. Figure 3-1 and Map A, in the back pocket of this Plan, shows the existing Zillah water system, including the general location of water mains, valves, fire hydrants, wells, and reservoirs.

2.1.1 Existing Zoning

The Zillah City Limits include an area of approximately 1,129.1 acres. Existing zoning within the City is presented in Table 2-1, and is shown on Figure 2-1 Existing Zoning Map. The City of Zillah UGA includes an area of approximately 874.0 acres.

TABLE 2-1 EXISTING ZONING WITHIN ZILLAH CITY LIMITS *

Zoning Category	Total Acreage	Percent of Total
Single-Family Residential (R-1)	291.1	31%
Two-Family Residential (R-2)	26.0	3%
Multi-Family Residential (R-3)	25.6	3%
Commercial (C-1)	66.8	7%
Commercial Tourism (CT)	293.8	31%
Light Manufacturing (M-1)	58.6	6%
Public Lands/Church Zone (PC)	126.3	13%
Suburban (SR)	59.7	6%
TOTAL	947.9	100%

* Source: Yakima County Geographic Information Services, April, 2013.
Note: The gross land within the City Limits is 1,129.1 acres. Remaining un-zoned land includes streets, right-of-ways, portions of the I-82 highway, the SVID canal, and remote, extremely limited areas.

As shown in Table 2-1, commercial tourism is the largest zoned area within the City Limits, comprising approximately 293.8 acres, 31% of the land. Residentially zoned areas make up approximately 342.7 acres (36.1%) of the land within the City Limits.

2.2 FUTURE SERVICE AREA

The Future Service Area boundary for the City of Zillah water, as described in Section 1.2.2, generally corresponds to the City's Urban Growth Area (UGA), as adopted in the 2006 Comprehensive Plan and modified thereafter. The Future Service Area/UGA boundary is shown on Figure 1-2 and Figure 2-2.

2.2.1 Future Land Use

As part of the City's 2006 Comprehensive Plan, Zillah developed a future land use map for areas within the City Limits and the UGA. Since then the future land use map has been updated as shown in Figure 2-2. A breakdown of the future land use within the City Limits is presented in Table 2-2, and a breakdown of the future land use within the UGA is presented in Table 2-3.

TABLE 2-2 FUTURE LAND USE WITHIN ZILLAH CITY LIMITS*

Land Use Category	Total Acreage	Percent of Total
Non-Residential	241.8	21.7%
Residential	474.9	42.6%
Mixed Land Use	229.1	20.6%
Undesignated / Undefined	168.2	15.1%
TOTAL	1114.0	100%

* Source: Yakima County Geographic Information Services, April, 2013.

TABLE 2-3 FUTURE LAND USE WITHIN ZILLAH'S URBAN GROWTH AREA*

Land Use Category	Total Acreage	Percent of Total
Non-Residential	155.1	13.9%
Residential	599.7	53.8%
Mixed Land Use	0	0.0%
Undesignated / Undefined	119	10.7%
TOTAL	873.8	78%

* Source: Yakima County Geographic Information Services, April, 2013.

As shown on Table 2-3, residential areas are the largest future land use total within Zillah's UGA, comprising approximately 599.7 acres (53.8% of the land within the UGA).

Future Land Use within the City Limits and the UGA is shown on Figure 2-2 Future Land Use Map.

CITY OF ZILLAH

Water System Plan Update

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EXISTING ZONING MAP LEGEND

- Zillah City Limits
- Zillah UGA Boundary
- Zillah Proposed UGA
- Toppenish City Limits
- Toppenish UGA Boundary
- Buena - Yakima County Rural Settlement Boundary

CITY ZONING

- Commercial (C-1)
- Commercial Tourism (CT)
- Light Manufacturing (M-1)
- Public Lands/Church Zone (PC)
- Single Family Residential (R-1)
- Two Family Residential (R-2)
- Multi-Family Residential (R-3)
- Suburban Residential (SR)

COUNTY ZONING

- Agriculture (AG)
- Commercial (C)
- Single Family Residential (R-1)
- Two Family Residential (R-2)
- Remote/Limited Development Potential (RLDP)
- Rural Settlement (RS)

HLA
Huibregtse, Louman Associates, Inc.
Civil Engineering ◆ Land Surveying ◆ Planning

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www.hlacivil.com

07-23-14
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FIGURE 2-1

CITY OF ZILLAH

Water System Plan Update

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FUTURE LAND USE MAP

LEGEND

- Zillah City Limits
- Zillah UGA Boundary
- Zillah Proposed UGA
- Toppenish City Limits
- Toppenish UGA Boundary
- Buena - Yakima County Rural Settlement Boundary
- Mixed Land Use
- Non-Residential
- Residential

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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 Zillah was 2,964, an increase of approximately 34.9% (or 766 people) since 2000. Zillah's growth rate for the period 2000-2010 was approximately 3.0% per year (34.9% for the ten-year period). Historical growth in Zillah has averaged 1.9% per year since 1920. Population trends for the City of Zillah, Yakima County, and the State of Washington for the period 1920 through 2010 are presented in Table 2-4.

TABLE 2-4 POPULATION TRENDS*

Year	City of Zillah		Yakima County		State of Washington	
	Population	Percent Change	Population	Percent Change	Population	Percent Change
1920	647		63,710		1,356,621	
1930	728	12.5%	77,402	21.5%	1,563,396	15.2%
1940	803	10.3%	99,109	27.9%	1,736,191	11.1%
1950	911	13.4%	135,723	37.1%	2,378,963	37.0%
1960	1,059	16.2%	145,112	6.9%	2,853,214	19.9%
1970	1,138	7.5%	145,212	0.1%	3,413,244	19.6%
1980	1,599	40.5%	172,508	18.8%	4,132,353	21.1%
1990	1,911	19.5%	188,823	9.5%	4,866,692	17.8%
2000	2,198	15.0%	222,581	17.9%	5,894,121	21.1%
2010	2,964	34.9%	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 and each county and city. OFM population estimates for Zillah, Yakima County, and the State of Washington for the period 2011 through 2013 are presented in Table 2-5.

TABLE 2-5 OFM POPULATION ESTIMATES*

Year	City of Zillah		Yakima County		State of Washington	
	Population	% Change	Population	% Change	Population	% Change
2011	3,000	1.2%	244,700	0.6%	6,767,900	0.6%
2012	3,035	1.2%	246,000	0.5%	6,817,770	0.7%
2013	3,115	2.6%	247,250	0.5%	6,882,400	0.9%

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

Zillah's population growth has slowed in the last three years after an average of 2.3% growth per year from 2004 to 2009. The population of Zillah has increased 23% since 2001, with an estimated 2013 population of 3,115 persons. Reasons for the increase include the construction of the Zillah Lakes development and the continuing growth of the wine industry in the area.

The Washington Office of Financial Management (OFM) estimates the total population within the City of Zillah in 2013 was 3,115. That same year, there were a total of 962 residential water services which included 14 residential services outside the City Limits. Assuming the household size of the 14 outside residential services was similar to that within the City (3.28 persons per residential service, based upon

the 2013 population estimate), the water system service population in 2013 was 3,115 + 14 x 3.28 = 3,161. The estimated population including outside services is used as the basis for projecting the future population and water service population in both the City and UGA.

2.3.2 Future Population

The Yakima County Planning Division provides the County-Wide Planning Policy Committee population projections for each community within Yakima County for the year 2025. In 2002 a population estimate for the year 2025 of 3,222 was made for Zillah. In 2006, the County recognized that this projection was low, and revised the year 2025 projection to 4,019 based on a straight line population increase of 72.8333 people per year (as experienced from 2000 to 2006). Converted to an average annual population increase, this is approximately equal to a 2.15% increase per year from the 2013 OFM estimate to 2025. The County's straight line projection for the City population in 2010 was 2,926, but the City's population was actually 2,964 according to the 2010 Census results provided by the U.S. Census Bureau. For 2011, the County's projection anticipated a population of 2,999, which is consistent with the OFM projection of 3,000. Although the County's projections have been reasonably accurate to date, the City believes that the population increase will be greater than the County projections.

The City's population growth estimate is based on a 2.7% average annual population increase due to the continued build-out of the Zillah Lakes planned development, and the evidence of higher grow rates from 2000 to 2010 where the average annual population increase was equal to a 3.0% increase per year. Although the City and County projections are inconsistent, the limited population difference of 91 additional persons in 2020 has no impact on the recommended improvements contained in this Plan. Additionally, the potential 'lost' revenue using the County's lower population projections would result in an estimated 1% revenue reduction which would not have a significant impact on financial strategies discussed later in this Plan. For these reasons the City's projected future population for water system planning purposes is based on the City growth estimate of 2.7% as shown in Table 2-6.

TABLE 2-6 CITY POPULATION PROJECTIONS

Year	Future Population	% Increase from Previous Year	Year	Future Population	% Increase from Previous Year
2014	3,199	2.7%	2025	4,288	2.7%
2015	3,285	2.7%	2026	4,404	2.7%
2016	3,374	2.7%	2027	4,523	2.7%
2017	3,465	2.7%	2028	4,645	2.7%
2018	3,559	2.7%	2029	4,771	2.7%
2019	3,655	2.7%	2030	4,900	2.7%
2020	3,754	2.7%	2031	5,032	2.7%
2021	3,855	2.7%	2032	5,168	2.7%
2022	3,959	2.7%	2033	5,307	2.7%
2023	4,066	2.7%	2034	5,451	2.7%
2024	4,176	2.7%	2035	5,598	2.7%

2.4 CURRENT AND FUTURE WATER SERVICES

2.4.1 Current Water Services

The location of the population of a purveyor whose water system includes multiple distribution pressure zones is critical in assessing the demands on the various water system components. The City generally determines the population location by identifying user categories and number of water services within each pressure zone. 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.

TABLE 2-7 WATER USER CATEGORIES
User Category
Single-Family Residential
Multi-Family Residential
Commercial
Industrial
Churches
City

The number of water services by user category per distribution pressure zone for the year 2013 is shown in Table 2-8.

TABLE 2-8 YEAR 2013 WATER SERVICES BY USER CATEGORY PER PRESSURE ZONE			
User Category	Zone 1	Zone 2	Total
Single-Family Residential	829	19	848
Multi-Family Residential	114	0	114
Commercial	90	0	90
Industrial	0	0	0
Churches	8	1	9
City	16	0	16
Total	1,057	20	1,077

2.4.2 Future Water Services

The number of residential water services within the City Limits is anticipated to increase consistent with the 2.7% population growth rate projection. However, increases in population per pressure zone will vary depending on the availability of undeveloped land and potential for new home construction. Based on available land and planned development, residential construction will most likely occur within Zone 1 at the Zillah Lakes area with some infill. Although substantial residential development is not anticipated in Zone 2, each new development or residence would have a proportionally greater effect on this smaller zone. Therefore, more specific future service projections have been included based on discussions with City officials about potential future developments. For the Zone 2 projections herein, a 20 unit multi family housing project is assumed to be completed by 2019, with an additional 1 unit each year thereafter. Additionally, it is assumed 1 additional single family residence will be constructed, or connected to the zone each year. Locations of anticipated future residential water services for the years 2019, 2023, and 2033 were determined based on these assumptions.

The City of Zillah currently provides water service to a limited number of customers outside of the City Limits. In 2012 the City annexed the Nugent and Alteejen areas which previously had contained the largest number of services outside the City Limits. There is not a significant residential population in the UGA, however it is likely the City will continue to serve some residences outside the City Limits. Currently the City serves 14 residential connections outside city limits and it is assumed this will remain constant.

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 similar to the population growth rate. The locations of these future services were determined based on the existing zoning and future land uses within the City. Future water services by user category per distribution pressure zone for the years 2019, 2023, and 2033 are shown in Table 2-9, Table 2-10, and Table 2-11, respectively.

TABLE 2-9 YEAR 2019 WATER SERVICES BY USER CATEGORY PER PRESSURE ZONE			
User Category	Zone 1	Zone 2	Total
Single-Family Residential	967	24	991
Multi-Family Residential	114	4	118
Commercial	93	0	93
Industrial	11	0	11
Churches	10	1	11
City	19	0	19
Total	1,214	29	1,243

TABLE 2-10 YEAR 2023 WATER SERVICES BY USER CATEGORY PER PRESSURE ZONE			
User Category	Zone 1	Zone 2	Total
Single-Family Residential	1,074	29	1,103
Multi-Family Residential	126	5	131
Commercial	103	0	103
Industrial	12	0	12
Churches	11	1	12
City	21	0	21
Total	1,347	35	1,382

TABLE 2-11 YEAR 2033 WATER SERVICES BY USER CATEGORY PER PRESSURE ZONE			
User Category	Zone 1	Zone 2	Total
Single-Family Residential	1,400	39	1,439
Multi-Family Residential	164	7	171
Commercial	135	0	135
Industrial	15	0	15
Churches	15	1	16
City	26	0	26
Total	1,755	47	1,802

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 Zillah are metered. Production meters are typically read daily and consumption meters are read monthly.

2.5.1 Current Water Consumption

Currently, water consumption data is maintained by a computer database at Zillah City Hall. Services are divided into and billed based upon user category. For the purposes of this Plan, data for the various user categories was broken out into the following categories:

1. Single-Family Residential
2. Multi-Family Residential
3. Commercial
4. Industrial
5. Churches
6. City
7. Parks (City sub-category)
8. WWTP Water (City sub-category)

In 2013, due to the new billing system, the City combined the Industrial and Commercial categories. For 2014 and beyond the City will again track the industrial users separately for use in future Plan updates. The data and projections used in this Plan will maintain a separate category which matches the majority of the data available.

The number of metered water services by user category for the period 2007 through 2013 is presented in Table 2-12. As can be seen in this Table, the total number of metered water services has increased each year, reflecting annual growth in the City. The one exception is between 2011 and 2012. The number of services actually decreased due to a revision in the City's billing system which affected the number of services reporting. The data has been reported herein, but is excluded in the user category average and subsequent calculations.

TABLE 2-12 AVERAGE METERED WATER SERVICES BY USER CATEGORY 2007-2013

User Category	2007	2008	2009	2010	2011	2012	2013	Average*
Single-Family Residential	779	809	822	834	841	804	848	822
Multi-Family Residential	86	88	88	90	87	70	114	92
Commercial	75	74	77	78	80	72	90	77
Industrial	7	9	9	9	9	9	0	8
Churches	10	10	10	11	11	9	8	10
City	8	8	8	8	7	8	9	8
Parks	5	6	5	6	7	6	6	6
WWTP Utility	1	1	1	1	1	1	1	1
Total	971	1,005	1,019	1,037	1,044	979	1,077	1,025

*Note: Commercial and Industrial average's exclude 2013 because Industrial was included in Commercial. Additionally, due to the reporting system revisions, all 2012 data is excluded.

The annual volume of water consumed (in million gallons per year) by user category for the period 2007 through 2013 is presented in Table 2-13.

TABLE 2-13 ANNUAL WATER CONSUMPTION BY USER CATEGORY 2007-2013
(values are in million gallons per year)

User Category	2007	2008	2009	2010	2011	2012	2013	Average*
Single-Family Residential	53.196	53.355	54.606	52.748	53.032	54.401	54.244	53.655
Multi-Family Residential	9.250	8.101	8.574	8.913	8.441	9.151	9.235	8.809
Commercial	20.775	19.059	24.708	20.131	25.093	15.073	45.477	20.807
Industrial	3.768	4.111	6.790	18.940	33.145	22.520	0.000	14.879
Churches	1.006	0.916	0.765	1.099	0.744	0.566	1.018	0.873
City	2.474	1.226	1.988	1.033	1.877	1.092	1.323	1.573
Parks	24.821	28.665	25.467	26.711	27.903	34.609	33.014	28.741
WWTP Utility	4.985	4.812	4.390	4.637	4.701	3.493	4.752	4.538
TOTAL	120.275	120.244	127.288	134.212	154.935	140.906	149.063	133.876

*Note: Commercial and Industrial average's exclude 2013 because Industrial was included in Commercial.

During the period 2007 through 2013, the total number of services increased from 971 to 1,077 (a 10.9% increase), and the volume of water consumption increased from 120.275 MG to 149.063 MG (a 23.9% increase).

The average day water consumption per service by user category (in gallons per service per day) for the period 2007 through 2013 is presented in Table 2-14. It can be seen from Table 2-14 that the average day consumption per service for residential and city user categories has declined between 2007 and 2013, while the other categories have fluctuated or increased. As noted previously, the number of services decreased in 2012 for all user categories due to a revision in the City's billing system; this increased the gallons per service per day calculations for that year.

TABLE 2-14 AVERAGE DAY WATER CONSUMPTION BY USER CATEGORY 2007-2013
(values are in gallons per service per day)

User Category	2007	2008	2009	2010	2011	2012	2013	Average*
Single-Family Residential	187	180	182	173	173	186	175	178
Multi-Family Residential	295	250	267	270	265	378	223	262
Commercial	761	707	865	703	845	572	1,364	776
Industrial	1,385	1,256	2,058	5,702	9,995	6,860	0	4,079
Churches	277	251	209	276	185	178	348	258
City	848	395	665	366	716	348	412	567
Parks	7,623	10,187	8,185	7,622	7,000	9,709	8,887	8,251
WWTP Utility	13,663	13,194	12,067	12,743	12,933	9,557	12,999	12,933

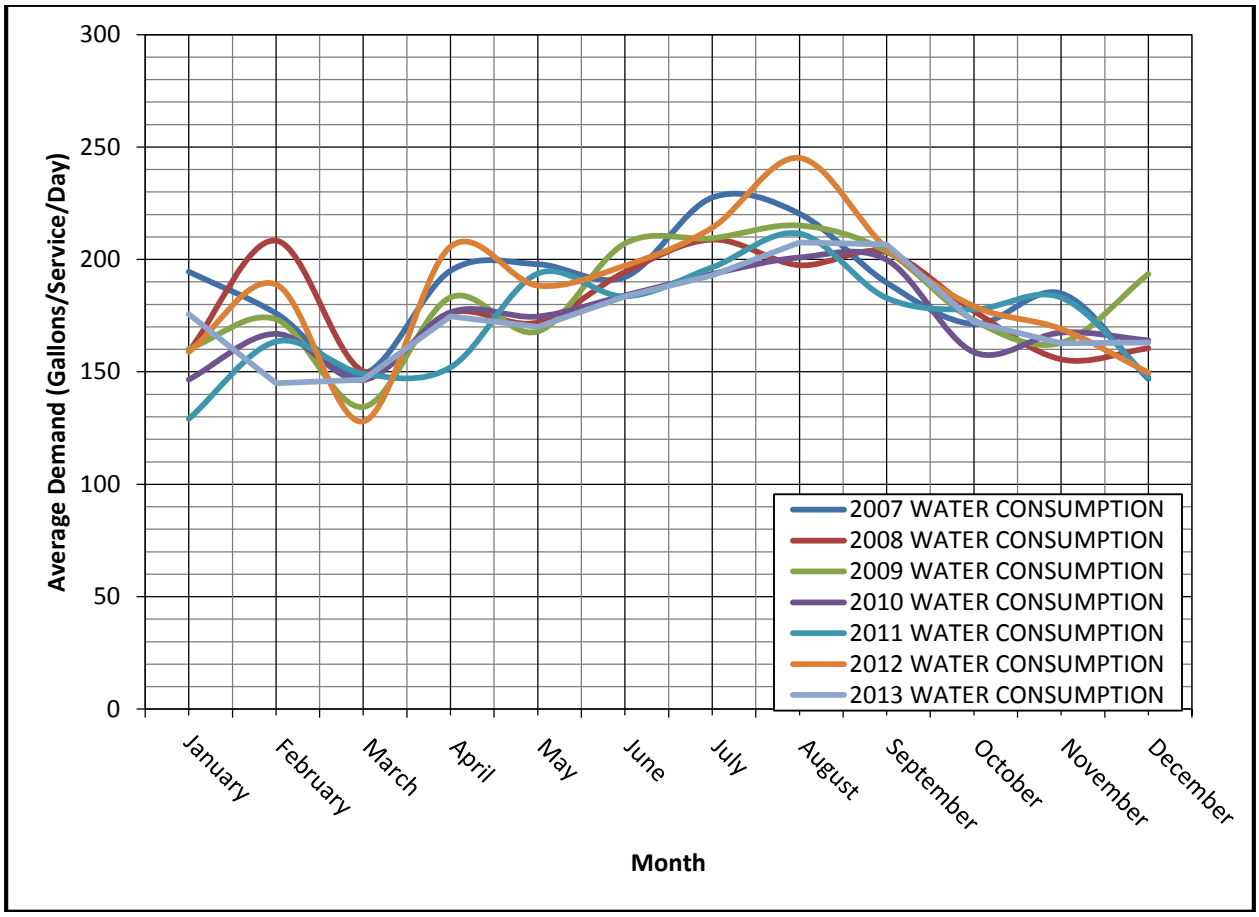
*Note: Commercial and Industrial average's exclude 2013 because Industrial was included in Commercial. Additionally, due to the reporting system revisions, all 2012 data is excluded.

During the period 2007 through 2013, residential water consumption fluctuated year to year, but decreased from 187 gallons per service per day to 175 gallons per service per day (a decrease of 6.4%) as shown in Table 2-14.

2.5.2 Seasonal Water Consumption

Water consumption in the City of Zillah varies throughout the year with the seasons, but not drastically. A separate non-potable irrigation system is available to most properties within the City, so domestic water is generally not used for irrigation. Figure 2-3 shows the seasonal change in residential consumption per service from 2007 through 2013.

FIGURE 2-3 RESIDENTIAL SEASONAL CONSUMPTION



2.5.3 Maximum and Peak Consumption

Between the years 2007 and 2013, year 2011 was the largest annual consumption on record, as a total of 155.2 million gallons (MG) was consumed. The maximum month of water consumption in the same time period was experienced in July 2011 when 30.690 MG of water was consumed. A breakdown of water consumption by user category for July 2011 is shown in Table 2-15.

TABLE 2-15 MAXIMUM MONTH WATER CONSUMPTION, JULY 2011

	Number of Services	Maximum Month Consumption (million gallons)	Average Day Consumption (gallons)	Maximum Month Consumption per Service (gallons)	Average Day Consumption per Service (gallons)
Single-Family Residential	845	5.147	166,019	6,091	196
Multi-Family Residential	88	0.921	29,708	10,465	338
Commercial	82	4.715	152,108	57,504	1,855
Industrial	9	13.478	434,766	1,497,528	48,307
Churches	11	0.056	1,806	5,089	164
City	7	0.160	5,166	22,878	738
Parks	12	5.839	188,357	486,590	15,696
WWTP Utility	1	0.374	12,060	373,850	12,060
Total	1,055	30.690	989,991	29,090	938

August 2011 was the second highest month of consumption in the last seven years, when 27.835 MG was consumed, not far behind the July 2011 demand of 30.690 MG. The maximum day of recorded water production within the maximum month was July 8, 2011 when 1.255 MG was pumped into the system. Utilizing the percentage breakdown of demand per user category from the July 2011 consumption data, maximum day demand (MDD) was calculated as shown in Table 2-16. The average distribution system leakage (DSL) percentage for 2011 (15.67%) was subtracted from the maximum day of water production to calculate MDD for each user category.

Peak hour demand (PHD), also shown in Table 2-16, has been calculated by multiplying the maximum day demand by a factor of 1.8 and dividing by 1,440 minutes per day. A peaking factor of 1.8 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.

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

C = 1.6, Coefficient associated with Range of ERUs, (*WSDM, Table 5-1 >500 ERUs)*
N = 5,034, Number of ERUs (ERUs for the maximum month)
F = 225, Factor associated with Range of ERUs, (*WSDM, Table 5-1 >500 ERUs)*
MDD_{ERU} = 210 gpd/ERU, Maximum Day Demand, (*1.058 MG / 5,034 ERUs)*

PHD = 1,225 gpm
Peaking Factor = PHD / MDD_{gpm} => 1,225 gpm / 735 gpm = 1.67

For calculations a peaking factor of 1.8 is used.

TABLE 2-16 MAXIMUM DAY AND PEAK HOUR WATER CONSUMPTION, JULY 8, 2011					
	No. of Services	Maximum Day Consumption (gallons)*	Maximum Day Con-sumption per Service (gallons)	Peak Hour Demand (GPM)	Peak Hour Demand per Service (GPM)
Single-Family Residential	845	177,482	210	222	0.3
Multi-Family Residential	88	31,760	361	40	0.5
Commercial	82	162,610	1,983	203	2.5
Industrial	9	464,783	51,643	581	64.6
Churches	11	1,930	175	2	0.2
City	7	5,522	789	7	1.0
Parks	12	201,362	16,780	252	21.0
WWTP Utility	1	12,893	12,893	16	16.1
TOTAL	1,055	1,058,342	1,003	1,323	1.3

* 1.255 MG production less 15.67% DSL (2011 average DSL) to arrive at a maximum day consumption of 1.058 MG

2.5.4 Water Production

Annual water production by source well for the period 2007 through 2013 is presented in Table 2-17. As can be seen from this table, the City predominantly uses Rainier and WIPPCO Wells. The 3rd Avenue Well was not used in the past seven years due to aesthetic water quality issues (sulfur). The investigation and rehabilitation of the 3rd Avenue Well is a priority improvement as discussed in Chapter 8 to address this issue.

TABLE 2-17 ZILLAH ANNUAL WATER PRODUCTION 2007-2013 (values are in million gallons)							
Well Name (Source No.)	2007	2008	2009	2010	2011	2012	2013
Rainier Well No. 1 (S01)	1.80	88.16	128.98	124.88	127.23	144.59	156.45
3rd Avenue Well No. 2 (S02)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WIPPCO Well (S03)	133.90	56.76	33.99	34.95	56.76	7.93	19.25
TOTAL	135.70	144.92	162.98	159.83	183.99	152.52	175.70

2.5.5 Distribution System Leakage (DSL)

Table 2-18 shows annual water production, annual metered water consumption, estimated unmetered water consumption, and the difference between production and total authorized consumption, including the DSL percentage. The City of Zillah tracks the estimated authorized consumption from unmetered uses such as water main flushing, fire department use, reservoir turnover and other uses. Water production from Zillah's source wells for the period 2007 through 2013 totaled 1,115.64 million gallons. Metered consumption during that same time period totaled 946.92 million gallons and estimated unmetered water consumption totaled 3.99 million gallons. The difference between production and authorized consumption for that period was 164.72 million gallons, or 14.77% of total water production for the period. The average DSL for the past three years (2011-2013) is lower at 12.61%.

TABLE 2-18 ZILLAH WATER PRODUCTION AND CONSUMPTION 2007-2013
(values are in million gallons)

Year	Production	Consumption	Estimated Unmetered	DSL	% DSL
2007	135.70	120.28	0.03	15.40	11.35%
2008	144.92	120.24	0.29	24.38	16.83%
2009	162.98	127.29	0.72	34.97	21.46%
2010	159.83	134.21	0.23	25.39	15.89%
2011	183.99	154.93	0.29	28.77	15.64%
2012	152.52	140.91	1.26	10.35	6.79%
2013	175.70	149.06	1.18	25.46	14.49%
Total	1,115.64	946.92	3.99	164.72	-
Average	159.38	135.27	0.57	23.53	14.77%
3-Yr. Ave.	170.74	148.30	0.91	21.53	12.61%

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 day) being considered. As discussed previously, maximum day and peak hour demands were calculated from the maximum day of production in the last seven years. 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 both ADD and peak day demand (MDD and PHD) have been calculated as shown in Table 2-19. This ERU information is useful for forecasting and analyzing future water system demand.

Residential ADD per service values from the last seven years vary from a high of 187 gallons per service per day to a low of 173 gallons per service per day. Even more variation in consumption per service occurs in the other user categories. Because of this variation in ADD, the average ADD from each user category for the period 2007 through 2013 from Table 2-14 was used in Table 2-19.

The peak day demand per service provided in Table 2-19 is based upon the calculated demand for July 8, 2011, which was the highest recorded day of production in the last seven years.

TABLE 2-19 EQUIVALENT RESIDENTIAL UNIT FACTORS (ERUS)				
User Category	ADD		Peak Day (MDD & PHD)	
	(GPD/Service)[a]	ERUs	(GPD/Service)[b]	ERUs
Single-Family Residential	178	1.0	210	1.0
Multi-Family Residential	262	1.5	361	1.7
Commercial [c]	776	4.4	1,983	9.4
Industrial [c]	4,079	22.9	51,643	245.9
Churches	258	1.4	175	0.8
City	567	3.2	789	3.8
Parks	8,251	46.3	16,780	79.9
WWTP Utility	12,933	72.5	12,893	61.4

[a] ADD values based upon 2007 through 2013 average (excluding 2012)

[b] Peak Day demand is based upon calculated demand for July 8, 2011 as provided in Table 2-16.

[c] Average GPD/Service excludes 2013 because those User Categories have been combined.

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 residential, outside residential and commercial water services, and the annual average day, maximum day, and peak hour water demand. As discussed previously, the population projections for the City of Zillah are assumed to be an annual growth rate of 2.7%.

The demographics and climate of Zillah are not anticipated to change in the future, so those factors are not expected to significantly impact future water system demand.

2.6.1 Future ERUs and ADD

The future number of water system services, ERUs and ADD, are calculated from the population projections provided in Section 2.3.2, Section 2.3.3 and the average day demand (ADD) per ERU by user category, provided in Table 2-19.

