Water System Master Plan

City of Post Falls

July 2018

State of Idaho
Department of
Environmental Quality

2110 Ironwood Parkway ▪ Coeur d'Alene, ID 83814 ▪ (208) 769-1422

C. L. "Butch" Otter, Governor
John H. Tippets, Director

June 14, 2018

Mr. John Beacham
City of Post Falls
408 N Spokane St
Post Falls, ID 83854
jbeacham@postfallsidaho.org

Subject: Water System Master Plan, City of Post Falls – Facility Plan Approval

Dear Mr. Beacham:

The Idaho Department of Environmental Quality (DEQ) has reviewed the Water System Master Plan submitted to DEQ on October 17, 2017 by Joseph H.B. Foote II, P.E. of Murraysmith. The facility plan appears to meet the State of Idaho standards and is approved based on the conditions listed below.

PROJECT SPECIFIC CONDITIONS:

A. This approval is for the Public Drinking Water Facility Plan only. Please submit a Preliminary Engineering Report (PER) to DEQ for review and approval prior to preparing and submitting detailed plans and specifications for any of the facility plan improvements. Detailed plans and specifications cannot be reviewed until the PER is approved; furthermore, no construction can begin until the detailed plans and specifications have been reviewed and approved by DEQ.

Should you have any questions or require additional information, please do not hesitate to contact me at (208) 666-4634 or via e-mail at Taylor.Enos@deq.idaho.gov.

Regards,

Taylor Enos
Water/Wastewater EIT

c: Joseph H.B. Foot II, P.E., Murraysmith, joe.foote@murraysmith.us
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File: Post Falls, City of – Drinking Water System FPS Facility Planning Study,
2017AGD11826 (P&S #13483) / 2018AGD3730

Water System Master Plan

City of Post Falls

July 2018

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Acknowledgements

Appreciation is expressed to all who contributed to the completion of this report.

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Acronyms & Abbreviations

A	
ADD	average day demand
AL	action levels
AWWA	American Water Works Association
C	
CCL	Contaminant Candidate List
CCR	Consumer Confidence Report
cfs	cubic feet per second
CIP	capital improvement plan
D	
DEQ	Idaho Department of Environmental Quality
E	
EPA	Environmental Protection Agency
EPS	extended period simulation
F	
fps	feet per second
ft	feet
FTE	full-time equivalent
FY	fiscal year
G	
GIS	geographic information system
gpa	gallons per acre
gpcpd	gallons per capita per day
gpepd	gallons per employee per day
gpd	gallons per day
gpm	gallons per minute
H	
HGL	hydraulic grade line
I	
IDAPA	Idaho Administrative Procedures Act
IOCs	inorganic contaminants
in	inch
K	
KMPO	Kootenai Metropolitan Planning Organization
L	
LCR	Lead and Copper Rule
lf	linear feet

M	
MCGL	maximum contaminant goal levels
MCL	maximum contaminant level
MDD	maximum day demand
mgd	million gallons per day
MG	million gallons
N	
NPDWR	National Primary Drinking Water Regulations
NSDWR	National Secondary Drinking Water Regulations
O	
O&M	operations and maintenance
OWQPs	optimal water quality parameters
P	
PHD	peak hour demand
ppm	parts per million
PRV	pressure reducing valve
psi	pounds per square inch
PSV	pressure sustaining valve
PUD	Asotin County Public Utility District
PVC	polyvinyl chloride
R	
ROV	Remotely Operated Vehicle
RR	Radionuclides Rule
RSMeans	RS Means Heavy Construction Cost Data
RTCR	Revised Total Coliform Rule
S	
SCADA	supervisory control and data acquisition
SDWA	Safe Drinking Water Act
SMCLs	secondary maximum contaminant levels
SVRPA	Spokane Valley/Rathdrum Prairie Aquifer
SOCs	synthetic organic contaminants
T	
TAZ	traffic analysis zone
TC	total coliform
TCR	Total Coliform Rule
V	
VFD	variable frequency drive
VOCs	volatile organic contaminants
W	
WQP	water quality parameter
WSMP	Water System Master Plan

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Executive Summary

Introduction

The City of Post Falls (City) owns and operates a public drinking water system that serves a population of about 18,000 people. This Water System Master Plan (WSMP) documents key water system information and provides analysis and recommendations that inform infrastructure development and operational decisions by City staff.

How This Plan Should Be Used

This WSMP serves as the guiding document for future water system improvements, and should:

- Be reviewed annually to prioritize and budget needed improvement projects.
- Have mapping updated regularly to reflect ongoing water system expansion.
- Have its specific project recommendations regarded as conceptual. (The location, size and timing of projects may change as additional site-specific details and potential alternatives are investigated and analyzed in the preliminary engineering phase of project design.)
- Have its cost estimates updated and refined with preliminary engineering and final project designs.

Scope of Work

The City selected Murraysmith to update the WSMP for its potable water system. The scope of work for this WSMP includes the following major tasks and deliverables:

- Describe the City's existing water system.
- Update and calibrate the hydraulic model.
- Develop population and water demand projections.
- Develop performance criteria for use in identifying deficiencies and sizing improvements.
- Evaluate the water system's hydraulic capacity to identify deficiencies for existing, 5-year, and 20-year planning horizons.
- Assess current facilities conditions.
- Provide benchmarking information for the City's system and comparable utilities.

- Review the system's compliance with water quality regulations.
- Develop project recommendations and cost estimates for a capital improvement plan (CIP).
- Evaluate capital improvement projects impact to rates.

Organization of the WSMP

This WSMP is organized into seven sections, as described in **Table ES-1**. Detailed technical information and support documents are included in the appendices.

Table ES-1
WSMP Organization

Section	Description
Executive Summary	Purpose and scope of the WSMP and summary of key components of each part of the document.
1 – Existing System Description	Description of the service area and overview of the existing system and facilities.
2 – Water Use Characterization	Population projections and water demand estimates for existing and future service areas.
3 – System Analysis	Overview of system performance criteria. Discussion of supply, storage, and pumping capacity, and distribution system hydraulic analysis and deficiencies for existing and future planning horizons.
4 – Facility Condition Assessment	Assessment of the condition of drinking water system components including, water production and distribution facilities.
5 – Operations & Maintenance and Water Quality	Description of the City's operation and maintenance programs as well as a benchmarking comparison to similar utilities. This section also summarizes water quality regulations.
6 – Capital Improvement Plan	Improvement project recommendations including cost estimates and timeframe for implementation.
7 – Financial Evaluation	Analysis of impact to water rates based on proposed capital improvement plan projects.

Existing System Description

The water system serves about 18,000 people, which is about half of the population within the City limits, with the remainder served by other public or private water providers. In 2015 the City supplied 1.8 billion gallons of water to over 7,300 customer accounts. The Water Division operates and maintains over 120 miles of water pipe, eight water supply wells, four active storage tanks, one active booster station, two pressure reducing valves (PRVs), and four pressure sustaining valves. This infrastructure supplies water across four pressure zones, the Main, North, West, and Highlands Zones.

Water Use Characterization

The City has seen significant population increases over the past decade. The City water system only serves a portion of residents, with other public or private systems serving just under half of the current population. The City's future water system boundary is relatively limited, except for the Stateline Industrial Area. Over the 20-year planning horizon, it is expected that much of the growth and demand will occur in this area. As the City continues to grow, the percent of residents connected to the City water system will decrease, since more residential growth is projected in the areas of the City served by private systems.

Land use and population estimates are based on City Planning Division data and KMPO Traffic Analysis Zone (TAZ) information. The increase in water demand was projected based on current residential and non-residential demand rates and allocated across the system using the KMPO TAZ data and acreage for the Stateline Industrial Area. As the system grows from infill and expansion to the future service boundary, average system-wide demands are projected to increase by 53 percent in the 5-year horizon, with 69 percent of that demand projected in the Stateline Industrial Area. In the 20-year horizon, average demand is projected to increase 324 percent (78 percent of the increase in the Stateline Industrial Area) over 2016 demands. The service area population and projected employees are shown in **Table ES-2**. The projected demand requirements by pressure zone are in **Table ES-3**.

Table ES-2
Service Area Population and Employees

Year	Service Area Population	Service Area Employees
2015	17,819	8,682
2016	18,299	8,949
2021	21,239	10,776
2036	26,658	14,992

Table ES-3
Demand Projections

Year	Demand Type	Zone Demand (gpm)					System-wide Demand	
		Highlands	Main	North	West		(gpm)	(mgd)
					West	Stateline Industrial Area		
2016	ADD	132	2,540	530	289	0	3,491	5.0
	MDD	357	6,859	1,432	780	0	9,428	13.6
	PHD	572	10,974	2,291	1,248	0	15,085	21.7
2021	ADD	134	2,920	624	383	1,285	5,346	7.7
	MDD	363	7,884	1,684	1,035	1,285	12,251	17.6
	PHD	581	12,615	2,694	1,656	2,055	19,601	28.2
2036	ADD	168	3,496	806	737	6,089	11,296	16.3
	MDD	453	9,440	2,175	1,989	6,089	20,146	29.0
	PHD	725	15,103	3,480	3,183	9,743	32,234	46.4
2040 (Buildout)	ADD	176	3,745	847	800	6,944	12,512	18.0
	MDD	475	10,112	2,287	2,159	6,944	21,977	31.6
	PHD	760	16,179	3,659	3,454	11,111	35,163	50.6

System Analysis

The water system analysis includes a review of the supply, pumping, storage, and distribution capacity of the system for existing, 5-year and 20-year planning horizons compared to regulatory and industry criteria outlined in **Table ES-4**. A calibrated hydraulic model was developed to assess existing pressure zones, service pressure, and distribution main capacity.

Table ES-4
Performance Criteria

Attribute	Evaluation Criterion
Water Supply	Firm Capacity[1]
	Emergency Power
Storage	Dead Storage
	Equalization Storage
	Fire Suppression Storage
	Operational Storage
	Standby Storage
Booster Pump Stations	Pump Redundancy
	Firm Capacity
	Emergency Power
Service Pressure	Minimum
	Standard Range
	Maximum
Distribution Piping	Maximum Velocity
	Minimum Future Diameter
Fire Suppression	Single Family, Multi-family, and Non-residential Requirements

Note:
1. Firm capacity: the total production capacity with the largest-capacity well/pump out of service.

The City provides reliable water supply to its customers when evaluated against criteria for pressure, storage, pumping, and fire suppression capability for existing and 5-year conditions. With planned future improvements, the City will also be able to meet criteria for the 20-year horizon. The following describe the high-level takeaways from each of the respective analysis components:

Supply Analysis Summary

- The City has adequate yearly water rights to meet existing and 5-year demand projections. In the 20-year horizon the City will have a small deficiency in water rights to meet projected demand. As the Stateline Industrial Area and other areas are annexed, the City's policy is to acquire the existing water rights, which will need to be evaluated to ensure they address the system supply deficiencies.

- The only existing supply deficiency is in the West Zone, which does not have adequate firm supply capacity to meet existing MDD. The Main Zone can supply this deficiency currently, however by 2021 every zone will be deficient. To meet the future deficiencies, the City will need to construct new well supply facilities within each zone.

Booster Station Analysis Summary

- The Highlands Booster Station is currently the only booster station in the system. It provides all supply to the Highlands Zone and has adequate capacity through 2036.

Backup Power Analysis Summary

- Backup power is required to meet ADD in all zones where storage is adequate to supply fire requirements. For the Highlands Zone backup power must meet ADD plus fire flow since there is no storage in that zone. For existing and 5-year projections, there is adequate backup power in each zone.

- By 2036, there will be a need for additional backup power in the West Zone. As new wells are constructed, to meet additional supply requirements, it is recommended that these wells have backup power installed to address this deficiency.

Storage Analysis Summary

- The Reilly Tanks and the North Standpipe have adequate storage capacity through the 20-year horizon.

- The West Standpipe has a future deficiency, due primarily to equalization requirements to meet demand projections in the Stateline Industrial Area, which could be addressed through additional storage or well supply facilities in the West Zone.

Distribution System Analysis Summary

- Much of the system experiences pressures within the desired service pressure range. In the areas where pressure is greater than 80 psi, building code may require customers to install service line PRVs.

- There are few locations with velocities exceeding the recommended criteria, with most occurring in short segments of pipe around facilities. No improvements are recommended to address pipe velocity issues.

Overall, the City’s system adequately meets service criteria in most areas, with some existing fire flow deficiencies and future supply deficiencies. Existing fire flow deficiencies will typically be addressed through pipe improvements. The primary future deficiencies are due to inadequate supply to meet MDD projections. These future supply deficiencies will be addressed through the construction of well supply facilities.

Facility Condition Assessment

A facility condition assessment of the water production facilities and the distribution system was performed. The water production facilities are comprised of well pump stations, a booster pump station, and reservoirs. The distribution system is comprised of buried pipelines.

The overall system evaluation was performed through desktop review of the 2014 DEQ Drinking Water Supply Report, geographic information system (GIS) system, available engineering drawings, interviews and questionnaires with the City's operations staff, and an onsite review of each facility. Each facility was evaluated using input from multiple sources to help identify problems and areas of concerns. Mechanical, electrical, and structural problems relating to well water pumping, treatment, and storage were noted, along with operator safety and equipment operation issues.

In general, the drinking water system is in good condition, with specific improvements recommended to replace the two oldest well stations and improve ventilation at several of the newer well stations. Priority of the defined condition assessment projects is to address the replacement of the Well 3 and Well 4 first to ensure supply capacity meets the demand requirements. A study of the SCADA system, to define upgrade options, is also recommended to improve control and operation of the system. The rest of the projects will be completed by the City over the next 5 years through ongoing maintenance activities.

The City's GIS records were analyzed to compare each pipeline's age. Condition and break records were not available for analysis. It is recommended that the City implement a program that catalogs main break information and defines unknown pipe material, which will allow for future prioritization of projects within the pipe replacement program. Pipe replacement should start to be budgeted now to build a reserve of funds that will allow the City to pursue a 100-year replacement schedule in the next 20 years. The prioritization of pipe replacement can be based on age, material, condition, capacity, and road repair schedules, with additional factors being considered as available.

Operations & Maintenance and Water Quality

A summary of operations and maintenance benchmarking compared the City to six similar regional utilities. The benchmark O&M information provides the City with a comparison of staffing, budgets, rates, and other system characteristics as needed when considering its operations. A general summary of the comparison is that the City serves the smallest population of the utilities, has the second highest average per capita flow rates, and the fewest number of water system O&M staff when compared to the other six utilities.

Overall, the City has a plentiful, high quality water source that it manages well. It communicates the quality of water in the system to customers through its annual Consumer Confidence Report. There are no future regulations anticipated to impact the City and the Contaminant Candidate List does not have a direct impact on the City's water system, since they do not currently impose any requirements on public water systems. However, the EPA may promulgate future regulations based on the listed contaminants, so the City should stay aware of potential future regulations.

Capital Improvement Plan

The projects recommended to address system deficiencies and condition issues are divided across two time periods, those required within 5 years and those in years 6 through 20. Projects are designed to address system deficiencies projected during these time periods, but should be evaluated annually through City reviews of demand growth, available budget, and development. Projects in the 5-year period have been scheduled annually as shown in **Table ES-5**, while those in the 6- to 20-year period, listed by type in **Table ES-6**, are not specifically ordered and should be prioritized during the 5-year WSMP updates.

A number of fire improvement projects that primarily consist of upsizing or looping pipes are recommended to address existing deficiencies, but are scheduled across the 20-year timeframe. Well supply projects are recommended to add additional supply to the system to meet projected demand requirements. The only existing supply deficiency is in the West Zone, which can be addressed by supply in the Main Zone through the PRV connection. However, within the 5-year horizon additional supply will be required to meet demand in both the West and Main Zones. The City also plans to begin implementing a pipe replacement program to address aging infrastructure. SCADA projects will improve operations and the City's operation data collection. All projects to address future deficiencies should be evaluated with production trends and development, particularly those intended to serve the new Stateline Industrial Area.

Table ES-5
Years 1 to 5 Capital Improvement Project Timeline

ID	Type	Cost by Year				
		FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
F1	New Well	$300,000	$1,538,000			
F2	Well Rehab		$220,000	$1,200,000		
F3	New Well				$300,000	$1,538,000
C1	HVAC		$25,000			
C2	HVAC & Access			$50,000		
C3	HVAC				$20,000	
C4	HVAC					$20,000
S1	SCADA Study	$75,000				
S2	Master Plan Update					$150,000
P1	Pipe	$70,000	$227,000			
P2	Pipe	$106,000				
P3	Pipe	$52,000				
P4	Pipe		$17,000			
P5	Pipe					$140,000
P6	Pipe				$181,000	$601,000
P7	Pipe				$156,000	$520,000
Annual Pipe Replacement	Pipe	$50,000	$50,000	$50,000	$50,000	$50,000
Total		**$653,000**	**$2,077,000**	**$1,300,000**	**$707,000**	**$3,019,000**

Table ES-6
Years 6 to 20 Capital Improvement Projects

Type	IDs	Cost
Well Supply	F4, F5, F6, F7, F8	$8,772,000
Master Plan Update	S2	$450,000
SCADA Upgrade	S3	$500,000
Pipe	P8 through P30[1]	$4,249,000
Annual Pipe Replacement	$50,000/year	$750,000
Total		**$14,721,000[2]**

Note:
1. Does not include project P31 through P35 because they are planned to be funded by development.
2. Does not include projects (P31 to P35) planned to be funded by developers.

Financial Evaluation

A financial analysis was completed to develop a water rate strategy and financial plan to fund capital projects. The financial plan provides the framework to analyze the overall impact on water rates based on implementing the 5-year water system improvements with continued operation and maintenance of the system. The building blocks of the financial plan are the projections of costs that the City will incur during the planning period and the revenues, under the existing rate structure, that the City expects to generate during the same period.

In FY2016/17, revenue from existing rates is estimated to be $2.3 million. By FY2022/23 the amount of revenue needed from rates is projected to be $2.8 million, assuming the use of some existing fund balances. The increased rate revenue requirement is due to increases in O&M expenses, as well as increases in cash outlays and transfers to fund capital projects.

To fund the projected revenue requirements, and to maintain a portion of existing cash reserves, an annual rate increase of 3 percent is recommended for the planning period through FY2022/23. This rate increase is projected to fund $8.9 million in capital projects of the next 5 years while maintaining ongoing operations without the City assuming any new debt. The analysis results in a projected change in the operating fund balance from $6.4 million in FY2016/17 to $3.6 million in FY2022/23. The capital fund balance will change from $8.3 million to $5.8 million over the same period.

This analysis is based on available information on revenue and expenditures as of September 2016, the last year for which final financial data was available at the time of this study. It is anticipated that changes will occur over time between assumed and actual conditions causing differences in the financial plan. Therefore, it is important that the City continue to monitor the financial plan annually, and adjust as needed.

Among the variables that could impact future rate increases are changes in customer growth and water consumption patterns. Over the past several years, the City has observed fluctuating water use. The financial plan assumes modest customer growth averaging 0.25 percent per year over the forecast period, and water use consistent with recent budgeted volumes.

Summary and Overall WSMP Recommendations

This WSMP constituted a significant investment of time and resources for City staff and provides a valuable resource for how to continue providing quality water to the system's customers. This WSMP utilized industry standard approaches by utilizing hydraulic modeling software to identify system deficiencies and refine recommended improvement projects. The capital projects that have been identified provide a plan, phased over the next 20 years, that will enable the City to continue meeting required standards and providing quality water to its customers.

As a result of this WSMP, the following recommendations are made:

- Implement the 1- to 5-year improvements as identified in the CIP to address existing capacity and condition deficiencies.
- Continue improving the quality of available water system information, specifically through improved SCADA.
- Continue replacing system piping and gradually increase the length of and budget for pipe installed, to ensure approximately a 100-year replacement cycle.
- Conduct updates of this WSMP regularly.
- Raise rates 3 percent annually to fund system improvements and continue to review and update financial plan regularly.

Section 1

SECTION 1

Existing System Description

1.1 Introduction

The City of Post Falls (City) is in Kootenai County in northern Idaho. The average annual rainfall is just over 25 inches, with an average 46 inches of snowfall each year. The 2015 Census population estimate for the City is 30,453. The City provides water to about half of its residents, with other public and private water systems also serving City residents.

This section describes the existing water supply and distribution system, organization and duties of the Water Division and basic operation parameters of the system. The Water System Master Plan (WSMP) evaluations and the hydraulic modeling were based on the information summarized in this section. The main sources of information were:

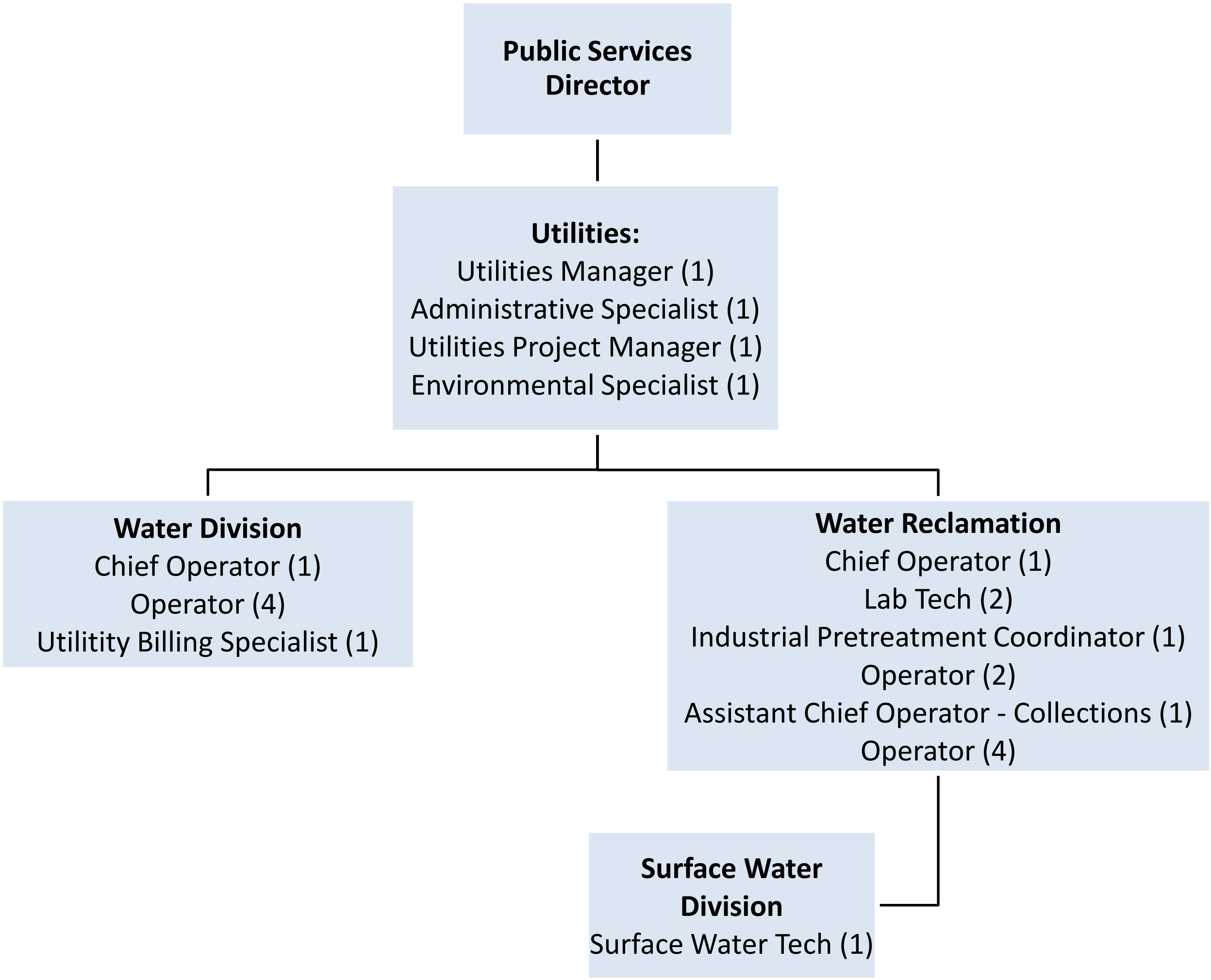
- City's geographical information system (GIS) infrastructure database
- City's 2011 hydraulic model network
- City's 2011 Water System Master Plan
- Infrastructure information provided by City staff

The information presented in this chapter and overall planning effort is subject to the quality of the data available at this time. The WSMP effort is an opportunity to consolidate system information from different sources and to identify gaps or quality issues with the available system information.

1.2 Water Division Organization

The City's Water Division operates under the Public Services Director. The Water Division currently has 6 full-time staff and is organized under a Chief Operator. The organization of the Division is shown in **Figure 1-1**.

Figure 1-1
Water Division Organizational Chart



1.3 Existing System

The City's existing water distribution system is comprised of a pipe network, five water storage facilities (one inactive), booster stations (one inactive), wells, and pressure regulating valves. The water distribution system is illustrated in **Figure 1-2**. There are portions of the City that are served by private water systems. The City areas served by these systems are illustrated in **Figure 1-2**. **Figure 1-3** provides a hydraulic profile of the system.

1.3.1 Pressure Zones

The water system currently has four pressure zones, the Main, West, North and Highlands Zones. Pressure zones are established to control the range of service pressures within established limits. The pressure zone boundaries are, for the most part, dictated by elevation. These boundaries are created by a mix of either physical separation, pressure reducing valves (PRV), closed valves, or booster stations. The hydraulic grade line (HGL) is set by tanks in all but the Highlands Zone, which is a closed system (does not have a storage tank) served by a booster station.

1.3.2 Interties

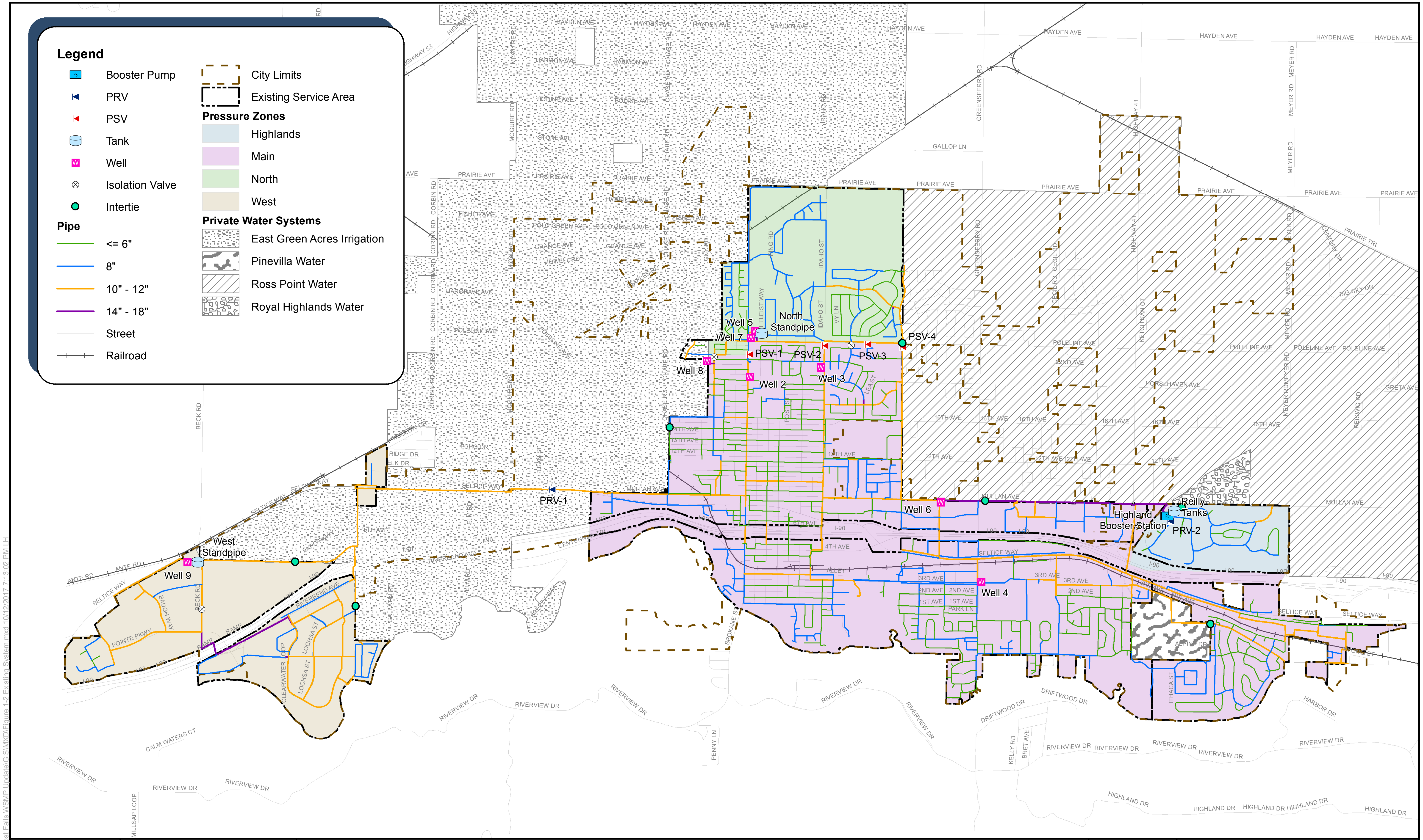
The water system has seven manually operated interties with the surrounding private water systems, which allow for the transfer of water between the City and adjacent water systems. There are three interties with East Greenacres Irrigation District and two with Ross Point Water District. The other two interties assist the Gillman Water and Pinevilla Water private systems, but do not serve as backup for the City system. These seven interties are identified on **Figure 1-2**.