The calculated future number of services, ERUs and projected ADD for years 2019, 2023 and 2033 are presented in Table 2-20, Table 2-21 and Table 2-22, respectively. To accommodate the 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 2-20 YEAR 2019 ERUS AND ADD

User Category	2019 Services	ERUs/ Service	ADD/Service (gallons)	ERUs	Total ADD (gallons)
Single-Family Residential	991	1.0	178	991	176,398
Multi-Family Residential	118	1.5	262	177	30,916
Commercial	93	4.4	776	409	72,168
Industrial	11	22.9	4,079	252	44,869
Churches	11	1.4	258	15	2,838
City	10	3.2	567	32	5,670
Parks	8	46.4	8,251	371	66,008
WWTP Utility	1	72.7	12,933	73	12,933
Subtotal	1,243			2,320	411,800
10% Contingency					41,180
TOTAL	1,243			2,320	452,980

TABLE 2-21 YEAR 2023 ERUS AND ADD

User Category	2023 Services	ERUs/ Service	ADD/Service (gallons)	ERUs	Total ADD (gallons)
Single-Family Residential	1,103	1.0	178	1,103	196,334
Multi-Family Residential	131	1.5	262	197	34,322
Commercial	103	4.4	776	453	79,928
Industrial	12	22.9	4,079	275	48,948
Churches	12	1.4	258	17	3,096
City	11	3.2	567	35	6,237
Parks	9	46.4	8,251	418	74,259
WWTP Utility	1	72.7	12,933	73	12,933
Subtotal	1,382			2,570	456,057
10% Contingency					45,606
TOTAL	1,382			2,570	501,663

TABLE 2-22 YEAR 2033 ERUS AND ADD					
User Category	2033 Services	ERUs/ Service	ADD/Service (gallons)	ERUs	Total ADD (gallons)
Single-Family Residential	1,439	1.0	178	1,439	256,142
Multi-Family Residential	171	1.5	262	257	44,802
Commercial	135	4.4	776	594	104,760
Industrial	15	22.9	4,079	344	61,185
Churches	16	1.4	258	22	4,128
City	14	3.2	567	45	7,938
Parks	11	46.4	8,251	510	90,761
WWTP Utility	1	72.7	12,933	73	12,933
Subtotal	1,802			3,283	582,649
10% Contingency					58,265
TOTAL	1,802			3,283	640,914

2.6.2 Future MDD and PHD

Future MDD and PHD for the system was calculated for the years 2019, 2023 and 2033 using the projected number of services for each user category and MDD per service as discussed in Section 2.5.3. Calculated future MDD and PHD values for 2019, 2023 and 2033 are presented in Table 2-23, Table 2-24 and Table 2-25, respectively. To accommodate the 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 2-23 YEAR 2019 MDD AND PHD							
User Category	2019 Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	MDD (gallons)	PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	991	1	991	210	208,110	260	0.3
Multi-Family Residential	118	1.7	201	361	42,598	54	0.5
Commercial	93	9.4	874	1,983	184,419	230	2.5
Industrial	11	245.9	2,705	51,643	568,073	710	64.6
Churches	11	0.8	9	175	1,925	2	0.2
City	10	3.8	38	789	7,890	10	1.0
Parks	8	79.9	639	16,780	134,240	168	21.0
WWTP Utility	1	61.4	61	12,893	12,893	16	16.1
Subtotal	1,243		5,518		1,160,148	1,450	
10% Contingency					116,015	145.0	
TOTAL	1,243		5,518		1,276,163	1,595	

TABLE 2-24 YEAR 2023 MDD AND PHD							
User Category	2023 Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	MDD (gallons)	PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	1,103	1	1,103	210	231,630	290	0.3
Multi-Family Residential	131	1.7	223	361	47,291	60	0.5
Commercial	103	9.4	968	1,983	204,249	255	2.5
Industrial	12	245.9	2,951	51,643	619,716	775	64.6
Churches	12	0.8	10	175	2,100	2	0.2
City	11	3.8	42	789	8,679	11	1.0
Parks	9	79.9	719	16,780	151,020	189	21.0
WWTP Utility	1	61.4	61	12,893	12,893	16	16.1
Subtotal	1,382		6,077		1,277,578	1,597	
10% Contingency					127,758	159.7	
TOTAL	1,382		6,077		1,405,336	1,757	

TABLE 2-25 YEAR 2033 MDD AND PHD							
User Category	2033 Services	ERUs/ Service	Total ERUs	MDD/ Service (gallons)	MDD (gallons)	PHD (GPM)	PHD/ Service (GPM)
Single-Family Residential	1,439	1	1,439	210	302,190	378	0.3
Multi-Family Residential	171	1.7	291	361	61,731	78	0.5
Commercial	135	9.4	1,269	1,983	267,705	334	2.5
Industrial	15	245.9	3,689	51,643	774,645	968	64.6
Churches	16	0.8	13	175	2,800	3	0.2
City	14	3.8	53	789	11,046	14	1.0
Parks	11	79.9	879	16,780	184,580	231	21.0
WWTP Utility	1	61.4	61	12,893	12,893	16	16.1
Subtotal	1,802		7,694		1,617,590	2,022	
10% Contingency					161,759	202.2	
TOTAL	1,802		7,694		1,779,349	2,225	

2.6.3 Future Demand Summary and ERU/Physical Capacity

Table 2-26 summarizes the current and future six-year, 10-year, and 20-year water demands for the City of Zillah and compares the future demand to the City's current and future source capacity and water rights.

TABLE 2-26 CURRENT AND FUTURE DEMAND, SOURCE CAPACITY AND WATER RIGHTS SUMMARY

Year	System Water Demand					Existing Source Capacity		Existing Water Rights		
	# of ERUs	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
2013	1,873[a]	149.063[b]	0.408[b]	1.058[c]	1,323[c]	2.304	1,600	2,550	3.672	475.091[d]
2019	2,320	165.345	0.453	1.276	1,595	2.304	1,600	2,550	3.672	475.091[d]
2023	2,570	183.230	0.502	1.405	1,757	2.304	1,600	2,550	3.672	475.091[d]
2033	3,283	233.965	0.641	1.779	2,225	2.304	1,600	2,550	3.672	475.091[d]

[a] Existing number of ERUs based upon 2007 through 2013 average (excluding 2012) number of services.
[b] Existing total annual demand and ADD are based on Year 2013 consumption values.
[c] Existing MDD and PHD quantities are based on maximum month consumption experienced in July 2011.
[d] 195.479 MG/Year of Groundwater Permit G4-29702P is for irrigation of 150 acres.

The system's current and future physical capacity (ERUs), in terms of water rights, source capacity, and storage capacity is summarized in Table 2-27. Further information on current water rights, source and reservoir capacities are provided in Chapter 3 and Chapter 4 of this Plan.

The water rights physical capacity in Table 2-27 is based upon comparing the 2013 production per ERU to the current and/or future total annual (Q_a) water right quantity and the max day production 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 average and max day production per ERU to the current and/or future well pump 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. Distribution System Leakage (DSL) is accounted for and distributed over all user categories by using production instead of consumption data. Therefore, as DSL is reduced it will have the benefit of providing greater ERU capacity.

The annual water rights physical capacity calculations described above have been completed separately for irrigation and non-irrigation user categories due to conditions of the Superseding Permit G4-29702. The permit provisions state that 600 acre-feet per year (of the maximum 1,458.1 acre-feet) shall be for irrigation. The City uses irrigation at municipal parks and fields. In 2013 the total annual water consumption was 149.06 MG, of which, 33.01 MG (22.1%) was for irrigation of parks. This percentage of consumption was used to estimate the 2013 production volume breakdown. The separate ERU capacities based on annual water rights for irrigation and non-irrigation uses are listed in Table 2-27.

The storage physical capacity in Table 2-27 is based on the available effective standby storage (SB). Physical capacity of the City's reservoirs is not based upon equalizing storage (ES), operational storage (OS) or fire suppression storage (FSS) because these are not expected to change with the number of ERUs. The DOH equation for determining standby storage physical capacity is the following:

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

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

Since N is unknown, the above equation is rearranged and a 10% contingency added to yield the following equation which solves for the existing and/or future standby storage ERU capacity (N):

$$N = \frac{SB}{220}$$

TABLE 2-27 SUMMARY OF CURRENT AND FUTURE PHYSICAL CAPACITY (ERUS)

System Component	Current Capacity	Future Capacity[a]	Demand / ERU[b]	Existing ERU Capacity	Future ERU Capacity	Existing Available ERU Capacity[c]	Future Available ERU Capacity[d]
Water Rights							
Annual (Q_a)	475.09 MG	475.09 MG	- -	- -	- -	- -	- -
Non-Irrigation	279.61 MG	279.61 MG	0.086 MG	3,257	3,257	1,663	484
Irrigation[f]	195.48 MG	195.48 MG	0.139 MG	1,402	1,402	1,123	891
Instantaneous (Q_i)	2,550 GPM	2,550 GPM	0.465 GPM	5,480	5,480	3,607	2,197
Source							
(ADD)	950 GPM[e]	1,600 GPM[e]	0.178 GPM	5,323	8,965	3,450	5,682
(MDD)	1,600 GPM	2,550 GPM	0.465 GPM	3,439	5,480	1,566	2,197
Storage (Effective)							
Standby	1.025 MG	1.025 MG	220 Gal.	4,659	4,659	2,786	1,376

[a] Assumes the construction of a new 950 GPM source well.
[b] Calculated with 2013 annual production, max day production, and the 2013 ERUs of 1,873 as described above. See Chapter 3 analysis for additional information.
[c] Existing available ERU capacity equals ERU capacity minus the 2013 number of ERUs.
[d] Future available ERU capacity equals future ERU capacity minus the 2033 number of ERUs.
[e] Sum of all sources minus largest source of supply.
[f] Irrigation water rights are applied to a specific user category only (City Parks).

It can be seen from Table 2-27 that the City's water system, with recommended system improvements, has sufficient physical capacity for the estimated 2033 system demands. Of the existing system components, annual non-irrigation water rights is the limiting factor beyond 20 years. The physical capacity of the system should be evaluated again in future Water System Plan updates and appropriate improvements recommended as needed.

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 Zillah 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 entitled *State Board of Health - Drinking Water Regulations*.

2. Average Daily Demand (ADD) – This demand shall be equivalent to the daily consumption per service in a user category averaged for the period 2007-2013, except as otherwise adjusted to account for recent changes in demand trends as discussed in Chapter 2 of this Plan. The ADD values for Zillah are presented in Table 2-14.

3. Maximum Daily Demand (MDD) – This demand shall be the equivalent to the maximum day of consumption per service in a user category, as calculated using the volume of water from the maximum day of production as described in Chapter 2. The MDD values are presented in Table 2-16.

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 1.8 times the MDD as shown in Table 2-16.

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 Zillah are presented later in this chapter.

6. Flow Rates – 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 Zillah currently has three primary source wells in service and will apply for new water rights and develop new sources as demand requires.

8. Fire Suppression Storage Requirements – Storage requirements for fire suppression shall be based on providing 2,000 gallons per minute (GPM) for a two-hour duration (240,000 gallons), as established by the Zillah Fire Department. Additional fire suppression storage and fire flow capacity requirements are discussed later in this chapter.

9. System Pressures – The City of Zillah water system currently has two pressure zones. The minimum service pressure under maximum instantaneous domestic demand conditions shall be 30 pounds per square inch (psi). Under fire flow conditions, the minimum fire hydrant flow 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 8-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 Zillah 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 Zillah monitors its system's water quality in accordance with the requirements of WAC 246-290-300 and 246-290-310. These requirements only apply to active water sources as emergency sources must be monitored only when they are actively providing water to consumers. 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 in accordance with *the* City's *Coliform Monitoring Plan*. Included in the City's *Coliform Monitoring Plan* is a follow-up procedure when a sample is coliform-positive, meeting the Triggered Source Water Monitoring requirements. 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.

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. Zillah collects water samples for IOCs and physical parameters prior to introduction into the distribution system.

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 (see Table 3-12).

Results of Zillah'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 the recommended level of sodium at all wells and the secondary standard for Manganese at the Third Ave. Well (S02). Highlighted cells in Table 3-1 and Table 3-2 represent samples that exceed the MCL. Copies of the most recent test results for the source wells are provided in the Chapter 10 of this Plan.

TABLE 3-1 INORGANIC (PRIMARY SUBSTANCES) CHEMICAL ANALYSIS SUMMARY

Chemical or Physical Property	MCL (mg/l)	Rainier Ave Well (S01) 9/20/2007	Third Ave Well (S02) 9/20/2007	WIPPCO Well (S03) 9/20/2007
Antimony (Sb)	0.0060	<0.0050	<0.0050	<0.0050
Arsenic (As)	0.01	<0.0020	<0.0020	<0.0020
Barium (Ba)	2.0	0.125	0.0550	0.1200
Beryllium (Be)	0.0040	<0.0002	<0.0002	<0.0002
Cadmium (Cd)	0.0050	<0.0003	<0.0003	<0.0003
Chromium (Cr)	0.05	<0.0047	<0.0047	<0.0047
Copper (Cu)*	1.3	0.0021	0.0027	<0.0020
Cyanide (HCN)	0.2	<0.0100	<0.0100	<0.0100
Fluoride (F)	4.0	0.2600	0.4900	0.2600
Lead (Pb)*	0.015	<0.0005	0.0006	<0.0005
Mercury (Hg)	0.0020	<0.0003	<0.0003	<0.0003
Nickel (Ni)	0.10	<0.0100	<0.0100	<0.0100
Nitrate (as N)	10.0	2.4600	<0.0500	2.4800
Nitrite (as N)	1.0	<0.0500	<0.0500	<0.0500
Selenium (Se)	0.050	<0.0050	<0.0050	<0.0050
Sodium (Na)*	20	30.4000	24.2000	28.0000
Thallium (Tl)	0.0020	<0.0010	<0.0010	<0.0010

* 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)	Rainier Ave Well (S01) 9/20/2007	Third Ave Well (S02) 9/20/2007	WIPPCO Well (S03) 9/20/2007
Chloride (Cl)	250.0	11.8000	3.8600	11.90000
Fluoride (F)	2.0	0.2600	0.4900	0.2600
Iron (Fe)	0.30	<0.0097	0.0670	0.0097**
Manganese (Mn)	0.050	<0.0020	0.0721**	<0.0020
Silver (Ag)	0.050	<0.0047	<0.0047	<0.0047
Sulfate (SO_4)	250.0	55.9000	9.4300	55.6000
Zinc (Zn)	5.0	<0.0200	0.0630	<0.0200
Color	15 (color units)	<4.0000	<4.0000	<4.0000
Conductivity	700 (umhos/cm)	611.0000**	225.0000	565.0000
Total Dissolved Solids (TDS)	500	372.0	162.0	370.0

**Sample collected on 9/23/2010. Limited IOC testing completed for select chemical or physical properties only.

Table 3-3 through Table 3-7 present both the latest, and previously conducted IOC analysis test results for each source well. The Rainier Well consistently exceeds the trigger level for Nitrate (additional information below). All wells consistently exceed the EPA recommended level for sodium. The 3rd Avenue Well consistently exceeds the secondary MCL for manganese. Highlighted cells in Table 3-3, Table 3-4, and Table 3-5 represent samples that exceed the MCL.

TABLE 3-3 INORGANIC CHEMICAL ANALYSIS RESULTS FOR RAINIER AVE. WELL (S01)

Chemical or Physical Property	MCL (mg/l)	Nov. 1992	Jan. 1998	Jun. 1999	Feb. 2000	Sept. 2007
Primary Substances						
Antimony (Sb)	0.006		ND	ND	ND	<0.0050
Arsenic (As)	0.01	<0.01	ND	ND	ND	<0.0020
Barium (Ba)	2	0.16	0.14	0.1	0.15	0.125
Beryllium (Be)	0.004				ND	<0.0002
Cadmium (Cd)	0.005	<0.002	ND	ND	ND	<0.0003
Chromium (Cr)	0.05	<0.05	ND	ND	ND	<0.0047
Copper (Cu)*	1.3				ND	0.0021
Cyanide (HCN)	0.2		ND	ND	ND	<0.0100
Fluoride (F)	4	<0.5	0.6	0.5	ND	0.26
Lead (Pb)*	0.015				ND	<0.0005
Mercury (Hg)	0.002	<0.0002	ND	ND	ND	<0.0003
Nickel (Ni)	0.1		ND	ND	ND	<0.0100
Nitrate (as N)	10	6.6	6.3	6.5	6.9	2.46
Nitrite (as N)	1				ND	<0.050
Selenium (Se)	0.05	<0.005	ND	ND	ND	<0.0050
Sodium (Na)*	20	31	27	26	29	30.4
Thallium (Tl)	0.002		ND	ND	ND	<0.0010
Secondary Substances						
Chloride (Cl)	250	28	23	ND	24	11.8
Fluoride (F)	2	<0.5	0.6	0.5	ND	0.26
Iron (Fe)	0.3	<0.05	ND	ND	ND	<0.0097
Manganese (Mn)	0.05	<0.01	ND	ND	ND	<0.0020
Silver (Ag)	0.05	<0.01	ND	ND	ND	<0.0047
Sulfate (SO_4)	250	92	87	ND	84	55.9
Zinc (Zn)	5	<0.05	ND	ND	ND	<0.0200
Color	15 (color units)	<5.0		ND	ND	<4.0000
Conductivity	700 (umhos/cm)	750	730	710	690	566 / 611**
Total Dissolved Solids (TDS)	500	–	–	–	–	372

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.
**Sample collected on 9/23/2010. Limited IOC testing completed for select chemical or physical properties only.

TABLE 3-4 INORGANIC CHEMICAL ANALYSIS RESULTS FOR 3RD AVE. WELL (S02)						
Chemical or Physical Property	MCL (mg/l)	Nov. 1992	Jan. 1998	Jun. 1999	Feb. 2000	Sept. 2007
Primary Substances						
Antimony (Sb)	0.006		ND	ND	ND	<0.0050
Arsenic (As)	0.01	<0.01	ND	ND	ND	<0.0020
Barium (Ba)	2	<0.1	ND	ND	ND	0.055
Beryllium (Be)	0.004				ND	<0.0002
Cadmium (Cd)	0.005	<0.002	ND	ND	ND	<0.0003
Chromium (Cr)	0.05	<0.05	ND	ND	ND	<0.0047
Copper (Cu)*	1.3				ND	0.0027
Cyanide (HCN)	0.2		ND	ND	ND	<0.0100
Fluoride (F)	4	<0.5	0.5	0.4	0.3	0.49
Lead (Pb)*	0.015				ND	0.0006
Mercury (Hg)	0.002	<0.0002	ND	ND	ND	<0.0003
Nickel (Ni)	0.1		ND	ND	ND	<0.0100
Nitrate (as N)	10	<1.0	ND	ND	ND	<0.0500
Nitrite (as N)	1			ND	ND	<0.0500
Selenium (Se)	0.05	<0.005	ND	ND	ND	<0.0050
Sodium (Na)*	20	24	21	22	23	24.2
Thallium (Tl)	0.002		ND	ND	ND	<0.0010
Secondary Substances						
Chloride (Cl)	250	<20	ND	ND	ND	3.86
Fluoride (F)	2	<0.5	0.5	0.4	0.3	0.49
Iron (Fe)	0.3	<0.05	ND	0.3	0.2	0.067
Manganese (Mn)	0.05	0.083	0.08	0.08	0.087	0.0825/ 0.0721**
Silver (Ag)	0.05	<0.01	ND	ND	ND	<0.0047
Sulfate (SO_4)	250	<10	ND	ND	ND	9.43
Zinc (Zn)	5	<0.05	ND	0.2	ND	0.063
Color	15 (color units)	5		ND	ND	<4.0000
Conductivity	700 (umhos/cm)	230	220	230	230	225
Total Dissolved Solids (TDS)	500	–	–	–	–	162

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.
**Sample collected on 9/23/2010. Limited IOC testing completed for select chemical or physical properties only.

TABLE 3-5 INORGANIC CHEMICAL ANALYSIS RESULTS FOR WIPPCO WELL (S03)						
Chemical or Physical Property	MCL (mg/l)	Nov. 1992	Jan. 1998	Jun. 1999	Feb. 2000	Sept. 2007
Primary Substances						
Antimony (Sb)	0.006		ND	ND	ND	<0.0050
Arsenic (As)	0.01	<0.01	ND	ND	ND	<0.0020
Barium (Ba)	2	0.15	0.13	0.13	0.13	0.12
Beryllium (Be)	0.004				ND	<0.0002
Cadmium (Cd)	0.005	<0.002	ND	ND	ND	<0.0003
Chromium (Cr)	0.05	<0.05	ND	ND	ND	<0.0047
Copper (Cu)*	1.3				ND	<0.0020
Cyanide (HCN)	0.2		ND	ND	ND	<0.0100
Fluoride (F)	4	<0.5	0.5	0.5	ND	0.26
Lead (Pb)*	0.015				ND	<0.0005
Mercury (Hg)	0.002	<0.0002	ND	ND	ND	<0.0003
Nickel (Ni)	0.1		ND	ND	ND	<0.0100
Nitrate (as N)	10	<0.5	0.5	0.5	3.2	2.48
Nitrite (as N)	1				ND	<0.0500
Selenium (Se)	0.05	<0.005	ND	ND	ND	<0.0050
Sodium (Na)*	20	32	27	27	28	28
Thallium (Tl)	0.002		ND	ND	ND	<0.0010
Secondary Substances						
Chloride (Cl)	250	<20	ND	ND	ND	11.9
Fluoride (F)	2	<0.5	0.5	0.5	ND	0.26
Iron (Fe)	0.3	<0.05	ND	0.7	0.19	0.0175 / 0.0097**
Manganese (Mn)	0.05	<0.01	ND	ND	0.02	<0.0020
Silver (Ag)	0.05	<0.01	ND	ND	ND	<0.0047
Sulfate (SO_4)	250	77	67	ND	69	55.6
Zinc (Zn)	5	<0.05	ND	ND	ND	<0.0200
Color	15 (color units)	5	ND	ND	ND	<4.0000
Conductivity	700 (umhos/cm)	660	230	610	600	565
Total Dissolved Solids (TDS)	500	–	–	–	–	370

* No DOH established MCL. Represents EPA established “action levels” for lead and copper and recommended level for sodium.
**Sample collected on 9/23/2010. Limited IOC testing completed for select chemical or physical properties only.

Nitrate/Nitrite Monitoring: The City of Zillah conducts annual monitoring for Nitrate and Nitrite on all City wells. The maximum contaminant levels (MCL) for Nitrate and Nitrite are 10.0 mg/l and 1.0 mg/l, respectively. Nitrates that exceed this concentration in drinking water can be a health hazard, especially to infants below six months of age.

The Rainier Well (S01) has a history of nitrate levels above the action level of 5.0 mg/l. Results of Zillah's nitrate monitoring of the Rainier Well from 1992 to 2012 are presented in Table 3-6. Test results for the period 2007 through 2012 for all wells is summarized in Table 3-7.

TABLE 3-6 NITRATE RESULTS FOR RAINIER WELL (S01)

Sampling Date	Nitrate Concentration
November 1992	6.60
January 1998	6.30
January 21, 1999	11.00
June 1999	6.50
January 3, 2000	11.00
January 10, 2000	10.0+
May 24, 2000	7.0+
May 8, 2000	5.5+
February 6, 2003	7.00
August 13, 2003	5.21
November 17, 2003	6.38
March 24, 2004	5.85
September 23, 2004	5.96
September 8, 2005	6.06
November 13, 2006	6.00
September 20, 2007	2.46
November 19, 2008	6.28
October 20, 2009	6.02
December 14, 2010	6.05
December 7, 2011	5.21
November 27, 2012	5.95
November 21, 2013	5.04

TABLE 3-7 NITRATE / NITRITE CHEMICAL ANALYSIS RESULTS							
	2007	2008	2009	2010	2011	2012	2013
Rainier Well (S01)							
Nitrate (NO_3-N)	2.46	6.28	6.02	6.05	5.21	5.95	5.04
Nitrite (NO_2-N)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Nitrate/Nitrite	2.46	6.28	6.02	6.05	5.21	5.95	5.04
3rd Ave. Well (S02)							
Nitrate (NO_3-N)	<0.05	<0.05	<0.05	<0.05	<0.05	2.40	<0.05
Nitrite (NO_2-N)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.07	<0.05
Total Nitrate/Nitrite	<0.05	<0.05	<0.05	<0.05	<0.05	2.40	<0.05
WIPPCO Well (S03)							
Nitrate (NO_3-N)	2.48	2.51	2.34	2.30	2.28	<0.07	2.49
Nitrite (NO_2-N)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.07	<0.05
Total Nitrate/Nitrite	2.48	2.51	2.34	2.30	2.28	<0.07	2.49
Highlighted cells are anomalies based on historical data. It appears the 3rd Ave. and WIPPCO Well 2012 sample results were transposed or mislabeled.							

The test results for the 3rd Avenue Well and for the WIPPCO Well show the City to be in compliance with State standards. The test results from the nitrate/nitrite analysis for all three of the City's wells are provided in the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

Volatile Organic Chemical Monitoring: Volatile Organic Chemical (VOC) monitoring is required once every three months during the first year of testing. Samples are to be taken following water treatment. If no VOCs are detected during the first year's testing, future monitoring shall be at least every three years. The City currently has a waiver from the Department of Health and is not required to complete VOC testing again until 2016/2017. Zillah conducted VOC testing on its source wells as shown on Table 3-8.

TABLE 3-8 SOURCE WELL VOC TESTING		
Rainier Well (S01)	3rd Avenue Well (S02)	WIPPCO Well (S03)
February 3, 2000	February 3, 2000	February 3, 2000
June 14, 2001	- - -	June 14, 2001
September 12, 2002	September 12, 2002	September 12, 2002
July 24, 2003	July 24, 2003	July 24, 2003
October 11, 2006	September 20, 2006	April 17, 2006
- - -	September 23, 2010	April 12, 2010
May 26, 2011	- - -	- - -

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

applicable). If no SOCs are detected during the first three years of testing, future monitoring shall be at least once every three years. The City currently has a waiver from the Department of Health and is not required to complete SOC testing until 2018. Zillah conducted SOC testing on its source wells as shown in Table 3-9. A copy of the SOC analysis test results is provided in Chapter 10 of this Plan.

TABLE 3-9 SOURCE WELL SOC TESTING

Rainier Well (S01)	3rd Avenue Well (S02)	WIPPCO Well (S03)
August 24, 1998	August 24, 1998	August 24, 1998
June 14, 2001	June 14, 2001	June 14, 2001
June 22, 2009	June 22, 2009	June 22, 2009

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 Zillah, radionuclide sampling from each source is required once every three years. 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. Zillah has completed radionuclide testing on its source wells as shown in Table 3-10.

TABLE 3-10 SOURCE WELL RADIONUCLIDE TESTING

Rainier Well (S01)	3rd Avenue Well (S02)	WIPPCO Well (S03)
June 14, 2001	June 14, 2001	June 14, 2001
April 20, 2004	May 25, 2004	June 8, 2004
October 6, 2004	November 4, 2004	December 2, 2004
June 27, 2007	March 28, 2007	June 27, 2007
September 24, 2007	September 24, 2007	September 24, 2007
December 12, 2007	- - -	December 12, 2007
August 30, 2010	September 23, 2010	- - -
July 3, 2012	- - -	September 25, 2012

Test results show the City to be in compliance with State standards. A copy of the radionuclide analysis test results are 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 City of Zillah is required to sample a minimum of three (3) locations within the distribution system. The *Coliform Monitoring Plan* and representative copies of bacteriological analysis results are provided in the Chapter 10 of this Plan.

Disinfection Byproducts (DBPs): The addition of chlorine to drinking water kills or inactivates harmful organisms that may cause various diseases; this process is known as disinfection. However, chlorine is an active substance and reacts with naturally occurring substances to form harmful compounds known as disinfection byproducts (DBPs). The most common disinfection byproducts formed when chlorine is used are trihalomethanes (TTHMs) and haloacetic acids (HAA5).

Zillah does not currently chlorinate its water supply for disinfection, and therefore is not required to collect or test water samples within its distribution system for disinfection byproducts analysis.

Although DBP testing is not currently required, it is important to understand the regulatory requirements triggered should the City install chlorination equipment.

The EPA issued the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 Rule) in 1998 to regulate four DBPs: total trihalomethanes (TTHMs), haloacetic acids (HAA5), Bromate and Chlorite. 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 TTHMs and HAA5. To determine these locations, the Stage 2 Rule requires many systems to complete an Initial Distribution System Evaluation (IDSE). Depending on the water system size and historical TTHM and HAA5 distribution system concentration some water systems are exempt from the IDSE requirement through a 40/30 certification. Once the monitoring locations are established, one dual sample set of TTHM and HAA5 samples is required at each of two locations annually (unless maximum historical TTHM and HAA5 concentrations occur at the same location). 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. The City would be required to create a Disinfection Byproducts Monitoring Plan to identify the sampling locations and schedules.

Lead and Copper: In 1993, Zillah 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. Twenty-two (22) samples were collected from various locations throughout the water system and tested for concentrations of lead and copper. Results from the latest (2011) monitoring indicated that none of the samples exceeded the federal action level of 0.015 parts per million for lead, and 1.30 parts per million for copper. Table 3-11 provides a summary of the 2011 lead and copper monitoring results, which are also provided in Chapter 10 of this Plan.

TABLE 3-11 LEAD AND COPPER MONITORING PROGRAM SUMMARY OF RESULTS
(all values are in milligrams per liter)

Sample Number	Sample Location	Year 2011	
		Lead	Copper
1	Intermediate School	0.00129	0.0185
2	107 Linda Street	0.00091	0.330
3	Zillah Elementary School	<0.0005	0.262
4	Zillah Middle School	<0.0005	0.292
5	Zillah High School	0.00385	0.0709
6	103 Second Avenue	<0.0005	0.0407
7	408 Edson Street	0.00695	0.00580
8	102 Northstone Parkway	<0.0005	0.0408
9	506 North 8th Street	<0.0005	0.0305
10	505 Virginia Court	<0.0005	0.0149
Federal Action Level		0.015	1.30

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 2012 Water Quality Monitoring Report (WQMR), is provided below in Table 3-12 and Table 3-13, respectively. A copy of the City's current WQMR is provided in Chapter 10 of this Plan.

TABLE 3-12 FUTURE SOURCE WATER SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
Rainier Well (S01)				
Inorganic Chemicals (IOC)	Once/3 Years	Sept. 2007	Sept. 2016	Secondary MCL exceeded for Na
Nitrate/Nitrite	Once/Year	November 2013	November 2014	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/3 Years	May 2011	Waiver[a]	Within MCLs
Synthetic Organic Chemicals (SOCs)	Once/3 Years	June 2009	Waiver[b]	Within MCLs
Radionuclide	Once/3 Years	July 2012	April 2015	Within MCLs
3rd Avenue Well (S02)				
Inorganic Chemicals (IOC)	Once/3 Years	Sept. 2007	Sept. 2016	Secondary MCL exceeded for Na and Mn
Nitrate/Nitrite	Once/Year	Sept. 2013	Sept. 2014	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/3 Years	Sept. 2010	Waiver[a]	Within MCLs
Synthetic Organic Chemicals (SOCs)	Once/3 Years	June 2009	Waiver[b]	Within MCLs
Radionuclide	Once/3 Years	Sept. 2010	Sept. 2016	Within MCLs
WIPPCO Well (S03)				
Inorganic Chemicals (IOC)	Once/3 Years	Sept. 2007	Sept. 2016	Secondary MCL exceeded for Na
Nitrate/Nitrite	Once/Year	Sept. 2013	Sept. 2014	Within MCLs
Volatile Organic Chemicals (VOCs)	Once/3 Years	April 2010	Waiver[a]	Within MCLs
Synthetic Organic Chemicals (SOCs)	Once/3 Years	June 2009	Waiver[b]	Within MCLs
Radionuclide	Once/3 Years	Sept. 2012	July 2015	Within MCLs

[a] VOC waived through 2016/2017.
[b] Herbicides, insecticide, general pesticides, and soil fumigant panels waived through 2018.

TABLE 3-13 FUTURE DISTRIBUTION SYSTEM SAMPLING REQUIREMENTS				
Sample Type	Frequency	Last Sample	Next Sample	Status
Coliform Bacteria	3 / Month	Sept. 2013	October 2013	Within MCLs
Lead & Copper	10 / 3 Years	August 2011	August 2014	No Exceedance
Asbestos	Waiver*	N/A	N/A	N/A

* Waived through December 2019.

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

3.3 SYSTEM DESCRIPTION AND ANALYSIS

The existing City of Zillah domestic water system consists of two distribution pressure levels. System storage is provided by an elevated steel storage tank reservoir, a steel standpipe reservoir, and a boosted ground level standpipe reservoir with a total combined nominal capacity of 1.471 million gallons, however, the total effective storage capacity of the reservoirs is 1.046 million gallons. Zone 2 is currently served by the Zone 2 constant pressure booster pump station. Static service pressures within the water system under normal operating conditions ranges from a minimum of 35 psi to a maximum of 95 psi as shown on Figure 3-1 Water System Service Pressures Map.

The City is supplied water from three primary source wells. The pumping capacity of the three wells is 1,600 gallons per minute (GPM), or 2.304 million gallons per day (MGD). A telemetry control system located at City Hall controls the pump operation based upon water level in the operator-selected reservoir. Currently, Zillah provides no treatment or disinfection of its water supply.

Figure 3-2 Water System Schematic, provides a schematic depicting the inter-relationship between the water system components. The existing distribution system is looped where possible and consists of mainly 6-inch and 8-inch water mains as shown on Figure 3-3 Water System Pipe Sizes Map. A map of Zillah's existing water system is enclosed as Map A in the back pocket of this Plan.