1.3.3 Water Rights

The City's water rights portfolio currently consists of 17 municipal and one irrigation water right. Following the Rathdrum Prairie Adjudication, a transfer will be finalized grouping and designating all the City's municipal water rights with multiple points of diversion so they can be utilized at any of the City's wells. The irrigation water right is 2.1 cubic feet per second (cfs) and is attached to part of a parcel on Rathdrum Prairie outside the current City limits. Currently it is used for farm production, with the intention that it will eventually be combined with the City's municipal water rights portfolio. Water rights information is summarized in **Table 1-1**.

Table 1-1
Municipal Water Rights Summary

Water Right	Date	Rate (cfs)	Rate (gpm)
95-17224	1908	0.78	350
95-4458	1947	1.69	758
95-4460	1947	2.50	1,122
95-2093	1951	1.26	565
95-2094	1951	1.25	561
95-2124	1957	3.36	1,508
95-2127	1958	0.13	58
95-2166	1964	1.40	628
95-15535	1969	4.92	2,208
95-7436	1974	4.00	1,795
95-7781	1977	0.07	31
95-8048	1980	3.79	1,701
95-8572	1988	1.16	521
95-8862	1994	4.68	2,100
95-9137	2002	3.00	1,346
95-9147	2002	5.79	2,599
95-8768	2003	3.75	1,683
Total		**43.53**	**19,536**



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murraysmith

CITY OF POST FALLS

City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

N S E W

Figure 1-2
Existing System

October 2017 16-1841

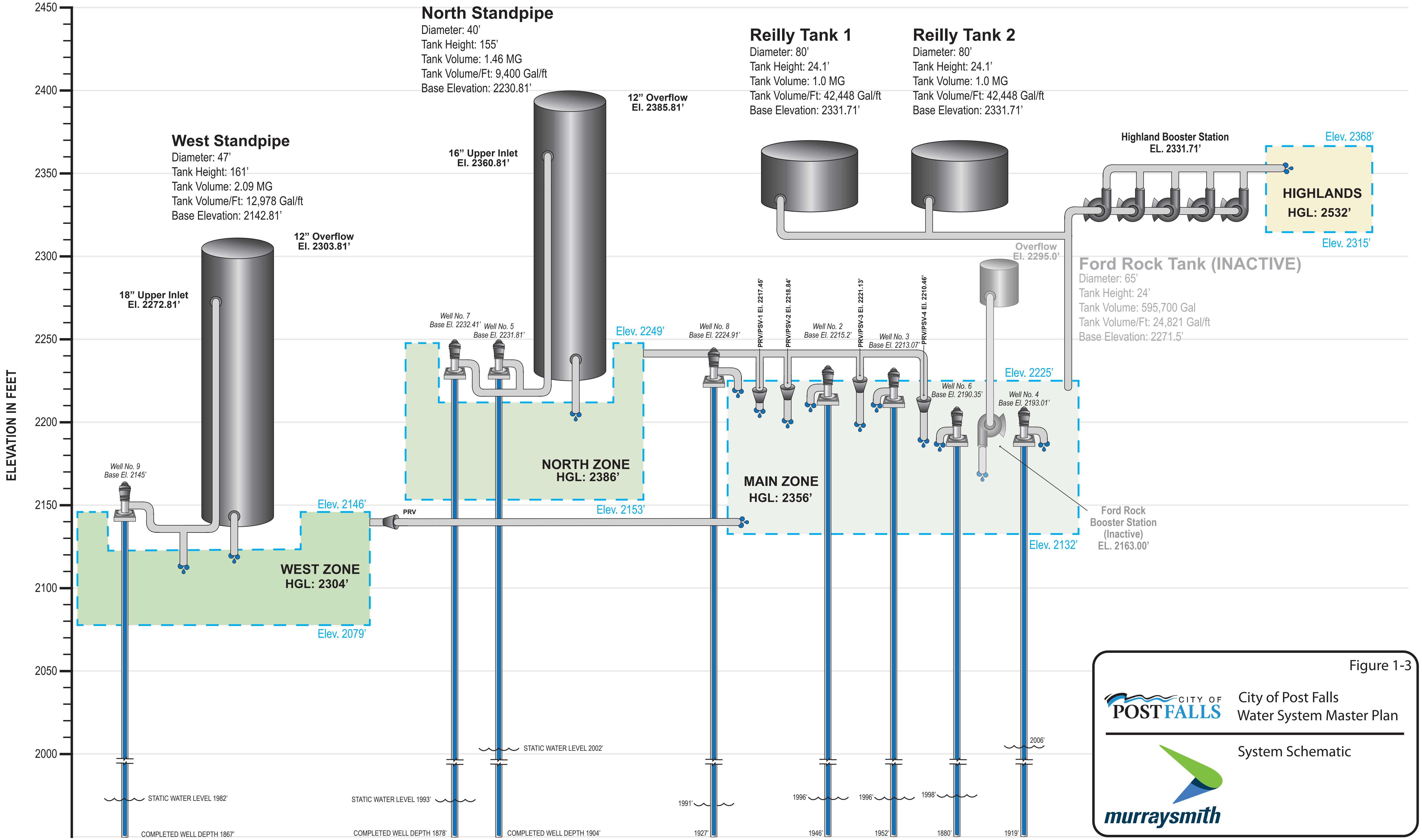

Figure 1-3

City of Post Falls
Water System Master Plan

System Schematic

1.3.4 Wells

The municipal water supply is provided by eight groundwater wells with a combined operating capacity of approximately 23.9 million gallons per day. All the wells are line-shaft vertical turbine pumps. All wells except 3 and 4, have “soft start” capability. Wells 5, 7, and 9 receive power from Kootenai Electric Cooperative, while the other five receive service from Avista Utilities. In addition, backup power exists for Wells 6, 8, and 9, with backup power at the Well 5 and 7 site that could operate one of these wells at a time. **Table 1-2** summarizes the attributes for all the existing wells. The City currently regularly operates seven of the wells during the year, with Well 5 serving as a backup. Wells 2, 3 and 4 are primarily used during peak demand in the summer.

Table 1-2
Well Summary

Well No.	Zone	Construction Year	Ground Elevation (ft)	Well Depth (ft)	Static Water Elevation (ft)	HP	Design Head (ft)	Design Flow (gpm)	Backup Power
2a	Main	2012	2,222	270	2,014	400	401	3,000	No
3	Main	1962	2,218	285	1,996	150	320	2,000[1]	No
4	Main	1974	2,198	279	2,006	150	334	2,000[2]	No
5	North	1980	2,232	328	2,002	200	390	1,600	Yes[3]
6	Main	1996	2,196	315	1,998	300	425	2,000	Yes
7	North	2004	2,230	352.6	1,992	300	402	2,000	Yes[3]
8	Main or North[4]	2004	2,223	296	1,994	300	402	2,000	Yes
9	West	2007	2,142	275	1,982	250	338	2,000	Yes

General Note: Data for all wells was not available so some values are based on approximate field information.

1. Well 3 does not pump at its design capacity and typically supplies approximately 1,000 gpm.
2. Well 4 does not pump at its design capacity and supplies approximately 1,600 gpm.
3. The generator at the Well 5/7 site can operate either well, but only one at a time.
4. Under typical operations Well 8 supplies the Main Zone, however it can be valved to supply either the North or Main Zone.

1.3.5 Storage Tanks

There are currently five storage tanks in the City’s water distribution system. The Ford Rock Tank is not active. Total storage (excluding Ford Rock), is 5.55 million gallons (MG). For the two standpipes, the volume of storage at the bottom of the tank does not provide adequate service pressure and is considered unavailable for service; **Section 3 – System Analysis**, provides information about usable storage. Information about each tank is summarized in **Table 1-3**.

Table 1-3
Storage Tank Summary

Tank	Zone	Capacity (MG)	Construction Year	Base Elevation (ft)	Overflow Elevation (ft)	Diameter (ft)	Material
Reilly #1	Main	1.0	1986	2,332	2,356	85	Precast Concrete
Reilly #2	Main	1.0	1994	2,332	2,356	85	Precast Concrete
Ford Rock (Inactive)	Main	0.26	1979	2,275	2,299	65	Welded Steel
North Standpipe	North	1.46	2003	2,230	2,386	40	Welded Steel
West Standpipe	West	2.09	2005	2,143	2,304	47	Welded Steel

1.3.6 Booster Station

There is one active booster station in the distribution system. As previously mentioned, it serves the Highlands Zone. The booster station draws water supply directly from the Reilly Tanks to serve the Highland Subdivision. The station was upgraded in 2003, with additional electrical upgrades in 2012, and has five pumps. Pump 2 has a variable frequency drive (VFD) and the other four pumps are constant speed with soft starts. **Table 1-4** provides details about each pump. The VFD allows the booster station to respond to varying low demand conditions, however in the event the pressures become too high, there is a PRV in the discharge piping to allow flow to return to the Reilly Tanks. The booster station is equipped with a new backup power generator that was installed in 2012. The inactive Ford Rock Tank has a booster pump that is also inactive.

Table 1-4
Highlands Booster Station Summary

Pump No.	HP	Estimated Head (ft)	Estimated Flow[1] (gpm)	Operational Sequencing
1	40	200	590	Alternating Lag – Low Demand Alternating Lead – High Demand
2 (VFD)	20	200	235	Lead
3	50	150	1,275	High Demand/Fire Flow Conditions
4	50	150	1,340	Standby High Flow
5	40	200	660	Alternating Lag – Low Demand Alternating Lead – High Demand

Note:
1. Based on previous planning and pumping studies

1.3.7 Control Valves

There are two PRVs and four pressure-sustaining valves (PSV) in the City's system. A PRV allows flow from the Main Zone to the West Zone, serving as a backup to Well 9, which is the primary supply to the West Zone. As mentioned, there is also a PRV that allows flow from the Highlands Zone back to the Main Zone if the Highlands Zone experiences high pressure. There are also four PSVs along the boundary between the Main Zone and North Zone. The PSVs are intended to maintain upstream pressure and to prevent water in the North Zone from flowing into the Main Zone. A list of the control valves in the system with their associated elevations and settings are presented in **Table 1-5**.

Table 1-5
Control Valve Summary

ID	Type	Name/Location	From Zone	To Zone	Setting (psi)	Elevation (ft)
PRV-1	Pressure Reducing	Seltice Way & Lean St	Main	West	48	2,149
PRV-2	Pressure Reducing/Pressure Relief	Highland Booster Station	Highlands	Main	80	2,332
PSV-1	Pressure Sustaining	Spokane St & 21st Ave	North	Main	65	2,217
PSV-2	Pressure Sustaining	Idaho St & Poleline Ave	North	Main	64	2,219
PSV-3	Pressure Sustaining	Triumph Ave & Poleline Ave	North	Main	63	2,221
PSV-4	Pressure Sustaining	Syringa St & Poleline Ave	North	Main	68	2,210

1.3.8 Pipe Network

The existing water system is comprised of over 120 miles of pipelines ranging in diameter from 2- to 18-inches, with most pipes 6- to 8-inches in diameter. Eighty-eight percent of the pipe within the system is PVC and over half of the system has been installed since 1990. A summary of pipe lengths by diameter and age are in **Table 1-6**.

Table 1-6
Pipe Summary (Length in feet)

Diam. (in)	Construction Year									Total
	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s	Unk	
Under 4	2,394	0	0	1,561	721	235	0	0	254	5,165
4	6,527	3,219	2,449	12,648	0	1,426	0	0	1,595	27,864
6	1,280	7,836	7,358	70,397	30,760	66,736	32,383	1,261	2,260	220,271
8	2,010	1,525	2,573	40,134	10,961	104,900	46,607	14,834	356	223,900
10	0	176	22	2,499	5,641	5,385	12,604	0	1,845	28,172
12	0	0	8,246	4,878	17,593	37,010	44,348	3,404	578	116,057
14	0	0	0	0	1,994	0	0	0	0	1,994
16	0	0	0	0	6,536	0	1,435	4,498	47	12,516
18	0	0	0	0	151	1,606	0	0	0	1,757
Total	**12,211**	**12,756**	**20,648**	**132,117**	**74,357**	**217,298**	**137,377**	**23,997**	**6,935**	**637,696**

1.3.9 SCADA and Monitoring Systems

The Water Division operates a supervisory control and data acquisition (SCADA) and telemetry system at each well and tank and the booster station and West Zone PRV. The signals are sent via licensed radio frequency from the facilities to the Water Division Office. Operators monitor information on temperature, flow, level, and pressure as well as starts, stops, run times and alarm conditions. The operators can also view SCADA information in the field on laptops or tablets. The City also has video surveillance at most of the facilities and is adding it to each location as resources allow.

1.4 Summary

The water system serves about half of the population within the City limits, with the remainder served by other public or private water providers. In 2015 the City supplied 1.8 billion gallons of water to over 7,300 customer accounts. The Water Division operates and maintains over 120 miles of water pipe, eight water supply wells, four active storage tanks, one active booster station, two PRVs, and four PSVs. This infrastructure supplies water across four pressure zones, Main, North, West, and Highlands.

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Section **2**

SECTION 2

Water Use Characterization

2.1 Introduction

The evaluation of water requirements under existing and future conditions involves the analysis of land use, population growth and historical water production for the City of Post Falls (City). Land use and population estimates are based on the City's Comprehensive Plan, Traffic Analysis Zone information from the Kootenai Metropolitan Planning Organization (KMPO) and input from City planning staff. This section presents current population and water production information and uses it in conjunction with future population to calculate future water system demands.

2.2 Existing Water Use

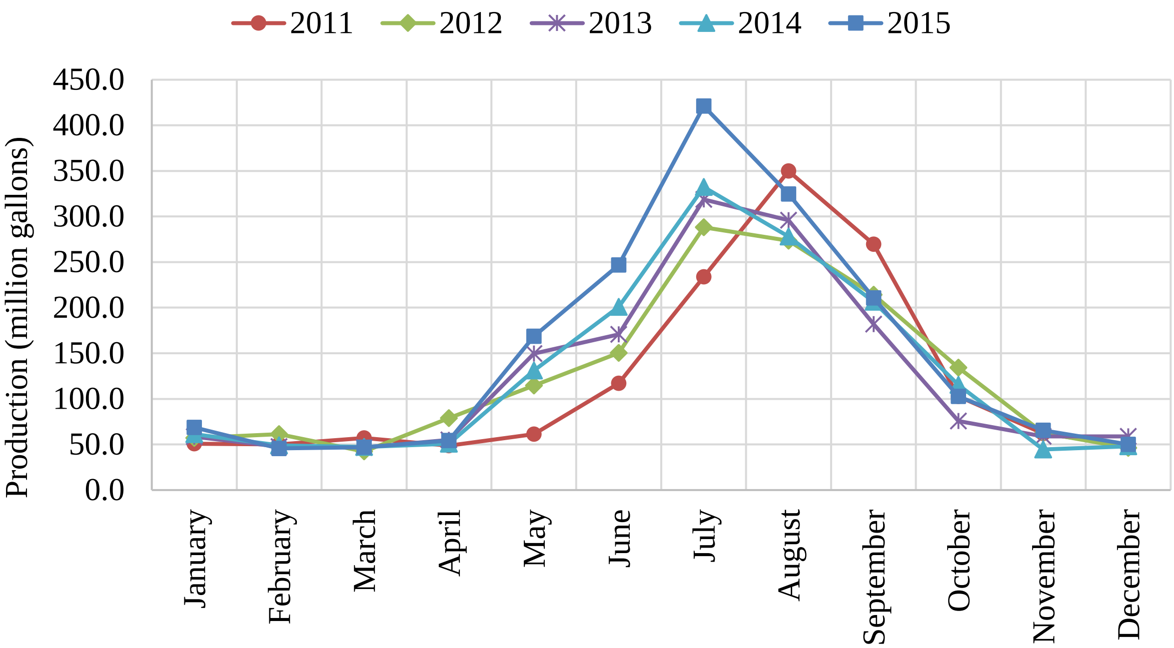
2.2.1 Historical Water Production

Table 2-1 and **Figure 2-1** provide a summary of monthly water production records for the years 2011 through 2015. The volume of water produced is the amount pumped from the aquifer and supplied into the distribution system.

Table 2-1
Historical Water Production (Millions of Gallons)

Month	2011	2012	2013	2014	2015
January	50.8	57.1	58.5	61.2	68.8
February	51.1	61.2	47.7	49.0	45.7
March	55.9	42.3	46.7	47.4	47.0
April	54.3	79.0	55.2	50.7	54.2
May	87.9	114.6	149.5	131.1	168.6
June	113.3	150.4	170.6	201.0	246.9
July	257.3	288.1	318.7	332.3	421.0
August	368.2	273.6	295.8	277.9	324.8
September	269.7	214.1	181.9	206.5	210.8
October	102.6	134.1	75.7	115.4	102.7
November	62.1	62.8	58.9	44.5	65.6
December	48.5	46.4	59.0	48.1	50.0
Total	**1,451.8**	**1,523.6**	**1,518.3**	**1,564.9**	**1,806.0**

Figure 2-1
Historical Production



2.2.2 Seasonal Variations and Peaking Factors

Seasonal variations in monthly water production followed similar patterns over the 5-year period with low flows from November through April and higher flows occurring from May to October with peak flows occurring in July or August. 2015, which was a hot and dry year, represents the highest annual water production during the 5-year period. City staff record the pumping at each well site weekly. From this data, the average weekly flow was calculated and is graphed in **Figure 2-2**. The maximum week production was averaged per day to approximate the MDD for each year. The 5-year average ADD and MDD are also displayed in **Figure 2-2**.

The City does not record hourly SCADA so the historical peak hour demand (PHD) is not known for each year. However, previous City evaluations, indicate a PHD factor of approximately 1.6 times the MDD. **Table 2-2** shows the average day demand (ADD) and maximum day demand (MDD) along with the associated peaking factor for each year.

Figure 2-2
5-year Average Production

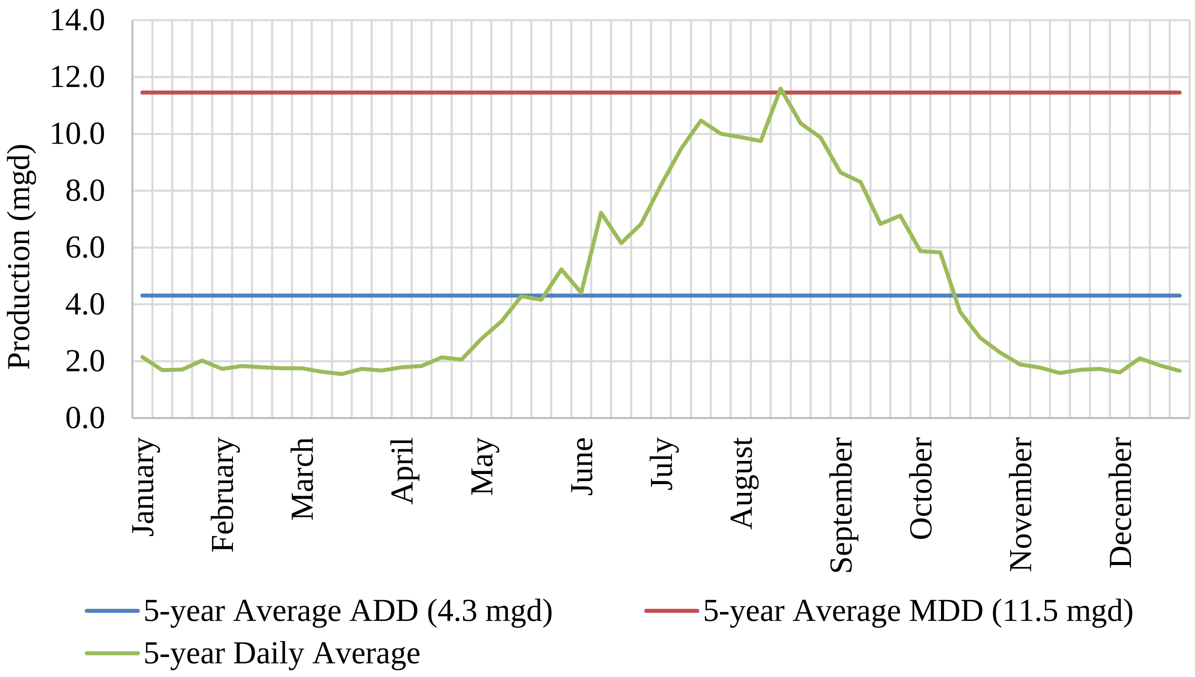


Table 2-2
Historical Demands and Peaking Factors

Year	ADD (mgd)	MDD (mgd)	PFMDD (MDD/ADD)
2011	4.0	11.7	2.9
2012	4.2	10.4	2.5
2013	4.2	11.1	2.7
2014	4.3	11.1	2.6
2015	4.9	13.1	2.6
Average	4.3	11.5	2.7

2.2.3 Billing Records

The City serves approximately 7,300 customer accounts. Based on the past five years of data the majority of the water accounts are residential at approximately 87 percent and the remaining 13 percent of customers are a mix of commercial and industrial accounts. For the same period, the residential customers used approximately 65 percent of billed demand and non-residential customers used 35 percent of billed demand.

2.2.4 Non-Revenue Water

Non-revenue water is the unbilled component of production; this is the difference between the volume of total water produced and the volume of water sold to customers. Sources of non-revenue water include water used for flushing the system, leakage, over-reporting errors associated with production meters and under-reporting customer meters. The City's non-revenue water is low and within industry standard recommendations. The comparison of production and metered water use for the past five years is in **Table 2-3**.

Table 2-3
Non-Revenue Water

Year	Production (Millions of Gallons)	Billing (Millions of Gallons)	Non-Revenue (%)
2011	1,451.8	1,366.6	5.9
2012	1,523.6	1,387.3	9.0
2013	1,518.3	1,443.0	5.0
2014	1,564.9	1,468.7	6.2
2015	1,806.0	1,754.8	2.8
Average	1,572.9	1,484.1	5.8

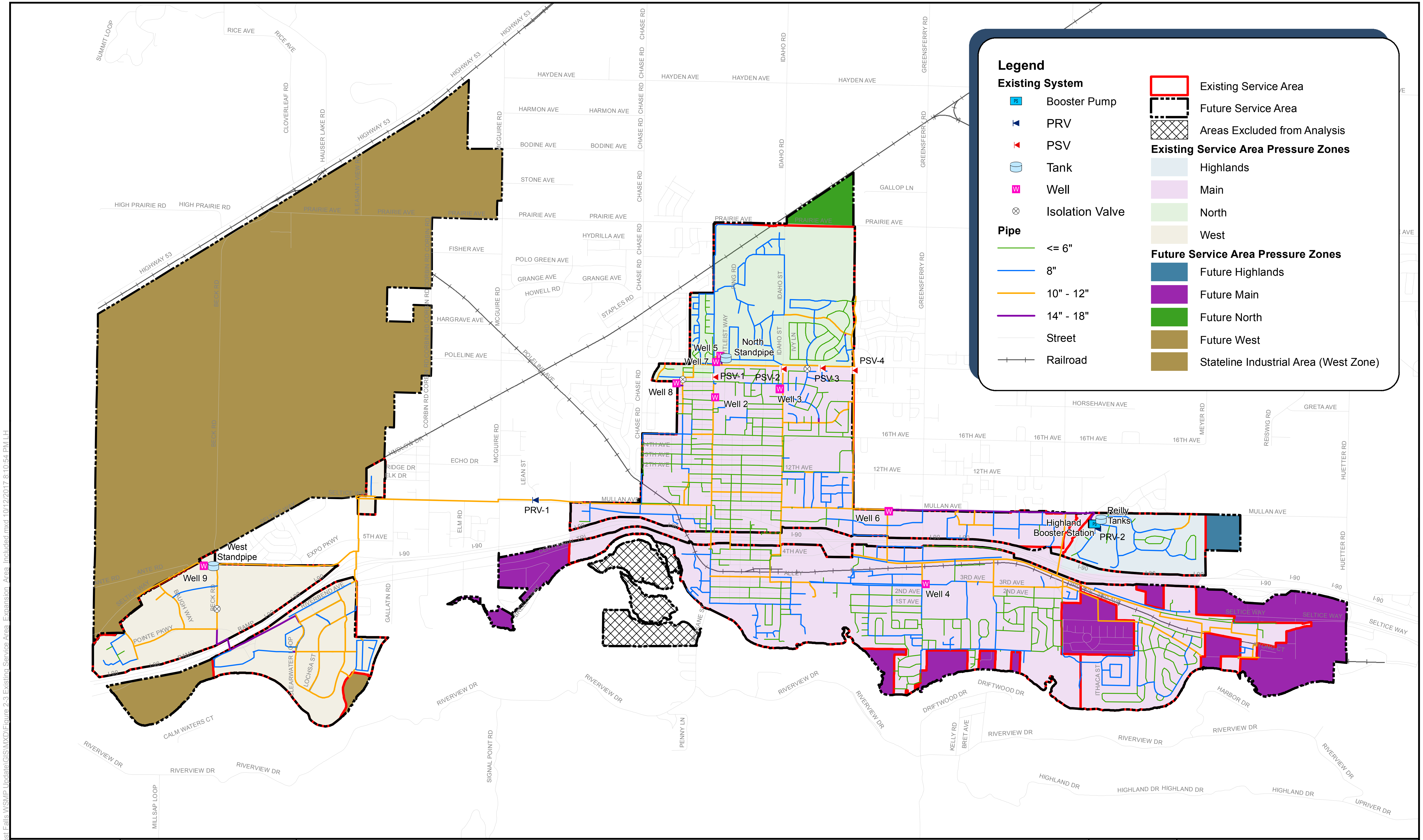
2.3 Service Area

2.3.1 Existing Service Area

The water system currently serves over half of the City population and covers just over half of the City limits. It does not provide water to any customers outside of City limits. The existing service boundary is shown in **Figure 2-3**.

2.3.2 Future Service Area

Due to the service area being bounded by other public water purveyors, limited expansion is projected, except for a large industrial area north of the existing West Zone, which is referred to as the Stateline Industrial Area. This area will be part of the West Zone. The remainder of the system is expected to grow primarily through infill of available vacant lots, with small areas of expansion in the future service area. The future service area boundary is in **Figure 2-3**. The hatched area within the future service area represents the City's Q'emiln Park and Avista's Post Falls Dam. Q'emiln Park is served by a well and is separate from the system; these areas are not planned for connection to the water distribution system and are not included in this Water System Master Plan (WSMP). City Planning Division projections and KMPO traffic analysis zone (TAZ) data was utilized to project and spatially allocate the anticipated growth. Updated TAZ is not available for the new expansion to the Stateline Industrial Area, so no spatial allocation was done for this area.



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CITY OF POST FALLS

City of Post Falls
Water System Master Plan

Figure 2-3
Service Areas

I:\BOI_Projects\16\1841 - Post Falls WSMP Update\GIS\MXD\Figure 2-3 Existing Service Area_Expansion_Area_Included.mxd 10/12/2017 8:10:54 PM LH

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2.4 Existing Residential and Non-residential Demands

Each City water account is designated as residential or commercial. Commercial accounts include retail and commercial users along with municipal accounts such as City parks and any industrial customers. The future system demand is projected using population estimates for residential demand and the non-residential use is projected through number of employees, as designated by the KMPO TAZ data.

2.4.1 Population

The City updates its population estimate and projections annually based on building permits, Census growth rates and KMPO data. The City historical population estimates are outlined in **Table 2-4**.

Table 2-4
Historical City Population Estimates

Year	Population	Annual % Change
2010	27,574	-
2011	28,318	2.7
2012	29,010	2.4
2013	29,593	2.0
2014	30,075	1.6
2015	30,774	2.3
2016	31,932	3.8
Average		2.5

As shown, the growth rate over the past six years has averaged 2.5 percent, with average annual growth, based on U.S. Census data, between the years 2000 and 2010 even higher at 4.8 percent.

The water system only serves a portion of the City residents. Future City population growth is largely within other water system service areas, so the percent of the City population served by City water will decrease in the future.

The residential dwelling units within the KMPO TAZ data was used to approximate the number of customers served with City water, resulting in approximately 6,828 residential dwelling units. This number was also validated with the number of residential billing accounts (based on 2015 data). Using the 2010 Census estimate of 2.68 people per household, the resulting 2016 service area population is 18,299 people. This corresponds to 57 percent of the estimated 2016 City population of 31,932.

This residential service population is divided by the average residential water use to determine an average per capita demand. Per capita demand multiplied by future population estimates are then used to calculate future demand requirements.

2.4.2 Employees

The other component of water demand is non-residential accounts. The type of non-residential accounts differs considerably and water use is variable. To approximate non-residential accounts, KMPO, TAZ data was utilized to estimate the number of employees associated with non-residential water use to project future non-residential demand. The resulting 2016 employee estimate for the current service area is 8,949.

2.4.3 Per Capita Demands

Per capita demand is a convenient method of comparing the water use of different water systems or areas served by the distribution system. Differences in climate, type of development, lot size, cost of water, billing structure, and conservation measures influence the per capita demand for different water systems. Additionally, the per capita demands are used with population and employment projections to approximate future residential and non-residential demand requirements, and with the TAZ allotments, spatially locate demand throughout the system.

The production, population, and non-residential employee counts for 2015 were used to calculate per capita and per employee demands, since this is the most recent complete year of production and billing information available. As previously stated, residential use represents approximately 65 percent of demand and non-residential comprises the remaining 35 percent. However, approximately 7 percent of demand is for municipal (City) uses at parks, irrigation areas, lift stations, and other facilities. Municipal property and facility water use is not expected to grow significantly in the future. To eliminate this municipal demand being carried forward based on employees, it was removed from the 2015 production used to calculate per capita and per employee demands, and percentages of 65 percent residential and 28 percent non-residential were used as shown in **Table 2-5**.