CITY OF ZILLAH

Water System Plan Update

WATER SYSTEM SERVICE PRESSURES MAP

N
W E
S

0 400 800 1600

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- ZILLAH PROPOSED UGA BOUNDARY
- ELEVATION 875 FT
- PRESSURE ZONE 1
- PRESSURE ZONE 2

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07-23-14
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FIGURE 3-1

CITY OF ZILLAH

Water System Plan Update

WATER SYSTEM SCHEMATIC

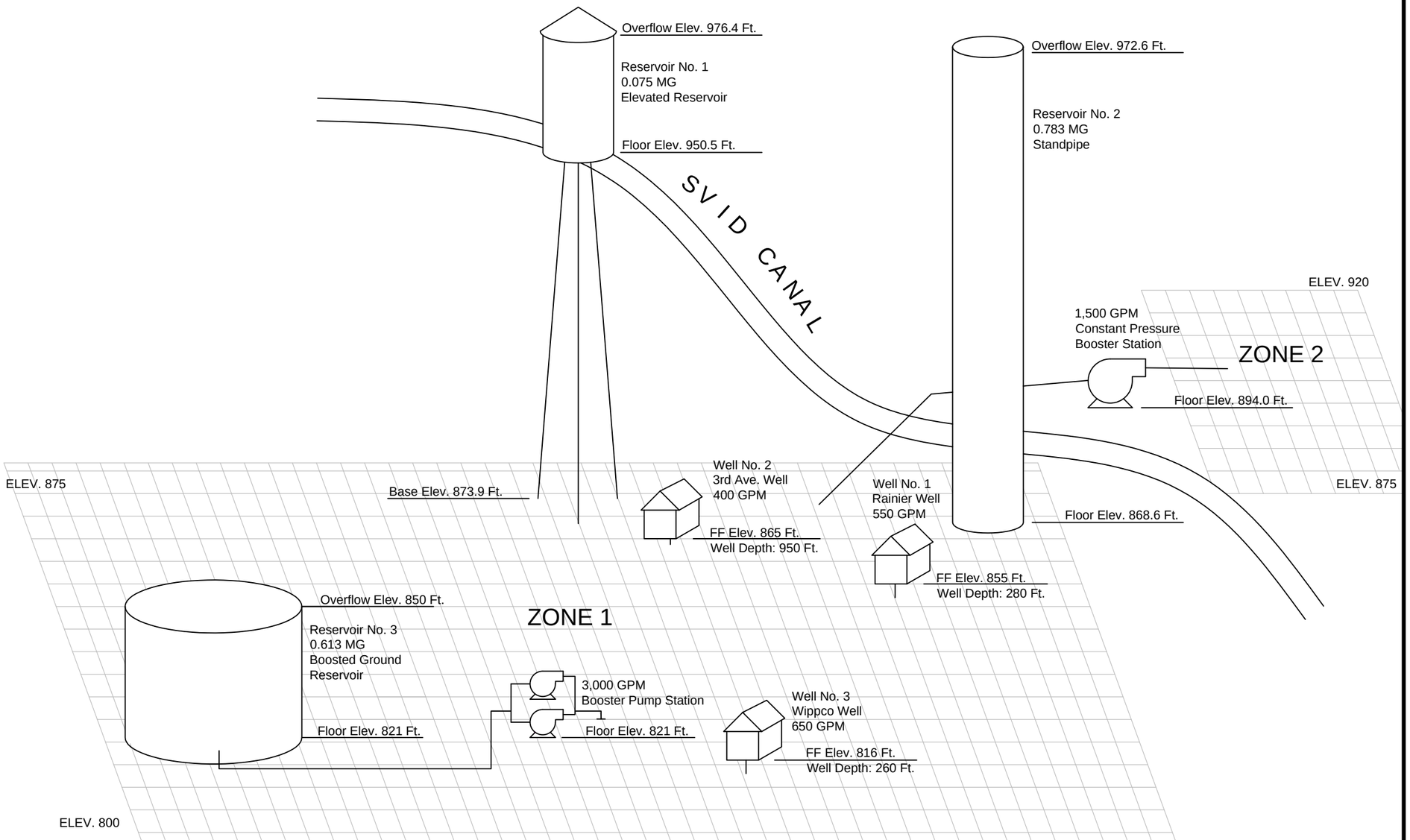

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FIGURE 3-2

CITY OF ZILLAH

Water System Plan Update

WATER SYSTEM PIPE SIZES MAP

N
W E
S

0 400 800 1600

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- ZILLAH PROPOSED UGA BOUNDARY
- 12" WATERMAIN
- 10" WATERMAIN
- 8" WATERMAIN
- 6" WATERMAIN
- 4" WATERMAIN
- 2" WATERMAIN
- < 2" WATERMAIN

CITY OF ZILLAH

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FIGURE 3-3

3.3.1 Water Sources

The City of Zillah has a total of three source wells that are all located within city limits, as shown on 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.

Rainier Well No. 1 (S01): Rainier Well is located northeast of the intersection of 6th Street and Rainier Street as shown on Figure 3-1 and Map A. Drilled in 1958 to a depth of 280 feet, the 12-inch diameter well is equipped with a turbine pump (Floway Type DKL 10 Stage), powered by a 50 horsepower, 1,775 rpm U.S. Electrical Motors motor.

The well is housed in a sheet metal building with limited ventilation and heat. A check valve, air release valve, and inline Seametrics flow meter are installed in the discharge piping. The well's current pumping capacity is 550 GPM. The well is equipped with an electrical connection point for the City's mobile generator. Information regarding Rainier Well is summarized in Table 3-14.

TABLE 3-14 RAINIER WELL NO. 1 (S01) INFORMATION SUMMARY

Date Constructed	1958
Well Depth	280 feet
Casing	0 – 242 feet: 12-inch standard black steel pipe
Casing Perforation/Screen	40 ft. Johnson Everdur screen, 12" screen from 238'-2" to 279'-9" feet: 10' of #20 slot; 30' of #30 slot.
Static Water Level	1958: 109 feet below ground
Pump Information Manufacturer/Type Model Year Installed Stages Bowl Set Depth	 Floway / Vertical Turbine DKL 1958; motor rebuilt 2010 10 Unknown
Motor Information Manufacturer Horsepower Phase/Voltage RPM	 U.S. Electrical Motors 50 3PH / 230V 1,775
Rated Capacity	Unknown
Current Well Capacity	550 GPM

3rd Avenue Well No. 2 (S02): The 3rd Avenue Well is located north of 3rd Avenue on Blossom Drive as shown on Figure 3-1 and Map A. Drilled in 1940 to a depth of 950 feet, the well was originally equipped with a Sterling turbine pump powered by a 25 horsepower U.S. Induction motor, and produced 276 GPM. Currently, the 12-inch diameter well is equipped with a submersible pump (brand and model unknown) and 40 horsepower motor (brand and model unknown).

3rd Avenue well is used sparingly as a backup well due to the sulfur odor produced and presence of manganese.

The well is housed in a sheet metal building which is not ventilated, but is heated. The discharge piping includes a Water Specialties inline flow meter (Model # ML-03), check valve and Laval Separator Corp. Model 6 Desander but does not include an air release valve. The well's current pumping capacity is 400 GPM and the last known static water level was 53 feet in 2008. On-site standby or mobile generator connection for temporary power is not provided at the well. Information regarding Well No. 2 is summarized in Table 3-15.

TABLE 3-15 3RD AVENUE WELL NO. 2 (S02) INFORMATION SUMMARY

Date Constructed	1940
Well Depth	950 feet
Casing	0 – 500+ feet: 12-inch (distances not given)
Casing Perforation/Screen	Unknown
Static Water Level	1940: 116 feet below ground 2008: 53 feet below ground
Pump Information	
Manufacturer/Type	Unknown / Submersible
Model	Unknown
Year Installed	Unknown
RPM	Unknown
Stages	Unknown
Bowl Setting	Unknown
Motor Information	
Manufacturer	Unknown
Horsepower	40
Phase/Voltage	Unknown
RPM	Unknown
Rated Capacity	Unknown
Current Well Capacity	400 GPM

WIPPCO Well (S03): The WIPPCO Well is located north of 1st Street and south of Leland Street as shown on Figure 3-1 and Map A. Drilled in 1942 to a depth of approximately 260 feet, the 12-inch diameter well is equipped with a turbine pump (Western Land Roller Model 10H75), powered by a 60 horsepower, 3 phase, 460 volt, 69 amp, 1,775 rpm U.S. Electrical Motors motor.

The well is housed in a sheet metal building which is ventilated and heated. A check valve, air release valve and Water Specialities inline flow meter (model # ML-T1-X) are installed in the discharge piping. The well's current pumping capacity is 650 GPM. The well is equipped with an electrical connection point for the City's mobile generator. Information regarding WIPPCO Well is summarized in Table 3-16.

TABLE 3-16 WIPPCO WELL (S03) INFORMATION SUMMARY

Date Constructed	1942
Well Depth	260 feet
Casing	Unknown
Casing Perforation/Screen	Unknown
Static Water Level	2008: 140 feet below ground
Pump Information Manufacturer Model Year Installed Stages Bowl Setting	 Western Land Roller / Vertical Turbine 10H75 Unknown Unknown Unknown
Motor Information Manufacturer Horsepower Phase/Voltage RPM	 U.S. Motor 60 3PH / 460V 1,775
Rated Capacity	Unknown
Current Well Capacity	650 GPM

A summary of Zillah's source wells, including well depth, current static water levels and capacity is provided in Table 3-17 below. The total capacity of all three wells is equal to 1,600 GPM.

TABLE 3-17 ZILLAH SOURCE WELL INFORMATION SUMMARY

	Rainier Well	3rd Avenue Well	WIPPCO Well
Source No.	S01	S02	S03
Date Drilled	1958	1940	1942
Depth	280 feet	950 feet	260 feet
Diameter	12-Inch	12-Inch	12-Inch
Casing Depth	242 feet	500+ feet	123 feet
Last Measured Static Water Level (below ground surface)	109 feet	53 feet	140 feet
Current Capacity	550 GPM	400 GPM	650 GPM

3.3.2 Water Treatment

Zillah currently provides no treatment or disinfection of its water supply. When constructed in 2010, the Zone 2 booster pump station was designed to allow for the future installation of chlorination equipment, and the Cutler Way booster station is able to chlorinate when in operation via a Constant Chlor® calcium hypochlorite feed system in the Joseph Well building.

With the continued growth of the City's water system, it is likely that chlorination equipment will be constructed at the source wells in the future. The estimated cost of this improvement is provided in Chapter 8.

The introduction of chlorine to the water system will require the implementation of an aggressive and coordinated flushing program both prior to and during initial chlorination to reduce the aesthetic impacts potentially caused by chlorination. The removal of existing organic materials, minerals, and sediment deposits in the distribution and storage system will minimize the amount of chlorine consumed and formation of disinfection byproducts.

An evaluation of chlorination options should be completed to compare available alternatives and select an option that best serves the City of Zillah.

3.3.3 Booster Stations

Two booster stations serve the City. The Zone 2 constant pressure booster pump station increases water pressure to services located north and east of the SVID canal. The pump station is located on the north side of the SVID irrigation canal and south of the Church located at 704 Schooley Road. This booster station is equipped with a 3 HP, 10 to 60 GPM variable frequency drive (VFD) Grundfos model CR 10-03 pump, a 15 HP, 50 to 300 GPM VFD Grundfos model CR 64-1 pump, and a 60 HP, 1,500 GPM PACO model KPV 5012-7 fire suppression pump. The pump station was designed to accommodate a second 1,500 GPM fire suppression pump for reliability, but it is not currently installed. Due to the small number of initial service connections within Zone 2 a 500 gallon hydro-pneumatic pressure tank was installed to allow the pumps to shut off during low demand periods. The pump station was designed to allow for the future installation of chlorination equipment and has an exterior pad mounted backup power generator for emergency operation.

The Cutler Way pump station located on the Cutler Way Reservoir No. 3 site (953 Cutler Way) boosts water pressure from Reservoir No. 3 to the Zone 1 distribution system. This booster station is currently equipped with two 100 HP, 1,500 GPM VFD PACO Model KPV 5015-9 pumps and was designed to accommodate a third pump for greater system reliability. A maximum of two pumps can be operated at any given time with a maximum VFD controlled flow rate of 3,000 GPM. The booster pumps are also used periodically at a VFD reduced flow rate of 500 GPM to "refresh" the water in the reservoir. During the "refresh" cycle, an actuator closes the 12 inch butterfly valve on the water line bypassing Reservoir No. 3 and one pump draws water from the reservoir to force it west towards the Zillah Lakes development. The emergency fire supply operation of the pump station is controlled by the level of Reservoirs No. 1 and No. 2. If the elevated reservoir levels fall below the set point (945-feet) one or two pumps will be called to draw water from Reservoir No. 3 and fill Reservoirs No. 1 and No. 2. The pump station has an exterior pad mounted backup power generator for emergency operation.

3.3.4 Storage Facilities

The City's water storage facilities consist of three painted steel reservoirs with a total nominal capacity of 1.471 million gallons (MG). The total effective storage capacity of the reservoirs is 0.872 million gallons above the 30 psi static pressure level and 1.046 million gallons above the 20 psi static pressure level. The reservoirs are located within the City UGA as shown on Figure 3-1 and Map A. The City's water storage reservoirs are all located in Zone 1 but serve both Zone 1 and Zone 2 via the Zone 2 constant pressure booster pump station, which provides service to a maximum elevation of 920 feet. Provided below in Table 3-18 is a summary of data for the City's three water storage reservoirs. Further descriptions of each reservoir are provided below Table 3-18.

TABLE 3-18 ZILLAH RESERVOIR INFORMATION SUMMARY			
	Reservoir No. 1	Reservoir No. 2	Reservoir No. 3
Type	Elevated Tank	Standpipe	Ground Level Standpipe
Material	Steel	Steel	Steel
Date Constructed	1928	1965	2009
Tank Height	26.4 feet	104 feet	29 feet
Diameter	22 feet	35.8 feet	60 feet
Base Elevation (above msl)	873.9 feet	868.6 feet	821 feet
Floor Elevation (above msl)	950.5 feet	868.6 feet	821 feet
Overflow Elevation (above msl)	976.9 feet	972.6 feet	850.0 feet
Total Storage Capacity	75,000 gallons	783,000 gallons	613,000 gallons
Storage Capacity Above 30 psi	61,000 gallons	208,000 gallons	603,000 gallons
Storage Capacity Above 20 psi	61,000 gallons	382,000 gallons	603,000 gallons

Reservoir No. 1: The City's 75,000 gallon elevated storage reservoir is located by the 3rd Avenue Well, north of Third Avenue, and west of Westwood Drive. Constructed in 1928, the ellipsoidal storage reservoir is 22 feet in diameter and is connected to the City's distribution system via a single 8-inch transmission main. This reservoir's interior was re-coated in 1962 and again in 1991. The overflow elevation of the elevated tank reservoir is 976.9 feet above sea level, but the operational storage elevation is only 972 feet above sea level due to the overflow elevation of Reservoir No. 2. Therefore, the effective storage capacity of Reservoir No. 1 is only approximately 61,000 gallons.

Reservoir No. 2: The City's 783,000 gallon standpipe reservoir is located on Moritz Drive. Constructed in 1965, the steel standpipe is 35.8 feet in diameter, has a total height of 104 feet, although only 28 feet of storage (208,000 gallons) is above the 30 psi static pressure level, and 51 feet of storage (382,000 gallons) exists above the 20 psi static pressure level. The standpipe is connected to the City's distribution system via a 10-inch transmission main. The overflow elevation of the standpipe reservoir is 972.6 feet above sea level.

Reservoir No. 3: The City's 613,000 gallon ground level reservoir is located on Cutler Way. Constructed in 2009, the steel reservoir is 60.0 feet in diameter, has a total height to overflow of 29 feet, with 28.5 feet being operational storage (603,000 gallons). The reservoir is connected to the City's distribution system via a 12-inch main, a 6-inch altitude control valve manufactured by Cla-Val Co., and the Cutler Way booster pump station controlled by the level of Reservoirs No. 1 and No. 2 (to maintain reservoir elevations above 945-feet). The altitude valve is set based on the level of Reservoir No. 3 to open and close to fill the reservoir from the Zone 1 distribution system. See Section 3.3.3 for additional information.

Reservoir No. 3 was designed to allow for future expansion to a total height of 48 feet. With an operational height of 47.5 feet the future storage capacity could be increased to approximately 1 million gallons. The overflow elevation of the standpipe reservoir is 850.0 feet above sea level.

3.3.5 Telemetry Control System

Zillah's telemetry control system was installed in December of 2002, and upgraded in 2010 with the construction of the Cutler Way and Zone 2 booster pump stations. The system exercises supervisory control, data collection, and monitoring of water system operation from a computer located in City Hall. The HMI software used for Zillah's telemetry system is Wonderware Intouch 2012, Version 10.5 with Win911 Version 7.12 for annunciating alarms. Data is monitored by Allen Bradley Micrologix PLCs at each site and sent to the telemetry system computer by means of radio communication. The system monitors source production, reservoir level information, and issues commands to start and stop wells and booster pumps. The reservoir water levels are sensed by pressure transmitters and source production is measured by flow meters at each of the three source wells.

The source pumps are controlled by the water level in the operator-selected reservoir. The telemetry control settings for low and high level alarms and for operating the various well pumps, based on water levels in both reservoirs, is shown in Table 3-19.

Should any equipment fail to respond as ordered (on or off), or a high or low water condition exists in a reservoir, an alarm is sounded at City Hall and through the City's answering service. An automatic telephone dialer (Win911) is also activated, which then proceeds to contact preprogrammed telephone numbers of key personnel until the alarm is properly acknowledged.

TABLE 3-19 EXISTING TELEMETRY CONTROL SOURCE WELL SETTINGS BASED ON ELEVATED RESERVOIR LEVELS

Source Well / Operation	Reservoir Level (feet)	Approximate Elevation (feet)*
Rainier Well (S01)		
Pump On	90.4	970.0
Pump Off	92.4	972.0
3rd Ave. Well (S02)		
Pump On	76.5	893.5
Pump Off	76.0	893.0
WIPPCO Well (S03)		
Pump On	89.7	969.3
Pump Off	92.3	971.9

*Approximate elevation calculated by adding the reservoir level to a base elevation of 879.6.

TABLE 3-20 EXISTING TELEMETRY CONTROL RESERVOIR SETTINGS		
Reservoir / Operation	Level (feet)	Approximate Elevation (feet)
Reservoir No. 1		
Low Level Alarm	85.0	964.6
High Level Alarm	99.5	979.1
Reservoir No. 2		
Low Level Alarm	76.0	955.6
High Level Alarm	94.0	973.6
Reservoir No. 3		
Low Level Alarm (Float)	2.0	823.0
Low Level Alarm (Pressure Trans.)	3.0	824.0
Inlet Valve Open (Pressure Trans.)	19.0	840.0
Inlet Valve Closed (Pressure Trans.)	28.0	849.0
High Level Alarm (Float and Pressure Trans.)	28.3	849.3
High Level Alt. Shutoff (Pressure Trans.)	28.5	849.5

3.3.6 Transmission and Distribution Systems

The City's existing transmission and distribution system along with main sizes and valve and fire hydrant locations is shown on Figure 3-1 Water System Service Pressures Map, Figure 3-3 Water System Pipe Sizes Map and Map A, enclosed in the back pocket of this Plan. Most line sizes within the system are six-inches in diameter or larger but vary from 2-inch to 12-inch. The majority of the City's water mains are constructed of PVC with limited, older sections of steel and A.C. pipes. The majority of the existing distribution system is looped, although there are several dead-end mains located along the outer perimeter of the system. An inventory of the total length of Zillah's water distribution system piping, including the length and percentage of each diameter of pipe is presented below in Table 3-21.

TABLE 3-21 WATER DISTRIBUTION SYSTEM PIPE SIZE SUMMARY		
Pipe Size (inches)	Length (feet)	Percent
2	790	0.69%
4	1,868	1.62%
6	47,341	41.06%
8	41,899	36.34%
10	8,335	7.23%
12	15,072	13.07%
Total	115,305	100%

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.

The critical storage components for Zillah's water system will be addressed in the storage analysis of the following Section.

3.4.1 Total System Storage Analysis

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 at a minimum pressure to all service connections of 20 psi.

For communities with multiple sources of supply such as the City of Zillah, 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:

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

Where:

SB_{TMS}	=	Total standby storage component for a multiple source water system (gallons)
ADD	=	Average day demand for the design year (GPD/ERUs)
N	=	Number of ERUs
Q_S	=	Sum of all installed and continuously available supply source capacities, except emergency sources (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 equation is applied to the existing and projected average day demand (ADD) and ERUs the resulting standby storage requirements are as shown in Table 3-22.

TABLE 3-22 EXISTING AND FUTURE STANDBY STORAGE REQUIREMENTS				
	Existing	2019	2023	2033
System ADD x 2 Days Storage Subtotal	0.408 MGD x 2 Days 0.816 MG	0.453 MGD x 2 Days 0.906 MG	0.502 MGD x 2 Days 1.004 MG	0.641 MGD x 2 Days 1.282 MG
Source Supply minus largest source x 1440 minutes Supply Subtotal	950 GPM x 1440 min 1.368 MG	950 GPM x 1440 min 1.368 MG	1,600 GPM* x 1440 min 2.304 MG	1,600 GPM* x 1440 min 2.304 MG
Storage Subtotal minus Supply Subtotal	less than 0	less than 0	less than 0	less than 0
Equivalent Residential Units (ERUs) x Min. 200 GPD Storage Minimum	1,873 x 200 0.375 MG	2,320 x 200 0.464 MG	2,570 x 200 0.514 MG	3,283 x 200 0.657 MG
Minimum Required Standby Storage	0.375 MG	0.464 MG	0.514 MG	0.657 MG
* Assumes construction of a new 950 GPM well prior to Year 2023.				

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 protection has been established based on fire flow ratings of various structures within Zillah. The storage required is 240,000 gallons, which will allow a demand of 2,000 GPM for a 2-hour duration. The fire protection demand was established by the Zillah Fire Department. Fire suppression storage shall be provided at an elevation to maintain 20 psi pressure throughout the distribution system. Fire suppression and standby storage may be "nested" in order to reduce the total system storage required. Fire suppression storage for the City of Zillah will be nested within the standby storage as shown in Table 3-24.

Equalizing Storage: Equalizing storage must also be provided to meet the periodic demands placed on the water system which exceed the 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 source production rate in GPM. Based on this method, the current and future equalizing storage requirements for Zillah are as shown in Table 3-23. Equalizing storage must be available to all service connections at a minimum pressure of 30 psi.

TABLE 3-23 EXISTING AND FUTURE EQUALIZING STORAGE REQUIREMENTS				
	Existing	2019	2023	2033
Peak Hour Demand	1,323 GPM	1,595 GPM	1,757 GPM	2,225 GPM
Source Capacity	- 1,600 GPM	- 1,600 GPM	- 2,550 GPM*	- 2,550 GPM*
	less than 0	less than 0	less than 0	less than 0
DOH Multiplier	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM	x 150 gal/GPM
Equalizing Storage Total	0 gal	0 gal	0 gal*	0 gal*
* Assumes construction of a new 950 GPM well prior to Year 2023. Without the new well the required equalizing storage volume would be 23,550 gallons in 2023 and 94,000 gallons in 2033.				

Operational Storage: The City of Zillah operates its lead source well within a 2.0-foot elevation range in the reservoirs. This corresponds to a volume of approximately 20,700 gallons, or approximately 11 gallons per existing ERU (1,873) for normal operational storage. Future operational storage capacity will

be calculated with maintaining a 2.0-foot operating range which will keep the pump on-off cycle below two times per hour. Operational storage, like equalizing storage, must be available to all service connections at a minimum pressure of 30 psi.

Total Storage: Table 3-24 summarizes the existing and future storage requirements for the water system. A 10% contingency was added to the total storage capacity to account for potential distribution system losses and other unknowns. Figure 3-4 Existing Reservoir Storage Levels shows a schematic representation of the existing storage components shown in Table 3-24, and discussed above. Figure 3-5 2033 Reservoir Storage Levels shows a schematic representation of the 2033 projected storage component requirements.

The Zone 2 booster pump station and Cutler Way booster pump station increase system pressure during a fire flow event, supplementing the Reservoir No. 1 and No. 2 storage volume and effectively increasing the system's storage capacity by 0.603 gallons as shown in Figure 3-4 and Table 3-24.

TABLE 3-24 EXISTING AND FUTURE TOTAL STORAGE REQUIREMENTS
(all storage values are in million gallons)

	Existing Requirements	Year 2019 Requirements	Year 2023 Requirements	Year 2033 Requirements
Number of ERUs	1,873	2,320	2,570	3,283
Number of Connections	1,077	1,243	1,382	1,802
Operational Storage[a]	0.021	0.021	0.021	0.021
Equalizing Storage	0.000	0.000	0.000	0.000
Standby Storage	0.375	0.464	0.514	0.657
Fire Suppression Storage[b]	0.240	0.240	0.240	0.240
Subtotal	0.396	0.485	0.535	0.678
10% Contingency	0.040	0.049	0.054	0.068
Total Storage Required	0.436	0.534	0.589	0.746
Required storage capacity above minimum 30 psi service pressure elevation	0.021	0.021	0.021	0.021
Available storage capacity above minimum 30 psi service pressure elevation	0.872	0.872	0.872	0.872
Required storage capacity above minimum 20 psi service pressure elevation	0.436	0.534	0.589	0.746
Available storage capacity above minimum 20 psi service pressure elevation	1.046	1.046	1.046	1.046
Total Storage Capacity (including storage below 20 psi service pressure requirement)	1.442	1.442	1.442	1.442

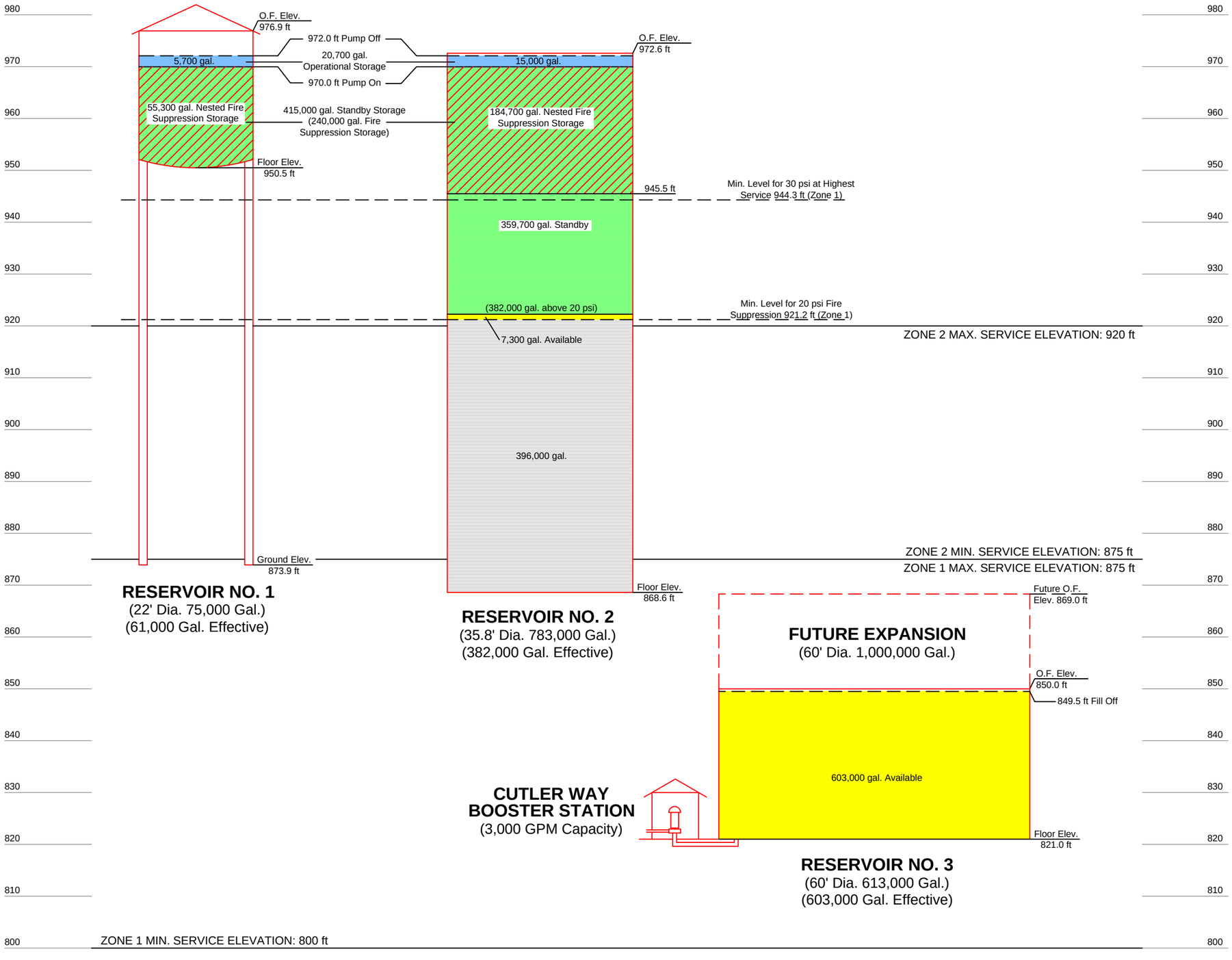
[a] Future operational storage is based upon maintaining a 2-foot operating range.
[b] Fire suppression and standby storage are nested. Fire suppression storage is 240,000 gallons, while standby storage is the controlling volume as listed in the table.

It can be seen from Table 3-24 that the current available storage capacity is adequate to meet existing and future needs through the year 2033. Further evaluation of storage is required in the future to determine when/if additional volume is required.