Table 2-5
Per Capita Demands

Demand Item	Value	Units
Total ADD Production	4.9	mgd
Percent Residential Demand	65	%
Residential Demand	3.2	mgd
Residential Population[1]	17,819	people
Residential Per Capita	179	gpcpd[2]
Percent Non-residential Demand	35	%
Non-residential Demand	1.7	mgd
Percent Municipal Demand	7	%
Municipal Demand	0.3	mgd
Percent Remaining Non-residential Demand	28	%
Remaining Non-residential Demand	1.4	mgd
Non-residential Employees	8,682	employees
Non-residential Per Employee Demand	161	gpepd[3]

Notes:
1. 2015 population estimate based on 6,649 active 2015 residential billing accounts and 2.68 people per account.
2. gpcpd: gallons per capita per day
3. gpepd: gallons per employee per day

2.4.4 Stateline Industrial Area Per Acre Demand

The large area east of the state boundary and north of the railroad tracks has recently been added to the City's service area. East Greenacres Irrigation District had previously indicated that they would serve the area, but no longer intends to provide service there. As a result, the City's Comprehensive Plan is currently being amended to include the Stateline Industrial Area to promote economic development for industrial uses. Although there are a few existing businesses that use private wells, no current City water use records exists for this area. TAZ information for the area does not reflect the adjustment to City water service and is not accurate for current plans for the area. As a result, a per capita or per employee methodology was not reasonable for this area and the overall demand for the area was estimated by City staff at approximately 10 mgd. This equates to about 2,850 gallons per acre per day for the 3,542 acre area. This is expected to be a relatively consistent daily demand for ADD or MDD, based on anticipated industrial development.

2.5 Future Residential and Non-residential Demands

Future demand was projected for new households and new employee numbers using the per capita demands and the 2015 ADD as a baseline for all areas except the Stateline Industrial Area.

For the Stateline Industrial Area, a per acre demand estimate was used. Municipal use within the service area was assumed to remain relatively consistent and independent of employment projections, so was included separately in total demand projections and not as part of the per capita demands.

2.5.1 Population and Employee Projections

City population growth is not necessarily representative of water system growth since most of the City's service area (except the West Zone) is more developed than other portions of the City, where growth will be higher. As a result, the percent of residents served by the City water system is anticipated to decrease moving forward. The 5-year and 20-year service population was based on the TAZ residential dwelling unit data within the future service area boundary (except for the Stateline Industrial Area) as shown in **Figure 2-3**. **Table 2-6** has the resulting 5-year and 20-year future service area population and employee projections.

Table 2-6
Service Area Population and Employees

Year	Population	Employees
2015	17,819	8,682
2016	18,299	8,949
2021	21,239	10,776
2036	26,658	14,992

2.5.2 Future Water Use

The average per capita demand of 179 gallons per day (gpd) and per employee demand of 162 gpd along with the 2,850 gallons per acre (gpa) demand for the Stateline Industrial Area are used as the primary demand forecasting values. System projections for ADD, MDD, and PHD water demands for each pressure zone are shown in **Table 2-7**, using the 2015 average demand and municipal demand as a baseline. 2016 demand projections are based on the number of new households and employees projected within the existing service area boundary. The 2021 and 2036 projections are for the future service area boundary. The future service areas are allocated to existing pressure zones, as shown in **Figure 2-3**, based on where they would connect to the existing distribution system. However, topography in some of the future area may necessitate the creation of new pressure zones to serve these areas. For all but the Stateline Industrial Area, the projected values were calculated using population and employee projections, average per capita and per employee demand, and average peaking factors of 2.7 (MDD/ADD) and 1.6 (PHD/MDD). For the Stateline Industrial Area, per acre demand, the number of acres and the 1.6 PHD/MDD factor was used. This area is expected to have a similar ADD and MDD demand, so only the PHD peaking factor was used.

The timing of the demand will be determined through development rates and patterns within the service area. Since no TAZ data was available to spatially place or give a timeframe to the Stateline Industrial Area demand, the growth rate for the West Zone was used as a pattern for allocating the Stateline Industrial Area demand in each timeframe. Additionally, the buildout demand timeline was determined based on projected TAZ growth rates and discussions with City staff. The buildout timing of the Stateline Industrial Area is particularly unpredictable, so a similar pattern of following the rest of the West Zone growth percentages was utilized to allocate the buildout demand for the Stateline Industrial Area.

The timing for all the projections is approximate and could vary based on demand and population trends across the system. As a result, the actual timing of these demand projections and any system modifications or improvements associated with these demands should be based primarily on when the system reaches the demand thresholds rather than predetermined dates.

Table 2-7
Demand Projections by Pressure Zone

Year	Demand Type	Zone Demand (gpm)					System-wide Demand	
		Highlands	Main	North	West		(gpm)	(mgd)
					West	Stateline Industrial Area		
2016	ADD	132	2,540	530	289	0	3,491	5.0
	MDD	357	6,859	1,432	780	0	9,428	13.6
	PHD	572	10,974	2,291	1,248	0	15,085	21.7
2021	ADD	134	2,920	624	383	1,285	5,346	7.7
	MDD	363	7,884	1,684	1,035	1,285	12,251	17.6
	PHD	581	12,615	2,694	1,656	2,055	19,601	28.2
2036	ADD	168	3,496	806	737	6,089	11,296	16.3
	MDD	453	9,440	2,175	1,989	6,089	20,146	29.0
	PHD	725	15,103	3,480	3,183	9,743	32,234	46.4
2040 (Buildout)	ADD	176	3,745	847	800	6,944	12,512	18.0
	MDD	475	10,112	2,287	2,159	6,944	21,977	31.6
	PHD	760	16,179	3,659	3,454	11,111	35,163	50.6

2.6 Summary

The City has seen significant population increases over the past decade. The City water system only serves a portion of residents, with other public or private systems serving just under half of the current population. The City's future water system boundary is relatively limited, except for the Stateline Industrial Area. As the City continues to grow, the percent of residents connected to the City water system will decrease, since more residential growth is projected in the areas of the City served by other systems. The number of current accounts is approximately 87 percent residential and 13 percent non-residential, however residential customers only use 65 percent of total demand with 7 percent use by municipal accounts and 28 percent by other non-residential users. The City has low non-revenue water.

Population projections are based on City Planning Division data and KMPO TAZ information. The increase in water demand was projected based on current residential and non-residential demand rates and allocated across the system using the KMPO TAZ data and acreage for the Stateline Industrial Area. As the system grows from infill and expansion to the future service boundary, average system-wide demands are projected to increase by 53% in the 5-year horizon, with 69% of that demand projected in the Stateline Industrial Area. In the 20-year horizon, average demand is projected to increase 324 percent (78 percent of the increase in the Stateline Industrial Area) over 2016 demands.

While the projected demands over the next 5 and 20 years will be used to evaluate the hydraulic capacity of the system and identify improvements, the buildout projection will be used to evaluate the adequacy of water rights. The actual timing of any improvements should be scrutinized and primarily based on when system demands reach the projected values, rather than set timelines.

Section 3

Section 3

System Analysis

3.1 Introduction

The analysis of the City of Post Falls (City) water system under existing and future conditions evaluates the hydraulic adequacy of the system and identifies any resulting deficiencies. A set of criteria have been utilized in accordance with state and local standards to evaluate the system. The future water use requirements projected in **Section 2 - Water Use Characterization** for 5-year and 20-year planning horizons are applied to the system to identify any potential deficiencies under future conditions. This section describes the analysis of the supply, pumping, storage, and distribution capacity of the system for existing, 5-year and 20-year planning horizons and provides the basis for recommended system improvements presented in **Section 6 - Capital Improvement Plan**.

3.2 Evaluation Criteria

The water distribution system needs to be capable of operating within certain performance limits under varying customer demand and operational conditions. The evaluation of the system is based on the criteria summarized in **Table 3-1**. The criteria are based on the requirements within the Idaho Department of Environmental Quality (DEQ) administrative rules (IDAPA 58.01.08), many of which come directly from the federal Safe Drinking Water Act requirements. Other standards that are not necessarily required by DEQ, have been determined from sources including the American Water Works Association (AWWA) acceptable practice guidelines, Ten States Standards, and City standards.

Table 3-1
Performance Criteria

Attribute	Evaluation Criterion	Value
Water Supply	Firm Supply Capacity[1]	Greater than MDD[2] assuming storage is adequate to supply equalization and fire suppression storage. If adequate storage not available, greater than MDD plus fire flow or PHD[3].
	Emergency Power	At least two independent sources if adequate standby storage is not available.
Storage	Total Storage Capacity	Sum of dead, equalization, fire, operational, and standby storage.
	Dead Storage	Storage that is unavailable for use or that can provide flows only at substandard pressures below 20 psi.
	Equalization Storage	(PHD-maximum supply capacity) *150 min
	Fire Suppression Storage	Largest fire flow in a zone multiplied by duration of that flow.
	Operational Storage	The volume of water before sources turn on. The larger of the volume required to prevent excess pump cycling or volume needed for sensitivity of level sensors.
	Standby Storage	If standby power into zone is not provided, 8 hours of operation at ADD[4].
Booster Pump Stations	Minimum No. of Pumps	2
	Firm capacity when pumping to storage	MDD
	Firm capacity when pumping to system (no storage)	PHD or MDD plus fire flow (whichever is larger)
	Emergency Power	At least two independent sources adequate to serve ADD plus largest fire flow (where standby and fire suppression storage are not adequate/available)
Service Pressure	Minimum during MDD plus fire flow	20 psi
	Minimum, during PHD	40 psi
	Standard Range	40-80 psi
	Maximum	100 psi[5]
Distribution Piping	Maximum Velocity during ADD or MDD	5 ft/s
	Maximum Velocity during PHD or Fire Flow	10 ft/s
	Minimum Future Pipe Diameter	8-inch (exception: 6-inch for short, dead-end mains without fire service)
Fire Suppression	Available Fire Flow Requirements[6]	Single Family Residential: 1,000 gpm for 2 hours Multi-family Residential: 1,500 gpm for 2 hours Non-residential: 3,000 gpm for 4 hours

Notes:

1. Firm capacity: the total production capacity with the largest-capacity well/pump out of service.
2. MDD: Maximum day demand: the maximum volume of water delivered to the system during any single day.
3. PHD: Peak hour demand: the maximum volume of water delivered to the system during any single hour of the maximum demand day.
4. ADD: Average day demand: the total volume of water delivered to the system throughout the year averaged over 365 days.
5. For pressures routinely above 80 psi, building code may require customers to install service line pressure reducing valves.
6. For all fire flow evaluations, it is assumed that flow for only one fire at a time must be available.

3.3 Supply Analysis

3.3.1 Water Rights

The City's water rights apply mostly to groundwater sources from the Rathdrum Prairie aquifer. Currently the City has a total of 43.53 cubic feet per second (cfs) or 19,536 gallons per minute (gpm) in municipal water rights. A summary of each municipal water right is provided in **Table 3-2**. Following the Rathdrum Prairie Adjudication, a pending transfer will be finalized grouping and designating all the City's municipal water rights with multiple points of diversion, so they can be utilized at any of the City's wells.

In addition to the municipal water rights in **Table 3-2**, the City has a 2.1 cfs (942 gpm) irrigation water right, which is not currently within the City limits or service area. The water is used for farm production and will eventually be combined with the City's municipal water rights portfolio.

Table 3-2
Municipal Water Rights Summary

Water Right	Date	Rate (cfs)	Rate (gpm)
95-17224	1908	0.78	350
95-4458	1947	1.69	758
95-4460	1947	2.50	1,122
95-2093	1951	1.26	565
95-2094	1951	1.25	561
95-2124	1957	3.36	1,508
95-2127	1958	0.13	58
95-2166	1964	1.40	628
95-15535	1969	4.92	2,208
95-7436	1974	4.00	1,795
95-7781	1977	0.07	31
95-8048	1980	3.79	1,701
95-8572	1988	1.16	521
95-8862	1994	4.68	2,100
95-9137	2002	3.00	1,346
95-9147	2002	5.79	2,599
95-8768	2003	3.75	1,683
Total		**43.53**	**19,536**

A summary of the projected water rights requirements is in **Table 3-3**. The water rights analysis was done through an estimated buildout timeframe (assumed near 2040). By 2036, the maximum day demand (MDD) will be over 20,000 gpm, creating a deficit of just over 600 gpm. The projected demand increase is expected to occur primarily in the Stateline Industrial Area. As the City annexes this and other areas, they acquire the existing water rights associated with the area. As this occurs, the City will need to evaluate if the water rights adequately address the deficiencies in **Table 3-3**.

Table 3-3
Municipal Groundwater Rights Analysis

Timeframe	MDD (gpm)	Existing Municipal Groundwater Rights (gpm)	Water Rights Surplus/Deficit (gpm)
2016	9,428	19,536	10,108
2021	12,251	19,536	7,286
2036	20,147	19,536	(610)
2040 (Buildout)	21,977	19,536	(2,441)

3.3.2 Well Supply

To adequately meet system demands, supply facilities must be capable of providing MDD with any single supply source out of service. This State requirement assumes that all demands above MDD, such as peak hour demand (PHD) and fire flows, are provided by storage. The City could choose to provide demands that exceed MDD directly from supply; however, this analysis assumes that pumping supply should equal MDD.

The system is supplied by eight wells that pump into three pressure zones and supply all four pressure zones. The Main Zone supply pumps through a booster pump to serve the Highlands Zone. For the well supply analysis, it is assumed these two zones will be combined and the Main Zone capacity must serve both zone. **Table 3-4** shows the well capacity for each pressure zone.

Table 3-4
Well Capacity

Zone	Well No.	Backup Power	Design Flow (gpm)	Zone Total Capacity (gpm)	Zone Firm Capacity (gpm)
Main	2a	No	3,000	11,000	8,000
	3	No	2,000[1]		
	4	No	2,000[2]		
	6	Yes	2,000		
	8[4]	Yes	2,000		
North	5	Yes[3]	1,600	3,600	1,600
	7	Yes[3]	2,000		
West	9	Yes	2,000	2,000	0

Notes:
1. Well 3 does not pump at its design capacity and typically supplies approximately 1,000 gpm.
2. Well 4 does not pump at its design capacity and supplies approximately 1,600 gpm.
3. The generator at the Well 5/7 site can operate either well, but only one at a time.
4. Under typical operations Well 8 supplies the Main Zone, however it can be valved to supply either the North or Main Zone.

Table 3-5 summarizes the supply capacity evaluation through 2036. The analysis assumes the largest capacity well in each pressure zone is out of service. Currently there is a deficiency in the West Zone. This deficiency can be met by the Main Zone through the existing PRV connection. However, in the future this deficit will be too large to be supplied by the Main Zone based on conveyance limitations through the PRV transmission piping. By 2021, there will be deficiencies in every zone and these deficiencies will increase significantly by 2036. The Stateline Industrial Area, which is the driver for new supply in the West Zone, may have some existing private wells, however these generally don't meet City standards and are not equipped to provide large capacity demands, such as those projected when the area is developed. As a result, the construction of new well supply facilities will be required in all zones to address these deficiencies.

Table 3-5
Supply Capacity Analysis

Zone	MDD (gpm)			Firm Capacity (gpm)	Surplus/Deficit (gpm)		
	2016	2021	2036		2016	2021	2036
Main[1]	7,216	8,247	9,893	8,000	784	(247)	(1,893)
North	1,432	1,684	2,175	1,600	168	(84)	(575)
West	780	2,320	8,079	0	(780)	(2,320)	(8,079)

Note:
1. Highlands MDD is included in the Main Zone

3.4 Booster Station Analysis

Pressure zones served by booster stations must have adequate firm capacity (pumping capacity with any single pump out of service) to supply MDD where adequate equalization and fire storage are available to meet peaking and fire flow demands. Where storage is not sufficient within the zone, the booster station must have adequate firm capacity to supply either MDD plus fire flow or PHD, whichever is larger.

The Ford Rock pump is inactive and not included in this analysis. The Highlands Booster Station is the only active booster station in the system and contains five pumps, three smaller pumps and two large fire flow pumps, with a total capacity of 4,100 gpm and firm capacity of 2,760 gpm. It supplies the Highlands Zone, which does not have storage and receives its well supply from the Main Zone. The fire flow requirement for the zone is 1,500 gpm. The PHD is less than 1,500 gpm for all analyzed timeframes, so the MDD plus fire flow is larger than PHD and the criteria used to evaluate the booster station. Based on the mass balance pumping analysis, there are no deficiencies at the booster station through 2036, as shown in **Table 3-6**, assuming there is adequate well capacity in the Main Zone to supply the Highlands Booster Station.

Table 3-6
Booster Station Capacity Analysis

Booster Station	Zone Firm Capacity (gpm)	MDD (gpm)			Fire Flow (gpm)	MDD + Fire Low (gpm)			Surplus/Deficit (gpm)		
		2016	2021	2036		2016	2021	2036	2016	2021	2036
Highlands	2,760	357	363	453	1,500	1,857	1,863	1,953	903	897	807

3.5 Backup Power Analysis

In the event of a power outage, the system should have adequate backup power to meet average day demand (ADD) plus the largest fire flow requirement for each pressure zone supplied by pumps in the system. Alternatively, there should be adequate standby storage to serve eight hours of ADD and adequate fire storage for each zone in the system. This analysis assumes that fire flow requirements are met through storage, where available, and the backup power must supply ADD. For the Highlands Zone that does not have storage, backup power must supply ADD plus fire flow.

A complete list of facilities with backup power and their capacity is in **Section 1**. A summary of the backup power in each zone and the analysis is in **Table 3-7**. Most of the system has adequate backup power supply through 2036. The West Zone is projected to see a large increase in demand in the Stateline Industrial Area and does not have current backup power capacity to meet 2036 ADD. New well supply facilities will need to be constructed in the West Zone to meet the demand and should include backup power to meet the backup power requirements.

Table 3-7
Backup Power Analysis

Zone	Backup Power Capacity (gpm)	Demand (ADD or ADD + Fire Flow)[1] (gpm)			Adequate		
		2016	2021	2036	2016	2021	2036
Highlands	4,100	1,632	1,634	1,668	Yes	Yes	Yes
Main	4,000	2,672[2]	3,054[2]	3,664[2]	Yes	Yes	Yes
North	2,000	530	624	806	Yes	Yes	Yes
West	2,000	289	1,668	6,827	Yes	Yes	No

Notes:

1. Highlands demand includes 1,500 gpm fire flow since there is no storage in the Highlands Zone. All other Zones require backup power to only meet ADD since fire flow is met through storage.
2. Highlands ADD is also included in the Main Zone, since Highlands supply originates in the Main Zone

3.6 Storage Analysis

Storage in the system is intended to serve four purposes: operational, equalization, fire suppression, and standby or emergency storage (if adequate standby power is not provided). The total distribution storage required is the sum of these four components plus dead storage. Dead storage is not available for system use or provides substandard flows and pressures.

The system has four active tanks. The Reilly Tanks serve the Main Zone and the Highlands Zone through the Highlands Booster Station. The West Standpipe serves the West Zone and the North Standpipe provides storage for the North Zone. The adequacy of storage in the system was determined by comparing the tank volume in millions of gallons (MG) to the total of the required storage components. The results are in **Table 3-8**. It is assumed that no standby power needs to be met through storage because it is met through backup power. The Ford Rock Tank is inactive and not included in this analysis.

As **Table 3-8** indicates, the West Zone has storage deficiencies in the 20-year horizon, due primarily to the significant increase in the equalization storage requirement. This is a result of the projected demand increase for the Stateline Industrial Area. The West Standpipe is projected to have a 1.21 MG deficit by 2036. The City can address these deficiencies through additional storage or the construction of new well supply facilities that meet part of the equalization requirement in the West Zone.

Although there is not a capacity deficiency, the North Standpipe has had operational issues and periodically overflows. A separate analysis was done for the operations of this tank, summarized in **Appendix A – North Standpipe Analysis**. Based on the information available, the recommendation coming out of the analysis is to make operational modifications to alleviate overflows and no capital improvements are recommended at this time.

Table 3-8
Storage Analysis

Zone	Tank	Volume (MG)	Storage Requirements (MG)									Surplus/Deficit (MG)		
			Dead	Fire	Operational	Equalization			Total					
						2016	2021	2036	2016	2021	2036	2016	2021	2036
Main[1]	Reilly #1	1.00	0	0.72	0.25	0.08	0.33	0.72	1.29	1.29	1.68	0.71	0.71	0.32
	Reilly #2	1.00	0	0.72	0.25									
North	North Standpipe	1.46	0.56	0.18	0.23	0.00	0.00	0.00	0.97	0.97	0.97	0.49	0.49	0.49
West	West Standpipe	2.09	0.49	0.72	0.46	0.00	0.26	1.64	1.67	1.92	3.31	0.42	0.17	(1.21)

Note:

1. Highlands equalization storage is added to Main Zone. Main Zone fire storage covers Highlands fire requirements also, since only one fire at a time in the system is assumed.

3.7 Distribution System Analysis

Distribution system performance was assessed based on the service pressure criteria summarized in **Table 3-1**. Pressures should not fall below 40 psi under PHD conditions and 20 psi under MDD plus fire flow conditions. IDAPA targets pressures to remain between 40-100 psi. Historically, the system falls within this range for all scenarios.

Pipe flow velocity criteria were also used during the distribution system analysis to indicate potential areas of undersized piping. These criteria alone did not dictate system improvements but helped guide system analysis and the prioritization of system improvements. Distribution piping was assessed based on a maximum velocity of 5 feet per second (fps) under MDD conditions and 10 fps under PHD or fire flow conditions.

3.7.1 Hydraulic Model

A steady-state hydraulic network analysis model was used to evaluate the performance of the existing distribution system under existing and future demand conditions to identify deficiencies and subsequently proposed improvements. The purpose of the model is to determine pressure and flow relationships throughout the distribution system for a variety of demand, supply, and emergency conditions. The City's existing WaterCAD model was updated to reflect the current system and used for the analysis. The model operates under steady state and extended period simulation (EPS) scenarios and was calibrated for both. A summary of the EPS and steady state calibration process and results are presented in **Appendix B – Model Calibration**. The steady state model was used for this distribution system analysis.

3.7.2 Modeling Conditions

System analysis was performed under existing, 5-year and 20-year demand conditions for ADD, MDD, PHD and MDD plus fire flow conditions. Pressure criteria deficiencies were identified and used to develop the improvement projects outlined in **Section 6**.

3.7.2.1 Fire Flow

Fire flow requirements were assigned based on general zoning classifications in accordance with the requirements outlined in **Table 3-1** and verified by the local fire department. The single family residential fire flow requirement is 1,000 gpm and multi-family residential is 1,500 gpm. Non-residential fire flow is typically 3,000 gpm. Based on the type of use and any structures requiring fire flow (such as park facilities), some of the non-residential users were determined to have 1,500 gpm fire flow. The fire flow requirements are shown in **Figure 3-1**.

3.7.2.2 Facilities

For distribution system modeling, the identification of which wells and booster pumps were operated was based on the amount of demand required and the typical order of operation, with a minimum requirement of the largest pump always off. To represent conservative conditions at the end of a peak demand period, or fire emergency, system storage tanks were modeled with operational, equalization, standby, and fire suppression storage depleted for fire flow scenarios and with operation and equalization storage removed for all other scenarios. The tanks have varying levels for winter and summer operation. The lower level of the two was used to simulate the more conservative scenario.

3.7.3 Distribution System Results

A detailed system analysis was performed to assess the ability of the City's current distribution system to provide water for existing and projected future demands and emergency fire suppression. The model was also utilized to validate the supply and pumping evaluations in conjunction with system distribution and transmission capabilities.

3.7.3.1 Existing Condition Analyses

The system was modeled using existing conditions for ADD, MDD and PHD. The pressures for each demand condition are illustrated in **Figures 3-2**, **3-3**, and **3-4** respectively. Most of the system operates within the desired service pressure range of 40 to 80 psi. In some areas, the operating pressure is above 80 psi. Service line PRVs could be installed in these areas to reduce pressures. Although some areas are above the desired range, none fall below the service pressure range.

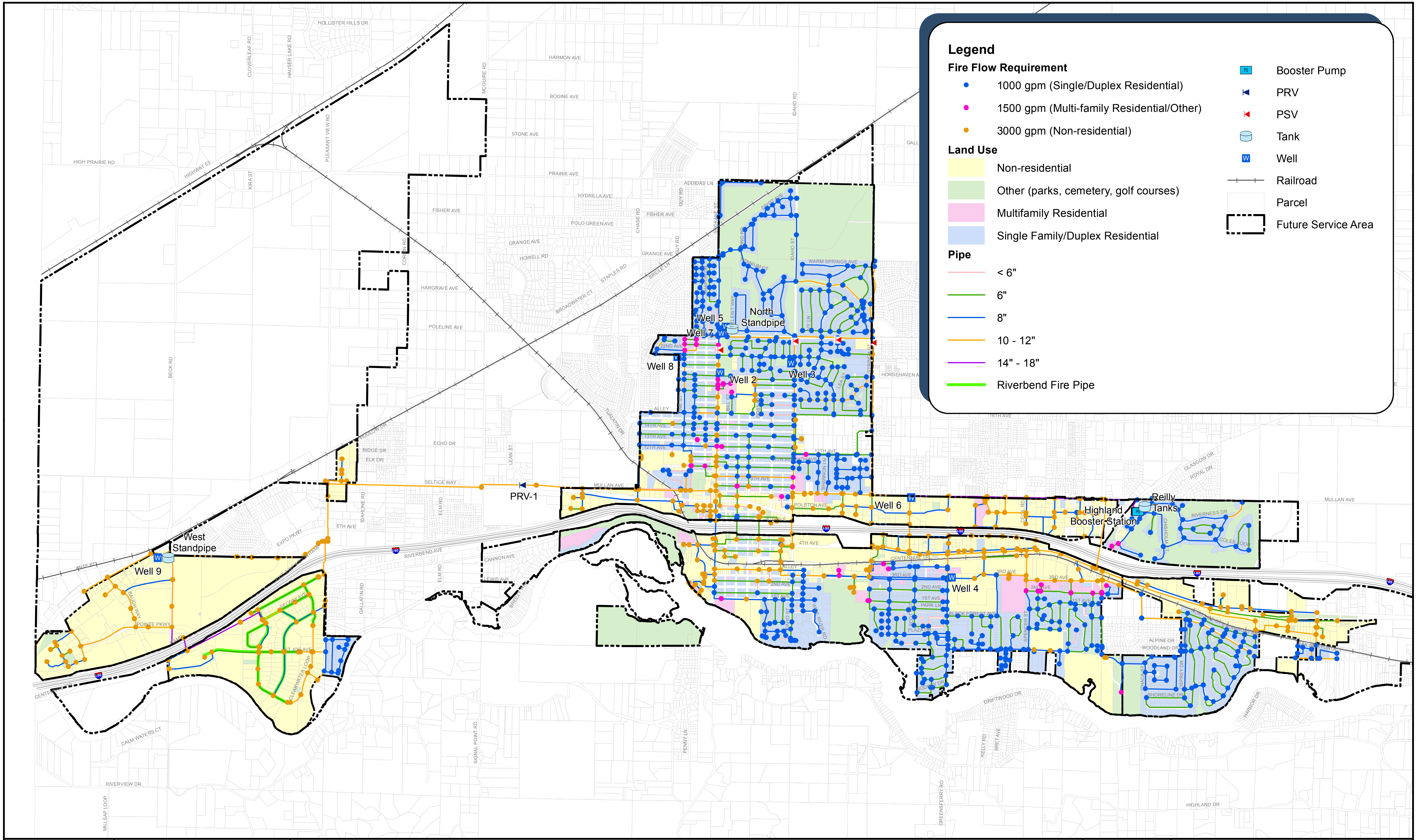
Pipe velocity exceedances alone do not typically trigger improvements; however, they are evaluated to check for potential restriction points in the system where high frictional losses may occur. There are few locations with velocities in exceedance of the recommended criteria. These are around facilities and improvements are not recommended to address just the pipe velocity issues.

Under MDD plus fire flow conditions, there are 37 locations identified with hydrants that do not currently maintain 20 psi under the required fire flow, as shown in **Figure 3-5**. Improvements outlined in **Section 6** are designed to address these deficiencies.

3.7.3.2 Future System Analyses

Similar demand scenarios (ADD, MDD, PHD and MDD plus fire flow) were modeled for the 5-year and 20-year horizons. Although not all existing deficiencies will be addressed within five years, future scenarios were modeled with recommended improvements implemented to address existing deficiencies in order to identify new deficiencies due to growth.

Due to relatively low growth projected in most of the system, the pressures across scenarios and fire flow availability did not change significantly between the existing, 5-year, and 20-year scenarios. Most of the projected growth is in the Stateline Industrial Area. As outlined in **Section 6**, new pipe and well supply facilities are recommended to serve this industrial area. Because there is little growth in most of the system, the deficiencies for both the 5-year and 20-year scenarios are similar to the existing system deficiencies. There are similar locations with pressures exceeding the recommended service pressure across the future demand scenarios as under existing conditions.



City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

Figure 3-1
Fire Flow Requirements

murraysmith

CITY OF POST FALLS

October 2017 16-1841

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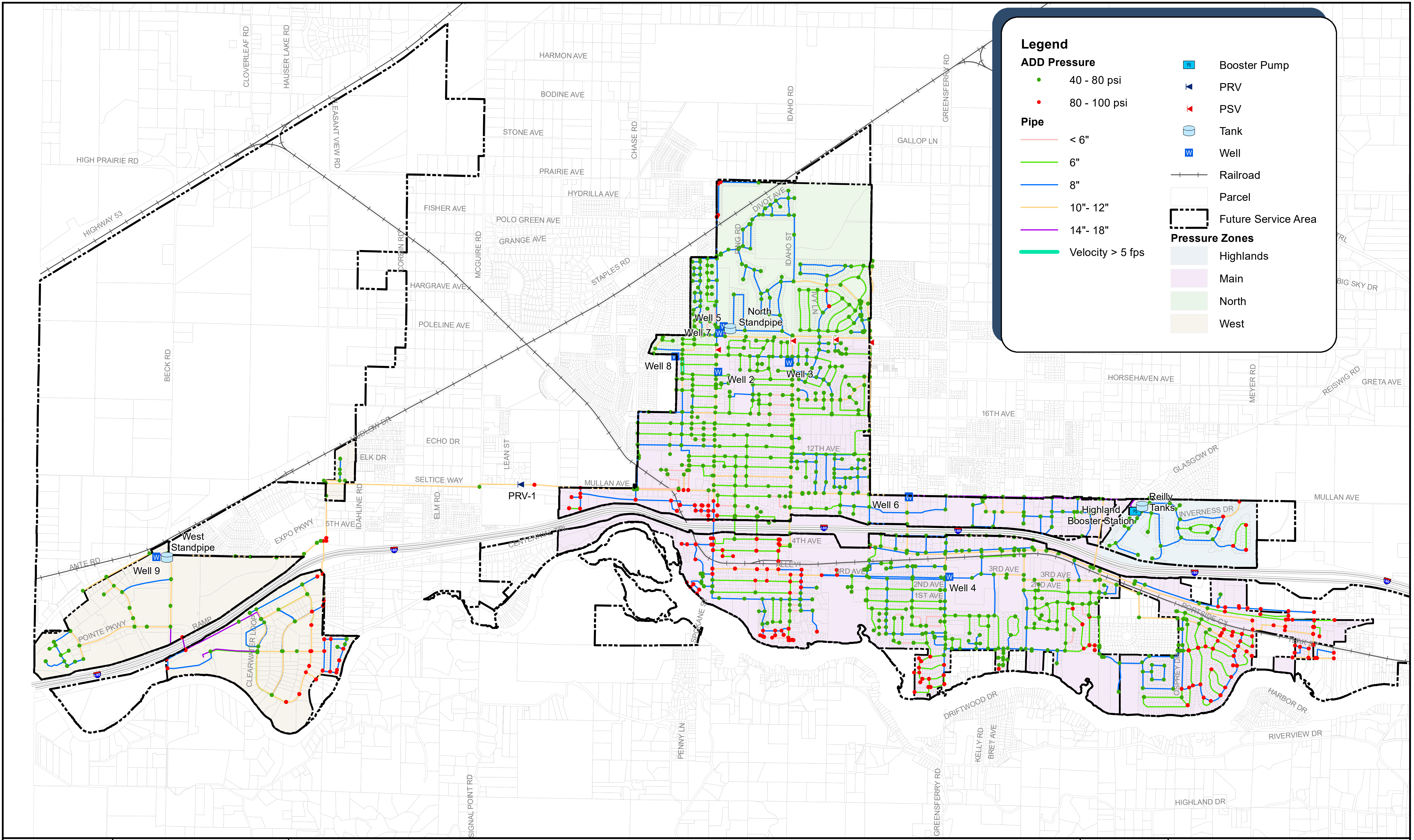

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City of Post Falls
Water System Master Plan

Figure 3-2
2016 ADD Results

October 2017 16-1841

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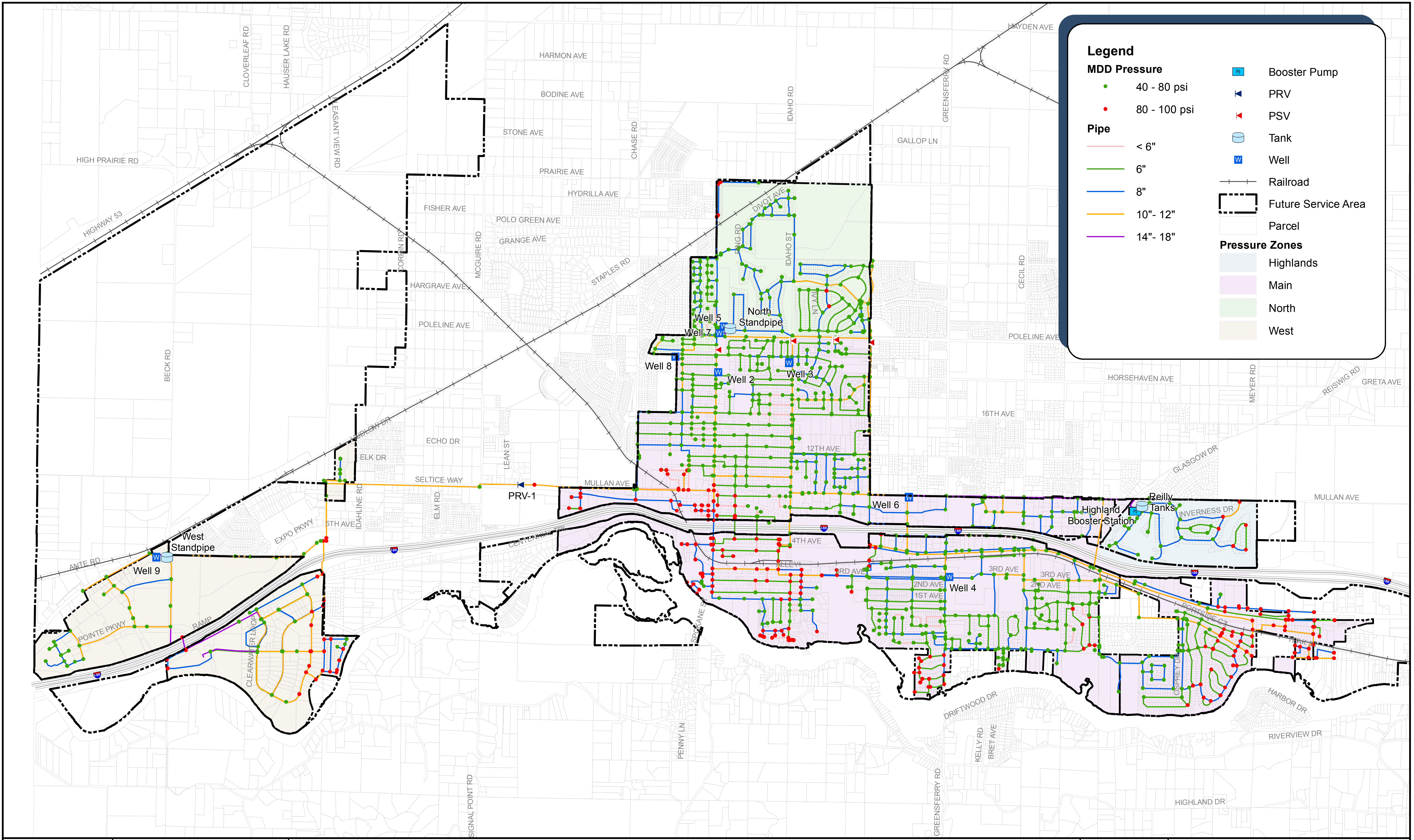

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Figure 3-3
2016 MDD Results

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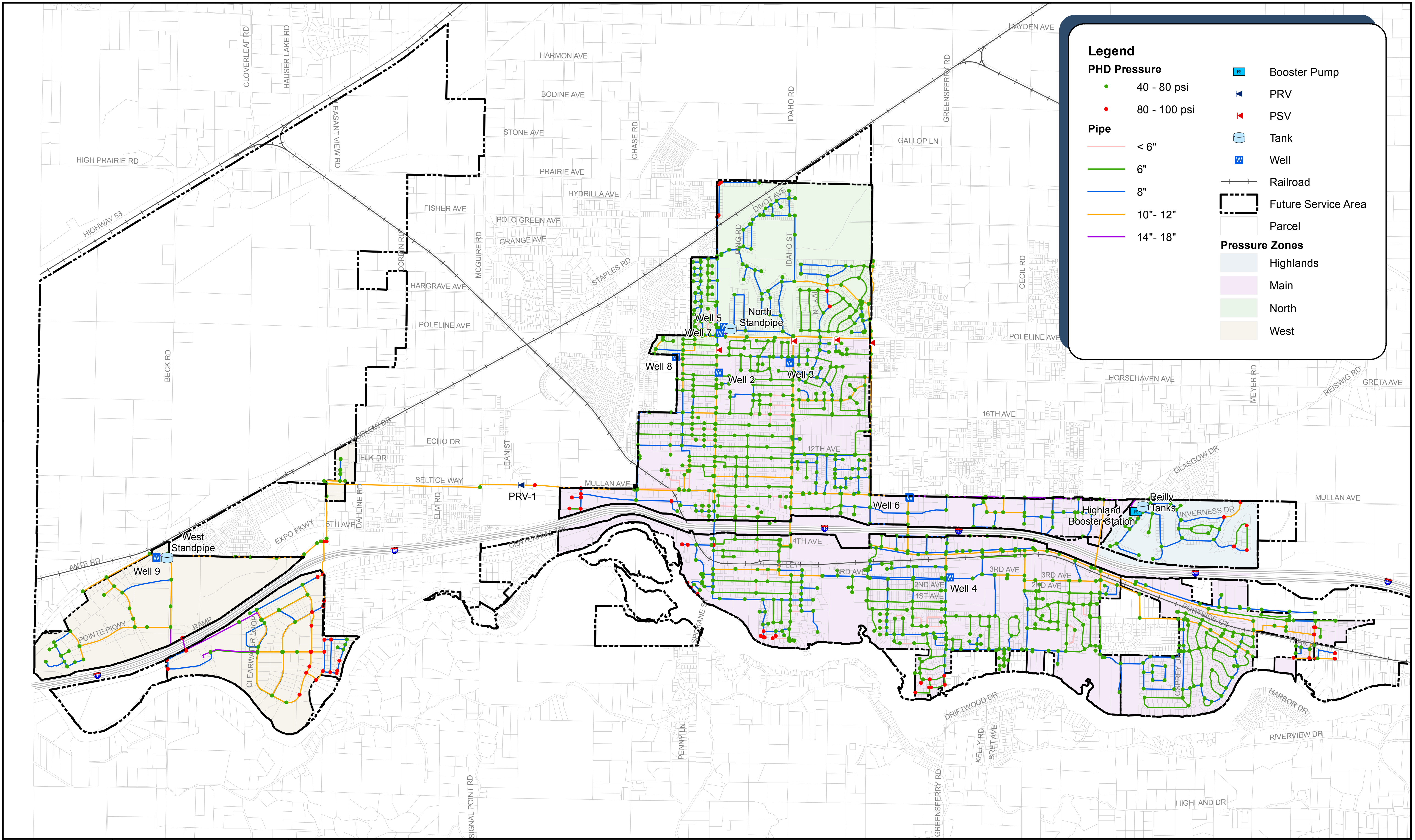

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City of Post Falls
Water System Master Plan

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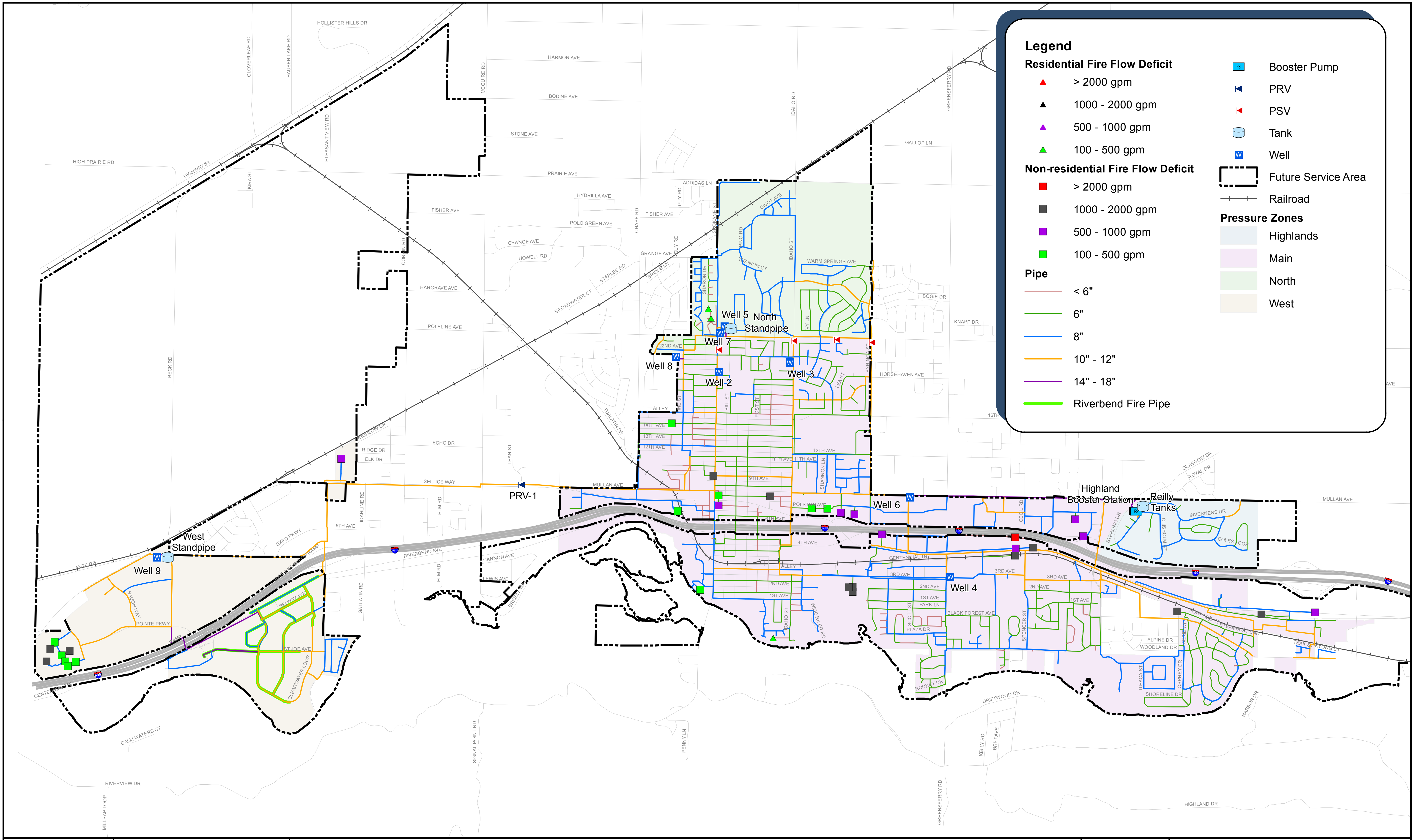
Figure 3-4
2016 PHD Results

October 2017 16-1841



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City of Post Falls
Water System Master Plan

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Figure 3-5
2016 Fire Flow Deficiencies

October 2017
16-1841

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3.8 Summary

The City provides reliable water supply to its customers when evaluated against criteria for pressure, storage, pumping, and fire suppression capability for existing and 5-year conditions. With planned future improvements, the City will also be able to meet criteria for the 20-year horizon. The following describe the high-level takeaways from each of the respective analysis sections:

3.8.1 Supply Analysis Summary

- The City has adequate yearly water rights to meet existing and 5-year demand projections. In the 20-year horizon the City will have a small deficiency in water rights to meet projected demand. As the Stateline Industrial Area and other areas are annexed, the City's policy is to acquire the existing water rights, which will need to be evaluated to ensure they address the system supply deficiencies.

- The only existing supply deficiency is in the West Zone, which does not have adequate firm supply capacity to meet existing MDD. The Main Zone can supply this deficiency currently, however by 2021 every zone will be deficient. To meet the future deficiencies, the City will need to construct new well supply facilities within each zone.

3.8.2 Booster Station Analysis Summary

- The Highlands Booster Station is currently the only booster station in the system. It provides all supply to the Highlands Zone and has adequate capacity through 2036.

3.8.3 Backup Power Analysis Summary

- Backup power is required to meet ADD in all zones where storage is adequate to supply fire requirements. For the Highlands Zone backup power must meet ADD plus fire flow since there is no storage in that zone. For existing and 5-year projections, there is adequate backup power in each zone.

- By 2036, there will be a need for additional backup power in the West Zone. As new wells are constructed, to meet additional supply requirements, it is recommended that these wells have backup power installed to address this deficiency.

3.8.4 Storage Analysis Summary

- The Reilly Tanks and the North Standpipe have adequate storage capacity through the 20-year horizon.

- The West Standpipe has a future deficiency, due primarily to equalization requirements to meet demand projections in the Stateline Industrial Area, which could be addressed through additional storage or well supply facilities in the West Zone.

3.8.5 Distribution System Analysis Summary

- Much of the system experiences pressures within the desired service pressure range. In the areas where pressure is greater than 80 psi, building code may require customers to install service line PRVs.

- There are few locations with velocities exceeding the recommended criteria, with most occurring in short segments of pipe around facilities. No improvements are recommended to address pipe velocity issues.

Overall, the City's system adequately meets service criteria in most areas, with some existing fire flow deficiencies and future supply deficiencies. Existing fire flow deficiencies will typically be addressed through pipe improvements. The primary future deficiencies are due to inadequate supply to meet MDD projections. These future supply deficiencies will be addressed through the construction of well supply facilities. A description of each recommended improvement is in **Section 6.**

Section **4**

Section 4

System Condition Evaluation

4.1 Introduction

As part of the water system planning effort, the City of Post Falls (City) has chosen to complete a facility condition assessment of the drinking water system components. These components include the water production facilities and the distribution system. The water production facilities are comprised of well pump stations, a booster pump station, and reservoirs. The distribution system is comprised of buried pipelines.

This section summarizes the evaluation and review of the City's existing water supply facilities, and provides recommendations for the rehabilitation and replacement of the system facility components.

The overall system evaluation was performed through desktop review of the 2014 DEQ Drinking Water Supply Report, geographic information system (GIS) system, available engineering drawings, interviews and questionnaires with the City's operations staff, and an onsite review of each facility on October 31 and November 2, 2016.

The onsite well facility review included a visual inspection by Murraysmith staff and City operators to identify issues and improvements. The distribution system assessment was done primarily through a desktop review of GIS data.

4.2 Background

The City's drinking water system is supplied solely by groundwater derived from 8 well pumping facilities distributed across the City's service boundary. The City currently operates 4 water storage reservoirs, two of which are ground level and two standpipes. A booster pump station provides supply to the highest-pressure zone. The City also has one inactive Ford Rock facility that includes a reservoir and booster station. A summary of each facility is included in **Section 1—Existing System Description** (**Tables 1-2, 1-3, 1-4**, and **1-6**). Five of the well stations and the booster pump station have been constructed or upgraded over the past 15 years. Six of the City's wells are equipped with sodium hypochlorite onsite generation and injection systems.

The distribution system consists of over 120 miles of underground pipeline ranging in size from 2 to 18 inches in diameter. Available information indicates that pipes in the system currently date back to the 1940s.

4.3 Facility Evaluation Process

Each facility was evaluated using input from multiple sources to help identify problems and areas of concerns. Mechanical, electrical, and structural problems relating to well water pumping, treatment, and storage were noted, along with operator safety and equipment operation issues.

As mentioned earlier, facility evaluation sources included a desktop review of the 2014 DEQ Drinking Water Supply Report to gain an understanding of items the state has catalogued as deficient or not meeting the current Idaho Administrative Procedures Act (IDAPA) regulations.

The evaluation process included an onsite review of each pumping facility using the survey forms in **Appendix C – Facility Condition Data**. The questions are intended to cover the condition, safety concerns, and operational deficiencies for the pump house, pump equipment, electrical equipment, and chlorination system. The survey also assesses the condition of site access and security, and well water quality or quantity problems. Each facility inspection summarized the layout, overall condition, and state of equipment, and identified potential improvement options. Additionally, the condition of each facility component was ranked based on responses to the survey questions mentioned earlier and given a score of 1 (good or not applicable), 2 (average) or 3 (poor). This facility condition summary information is in **Appendix C** and can be used by the City as a basis for future condition assessments. No testing or structural evaluations (e.g., equipment testing, destructive load) were performed.

4.4 Facility Condition Summary

Based on the evaluation a summary was developed from the condition assessment for each of the major facilities within the City's water system.

Well 2a contains a 400-HP deep well vertical lineshaft turbine pump with a design flow of 3,000 gpm. The CMU pump house with a metal roof was constructed in 2012 and contains an electrical motor control center, supervisory control and data acquisition (SCADA) communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. The primary noted deficiency is that the ventilation system is not able to address the heat load from the motor during the summer months. The elevated temperatures in the facility impact the operation of the SCADA communication equipment at times causing control malfunctions. It is recommended to upgrade the ventilation system to address functioning during elevated temperatures.

Well 3 contains a 150-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The small CMU pump house with a flat roof is the City's oldest well station, constructed in 1962, and contains an electrical motor control center, SCADA communication equipment, and a ventilation system. This facility has a number of noted deficiencies. There is limited space within the building, which does not allow for electrical equipment clearances. Functionally, the pump has a reduced capacity by about 1,000 gpm because when Well 2a operates the Well 3 pump competes with the higher pressure produced by Well 2a. The City also indicated that the air tube for measuring the well depth has failed, requiring manual measurement. This facility also has a full-time pre-lube system. The electrical system does not include a soft start, which the City prefers since it reduces the torque and the load temporarily during the startup process. Using such a device can help to reduce the surge of electric current during startup, as well as to reduce the mechanical stress on the shaft and motor. The pump-to-waste system also has overflowed with multiple pump starts. The recommendation is that this facility be replaced in the future to address the deficiencies with the primary objective to allow the well to pump at or near 2,000 gpm.

Well 4 contains a 150-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The small CMU pump house with a flat roof is the City's second oldest well station, constructed in 1974. It contains an electrical motor control center, SCADA communication equipment, and a ventilation system. The building has very limited space, which does not allow for electrical equipment clearances. A new roof is required. Similar to Well 3, the pump has a reduced actual capacity of 1,600 gpm and the City suspects that the column shaft may be smaller than industry standards. The City also indicated that the air tube for measuring the well depth has failed requiring manual measurement. This facility also has a full-time pre-lube system. The electrical system does not include a soft start, which the City prefers. The flow meter also needs to be upgraded to replace worn propeller. The pump-to-waste system also has overflowed with multiple pump starts. To address these issues, the recommendation is that this facility be replaced in the future to address the deficiencies and allow for increased capacity to meet future demands.

Well 5 contains a 200-HP deep well vertical lineshaft turbine pump with a design flow of 1,600 gpm. The CMU pump house has a flat roof and was constructed in 1980. In 2003 upgrades were made to the ventilation system and pump and electrical system upgrades were completed in 2012 along with a new roof membrane and hatch. The facility contains an electrical motor control center, SCADA communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. Relatively minor issues exist at this facility. The facility has a full-time pre-lube system and the City would prefer a soft start setup. The pump-to-waste system also has overflowed with multiple pump starts. The well is located at the same site as Well 7 and the North Standpipe. Well 5 does not pump directly to the North Standpipe, like Well 7 does. Rather it must enter the distribution system and then fill the tank. An additional isolation valve on the discharge piping is needed to allow for Well 5 to function as Well 7 and pump directly to the North Standpipe. To address these issues, the recommendation is that the pre-lube be modified along with the installation of an isolation valve on the discharge piping.

Well 6 contains a 300-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The CMU pump house has a flat roof and was constructed in 1996. It contains an electrical motor control center, SCADA communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. Similar to Well 2a, the primary noted deficiency is that the ventilation system is not able to address the heat load from the motor during the summer months. The elevated temperatures in the facility impact the operation of the SCADA communication equipment at times requiring re-setting of the HOA switch. Additionally, the only access to the site is from Mullan Avenue, which is a busy street restricting access. It is recommended that the ventilation system is upgraded to address elevated temperatures and to create an additional access point from Alberta Street.

Well 7 contains a 300-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The CMU pump house has a metal roof and was constructed in 2004. It contains an electrical motor control center, SCADA communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. The only noted deficiency is that the ventilation system is not able to address the heat load from the motor during the summer months. The elevated temperatures in the facility impact the operation of the SCADA communication equipment at times requiring re-setting of the HOA switch. The recommendation is to upgrade the ventilation system to address elevated temperatures.

Well 8 contains a 300-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The CMU pump house has a metal roof and was constructed in 2004 and contains an electrical motor control center, SCADA communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. The only noted deficiency is that the ventilation system is not able to address the heat load from the motor during the summer months. The elevated temperatures in the facility impact the operation of the SCADA communication equipment at times requiring re-setting of the HOA switch. The recommendation is to upgrade the ventilation system to address elevated temperatures.

Well 9 contains a 250-HP deep well vertical lineshaft turbine pump with a design flow of 2,000 gpm. The CMU pump house has a metal roof and was constructed in 2007 and contains an electrical motor control center, SCADA communication equipment, a ventilation system, and an onsite sodium hypochlorite generation system. There are no noted deficiencies.

Highland Booster Station contains five end suction centrifugal pumps ranging in size from 20-HP to 50-HP. The combined firm capacity of the pump station is 2,760 gpm. The CMU pump house was upgraded with a metal roof in 2003, which included the addition of a I-Beam hoist. The electrical motor control center was upgraded in 2012 with the addition of backup power in an adjacent structure. The facility has limited space, since it houses pumps, electrical equipment, SCADA communication equipment, and ventilation system, but is functional. There are no noted deficiencies.

North Standpipe is a 1.46 million-gallon (MG) capacity welded steel standpipe water storage tank constructed in 2003. On October 3, 2016, Liquid Engineering Corporation completed a Remotely Operated Vehicle (ROV) video camera inspection of the interior of the tank. The inspection report is included in Appendix C, which indicated that the tank is in overall good condition. The inspection did find some areas of coating failure on the upper panels. Based on the video there were 5 areas in total that appeared to have failure of the coating system exposing the primer layer. It is recommended that the tank is inspected in 5 years to review these areas of surface coating to determine if they are expanding and should be repaired.

West Standpipe is a 2.09 MG capacity welded steel standpipe water storage tank constructed in 2005. On October 3, 2016, Liquid Engineering Corporation completed a ROV video camera inspection of the interior of the tank. The inspection report is included in **Appendix C**, which indicated that the tank is in overall good condition. The inspection did find some areas of coating failure on the upper panels. Based on the video there were 4 to 5 areas in total that appeared to have failure of the coating system exposing the primer layer. It is recommended that the tank is inspected in 5 years to review these areas of surface coating to determine if they are expanding and should be repaired.

Reilly #1 is a 1 MG capacity precast concrete AWWA D115 ground level water storage tank constructed in 1983. The tank appears to be in overall good condition, but the City noted that they have had to fix leaks in the past. No information was available on past diver inspections. It is recommended that the tank is inspected every 5 years to review condition and if further evaluation is needed.

Reilly #2 is a 1 MG capacity precast concrete AWWA D115 ground level water storage tank constructed in 1994. The tank appears to be in overall good condition. No information was available on past diver inspections. It is recommended that the tank is inspected every 5 years to review condition and if further evaluation is needed.

Ford Rock is a 0.26 MG capacity welded steel ground level water storage tank constructed in 1979. This tank is currently inactive, with no plans by the City to put it back into service. No evaluation was done of this tank.

Linked with all facilities, the City staff indicated that the SCADA system needs to be upgraded. This was based on communication limitations of the existing system and replacement of older equipment which would improve operations of the system. It is recommended that a comprehensive study of the SCADA system be completed to determine upgrade options, which would define required improvements.

4.5 Recommended Facility Improvements

The recommended facility improvements based on the condition assessment and input from City staff are shown in **Table 4-1**. Priority of the defined condition assessment projects is to address the replacement of Well 3 and Well 4 first to ensure supply capacity meets the requirements defined in **Section 3 – System Analysis**. The SCADA system analysis is planned for the next 5 years to define upgrade requirements for the City's future Capital Improvement Plan. The rest of the projects will be completed by the City over the next 5 years through ongoing maintenance activities.

Table 4-1
Summary of Facility Condition Assessment Improvements

Facility	Improvement Description
Well 3	Complete a study of pump capacity to define the replacement requirements of the pump and construct a new facility.
Well 4	Complete a study of pump capacity to define the replacement requirements of the pump and construct a new facility.
Well 2a	Upgrade the HVAC System to address elevated temperatures impacting the control system.
Well 5	Modification of the pre-lube and installation of an isolation valve on the discharge piping.
Well 6	Upgrade the HVAC System to address elevated temperatures impacting the control system. Add second site access from Alberta Street.
Well 7	Upgrade the HVAC System to address elevated temperatures impacting the control system.
Well 8	Upgrade the HVAC System to address elevated temperatures impacting the control system.
System-wide	To improve communication and control of facilities to allow City staff to better operate the water system, a comprehensive study of the SCADA system to determine upgrade options.