CITY OF ZILLAH

Water System Plan Update

EXISTING RESERVOIR STORAGE LEVELS



LEGEND

- OPERATIONAL STORAGE
- FIRE SUPPRESSION STORAGE (NESTED IN STANDBY)
- STANDBY STORAGE
- EQUALIZING STORAGE
- AVAILABLE STORAGE
- DEAD STORAGE

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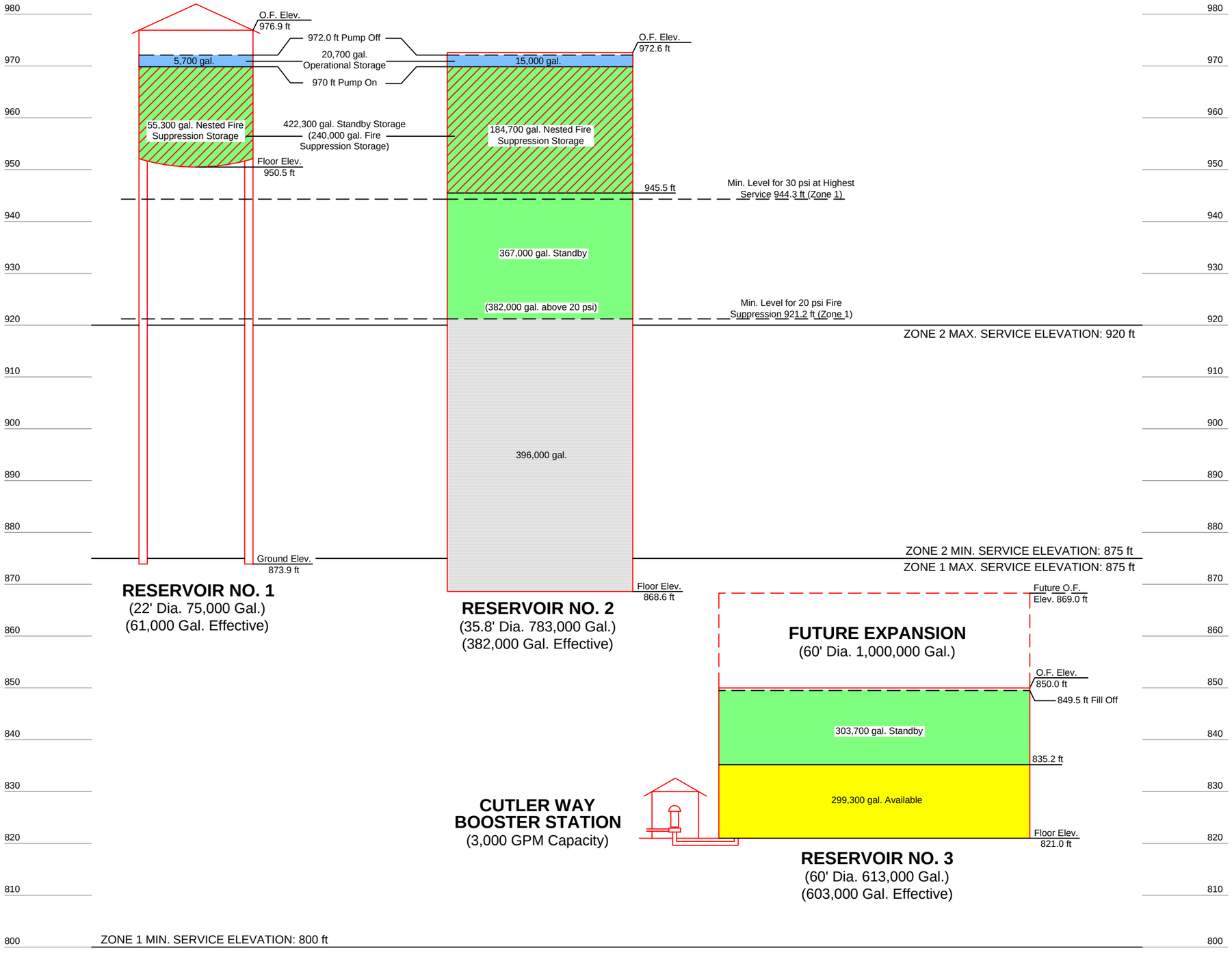
FIGURE 3-4



CITY OF ZILLAH

Water System Plan Update

2033 RESERVOIR STORAGE LEVELS

LEGEND

- OPERATIONAL STORAGE
- FIRE SUPPRESSION STORAGE (NESTED IN STANDBY)
- STANDBY STORAGE
- EQUALIZING STORAGE
- AVAILABLE STORAGE
- DEAD STORAGE

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FIGURE 3-5

3.4.2 Zone 2 Storage Analysis

The supply and storage of Zone 2 must be analyzed separately from the total system due to its dependence on a booster pump station for water supply. All of the system's source wells and storage reservoirs are located in Zone 1. However, Zone 2 is a closed system without a storage component, so the booster pump station must supply the entire flow and pressure required by the service area and a storage analysis is not required. A hydraulic analysis of the booster pump station is provided in Section 3.6.3.

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 established by the Department of Health (DOH). A community may, however, develop its own standards as long as they exceed the DOH minimum requirements.

The City of Zillah Fire Department has developed a list of minimum fire flow capacities required for many structures throughout the City, consistent with their adoption of the 2009 International Fire Code (IFC) standards and results of required flow capacity calculations developed as part of the fire insurance classification rating by the Washington Surveying and Rating Bureau in 2002 (updated in 2005 using the same flow data). These fire flow capacities, provided in Chapter 10 of this Plan, were used to develop Figure 3-6 Existing Fire Flow Capacities Map, which shows the 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 500 GPM.

A computer hydraulic analysis was used to determine the existing fire flow capacities at certain locations shown on Figure 3-6. The hydraulic analysis parameters are discussed later in Section 3.6. As can be seen on Figure 3-6, the greatest fire flow requirements are within the industrially and commercially zoned areas and at some of the public schools. It can be seen on Figure 3-6 that most all locations throughout the distribution system are able to provide the required minimum fire flow capacities. Recommended system improvements to correct any fire flow deficiencies are discussed further in Section 3.7.

CITY OF ZILLAH

Water System Plan Update

EXISTING FIRE FLOW CAPACITIES MAP

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- ZILLAH UGA BOUNDARY

FIRE FLOW RANGE	EXISTING CAPACITY	FIRE DEPT. REQUESTED FLOW CAPACITIES
> 4000 GPM	●	
3000 - 4000 GPM	●	
2000 - 3000 GPM	●	
1000 - 2000 GPM	●	
500 - 1000 GPM	●	MINIMUM 500 GPM
< 500 GPM	⊗	

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FIGURE 3-6

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, reservoirs, 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 Zillah 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 Zillah 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 elevations.

Table 3-25 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 source wells are operating and that the operating and 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 and the booster pump stations are running.

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.

TABLE 3-25 HYDRAULIC ANALYSIS PARAMETERS

Water System Feature	Hydraulic Analysis Scenario			
	Existing Peak Hour Demand	Existing Fire Flow w/MDD	Year 2019 Fire Flow w/MDD [a]	Year 2033 Peak Hour Demand
	1,323 GPM	735 GPM	886 GPM	2,225 GPM
Reservoir No. 1 Levels				
Maximum Elevation	976.9	976.9	976.9	976.9
Initial Elevation	970.0 [a]	952.5 [b]	952.5 [b]	970.0 [a]
Minimum Elevation [c]	921.2	921.2	921.2	921.2
Floor Elevation	950.5	950.5	950.5	950.5
Ground Elevation	873.9	873.9	873.9	873.9
Reservoir No. 2 Levels				
Maximum Elevation	972.6	972.6	972.6	972.6
Initial Elevation	970.0 [a]	947.5 [b]	947.5 [b]	970.0 [a]
Minimum Elevation [c]	921.2	921.2	921.2	921.2
Floor Elevation	868.6	868.6	868.6	868.6
Ground Elevation	868.6	868.6	868.6	868.6
Reservoir No. 3 Levels				
Maximum Elevation	850.0	850.0	850.0	850.0
Initial Elevation	849.5 [a]	849.5 [b]	849.5 [b]	849.5 [a]
Minimum Elevation [d]	NA	NA	NA	NA
Floor Elevation	821.0	821.0	821.0	821.0
Ground Elevation	821.0	821.0	821.0	821.0
Source Well Status				
Rainier Well (S01)	550 GPM	550 GPM	550 GPM	550 GPM
3rd Avenue Well (S02)	400 GPM	400 GPM	400 GPM	400 GPM
WIPPCO Well (S03)	650 GPM	650 GPM	650 GPM	650 GPM
New Source Well	0 GPM	0 GPM	0 GPM	950 GPM
Total Supply	1,600 GPM	1,600 GPM	2,550 GPM	2,550 GPM

[a] Equalizing storage depleted.
[b] Equalizing and fire suppression storage depleted.
[c] Minimum reservoir level to provide 20 psi service pressure to all services.
[d] Minimum reservoir level not applicable, volume is provided by constant pressure booster pump station.

3.6.2 Analysis Scenarios

The existing water system was first analyzed considering a present peak hour demand of 1,323 GPM, which was the total calculated peak hourly flow on July 8, 2011. 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 feet per second (fps) design parameter. A copy of the computer printout of this scenario and all other hydraulic analyses results discussed in this section are provided in the 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 2033 of 2,225 GPM, assuming recommended system improvements are in place. This scenario was conducted using the year 2033

equalizing storage volume. 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 an existing system consumptive demand of 735 GPM, which was the calculated MDD on July 8, 2011. The computer hydraulic model was used to calculate the maximum flow attainable at designated hydrant nodes while providing a residual, positive pressure of 20 psi. Operational, equalizing and fire suppression storage was depleted at the start of the fire flow analysis. The resulting fire flow capacities are shown on Figure 3-6, along with the fire department requested fire flow capacities as previously discussed in Section 3.5. Some locations were calculated to be deficient in meeting the specified fire flow capacities, as shown on Figure 3-6. A future fire flow analysis was performed on the system with the same conditions to verify the available fire flow capacity with improvements in place. A summary of the improvements in fire flow capacity at deficient locations as a result of proposed water system improvements is presented in Table 3-26 below and shown on Figure 3-7 Fire Flow Capacity Improvement Map.

TABLE 3-26 EXISTING FIRE FLOW DEFICIENCIES

Deficiency Location No.	Junction Node No.[a]	Existing Fire Flow (GPM)	Required Fire Flow (GPM)	Improved Fire Flow (GPM)[b]
1	J-251	< 500	≥ 500	1,700
2	J-14	1,850	≥ 2,000	3,350
3	J-54	650	≥ 1,000	> 4,000
4	J-71	2,450	≥ 3,000	> 4,000
5	J-259	1,750	≥ 3,000	3,200
6	J-97	1,450	≥ 2,000	2,050
7	J-305	1,200	≥ 3,000	> 4,000
8	J-145	700	≥ 1,000	> 4,000
9	J-198	< 500	≥ 500	1,800
10	J-173	1,700	≥ 3,000	3,100

[a] Refer to Map B in the back of this Plan for Junction Node locations.
[b] Improved fire flow capacities are based upon applicable fire flow improvements in place.

3.6.3 Zone 2 Hydraulic Analysis

As discussed previously, Zone 2 is a closed system without a storage component, therefore the booster pump station must supply the entire flow and pressure required by the service area.

Zone 1 water pressure is increased to Zone 2 pressure through the Zone 2 Booster Pump Station. The Zone 2 Booster Pump Station contains a 3 HP, 15 HP, and a 60 HP pump, providing a constant pressure of 50 psi with the use of a pressure tank and VFD pump control. Refer to Section 3.3.3 of this Plan for additional information. The pump station has a fire pump capacity of 1,500 GPM, or 2.160 MGD, and a service pump capacity of 300 GPM, or 0.432 MGD which exceeds the current Zone 2 peak hour demand of 6 GPM.

Currently this pressure zone includes 19 single-family residential services and one church service, however, steady growth is expected in the future. Future supply requirements will be based on the anticipated growth in Zone 2, as discussed in Chapter 2.

Per the DOH *Water System Design Manual* Section 10.1.2, a closed system booster pump station must meet the following requirements:

1. Provide PHD at no less than 30 psi at all service connections;

2. Meet fire suppression requirements plus MDD while maintaining 20 psi at all service connections;

3. During fire flow, assume the largest capacity booster pump "routinely used" is out of service

Additionally, due to the booster pump station's reliance on the supplying system, Zone 1, the following conditions must be met within the supplying system (Zone 1):

1. Maintain 20 psi at all points in Zone 1 under fire flow plus MDD rate conditions in Zone 1 while supplying PHD to Zone 2.

2. Maintain 20 psi at all points in Zone 1 under PHD within Zone 1 while supplying fire flow plus MDD to Zone 2.

To analyze the above conditions and scenarios, Zone 2 existing and future demands were calculated as shown in Table 3-27 below:

TABLE 3-27 ZONE 2 EXISTING AND FUTURE DEMANDS

	2013	2019	2023*	2033*
Peak Hour Demand (GPM)	6.0	10.0	12.0	16.0
Max Day Demand (GPM)	2.9	4.9	5.9	7.8
Max. Fire Flow Requirement (GPM)	2,000	2,000	2,000	2,000
Service Pump Capacity (GPM)	10-300	10-300	10-300	10-300
Fire Pump Capacity (GPM)	0	0	1,500	1,500

*Assumes Zone 2 growth as discussed in Chapter 2 and the installation of the second fire pump.

The smallest, 3 HP pump within the Zone 2 Booster Pump Station is capable of 10 to 60 GPM at 50 to 55 psi and is able to meet existing and future demands for the zone. The 15 HP, 50 to 300 GPM pump is available to meet flows exceeding the calculated PHD, or if Zone 2 grows faster than currently projected. With regards to fire flow, DOH recommends that fire flow be met when the largest pump is out of service. Currently, only one of the 1,500 GPM fire pumps is installed. Therefore, in order to meet DOH reliability requirements and the required fire flow, it is recommended that the second fire pump be installed.

Currently the largest fire flow demand is the church, which the Zillah Fire Department has requested 2,000 GPM of available fire flow at 20 psi.

To evaluate the impact of the Zone 2 Booster Pump Station on Zone 1, the PHD and Fire Flow scenarios were evaluated with the pump station in operation. Copies of the hydraulic analysis used to analyze these scenarios are included in Chapter 10.

3.6.4 Model Calibration

Fire flow tests throughout the distribution system were performed by the Zillah Fire Department and Public Works staff in December 2013. The results of the flow tests were compared to the system hydraulic model. In general, differences between the results are likely due to several factors including, but not limited to, the reservoir elevation and well operation status were not documented during testing, elevation differences between the actual hydrant and the modeled node, distribution system valves may be closed, partially closed, or leaking. Additionally, it is important to understand fundamental differences expected between the results; the fire flow analysis is used to calculate the available fire flow at 20 psi within the water main, whereas the field test is an instantaneous free-discharge hydrant flow.

When comparing the results, the static pressures are generally within 5%. The residual pressures at field measured flows are more variable, with the model generally reporting higher residual pressures. As discussed, several factors are involved which may result in differences. A copy of the 2013 hydrant flow tests is provided in Chapter 10 of the Plan.

CITY OF ZILLAH

Water System Plan Update

FIRE FLOW CAPACITY IMPROVEMENT MAP

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY

FIRE FLOW CAPACITY INCREASE

LOCATION X
EXIST. 1,700 GPM
IMPR. 3,050 GPM
REQ. 3,000 GPM

LOCATION NUMBER
EXISTING WATER SYSTEM CAPACITY
CAPACITY WITH IMPROVEMENTS IN PLACE
REQUIRED CAPACITY

LOCATION 1
EXIST. < 500 GPM
IMPR. 1,700 GPM
REQ. > 500 GPM

LOCATION 2
EXIST. 1,850 GPM
IMPR. 3,350 GPM
REQ. 2,000-3,000 GPM

LOCATION 3
EXIST. 650 GPM
IMPR. > 4,000 GPM
REQ. 1,000-2,000 GPM

LOCATION 4
EXIST. 2,450 GPM
IMPR. > 4,000 GPM
REQ. 3,000-4,000 GPM

LOCATION 5
EXIST. 1,750 GPM
IMPR. 3,200 GPM
REQ. 3,000-4,000 GPM

LOCATION 6
EXIST. 1,450 GPM
IMPR. 2,050 GPM
REQ. 2,000-3,000 GPM

LOCATION 7
EXIST. 1,200 GPM
IMPR. > 4,000 GPM
REQ. 3,000-4,000 GPM

LOCATION 8
EXIST. 700 GPM
IMPR. > 4,000 GPM
REQ. 1,000-2,000 GPM

LOCATION 9
EXIST. < 500 GPM
IMPR. 1,800 GPM
REQ. >500 GPM

LOCATION 10
EXIST. 1,700 GPM
IMPR. 3,100 GPM
REQ. 3,000-4,000 GPM

950 GPM WELL ADDED

N W E S

0 300 600 1200

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07-23-14 P:\Projects\2013\13033\Cwp Figures.dwg

FIGURE 3-7

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 items 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

1. **Source Water Quality** – The 3rd Avenue Well (S02) is seldom used due to aesthetic/water quality issues with the source water. The well produces sulfur odor and has elevated manganese levels. By improving the water quality this well could be put into normal service and reduce the run time of the other wells.

2. **Existing Source Reconstruction, Rehabilitation and Upgrades** – The City's existing source wells are in need of substantial building, mechanical, and electrical upgrades to sustain their current capacity, supply efficiency, and reliability. Wells have historically had failures every eight to ten years with Rainier Well reporting issues even more frequently. 3rd Avenue Well has water quality issues as described elsewhere and WIPPCO Well has produced sand which may begin to limit production capacity. In anticipation of future failures, the City will need to budget funds or pursue funding for reconstruction and rehabilitation of the existing source wells. Additionally, the wells are not equipped with a submersible level sensor to actively monitor the well draw down.

3. **Protective Covenants** – The City currently does not have protective covenants at Rainier Well and 3rd Avenue Well. These covenants are necessary to provide the required 100-foot sanitary protective radius around the wells.

4. **Source Well Capacity and Reliability** – Source well capacity will need to be increased beyond the year 2019 to meet PHD and remove the need for future equalization storage. Additionally, an additional source will provide greater redundancy and system reliability. Any new well will need to be coordinated with existing water rights.

5. **Water Rights** – Overall, the City's current water rights are adequate in providing for existing and projected year 2033 demands. However, the use of Rainier Well has exceeded the individual well water right, largely due to the aesthetic water quality issues related to 3rd Avenue Well. To address this issue, the investigation and rehabilitation of the 3rd Avenue Well is a priority improvement. A specific improvement for water rights is not proposed.

6. **System Disinfection/Chlorination –** Water system disinfection/chlorination is not a required improvement nor an existing deficiency, but as the City's water system continues to grow it may become one. Chlorination is used to ensure consistent, safe water quality throughout the distribution system. To begin initial planning for this future improvement the impacts of chlorination are discussed in Chapter 3 and the estimated cost is provided in Chapter 8.

3.7.2 Storage

7. **Reservoir Cleaning, Inspection and Painting** – The two elevated reservoirs were last painted in 1998 and are in need of cleaning, inspection, and re-painting to ensure continued high quality of stored water, to monitor their structural integrity and water tightness and to prevent corrosion. It is recommended that steel reservoirs are re-painted every 20 to 25 years. The frequency of cleaning and inspections is variable depending on several characteristics (water quality, mixing, water age and turnover, etc.) but it is recommended that the reservoirs are inspected and cleaned every 2 to 3 years.

8. **Storage Capacity** – As discussed previously in this Chapter and Chapter 2 of this Plan, the City's reservoir storage capacity is adequate to meet the 20-year demand. Therefore, no improvement project is recommended at this time. If future water demands change, the City may need to reevaluate the need for additional storage.

3.7.3 Distribution

9. **Service Meters** – There are approximately 400 old, manual-read meters that are planned to be replaced. The City has budgeted annually to replace approximately 30 meters per year throughout the City. They will replace old manual-read, or leaking meters with new radio-read style meters.

10. **Booster Pump Stations** – Cutler Way Booster Station and Zone 2 Constant Pressure Booster Station were constructed without the designed spare pump due to budget constraints. The booster station capacity is impacted when the primary pump is out of service due to maintenance or repairs unless a spare pump is available.

11. **Fire Flow Capacity** – A number of locations within the City were identified in Section 3.6 as having insufficient fire flow capacities. Fire flow deficiencies will require pipeline upsizing or looping in the future. The City will construct system improvements in order to increase fire flow capacities at key locations as shown on Figure 3-7.

    Additionally, the 2007 Comprehensive Water Plan (CWP) identified 37 locations where main line valves need to be added for improved line control, 8 locations where fire hydrants need to be added to the distribution system to meet minimum spacing requirements, and 21 locations where hydrants need to be replaced because they are inoperable or have inadequate pressures. Upon review of the deficient fire hydrants, only 4 deficient hydrants remain as shown in Table 3-28 below due to recent system improvements and replacement of aging hydrants. Therefore, approximately 37 new valves and 9 fire hydrants need to be added to the system. The other deficient fire hydrants will be addressed by related improvements discussed elsewhere.

TABLE 3-28 ZILLAH FIRE DEPARTMENT FIRE HYDRANT DEFICIENCIES

Fire Hydrant Number	Fire Hydrant Location	Deficiency
1	501 Westwind Dr.	Bad Leaks
2	230 Alteejen Road	Remove (Not Approved Hyd.)
3	1109 Pollock Avenue	Low Pressure *
4	1116 Reo Drive	Low Pressure *

* System pressure does not meet Zillah Fire Department minimum requirements of 20 psi. To be addressed with identified improvements discussed in Chapter 8.

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 Report are provided. Further description of the water system improvements is provided in Chapter 8 of the Plan.

3.8.1 Supply

Source Water Quality – To address the 3rd Avenue Well (S02) aesthetic/water quality issues related to sulfur and manganese the initial planned improvement is a water quality analysis, investigation, and report to determine mitigation options. [O&M Improvement No. 1]

Existing Source Reconstruction, Rehabilitation, and Upgrades – The City's existing source wells are in need of substantial building, mechanical, and electrical upgrades to remain reliable sources. 3rd Avenue Well requires rehabilitation after the water quality analysis and report is completed to allow the City to operate and rotate the well as a normal source. The exact mitigation scope is unknown, but due to the lack of access to the well, substantial building and roof modifications will be needed to accommodate well rig access. Rainier Well (S01) requires HVAC and electrical improvements to prevent frequent motor failure and the building is insufficient to accommodate the needed improvements. Complete

reconstruction of Rainier Well is recommended. WIPPCO Well (S03) is limited by poor site access and is in need of mechanical and electrical improvements to ensure future reliability. Additionally, as the largest City source, a permanent, onsite generator is recommended for overall water system resiliency. Complete reconstruction of WIPPCO Well is also recommended. To monitor well draw down submersible level sensors are recommended at all wells as they are reconstructed or rehabilitated. [Capital Improvement No. 2, 4, & 5]

Protective Covenants – Protective covenants will be created and executed for source wells owned by the City of Zillah that currently do not have a protective covenant, providing the necessary 100-foot sanitary protective radius around the wells. [O&M Improvement No. 2]

New Source Well – The City will need to provide an additional source of supply to meet future water PHD system demands, remove the need for future equalization storage, maximize their existing instantaneous water rights, and provide greater redundancy and system reliability. The City has purchased the Joseph Well property as part of the 0.6 MG storage reservoir and booster pump station improvement and plans to either rehabilitate the existing well or drill a new well, which will supply an additional 950 GPM of water. The location of the new well will need to be coordinated with existing water rights, otherwise alternate locations may need to be evaluated. [Capital Improvement Nos. 12]

3.8.2 Storage

Reservoir Cleaning, Inspection, and Painting – The elevated reservoirs were last coated in 1998 and should be re-painted approximately every 20 to 25 years to maintain water quality and prevent corrosion. To determine the existing condition of Reservoirs No. 1 and 2, it is recommended that the City contract with a certified diver to inspect and clean the existing reservoirs. If any mechanical or structural deficiencies are discovered, they can be planned for correction when the reservoirs are offline for re-painting. [O&M Improvement Nos. 5 and 6]

3.8.3 Distribution

Service Meters – Approximately 400 service meters require replacement. The City is planning to continue replacing approximately 30 meters per year with new radio-read meters. [O&M Improvement Nos. 3]

Backup Booster Pump Installation – The City's existing booster pump stations at Cutler Way and Zone 2 were designed to accommodate redundant backup booster pumps. At the time of construction, funds were not available for these pumps. However, to provide greater system reliability during routine maintenance and repairs, it is recommended that these backup pumps be installed. [Capital Improvement Nos. 3 and 6]

Water Main Upsizing, Replacement and Looping – Installation of water main loops, main upsizing, and replacing old leaking mains will improve overall system capacity, reliability, and water loss. A brief summary of these improvements is below:

- Complete the 10-inch water main loop within Cutler Way from Roza Drive to Cheyne Road on the north side of the City. [Capital Improvement No. 1]

Fire Flow Capacity – Upsizing existing water mains or providing new connections and loops will increase system flows and pressure to areas identified as deficient in Figure 3-6.

- Additional 8-inch water main loop in the Alteejen Road area of Zone 2 will improve fire flow to this residential area. [Capital Improvement No. 7]

- Providing approximately 9 hydrants and 37 valves is needed to increase operational reliability and flexibility of the system. [O&M Improvement No. 7]

- Looping the water main at the end of Schoentrup Lane to the existing standpipe reservoir (Reservoir No. 2) outlet piping will increase fire flow in this neighborhood from below 1,000 GPM to over 4,000 GPM. This improvement will also include a water main loop from the standpipe reservoir outlet piping to the 6-inch water main at the end of Reo Drive, along the SVID canal,

which will also raise fire flow around Reo Drive from below 500 GPM to over 1,000 GPM. [Capital Improvement No. 8]

- Installation of an 8-inch water main loop from the south end of Miles Drive to First Avenue will improve fire flow at the commercial and industrial property along First Avenue and improve fire flow to the church property on Miles Drive. [Capital Improvement No. 9]

- Installation of an 8-inch water main loop from Meade Street to First Avenue will improve fire flow capacity to hydrants in this area. [Capital Improvement No. 10]

- Upsizing a portion of the water main in Moritz Street and Pollock Avenue to the existing fire hydrant will improve fire flow to over 1,000 GPM. [Capital Improvement No. 11]

- Replace the aging and undersized 6-inch steel water main in First Avenue from Cheyne Road to Fourth Avenue. [Capital Improvement No. 13]

- Replace the aging and undersized 4-inch water main in Edson Street and loop the main to Fourth Avenue. [Capital Improvement No. 14]

- Replace the 6-inch water main in Collins Place with an 8-inch water main to meet required fire flow capacity. [Capital Improvement No. 15]

- Replace the 6-inch water main in Zone 2 to the Catholic Church with an 8-inch water main to meet required fire flow capacity. [Capital Improvement No. 16]

- Replace the 6-inch water main in South First Avenue from Meade Street to Glen Drive with an 8-inch water main to meet required fire flow capacity. [Capital Improvement No. 17]

- Installation of an 8-inch water main loop from Pearson Street to South Industrial Area Loop along I-82 right of way to meet required fire flow capacity. [Capital Improvement No. 18]

- Upsize the 6-inch PVC water main in Fifth Street from Glennwood Drive to Third Avenue. [Capital Improvement No. 19]

CHAPTER 4 - WATER USE EFFICIENCY PROGRAM AND WATER RIGHTS

4.1 WATER USE EFFICIENCY PROGRAM

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 services, the deadline for establishing system goals is July 1, 2009. The first annual report to DOH is required by July 1, 2008. 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
- Distribution System Leakage (DSL) Evaluation.

4.1.2 Current Water Conservation Program

Zillah's current Water Conservation Program is included in Chapter 4 of the City's 2007 Water System Plan update. During the completion of this Plan, the City created a WUE program that is structured in accordance with WAC 246-290-810(4) and consists of the elements listed in Section 4.1.1.

This *2014 Water System Plan* has incorporated the City's WUE program in a similar format, as outlined in the remainder of this Chapter.

Provided in Table 4-2 is a summary of the population, number of services, water consumption, and per service consumption from 2008 through 2013. Further information on historical water use is provided in Chapter 2 of this Plan. In general, while number of services has increased, residential average day consumption has fallen or remained steady. The exception is 2012, but the reason for this change is discussed further in Chapter 2.

TABLE 4-2 WATER CONSUMPTION INFORMATION 2008 - 2012

Year	Population*	Total Water Services	Annual Water Consumption (MG)	Annual Residential Consumption (MG)	Residential Water Services	Residential Avg. Day Consumption per service (gal/service/day)
2008	2,905	1,005	120.244	61.456	897	180 (SFR), 250 (MFR)
2009	2,969	1,019	127.288	63.180	910	182 (SFR), 267 (MFR)
2010	3,010	1,037	134.212	61.661	924	173 (SFR), 270 (MFR)
2011	3,046	1,044	154.935	61.473	928	173 (SFR), 265 (MFR)
2012	3,081	979	140.906	63.552	874	186 (SFR), 378 (MFR)
2013	3,161	1,077	149.063	63.479	962	175 (SFR), 222 (MFR)

* From Washington State OFM population estimates. Includes UGA population.

While residential average day consumption has fallen, it can be seen from Table 4-2 that there has been an approximate 15.7% increase in per service annual water consumption since 2008, which does not achieve the goal of a 5% reduction in per service water consumption from the previous water conservation program.

Based on the 2008-2013 consumption, it appears that the Water Conservation Program from the 2007 Water System Plan has been ineffective in reducing water system consumption per service across all service categories. The City's WUE Program, provided in this Plan, will attempt to better meet the primary goals and objectives of the previous program by working towards more efficient use of water.

4.1.3 Water Use Efficiency Goals

Water use efficiency goals are an integral component of the WUE program, setting the ground work for more efficient use of water. The City of Zillah has adopted the following WUE goal:

- Reduce the average equivalent residential unit annual water consumption by a minimum of 1% across all user classes within six years.

It is anticipated that the reduction in use by 1% across all user classes could save approximately 1.65 million gallons in 2019, based upon the projection of 1,243 services.

TABLE 4-3 WATER DEMAND FORECAST FOR YEAR 2019 WITH WATER USE EFFICIENCY GOAL

	Estimated 2019 Services	Annual Demand (MG)	Average Day Demand (Gallons)
Projected Demand	1,243	165.34	452,980
1% Consumption Reduction Goal	- -	1.65	4,530
Total	1,243	163.69	448,450

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, supply side measures and demand side measures. All of the selected WUE measures pertaining to Zillah's WUE goals are presented to the public during the goal setting process.

Supply Side Measures

Supply side measures are essential to control distribution system leakage (DSL) and improve supply efficiency and overall system performance. The following are discussions of supply side WUE measures that have already, or will be implemented within the next six years to reduce the system's current DSL percentage and satisfy the City's Water Loss Control Action plan objective. The estimated cost of these measures and anticipated water savings are also provided.

Source Metering – City of Zillah currently meters all customers and sources. The City has production meters on all water sources as well as a state of the art telemetry system to monitor these sites. The telemetry system monitors the operation of source wells for possible pressure loss, pump function, and water reservoir levels.

WUE Measure Cost Estimate: $0. Source meters in place.

Estimated Water Savings: None.

WUE Measure Action Status: Already implemented.

Meter Calibration – The City must calibrate and maintain source meters and large service meters (4-inch and larger) based on generally accepted industry standards and manufacturer information. Compliance will be maintained by the City by performing maintenance on the source and service meters every two (2) years as recommended by DOH. Actual water savings from meter calibration is unknown, but if the accuracy of all source meters is improved by 0.5%, the resulting water savings could be as much as 880,000 gallons, considering that approximately 176 million gallons were pumped into the system in 2013. It should be noted that the opposite of water savings could result, therefore, it is unknown if distribution system leakage (DSL) will be reduced or how much water could be saved through meter calibration.

WUE Measure Cost Estimate: $1,500 annually for calibration of one source meter and half of the larger service meters.

Estimated Water Savings: Unknown, could potentially reduce DSL by 0.5%.

WUE Measure Action Status: Already implemented.

Leak Detection and Water Accounting Leak Detection – As leaks are discovered, they are repaired or mains are reconstructed as needed. One way the City watches for system leaks is through a meter reading program. The City's Finance Department uses software that tracks the consumption history of each meter. If a meter shows a higher than average consumption level during any given billing cycle a maintenance worker is sent to the site to verify the reading. If the reading is accurate, the location is then investigated for potential leaks to prevent further water loss.

WUE Measure Cost Estimate: $500. Already in annual operating budget.

Estimated Water Savings: Unknown, but potentially significant reduction in DSL if leak detected.

WUE Measure Action Status: Already implemented.

Water Loss Control Action Plan – To control leakage, systems that do not meet the DSL standard must implement a Water Loss Control Action Plan (WLCAP). The City's current 3-year average DSL is 12.6 percent and the 2013 DSL percentage is 14.5. The City has improved recordkeeping to more accurately estimate authorized water consumption uses such as construction, flushing, and firefighting activities which will improve the DSL percentage. The City will conduct a leak detection survey of 25% of the total system in 2014, 2015, 2016, and 2017 to identify leaking water mains.

It is anticipated that the 2013 DSL of 14.5 percent will be reduced because of new record keeping practices and the completion of the leak detection surveys to identify and correct leaks.

WUE Measure Cost Estimate: $1,000 for survey. Cost of needed improvements unknown, possibly part of other identified improvements.

Estimated Water Savings: Unknown, but potentially significant reduction in DSL.

WUE Measure Action Status: Already implemented.

The above costs and estimated water savings of the identified supply side measures have been summarized in Table 4-4.