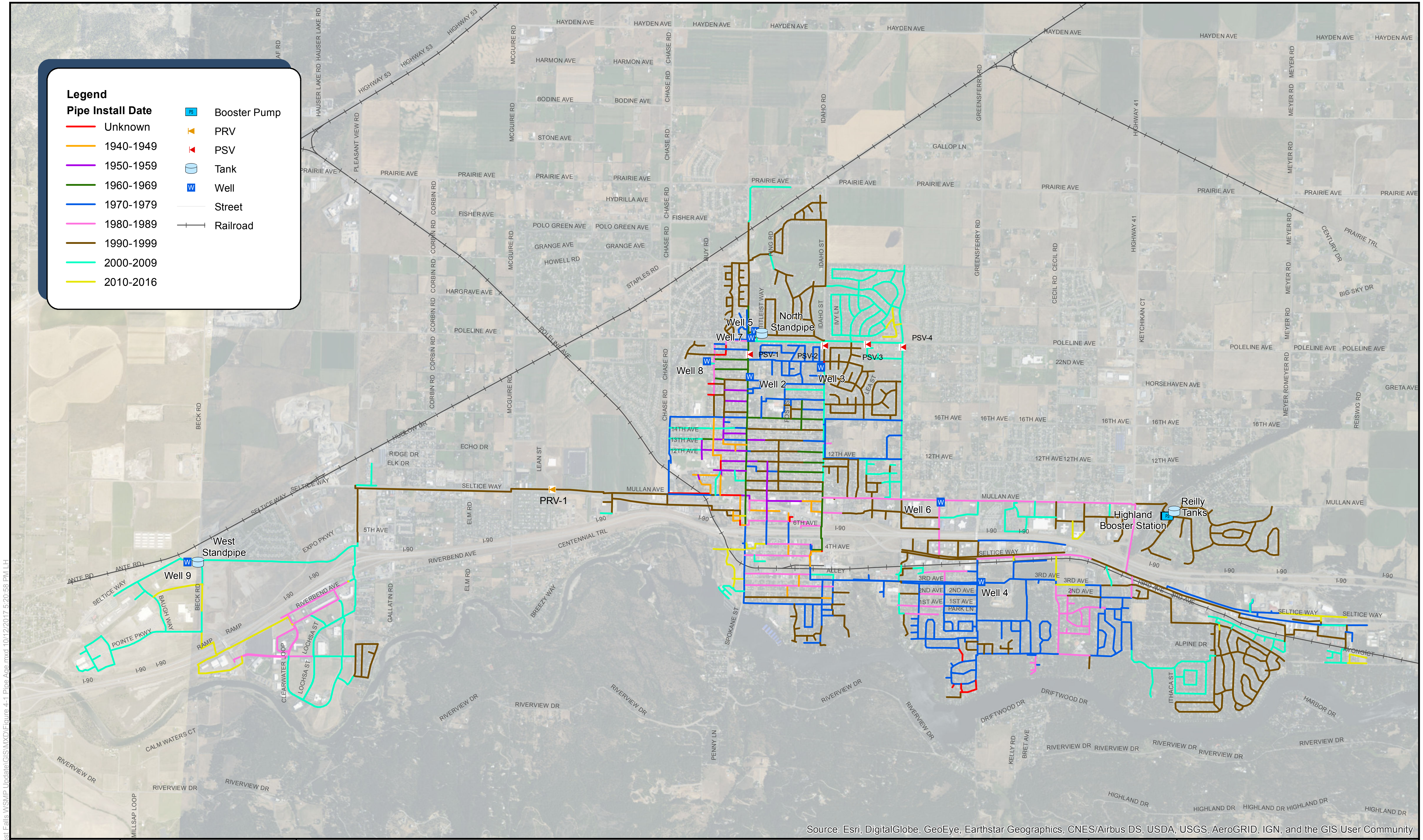
4.6 Pipe Replacement Program

Murraysmith conducted a desktop analysis to identify a long-term replacement program for the City's distribution piping. Murraysmith used pipeline information from GIS and staff interviews to identify the prospective useful life of the differing age and pipe materials within the system.

Table 4-2 below shows the pipeline length by diameter and age in the City's distribution system. **Figure 4-1** shows the distribution piping by age. Analysis of **Table 4-2** shows that the majority of the City's distribution system piping was installed in the last 40 to 50 years.

Table 4-2
Pipe Summary (Length in feet)

Diam. (in)	Construction Year									Total
	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s	Unk	
Under 4	2,394	0	0	1,561	721	235	0	0	254	5,165
4	6,527	3,219	2,449	12,648	0	1,426	0	0	1,595	27,864
6	1,280	7,836	7,358	70,397	30,760	66,736	32,383	1,261	2,260	220,271
8	2,010	1,525	2,573	40,134	10,961	104,900	46,607	14,834	356	223,900
10	0	176	22	2,499	5,641	5,385	12,604	0	1,845	28,172
12	0	0	8,246	4,878	17,593	37,010	44,348	3,404	578	116,057
14	0	0	0	0	1,994	0	0	0	0	1,994
16	0	0	0	0	6,536	0	1,435	4,498	47	12,516
18	0	0	0	0	151	1,606	0	0	0	1,757
Total	**12,211**	**12,756**	**20,648**	**132,117**	**74,357**	**217,298**	**137,377**	**23,997**	**6,935**	**637,696**
Percent	**2%**	**2%**	**3%**	**21%**	**12%**	**33%**	**22%**	**4%**	**1%**	**100%**



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

murraysmith

CITY OF POST FALLS

City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

N S E W

Figure 4-1
Pipe Age

October 2017 16-1841

I:\BOI_Projects\16\1841 - Post Falls WSMP Update\GIS\MXD\Figure 4-1 Pipe Age.mxd 10/12/2017 5:20:58 PM LH

An industry benchmark bases replacement programs on water mains having a 100-year design life, which would require one percent of the system to be replaced annually. As identified in **Table 4-2**, the City currently has approximately 637,700 feet of public pipeline, which would average 6,400 feet of pipeline replacement per year.

The 100-year life cycle is a target replacement rate; however, the City should consider constructability and budget constraints when developing a pipeline replacement program. The amount of pipe in the system was not installed consistently across each year, with some decades having much more pipe installed than others, as identified in **Table 4-2**. For example, during the 1990s, the system averaged almost 22,000 feet of pipe installed per year. To replace the pipe at this rate is likely infeasible due to cost and the extent of disruption to the City to complete this much construction annually. As a result, some pipe will need to be replaced sooner and some later than the 100-year life cycle to even out the replacement schedule.

In addition to a 100-year life cycle target, pipeline replacement program prioritization should consider the following indicators:

- Known condition issues
- Capacity issues
- Pipe material issues based on complaint and break records
- Pipeline age
- Coordination with planned street improvement projects
- Cost
- Constructability

Information on the location, date, material of pipe, and description of water main breaks and repairs has not been consistently maintained. It is recommended that the City implement a program to catalog main breaks, as this information is invaluable for determining trends for what type and age of pipe is breaking and should be scheduled for replacement. Additionally, for pipes with unknown material, it is recommended that the City collect material information during future projects where pot holing is feasible. This information will allow the City to assess pipe life expectancy to determine if a 100-year replacement schedule is appropriate. Using this information along with pipe age, the City can determine a phased approach for replacement.

Since the first installed pipelines will not reach 100 years old for another 20 years, the City should implement a budget place holder now to build a reserve of funds that will allow for implementation of a future pipe replacement program without requiring a large rate increase. By collecting information on the pipe and adding pipe replacement to the budget, the City will have better resources to formalize a pipeline replacement program over the coming years. This will help determine if the pipe life cycle is greater than 100 years prior to implementing a pipe replacement program.

In addition to water main pipeline replacement, service lines, including both laterals from the water main to the meter pit (or property line where no pit exists) and hydrant laterals, should be considered and budgeted for replacement at the same time the water mains are being replaced.

City design criteria dictate the standard service material is 1-inch diameter, polyethylene, 200 psi rating for domestic connections. Larger hydrant lateral connections are typically C900 polyvinyl chloride (PVC) pipe.

4.7 Summary

Multiple sources of information were reviewed to evaluate the condition of the City's drinking water system. In general, the drinking water system is in good condition, with specific improvements recommended to replace the two oldest well stations and improve ventilation at several of the newer well stations. Priority of the defined condition assessment projects is to address the replacement of the Well 3 and Well 4 first to ensure supply capacity meets the demand requirements. A study of the SCADA system, to define upgrade options, is also recommended to improve control and operation of the system. The rest of the projects will be completed by the City over the next 5 years through ongoing maintenance activities. No improvements to the four tanks or booster station are recommended at this time. It is recommended that all facilities be inspected every 5-years as part of the Water System Master Plan update process to continue to document condition and assess any needed improvements.

The City's GIS records were analyzed to compare each pipeline's age. Condition and break records were not available for analysis. It is recommended that the City implement a program that catalogs main break information and defines unknown pipe material, which will allow for future prioritization of projects within the pipe replacement program. Pipe replacement should start to be budgeted now to build a reserve of funds that will allow the City to pursue a 100-year replacement schedule in the next 20 years. Assuming, a 100-year life cycle, which is 1 percent of total pipe length needs to be replaced each year on average. This is approximately 6,400 feet of pipe per year for the current system. Service and lateral lines connected to the mains should also be replaced. The prioritization of pipe replacement can be based on age, material, condition, capacity, and road repair schedules, with additional factors being considered as available.

Section **5**

Section 5

Operations & Maintenance and Water Quality

5.1 Introduction

This section summarizes operations and maintenance (O&M) benchmarking information from six similar regional utilities. This O&M benchmarking information provides the City of Post Falls (City) a comparison of different O&M elements including number of staff, size of system, rates, and yearly budget for similar regional utilities. A summary of water quality regulations pertaining to the City's system is also included in this section. Areas of concern for the City from a water quality perspective are summarized with recommendations for further analysis as required.

5.2 System Overview

The following list provides an overview of the City's water distribution system:

- Service population: 18,000 people
- Service Area: 7.0 square miles
- Volume of water produced (approximate 2016 values, million gallons per day (mgd)).
    - Average Daily Demand (ADD): 5.0 mgd
    - Maximum Daily Demand (MDD): 13.6 mgd
    - Peak Hourly Demand (PHD): 21.7 mgd
- Total Length of water line: 126 miles
- Number of active wells: 8
- Number of active booster pumping stations: 1 (excludes Ford Rock)
- Number of active finished water tanks: 4 (excludes Ford Rock)
- Number of pressure zones: 4

The City's Water Utility staff are responsible for the maintenance and operation of the distribution and treatment systems. The Water Division is currently operated with five full-time equivalent (FTE) operations employees.

5.3 O&M Benchmarking

Operations and maintenance information was collected through an online survey of six groundwater providers primarily in Idaho. This information was summarized to provide a benchmark comparison for the City on staffing, budgets, and rates based on different sized systems with similar groundwater supply. These utilities and the populations they serve are listed below:

1. Asotin County Public Utility District (PUD), Washington (20,000)
2. City of Coeur d' Alene, Idaho (47,540)
3. City of Idaho Falls, Idaho (58,000)
4. City of Nampa, Idaho (82,160)
5. City of Pocatello, Idaho (56,180)
6. City of Meridian, Idaho (91,420)

The benchmark information is summarized in **Table 5-1**, **Table 5-2**, and **Table 5-3**. **Table 5-1** summarizes number of staff, with comparisons of annual budget per average day flow, average day flow per FTE, feet of pipe per FTE, and annual budget per FTE. **Table 5-2** summarizes system service characteristics. **Table 5-3** summarizes O&M budget and rate information.

This information is summarized for the City to reference as needed when considering its operations allowing them to compare with other regional utilities. A general summary of the comparison is that the City ranks seventh in population served and second in average flow rates when compared to the other six utilities. The City is ranked seventh in the length of water lines maintained and ranked seventh in the number of water system O&M staff and seventh in O&M budget. Although the City is one of the smaller utilities in terms of customers and distribution mains, it has one of the higher annual average daily flows, which is attributed to the second highest per capita demand. The performance indicators show that each FTE in the City is responsible for more distribution system piping than the other utilities.

Table 5-1
Staff and Budget Comparison

Utility Name	Number of FTE on Staff		Annual Budget/ Average Day Flow ($/mgd)	Average Day Flow/FTEs (gal/FTE)	Feet of Pipe/FTEs (lf/FTE)	Annual Budget/FTE ($/FTE)
	Distribution	Treatment				
Asotin County PUD	8	1	713,181	522,222	75,093	372,439
Coeur d'Alene	23	0	525,000	521,739	69,788	273,913
Idaho Falls	14	0	149,388	1,750,000	116,914	261,429
Meridian	18	4	444,444	409,091	123,840	181,818
Nampa	25	5	1,024,837	238,333	80,960	244,253
Pocatello	37	6	548,601	309,302	33,767	169,684
Post Falls	4.5	0.5	486,337	1,010,000	127,776	491,200

Table 5-2
System Characteristics Comparison

Utility Name	Population Served	Number of Service Connections	Service Area (sq. miles)	Miles of Pipe	GPCPD (ADD)[1]
Asotin County PUD	20,000	7,200	20	128	235
Coeur d'Alene	47,540	18,378	16	304	252
Idaho Falls	58,000	24,000	23	310	422
Meridian	91,420	32,000	62	516	98
Nampa	82,160	28,000	55	460	87
Pocatello	56,180	17,600	30	275	237
Post Falls	17,819	8,419	7	121	283

Note:
1. gpcpd: gallons per capita per day

Table 5-3
Budget and Rate Comparison

Utility Name	Total Water System O&M Budget	Monthly Residential Water Rate[1] ($)
Asotin County PUD	$3,351,950	$20.48
Coeur d'Alene	$6,300,000	$13.45
Idaho Falls	$3,660,000	$28.90
Meridian	$4,000,000	$14.99
Nampa	$7,327,587	$20.28
Pocatello	$7,296,392	$21.25
Post Falls	$2,456,000	$16.04

Note:
1. Based on 5,000 gal/month, except Idaho Falls which does not meter and charges a flat monthly rate.

5.4 Water Quality

The City relies primarily on groundwater as its source of supply. All eight of the City's wells draw water from the Spokane Valley/Rathdrum Prairie Aquifer (SVRPA). The aquifer was designated as a "Sole-Source Aquifer" by the Environmental Protection Agency in 1978. It has been further protected by Kootenai County and the Panhandle Health District, which limits septic tank wastewater service to one residential equivalent per five acres. Additionally, the Sensitive Resource Aquifer designation in 1997 by the State of Idaho further protects the SVRPA with Idaho's only "non-degradation" management standard.

The Spokane Valley/Rathdrum Prairie Aquifer is comprised of a thin layer of soil overlaying 200 to 400 feet of coarse sands and gravels. The alluvial material was deposited by Ice Age floods from Glacial Lake Missoula approximately 12,000 years ago. The 2007 "Bi-State" aquifer study completed by the U.S Geological Survey shows that annual estimated aquifer withdrawals are approximately 22 percent of estimated annual recharge for the aquifer. While adequate aquifer supply appears to exist, pressure has been building from conservation groups to reduce consumption in order to maintain Spokane River flows and water quality.

Water throughout the system is generally of high quality. The SVRPA exhibits high water quality characteristics and rarely elicits customer complaints. All actively used City wells comply with the primary drinking standards. The City's water supply has naturally occurring arsenic detected in several wells over the past decade, but that remains well below the maximum contaminant level (MCL). There is also measurable nitrate in the wells, but it is also at levels far below the MCL. Due to the high quality of the water source, the City only chlorinates once a year in the fall as part of the City's maintenance program. Chlorinating this time of year helps protect against potential contamination during blow-out of irrigation sprinkler systems. Since the City does minimal chlorination, it is not required by the Idaho Department of Environmental Protection (DEQ) to monitor disinfection byproducts.

5.4.1 Water Quality Monitoring

The City follows federal and state requirements for water quality monitoring. The following lists the water quality parameters that the City monitors:

- Coliform
- Turbidity
- Inorganics
- Radionuclides
- Lead and copper at water taps
- Synthetic Organic Contaminants (SOCs)/ Volatile Organic Contaminants (VOCs)

Water quality monitoring over the last 5 years indicates that the City's water meets federal and state requirements. The Consumer Confidence Report (CCR) is published every year before July 1st for the prior calendar year, which includes the most current water quality information. The current reports are available on the City's website.

5.4.1.1 Current information from 2016 Consumer Confidence Report

Water quality reports for the City's well sources show no detection of most chemical contaminants. Slight levels of nitrate exist within some of the City's wells. The highest level measured in 2016 was 1.03 mg/L, which is typical of SVRPA wells and is far below the MCL of 10 mg/L. Also, typical of area wells, naturally occurring arsenic measurements in the City wells ranged from 0.00154 ppm to 0.0045 ppm, which is below the MCL of 0.010 ppm.

The following summarizes additional information from the 2016 CCR:

- Microbiological Contaminants: 193 samples taken during the required monitoring period to determine the presence of Total Coliform, Fecal Coliform, and E. coli.

    - 4 samples positive for the presence of Total coliform, but all samples were negative for Fecal or E. coli bacteria

- VOCs were tested in 2016 and none were detected
- SOCs were last tested in March 2010 and none were detected.
- Inorganic Contaminants and Radiological contaminants:
    - Lead: Initial tests at one location measured in 2016 had a level of 0.0012-0.019 parts per million (ppm) when the MCL is 0.015, but re-testing as directed by IDEQ following correct sampling procedures, resulted in tests below the MCL. No further action was required.

5.4.2 Regulatory Overview

This section summarizes the regulations that pertain to the City's groundwater supply sources. This regulatory review includes a summary of enacted and proposed legislation that pertains to the Safe Drinking Water Act (SDWA). The SDWA was passed by Congress in 1974 and amended twice, once in 1986 and again in 1996. The intent of these amendments was to strengthen the 1974 SDWA, primarily in setting regulations to ensure public water supplies are safe. The Environmental Protection Agency (EPA) was mandated by Congress to establish rules and regulations relating to the SDWA and subsequent Amendments.

The EPA has promulgated several rules and regulations to implement the SDWA in water systems. Those that apply to the City's water system are shown in **Table 5-4**.

Table 5-4
Drinking Water Rules

Regulation	Type	Rule
National Primary Drinking Water Regulations (NPDWR)	Chemical Contaminants	Arsenic
		Chemical Contaminant
		Lead and Copper
		Radionuclides
	Microbial Contaminants	Groundwater
		Total Coliform & Revised Total Coliform
	Right-to-Know	Consumer Confidence Report
		Public Notification
National Secondary Drinking Water Regulations (NSDWR)	Aesthetic	Aluminum, Chloride, Color, Copper, Foaming Agents, Iron, Manganese, pH, Sulfate, Threshold Odor Number, Total Dissolved Solids, Zinc
	Cosmetic	Fluoride, Silver
	Technical	Aluminum, Chloride, Copper, Corrosivity, Iron Manganese, pH, Total Dissolved, Solids, Zinc
Contaminant Candidate List		

5.5 Regulations

The SDWA was originally passed to protect public health by regulating the nation's drinking water supply. There are two basic mechanisms for regulation: 1) National Primary Drinking Water Regulations (NPDWR), also known as primary drinking water standards, and 2) National Secondary Drinking Water Regulations (NSDWR), also known as secondary drinking water standards.

Primary drinking water standards establish the MCLs and maximum contaminant goal levels (MCGL). MCLs are enforceable standards, while MCLGs are non-enforceable public health goals.

5.5.1 National Primary Drinking Water Regulations

The NPDWR rules are enforceable regulations that cover numerous contaminants and communication requirements. The City is in compliance with all NPDWRs. Due to the presence of Total Coliform in samples collected, the Groundwater Rule is one of the City's area of concern amongst the primary standards. Another area of concern is the lead and copper rule, the 2016 CCR listed an exceedance of the lead MCL by 0.04mg/L, the City retested and found the MCL not exceeded. The City is not required to test for disinfection byproducts because it chlorinates for such a short period each year.

5.5.1.1 Groundwater Rule

The Groundwater Rule seeks to reduce the risk of illness caused by microbial contamination and includes treatment technique requirements, compliance monitoring and source water monitoring. Treatment technique requirements include providing treatment that reliably achieves 4-log treatment of viruses and correcting all significant deficiencies. Compliance monitoring is composed of testing for minimum disinfectant residual concentrations. Source water monitoring adds fecal indicator bacterial testing of the water source, as well as regulatory steps, should a source water test return positive.

5.5.1.2 Revised Total Coliform Rule

The Revised Total Coliform Rule (RTCR) was published in 2013 with minor corrections in 2014 and is a revision to the Total Coliform Rule (TCR). The TCR establishes a zero MCL for total coliform (TC), which can be an indicator of disease-causing pathogens. The RTCR establishes testing procedures should a sampling location test positive for TC, including requiring that E. coli testing be done for any positive TC sample.

The required number of samples taken each month depends on the population served by the water system. **Table 5-5** provides a summary of the sampling requirements for various populations served. The City must currently collect at least 15 samples each month, but will soon exceed the population threshold in this category and be required to collect 20 samples per month and within the 20-year horizon will likely need to take 25 samples per month.

Table 5-5
TCR Sampling Requirements

Population Served	Minimum Number of Samples per Month
12,901 - 17,200	15
17,201 - 21,500	20
21,501 -25,000	25

5.5.1.3 Arsenic

The Arsenic Rule MCL is 0.01 mg/L. The MCLG for arsenic is zero. If any arsenic concentration exceeds ½ the MCL (0.005 mg/L), it must be reported in the annual Consumer Confidence Report. The City has naturally occurring arsenic in the groundwater supply, but it has consistently measured below the MCL.

5.5.1.4 Chemical Contaminant Rules

Chemical contaminants have been regulated in phases, which are referred to as the Chemical Contaminant Rules. The chemicals regulated fall in three categories: Inorganic Contaminants (IOCs), Synthetic Organic Contaminants (SOCs) and Volatile Organic Contaminants (VOCs). The Contaminant Rules regulate over 65 chemicals and establish recommended MCLGs and enforceable MCLs for each contaminant. The number of samples and monitoring frequency is based on numerous factors and can be reduced for some contaminants based on historic sampling levels. The Standardized Monitoring Framework is used to standardize, simplify, and consolidate drinking water monitoring requirements across the contaminant groups. The monitoring framework is divided into 9-year compliance cycles which are further divided into three 3-year compliance periods.

5.5.1.5 Lead and Copper

The Lead and Copper Rule (LCR) establishes action levels (AL) of 0.015 mg/L for lead and 1.3 mg/L for copper based on the 90th percentile of samples. An AL exceedance is not a violation, but can trigger other requirements including additional service and source monitoring, corrosion control treatment, public education, or lead service line replacement. Monitoring must occur at high-risk (i.e. lead service lines) consumer taps every 6 months, with two monitoring periods per calendar year, unless a system qualifies for reduced monitoring. Reduced monitoring eligibility is dependent on having optimal water quality parameters (OWQPs) for pH, alkalinity, calcium, conductivity, orthophosphate, silica, and temperature. The number of samples and the frequency can both be reduced if the OWQPs are met for certain numbers of consecutive monitoring periods.

All systems that exceed the lead or copper action level and all systems serving more than 50,000 persons are required to conduct corrosion control studies and develop a plan to optimize corrosion control at the customer tap. Corrosion control studies must compare the effectiveness of pH and alkalinity adjustment, calcium adjustment, and addition of a phosphate or silica-based corrosion inhibitor.

The minimum required number of samples is based on the population served and if it qualifies for reduced sampling. **Table 5-6** provides a summary of the sampling requirements for various populations served. Based on a reduced sample schedule, the City must currently collect at least 30 lead/copper tap samples and 7 water quality parameter (WQP) tap samples, based on a population of under 100,000. The City had one lead sample test above the MCL in 2016, but after retesting with proper procedure the retest was below the MCL and no further action was required.

Table 5-6
LCR Monitoring Requirements

System Size	Lead/Copper Tap Sample Sites		WQP Tap Sample Sites[1]	
	Standard	Reduced	Standard	Reduced
10,001-100,000	60	30	10	7
≥100,000	100	50	25	10

Note:
1. Two WQP tap samples are collected at each sampling site.

5.5.1.6 Radionuclides Rule

The Radionuclides Rule sets MCLs for combined radium-226 and radium-228, gross alpha particle radioactivity, beta photon emitter radioactivity, and uranium. The current MCL standards are combined radium of 5.0 pCi/L, gross alpha of 15.0 pCi/L (not including radon and uranium) and uranium of 30.0 µg/L. The MCL of beta photon emitters is 4 millirems (a traditional unit of radiation dose equivalent) per year.

5.5.1.7 Consumer Confidence Report Rule

The Consumer Confidence Report Rule requires systems to prepare and distribute an annual water quality report summarizing information about source water, detected contaminants, compliance, and educational information. The CCR must be mailed or directly delivered to customers by July 1 annually and sent to the DEQ Director. For systems serving over 100,000 people, the CCR must also be posted on the internet.

5.5.1.8 Public Notification Rule

The Public Notification Rule requires systems to inform customers of any violation of a NPDWR or any situation posing a risk to public health. Ten required elements must be present in each public notice. There are three tiers of violations and required response times for each, with the most severe, Tier 1, violation requiring notice within 24 hours.

5.5.2 National Secondary Drinking Water Regulations

The NSDWR set non-mandatory water quality standards for the 15 contaminants in **Table 5-7**. These are not enforceable, but recommended secondary maximum contaminant levels (SMCLs). They establish guidelines for managing aesthetic concerns such as taste, color, and odor that are not considered a risk to human health at the SMCL. Although the SMCLs are not enforced, public notice is required if the fluoride SMCL is exceeded.

Table 5-7
Secondary Drinking Water Standards

Contaminant	SMCL
Aluminum	0.05 - 2.0 mg/L
Chloride	250 mg/L
Color	15 color units
Copper	1.0 mg/L
Corrosivity	Non-corrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 TON (threshold odor number)
pH	6.5 - 8.5
Silver	0.1 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

5.5.3 Contaminant Candidate List

The 1996 amendment to the SDWA requires the EPA to list unregulated contaminants that are known, or anticipated to occur in public water systems. Every five years, the EPA must publish this list of contaminants called the Contaminant Candidate List (CCL). EPA uses the CCL to identify priority contaminants for decision making and information collection. After publishing, EPA must also review at least five contaminants from the list and determine if they will be regulated in a separate process called Regulatory Determinations.

5.6 Summary

The benchmark O&M information from six other utilities with groundwater supply in the region that were surveyed provides the City with a comparison of staffing, budgets, rates, and other system characteristics as needed when considering its operations. A general summary of the comparison is that the City ranks seventh in population served, second in average flow rates, and seventh in the number of water system O&M staff when compared to the other six utilities.

Overall, the City has a plentiful, high quality water source that it manages well. It communicates the quality of water in the system to customers through its annual Consumer Confidence Report. There are no future regulations anticipated to impact the City and the Contaminant Candidate List does not have a direct impact on the City's water system, since they do not currently impose any requirements on public water systems. However, the EPA may promulgate future regulations based on the listed contaminants, so the City should stay aware of potential future regulations.

Section **6**

Section 6

Capital Improvement Plan

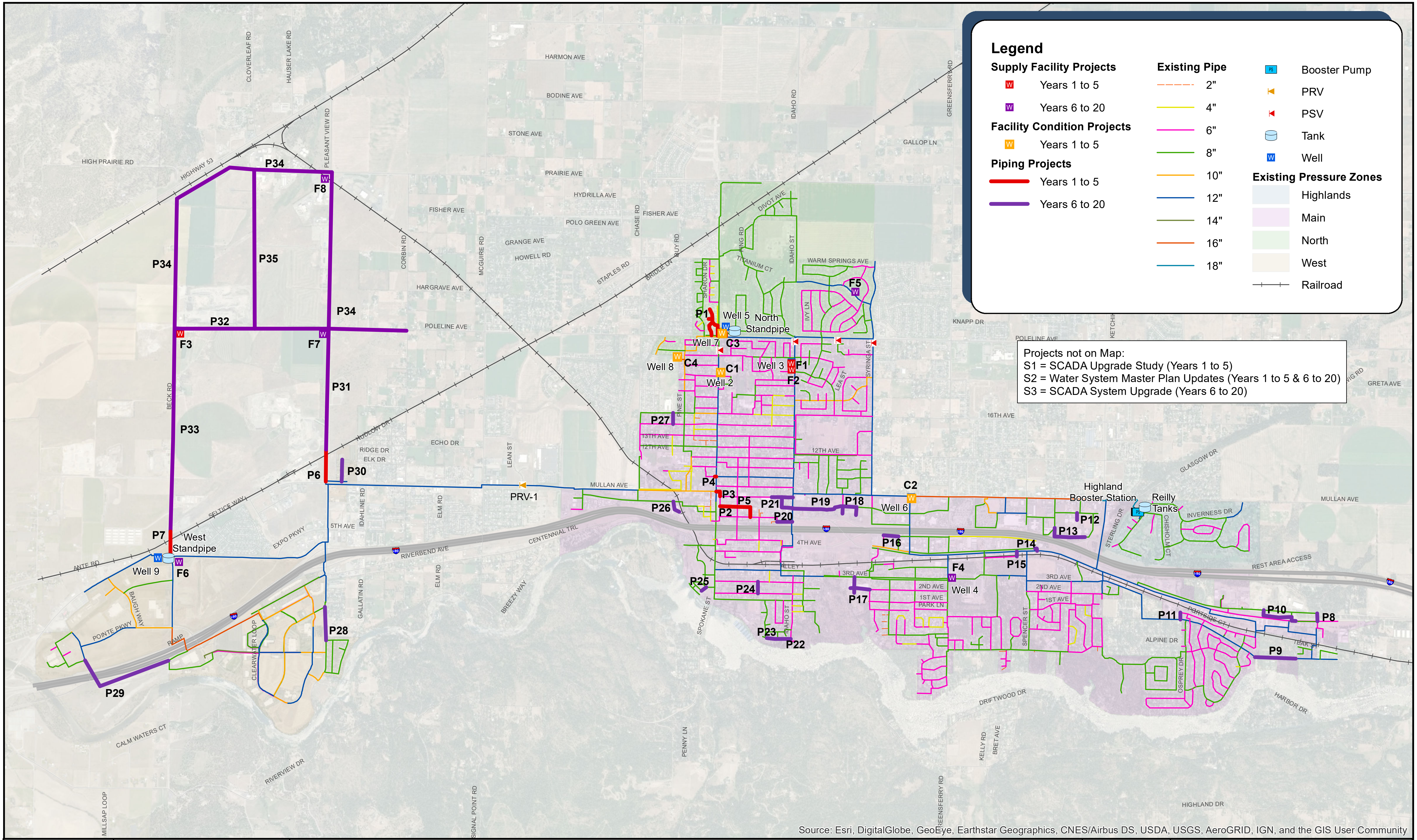
6.1 Introduction

This section describes the water system Capital Improvement Plan (CIP) for the City of Post Falls' (City's) service area to address deficiencies identified in **Section 3 – System Analysis** and **Section 4 – System Condition Evaluation**. It includes projects recommended for the next 5-years and those in the 6- to 20-year planning horizon. The recommended improvement projects are shown in **Figure 6-1** and summarized in **Tables 6-5** and **6-6**. The total cost of projects within the 5-year timeframe is approximately $7.8 million and within the 6- to 20-year timeframe is approximately $14.7 million (without developer funded projects), bringing the 20-year total to $22.5 million.