TABLE 4-4 SUMMARY OF SUPPLY SIDE WUE MEASURES

Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Source Metering	$0	Implemented	Unknown
Meter Calibration	$1,500 annually	Implemented	Unknown
Leak Detection and Water Accounting Leak Detection	$500 annually	Implemented	Unknown
Water Loss Control Action Plan	$1,000 annually	Implemented	Unknown

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 4-5 shows the minimum number of measures required to be evaluated or implemented by the City of Zillah.

TABLE 4-5 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 (Zillah's current requirement)
2,500 – 9,999	6
10,000 – 49,999	9
Greater than 50,000	12

A discussion of the demand side measures that the City of Zillah has evaluated to achieve its specified efficiency goal is 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.

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.

Customer Consumption History – The monthly utility statements that the City sends out to its customers indicate monthly water consumption. Customers may request a more detailed breakdown of water consumption history, allowing customers to track and compare their usage. Citizens can be informed of their own water use trends. The City normally contacts a customer that has had a couple of months of higher than normal bills. The awareness can allow them to evaluate their individual water conservation needs and alert them of potential leaks. This measure is implemented across all user categories.

WUE Measure Cost Estimate: $500 total, already part of billing process.

Estimated Water Savings: Unknown, but anticipated to reduce consumption through awareness.

WUE Measure Action Status: Already implemented.

Bi-monthly Educational Seasonal Conservation Information – City of Zillah will evaluate offering more frequent educational information outlining more efficient indoor and outdoor water use during each billing cycle. Bi-monthly educational tips would target the high users of water in the area. City of Zillah may educate the public about why water conservation is important and why there is a particular need to lower water usage, especially during the peak months of June, July, and August. Conservation tips would address seasonal topics such as outdoor water reduction in the yard, and during the winter months will focus on indoor leak prevention tips. This measure will be implemented across all user categories.

WUE Measure Cost Estimate: $500, funded through existing budget.

Estimated Water Savings: Unknown, but anticipated to reduce consumption through awareness.

WUE Measure Action Status: City to schedule implementation.

A summary of the estimated costs to implement the selected measures, their estimated water savings, and overall cost-effectiveness are provided in Table 4-6.

TABLE 4-6 SUMMARY OF DEMAND SIDE WUE MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Customer Consumption History – Single-Family Residential	$500	Implemented	Unknown
Customer Consumption History – Multi-Family Residential	- -	Implemented	Unknown
Customer Consumption History – Commercial	- -	Implemented	Unknown
Customer Consumption History – Industrial	- -	Implemented	Unknown
Customer Consumption History – Churches	- -	Implemented	Unknown
Customer Consumption History – City	- -	Implemented	Unknown
Bi-monthly Educational Seasonal Conservation Information – To Be Evaluated	$500	TBD	Unknown

The customer consumption history is already implemented and summarized in Table 4-7. The City will evaluate the effectiveness of the other measures during each program update to determine their potential for implementation.

4.1.5 WUE Measure Implementation

A summary of the WUE program measures that are planned for implementation is provided in Table 4-7, including measure description, implementation cost, annual cost after implementation (if applicable), and year of implementation. All of the implemented measures support the system's WUE goals to reduce distribution system leakage and overall system consumption.

TABLE 4-7 SUMMARY AND PROJECTED SAVINGS OF WATER USE EFFICIENCY MEASURES			
Measure Description	Implementation Cost	Year of Implementation	Projected Water Savings
Source Metering	$0	Implemented	Unknown
Meter Calibration	$1,500 annually	Implemented	Unknown
Leak Detection and Water Accounting Leak Detection	$500 annually	Implemented	Unknown
Water Loss Control Action Plan	$1,000 annually	Implemented	Unknown
Customer Consumption History – Single-Family Residential	$500	Implemented	Unknown
Customer Consumption History – Multi-Family Residential	- -	Implemented	Unknown
Customer Consumption History – Commercial	- -	Implemented	Unknown
Customer Consumption History – Industrial	- -	Implemented	Unknown
Customer Consumption History – Churches	- -	Implemented	Unknown
Customer Consumption History – City	- -	Implemented	Unknown

The City plans to budget funds each year for the next six-year period to fund the WUE measures listed above in Table 4-7. These budget amounts are reflected in the proposed City of Zillah 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. Zillah currently provides informational materials aimed at water use efficiency for customers on the City's website (www.cityofzillah.us) and at City Hall. Additionally the City sends out seasonal water conservation tips to their customers in each *Consumer Confidence Report* to help prepare customers for the changing season. In the future, the City plans to provide bi-monthly seasonal conservation information to customers during each billing cycle to further educate the public on the purpose of using water more efficiently. In 2011, the City implemented a new customer billing format to provide customers with a consumption history on their monthly bills along with a message box for water conservation tips and announcements.

Customer education programs that Zillah has considered for further evaluation include the following:

- Program Promotion – Program promotion can include public service announcements, news articles, information provided in the City's annual Consumer Confidence Report, bill inserts, providing water use history as part of utility bills, and distribution of inexpensive, easily installed water-saving devices such as shower flow restrictors, toilet tank water displacement bags, and leak detection dye tablets.

- Speakers Bureaus – Speakers bureaus involve identifying water conservation speaking opportunities appropriate to various civic, service, community and other groups. Such speaking opportunities focus on increasing public awareness of water resource and conservation issues, and may involve the use of audio and visual aids.

- School Outreach – School outreach involves preparation of educational programs for school children targeted to increase awareness of local water resources and encourage water conservation practices. These may include school presentations, preparation of curriculum material, and tours of water system facilities.

- Theme Shows and Fairs – This activity involves preparation of a portable display of water conservation devices and selected written material, and making this display available at local area theme festivals and activities.

Zillah has identified some of these customer education programs as evaluated WUE measures that may be implemented in the future, as discussed in Section 4.1.4.

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.

Zillah will submit its Annual WUE Performance Report to DOH by July 1 of each year. Information contained in the Annual WUE Performance Report will also be included in the City's *Consumer Confidence Report* distributed to all water system customers annually. WUE Program effectiveness will also be evaluated every six years when the Water System Plan is updated. 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 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. Distribution system leakage may also include un-metered uses such as hydrant use for fire fighting, 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 Zillah's water sources are metered, and these source meters are recorded daily. All services in Zillah's distribution system are metered and read monthly. Table 4-8 presents Zillah's water production and water consumption values for the last three-year period (2011 through 2013). Estimated water consumption from authorized unmetered uses is also included in Table 4-8.

TABLE 4-8 WATER PRODUCTION & CONSUMPTION INFORMATION 2011 – 2013
(values are in million gallons)

Year	Water Production (MG)	Water Consumption (MG)	Un-Metered / Non-Revenue Consumption (MG)	Distribution Leakage (MG)	Distribution Leakage %
2011	183.994	154.935	0.288	28.771	15.6%
2012	152.521	140.906	1.265	10.350	6.8%
2013	175.698	149.063	1.175	25.460	14.5%
3-Year Average	170.738	148.301	0.909	21.527	12.6%

Zillah currently does not meet the 10% DSL standard with the current three-year average DSL equal to 12.6%. The City is continually working to improve DSL with a variety of methods including: improved recordkeeping and estimating of authorized water consumption, a system-wide leak detection survey, and replacing old steel water mains whenever possible.

4.3 WATER LOSS CONTROL ACTION PLAN

As discussed above in Section 4.1.8 the City's current three-year average DSL percentage is above the 10% standard. Therefore, the City is required to develop a Water Loss Control Action Plan (WLCAP). It is important that the City continues to monitor and control water loss to work towards the 10% standard. A summary of the WLCAP requirements needed to address the key items outlined in Section 6.7 of the current WUE Guidebook is below:

- Water loss control methods that will be used.
- An estimate of how long it will take to achieve the DSL standard.
- A budget that demonstrates how the system will pay for leakage control.
- Any technical or economic concerns that will prevent complying with the standard.

The complete WLCAP is included in the City's Water Use Efficiency Program which is included in Chapter 10.

With continued tracking of any estimated authorized consumption, implementation of supply-side efficiency measures, and replacing leaking mains whenever possible as identified in the City's future leak detection survey, the City anticipates meeting the DSL standard at some point within the next six-year planning period.

4.4 WATER RIGHT STATUS SUMMARY

The City of Zillah currently maintains certificated and permitted water rights from the State of Washington for the appropriation of ground water at each of its wells. A copy of the City's water right certificates, permits and applications, and any associated reports of examination (ROE) and water right correspondence documents are provided in Chapter 10 of this Plan.

Rainier Well (S01)

Zillah's Certificate of Ground Water Right (GWC3350) for the Rainier Well is for a maximum annual volume of 296 acre feet (96.45 MG), and a maximum instantaneous flow rate of 550 GPM. In addition, in 1988, Zillah submitted Groundwater Application G4-29869 for the withdrawal of 1,600 GPM from the Rainier Well for continuous municipal and industrial use, and for the irrigation of 150 acres. This application does not specify an annual quantity. The application has not been acted upon by the Washington Department of Ecology.

3rd Avenue Well (S02)

Zillah's Certificate of Ground Water Right (GWC606-D) for the 3rd Avenue Well is for a maximum annual volume of 150 acre feet, and a maximum instantaneous flow rate of 276 GPM. In addition, Zillah's Groundwater Permit (G4-29702P) authorizes 2,000 GPM and 1,458.1 acre feet per year from the 3rd Avenue Well and from the WIPPCO Well. A portion of this right (600 acre feet per year) is primarily for irrigation of 150 acres. The remainder of the right is supplemental, allowing the City to withdraw water from either the WIPPCO Well or from the 3rd Avenue Well.

WIPPCO Well (S03)

Zillah's Groundwater Permit (G4-29702P) authorizes 2,000 GPM and 1,458.1 acre feet per year from the 3rd Avenue Well and from the WIPPCO Well. A portion of this right (600 acre feet per year) is primarily for irrigation of 150 acres. The remainder of the right is supplemental, allowing the City to withdraw water from either the WIPPCO Well or from the 3rd Avenue Well. Zillah's Water Rights Claim (CG4-WRC007086) for the WIPPCO Well is for a maximum annual volume of 858.1 acre feet, and a maximum instantaneous flow rate of 700 GPM.

The status of Zillah's water rights as compared to their current and future water system demand is shown in Table 4-9, Table 4-10, and Table 4-11. The excess and/or deficiencies in the City's water rights are also shown in these tables. It can be seen that the current and future water right status for the City is adequate to satisfy current and projected future demand.

TABLE 4-9 WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

Permit Certificate or Claim #		Name on Document	Priority Date (list oldest first)	Source Name/Number	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Existing Consumption		Current Water Right Status Excess (Deficiency)	
						Maximum Instantaneous Flow Rate (Q_i) GPM	Maximum Annual Volume (Q_a) acre-feet	Maximum Instantaneous Flow Rate (Q_i)[d] GPM	Maximum Annual Volume (Q_a)[d] acre-feet	Maximum Instantaneous Flow Rate (Q_i) GPM	Maximum Annual Volume (Q_a) acre-feet
Permit / Certificates											
1.	GWC606-D	Zillah	July 1948	3rd Avenue Well, SO2	Primary	276	150.0				
2.	GWC3350	Zillah	July 1958	Rainier Well, SO1	Primary	550	296.0				
3.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Primary	1,024	450.0				
4.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Supplemental	976	1,008.1				
Claims											
1.	WRC007086	Stokely-Van Camp, Inc.	Sept. 1942	WIPPCO Well, SO3	Primary	700	858.1				
TOTAL[c]						2,550	1,458.1	871.5[d]	564.6[d]	1,678.5	893.5

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

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Qi) REQUESTED	Maximum Annual Volume (Qa) REQUESTED
1. G4-29869[a]	Zillah	1988	Primary	1,600	

[a.] Groundwater Application G4-29869 proposes the withdrawal of 1,600 gallons per minute from the Rainier Well (S01) for continuous municipal and industrial use, and irrigation of 150 acres. This application does not specify an annual quantity. The application, submitted in 1988, has not been acted upon by WDOE.

[b.] Groundwater Permit G4-29702P authorizes a total of 2,000 GPM and 1,458.1 acre feet per year for the 3rd Avenue Well and the WIPPCO Well combined. A portion of this right (600 acre feet per year) is primarily for irrigation of 150 acres. The remainder of the right is supplemental, allowing the City to withdraw water from either the WIPPCO Well or the 3rd Avenue Well.

[c.] The combined withdrawal between Groundwater Certificate Nos. 3350-A and 606-D, the Certificate for Change for WRC No. 007086, and Permit No. G4-29702P shall not exceed 2,550 gpm instantaneous and 1,458.1 acre-feet annually.

[d.] The existing instantaneous consumption is based upon the existing combined maximum well pump capacities and the existing annual consumption is based upon the combined 2011 annual volume pumped from each source well.

TABLE 4-10 WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

Permit Certificate or Claim #		Name on Document	Priority Date (list oldest first)	Source Name/Number	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Forecasted Consumption		Forecasted 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)[d] GPM	Maximum Annual Volume (Q_a)[d] acre-feet	Maximum Instantaneous Flow Rate (Q_i) GPM	Maximum Annual Volume (Q_a) acre-feet
Permit / Certificates											
1.	GWC606-D	Zillah	July 1948	3rd Avenue Well, SO2	Primary	276	150.0				
2.	GWC3350	Zillah	July 1958	Rainier Well, SO1	Primary	550	296.0				
3.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Primary	1,024	450.0				
4.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Supplemental	976	1,008.1				
Claims											
1.	WRC007086	Stokely-Van Camp, Inc.	Sept. 1942	WIPPCO Well, SO3	Primary	700	858.1				
TOTAL[c]						2,550	1,458.1	886.2[d]	571.4[d]	1,664	886.7

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

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Qi) REQUESTED	Maximum Annual Volume (Qa) REQUESTED
1. G4-29869[a]	Zillah	1988	Primary	1,600	

[a.] Groundwater Application G4-29869 proposes the withdrawal of 1,600 gallons per minute from the Rainier Well (S01) for continuous municipal and industrial use, and irrigation of 150 acres. This application does not specify an annual quantity. The application, submitted in 1988, has not been acted upon by WDOE.

[b.] Groundwater Permit G4-29702P authorizes a total of 2,000 GPM and 1,458.1 acre feet per year for the 3rd Avenue Well and the WIPPCO Well combined. A portion of this right (600 acre feet per year) is primarily for irrigation of 150 acres. The remainder of the right is supplemental, allowing the City to withdraw water from either the WIPPCO Well or the 3rd Avenue Well.

[c.] The combined withdrawal between Groundwater Certificate Nos. 3350-A and 606-D, the Certificate for Change for WRC No. 007086, and Permit No. G4-29702P shall not exceed 2,550 gpm instantaneous and 1,458.1 acre-feet annually.

[d.] The total future instantaneous withdrawal rate and annual volume is calculated from the values provided in Chapter 2. The City tracks withdrawals from each of its source wells to ensure that future instantaneous and annual withdrawals do not exceed the authorized quantities.

TABLE 4-11 WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

Permit Certificate or Claim #		Name on Document	Priority Date (list oldest first)	Source Name/Number	Any Portion Supplemental? (if yes, explain in footnote)	Existing Water Rights		Forecasted Consumption		Forecasted 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)[d] GPM	Maximum Annual Volume (Q_a)[d] acre-feet	Maximum Instantaneous Flow Rate (Q_i) GPM	Maximum Annual Volume (Q_a) acre-feet
Permit / Certificates											
1.	GWC606-D	Zillah	July 1948	3rd Avenue Well, SO2	Primary	276	150.0				
2.	GWC3350	Zillah	July 1958	Rainier Well, SO1	Primary	550	296.0				
3.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Primary	1,024	450.0				
4.	G4-29702P[b]	Zillah	Feb. 1989	WIPPCO Well, SO3 3rd Avenue Well, SO2	Supplemental	976	1,008.1				
Claims											
1.	WRC007086	Stokely-Van Camp, Inc.	Sept. 1942	WIPPCO Well, SO3	Primary	700	858.1				
TOTAL[c]						2,550	1,458.1	1235.4[d]	808.5[d]	1,315	649.6

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

Pending Water Right Application (New/Change)	Name on Application	Date Submitted	Any Portion Supplemental? (If yes, explain in footnote)	Pending Water Rights	
				Maximum Instantaneous Flow Rate (Qi) REQUESTED	Maximum Annual Volume (Qa) REQUESTED
1. G4-29869[a]	Zillah	1988	Primary	1,600	

[a.] Groundwater Application G4-29869 proposes the withdrawal of 1,600 gallons per minute from the Rainier Well (S01) for continuous municipal and industrial use, and irrigation of 150 acres. This application does not specify an annual quantity. The application, submitted in 1988, has not been acted upon by WDOE.

[b.] Groundwater Permit G4-29702P authorizes a total of 2,000 GPM and 1,458.1 acre feet per year for the 3rd Avenue Well and the WIPPCO Well combined. A portion of this right (600 acre feet per year) is primarily for irrigation of 150 acres. The remainder of the right is supplemental, allowing the City to withdraw water from either the WIPPCO Well or the 3rd Avenue Well.

[c.] The combined withdrawal between Groundwater Certificate Nos. 3350-A and 606-D, the Certificate for Change for WRC No. 007086, and Permit No. G4-29702P shall not exceed 2,550 gpm instantaneous and 1,458.1 acre-feet annually.

[d.] The total future instantaneous withdrawal rate and annual volume is calculated from the values provided in Chapter 2. The City tracks withdrawals from each of its source wells to ensure that future instantaneous and annual withdrawals do not exceed the authorized quantities.

4.5 WATER SUPPLY RELIABILITY ANALYSIS

4.5.1 Source Reliability

The single most important aspect of a water utility is its domestic water supply source. The City of Zillah's water supply is dependent on ground water sources. As previously discussed in this Plan, the City utilizes three source wells. The locations of these wells within the water system are shown on Map A enclosed in the back of this Plan. Currently, the only well with a protective covenant to establish a 100-foot sanitary radii is WIPPCO Well.

As discussed in Chapter 3 of this Plan, there has been no significant change in source well water quality from any of Zillah's wells as demonstrated by inorganic chemical and volatile organic chemical monitoring over time. Zillah has taken steps to protect its aquifers through implementation of a Wellhead Protection Program. Completed in 2000, the program is intended to protect Zillah's aquifers through a combination of regulatory measures, best management practices, and public education and awareness. Details of Zillah's Wellhead Protection Program are provided in Chapter 5 of this Plan.

The existing City wells all withdraw water from the Columbia River Basalt Group. This geologic formation consists of four distinct hydrogeologic units. Starting with the oldest, these four units are known as the Grande Ronde, Wanapum, and Saddle Mountain Units (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.

The Rainier Well is drilled to a depth of 280 feet; the 3rd Avenue Well is drilled to a depth of 950 feet; and the WIPPCO Well is drilled to a depth of approximately 260 feet. From the well log of the Rainier Well, it appears this well draws water from the Ellensburg Formation of the Overburden Unit, which contains beds of undivided Miocene sedimentary rock. Although no well log is available for the WIPPCO Well, it probably also draws water from the Ellensburg Formation, because of its similar depth to the Rainier Well. It has been determined, through a geologic assessment by the Department of Ecology, that the 3rd Avenue Well also draws water from Ellensburg Formation aquifer. A copy of the DOE memorandum, clarifying the aquifer designations for the City's groundwater wells, is provided in Chapter 10 of this Plan.

Locally, other municipalities and individuals utilize water primarily from the Ellensburg Formation of the Overburden Unit, and the other units, for domestic and irrigation supply. Consequently, many 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.

Municipal source wells within Zillah were not directly involved with the USGS studies and reports. Because of this and the absence of well level measurements, an accurate determination of diminished capacities and lower drawdown cannot be concluded for the City's source wells. However, the City has not noticed a decline in well capacity as a result of declining groundwater levels. The City will begin to track static and drawdown water levels in the future as a recommended system improvement to establish a record of water levels and have the ability to anticipate any potential source deficiencies.

Provided below in Table 4-11 is a brief description of each of Zillah's wells. Copies of the well logs are included in Chapter 10 of this Plan.

TABLE 4-12 SOURCE WELLS INFORMATION SUMMARY

	Rainier Well (S01)	3rd Avenue Well (S02)	WIPPCO Well (S03)
Date Drilled	1958	1940	1942
Well Depth	280 feet	950 feet	260 feet
Casing Size / Depth	12"/242 ft.	12"/500+ ft.	12"/123 ft.
Initial Flow	250 GPM	650 GPM	1,385 GPM
Initial Static Level	109 ft. below ground	116 ft. below ground	Unknown
Current Static Level	Unknown	53 ft. below ground	140 ft. below ground
Current Capacity	550 GPM	400 GPM	650 GPM

4.5.2 Water Right Adequacy

Zillah's existing certified and permitted water rights of 2,550 GPM and 1,458.1 acre-feet per year (AFY), discussed earlier in this Chapter, are adequate to satisfy the projected future demand. An application for additional water rights (1,600 GPM) for the Rainier Well was submitted to the Department of Ecology in 1988. No action has been taken on this application to date.

Although the City's existing water rights are adequate to satisfy the projected demand for the next 20-year period, Zillah will pursue water conservation measures, continue its annual review of water production and consumption data, and evaluate the possibility of alternative and/or additional sources of supply if necessary in the future.

4.5.3 Facility Reliability

Zillah's source wells are in need of substantial building, mechanical, and electrical repairs and upgrades. Rainier Well is operated as the City's primary well but the mechanical status is poor. The motor requires substantial repairs every 3 to 4 years primarily due to a lack of ventilation and the motor being undersized. To accommodate the necessary building and electrical improvements needed to improve pump and well reliability a new well building is recommended. The 3rd Avenue Well is seldom used due to the production of a sulfur odor, but the mechanical status is in fair shape, with moderate electrical upgrades needed. To increase overall system reliability by using 3rd Avenue Well as a primary source, it is recommended that the cause of the odor be investigated, a mitigation plan determined and well rehabilitation be completed as soon as possible. WIPPCO Well's mechanical status is acceptable, but the pump and motor is in need of standard preventative maintenance and has begun to produce sand. The well site has poor access which would make pump, mechanical and/or electrical improvements difficult and costly. To accommodate the necessary building and electrical improvements needed to improve pump and well reliability a new well building is recommended.

Although the Wells require improvements, the combined capacity of Zillah's wells exceeds both the current and future maximum day demand; so no deficiency in source capacity exists at this time.

The City will need to budget funds and obtain additional funding to address the existing Well deficiencies as discussed further in Chapter 8 of the Plan.

Power outages in Zillah are rare, and when they occur their duration is generally brief. However, to provide an additional measure of reliability, Rainier and WIPPCO well are equipped with a connection for the City's portable generator to maintain at least one source well during a power outage. It is recommended that a permanent backup generator be installed at WIPPCO well in coordination with the well improvements.

4.5.4 Water Shortage Response Planning

Zillah does not have a water conservation and rationing ordinance to deal with short-term water shortages. Such an ordinance would allow the Public Works Director or the Mayor to implement conservation and rationing measures through alert stages. The following is an example of alert stages that may be contained within a water conservation and rationing ordinance:

1. Stage 1 - When consumption reaches 85% of production capacity, the public is requested to voluntarily make every effort to conserve water through a variety of means, such as cutting back on irrigation, not washing cars, taking shorter showers, etc.

2. Stage 2 - When consumption reaches 90% of production capacity, the public is requested to practice "even-odd" residential landscape irrigation. Residences with odd numbered address irrigate on odd number calendar days; those residences with even numbered addresses irrigate on even number calendar days.

3. Stage 3 - When consumption reaches 95% of production capacity, mandatory rationing is implemented which requires that "even-odd" landscape irrigation be practiced, and that residential irrigation only take place between 5 a.m. and noon.

4. Stage 4 - When consumption reaches 100% of production capacity, all residential landscape irrigation with City water is curtailed.

When implementation of water conservation and rationing measures becomes necessary, the City could use the media (radio, television, and newspapers) and mailings to keep water customers informed and to seek their cooperation.

During short-term water shortages, the City should 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.

It is recommended that within the next five years, the City will develop and implement water conservation and rationing measures similar to those listed above.

4.6 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. Zillah's 20-year water demand projections will not exceed their existing certificated and permitted authorizations, but the following source of supply analysis may be valuable in the future as projected growth occurs. This source of supply analysis includes an evaluation and discussion of the following items:

- Water Rights Changes;
- Interties;
- Artificial Recharge;
- Evaluation of Water Reclamation / Reuse Opportunities.

These items are discussed in detail below.

4.6.1 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 Zillah 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).

Neighboring community water system or permitted wells near the City of Zillah and within their retail service area are discussed in Chapter 1 and other sections of the Plan. To date, no discussions have taken place between the City and any of these neighboring and/or adjacent purveyors, regarding acquisition of their water system or water right(s).

4.6.2 Interties

Currently there is one substantial water purveyor adjacent to Zillah's retail service area, the Yakima County Community of Buena. Currently, no physical intertie exists between the two systems but the County Water System Plan acknowledged the possibility of a connection as an emergency supply for Buena. An intertie would provide emergency service for the Buena system but due to the difference in overflow elevations between the systems (972.6 feet in Zillah vs. 914.5 feet in Buena) the intertie provides limited benefit to the City. Therefore this intertie is not a planned or future improvement in this Plan.

If a future intertie is proposed between the City of Zillah and an adjacent purveyor, 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.

4.6.3 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, Zillah has no surface water right to use for artificial recharge. Zillah 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.

4.6.4 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. Zillah's sources of reclaimed or reused water are the few industrial entities located within the City and treated effluent from the Zillah Wastewater Treatment Facility.

Zillah has two industrial water users, both associated with agricultural activities. Of the total 22.520 million gallons they consumed in 2012, uses included non-contact water used in refrigeration and fruit washing. In theory, it should be possible to reuse some of the non-contact water to irrigate public

facilities such as City parks and school playgrounds and athletic fields. However, two issues prevent the re-use of such water: 1) the remote locations of Zillah's industrial facilities; and 2) chemicals added to non-contact refrigeration water. To convey the water from the industrial sites to City parks would require a separate reclaimed water pipeline and pumping facilities. At this time, the cost of constructing such facilities outweighs the benefit that would be derived. In addition, chemicals are periodically added to non-contact refrigeration water to prevent the growth of algae and mold within the systems, and to prevent mineral deposits from forming within refrigeration systems. Such chemicals may have an adverse effect on the grassy areas and may not be approved for public contact. Thus, the small/unknown non-contact volume, the distances, and the chemical issues preclude consideration of industrial non-contact refrigeration water at this time.

The Zillah Wastewater Treatment Facility (WWTF or WWTP) discharged treated effluent at an average of 212,000 gallons per day (77.4 million gallons per year) in 2013 according to Department of Ecology Discharge Monitoring Report (DMR) data available. Zillah's wastewater facility is located in the southern portion of the community, adjacent to Interstate 82. Washington State requires reclaimed wastewater used on playgrounds, ballfields and other areas where the public has access or exposure to it meet Class A reclaimed standards. Class A reclaimed water standards far exceed the level of treatment currently provided by the Zillah Wastewater Treatment Facility. Use of wastewater on public contact areas would require a significant upgrade of the treatment capabilities of Zillah's system. The level of wastewater treatment currently provided precludes consideration of reuse of municipal wastewater at this time. Zillah will revisit this issue at such time as more stringent levels of wastewater treatment are required.

Another opportunity to reduce potable water consumption is to evaluate the possibility of using reclaimed water/utility water at the WWTP. Although this would require significant plant upgrades, it may be more feasible and cost effective than reclaimed water. In 2013 the WWTP consumed 4.752 MG of potable water for treatment and cleaning needs. During future WWTP upgrades it is recommended that the treatment process be evaluated for the opportunity to install a utility water system.

4.6.5 Existing Non-Potable Water Sources

The City of Zillah currently has a Class 1 irrigation water right from the Sunnyside Valley Irrigation District (SVID). The City's Class 1 water right entitles it to 3 acre-feet per year (AFY) for each acre of land within the city limits. Additional water rights of 33 cfs are available to portions of the City through the Konewock Ditch Company. Irrigation water is supplied to approximately 90 percent of the City's water service area through four irrigation districts as shown in Table 4-13. See Figure 4-1for areas within the existing UGA, served by the irrigation districts in Table 4-13.

TABLE 4-13 CITY OF ZILLAH IRRIGATION DISTRICTS

	Zillah Irrigation District	City of Zillah Irrigation District	Konewock Ditch Company	SVID
Source Water	SVID	SVID	SVID	SVID
Administration of Water Assessment	Zillah Irrigation District	City of Zillah	Konewock Ditch Company	SVID
System Description	Shares Distribution Box w/ City of Zillah Irrigation District	Shares Distribution Box w/ Zillah Irrigation District	Independent of other systems	Independent and purveyor to Zillah and City of Zillah Irrigation Districts
Owner/Operator	Zillah Irrigation District	City of Zillah	Konewock Ditch Company	SVID
Water Rights	Class 1 3 AFY per acre	Class 1 3 AFY per acre	33 cfs allocated by shares	Class 1 3 AFY per acre

The City of Zillah Irrigation District was created in 1987 by City Ordinance 1015. All other irrigation districts within the city limits are owned and operated by independent boards. Irrigation water is delivered to City customers through underground piping systems, and approximately half of users have privately owned pumping facilities to pressurize their systems.

CITY OF ZILLAH

Water System Plan Update

IRRIGATION DISTRICT SERVICE AREA MAP

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- KONNOWAC DITCH COMPANY
- SUNNYSIDE VALLEY IRRIG. DISTRICT
- CITY OF ZILLAH IRRIG. DISTRICT
- ZILLAH IRRIG. DISTRICT

HLA
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Yakima, WA 98902
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Fax 509.965.3800
www.hlacivil.com

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FIGURE 4-1

CHAPTER 5 - SOURCE WATER PROTECTION

5.1 WELLHEAD PROTECTION PROGRAM

In 2000, Zillah completed and implemented a wellhead protection plan. The purpose of the plan was to:

- Identify potential sources of contamination near the City's ground water supplies;
- Implement management strategies to prevent contamination of those supplies; and
- Develop a contingency plan for contamination mitigation in the event that ground water does become contaminated.

The City of Zillah's Wellhead Protection Plan, prepared in accordance with the Department of Health's requirements, consists of the following sections:

- Introduction
- Hydrology
- Identification of the wellhead protection areas
- An inventory of potential contamination sources
- A management strategy
- A contingency plan
- A list of figures
- An appendix
- Well logs
- A resource contact list

The City of Zillah's Wellhead Protection Plan is considered a companion document to the City's 2000 Comprehensive Water Plan, and should be consulted for specific details and information regarding Zillah's wellhead protection program. A copy of Zillah's Wellhead Protection Plan is included in the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

As part of this *Water System Plan*, the Potential Contaminant Source and Notification List has been updated and is presented below. Location of these potential contaminant sources are shown on Figure 5-1 Potential Groundwater Contaminant Sources.

5.2 EXEMPT WELLS

The City of Zillah allows the drilling and use of exempt wells within its service area only if the property to be served is located outside the 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.

CITY OF ZILLAH

Water System Plan Update

POTENTIAL GROUNDWATER CONTAMINANT SOURCES

LEGEND

ZILLAH CITY LIMITS

ZILLAH UGA BOUNDARY

SOURCE WELL

WELLHEAD PROTECTION AREA

POTENTIAL CONTAMINANT SOURCE (#)

No.	Potential Source
1.	Bleyhl Farm Service
2.	Borton Fruit
3.	Circle K East
4.	Cherry Patch
5.	Zillah School District Bus Garage
6.	Zillah Wastewater Treatment Facility
7.	Zillah Public Works Department
8.	Circle K West
9.	Stadelman Fruit Warehouse
10.	Stadelman Fruit Warehouse
11.	Shawn Hyatt Construction
12.	Circle L Minimart / Texaco
13.	RSI
14.	Stadelman Bin Storage
15.	Community Dental Care
16.	Benjamin Weege Dentist
17.	Valley Hills Funeral Home
18.	Davita Zillah Dialysis Center
19.	Fire District #5
20.	City of Zillah Fire Department

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FIGURE 5-1

5.3 UPDATES AND MODIFICATIONS TO THE WELLHEAD PROTECTION PLAN

When completed, information regarding the City's new source well will be added to the City's Wellhead Protection Plan. In addition, the Potential Contaminant Source and Notification List, originally developed in 2000, updated in 2006, has been updated as part of this *Water System Plan* as shown in Table 5-1.

TABLE 5-1 POTENTIAL CONTAMINANT SOURCE AND NOTIFICATION LIST

No.	Potential Source	Location
1.	Bleyhl Farm Service	1404 First Avenue
2.	Borton Fruit	1511 Cutler Way
3.	Circle K East	824 Zillah West Road
4.	Cherry Patch	101 First Avenue
5.	Zillah School District Bus Garage	205 Second Avenue
6.	Zillah Wastewater Treatment Facility	740 Railroad Avenue
7.	Zillah Public Works Department	130 First Avenue
8.	Circle K West	900 Vintage Valley
9.	Stadelman Fruit Warehouse	100 Cheyne Road
10.	Stadelman Fruit Warehouse	111 Meade Dr. (First Ave. & Meade Dr.)
11.	Shawn Hyatt Construction	1420 Gilbert Rd. / 300 Golden Dr.
12.	Circle L Minimart / Texaco	723 First Avenue
13.	RSI	504 First Avenue
14.	Stadelman Bin Storage	W. Northstone Parkway
15.	Community Dental Care	812 Zillah West Road
16.	Benjamin Weege Dentist	111 First Avenue
17.	Valley Hills Funeral Home	607 Second Avenue
18.	Davita Zillah Dialysis Center	823 Zillah West Road
19.	Fire District #5	90 7th Street
20.	City of Zillah Fire Department	717 First Avenue

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 Zillah'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. Approves all expenditures.

Public Works Director: 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 and City Council. 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.

City Clerk-Treasurer: Responsible for supervision of utility billings and budgeting preparation. Allocates funds for approved expenditures.

Utility Billings 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 in technical aspects of water system, and provides design engineering and construction services for capital improvements.

Water Distribution Manager: Under the direction of the Public Works Director, is responsible for supervising subordinate field personnel; managing 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 maintain a valid Class II, or better, Washington State Water Distribution Manager Certificate.

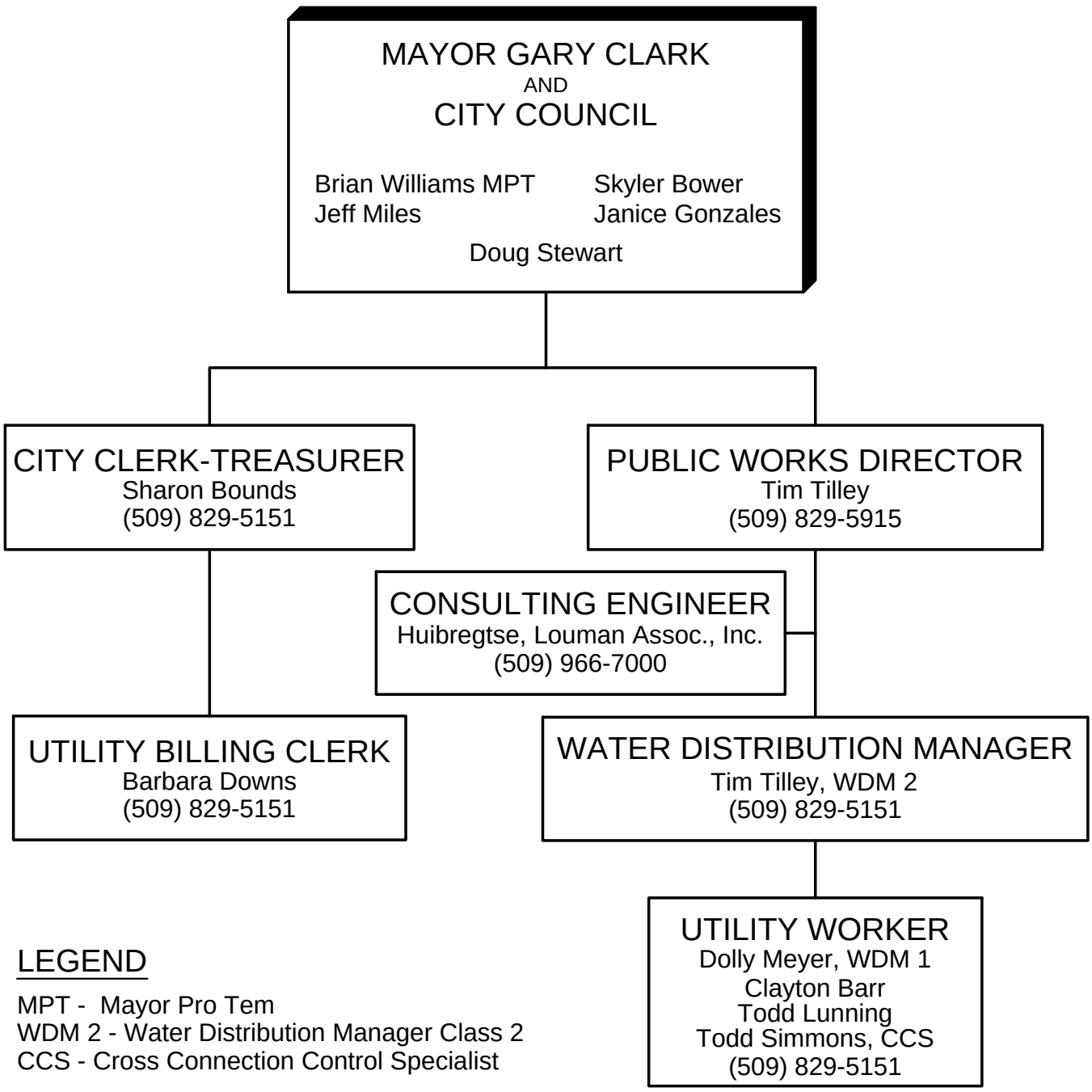
Utility Workers: Responsible for having knowledge of all aspects of the general operations, maintenance, and preventive maintenance, policies, and safety procedures of the water system facilities. Must be capable of performing duties required with a minimum of supervision or direction.

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. Zillah'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. Zillah 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 Zillah's water system. Zillah currently has one employee with a

Water Distribution Manager 2 certification, and one employee with Cross-Connection Control Specialist certifications. Figure 6-1 provides the current certifications of all of Zillah's water system employees who work in and have water system responsibilities.



CITY OF ZILLAH

Water System Organizational Chart

1–29–2014 P:\PROJECTS\2013\13033\CWP FIGURES.dwg

FIGURE 6-1

6.3 SYSTEM OPERATION AND CONTROL

Chapter 3 provides a detailed look at the various water system components and their interrelationship. This interrelationship is depicted in Figure 3-1, and a map of the existing water system (Map A) is provided 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. Check telemetry system.
    c. Manually record flow meter totalized readings as a backup to telemetry.

2. Weekly Tasks

    a. Maintain oil levels in well pumps.

3. 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.

4. Quarterly Tasks

    a. Grease seal bearings on pump motors.

5. 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.

6. Yearly Tasks

    a. Summarize flow meter totalizer records.
    b. Change oil in turbine pumps at Rainier Well, 3rd Avenue Well, and WIPPCO Well.
    c. Take sample of raw water from each well and submit to the State Department of Health Lab for Nitrate analysis.

7. Every Three Years Tasks

    a. Take sample of raw water from each well and submit to the State Department of Health Lab 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.

8. As Needed

    a. Conduct sampling as directed in the current DOH Water Quality Monitoring Report.

B. Reservoirs

1. Daily Tasks

    a. Visually check reservoirs.

2. Yearly Tasks

    a. Visually inspect reservoir exteriors.
    b. Inspect reservoir interiors without removing them from service.

3. As Required Tasks

    a. Inspect and video record reservoir interior using diver, and vacuum remove accumulated debris.

C. Distribution System

1. Monthly Tasks

    a. Take required number of water samples from various representative sites within the distribution system and submit them to a certified laboratory for bacteriological analysis in accordance with the Coliform Monitoring Plan.
    b. Collect and record service meter readings.

2. Seasonal Tasks

    a. Insulate service meters.

3. Yearly Tasks

    a. Operate all valves through their full range and listen for leaks.
    b. Operate and flush all fire hydrants. Lubricate hydrant caps and threads. Touch-up paint as required.
    c. Inspect all cross-connection control devices.

4. As Required Tasks

    a. Flush low velocity water mains as required to remove sedimentation.
    b. Review plans for installation of cross-connection control devices on proposed new construction.
    c. Inspect installation of required devices on new construction.
    d. Repair and/or replace service meters.

D. Telemetry System

1. Daily Tasks

    a. Observe telemetry system operation.

2. Weekly Tasks

    a. Check automatic dialer status.

3. Monthly Tasks

    a. Check telemetry system alarms.

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 Pump

   a. Shut off power to the pump, use lockout, tagout policy and procedures.
   b. Close valves.
   c. Ensure power is disconnected and then remove electrical cables.
   d. Lift pump with proper equipment.

2. Installing Pump

   a. Lift pump with proper equipment.
   b. Ensure all pipe connections are properly installed and tightened.
   c. Employ an electrician to properly connect power cables.
   d. Check pump rotation.
   e. Open valves.
   f. Ensure pump control valve (if present) is operating properly.
   g. 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 (if required) 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, and partially backfill the trench at a minimum prior to charging the pipeline.
   f. Flush, disinfect pipe and conduct bacteriological testing prior to putting new line into service.

6.5 SERVICE AND SUPPLY REPRESENTATIVES

Provided below is a list of service and supply representatives 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

B. Water Service Materials

1. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: (509) 248-8400

C. Service Meters

1. Ferguson (Badger Meters)
   1130 West Washington Street
   Pasco, WA 99301
   Phone: 509-545-2111

2. HD Supply (Neptune Meters)
   645 W. Lockheed Street
   Pasco, WA 99302
   Phone: 1-800-422-0057

3. H.D. Fowler Co.
   1100 River Road
   Yakima, WA 98902
   Phone: (509) 248-8400

D. Water Main Tapping

1. Speer Taps, Inc.
   P.O Box 1135
   Carnation, WA 98014
   Phone: 425-485-4764

2. GK Mechanical & Construction, Inc.
   8306 Midvale Road
   Yakima, WA 98908
   Phone: 509-965-0599
   Contact: Gene Killioin - 509-454-6829

E. Electrical

1. Ziegler Electric
   202 County Crest Road
   Yakima, WA 98901
   Phone: 509-453-6012

2. Waymire Electric
   630 Zillah Heights Road
   Zillah, WA 98953

Phone: 509-829-3799 Cell: 509-945-1101
Contact: John Waymire

3. Hutchinson Electric Inc.
3660 Washout Road
Sunnyside, WA 98944
Phone: 509-837-6551

4. H&N Electric, Inc.
4224 East "B" Street
Pasco, WA 99301
Phone: 509-547-1691

F. Pumps

1. Akland Pump & Irrigation
3701 Fruitvale Blvd.
Yakima, WA 98902
Phone: 509-452-7867

2. Picatti Brothers
105 South Third Avenue
Yakima, WA 98902
Phone: 509-248-2540

3. H&N Electric, Inc.
4224 East "B" Street
Pasco, WA 99301
Phone: 509-547-1691

G. Pressure Reducing Valves

1. GC Systems
P.O. Box 848
Sumner, WA 98390
Phone: 1-800-525-9425

H. Telemetry System

1. Technical Systems, Inc.
2303 - 196th SW, #B
Lynnwood, WA 98036
Phone: 206-775-7309

I. Pump and Motor Oil

1. Wondrack Distributing, Inc.
North Front & East First
Yakima, WA 98901
Phone: 509-453-3147

J. Bearing Grease

1. NAPA Auto Parts
717 West First Street
Wapato, WA 98942
Phone: 509-877-6156

2. Zillah Pro Hardware
605 First Avenue

Zillah, WA 98953
Phone: 509-829-6888

3. Zillah Auto Parts
   104 7th Street
   Zillah, WA 98953
   Phone: 509-829-6655

6.6 COMPREHENSIVE MONITORING PLAN

The City of Zillah monitors its system's water quality in accordance with the requirements of WAC 246-290-300, 246-290-310, and 246-290-320, which 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 Zillah:

6.6.1 Monitoring Requirements, Location, and Frequency

Bacteriological Analysis: Bacteriological analysis is conducted in accordance with the procedures and locations specified in Zillah's Coliform Monitoring Plan, a copy of which is provided in the Miscellaneous Documents Chapter (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
1 - 1,000	1
1,001 - 2,500	2
2,501 - 3,300	3 (Zillah's current requirement)
3,301 - 4,100	4
4,101 - 4,900	5
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

Inorganic Chemical and Physical Analyses: A minimum of one sample every three years from each source well is required. The samples shall be collected from a point representative of the source, after treatment (if treated), and prior to entry into the distribution system.

Radionuclides: Radionuclide samples from each source are required once every three years. The samples shall be collected from a point representative of the source, after treatment (if treated), and prior to entry into the distribution system.

Volatile Organic Chemicals (VOCs): VOC samples shall be taken at each source once every 3 months for the first 12 months of operation, 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 first 12 months. If no VOCs are above the specified MCLs after the initial 12 months of monitoring, the water system shall monitor each source at least once every three years. The samples shall be collected from a point representative of the source, after treatment (if treated), and prior to entry into the distribution system.

Synthetic Organic Chemicals (SOCs): SOC samples shall be taken at each source once every 3 months for the first 12 months of operation, 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 first 12 months. If no SOCs are above the specified MCLs after the initial 12 months of monitoring, the water system shall monitor each source at least once every three years. The samples shall be collected from a point representative of the source, after treatment (if treated), and prior to entry into the distribution system.

Lead and Copper: 10 samples at targeted sample tap locations throughout the distribution system are required every three years for lead and copper monitoring in accordance with the *Water Quality Monitoring Report* (Chapter 10). The water system must provide individual sampling results to the persons at each sample location no later than 30 days after learning the results. Additionally, the water system must complete and submit the signed *Lead and Copper Consumer Notice Certification Form* (Chapter 10) and a sample copy of one consumer notice to the Department of Health within 90 days after the end of the monitoring period.

Other Substances: No other substances are required to be monitored at this time. Monitoring of other substances in the future will be 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 Zillah routinely delivers bacteriological samples to Cascade Analytical 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 state certified laboratory 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 Zillah 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), the City shall take follow-up action as outlined under WAC 246-290-320.

A. Maximum Contaminant Levels (MCLs)

1. 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.

2. Inorganic Chemical and Physical (IOC) – MCLs for inorganic chemical and physical properties are as shown in Table 6-2.

TABLE 6-2 INORGANIC CHEMICAL MCLS	
Chemical or Physical Property	MCL (mg/l)
Primary Substances	
Antimony (Sb)	0.006
Arsenic (As)	0.05
Asbestos	7 million fibers/liter (> 10 microns)
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)	0.002
Nickel (Ni)	0.1
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
Zinc (Zn)	5.0
Color	15 Units
Hardness	None
Specific Conductivity	700 umhos/cm

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

3. Radionuclides – MCLs for Radionuclides are as shown in Table 6-3.

TABLE 6-3 RADIONUCLIDE MCLS	
RADIONUCLIDE	MCL
Radium-226	3 pCi/l
Combined Radium-226 and Radium-228	5 pCi/l
Gross alpha particle activity (excluding uranium)	15 pCi/l
Beta particle and photon radioactivity	4 milliren/year

4. Volatile Organic Chemicals (VOCs) – MCLs for VOCs are as shown in Table 6-4.

TABLE 6-4 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

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

TABLE 6-5 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

B. 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: The purveyor shall collect and submit for analysis a set of repeat samples for every sample in which the presence of coliforms is detected in accordance with the following:

      i. A set of three (3) repeat coliform samples is required for Group A systems and shall be collected at the following locations:

         (1) At the site of the previous sample with a coliform presence.
         (2) Within five active services upstream of the site of the sample with a coliform presence.
         (3) Within five active services downstream of the site of the sample with a coliform presence.

      ii. 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.

      iii. When repeat samples have coliform presence, the purveyor shall:

         (1) Contact the Department and collect a minimum of one additional set of repeat samples as directed by the Department; or
         (2) Collect one additional set of repeat samples for each sample where coliform presence was detected.

iv. 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.

v. The purveyor may change a previously submitted routine sample to a sample in a set of repeat samples when the purveyor:

(1) Collects the sample within five adjacent service connections of the location from which the initial sample with a coliform presence was collected;
(2) Collects the sample after the initial sample with a coliform presence was submitted for analysis;
(3) Collects the sample on the same day as other samples in the set of repeat samples, except under b.vi. of this subsection; and
(4) Notifies the Department of the change.

vi. 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 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:

(1) Provide an alternate source of water.
(2) Eliminate the source of contamination.
(3) 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 Table 6-1.

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:

(1) The cause of the sample with a coliform presence; and
(2) 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:

(1) 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
(2) The Department shall make available a written description explaining:

(a) The specific cause of the coliform presence; and
(b) 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:

(1) Multiple tube technique cultures are turbid without appropriate gas production;
(2) Presence-Absence technique cultures are turbid in the absence of an acid reaction;
(3) 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
(4) There is excess debris in the sample.

ii. The Department may also invalidate a coliform sample when:

(1) The analyzing laboratory establishes that improper sample analysis occurred;
(2) The Department determines a domestic or nondistribution system problem is indicated by:

(a) All samples in the set of repeat samples collected at the same location as the original coliform presence sample also have coliform presence; and
(b) All other samples in the set of repeat samples are free of coliform.

(3) 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:

(a) The purveyor shall collect a set of repeat samples following the sample invalidation in accordance with 2.b. above; and
(b) 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:

(1) An additional coliform sample from the same location as each invalid sample within 24 hours of notification of the invalid sample; or
(2) 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.

3. Inorganic Chemical and Physical (IOC): When an initial analysis of any substance exceeds the MCL, the purveyor shall take the following action:

a. 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
b. 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:

            (1) Tabulation of VOC sample analysis results, including the location where VOCs were detected;
            (2) Description of monitoring plans for system sources;
            (3) Strategy for informing the public of monitoring results and investigations; and
            (4) 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:

            (1) Substantial construction is required; and
            (2) 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. For any additional substance exceeded, follow-up action shall be determined by the Department when the MCL violation occurs.

C. 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:

   a. Exceedances of maximum contaminant levels (MCLs) or maximum residual disinfectant levels (MRDLs);
   b. Violation of treatment techniques;
   c. Monitoring and testing procedure violations;
   d. Failure to comply with the schedule of a variance or exemption;
   e. Operation under a variance or exemption;
   f. Occurrence of a waterborne disease outbreak or other waterborne emergency;
   g. Exceedance of the secondary maximum contaminant level for fluoride; and
   h. 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
      iii. Failure to comply with the terms and conditions of any variance or exemption in place.

   c. Tier 3 conditions require public notification within one 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:

         (1) Inclusion in the first set of water bills issued after receipt of the results;
         (2) Newspaper notice which shall run at least one day each month for three consecutive months;
         (3) Direct mail;

(4) Posting if NTNC system; or
(5) 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.
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b. Consumer information:

i. The purveyor shall provide consumer information within 21 days of receipt of confirmation sample results when:

(1) 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
(2) The Department determines a List 2 or List 3 VOC is confirmed at a level greater than an SAL.

ii. Consumer information shall include:

(1) Name and level of VOC detected;
(2) Location where the VOC was detected;
(3) Any health effects the VOC could cause at its present concentration;
(4) Plans for follow-up activities; and
(5) Phone number to call for further information.

iii. Consumer information shall be distributed by any of the following methods:

(1) Notice placed in the major newspaper in the affected area;
(2) Direct mail to customers;
(3) Posting if NTNC system; or
(4) 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

Zillah's Emergency Response Program is a plan addressing the City's response to and operation of the water system during unplanned emergency events. The Emergency Response Program consists of the following elements:

- System Information
- Chain of Command
- Emergency Notification
- Water Quality Sampling
- Response Actions for Specific Events
- Alternative Water Sources
- Returning to Normal Operations

System Information

The following is current information pertinent to the Zillah Water System:

System Name:	City of Zillah Water System
System Identification Number:	99800W
System Address:	503 First Avenue; Zillah, WA 98953
System Phone Number:	(509) 829-5151
City Mayor:	Gary Clark
Public Works Director/Water System Manager:	Tim Tilley
System Consulting Engineer:	Huibregtse, Louman Associates, Inc. 2803 River Road Yakima, WA 98902 (509) 966-7000 Dustin L. Posten, PE
System Service Population:	3,161
System Service Connections:	1,077
Emergency Plan Responsible Party:	Tim Tilley (509) 829-5151

Chain of Command

When an emergency occurs, there can be confusion, lack of coordination, and poor communication. Timely and effective response can minimize the effects of an emergency. Often, the initial response sets the tone for how the entire emergency is handled.

Having a chain of command that defines clear lines of authority and responsibilities for system personnel during an emergency speeds up response time and helps eliminate confusion. Water system personnel need to know who to report the emergency to, who manages the emergency, who makes decisions, and what their own responsibilities are.

The first step in any emergency is to notify the person at the top of the chain of command - the person responsible for managing the emergency and making key decisions. This lead person will assess the situation and initiate a series of response actions based on the type and severity of emergency. In addition to an individual having the lead responsibility, other key duties that should be assigned to system personnel include the following:

- Handling incoming phone calls and administrative support.
- Providing information to the public and the media.
- Contacting and providing information to system customers.
- Assessing the water system's facilities, condition, and ability to operate.
- Organizing and completing system repairs.

Table 6-6 shows the Zillah Water System's emergency chain of command, and responsibilities of individuals during water system emergencies:

TABLE 6-6 EMERGENCY CHAIN-OF-COMMAND AND RESPONSIBILITIES		
Name / Title	Responsibilities	Contact Numbers (Area Code 509)
Gary Clark Mayor	Lead for providing information to the public and the media.	Phone: 829-5151 Cell: 949-0164
Tim Tilley Public Works Director (PWD) Water System Manager (WSM)	Overall management and decision-making for the water system. Lead for managing the emergency, providing information to regulatory agencies. Operation of the water system, performing inspections, maintenance and sampling, relaying critical information, and assessing facilities.	Phone: 829-5915 Cell: 949-0380
Sharon Bounds City Clerk-Treasurer	Administrative functions including receiving phone calls and keeping a log of events.	Phone: 829-5151 Cell: 949-1266
Dolly Meyer Utility Worker	Perform duties, functions, and activities as directed by the WSM.	Cell: 945-8364 Pager: 576-4136
Todd Simmons Utility Worker	Perform duties, functions, and activities as directed by the WSM.	Phone: 829-5151 Pager: 576-4136
Clayton Barr Utility Worker	Perform duties, functions, and activities as directed by the WSM.	Phone: 829-6083 Pager: 576-4136

Events that Cause Emergencies

Emergencies happen for a variety of reasons including:

- Natural disasters including high winds, excessive snowfall and ice storms, floods, drought, well contamination, land slides and earthquakes, and volcanic eruptions.
- Accidents.
- Deliberate acts of vandalism or terrorism.
- System neglect, poor operation, or deferred maintenance.

Severity of Emergencies

Emergencies usually have a wide range of severity. Defining categories of severity can significantly aid in determining appropriate response actions. Knowing the severity of the emergency and being able to communicate it to others will help system personnel keep their response balanced and effective.

Making a decision on severity should be collaborative among system personnel, but is ultimately made by the person in charge of the emergency. The person in charge may also choose to coordinate with external parties, especially if partnerships have been formed in advance of the event. The information for making the decision will accumulate over time, and may result in the level of severity being changed.

An assessment of severity, once determined, must be communicated immediately to all those dealing with the emergency. Make sure staff have cell phones, pagers, and/or radios when they are in the field. Remember to have an alternate method of communicating if cell phones and pagers won't work.

The following is a four-level emergency severity classification system for the Zillah Water System.

A. Level 1 - Routine Emergencies

Routine emergencies are normally resolved within 24 hours, and with minimal outside assistance. The Zillah Water System considers the following to be Level 1 emergencies:

- Short power outages.
- Minor mechanical problems in pumphouses.
- Distribution line breaks.
- Other minor situations where it is not likely that public health will be jeopardized.

B. Level 2 - Minor Emergencies

Minor emergencies are those where the water system experiences minor disruption in supply, or has indications of possible contamination. In these types of emergencies, public health may be jeopardized, and the system may need to coordinate with DOH and may consider issuing a health advisory to customers. It is important for water system personnel to be on alert and to initiate a quick response. Minor emergencies can usually be resolved within 72 hours. The Zillah Water System considers the following to be Level 2 emergencies:

- Disruption of supply such as a transmission line break, pump failure with a potential for backflow, and loss of pressure.
- Storage is not adequate to handle disruption in supply.
- An initial positive coliform or E. coli sample test result.
- An initial primary chemical sample test result above the DOH standard.
- A minor act of vandalism.

C. Level 3 - Significant Emergencies

The system experiences a significant mechanical or contamination problem where disruption in supply is inevitable, and issuance of a health advisory is necessary to protect public health. Significant emergencies should be reported to DOH as soon as possible to determine the best available means to protect the health of the system users. Resolution of the emergency may require the aid and assistance of outside entities, and may take longer than 72 hours to resolve. The Zillah Water System considers the following to be Level 3 emergencies:

- A verified sample test result above a DOH standard requiring immediate consideration of a health advisory notice to customers.
- A loss or failure of a major water system component resulting in a water shortage or requiring system shutdown.
- An act of vandalism or terrorist threat such as intrusion or damage to a major water system component.

D. Level 4 - Catastrophic Disasters/Major Emergencies

The water system experiences major damage or contamination from a natural disaster, an accident, or an act of terrorism. Such incidents usually require immediate notification of local law enforcement and local emergency management services. Immediate issuance of health advisories and declaration of water supply emergencies are critical to protect public health. These events often take several days or weeks to resolve before the system returns to normal operation. The Zillah Water System considers the following to be Level 4 emergencies:

- An earthquake or landslide that shuts down the system or impacts sources, lines, etc.
- An act of terrorism possibly contaminating the water system with biological or chemical agents.
- A significant chemical spill in close proximity to one of the system's sources.
- A storm that significantly damages system facilities.

<u>Emergency Notification</u>

During most emergencies, it will be necessary to quickly notify a variety of parties. Preparation for such notification has the following three essential components:

- Assigning responsibility to oversee and carry out the notifications.
- Assembling comprehensive call-up lists with names and contact numbers.
- Writing out procedures for quickly disseminating information to appropriate parties.

Valuable response time can be lost without readily available notification information or the means to deliver it. Having well-formed partnerships will help during these times.

In addition to phone, email, and media (radio, television, newspaper) for notification, the water system may consider forming partnerships with local community groups to assist in delivering information to customers when needed.

Call-up lists should be comprehensive, including local law enforcement, Yakima County Emergency Management, Yakima County Health District, DOH Drinking Water, WDOE, county and neighboring city officials, service and repair providers, and water testing laboratories. A list of priority customers, such as nursing homes, medical clinics, and schools should also be maintained for immediate notification. Provided on Table 6-7, Table 6-8, Table 6-9, and Table 6-10 are notification lists to be used during emergency situations.

TABLE 6-7 LOCAL NOTIFICATION LIST

Entity	Contact Numbers
Zillah Public Works (Water) Department	daytime phone: 829-5151 pager number: 576-4136
Zillah Police Department	daytime phone: 829-6100 24-hour phone: 911
Yakima County Sheriff's Office	daytime phone: 574-2500 24-hour phone: 574-2500
Yakima County Office of Emergency Management	daytime phone: 574-1900 24-hour phone: 574-2500
Yakima Health District	daytime phone: 575-4040 24-hour phone: 575-4040
Yakima County Public Works Department	daytime phone: 574-2300 24-hour phone: 574-2300
City of Yakima Water Department	daytime phone: 575-6154 24-hour phone: 575-6154
City of Toppenish Water Department	daytime phone: 865-2080
Water Testing Laboratory: Cascade Analytical, Inc.	daytime phone: 452-7707
Newspaper: Yakima Herald Republic	daytime phone: 248-1251
Radio Stations: KIT - 1280 AM	daytime phone: 972-5481
Television Stations: KAPP KNDO KIMA	daytime phone: 453-0351 daytime phone: 225-2300 daytime phone: 575-0029

TABLE 6-8 STATE NOTIFICATION LIST	
Entity	Contact Numbers
Department of Health (DOH)	daytime phone: (509) 329-2100 24-hour phone: 1-877-481-4901
Washington Department of Ecology (WDOE)	daytime phone: 575-2490 24-hour phone: 575-2490
DOH Drinking Water After-Hours Emergency Hotline	1-877-481-4901

TABLE 6-9 SERVICE / REPAIR NOTIFICATION LIST	
Entity	Contact Numbers
Electrical: Hoydar Buck Waymire Electric Hutchinson Electric	 daytime phone: 453-6012 daytime phone: 829-3799 daytime phone: 837-6551
Pumps: Akland Picatti Brothers Ponderosa Pump Systems, Inc.	 daytime phone: 452-7867 daytime phone: 248-2540 daytime phone: 457-6018
Telemetry System: Technical Systems, Inc. (service) Crown Control (supplies)	 daytime phone: (206) 775-7309 daytime phone: (206) 775-5696
Water System Materials: H.D. Fowler Co. Pacific Waterworks Western Utilities	 daytime phone: 952-7751 daytime phone: (800) 422-0057 daytime phone: (509) 535-1396

TABLE 6-10 SENSITIVE USERS NOTIFICATION LIST	
Entity	Contact Numbers
Schools: Zillah School District	 daytime phone: 829-5911
Medical / Dental Facilities: Zillah Medical Clinic Valley Medical Clinic Craig Hisey Dental Office Stephen Harrison Dental	 daytime phone: 829-5699 daytime phone: 829-5221 daytime phone: 829-6611 daytime phone: 829-5466
Daycare Facilities: Santana's Playhouse A Child's Place	 daytime phone: 829-6813 daytime phone: 865-5100
Red Cross:	daytime phone: 457-1690

Notification procedures describe who is responsible for conducting notifications, who assists in the notifications, how to make notifications to specific parties, and what methods are used to complete the notifications. Notification procedures include how to issue a health advisory in the event the water supply is unsafe for drinking or use.

Other procedures include:

- Notifying water system personnel who are on-call and/or off-duty.
- Notifying customers, priority customers, and industrial users.
- Alerting local law enforcement, local emergency management, local health officials, drinking water officials, and water testing laboratories when appropriate.
- Contacting service and repair contractors.
- Contacting neighboring water systems for assistance, if necessary.
- Arranging for alternative water supplies.

Table 6-11 through Table 6-15 provide notification procedures for the Zillah Water System.

TABLE 6-11 CUSTOMER NOTIFICATION PROCEDURES

Responsibility:	The Public Works Director / Water System Manager should consult with the Mayor, as part of the decision-making process, whether to notify customers regarding a potential water shortage, water contamination, or other situation that results in water use restrictions. Once the decision is made to notify customers, procedures for notification should be initiated.
Procedures:	The Mayor and the PWD/WSM develop the message to be delivered to the customers and to the media. PWD/WSM consults with Department of Health regarding the problem and response alternatives. PWD/WSM continues to investigate problem and make repairs/take action as necessary. Notice to customers will be distributed by: Water System staff placing water notices on customers' doors and on signs posted on travel routes throughout the City. PWD/WSM contacts media requesting issuance of notice and information on the problem. Administrative support person will provide a pre-scripted message to phone callers and log in each phone call. PWD/WSM continuously updates the Mayor on the current condition of the problem. Once the problem is resolved: Water System staff re-notify customers through signs on doors. PWD/WSM notifies media regarding problem resolution.