6.2 Cost Estimates

All project descriptions and estimates represent AACE International Class 5, planning-level accuracy and opinions of costs (+50%, -30%). Total project costs will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule, and other factors. During the design phase, final sizing, location, and project components should be verified and a Preliminary Engineering Report completed. As part of the Preliminary Engineering Report or predesign, the cost estimate should be refined. Therefore, project feasibility and any associated risks should be carefully reviewed prior to making specific financial decisions or establishing yearly project budgets to help ensure adequate project funding.

All project costs presented in this Water System Master Plan (WSMP) are developed in 2017 dollars (Sept. 2017 20-City ENR 10823), using the 2017 RSMeans Heavy Construction Cost Data (RSMeans), City input, construction costs for similar projects across the Northwest, and local contractor and supplier rates. The project costs presented in this WSMP include estimated construction charges, and allow for contingency, permitting, and engineering and administrative fees. Costs do not include any land or right-of-way acquisition and do not include any ongoing maintenance or operation expenses. Construction costs are based on the preliminary concepts and layouts of the water system components developed during the system analysis. The detailed cost methodology is presented in **Appendix D – Cost Estimating Methodology.**



Projects not on Map:
S1 = SCADA Upgrade Study (Years 1 to 5)
S2 = Water System Master Plan Updates (Years 1 to 5 & 6 to 20)
S3 = SCADA System Upgrade (Years 6 to 20)

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

murraysmith

CITY OF POST FALLS

City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

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Figure 6-1
Capital Improvement Projects

October 2017
16-1841

I:\BOI_Projects\16\1841 - Post Falls WSMP Update\GIS\MXD\Figure 6-1 CIP.mxd 10/12/2017 8:26:58 PM LH

6.3 Project Descriptions

Projects are intended to address deficiencies related to hydraulic capacity and condition. Most projects address fire flow pipeline deficiencies. The primary facility projects will add well supply to the system. The Main and West Zones will both need additional supply in the 5-year timeframe. The majority of growth is projected in the Stateline Industrial Area in the West Zone. New sources of supply and transmission piping will be required to serve this area. The City will coordinate with developers to provide adequate water supply and piping.

There are also a number of small HVAC upgrades to existing well facilities. The City would also like to make upgrades and improvements to the SCADA system, however a more in depth SCADA study is recommended to determine the best approach. Most of the system piping is less than 80-years old, however the City plans to begin implementation of a pipe replacement program now to manage long term system replacement costs. As the WSMP is updated on a regular schedule, projects, especially those beyond the 5-year horizon should be evaluated relative to actual and updated projections for growth within the system.

Projects are depicted in **Figure 6-1**. The location of projects, particularly new facilities, are approximate and specific locations will be determined during design. The projects are organized in two timeframes, those to be constructed over the next 5 years and those recommended for completion between years 6 through 20. Within the near-term, 5-year grouping, the projects are generally prioritized by year. In the long-term grouping for years 6 through 20, the projects are not placed in any particular order. For all projects, as the City annually reviews system growth, available budget, and other factors, the list of projects to be constructed will be determined and may vary somewhat from the recommendations in this section.

6.3.1 Projects Years 1 to 5

The projects prioritized over the next 5 years are intended to address the supply, condition, and piping deficiencies over the next 5 years. Additionally, two projects are for studies of the system, one to determine a SCADA upgrade plan and the other an update to this WSMP. A description of each project is provided below.

6.3.1.1 Supply Facility Projects Years 1 to 5

Three facility projects are recommended in the next 5 years. The first two are to increase capacity in the Main Zone to address deficiencies in the 5-year horizon and the third is to address existing supply deficiencies in the West Zone, which can be met in the near-term through the PRV connection with the Main Zone. The projects are in **Table 6-1**.

Table 6-1
Supply Facility Projects Years 1 to 5

ID	Type	Description	Cost
F1	New Well	Second Well at Well 3 Site New Well & Building 2000 gpm, 400ft pump design point	$1,838,000
F2	Well Rehab	Replace Well 3 pump and building Includes study of Well 3 capacity Does not include drilling a new well	$1,420,000
F3	New Well	New Well in West Zone New Well & Building 2000 gpm, 400ft pump design point	$1,838,000

6.3.1.1.1 F1 and F2 – Rehab of Well 3 and Second, New Well at Well 3 Site

Project F1 and F2 are at the same location, the existing Well 3 site. As a result, their designs, hydrogeologic impacts, and construction should be coordinated even if they are completed in phases. Both projects are intended to increase the capacity of the system to address the Main Zone supply deficiency in the 5-year horizon. Project F1 adds a new well to the system at this site and includes drilling a new well, site improvements, building the well house, installing mechanical and electrical components, and including a backup power generator. Project F2 would replace the existing Well 3, which is an old, small structure with restricted pump capacity as defined in **Section 4**, with a new well house and mechanical and electrical components. Project F1 could be combined with Project F2 to locate the wells within the same building, but this requires further evaluation during design. F1 includes a generator to supply backup power to the site. It should be configured so that the generator could operate either one of the well pumps, but not both simultaneously.

6.3.1.1.2 F3 – New Well in West Zone

The West Zone has an existing firm capacity supply deficiency since there is only one well in the zone. In the near-term the supply for the Zone can be provided from the Main Zone through the PRV connection. The ability of the PRV to serve as a redundant connection to provide adequate pressures in the West Zone is dependent on the available supply in the Main Zone, the PRV setting, and demand conditions in the West Zone. However, within the 5-year horizon, additional supply will be needed in the West Zone, primarily due to growth in the Stateline Industrial Area. F3 is a new well facility to address this need. The location of the new well is not set and should be based on where growth in the Stateline Industrial Area occurs, adequate transmission piping exists, and land is available for construction. One possibility is to construct the new well at the existing Well 9 site. Another option is to put it at the end of the transmission piping along Beck or Pleasant View Roads. Project F3 includes drilling a new well, site improvements, building the well house, mechanical and electrical components, and installing a backup power generator.

6.3.1.2 Facility Condition Projects Years 1 to 5

In addition to the condition issues addressed through Project F2, four facility condition projects are recommended in the next 5 years. These projects address condition issues in existing facilities, as described in **Section 4**. The facility condition projects are in **Table 6-2**.

Table 6-2
Facility Condition Projects Years 1 to 5

ID	Type	Description	Cost
C1	HVAC	Upgrade the HVAC System at Well 2A	$25,000
C2	HVAC & Access	Upgrade the HVAC System and construct additional access at Well 6	$50,000
C3	HVAC	Upgrade the HVAC System at Well 7	$20,000
C4	HVAC	Upgrade the HVAC System at Well 8	$20,000

6.3.1.2.1 C1 through C4 – HVAC Upgrades to Existing Well Facilities

The primary condition issue addressed by each facility project involve upgrades to the HVAC system to improve ventilation and operation of the control system. Project C2 also adds another access point to Well 6, since the current access is on an arterial street, making it difficult to access and use cranes or other maintenance equipment at the facility.

6.3.1.3 Study Projects Years 1 to 5

Two system evaluations are recommended in the next 5 years. The two projects to evaluate the SCADA and update this WSMP are listed in **Table 6-3**.

Table 6-3
Study Projects Years 1 to 5

ID	Type	Description	Cost
S1	SCADA Study	Commission a study of SCADA upgrade options	$75,000
S2	Master Plan Update	Update the Water System Master Plan every 5 years	$150,000

6.3.1.3.1 S1– SCADA Upgrade Study

The City would like to do a comprehensive upgrade to its SCADA system to improve communication, operations, and accessibility of the system data. This project will evaluate SCADA system upgrade alternatives and define a recommended improvement plan for completion of the actual upgrade within the 20-year horizon. The actual upgrades are defined as project S3 in the 6- to 20-year CIP.

6.3.1.3.2 S2 – Master Plan Updates

To continue to evaluate and assess the condition of and growth within the system, it is recommended that the City continue to update this WSMP every 5 years. This allows near-term, 5-year projections, to be made and updated with current information, leading to more accurate evaluations of the system and periodic updates to this CIP.

6.3.1.4 Piping Projects Years 1 to 5

The pipeline projects recommended in the 5-year horizon address existing fire flow deficiencies or new transmission lines to extend service to the Stateline Industrial Area. There is also a small amount budgeted each year to build budget reserves for a pipeline replacement program. The pipe projects are listed in Table 6-4.

6.3.1.4.1 P1 through P5 – Fire Flow Improvements

The fire flow improvement projects involve replacing undersized pipe and making loops to improve capacity in particular areas of the system. In some instances, there may be alternatives to address the deficiencies for each project. For example, although the existing pipe in Project P1 is undersized (4-inch), and the project includes upsizing all the piping, the deficiency may also be addressed by adding one or more hydrants to the 8-inch line along Spokane Street to provide adequate fire flows.

6.3.1.4.2 P6 and P7 – Transmission Lines

The two near-term Stateline Industrial Area projects extend transmission mains north of the railroad tracks. As development occurs, these transmission mains will continue north along Beck and Pleasant View Roads. The size of the pipes was based on serving fire flow and build-out demand in the area.

6.3.1.4.3 Pipe Replacement

Although most pipe in the system is less than 80 years old and does not need to be replaced now, the City should plan to save money annually to implement a formal pipeline replacement program over the coming years, as the infrastructure ages. Data should be collected on breaks and condition issues in the coming years to inform the expected life cycle of pipe. Although the exact life of pipe, particularly modern PVC is not known, the annual amount budgeted will need to be evaluated and likely increased over the coming years. A current industry benchmark is to anticipate a 100-year life cycle, which equates to 1 percent of the system being replaced annually. Based on the current length of pipe in the system, that would be approximately 6,400 feet or 1.25 miles annually, which would cost approximately $1.25 million annually.

Table 6-4
Piping Projects Years 1 to 5

ID	Type	Description	Cost
P1	Pipe	Crestview Dr and Bradley Dr Upsize 1,690 ft of existing 4" to 6" and 8" pipe	$297,000
P2	Pipe	William St and 7th Ave Upsize 590 ft of 4" to 8" pipe	$106,000
P3	Pipe	Mullan and Spokane St Upsize 290 ft of 4" to 8" pipe	$52,000
P4	Pipe	9th Ave and Spokane St Install 60 ft of new 12" pipe	$17,000
P5	Pipe	Henry St and 7th Ave Upsize 450 ft of 2" to 8" pipe Install 340 ft of 8" pipe	$140,000
P6	Pipe	Pleasant View Rd from Seltice Way to Across RR Tracks Install 1,090 ft of 18" pipe	$782,000
P7	Pipe	Beck Rd from South of Seltice Way to Across RR Tracks Install 820 ft of 18" pipe	$676,000
Annual Pipe Replacement	Pipe	Annual Pipe Replacement ($50,000/yr)	$250,000

6.3.1.5 Project Timing Years 1 to 5

The projects recommended over the next 5 years are scheduled by year primarily based on the timing of the need and availability of funding. **Table 6-5** shows the projects outlined by year. The larger facility and piping projects are generally spread across two years, with the design occurring first and the construction costs in the second year. This timing was used in the financial analysis completed in **Section 7 – Financial Evaluation**, however as the City annually reviews system growth, available budget, and other factors, the list of projects to be constructed will be refined and may vary somewhat from these recommendations.

Table 6-5
Capital Improvement Project Timeline Years 1 to 5

ID	Type	Cost by Year				
		FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
F1	New Well	$300,000	$1,538,000			
F2	Well Rehab		$220,000	$1,200,000		
F3	New Well				$300,000	$1,538,000
C1	HVAC		$25,000			
C2	HVAC & Access			$50,000		
C3	HVAC				$20,000	
C4	HVAC					$20,000
S1	SCADA Study	$75,000				
S2	Master Plan Update					$150,000
P1	Pipe	$70,000	$227,000			
P2	Pipe	$106,000				
P3	Pipe	$52,000				
P4	Pipe		$17,000			
P5	Pipe					$140,000
P6	Pipe				$181,000	$601,000
P7	Pipe				$156,000	$520,000
Annual Pipe Replacement	Pipe	$50,000	$50,000	$50,000	$50,000	$50,000
Total		**$653,000**	**$2,077,000**	**$1,300,000**	**$707,000**	**$3,019,000**

6.3.2 Projects Years 6 to 20

The projects projected beyond the next 5 years primarily add supply to the system, address fire flow deficiencies, and further extend transmission piping to serve the Stateline Industrial Area. It is likely that developer contributions will fund or construct some pipelines needed to accommodate growth. There is also money allocated to complete WSMP updates every 5-years. A placeholder budget number is also allocated to implement SCADA system upgrades based on the results of the study conducted in the 5-year horizon, which will need to be reviewed and updated based on the study recommendations. Scheduling of the projects in the 20-year horizon is not prioritized since the exact timing and needs, particularly for additional supply, should be based on updated future system demand conditions, which will be determined during each 5-year WSMP update. A list and description of each project recommended in the 6- to 20-year horizon is in **Table 6-6**. To facilitate locating the projects on **Figure 6-1**, the piping projects are generally in numeric order from the southeast to northwest of the system.

Table 6-6
Capital Improvement Projects Years 6 to 20

ID	Type	Description	Cost
F4	Well Rehab	Replace Well 4 pump and building Does not include drilling a new well	$1,420,000
F5	New Well	New Well in North Zone New Well & Building 2000 gpm, 400ft pump design point	$1,838,000
F6	New Well	New Well in West Zone New Well & Building 2000 gpm, 400ft pump design point	$1,838,000
F7	New Well	New Well in West Zone New Well & Building 2000 gpm, 400ft pump design point	$1,838,000
F8	New Well	New Well in West Zone New Well & Building 2100 gpm, 400ft pump design point	$1,838,000
S2	Master Plan Update	Update the Water System Master Plan every 5 years ($150,000/update)	$450,000
S3	SCADA Upgrade	SCADA System Upgrade	$500,000
P8	Pipe	Seltice Way and Commerce Loop Install 280 ft of new 8" pipe	$49,000
P9	Pipe	Maplewood Ave and Teak St Install 1,400 ft of 12" pipe	$320,000
P10	Pipe	Seltice Way and Commerce Loop Upsize 1,240 ft of 6" to 10" pipe Install 190 ft of new 10" pipe	$289,000
P11	Pipe	Cedar St and Portside Ct Install 230 ft of new 12" pipe	$54,000
P12	Pipe	Covington Ave and Regal St Upsize 240 ft of 6" to 10" pipe	$50,000
P13	Pipe	Primrose Ln and Thornton St Install 1,340 ft of new 10" pipe	$271,000
P14	Pipe	Seltice Way north of 3rd Ave Install 150 ft of new 12" pipe	$40,000
P15	Pipe	Seltice Way and Spencer St Install 180 ft of new 12" pipe	$247,000
P16	Pipe	Schneidmiller Ave and Vest St Install 510 ft of new 8" pipe	$91,000
P17	Pipe	2nd Ave and Bay St Upsize 670 ft of 6" to 8" and 12" pipe Install 530 ft of new 12" pipe	$276,000

ID	Type	Description	Cost
P18	Pipe	Polston Ave between Shetland Ct and Calgary Ct Upsize 1,000 ft of 6" and 8" to 10" pipe	$202,000
P19	Pipe	Polston Ave east of Idaho St Upsize 1,740 ft of 6" to 10" pipe	$352,000
P20	Pipe	Idaho St and 6th Ave Upsize 520 ft of 6" to 12" pipe	$120,000
P21	Pipe	Brigger St and 8th Ave Upsize 1,440 ft of 4" to 8" and 12" pipe	$295,000
P22	Pipe	Idaho St and Anchor Way Upsize 550 ft of 4" pipe to 8"	$98,000
P23	Pipe	Idaho St and Anchor Way Install 270 ft of new 8" pipe	$47,000
P24	Pipe	Post St between 1st Ave and 2nd Ave Upsize 400 ft of 4" to 8" pipe	$71,000
P25	Pipe	McReynolds Dr and 2nd Ave Install 200 ft of new 8" pipe	$36,000
P26	Pipe	Off Seltice Way east of Chase Rd Upsize 450 ft of 8" to 10" pipe	$92,000
P27	Pipe	Fir St from 15th Ave to 14th Ave Install 380 ft of new 8" pipe	$68,000
P28	Pipe	Pleasant View Rd from Highwater Dr to Lochsa St Install 1,140 ft of new 8" pipe	$201,000
P29	Pipe	Cabela Way and South of I-90 Install 3,510 ft of new 12" pipe	$807,000
P30	Pipe	Boulder Ct Upsize 750 ft of 8" to 12" pipe	$173,000
P31[1]	Pipe	Pleasant View Rd from North of RR Tracks to Poleline Ave Install 4,120 ft of 18" pipe	$1,613,000
P32[1]	Pipe	Poleline Ave from Corbin Rd to Beck Rd Install 5,245 ft of 18" pipe	$2,053,000
P33[1]	Pipe	Beck Rd from North of RR Tracks to Poleline Ave Install 6,930 ft of 18" pipe	$2,713,000
P34[1]	Pipe	Connecting Beck Rd and Pleasant View Rd from Poleline Ave to Prairie Ave & along Poleline Ave to Corbin Rd Install 17,980 ft of 18" pipe	$7,925,000
P35[1]	Pipe	Kira St from Prairie Ave to Poleline Rd Install 5,420 ft of 12" pipe	$1,499,000
Annual Pipe Replacement	Pipe	Annual Pipe Replacement ($50,000/year)	$750,000
Total			**$14,721,000[2]**

Notes:

1. Project planned to be funded by development.
2. Does not include projects planned to be funded by developers.

6.4 Summary

Recommended projects are divided across two time periods, those required within 5 years and those in years 6 through 20. Projects are designed to address system deficiencies projected during these time periods, but should be evaluated annually through City reviews of demand growth, available budget, and development. Projects in the 5-year period have been scheduled annually, while those in the 6- to 20-year period are not specifically ordered and should be prioritized during the 5-year WSMP updates.

A number of fire improvement projects that primarily consist of upsizing or looping pipes are recommended to address existing deficiencies, but are scheduled across the 20-year timeframe. The well projects are to add additional supply to the system to meet projected demand requirements. The only existing supply deficiency is in the West Zone, which can be addressed by supply in the Main Zone through the PRV connection. However, within the 5-year horizon additional supply will be required to meet demand in both the Main and West Zones. The City also plans to begin implementing a pipe replacement program to address aging infrastructure. SCADA projects will improve operations and the City's operation data collection. All projects to address future deficiencies should be evaluated with production trends and development, particularly those intended to serve the new Stateline Industrial Area.

Section 7

Section 7

Financial Evaluation

7.1 Introduction

This section presents the water system financial evaluation completed for the City of Post Falls' (City's) water system as part of the Water System Master Plan update. Galardi Rothstein Group performed a financial analysis, assisting Murraysmith, to help the City develop a water rate strategy and financial plan to fund the capital projects recommended in **Section 6 – Capital Improvement Plan.** The financial plan provides the framework to analyze the overall impact on water rates based on implementing the 5-year water system improvements with continued operation and maintenance of the system. The building blocks of the financial plan are the projections of costs that the City will incur during the planning period and the revenues, under the existing rate structure, that the City expects to generate during the same period.

7.2 Key Forecast Assumptions

The financial plan is based on a set of overall assumptions related to customer growth, inflation, and other factors, as well as the phasing of the water system Capital Improvement Plan (CIP). The following is a list of key assumptions used in the forecast:

- Annual customer growth is estimated to average 0.25 percent throughout the study period.
- O&M costs are based on the current fiscal year (FY2016/17) budget estimates and cost escalation (a combination of inflation and system growth). Specific escalation factors used are:
    - Salary costs: 4.0%
    - Benefit costs: 5.0%
    - Material and supplies costs: 3.0%
    - General cost escalation rate (for non-specified categories): 3.0%
- Future capital costs are increased at an annual rate of 3.0%.
- Annual rate increases are assumed to take effect at the start of each fiscal year (FY).
- Non-rate revenues will remain at FY2016/17 budgeted levels.
- Interest earnings on fund balances and reserves are estimated to accrue at a rate of 0.5% annually.

Each component of the baseline financial projection is discussed in more detail in the following sections.

7.3 Expenses

To develop adequate revenues from water rates, the annual expenses of the system must be determined. The basic revenue requirements are composed of the following:

- Operation and maintenance (O&M) costs;
- Annual capital improvement project costs funded by rates and reserves (cash outlays or pay as you go capital).
- Debt service expenditures (principal and interest on long-term debt).
- Transfers to the City's General Fund for support services.

Revenue requirements are presented by fiscal year through FY2022/23.

7.4 Operating Costs

Operation and maintenance costs include all costs associated with operating and maintaining the system, including personnel, materials and services, and routine capital outlay. Water system operating costs are projected for the study period based on the City's FY2016/17 budget and the assumed escalation rates presented previously.

Table 7-1 provides a summary of projected operating costs for the water system for FY2016/17 through FY2022/23. Annual costs are about $2.0 million currently, including routine capital outlays, transfers to other funds, and contingency. Contingency ensures a minimum of 30-days of operating expenses remain in the account. The largest component of operating costs is materials and services currently at $0.6 million, of which about one-half is electricity costs. Personnel costs and transfers are both just over $0.5 million annually for FY2016/17. Future operating costs are projected to increase to almost $2.5 million in FY2022/23.

7.4.1 Capital Costs

Table 7-2 provides a summary of the 6-year recommended CIP with inflation adjustments. **Section 6** identifies projects in 5-year increments, however, since the most recent budget numbers are for FY2016/17 and implementation of the CIP will not occur until FY2018/19, beyond a pipe replacement allocation in FY2017/18, this financial analysis includes 6 years of forecast information. Based on the anticipated project schedules and an estimated annual capital cost escalation rate of 3.0 percent, the total, inflation-adjusted CIP over the 6-year planning period is approximately $8.9 million.

Table 7-1
Operating Costs

Item	Budget	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Personnel	$552,633	$576,670	$701,764[1]	$700,764	$731,030	$762,619	$795,589
Materials & Services	$623,961	$642,680	$661,960	$681,819	$702,274	$723,342	$745,042
Other Expenses	$1,500	$1,500	$1,545	$1,591	$1,639	$1,688	$1,739
Capital Outlay	$216,500	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000
Transfers to Other Funds	$531,082	$547,014	$563,425	$580,327	$597,737	$615,669	$634,139
Contingency	$96,953	$100,467	$112,341	$113,899	$118,075	$122,411	$126,913
Total Operating Costs	**$2,022,629**	**$2,148,331**	**$2,321,035**	**$2,358,400**	**$2,430,756**	**$2,505,730**	**$2,583,422**

Note:
1. FY2018-19 Personnel costs reflect the addition of a new operator position that includes a one-time expense and ongoing salary and benefit costs

Table 7-2
Capital Improvement Plan Costs (Adjusted for Inflation)

Project ID	Project	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23	Total
F1	Second Well at Well 3 Site	$0	$309,000	$1,631,664	$0	$0	$0	$1,940,664
F2	Replace Well 3 pump and building	$0	$0	$233,398	$1,311,272	$0	$0	$1,544,670
F3	New Well in West Zone	$0	$0	$0	$0	$337,653	$1,782,964	$2,120,617
P1	Crestview Dr and Bradley Dr	$0	$72,100	$240,824	$0	$0	$0	$312,924
P2	William St and 7th Ave	$0	$109,180	$0	$0	$0	$0	$109,180
P3	Mullan and Spokane St	$0	$53,560	$0	$0	$0	$0	$53,560
P4	9th Ave and Spokane St	$0	$0	$18,035	$0	$0	$0	$18,035
P5	Henry St and 7th Ave	$0	$0	$0	$0	$0	$162,298	$162,298
P6	Pleasant View Rd from Seltice Way to Across RR Tracks	$0	$0	$0	$0	$203,717	$696,724	$900,441
P7	Beck Rd from South of Seltice Way to Across RR Tracks	$0	$0	$0	$0	$175,579	$602,823	$778,402
S1	Commission a study of SCADA upgrade options	$0	$77,250	$0	$0	$0	$0	$77,250
C1	Upgrade the HVAC System at Well 2A	$0	$0	$26,523	$0	$0	$0	$26,523
C2	Upgrade the HVAC System put additional access at Well 6	$0	$0	$0	$54,636	$0	$0	$54,636
C3	Upgrade the HVAC System at Well 7	$0	$0	$0	$0	$22,510	$0	$22,510
C4	Upgrade the HVAC System at Well 8	$0	$0	$0	$0	$0	$23,185	$23,185
S2	Update the Water System Master Plan	$0	$0	$0	$0	$0	$173,891	$173,891
	Annual Pipe Replacement	$300,000	$51,500	$53,045	$54,636	$56,275	$57,964	$573,420
Total		**$300,000**	**$672,590**	**$2,203,489**	**$1,420,544**	**$795,734**	**$3,499,849**	**$8,892,206**

7.5 Revenue

Service (rate) revenues are generally the main source of funding for water system revenue requirements. Other revenue sources available to fund a portion of the annual revenue requirements for the water system include investment income, miscellaneous revenue, and other fees and charges (e.g., account set-up and turn on/off fees). Expenses in past years have been less than revenue sources on an average basis so the City also has fund balances available to use on future expenses.

7.5.1 Existing Fund Balances

The City has current available balances in the operating and capital funds. The balance for FY2016/17 is shown in **Table 7-3**.

Table 7-3
Fund Beginning Balances

Fund	FY 2016-17 Beginning Balance
Capital	$8,334,997
Operating	$6,377,899

7.5.2 Existing Water Rates

The City last modified rates in August 2017. The current rate schedule is shown in **Table 7-4**. The adopted rates include a monthly base fee that varies by meter size. A volume charge is assessed based on actual water usage and is the same for all meter sizes. The volume charge is based on a 2-block inclining rate structure, where use up to 49,000 gallons is charged at $1.17 per 1,000 gallons, and usage over 49,000 gallons is charge $1.68 per 1,000 gallons.

Table 7-4
Current Water Rates (Effective 10/1/17)

Meter Size	Monthly Base Fee
1” or less	$10.71
1-1/2”	$17.94
2”	$26.68
3”	$47.14
4”	$76.16
6”	$148.94

Volume Charge (per 1,000 gallons)	
Block 1 (0-49,000 gallons)	$1.17
Block 2 (50,000+ gallons)	$1.68

7.5.3 Other Revenues

Other operating revenues, including interest income and meter installation charges, have also been projected for the study period. Other operating revenues are projected to total less than $200,000 per year through the study period.

The City also receives Cap fees from new development to help fund a portion of capital improvements. Cap fee revenue is estimated to be about $140,000 per year.

7.6 Revenue Requirements

An analysis was done to determine how the City's existing revenue sources compare to expenses and what the financial forecast looks like over the next 6-years. Maintaining adequate financial reserves, while making needed system improvements, and continuing to effectively operate the system are all priorities that must be balanced with water rate revenues, which fund most of the budget, with minimal non-rate revenue (e.g., interest or meter installation fees).

Table 7-5 shows how the estimated FY2016/17 revenue from rates, about $2.3 million, is distributed across major expense categories. Operating costs for FY2016/17 are $1.7 million. After offsetting operating expenses by revenue from sources other than rates (non-rate revenues), which were $0.2 million in FY2016/17, 73 percent ($1.5 million) of revenue from rates was used for operating costs. After operating costs, about $0.8 million remains for capital-related costs. As shown in **Table 7-5**, existing debt service and routine capital outlay are each about $0.2 million, and the City budgeted $0.4 million in FY2016/17 to transfer to the capital fund for future capital replacement.

Projected revenue requirements for the next 6-years are also shown in **Table 7-5**. Annual operating transfers to the capital fund are assumed to range from $0.75 million to $1.5 million, and are funded in part by annual rate revenue and existing operating fund balances. Rate increases will be necessary to generate the revenues required to support the proposed capital improvements and fund ongoing operating costs, while preserving a portion of existing fund balances for future expenses. An annual rate adjustment of 3 percent is projected through FY2022/23 to generate revenues approximating those shown in **Table 7-5** (when customer growth is incorporated). This rate increase funds the projected expenses through the 6-year period without the City acquiring any new debt for the water system.

To the extent that actual key variables differ from those projected in this financial plan, it may be necessary to modify the rate increases in the future.

Table 7-5
Revenue Requirements from Rates

Source	Item	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Revenue Requirements	Operating Costs[1]	$1,709,176	$1,767,864	$1,928,694	$1,964,502	$2,032,680	$2,103,318	$2,176,509
	Capital Outlay	$216,500	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000
	Debt Service	$220,350	$220,250	$219,925	$219,450	$218,350	$216,613	$219,613
	Capital Fund Transfers	$378,851	$1,500,000	$750,000	$750,000	$750,000	$750,000	$750,000
	Total Requirements	*$2,524,877*	*$3,768,114*	*$3,178,619*	*$3,213,952*	*$3,281,030*	*$3,349,931*	*$3,426,122*
Non-rate Revenue	Interest	$25,000	$36,889	$31,114	$28,651	$26,405	$24,232	$22,138
	Other Fees and Charges	$159,200	$159,200	$159,200	$159,200	$159,200	$159,200	$159,200
	Non-rate Revenue Subtotal	*$184,200*	*$196,089*	*$190,314*	*$187,851*	*$185,605*	*$183,432*	*$181,338*
Amount Used for Capital Project from Existing Operating Fund Balance		*$0*	*$1,155,100*	*$492,649*	*$449,149*	*$434,529*	*$418,924*	*$407,707*
Net Requirements from Water Rates		**$2,340,677**	**$2,416,925**	**$2,495,656**	**$2,576,952**	**$2,660,896**	**$2,747,575**	**$2,837,077**

Note:
1. Operating expenses excluding contingency and capital outlay

7.7 Financial Performance Targets

Table 7-6 and **Table 7-7** present the expected changes in fund balance for the City's operating and capital funds, respectively, for the current year and 6-year period ending September 30, 2023 based on the 3 percent rate increase and projected expenses for each fund shown in **Table 7-1** and **Table 7-2**. **Table 7-8** presents just the forecasted operating expense results for the same period.

7.7.1 Fund Balances

As shown in **Table 7-6**, the City's beginning operating fund balance in FY2016/17 was about $6.4 million. The forecast revenue requirements also include an operating contingency of 30 days of O&M; however, contingency funds are not assumed to be spent, so they roll forward to the next year's beginning fund balance. As mentioned previously, operating fund balances are projected to decrease over the study period, as funds are transferred to capital. The ending fund balance in FY2022/23 is projected to be $3.0 million.

Table 7-7 shows that the beginning capital fund balance in FY2016/17 was about $8.3 million. As some existing funds will be applied to CIP projects within the planning period, the ending fund balance in FY2022/23 is projected to be $5.8 million. The CIP identifies future significant capital needs over the 20-year period; therefore, it is necessary to preserve some funds for planned future expenditures.

7.7.2 Debt Service Coverage

The City currently has outstanding water system revenue refunding bonds (Series 2012). As such, the City is required to report revenue bond coverage, which is equal to net revenues available for debt service, divided by annual debt service. Net revenues available to pay debt service are calculated as operating revenues minus operating expenses. As shown in **Table 7-7**, the City's debt service coverage is expected to range from 3.7 to 3.8 during the study period.

Table 7-6
Operating Fund Sources and Uses

Source	Item	Budget	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
		FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Beginning Balance		**$6,377,899**	**$6,377,899**	**$5,222,799**	**$4,730,150**	**$4,281,000**	**$3,846,471**	**$3,427,547**
Income	Investment Income	$20,000	$31,889	$26,114	$23,651	$21,405	$19,232	$17,138
	Designated Investment Income	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
	Utility Collection	$2,340,677	$2,416,924	$2,495,656	$2,576,952	$2,660,896	$2,747,575	$2,837,077
	Utility Penalty-Svc Fee	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
	Miscellaneous Income	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
	Other Fees and Charges	$132,200	$132,200	$132,200	$132,200	$132,200	$132,200	$132,200
	Income Subtotal	*$2,524,877*	*$2,613,014*	*$2,685,970*	*$2,764,803*	*$2,846,501*	*$2,931,007*	*$3,018,415*
Total Available Funds		***$8,902,776***	***$8,990,913***	***$7,908,769***	***$7,494,952***	***$7,127,501***	***$6,777,478***	***$6,445,962***
Expenses	O&M Costs	$1,176,594	$1,219,350	$1,363,725	$1,382,583	$1,433,304	$1,485,961	$1,540,631
	Capital Outlay	$216,500	$280,000	$280,000	$280,000	$280,000	$280,000	$280,000
	Debt Service	$220,350	$220,250	$219,925	$219,450	$218,350	$216,613	$219,613
	Replacement/Capital Fund Transfers	$378,851	$1,500,000	$750,000	$750,000	$750,000	$750,000	$750,000
	Other Transfers	$531,082	$547,014	$563,425	$580,327	$597,737	$615,669	$634,139
	Other Expenses	$1,500	$1,500	$1,545	$1,591	$1,639	$1,688	$1,739
	Expenses Subtotal	*$2,524,877*	*$3,768,114*	*$3,178,620*	*$3,213,951*	*$3,281,030*	*$3,349,931*	*$3,426,122*
	Contingency (30-day reserve)	$96,953	$100,467	$112,341	$113,899	$118,075	$122,411	$126,913
Ending Balance		**$6,377,899**	**$5,222,799**	**$4,730,149**	**$4,281,001**	**$3,846,471**	**$3,427,547**	**$3,019,840**
Net Change in Balance from Beginning of FY		$0	($1,155,100)	($492,650)	($449,149)	($434,529)	($418,924)	($407,707)

Table 7-7
Capital Fund Sources and Uses

Source	Item	Budget	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
		FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22	FY 2022-23
Beginning Balance		**$8,299,997**	**$8,334,997**	**$9,716,672**	**$9,982,665**	**$8,719,089**	**$8,232,140**	**$8,367,566**
Income	Investment Income	$20,000	$41,675	$48,583	$49,913	$43,595	$41,161	$41,838
	Cap Fees	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000	$140,000
	Transfers In	$0	$1,500,000	$750,000	$750,000	$750,000	$750,000	$750,000
	Income Subtotal	*$160,000*	*$1,681,675*	*$938,583*	*$939,913*	*$933,595*	*$931,161*	*$931,838*
Total Available Funds		***$8,459,997***	***$10,016,672***	***$10,655,255***	***$10,922,578***	***$9,652,684***	***$9,163,301***	***$9,299,404***
Expenses	Capital Projects	$125,000	$300,000	$672,590	$2,203,489	$1,420,545	$795,735	$3,499,848
	Expenses Subtotal	*$125,000*	*$300,000*	*$672,590*	*$2,203,489*	*$1,420,545*	*$795,735*	*$3,499,848*
Ending Balance		**$8,334,997**	**$9,716,672**	**$9,982,665**	**$8,719,089**	**$8,232,139**	**$8,367,566**	**$5,799,556**
Net Change in Balance from Beginning of FY		$35,000	$1,381,675	$265,993	($1,263,576)	($486,950)	$135,426	($2,568,010)

Table 7-8
Projected Operating Fund Results

Source	Item	Budget FY 2016-17	Forecast FY 2017-18	Forecast FY 2018-19	Forecast FY 2019-20	Forecast FY 2020-21	Forecast FY 2021-22	Forecast FY 2022-23
Income	Water Sales Revenue	$2,340,677	$2,416,924	$2,495,656	$2,576,952	$2,660,896	$2,747,575	$2,837,077
	Interest	$25,000	$36,889	$31,114	$28,651	$26,405	$24,232	$22,138
	Other Fees and Charges	$159,200	$159,200	$159,200	$159,200	$159,200	$159,200	$159,200
	Total Operating Revenue	***$2,524,877***	***$2,613,013***	***$2,685,970***	***$2,764,803***	***$2,846,501***	***$2,931,007***	***$3,018,415***
Expenses	Personnel and Materials & Service	$1,176,594	$1,219,350	$1,363,725	$1,382,583	$1,433,304	$1,485,961	$1,540,631
	Non-capital Transfers	$531,082	$547,014	$563,425	$580,327	$597,737	$615,669	$634,139
	Other	$1,500	$1,500	$1,545	$1,591	$1,639	$1,688	$1,739
	Total Operating Expenses	***$1,709,176***	***$1,767,864***	***$1,928,695***	***$1,964,501***	***$2,032,680***	***$2,103,318***	***$2,176,509***
Net Revenue Available for Debt Service		$815,701	$845,149	$757,275	$800,302	$813,821	$827,689	$841,906
Debt Service		$220,350	$220,250	$219,925	$219,450	$218,350	$216,613	$219,613
Total Debt Service Coverage		**3.70**	**3.84**	**3.44**	**3.65**	**3.73**	**3.82**	**3.83**

7.8 Summary

7.8.1 Rate and Revenue Increases

In FY2016/17, revenue from existing rates is estimated to be $2.3 million. By FY2022/23 the amount of revenue needed from rates, is projected to increase to $2.8 million, assuming the use of some existing fund balances. The increased rate revenue requirement is due to ongoing increases in O&M expenses, as well as increases in cash outlays and transfers to fund the capital projects identified in Section 6.

To fund the projected revenue requirements, and to maintain a portion of existing cash reserves, an annual rate increase of 3 percent is projected for the planning period through FY2022/23. This rate increase is based on the assumptions outlined in this section and will fund $8.9 million in capital projects while maintaining ongoing operations without the City assuming any new debt. The analysis results in a projected change in the operating fund balance from $6.4 million in FY2016/17 to $3.0 million in FY2022/23. The capital fund balance will change from $8.3 million to $5.8 million over the same period.

7.8.2 Financial Planning Update

The financial plan presented in this report is based on available information on revenue and expenditures as of September 2016, the last year for which final financial data was available at the time of this study. It is anticipated that changes will occur over time between assumed and actual conditions causing differences in the financial plan. Therefore, it is important that the City continue to monitor the financial plan annually, and make adjustments as needed.

Among the variables that could impact future rate increases are changes in customer growth and water consumption patterns. Over the past several years, the City has observed fluctuating water use. The financial plan assumes modest customer growth averaging 0.25 percent per year over the forecast period, and water use consistent with recent budgeted volumes.

Appendix

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APPENDIX A

Appendix A

North Standpipe Analysis

A.1 Introduction

As part of the Water System Master Plan (WSMP) update for the City of Post Falls (City), an evaluation was done of the North Zone operational settings to determine the cause of the observed overflows of the North Standpipe. The City has reduced the operational range of the North Standpipe to address these overflows. This analysis assesses the potential cause of the overflows and impacts on system pressures and tank operational range. This appendix documents the analysis and conclusions, including the possible sources filling the North Standpipe and any system or control changes to expand the operational range and prevent future overflows.

A.2 Background

The City's water distribution system has three pressure zones. The highest-pressure zone is the North Zone, served by the North Standpipe, which has an overflow elevation of 2,386 feet. The North Zone includes two sources of supply, Well 7 and Well 5. The Main Zone is the largest pressure zone in the system. The Main Zone storage tanks (Reilly #1 and #2) have a slightly lower overflow elevation of 2,356 feet. Several sources of supply serve the Main Zone and some are located near the boundary of the Main Zone with the North Zone. **Figure 1** shows the North Zone and Main Zone boundary, as well as the location of supplies and storage tanks for each zone. Four pressure sustaining valves (PSVs) are located at the pressure boundary between the Main Zone and the North Zone, as shown in **Figure 1**. The PSVs allow supply from the North Zone to feed the Main Zone, if a minimum hydraulic grade line (HGL) in the North Zone is maintained. Manually operated isolation valves otherwise isolate the North Zone from the Main Zone.

The City has experienced overflows of the North Standpipe when both supply sources in the North Zone (Well #5 and #7) are off. To allow additional buffer and prevent overflows, the City has reduced the operational range of the North Standpipe, maintaining the water surface approximately 25 feet below the overflow, at around 2,631 feet, which limits the City's use of the tank.

For the analysis Supervisory Control and Data Acquisition (SCADA) data was collected to provide information about the status of supplies and tank levels during unexplained filling of the North Standpipe. This data includes pressure at the point of discharge for sources of supply in the Main Zone, as well as tank levels and the on/off status and flow rates from well supplies.

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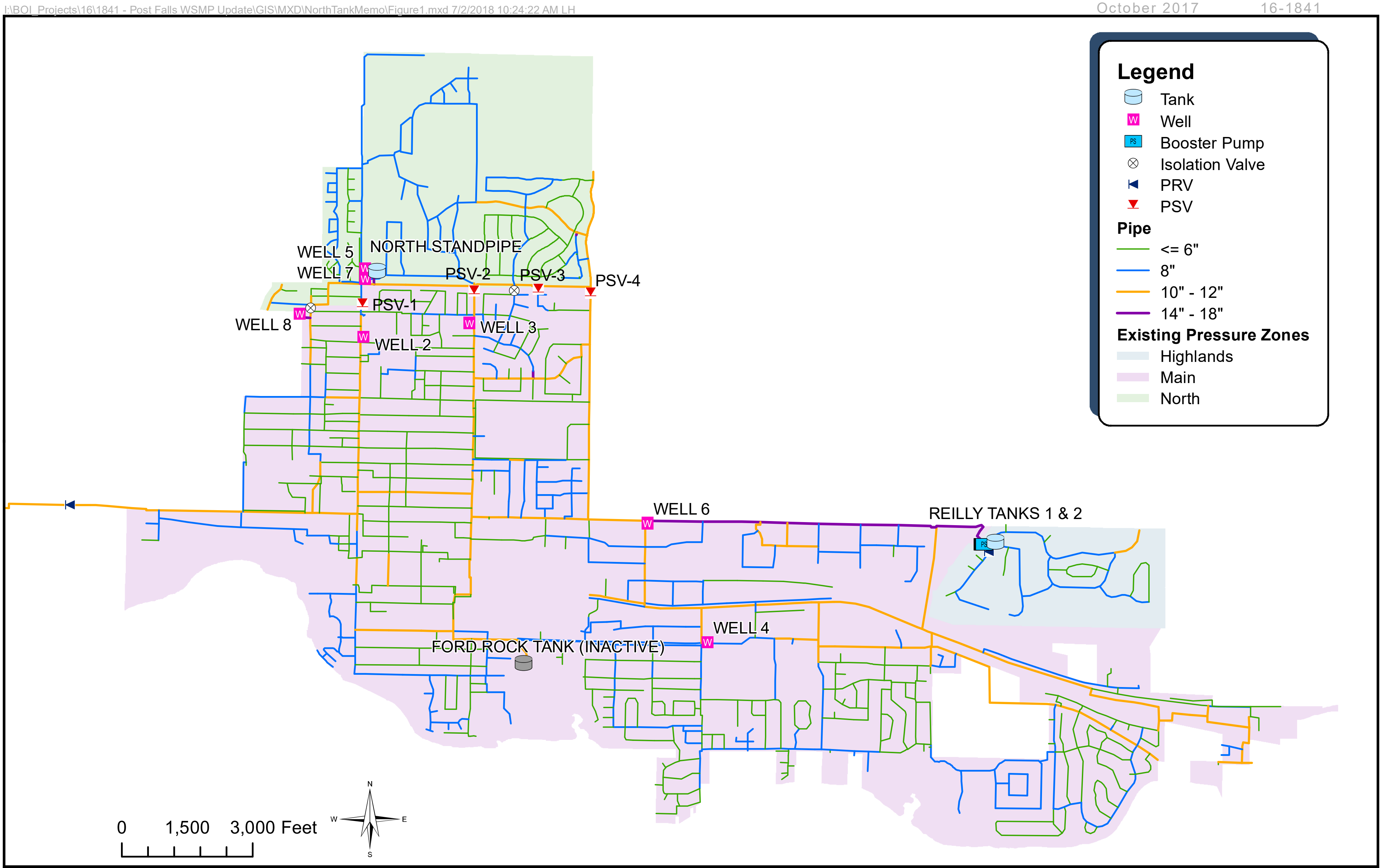

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City of Post Falls
Water System Master Plan

Figure 1
North Standpipe Analysis

CITY OF POST FALLS

A.3 Analysis

The City's SCADA data was evaluated to determine periods of filling of the North Standpipe when both Wells 5 and 7 are off, which typically occurs during the shoulder seasons (Spring and Fall). Plots of the North Standpipe HGL and well supply on/off status (Well 5 and Well 7) were used to confirm that filling of the North Standpipe occurred when both North Zone's sources of supply were off. The well on/off status and HGL at sources of supply in the Main Zone were also plotted to determine if the HGL in the Main Zone, near the North Zone boundary, was high enough that it could theoretically fill the North Standpipe. The plots confirmed that the HGL at Well 3 and Well 8 in the Main Zone were high enough (above 2,386 feet) to fill and even overflow the North Standpipe if an unintentional pathway for flow from the Main Zone to the North Zone exists. **Figure 2** provides an example of the plotted SCADA data during the described filling condition when both Wells 5 and 7 are off. **Figure 3** shows the example period of the North Standpipe filling in more detail. The City's hydraulic model was used to confirm that localized high pressure may occur with the use of supply near the North Zone boundary during shoulder seasons.

A.4 Conclusions and Recommendations

The North Standpipe was observed to fill with no sources of supply active in the North Zone while a high localized HGL was observed near the Main Zone/North Zone boundary. This suggests that the North Standpipe may be filling by flow from the Main Zone to the North Zone through an unintentional connection. One possible route for this flow may be reverse flow through the PSVs intended to deliver supply from the North Zone to the Main Zone. An unintentionally open isolation valve could also be the cause.

Before any system or control changes can be recommended to expand the operational range of the North Standpipe, additional data is needed to isolate this potential connection between the North and Main Zones. The first recommendation is to verify that that the PSVs have check valve functionality, which prevents backflow from the Main Zone to the North Zone through the PSVs.

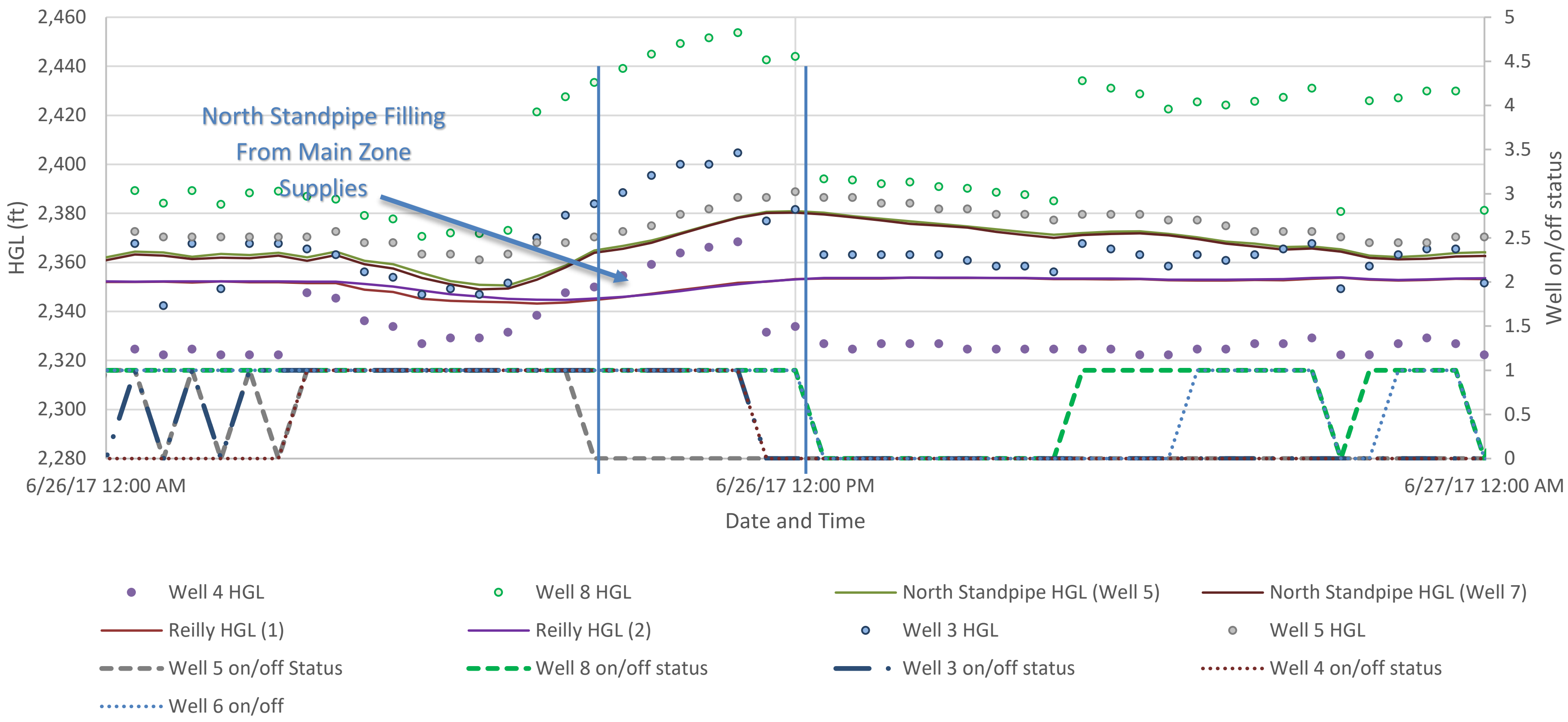
Once it is confirmed that the PSVs have check valve functionality, if the North Standpipe is still filling when Wells 5 and 7 are off, additional field flow and pressure testing is recommended to isolate a potentially open isolation valve or a pipe connection between the two zones. Operations staff will need to systematically select multiple pairs of hydrants along the boundary of the North Zone and the Main Zone. Each hydrant pair should be as close as possible to each other with one hydrant in the Main Zone and one hydrant in the North Zone. System pressure can be measured at the hydrants in each Zone (static pressure), and then recorded. The hydrant in the North Zone can be flowed, while continuing to observe the pressure on the hydrant in the Main Zone. More than one hydrant in the North Zone can be flowed to determine if Main Zone pressure responds to flow in the North Zone. The final pressure read (residual pressure) on the Main Zone hydrant while a North Zone hydrant is flowing should be recorded.

If a drop in pressure is observed in the Main Zone while flowing a North Zone hydrant, then there is an unintentional connection in the vicinity of the hydrant pair that needs to be reviewed.

Inspection of isolation valves in the area is required to determine if valves are not fully closed. If isolation valves are determined to be closed and the described filling is still occurring the City will need to investigate other options to identify the possibility of an undocumented connection between the two zones. One option might be to use ground penetrating radar (GPR) to identify subsurface piping.

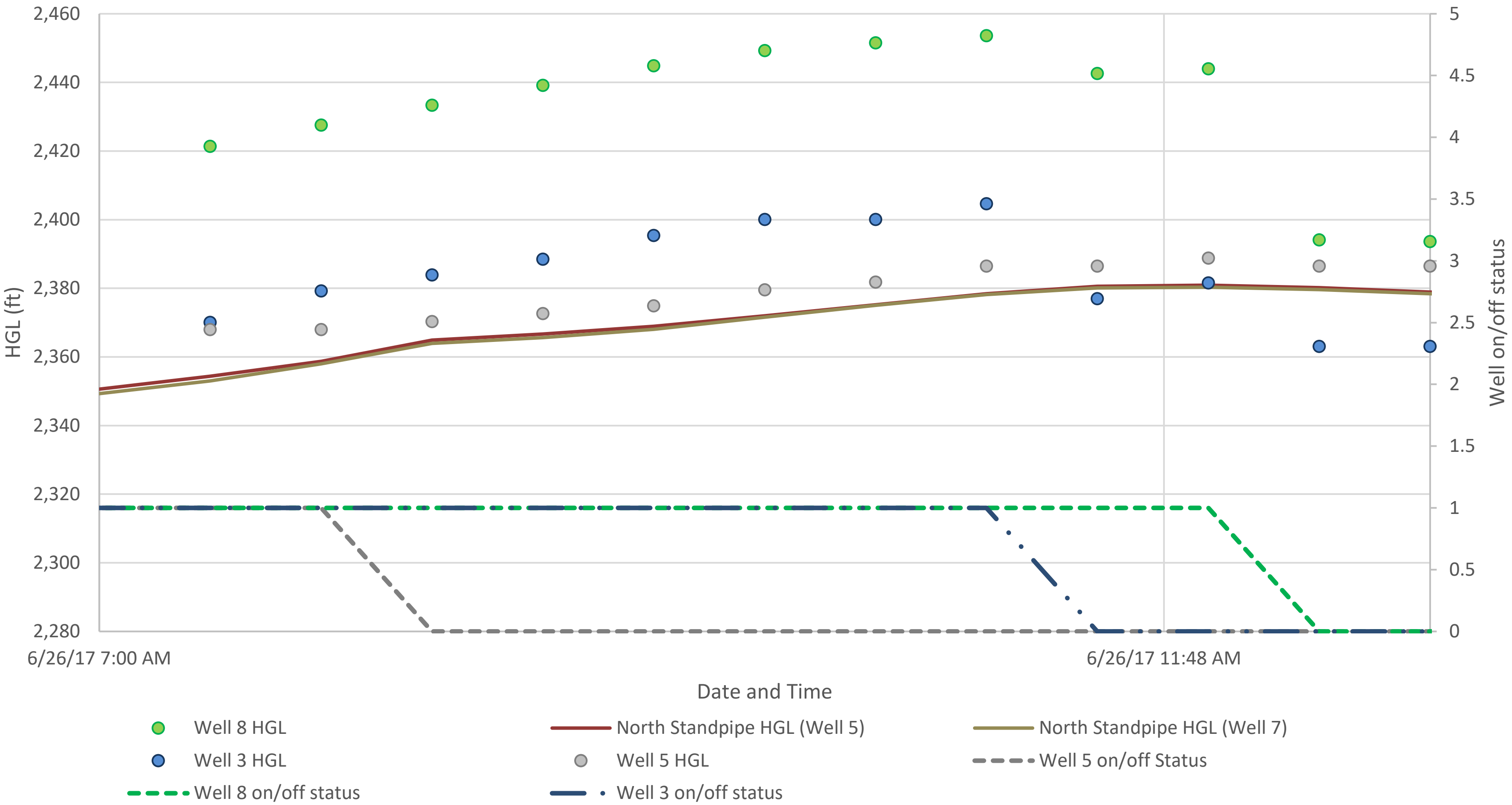
After the unintentional connection between the two zones is determined, the City should be able to adjust the operational range of the North Standpipe to fully utilize the height of the tank without overflows since it will not be able to be filled from the Main Zone.

Figure 2
SCADA Data and System HGL[1]



1. Well 7 was off during the period shown.

Figure 3
North Standpipe Filling and Main Zone HGL[1,2]



1. The HGL at Wells 3 and 8 in the Main Zone remain above the HGL of the North Standpipe.
2. The North Standpipe is filling with Well 5 and Well 7 off.

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APPENDIX B

Appendix B

Model Calibration

B.1 Introduction

As part of the City of Post Falls' (City) Water System Master Plan (WSMP) update, the hydraulic model was updated and calibrated. The model update included the development of both steady state and extended period modeling capabilities. Steady state simulations occur at a single snapshot in time, while extended period simulations (EPS) take place over the course of a set time duration. The City's geographic information system (GIS) data and previous model were used for the update. To complete the update of the model a calibration was performed for both steady state and extended period simulations. The purpose of calibration is to ensure that the hydraulic model that is being used for planning purposes reflects real world conditions prior to using it for predictive purposes. Steady state calibration relied on comparing model outputs to field pressure and hydrant flow tests. Extended period calibration compared SCADA trends for the City's system to model outputs over a 24-hour period. This appendix outlines the calibration process and results for both the steady state and extended period calibration.

B.2 Steady State Calibration

B.2.1 Purpose

Model calibration typically involves evaluating the model parameters for accuracy in matching field data. The steady state calibration involves matching field-measured pressures and fire flows with model simulated system pressures and flows. This calibration process will test model pipeline friction factors, valve status, and network configuration as well as facilities, such as tank elevations and pump controls and curves.

B.2.2 Methodology

For the collection of field data, a plan was developed for static pressure and fire flow tests to be performed by the City in August 2016. The selected locations are shown in **Figure 1**. Fire flow testing consists of taking an original static pressure at a hydrant and then measuring the residual pressure to obtain the pressure drop that occurs when the system is "stressed" by flowing an adjacent hydrant. The calibration accuracy involves comparing the similarity of the static pressures and the change in pressure obtained in the field with those produced by the model.

A steady state model provides a "snapshot" in time of the system. Boundary condition data, such as reservoir levels and pump on/off status, must also be known to accurately portray the system conditions during the time of field pressure and flow data collection so that the same conditions can be replicated in the model. The time of testing was recorded for each hydrant flow test and boundary condition data during testing was collected from available system SCADA data.

B.2.3 Results

For any system, a portion of the data describing the distribution system will be missing, or inaccurate, and assumptions will be required. This does not necessarily mean that the accuracy of the hydraulic model will be compromised. Depending on the accuracy and completeness of the available information, some pressure zones may achieve more accurate calibration than others. Models that do not meet the highest degree of calibration are still useful for planning purposes. The level of the tanks and status of the pumps was set to correspond with the SCADA values from the fire flow test dates. The model was then run, and the resulting model pressures were compared to the values obtained in the field. The level of confidence in the calibration was then evaluated using the predetermined criteria shown in **Table 1**.

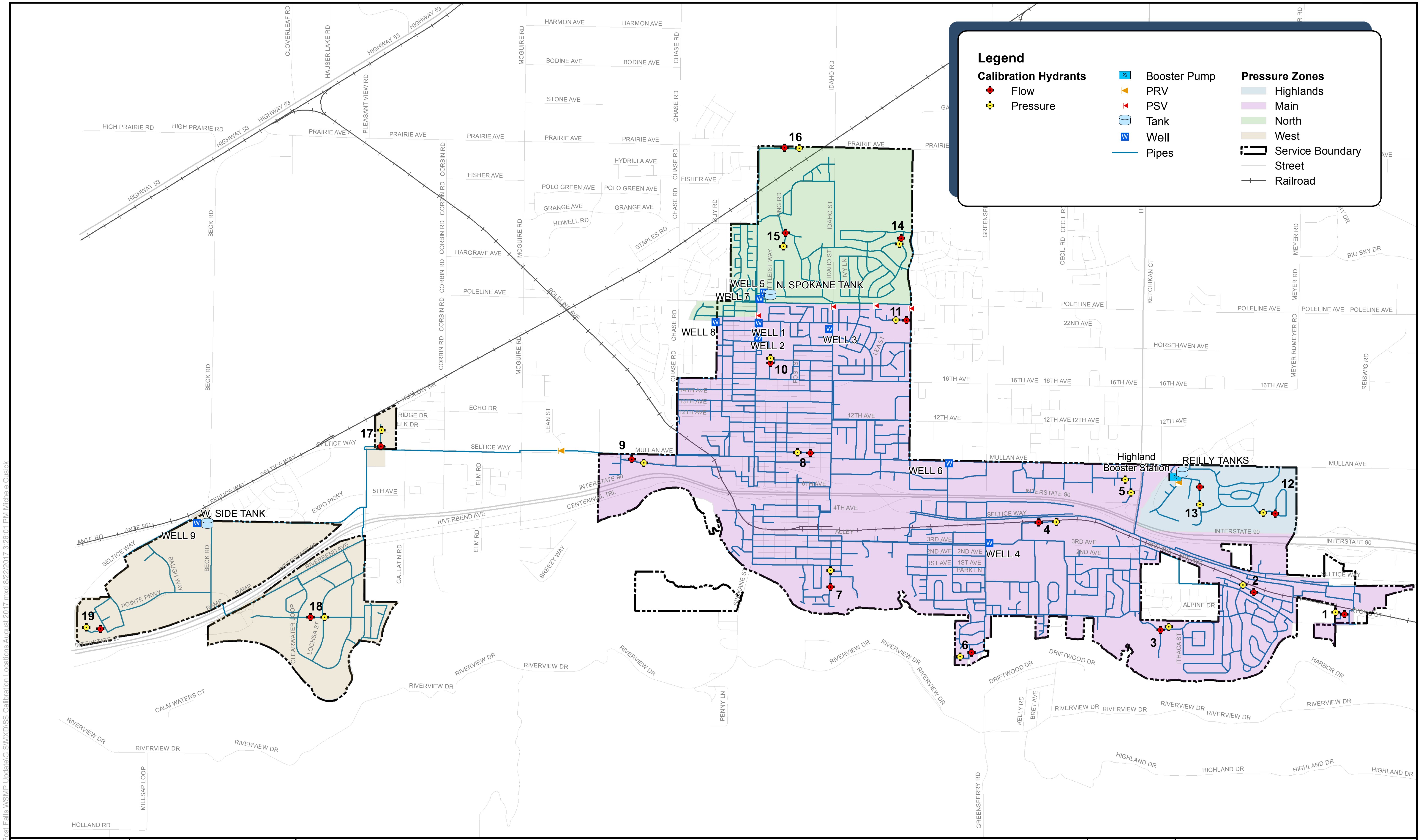
Table 1
Steady State Calibration Confidence Criteria

Confidence Level	Static Pressure Difference	Residual Pressure Drop Difference
High	± 5 psi	≤10 psi
Medium	± 5-10 psi	10-20 psi
Low	>10 psi	>20 psi

The overall confidence level of each zone was high based on the number of low, medium, and high confidence results, which is summarized in **Table 2** and shown in **Figure 2**. Overall calibration confidence was considered relatively high. Approximately 68 percent of static tests were within 5 psi or less of each other and the remainder were within 10 psi. All the residual tests had less than 10 psi difference between model and field results, indicating a high level of calibration.