TABLE 6-12 LAW ENFORCEMENT, EMERGENCY MANAGEMENT, COUNTY HEALTH, DOH, AND WDOE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director / Water System Manager is responsible for notifying law enforcement, emergency management, county health, DOH, and WDOE.
Procedures:	PWD/WSM consults with the Mayor regarding if and when to notify law enforcement, emergency management, county health, DOH, and WDOE. PWD/WSM consults with DOH regarding the problem and response alternatives. PWD/WSM informs law enforcement, emergency management, county health, and WDOE, and requests assistance as appropriate.

TABLE 6-13 SERVICE AND REPAIR CONTRACTOR NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director / Water System Manager is responsible for contacting service and repair contractors.
Procedures:	PWD/WSM determines what repairs and/or services are needed to return the water system to normal operation, contacts service and repair contractors, and monitors the progress of the work.

TABLE 6-14 NEIGHBORING WATER SYSTEM NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director / Water System Manager is responsible for contacting neighboring water systems.
Procedures:	PWD/WSM consults with the Mayor regarding if and when a neighboring water system will be contacted, and what assistance will be requested. PWD/WSM contacts neighboring water system and requests appropriate assistance.

TABLE 6-15 HEALTH ADVISORY ISSUANCE NOTIFICATION PROCEDURES	
Responsibility:	The Public Works Director / Water System Manager is responsible for issuing a health advisory.
Procedures:	PWD/WSM consults with DOH regarding problem and response procedures.

Water Quality Sampling

Many types of emergencies can jeopardize the quality of water and potentially sicken those using the water. Because the most important goal for any water system is to protect human health, the system must know how to act quickly and make decisions on whether to issue a health advisory.

Contamination of drinking water, whether intentional or unintentional, comes in many forms, and are classified in the following four general categories:

- Bacteriological organisms.
- Inorganic substances such as metals or cyanide.
- Organic substances such as pesticides or volatile compounds.
- Radionuclides.

The Zillah Water System monitors its system's water quality in accordance with DOH requirements. Zillah's regular water testing program was described earlier in this Chapter.

If there is reason to believe that the water has been contaminated, the Public Works Director / Water System Manager should consult with DOH and consider issuing a health advisory as soon as possible - often before conducting water quality sampling.

If Zillah determines that water quality sampling and testing should be conducted, the City should immediately contact the laboratory that will be performing the analysis to obtain appropriate sampling bottles, and sampling and chain-of-custody procedures. Zillah typically uses Cascade Analytical for its water quality analysis.

Cascade Analytical, Inc.
1008 West Ahtanum Road
Yakima, WA 98903
Phone: (509) 452-7707

Bacteriological testing should be conducted in accordance with the City's current Coliform Monitoring Plan. A copy of that document is included in Chapter 10 of this Plan.

Response Actions for Specific Events

For any emergency, there are a series of general steps that a water system should take:

- Confirm and analyze the type and severity of the emergency.
- Take immediate action to save lives.
- Take action to reduce injuries and system damage.
- Prioritize and accomplish system repairs.
- Return the system to normal operation.

Table 6-16 through Table 6-23 identify the assessment, response actions, notifications, and follow-up actions required for various emergency situations.

TABLE 6-16 RESPONSE ACTIONS FOR POWER OUTAGES

Assessment	The Zillah Water System experiences an average of 2 outages per year that last 20 minutes to several hours. None of the system's source wells are equipped with emergency electrical generators. Historically, power outages have been of short duration such that reservoir storage has been able to supply the City with water until power is restored.
Immediate Actions	Assess whether the outage is likely to last more than 2 hours. If not, be on alert for changing conditions and monitor reservoir levels. If so, implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Notifications	1. Pacific Power (power company) - Let them know that a public water system is experiencing an outage. 2. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Follow-Up Actions	1. Return system to general power supply. 2. Inspect reservoirs and pumping facilities to ensure proper operation and to assess any damages.

TABLE 6-17 RESPONSE ACTIONS FOR WATER MAIN BREAK	
Assessment	Visually determine the physical nature of the problem.
Immediate Actions	Visually assess the problem. Return to the area if the water needs to be turned off to effect repairs.
Notifications	Notify customers prior to shutting off water.
Follow-Up Actions	Check with all customers to ensure water has been returned to normal service. Take water samples for bacteriological testing.

TABLE 6-18 RESPONSE ACTIONS FOR MICROBIAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the reason for the cause or source and the locations of the contamination.
Immediate Actions	Inform the Public Works Director / Water System Manager, who will review the assessment with the appropriate personnel. Immediately take corrective actions.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and additional steps to resolve the problem. Acute maximum containment levels (MCL) violations require public notification within 24 hours, and a boil water order will almost always be issued.
Follow-Up Actions	If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-19 RESPONSE ACTIONS FOR CHEMICAL CONTAMINATION	
Assessment	Collect repeat samples to confirm contamination. If confirmed, determine the cause or source and the location(s) of the contamination.
Immediate Actions	Inform the Public Works Director / Water System Manager, who will review the assessment with the appropriate personnel. Immediately take corrective action.
Notifications	Contact DOH to discuss public notification, follow-up requirements, and steps to resolve the problem. Maximum containment levels (MCL) violations require public notification within 24 hours.
Follow-Up Actions	Follow-up actions for chemical contamination monitoring and sampling frequency will be conducted under the procedures listed in WAC 246-290-320 and the Code of Federal Regulation 141.24. If contamination was accidental due to construction or a repair procedure, then those procedures need to be reviewed. If the cause was intentional, then new or existing safeguards need to be implemented or reviewed.

TABLE 6-20 RESPONSE ACTIONS FOR EARTHQUAKE	
Assessment	Visually determine the nature and extent of damage to the water system.
Immediate Actions	Inform the Mayor and the Public Works Director / Water System Manager of the nature and extent of damage/disruption to the water system.
Notifications	Notify affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-21 RESPONSE ACTIONS FOR HAZARDOUS MATERIAL SPILL IN THE VICINITY OF A WATER SOURCE	
Assessment	Assess the nature and extent of the spill.
Immediate Actions	Contact local agencies including DOH, WDOE, Zillah Police, Yakima County Sheriff, and Yakima County Office of Emergency Management.
Notifications	Notify affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-22 RESPONSE ACTIONS FOR ELECTRONIC EQUIPMENT FAILURE	
Assessment	Assess the nature and extent of the failure.
Immediate Actions	Contact certified electrician.
Notifications	Notify all affected customers.
Follow-Up Actions	Provide customers with estimated length of service disruption.

TABLE 6-23 RESPONSE ACTIONS FOR VANDALISM OR TERRORIST ATTACK	
Assessment	Assess the nature and extent of the situation/condition.
Immediate Actions	Contact Zillah Police Department.
Notifications	Notify any and all affected customers.
Follow-Up Actions	Repair all known problems.

Alternative Water Sources

Water contamination or disruption of supply may require that the water system obtain water from another source to meet basic community needs, and water systems should plan ahead to provide safe water during an emergency. It is important to evaluate potential alternative water supplies ahead of time to ensure the water is safe and the supply is available.

Table 6-24 provides information regarding alternative water sources.

TABLE 6-24 ALTERNATIVE WATER SOURCES

Alternative Source	Name	Phone	Availability	Safe for Drinking?
City of Yakima in conjunction with tanker trucks	City of Yakima Dave Brown	575-6204	yes	yes
City of Toppenish in conjunction with tanker trucks	City of Toppenish Lance Hoyt	865-6319	yes	yes
Bottled Water	Central Vending	248-1212	yes	yes
	Crystal Springs Water Co.	1-(800) 728-5508	yes	yes
	Culligan Water Conditioning	1-(866) 964-4826	yes	yes
	Independent Water Service	457-3631	yes	yes

Returning to Normal Operations

As the emergency passes, the system must prepare to return to normal operation. This may be a very simple or very complex process, depending on the type and severity of the emergency. Returning to normal operation may simply mean the system restores power and the portable generator is disconnected, or it could mean the system has to be repeatedly disinfected to obtain the proper number of satisfactory coliform tests necessary to lift a health advisory.

Many factors may need to be considered before a water system is returned to normal operation. Examples include:

- Has the system been repaired to the point that it can meet demand?
- Has the system manager made a safety and operational inspection of all system components?
- Has the system been properly flushed, disinfected, and pressure tested?
- Has the water been adequately tested in accordance with sampling regulations?
- Does the water meet drinking water standards?
- Is there adequate staff to operate and manage the system?
- Do federal, state, and local agencies support returning the system to normal operation?
- Have the proper public messages and notifications been developed?

Table 6-25 presents a guide of actions and activities for returning the system to normal operation.

TABLE 6-25 ACTIONS FOR RETURNING THE SYSTEM TO NORMAL OPERATION	
Action / Activity	Description
Inspect, flush, and disinfect the system	Public Works Director / Water System Manager and support staff inspect all system facilities and verify that the system has been flushed and disinfected and that all water quality tests have been done.
Verification of water quality	PWD/WSM verifies water quality sampling results.
Coordinate with DOH	PWD/WSM coordinates with DOH regarding system condition and water quality results.
Notify customers	PWD/WSM meets with communications lead to write and distribute notice to customers.

6.8 CROSS-CONNECTION CONTROL PROGRAM

In 1988, Zillah 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. Zillah's cross-connection program includes the following elements:

1. Adoption (by City Ordinance No. 635) of a cross-connection control program;

2. A written Cross-Connection Control Manual;

3. 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;

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

5. A list of approved backflow assemblies;

6. 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;

7. 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; and

8. A description of the process which will provide cross-connection control information to existing and future system users.

All backflow assemblies are tested annually by an outside contractor. A copy of Zillah's Cross-Connection Control Manual is included within the Miscellaneous Documents Chapter (Chapter 10) of this Plan.

6.9 CUSTOMER COMPLAINT RESPONSE PROGRAM

The City of Zillah's complaint response program is designed to formally receive, track and record complaints received regarding the City's water system. Water system complaints typically include cloudy and/or discolored, odor, taste, or low or excessive pressure, or leaky or broken service connections or water mains.

Complaints received by the City are routed to the Public Works Department, where the information is recorded onto a Public Works Department Work Order form. The complaint information and form are routed to the Public Works staff for investigation and to 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 Water Department Work Order form is included in Chapter 10 of this Plan.

For future tracking of complaints, the City plans to implement a web based work order program in 2014. It is anticipated that the web based process will work as follows: A customer calls in with a complaint, City Hall staff logs the complaint into the new system which notifies the public works director, the director assigns the work to a public works crew member, the crew member completes the task or investigates the complaint and records it in the system. The program will have reporting capabilities to assist with tracking customer complaint history.

6.10 RECORD KEEPING AND REPORTING

The City of Zillah keeps and maintains records on its water system as shown in Table 6-26.

TABLE 6-26 ZILLAH WATER SYSTEM RECORDS

Record Type	Location of Records	Retained For:
Water Consumption (by user category)	City Hall	10 Years
Water Production (by well)	City Hall	10 Years
Water Quality Chemical Analysis Results	Public Works Department	Lifetime of System
Water Quality Bacteriological Analysis Results	Public Works Department	5 Years
Equipment Maintenance	Public Works Department	6 Years
Water System Complaints	Public Works Department	6 Years
Backflow Assembly Testing	Public Works Department	6 Years
* Does not include chemical analysis results, which shall be kept as long as the system is in operation.		

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 operational budget and have not been identified or estimated separately.

Recommended improvements necessary for maintenance of the existing system, such as meter replacement and calibration, hydrant replacement, 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 Zillah 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 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 Department, 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, Fire Department, and engineering consultant, project design reports and/or construction plans and documents for other 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

Zillah will provide water service to properties outside the City Limits and within its Retail Service Area in accordance with the service area policies of Section 1.6 and Chapter 13.18 of the City's Municipal Code, 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 13.08.065.

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 addressed in City Code Chapters 13.08, 13.18, and 15.10 copies of which are provided in Chapter 10 of this Plan.

7.3 DESIGN STANDARDS AND CONSTRUCTION STANDARDS

All water system improvements must conform to Zillah's most current design and construction standards (Water Developer Standards). A copy Zillah's Water Developer Standards are provided in Chapter 10 of this Plan.

7.4 CONSTRUCTION CERTIFICATION AND FOLLOW-UP PROCEDURES

Zillah 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 City Code Chapter 15.10 and specified in the City's Water Developer Standards, both of which are 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 report, deficiencies in the existing City of Zillah 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 three main categories: 1) Operational and Maintenance (O&M) Improvements, 2) Major Capital Improvements, and 3) Future Capital Improvements (Planning). The O&M improvements are system operation and maintenance of existing facilities, including meter calibration and replacement, hydrant and valve replacements, 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. The future planning improvements category describes improvements that would be necessary to accommodate system expansion as a result of new development.

In each improvement category section, with the exception of the future planning improvements section, there is 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 2014 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 2015.

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 and projected year the improvement will take place. A six-year schedule for completion of the recommended O&M improvements is provided in Table 8-1. The estimated improvement costs are also 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 2015 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 2019 have been inflated to reflect year 2020 costs, although some of these improvements may take place after the year 2020.

1. 3RD AVENUE WELL WATER QUALITY ANALYSIS

   The 3rd Avenue Well is not used due to aesthetic water quality issues, primarily a sulfur odor. It is recommended that the City investigate the source of the sulfur odor and determine possible mitigation options. Provided below are the estimated costs of this analysis and report:

Item	Unit	Qty.	Unit Cost	Total Cost
Preliminary Review and Investigation	LS	–	–	$1,500
Water Quality Samples and Analysis	LS	–	–	$5,000
Water Quality Report and Recommendations	LS	–	–	$10,000
			TOTAL ESTIMATED COST	**$16,500**

2. SOURCE WELL PROTECTIVE COVENANTS

Of the City's three wells, only WIPPCO Well was found to have a recorded protective covenant establishing a 100-foot sanitary radius in accordance with Department of Health requirements. The City plans to execute and file a "Declaration of Covenant" with the Yakima County Auditor's Office, for their two remaining source wells without recorded protective covenants. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Survey of Well Locations	LS	–	–	$3,000
Legal Description Preparation	LS	–	–	$6,000
Covenant Preparation and Filing	LS	–	–	$1,000
			TOTAL ESTIMATED COST	**$10,000**

3. WIPPCO WELL MAINTENANCE

The well pump and motor is in need of preventative maintenance to maintain reliability until funding is in place to completely reconstruct the well. Maintenance will include replacing bearings and seals and rebuilding the existing motor. It is estimated that the maintenance work will cost $30,000 and be contracted directly by the City.

4. METER REPLACEMENT PROJECT

The City of Zillah has budgeted annually to replace approximately 30 meters throughout the City. The new meters will be radio-read style meters. This improvement project will take place over the next six year period. The estimated cost for this improvement project is $60,000 distributed over the 6 year period.

5. DOH SANITARY SURVEY

The DOH conducts sanitary surveys for community water systems approximately every five (5) years. The anticipated date of the next sanitary survey for Zillah is 2015. The approximate cost of this required improvement is $3,000, including any minor repairs.

6. RESERVOIR INSPECTION (DIVERS)

Prior to re-painting the existing elevated reservoirs, it is recommended that the City contract with professional divers certified for operation in potable water to determine the existing condition of the reservoir interior. If structural or mechanical deficiencies are discovered, the necessary remedial work can be coordinated and completed at the time of the re-painting work to avoid having the reservoir offline longer than required. The approximate cost of this inspection is $5,000 per reservoir for a total of $10,000. This does not include costs for repairs.

7. RE-PAINT EXISTING RESERVOIRS NO. 1 AND NO. 2

The existing standpipe and elevated tank reservoirs were last coated in 1998 and it is recommended that they be recoated approximately every twenty years. The approximate cost of this required improvement is below. This estimated cost does not include structural or mechanical repairs to the reservoirs.

Item	Unit	Qty.	Unit Cost	Total Cost
Clean and Paint Reservoir No. 1	LS	–	–	$100,000
Clean and Paint Reservoir No. 2	LS	–	–	$150,000
			Construction Cost Subtotal	$250,000
			Sales Tax (7.9%)	$19,800
			Subtotal	$269,800
			Contingency (15%)	$40,500
			Subtotal	$310,300
			Engineering and Administration (25%)	$77,575
			TOTAL ESTIMATED COST	**$387,875**

8. VALVE AND FIRE HYDRANT REPLACEMENT

The 2007 Comprehensive Water Plan (CWP) identified 37 locations where main line valves need to be added for improved line control, 8 locations where fire hydrants need to be added to the distribution system to meet minimum spacing requirements, and 21 locations where hydrants needed to be replaced because they were inoperable or have inadequate pressures. Upon review of the deficient fire hydrants, only 4 deficient hydrants remain as shown in Table 3-28 due to recent system improvements and replacing aging hydrants. Therefore, approximately 37 new valves and 9 fire hydrants need to be added to the system. The other deficient fire hydrants will be addressed by related improvements discussed elsewhere.

Provided below is the estimated cost to install approximately 37 valves and 9 hydrants at locations at locations identified by the Zillah Fire Department and Public Works Department. Provided below are the estimated project costs. The costs are based on the work being completed by City forces without engineering design or construction services.

Item	Unit	Qty.	Unit Cost	Total Cost
Install Valve and Valve Box	EA	37	$2,500.00	$92,500
New Fire Hydrant Assembly	EA	9	$4,000.00	$36,000
			Construction Cost Subtotal	$128,500
			Sales Tax (7.9%)	$10,200
			TOTAL ESTIMATED COST	**$138,700**

9. WATER SYSTEM PLAN UPDATE

The Department of Health requires Water System Plans to be reviewed and updated every six years. The next Water System Plan update is planned for 2020. The approximate cost of this improvement project is $95,000.

TABLE 8-1 SCHEDULE OF RECOMMENDED O&M IMPROVEMENTS

Priority No.	Improvement Description	Est. Cost in 2014 Dollars	Completion Year							Funding Source
			2014	2015	2016	2017	2018	2019	2020 - 2033	
1	3rd Avenue Well Water Quality Analysis	$16,500		$16,500						City
2	Source Well Protective Covenants	$10,000		$10,000						City
3	WIPPCO Well Maintenance	$30,000		$30,000						City
4	Meter Replacement Project	$60,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000		City
5	DOH Sanitary Survey	$3,000		$3,000						City
6	Reservoir Inspection (Divers)	$10,000				$10,000				City
7	Re-Paint Existing Reservoirs	$387,875					$436,557			City
8	Valve and Fire Hydrant Replacement	$138,700						$160,791		City/Grant
9	Water System Plan Update	$95,000							$95,000	City
	TOTAL COSTS	$751,075	$10,000	$69,500	$10,000	$20,000	$446,557	$170,791	$95,000	

Note: Improvement costs for years following 2015 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 2014 through year 2019 prioritized improvements and 2) year 2020 through year 2033 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 Recommended Water System Improvements Map.

8.3.1 Year 2014 Through Year 2019 Prioritized Improvements

1. CUTLER WAY, 10-INCH WATER MAIN LOOP

The City plans to budget approximately $30,000 annually for installation of water main by City forces in Cutler Way to complete a 10-inch water main loop. Approximately 1,000 LF of water main is left to be installed over the next two years. The total estimated cost is $60,000.

2. 3RD AVENUE WELL REHABILITATION

During inspection and review with the City it was determined that 3rd Avenue Well has aesthetic water quality issues due to the presence of Sulfur and Manganese. As discussed in Chapter 3 the well is in need of cleaning and rehabilitation, after an initial investigation, to return the well to a primary source. This improvement is important not only to allow for resting and rotating the source wells, but also to rebalance well production to comply with existing individual well water rights.

This improvement will require demolition and reconstruction of the well building roof to allow drill rig access to the well, installation of a level transducer to monitor well drawdown levels, a new pump and motor based on the rehabilitated well capacity, installation of an air release valve assembly and venting, HVAC upgrades to the existing structure, and revised site access and fencing as needed for well access. Provided below are the estimated costs of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$20,000
Roof Demolition and Well Pump Removal	LS	–	–	$25,000
Install New Roof with Access Hatch	LS	–	–	$75,000
Electrical and Control System Upgrades	LS	–	–	$75,000
HVAC Upgrades	LS	–	–	$15,000
Video Inspection and Well Cleaning	LS	–	–	$10,000
Well Redevelopment	LS	–	–	$20,000
Well Test Pumping	LS	–	–	$20,000
New Well Pump and Motor	LS	–	–	$30,000
Install Submersible Level Transducer	LS	–	–	$7,500
Install Air Release Valve Assembly	LS	–	–	$5,000
Site, Fencing and Access Revisions	LS	–	–	$25,000
Minor Change	LS	–	–	$10,000

Construction Cost Subtotal	$337,500
Sales Tax (7.9%)	$26,700
Subtotal	$364,200
Contingency (15%)	$54,600
Subtotal	$418,800
Engineering and Administration (30%)	$125,640
TOTAL ESTIMATED COST	**$544,440**

CITY OF ZILLAH

RECOMMENDED WATER SYSTEM IMPROVEMENTS MAP

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- ZILLAH PROPOSED UGA

Recommended System Capital Improvements

Year 2014-2019 Improvements

1. Cutler Way Water Main Loop
2. 3rd Ave. Well Rehabilitation
3. Rainier Well Reconstruction
4. WIPPCO Well Reconstruction

Year 2019-2023 Improvements

5. Zone 2 Booster Station Pump No. 4
6. Cutler Way Booster Station Pump No. 2
7. Zone 2 Water Main Loop
8. Schoentrup Dr. to Reo Dr. Loop
9. S. 1st Ave. to Miles Dr. Loop
10. Meade St. to 1st Ave. Loop
11. Pollock Ave. Watermain Upsize
12. Construct New Source Well
13. 1st Ave. Water Main Replacement
14. Edson St. Water Main Replacement

Year 2023-2033 Improvements

15. Collins Pl. Water Main Upsize
16. Catholic Church Water Main Upsize
17. S. 1st Ave. Water Main Upsize
18. Pearson to South Industrial Area Loop
19. 5th St. Water Main Upsize
20. System Hypochlorination (All Wells)

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07-23-14 P:\Projects\2013\13033\Cwp Figures.dwg

FIGURE 8-1

3. RAINIER WELL RECONSTRUCTION

During inspection and review with the City it was determined that Rainier Well has had reliability issues due to the motor overheating, as discussed in Chapter 3, and, at a minimum, is currently in need of pump inspection and repair, motor replacement, and HVAC upgrades to prevent failure and maintain the reliability of this source of supply. Due to the condition of the building structure and mechanical equipment, and the extent of improvements needed, it is recommended that the well be completely replaced and building reconstructed.

This improvement will include demolition of the existing structure, piping, and well pump, construction of a new well building including electrical and HVAC, installation of a new 60 HP vertical turbine pump and motor, building piping, fittings, valves, flow meter, air release valve, installation of a level transducer to monitor well drawdown levels, site piping, fittings, valves and connections, and site improvements including grading, surfacing, and fencing. Provided below are the estimated costs of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$40,000
Demolition and Well Pump Removal	LS	–	–	$15,000
New Well Building	LS	–	–	$100,000
Electrical and Control System	LS	–	–	$90,000
HVAC System	LS	–	–	$20,000
New Well Building Piping, Fittings and Valves	LS	–	–	$35,000
New 60HP Vertical Turbine Well Pump and Motor	LS	–	–	$60,000
Site Grading, Surfacing and Fencing	LS	–	–	$20,000
Site Piping, Fittings, and Valves	LS	–	–	$25,000
Minor Change	LS	–	–	$10,000
			Construction Cost Subtotal	$415,000
			Sales Tax (7.9%)	$32,800
			Subtotal	$447,800
			Contingency (15%)	$67,200
			Subtotal	$515,000
			Engineering and Administration (25%)	$128,750
			TOTAL ESTIMATED COST	**$643,750**

4. WIPPCO WELL RECONSTRUCTION

During inspection and review with the City it was determined that WIPPCO Well has signs of wear and fatigue, as discussed in Chapter 3, and is currently in need of inspection and repair to prevent failure and maintain the reliability of the City's largest source of supply. Additionally, the site is limited by poor access and does not have a permanent emergency power generator. Due to the limited access and extent of improvements needed, it is recommended that the well be completely replaced and building reconstructed.

This improvement will include demolition of the existing structure, extending the well column and filling the immediate site, removal of the existing piping and well pump, construction of a new well building including electrical and HVAC, installation of a new 60 HP vertical turbine pump and motor, building piping, fittings, valves, flow meter, air release valve, installation of a level transducer to monitor well drawdown levels, site piping, fittings, valves and connections, and site improvements including grading, site access, surfacing, and fencing. Provided below are the estimated costs of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$50,000
Demolition and Well Pump Removal	LS	–	–	$25,000
New Well Building	LS	–	–	$120,000
Electrical and Control System	LS	–	–	$110,000
HVAC System	LS	–	–	$20,000
New Well Building Piping, Fittings and Valves	LS	–	–	$35,000
New 60HP Vertical Turbine Well Pump and Motor	LS	–	–	$60,000
New Sand Separator	LS	–	–	$25,000
Engine Generator and Transfer Switch	LS	–	–	$80,000
Fill Site and Provide Road Access	LS	–	–	$50,000
Site Grading, Surfacing and Fencing	LS	–	–	$30,000
Site Piping, Fittings, and Valves	LS	–	–	$25,000
Minor Change	LS	–	–	$10,000
			Construction Cost Subtotal	$640,000
			Sales Tax (7.9%)	$50,600
			Subtotal	$690,600
			Contingency (15%)	$103,600
			Subtotal	$794,200
			Short Plat and Easement Surveying	$5,000
			Engineering and Administration (25%)	$198,550
			TOTAL ESTIMATED COST	**$997,750**

8.3.2 Year 2020 Through Year 2033 Prioritized Improvements

5. ZONE 2 BOOSTER STATION PUMP NO. 4

At the time of construction, available funds did not permit the installation of the second 1,500 GPM booster pump (pump No 4 in the station). However, to meet DOH reliability requirements, assuming one pump is out of service, the second fire pump is necessary. The cost is based on the City contracting directly with a Contractor to install a second fire pump matching the installed fire pump. Provided below are the estimated costs for construction this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Pump, Piping, Valves and Electrical Controls	LS	–	–	$80,000
			Construction Cost Subtotal	$80,000
			Sales Tax (7.9%)	$6,300
			Subtotal	$86,300
			Contingency (15%)	$12,900
			Subtotal	$99,200
			Engineering and Administration (30%)	$29,760
			TOTAL ESTIMATED COST	**$128,960**

6. CUTLER WAY BOOSTER STATION PUMP NO. 3

At the time of construction, available funds did not permit the installation of the third 1,500 GPM booster pump. However, to provide greater reliability when one pump is out of service, the third pump is recommended as designed. Provided below are the estimated costs for this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Pump, Piping, Valves and Electrical Controls	LS	–	–	$80,000
			Construction Cost Subtotal	$80,000
			Sales Tax (7.9%)	$6,300
			Subtotal	$86,300
			Contingency (15%)	$12,900
			Subtotal	$99,200
			Engineering and Administration (30%)	$29,760
			TOTAL ESTIMATED COST	**$128,960**

7. ZONE 2 8-INCH WATER MAIN LOOPS

Additional 8-inch water main will be installed from the new 8-inch booster pump supply line east to Alteejen Road, where a connection will be made to the existing 6-inch water main. This improvement will significantly increase fire flow to hydrants in Zone 2. Provided below are the estimated costs for this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	1100	$55.00	$60,500
8-Inch Gate Valve & Valve Box	EA	2	$1,500.00	$3,000
6-Inch Gate Valve & Valve Box	EA	2	$1,250.00	$2,500
Fire Hydrant Assembly	EA	2	$4,500.00	$9,000
Select Backfill	TON	50	$30.00	$1,500
Asphalt Surface Repair	SY	130	$75.00	$9,750
			Subtotal	$106,250
			Sales Tax (7.9%)	$8,400
			Subtotal	$114,650
			Contingency (15%)	$17,200
			Subtotal	$131,850
			Engineering and Administration (25%)	$32,963
			TOTAL ESTIMATED COST	**$164,813**

8. SCHOENTRUP DRIVE TO REO DRIVE, 8-INCH WATER MAIN LOOP

Approximately 200 linear feet of 8-inch water main will be installed from the end of Schoentrup Drive to the existing 10-inch reservoir outlet piping. Approximately 1,200 linear feet of 8-inch water main will installed from the new 8-inch water main to the end of Reo Drive, northeast of the existing standpipe reservoir, within S.V.I.D. canal right-of-way. This new 8-inch water main loop and connection to the existing reservoir outlet piping will increase fire flow to these residential areas and the northern half of Zillah's system. Provided below are the estimated project costs:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
8-Inch C900 PVC Watermain	LF	1400	$55.00	$77,000
8-Inch Gate Valve & Valve Box	EA	5	$1,500.00	$7,500
6-Inch Gate Valve & Valve Box	EA	1	$1,250.00	$1,250
Gravel Surface Repair	SY	900	$15.00	$13,500
			Subtotal	$114,250
			Sales Tax (7.9%)	$9,000
			Subtotal	$123,250
			Contingency (15%)	$18,500
			Subtotal	$141,750
			Engineering and Administration (25%)	$35,438
			TOTAL ESTIMATED COST	**$177,188**

9. SOUTH FIRST AVENUE TO MILES DRIVE, 8-INCH WATER MAIN LOOP

This improvement will include the construction of approximately 850 linear feet of 8-Inch water main from the corner of Miles Drive and Kagley Way to South First Avenue, which will improve fire flow to residences and the church along Miles Drive, as well as greatly increasing fire flow to businesses along South First Avenue. Provided below are the estimated costs for this recommended improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$10,000
Temporary Traffic Control	LS	–	–	$7,500
8-Inch C900 PVC Watermain	LF	850	$55.00	$46,750
8-Inch Gate Valve & Valve Box	EA	3	$1,500.00	$4,500
6-Inch Gate Valve & Valve Box	EA	2	$1,250.00	$2,500
Select Backfill	TON	50	$30.00	$1,500
HMA Surface Repair	SY	30	$75.00	$2,250
Gravel Surface Repair	SY	400	$15.00	$6,000
			Subtotal	$81,000
			Sales Tax (7.9%)	$6,400
			Subtotal	$87,400
			Contingency (15%)	$13,100
			Subtotal	$100,500
			Engineering and Administration (25%)	$25,125
			TOTAL ESTIMATED COST	**$125,625**

10. MEADE STREET TO S. FIRST AVENUE WATER MAIN LOOP

Looping from the 8-inch water main at the end of Meade Street to the 6-inch water main in South First Avenue, as shown on Figure 8-1, will improve fire flow to this area to be above the 3,000 GPM minimum requirement established in Chapter 3. Provided below are the estimated costs for this recommended improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	150	$55.00	$8,250
8-Inch Gate Valve & Valve Box	EA	1	$1,500.00	$1,500
6-Inch Gate Valve & Valve Box	EA	1	$1,250.00	$1,250
Select Backfill	TON	25	$30.00	$750
HMA Surface Repair	SY	20	$75.00	$1,500
Gravel Surface Repair	SY	80	$15.00	$1,200
			Subtotal	$24,450
			Sales Tax (7.9%)	$1,900
			Subtotal	$26,350
			Contingency (15%)	$4,000
			Subtotal	$30,350
			Engineering and Administration (30%)	$9,105
			TOTAL ESTIMATED COST	**$39,455**

11. POLLOCK AVENUE UPSIZE 4-INCH WATER MAIN

The 4-inch water main in Moritz Street and Pollock Avenue provides insufficient fire flow to the hydrant at the end of this dead-end street. Upsizing the existing main to a new 8-inch water main and replacing the existing fire hydrant will improve fire flow. Below are the estimated costs for this recommended improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	700	$55.00	$38,500
8-Inch Gate Valve & Valve Box	EA	3	$1,500.00	$4,500
Fire Hydrant Assembly	EA	1	$4,500.00	$4,500
Water Service Connection	EA	14	$1,500.00	$21,000
Select Backfill	TON	15	$30.00	$450
HMA Surface Repair	SY	160	$75.00	$12,000
			Subtotal	$90,950
			Sales Tax (7.9%)	$7,200
			Subtotal	$98,150
			Contingency (15%)	$14,700
			Subtotal	$112,850
			Engineering and Administration (25%)	$28,213
			TOTAL ESTIMATED COST	**$141,063**

12. CONSTRUCT NEW SOURCE WELL AT JOSEPH WELL SITE

It is not anticipated that the City will be able to rehab the existing Joseph Well due to its production of sand. The existing well will have to be deepened or a new well drilled on the site. The estimate below is based on using the existing building at the Joseph Well site. The new well will increase source capacity to the system, as discussed in Chapter 3 of this Plan. This improvement is based on the ability to use existing well rights by withdrawing groundwater from the same aquifer as the existing wells. Additional investigation and verification of this is required prior to design and construction. If water rights will not extend to the Joseph Well site area, alternate sites near WIPPCO and 3rd Avenue wells will need to be investigated for possible well sites. Provided below are the estimated costs for this recommended improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$80,000
Remove Existing Equipment	LS	–	–	$10,000
Decommision Existing Well	LS	–	–	$10,000
Drill New Well (Approx. 1400' Deep)	LF	1400	$450.00	$630,000
New Submersible Well Pump and Motor	LS	–	–	$60,000
Site Grading & Drainage	LS	–	–	$25,000
Site Piping and Connections	LS	–	–	$10,000
Submersible Level Transducer	LS	–	–	$7,500
Well Building Piping, Valves & Flow Meter	LS	–	–	$50,000
Engine Generator and Transfer Switch	LS	–	–	$80,000
Chlorination Equipment & Misc. Piping	LS	–	–	$30,000
Electrical, Telemetry and Control System	LS	–	–	$80,000
Test Well Pump	LS	–	–	$10,000
			Construction Cost Subtotal	$1,082,500
			Sales Tax (7.9%)	$85,500
			Subtotal	$1,168,000
			Contingency (15%)	$175,200
			Subtotal	$1,343,200
			Engineering and Administration (25%)	$335,800
			TOTAL ESTIMATED COST	**$1,679,000**

13. REPLACE 6-INCH STEEL LINE IN FIRST AVENUE FROM CHEYNE ROAD TO THIRD STREET

The existing 6-inch steel water main in First Avenue was installed in the 1940's and leaks in many locations. Leaks up to ¼-inch in diameter have been found in the existing steel pipe. This improvement project will replace the existing, leaking 6-inch steel pipe with a new 8-inch diameter water main, reducing water losses and significantly improving fire flow to the central commercial district of Zillah, where the highest fire flow is required. Provided below are the estimated costs of this improvement project:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$45,000
Temporary Traffic Control	LS	–	–	$20,000
8-Inch C900 PVC Watermain	LF	2400	$55.00	$132,000
8-Inch Gate Valve & Valve Box	EA	6	$1,500.00	$9,000
Fire Hydrant Assembly	EA	6	$4,500.00	$27,000
Water Service Connection	EA	14	$1,500.00	$21,000
Cement Concrete Sidewalk, 4-Inch Thick	SY	1280	$50.00	$64,000
Cement Concrete Curb & Gutter	LF	2300	$30.00	$69,000
Concrete Sidewalk Ramp	EA	4	$1,500.00	$6,000
Select Backfill	TON	50	$30.00	$1,500
HMA Surface Repair	SY	900	$75.00	$67,500
			Subtotal	$462,000
			Sales Tax (7.9%)	$36,500
			Subtotal	$498,500
			Contingency (15%)	$74,800
			Subtotal	$573,300
			Engineering and Administration (25%)	$143,325
			TOTAL ESTIMATED COST	**$716,625**

14. REPLACE EXISTING 4-INCH WATER MAIN IN EDSON STREET AND LOOP NEW PIPING TO FOURTH AVENUE 8-INCH WATER MAIN

The existing 4-inch water main in Edson Street is old, undersized, and there are no fire hydrants. This improvement project will upsize the existing undersized water main to a new 8-inch water main and provide additional looping to the Fourth Avenue 8-inch water main. Provided below are the estimated costs of this improvement project:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$11,000
Temporary Traffic Control	LS	–	–	$10,000
8-Inch C900 PVC Watermain	LF	420	$55.00	$23,100
8-Inch Gate Valve & Valve Box	EA	4	$1,500.00	$6,000
6-Inch Gate Valve & Valve Box	EA	1	$1,250.00	$1,250
Fire Hydrant Assembly	EA	1	$4,500.00	$4,500
Water Service Connection	EA	15	$1,500.00	$22,500
Select Backfill	TON	25	$30.00	$750
HMA Surface Repair	SY	280	$75.00	$21,000
			Subtotal	$100,100
			Sales Tax (7.9%)	$7,900
			Subtotal	$108,000
			Contingency (15%)	$16,200
			Subtotal	$124,200
			Engineering and Administration (25%)	$31,050
			TOTAL ESTIMATED COST	**$155,250**

15. COLLIN'S PLACE WATER MAIN UPSIZE

The existing 6-inch water main in Collins Place is undersized to meet fire flow requirements. This improvement project will include the replacement of the existing 6-inch water main with a new 8-inch water main. Provided below is the estimated cost of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$8,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	400	$55.00	$22,000
8-Inch Gate Valve & Valve Box	EA	2	$1,500.00	$3,000
Water Service Connection	EA	6	$1,500.00	$9,000
Select Backfill	TON	25	$30.00	$750
HMA Surface Repair	SY	280	$75.00	$21,000
			Subtotal	$68,750
			Sales Tax (7.9%)	$5,400
			Subtotal	$74,150
			Contingency (15%)	$11,100
			Subtotal	$85,250
			Engineering and Administration (25%)	$21,313
			TOTAL ESTIMATED COST	**$106,563**

16. ZONE 2 CATHOLIC CHURCH WATER MAIN UPSIZE

The existing 6-inch water main serving the Catholic Church in Zone 2 is undersized to meet fire flow requirements. This improvement project will include the replacement of the existing 6-inch water main with a new 8-inch water main. Provided below is the estimated cost of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$2,000
8-Inch C900 PVC Watermain	LF	350	$55.00	$19,250
8-Inch Gate Valve & Valve Box	EA	2	$1,500.00	$3,000
Water Service Connection	EA	2	$1,500.00	$3,000
Select Backfill	TON	25	$30.00	$750
Gravel Surface Repair	SY	240	$15.00	$3,600
			Subtotal	$36,600
			Sales Tax (7.9%)	$2,900
			Subtotal	$39,500
			Contingency (15%)	$5,900
			Subtotal	$45,400
			Engineering and Administration (25%)	$11,350
			TOTAL ESTIMATED COST	**$56,750**

17. FIRST AVENUE 6-INCH STEEL LINE REPLACEMENT

The existing 6-inch water main in South First Avenue is old and undersized to meet fire flow requirements. This improvement project will upsize the existing undersized water main to a new 8-inch water main. Provided below are the estimated costs of this improvement project:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$20,000
Temporary Traffic Control	LS	–	–	$20,000
8-Inch C900 PVC Watermain	LF	700	$55.00	$38,500
8-Inch Gate Valve & Valve Box	EA	4	$1,500.00	$6,000
Fire Hydrant Assembly	EA	4	$4,500.00	$18,000
Water Service Connection	EA	8	$1,500.00	$12,000
Select Backfill	TON	500	$30.00	$15,000
HMA Surface Repair	SY	250	$75.00	$18,750
			Subtotal	$148,250
			Sales Tax (7.9%)	$11,700
			Subtotal	$159,950
			Contingency (15%)	$24,000
			Subtotal	$183,950
			Engineering and Administration (25%)	$45,988
			TOTAL ESTIMATED COST	**$229,938**

18. INDUSTRIAL AREA WATER MAIN LOOP

To improve fire flow within the South Industrial area, a new 8" water main loop is proposed. This improvement project will construct a new 8-inch water main loop in the existing industrial area from Pearson Street to the South Industrial Area along I-82 right of way. Provided below are the estimated costs of this improvement project:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	800	$55.00	$44,000
8-Inch Gate Valve & Valve Box	EA	4	$1,500.00	$6,000
Fire Hydrant Assembly	EA	2	$4,500.00	$9,000
Water Service Connection	EA	4	$1,500.00	$6,000
Select Backfill	TON	100	$35.00	$3,500
HMA Surface Repair	SY	550	$75.00	$41,250
			Subtotal	$129,750
			Sales Tax (7.9%)	$10,300
			Subtotal	$140,050
			Contingency (15%)	$21,000
			Subtotal	$161,050
			Engineering and Administration (25%)	$40,263
			TOTAL ESTIMATED COST	**$201,313**

19. FIFTH STREET FROM GLENWOOD DR. TO THIRD AVENUE WATER MAIN UPSIZE

The existing 6-inch PVC water main in Fifth Street from Glennwood Drive to Third Avenue is old and in need of replacement. This improvement project will include the replacement of the existing 6-inch water main with a new 8-inch water main, which will replace the dated pipe and also improve fire flow. Provided below is the estimated cost of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$5,000
Temporary Traffic Control	LS	–	–	$5,000
8-Inch C900 PVC Watermain	LF	460	$55.00	$25,300
8-Inch Gate Valve & Valve Box	EA	6	$1,500.00	$9,000
6-Inch Gate Valve & Valve Box	EA	1	$1,250.00	$1,250
Fire Hydrant Assembly	EA	2	$4,500.00	$9,000
Water Service Connection	EA	6	$1,500.00	$9,000
Select Backfill	TON	80	$30.00	$2,400
HMA Surface Repair	SY	40	$75.00	$3,000
Gravel Surface Repair	SY	280	$15.00	$4,200
			Subtotal	$73,150
			Sales Tax (7.9%)	$5,800
			Subtotal	$78,950
			Contingency (15%)	$11,800
			Subtotal	$90,750
			Engineering and Administration (25%)	$22,688
			TOTAL ESTIMATED COST	**$113,438**

20. SYSTEM HYPOCHLORINATION

The City currently does not provide chlorine disinfection at any of its source wells. The Cutler Way booster pump station has chlorination equipment installed, and the Zone 2 booster pump station was designed for the future installation of chlorination equipment. This improvement project will include retrofitting the Zone 2 booster pump station, Rainier, 3rd Avenue, and WIPPCO Wells with new chlorination equipment, if required in the future. Provided below are the estimated costs of this improvement:

Item	Unit	Qty.	Unit Cost	Total Cost
Mobilization	LS	–	–	$15,000
Well Chlorination Equipment & Misc. Piping	EA	3	$30,000	$90,000
Zone 2 Chlorination Equipment & Misc. Piping	EA	1	$20,000	$20,000
Well Electrical, Telemetry and Control System	EA	3	$25,000	$75,000
			Subtotal	$200,000
			Sales Tax (7.9%)	$15,800
			Subtotal	$215,800
			Contingency (15%)	$32,400
			Subtotal	$248,200
			Engineering and Administration (25%)	$62,050
			TOTAL ESTIMATED COST	**$310,250**

8.3.3 Major Capital Improvement Schedule

Table 8-2 provides a six-year schedule for completion of some of the recommended major capital improvements. Scheduling of the remaining improvements beyond this six-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 2015 to reflect the possible future costs, based upon the projected year the improvement will be completed.

TABLE 8-2 SCHEDULE OF RECOMMENDED CAPITAL IMPROVEMENTS

Priority No.	Improvement Description	Est. Cost in 2014 Dollars	Completion Year							Funding Source
			2014	2015	2016	2017	2018	2019	2020 - 2033	
1	Cutler Way, 10-Inch Water Main Loop	$60,000	$30,000	$30,000						City
2	3rd Avenue Well Rehabilitation	$544,440		$544,440						SRF Loan/City
3	Rainier Well Reconstruction	$643,750				$703,443				SRF Loan/City
4	WIPPCO Well Reconstruction	$997,750						$1,156,666		SRF Loan/City
5	Zone 2 Booster Station Pump No. 4	$128,960							$153,985	City
6	Cutler Way Booster Station Pump No. 3	$128,960							$153,985	City
7	Zone 2 8-Inch Water Main Loop	$164,813							$196,795	Private
8	Schoentrup Drive to Reo Drive, 8-Inch Water Main Loop	$177,188							$211,571	SRF Loan/City
9	South First Avenue to Miles Drive, 8-Inch Water Main Loop	$125,625							$150,003	SRF Loan/City
10	Meade Street to S. First Avenue Water Main Loop	$39,455							$47,111	SRF Loan/City
11	Pollock Avenue Upsize 4-Inch Water Main	$141,063							$168,436	SRF Loan/City
12	Construct New Source Well at Joseph Well Site	$1,679,000							$2,004,814	SRF Loan/City
13	Replace 6-Inch Steel Line in First Avenue From Cheyne Road to Third Street	$716,625							$855,688	SRF Loan/City
14	Replace Existing 4-Inch Water Main in Edson Street and Loop New Piping to Fourth Avenue 8-Inch Water Main	$155,250							$185,377	SRF Loan/City
15	Replace Existing 6-Inch Water Main in Collins Place with 8-Inch Water Main	$106,563							$127,241	SRF Loan/City
16	Replace Existing 6-Inch Water Main in Zone 2 to Catholic Church with 8-Inch Water Main	$56,750							$67,762	SRF Loan/City
17	Replace 6-Inch Steel Line in South First Avenue From Meade Street to Glen Drive with 8-Inch Water Main	$229,938							$274,557	SRF Loan/City
18	8-Inch Water Main Loop From Pearson Street to South Industrial Area Loop Along I-82 ROW	$201,313							$240,378	SRF Loan/City
19	Fifth Street From Glenwood Dr. to Third Avenue Water Main Upsize	$113,438							$135,450	SRF Loan/City
20	System Hypochlorination	$310,250							$370,455	SRF Loan/City
	TOTAL COSTS	$6,721,128	$30,000	$574,440	$0	$703,443	$0	$1,156,666	$5,343,608	

Note: Improvement costs for years following 2015 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 Future Major Improvements Map. 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 ZILLAH

FUTURE MAJOR IMPROVEMENTS MAP

LEGEND

- ZILLAH CITY LIMITS
- ZILLAH UGA BOUNDARY
- ZILLAH PROPOSED UGA
- POSSIBLE FUTURE MAJOR SYSTEM IMPROVEMENTS

HLA
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07-23-14 P:\Projects\2013\13033\Cwp Figures.dwg

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. Presented below in Table 9-1 is a summary of the City's Water Operating Fund (402) revenue and expenditure history for the last five-year period. A summary of the City's Water Reserve Fund (420) revenue and expenditure history for the last five years is provided in Table 9-2.

TABLE 9-1 WATER OPERATING FUND (402) HISTORY

Year	2009	2010	2011	2012	2013
BEGINNING FUND BALANCE	$ 682,735.92	$ 666,630.28	$ 655,859.51	$ 376,292.77	$ 424,926.34
REVENUES					
Water Sales	$ 266,826.37	$ 277,981.21	$ 341,649.38	$ 325,797.85	$ 327,107.97
Irrigation Sales	$ 70,474.87	$ 81,035.52	$ 78,567.25	$ 73,615.55	$ 88,112.82
Fees and Penalties	$ 37,620.04	$ 41,493.66	$ 52,857.01	$ 95,531.87	$ 47,792.84
Misc. Revenues & Utility Tax	$ 25,777.22	$ 23,223.40	$ 22,327.31	$ 24,863.06	$ 126,622.65
Non-Revenues/Loan Repayment				$ 200,000.00	$ 202,000.00
Transfers In/From 420 Fund				$ 130,669.69	
TOTAL - REVENUES	$ 400,698.50	$ 423,733.79	$ 495,400.95	$ 850,478.02	$ 791,636.28
EXPENDITURES					
Water Operating - General	$ 299,695.59	$ 310,334.12	$ 317,874.03	$ 336,342.03	$ 472,142.92
Irrigation Operating - General	$ 117,108.55	$ 124,170.44	$ 125,810.50	$ 131,460.91	$ 142,219.98
Debt Service					
PWTF Loan Principal/Interest			$ 131,283.16	$ 130,669.69	
Interfund Loan			$ 200,000.00	$ 200,000.00	
Capital Outlay					
Other Improvements				$ 3,371.82	
Machinery and Equipment					$ 2,041.59
TOTAL - EXPENDITURES	$ 416,804.14	$ 434,504.56	$ 774,967.69	$ 801,844.45	$ 616,404.49
ENDING FUND BALANCE	$ 666,630.28	$ 655,859.51	$ 376,292.77	$ 424,926.34	$ 600,158.13
Net Increase (Decrease) in Fund Balance	$ (16,105.64)	$ (10,770.77)	$ (279,566.74)	$ 48,633.57	$ 175,231.79
% Fund Change from Previous Year	-2.4%	-1.6%	-42.6%	12.9%	41.2%

TABLE 9-2 WATER RESERVE FUND (420) HISTORY					
Year	2009	2010	2011	2012	2013
BEGINNING FUND BALANCE	$ 1,043,818.83	$ 628,447.52	$ 528,651.36	$ 597,214.60	$ 529,950.10
REVENUES					
Water Reserve Fund Fees & Charges/Surcharge	$ 16,000.00	$ 14,145.00	$ 20,000.00	$ 20,000.00	
Investment Interest	$ 3,803.62		$ 832.77	$ 510.23	$ 1,170.65
Water Imp. - Ord. 906	$ 125,599.45	$ 126,179.41	$ 127,963.39	$ 101,605.78	$ 129,637.92
PWTF Loan	$ 517,454.32				
Cost Recovery	$ 3,650.00	$ 4,075.00	$ 5,250.00	$ 7,400.00	$ 2,875.00
Miscellaneous	$ 53,505.05	$ 1,161.76	$ 24.78		$ 37,200.00
TOTAL - REVENUES	$ 720,012.44	$ 145,561.17	$ 154,070.94	$ 129,516.01	$ 170,883.57
EXPENDITURES					
Water Utilities				$ 22,157.10	$ 62,481.33
Operating Transfers-Out					
to 207/PWTF Reservoir Loan	$ 123,270.77	$ 131,827.43			
to 001/Admin Costs				$ 3,508.00	
to 402 PWTF				$ 130,669.69	
Debt Service					
PWTF Loan - Telemetry	$ 5,969.15	$ 5,941.13	$ 5,913.10	$ 5,885.08	$ 5,857.05
PWTF Loan - Water Tower					$ 130,056.21
Capital Outlay					
Capital Improvements	$ 823,137.99	$ 4,486.44			
Annual Improvements/Misc.	$ 183,005.84	$ 103,102.33	$ 79,594.60	$ 34,560.64	$ 9.89
TOTAL - EXPENDITURES	$ 1,135,383.75	$ 245,357.33	$ 85,507.70	$ 196,780.51	$ 198,404.48
ENDING FUND BALANCE	$ 628,447.52	$ 528,651.36	$ 597,214.60	$ 529,950.10	$ 502,429.19
Net Increase (Decrease) in Fund Balance	$ (415,371.31)	$ (99,796.16)	$ 68,563.24	$ (67,264.50)	$ (27,520.91)
% Fund Change from Previous Year	-39.8%	-15.9%	13.0%	-11.3%	-5.2%

It can be seen from Table 9-1 and Table 9-2 that both account balances have remained positive in the past five years. Although account balances have remained positive, a close examination of the City's future financial plan, including necessary rate increases, and their rate structure will be crucial to keep a positive account balance and construct the system improvements recommended in this Plan.

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. This method of financing is desirable, in that the City is collecting interest on the reserves as opposed to paying interest on a loan balance. ("Pay as you go.")

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 are 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: 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.

State Revolving Fund: 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 Department of Health and Department of Commerce.

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 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 most needy communities, grants are designed to keep costs economical. Grants are limited to reducing the facility's 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 9-3 provides a summary of funding sources and projects which are eligible under each program.

TABLE 9-3 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
State Revolving Fund	All water system projects
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 9-4 and Table 9-5 is a financial program for Zillah's water operating and reserve funds, which incorporates projected water service fees, operating costs, improvements, and loan costs for the next six-year period. The values for year 2014 are budgeted numbers from 2013.

The projected water department revenue from water service fees after 2014 includes additional revenue from a combination of projected increases in the number of services and rate increases at the beginning of the year. The current codified water rates include a 2% annual increase, but additional increases are recommended as shown based on a recent water rate analysis. These projected revenue and rate increases are necessary to complete the recommended system improvements, while maintaining a positive balance in both funds. If conditions change that reduce the projected future revenue or increase future water department expenses, the financial program shown in Table 9-4 and Table 9-5 will have to be revised to account for the reduced revenue, or modifications to successive year rate increases will have to be made.

Future water department expenses were estimated based upon an average inflation rate of three to four percent per year, as shown in Table 9-4.

Funding for major capital improvements scheduled to be completed in and after 2014 has not been obtained and will be required in order to complete those recommended system improvements. Further evaluation and research of available funding sources may be necessary in the future to ensure a funding package will be established to meet the requirements of the proposed financial plan.

If loan and/or grant funding is not available for major capital improvements, project construction would most likely need to be delayed until the funds become available or sufficient local funds are saved. For this reason, it is critical that the City actively seek and apply for available grants and low interest loans whenever possible.

Funding for most O&M improvements is based upon using City funds unless otherwise noted.

As discussed in Chapter 4 of this plan, the City of Zillah owns and maintains its own irrigation system that serves a portion of irrigation water users within the City's existing service area. Project irrigation revenues and expenditures have been included in Table 9-4 and Table 9-5 because they are currently part of the City's water system fund balances. No analysis of the irrigation department rate structure or financial viability were conducted as part of this plan.

The City of Zillah 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 2020. This continued review will allow for modifications to the proposed rate and revenue increases, should financial conditions change.

TABLE 9-4 PROPOSED WATER OPERATING FUND (402) FINANCIAL PROGRAM						
Year	2014[a]	2015	2016	2017	2018	2019
BEGINNING FUND BALANCE	$ 598,256.07	$ 545,102.18	$ 518,180.39	$ 523,629.49	$ 566,615.96	$ 652,951.39
REVENUES[b]						
Water Sales	$ 321,617.03	$ 353,778.73	$ 389,156.61	$ 428,072.27	$ 470,879.49	$ 494,423.47
Irrigation Sales	$ 91,000.00	$ 103,740.00	$ 118,263.60	$ 134,820.50	$ 153,695.37	$ 175,212.73
Fees and Penalties	$ 51,245.84	$ 53,000.00	$ 53,000.00	$ 53,000.00	$ 53,000.00	$ 53,000.00
Misc. Water Revenues & Utility Tax	$ 126,261.34	$ 134,934.70	$ 146,121.01	$ 158,601.27	$ 172,514.52	$ 180,480.27
Non-Revenues/Loan Repayment						
Transfers In/From 420 Fund						
TOTAL - REVENUES	$ 590,124.21	$ 645,453.43	$ 706,541.22	$ 774,494.04	$ 850,089.39	$ 903,116.47
EXPENDITURES[c]						
Water Operating - General	$ 497,968.00	$ 507,927.36	$ 518,085.91	$ 528,447.63	$ 539,016.58	$ 549,796.91
Irrigation Operating - General	$ 152,350.00	$ 155,397.00	$ 158,504.94	$ 161,675.04	$ 164,908.54	$ 168,206.71
Transfer OUT Utility Tax / 001 Admin / Interfund	$ 193,112.10	$ 207,180.74	$ 220,357.36	$ 234,702.96	$ 250,331.48	$ 259,834.10
Transfer OUT Fund 420						$ 190,700.00
TOTAL - EXPENDITURES	$ 643,278.10	$ 672,375.22	$ 701,092.11	$ 731,507.57	$ 763,753.96	$ 981,141.54
ENDING FUND BALANCE	$ 545,102.18	$ 518,180.39	$ 523,629.49	$ 566,615.96	$ 652,951.39	$ 574,926.31
Net Increase (Decrease) in Fund Balance	$ (53,153.89)	$ (26,921.79)	$ 5,449.10	$ 42,986.47	$ 86,335.42	$ (78,025.07)
Projected Water Revenue Increase at Start of Year	0.0%	10.0%	10.0%	10.0%	10.0%	5.0%

[a] 2014 values are budgeted numbers in 2013.

[b] Water sales revenues for years 2015-2018 include a 10% projected revenue increase per year and a 5% increase in 2019. Irrigation sales assumes a 14.0% increase per year. The revenue increases are consistent with a City initiated Water and Irrigation Rate Analysis completed in 2014.

[c] Operating expenditures for years 2015-2019 include 3% inflation per year for water, and 4% inflation per year for irrigation.

TABLE 9-5 PROPOSED WATER RESERVE FUND (420) FINANCIAL PROGRAM						
Year	2014[a]	2015	2016	2017	2018	2019
BEGINNING FUND BALANCE	$ 502,476.05	$ 431,592.29	$ 384,238.06	$ 398,775.32	$ 407,452.31	$ 430,278.10
REVENUES						
Water Reserve Fund Fees & Charges/Surcharge						
Investment Interest	$ 1,493.52	$ 2,157.96	$ 1,921.19	$ 1,993.88	$ 2,037.26	$ 2,151.39
Water Imp. - Ord. 906	$ 130,469.49	$ 133,992.17	$ 137,609.95	$ 141,325.42	$ 145,141.21	$ 149,060.02
Cost Recovery	$ 7,350.00	$ 7,800.00	$ 6,575.00	$ 6,575.00	$ 6,575.00	$ 6,575.00
Miscellaneous	$ 23,915.48	$ 20,000.00	$ 20,000.00	$ 20,000.00	$ 20,000.00	$ 20,000.00
Loan/Bond Proceeds (Future)			$ 544,440.00	$ 703,443.00	$1,593,223.00	
Transfer from Fund 402						$ 190,700.00
TOTAL - REVENUES	$ 163,228.49	$ 163,950.13	$ 710,546.14	$ 873,337.30	$1,766,976.47	$ 368,486.41
EXPENDITURES						
Debt Service						
PWTF Loan - Telemetry (Existing)	$ 5,829.03	$ 5,801.17	$ 5,858.00	$ 5,858.00	$ 5,858.00	$ 5,858.00
PWTF Loan - Water Tower (Existing)	$ 129,442.74	$ 128,829.27	$ 128,250.00	$ 127,600.00	$ 127,000.00	$ 126,400.00
DWSRF Loans (Future 2015-2019)						$ 190,683.27
Transfer OUT to 001 Admin	$ 6,898.00	$ 7,173.92	$ 7,460.88	$ 7,759.31	$ 8,069.68	$ 8,392.47
Proposed Capital Outlay						
Capital Improvements	$ 91,942.48		$ 544,440.00	$ 703,443.01	$1,156,666.00	
O&M Improvements	$ -	$ 69,500.00	$ 10,000.00	$ 20,000.00	$ 446,557.00	$ 170,791.00
TOTAL - EXPENDITURES	$ 234,112.25	$ 211,304.36	$ 696,008.88	$ 864,660.32	$1,744,150.68	$ 502,124.74
ENDING FUND BALANCE	$ 431,592.29	$ 384,238.06	$ 398,775.32	$ 407,452.31	$ 430,278.10	$ 296,639.77
Net Increase (Decrease) in Fund Balance	$ (70,883.76)	$ (47,354.23)	$ 14,537.27	$ 8,676.99	$ 22,825.79	$ (133,638.33)

[a] 2014 values are budgeted numbers in 2013.

9.4 WATER RATES

Zillah's current water rates and rate structure were adopted in 2011 and are based on a monthly base rate charge, and additional charge, plus a per cubic foot charge for volumes over 300 cubic feet. A summary of the current water rates for services within the City Limits is provided below in Table 9-6. The complete list of the City's current water rates is provided in Chapter 13.08.050 of the City's municipal code, a copy of which is provided in Chapter 10 of this Plan.

TABLE 9-6 SUMMARY OF CURRENT WATER RATES

	Base Rate per Month up to 300 cubic feet, 2% Increase per Year				
	2014	2015	2016	2017	2018
Base Rate per Metered Hook-Up (In City)*	$10.08	$10.28	$10.49	$10.70	$10.91
Surcharge for Users Outside City in Addition to Base Rate	$5.04	$5.14	$5.24	$5.35	$5.45
Rates per cubic foot in excess of 300 cubic foot minimum charge, 2% Increase per Year					
300 - 1,000 cu. ft	$0.0254	$0.0259	$0.0264	$0.0270	$0.0275
1,001 - 2,000 cu. ft.	$0.0233	$0.0238	$0.0242	$0.0247	$0.0252
2,001 - 3,000 cu. ft.	$0.0127	$0.0130	$0.0132	$0.0135	$0.0137
More than 3,000 cu. ft.	$0.0074	$0.0075	$0.0077	$0.0079	$0.0080

*In addition to the Base Rate, an additional monthly charge of $9.00 is included in the water rate (ZMC 13.08.118).

Based on the above rates, the typical monthly charge for a Single-Family residential customer that uses 700 cubic feet of water in a month (approximately 175 gallons per day) would be equal to $29.24. This monthly service charge is reasonable when compared with neighboring cities of a similar size and amount of water use.

The City's current rates and/or total revenue will need to be increased in future years in order to maintain a positive operating fund balance, pay for rising O&M costs, fund necessary improvement projects, and make the necessary debt service payments for prior and future improvement projects. The existing annual rate increases of 2% a year will have a minimal impact on residential customers. Based on a monthly consumption of 700 cubic feet of water, the monthly charge with a 2% increase of the 2014 rate would be equal to approximately $29.64 in 2015, which is only $0.40 more per month. Due to the proposed improvements and financial projections it is recommended that the City consider increasing the revenue as proposed in Table 9-4. One option to consider is a rate increase. In 2018 a rate increase of 10% in lieu of 2% would result in a monthly charge for consumption of 700 cubic feet of $31.77 compared to $30.91 at the current water rates.

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.

With the City's current rate structure, customers pay more with increased water usage but the rate per cubic foot decreases as use increases. Further conservation may be possible by changing to an inclining-block rate or similar structure. This type of rate structure would penalize customers that use excessive amounts of water, potentially encouraging more efficient use of water. As noted in the 2008 Comprehensive Water Plan, over the past six years the City has considered alternate rate structures that encourage water efficiency, including:

1. An "increasing block rate" structure (one in which the charge per cubic foot of consumption increases with greater usage);
2. A flat rate structure; and

3. A “seasonal pricing structure” (one in which the unit price of water would be increased during the higher summer use period).

These past discussions and evaluations have not led to a change in the rate structure, largely due to political resistance to “rate increases,” particularly for larger industrial users. However, with the continued growth of the City, the need for more efficient water use and greater revenue, the City anticipates re-evaluating the rate structure biennially to discuss and evaluate different options. Beyond the specific alternate rate structures described above, actions to work towards an efficient rate structure for the City of Zillah may include:

1. Considering different rate structures for different user classes;
2. Advertising to customers the City’s intent to revise the rate structure and request customer comments and suggestions;
3. Approach individual large industrial users to discuss water efficiency changes they could make so that an alternate rate structure would not result in a larger bill.

Additional information on water use efficiency is provided in Chapter 4 of this Plan.