Table 2
Steady State Calibration Results

Test #	Zone	Pressure Hydrant ID	Field Static (psi)	Model Static (psi)	Static Pressure Difference	Static Confidence Level	Field Residual (psi)	Field Pressure Drop	Model Residual (psi)	Model Pressure Drop	Pressure Drop Difference	Residual Drop Confidence Level
1	Main	1652	88	89	1	High	74	14	75	13	-1	High
2	Main	1642	76	84	8	Medium	62	14	78	6	-8	High
3	Main	1362	72	71	-1	High	52	20	59	12	-9	High
4	Main	1230	68	69	1	High	64	4	65	4	0	High
5	Main	995	68	73	5	High	60	8	68	5	-3	High
6	Main	158	90	91	1	High	70	20	72	19	-1	High
7	Main	104	82	76	-7	Medium	68	14	68	7	-7	High
8	Main	423	76	75	-1	High	68	8	70	5	-3	High
9	Main	1024	90	80	-10	Medium	78	12	72	8	-5	High
10	Main	513	72	64	-8	Medium	58	14	56	8	-6	High
11	Main	1656	68	62	-6	Medium	66	2	58	4	2	High
12	Highlands	1126	76	77	1	High	67	9	65	12	3	High
13	Highlands	1112	78	76	-2	High	70	8	62	14	6	High
14	North	1695	64	64	0	High	56	8	62	3	-5	High
15	North	740	56	57	1	High	50	6	52	5	-1	High
16	North	58	80	77	-3	High	56	24	50	27	3	High
17	West	1014	72	74	2	High	62	10	67	6	-4	High
18	West	1049	72	77	5	High	68	4	74	4	-1	High
19	West	1676	70	76	6	Medium	62	8	67	9	1	High



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murraysmith

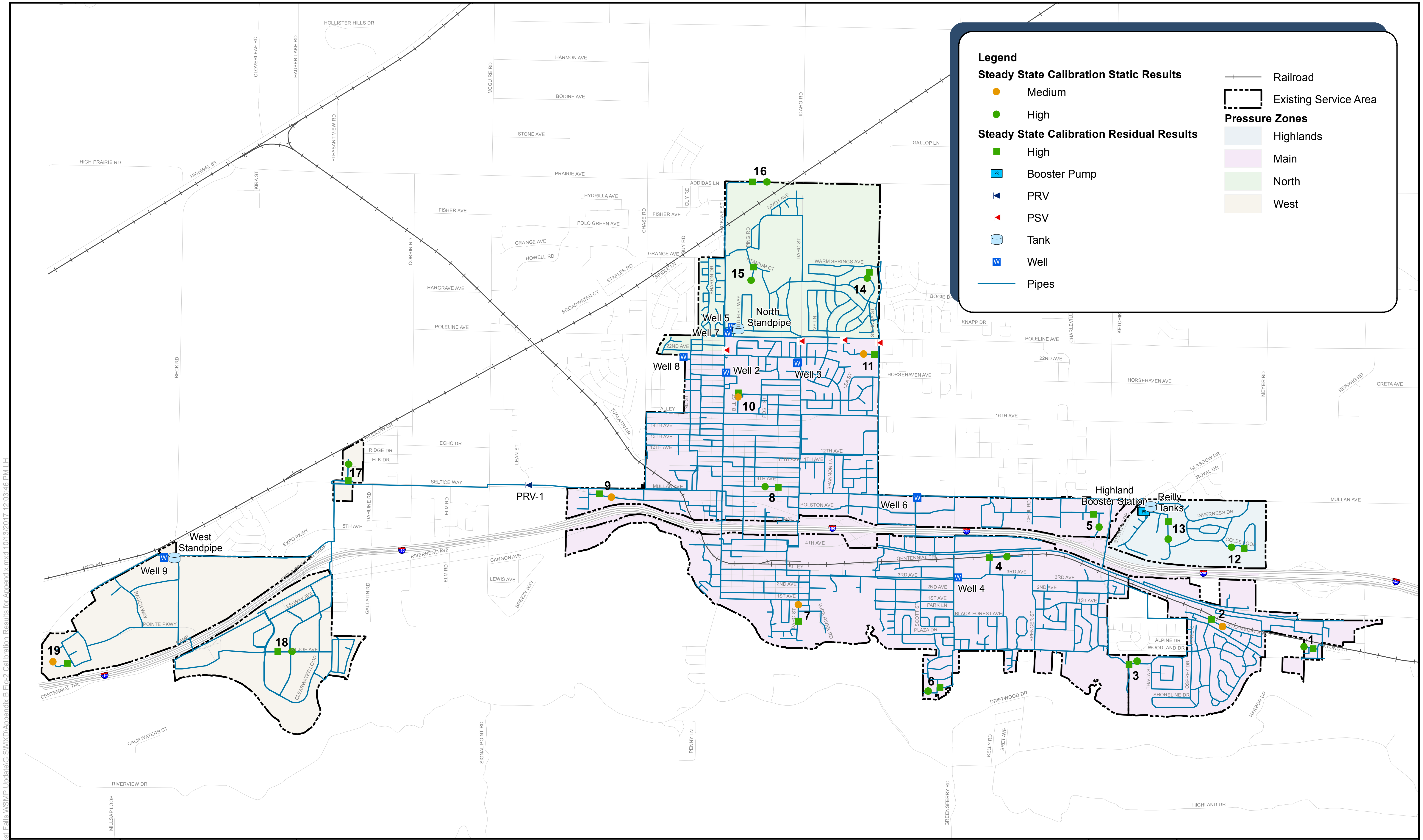
CITY OF POST FALLS

City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

Figure 1
Steady State Calibration Locations

October 2017 16-1841



I:\BOI_Projects\16\1841 - Post Falls WSMP Update\GIS\MXD\Appendix B Fig-2 Calibration Results for Appendix.mxd 10/13/2017 12:03:46 PM LH

City of Post Falls
Water System Master Plan

0 1,500 3,000 Feet

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Figure 2
Steady State Calibration Results

October 2017 16-1841

B.3 Extended Period Simulation Calibration

B.3.1 Purpose

The EPS model simulates the operation of the system over a period of time. It allows dynamic analysis of the system under the specific patterns and controls represented in the model. The EPS calibration process tests the accuracy of model demand distribution, diurnal patterns, and facility parameters such as tank size and pump controls.

B.3.2 Methodology

City staff provided winter and summer pump control information as well as pump status and tank level information from SCADA for facilities where it was available for days in July, August, and December of 2016. The SCADA information was incomplete and flow information was not available for most of the well supplies. Since time-based demand information is needed for an EPS model, but complete flow information was not available, the diurnal pattern information developed during the 2010 model update was used.

B.3.3 Results

The calibration of an EPS model is focused on comparing trends between the field information and the model outputs over time. This comparison focuses on the emptying and filling trends of the reservoirs in addition to the on/off status of the well and booster station pumps over time. The hydraulic model was run over a 24-hour period. Graphs of the model and SCADA information are shown in Figure 3 through Figure 8. The Reilly Reservoirs are in the Main Zone, the North Standpipe is in the North Zone and the West Standpipe serves the West Zone. There was no SCADA information available for the Highlands Booster Station, so calibration of that facility and the Highlands Zone were not possible.

The SCADA and EPS model scenarios need additional validation and further calibration. The West Standpipe had a high level of calibration and is the zone with the least demand and fewest sources of supply. The Main Zone had a medium level of calibration, with better results in the summer scenario than in the winter. The North Zone had a low level of calibration and the City is aware of issues with the North Standpipe. A separate analysis was done for this Standpipe that indicated there may be unintentional connections between the North Zone and Main Zone, which primarily impacts the North Standpipe levels. Additionally, the differences in the SCADA and model results indicate a difference in value of the high and low points of the curves and shift in when the peaks occur, likely indicating a difference in the diurnal pattern and setpoints of the supplies. The calibration accuracy should be considered when using the model for operational planning purposes. Additional refinement should be done when more detailed SCADA is available and after further information is available about the sources of flow to the North Standpipe.

Figure 3
Reilly Reservoirs Summer EPS Calibration

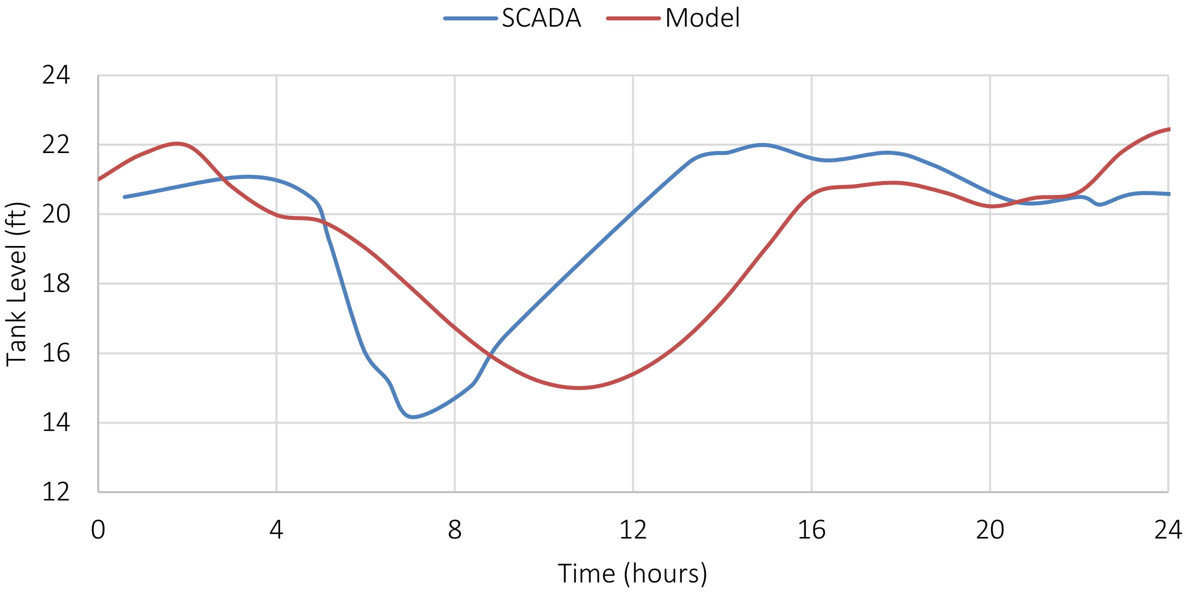


Figure 4
West Standpipe Summer EPS Calibration

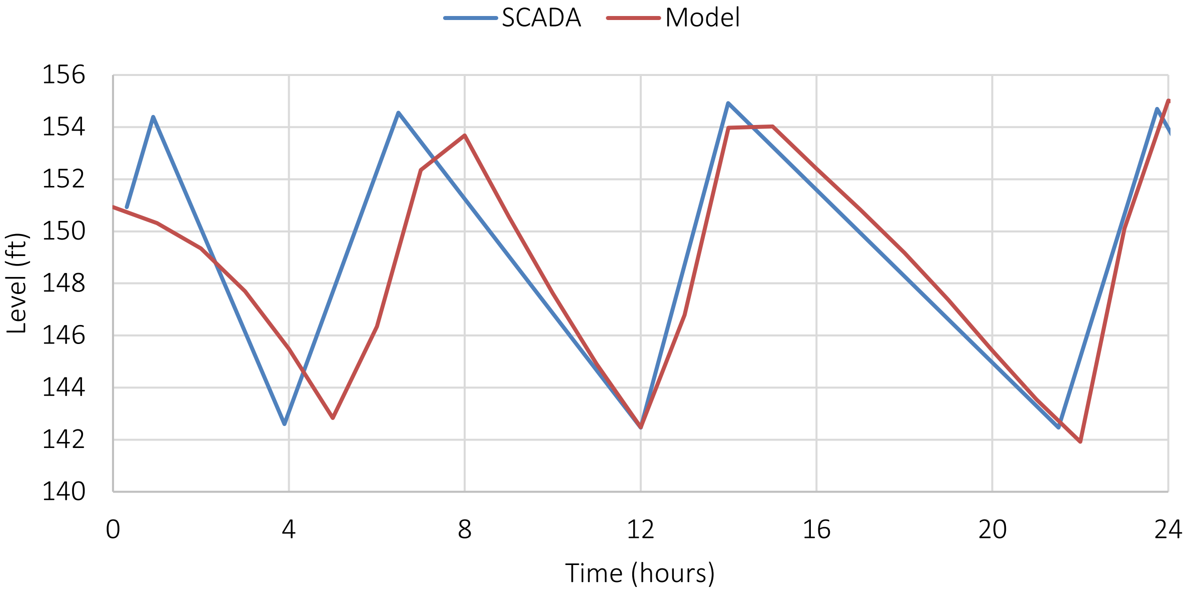


Figure 5
North Standpipe Summer EPS Calibration

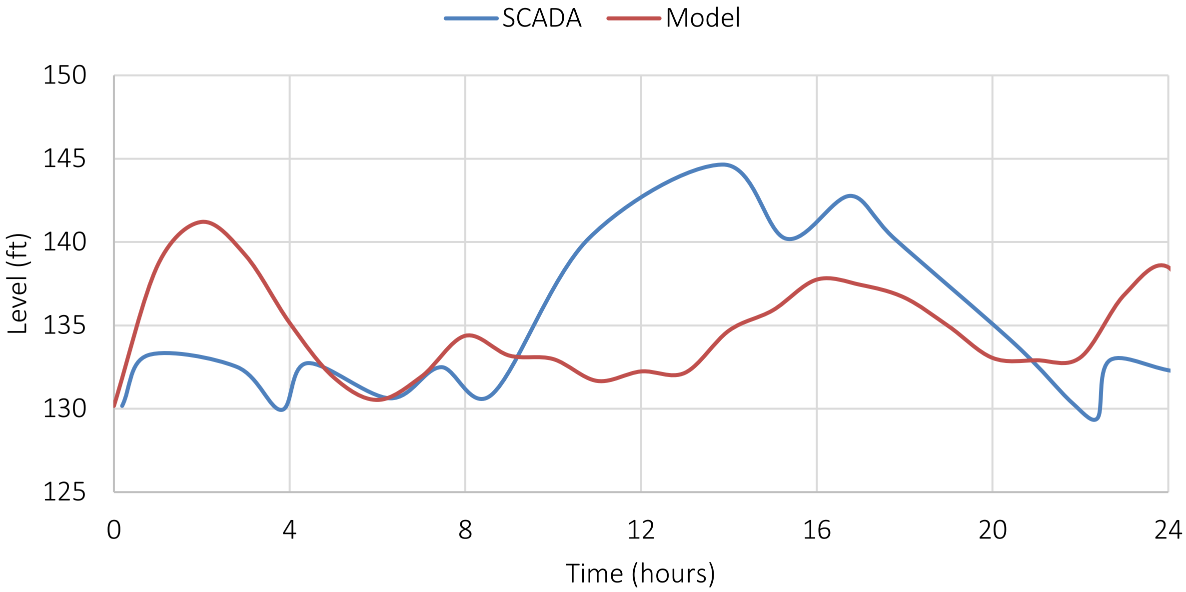


Figure 6
Reilly Reservoirs Winter EPS Calibration

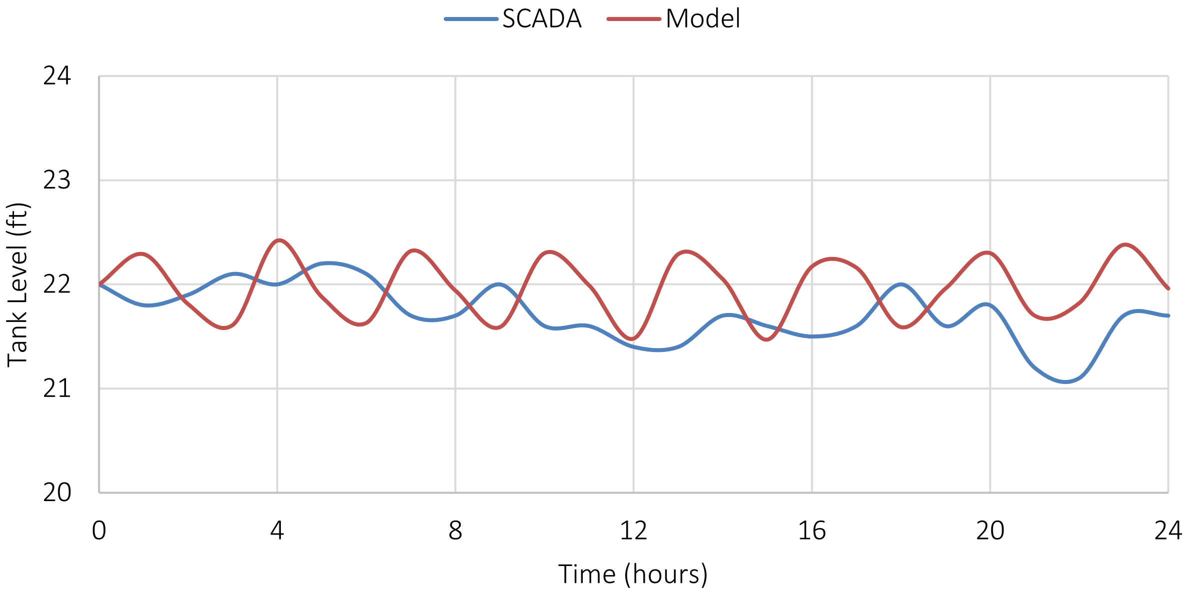


Figure 7
West Standpipe Winter EPS Calibration

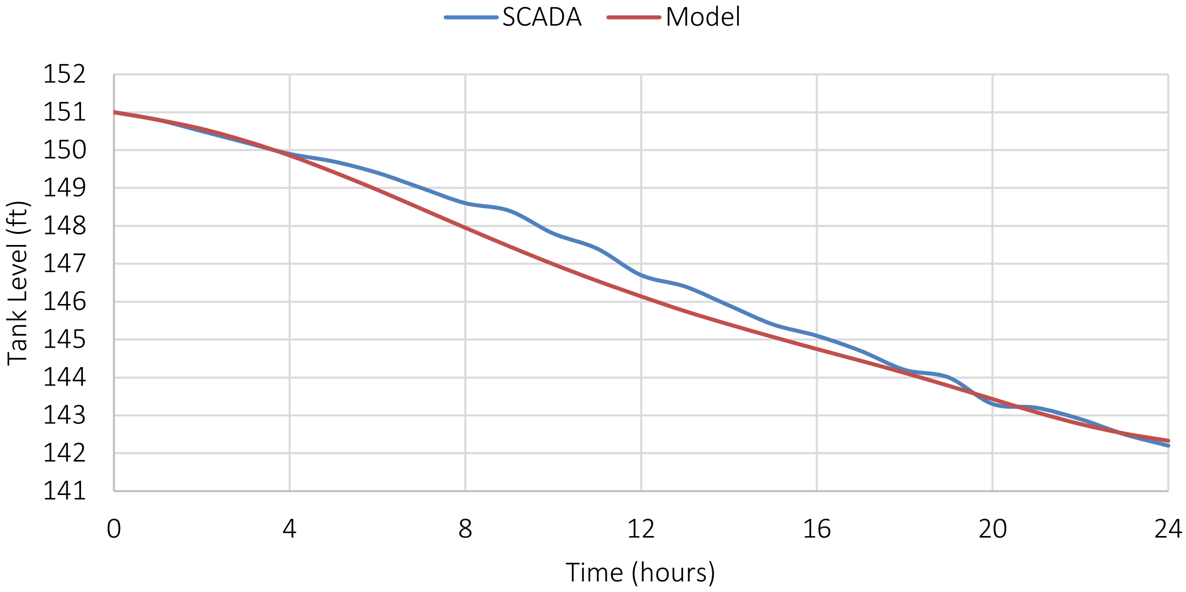
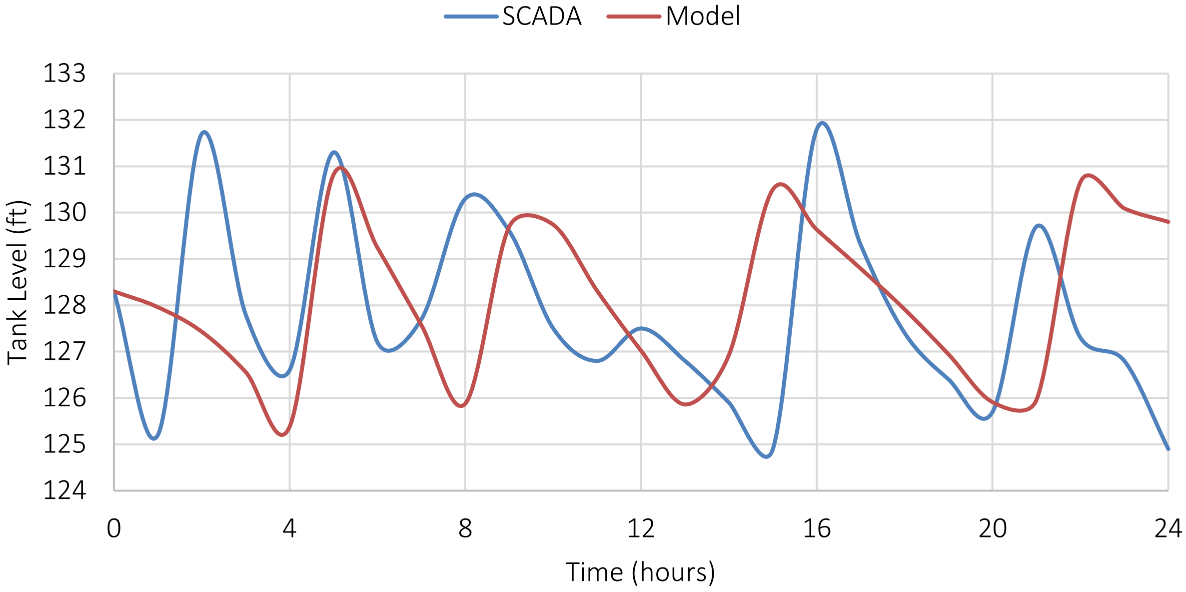


Figure 8
North Standpipe Winter EPS Calibration



B.4 Summary and Recommendations

Based on the calibration results, the steady state model calibrated well, indicating the connectivity and attributes of the model elements are relatively accurate. The extended period simulation calibration was mixed, with the West Zone calibrating better than the other zones and the summer

EPS calibration being somewhat better than the winter EPS calibration. Based on the EPS results, additional, more accurate SCADA is needed to capture the flow through the wells and boosters in addition to the tank levels and pump status. This will allow the pump setpoints and the diurnal pattern to be updated in the model to reflect field conditions more accurately. Additionally, prior to updating the EPS calibration, the recommendations from the North Standpipe analysis should be done to eliminate any unintentional flow from the Main Zone to the North Zone. This should be done prior to any further calibration since such flow would impact the North Standpipe levels, but would not be measured and would be unable to be represented in the model.

APPENDIX C

Facility Condition Assessment Survey

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. **Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?**

Additional Comments: 1. Ventilation needs to be upgraded to maintain building temperature limits. The City has noted electrical equipment impacts, typically in late summer. Requires re-setting HOA switch.	3

2. **Rate the existing condition of the facility structure lighting.**

Additional Comments: Good	1

3. **Rate the existing condition of the facility structure plumbing.**

Additional Comments: Good	1

4. **Are there any structural deficiencies apparent at the pump house?**

Additional Comments: 4. CMU block structure. Sloped roof, with metal roofing. Structure OK. Noted that there were tiny pieces of closed cell foam insulation on the floor, City indicated that it was from some insect borrowing into insulation.	1

5. **Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?**

Additional Comments: 2 FDs, sufficient.	1

6. **Does the pump house have any safety concerns?**

Additional Comments: None	1

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: The building FF is lower than the access parking, which has drainage going towards and into the building. City has created a graded low area to drain away from the building.	1

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City has camera on site but has limitations with radio signal, currently not functioning. There is an upgrade to the radio system planned that is anticipated to address this issue.	1

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Good	1

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good	1

11. Rate the existing condition of the motor.

Additional Comments: Good, station includes soft start.	1

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	1

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Good, pump to waste system has overflowed when there are multiple pump starts.	1

14. Describe any equipment access or maintenance concerns.

Additional Comments: Good	1

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: Good	1

19. Rate existing condition of the electrical system.

Additional Comments: Good	1

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Impacted by high building temperatures, see Item 1.	3

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: No	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: No	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Electronic water depth measure, manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	1

Facility Condition Assessment Survey

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?

Additional Comments: Good	2

2. Rate the existing condition of the facility structure lighting.

Additional Comments: Good	2

3. Rate the existing condition of the facility structure plumbing.

Additional Comments: Good, includes full time pre-lube system, which the City would like to modify.	2

4. Are there any structural deficiencies apparent at the pump house?

Additional Comments: Small CMU block structure with added dog house for piping. Flat roof. Structure in good condition, just old building facility.	2

5. Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?

Additional Comments: 1 FD, sufficient.	2

6. Does the pump house have any safety concerns?

Additional Comments: Tight electrical space in front of panels, safety concern.	3

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Good	2

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City interested in added camera, all facilities use keyed locked for doors.	2

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Potential pump condition, reduced capacity from design point, particularly if Well 2A is running.	3

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good, full time pre-lube, which City would like to modify.	2

11. Rate the existing condition of the motor.

Additional Comments: 11. Good, note that City cycles through all pumps in the winter to keep them functioning, no soft start.	2

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	2

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Modification of pre-lube to only run during pre-pump start.	2

14. Describe any equipment access or maintenance concerns.

Additional Comments: Tight but is workable.	2

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: NA	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments:	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: No soft start, which the City would prefer.	2

19. Rate existing condition of the electrical system.

Additional Comments: Limited space in front of electrical cabinets.	3

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	2

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: No	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: No	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Air tube failure, manual measure, manual/SCADA for pressur	2

Facility Condition Assessment Survey

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?

Additional Comments: Ventilation basic, need to open windows in the summer to air intake, could consider adding filters to these windows.	2

2. Rate the existing condition of the facility structure lighting.

Additional Comments: Good	2

3. Rate the existing condition of the facility structure plumbing.

Additional Comments: Good, includes full time pre-lube system, which the City would like to modify.	2

4. Are there any structural deficiencies apparent at the pump house?

Additional Comments: Small CMU block structure, just old building facility, could use paint. Flat roof, which has leak repairs and needs replacement.	2

5. Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?

Additional Comments: 1 small FD, north wall has holes at floor to allow for drainage, consider improving.	2

6. Does the pump house have any safety concerns?

Additional Comments: Tight electrical space for panel access and potential limitation on meeting current industrial clearance requirements.	3

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Site access is through adjacent park.	2

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City interested in added camera, there are Police Department cameras on already onsite but City does not have direct access to them. Closed Circuit TV in building that records to DVR, but not accessible from Water Dept, only available onsite.	2

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Potential pump condition, reduced capacity from design point, column shaft is assumed to be smaller than industry standards, based on failure with Well 5.	2

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good, full time pre-lube, which City would like to modify, City would like to replace flow meter propeller.	2

11. Rate the existing condition of the motor.

Additional Comments: 11. Good, note that City cycles through all pumps in the winter to keep them functioning, no soft start.	2

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	2

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Modification of pre-lube to only run during pre-pump start.	2

14. Describe any equipment access or maintenance concerns.

Additional Comments: Tight but is workable, need to close adjacent park when pulling pump.	2

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: NA	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: No soft start, which the City would prefer, improve access to electrical panels which are not code compliant.	2

19. Rate existing condition of the electrical system.

Additional Comments: Limited space in front of electrical cabinets and old equipment.	3

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	2

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: No	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: No	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Manual water depth measure, manual/SCADA for pressure ar	2

Facility Condition Assessment Survey

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. **Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?**

Additional Comments: Ventilation good upgraded in 2003.	2

2. **Rate the existing condition of the facility structure lighting.**

Additional Comments: Good	2

3. **Rate the existing condition of the facility structure plumbing.**

Additional Comments: Good, includes full time pre-lube system, which the City would like to modify.	2

4. **Are there any structural deficiencies apparent at the pump house?**

Additional Comments: CMU block structure in good condition. Flat roof, has membrane and hatch redone.	2

5. **Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?**

Additional Comments: 1 FD, sufficient.	2

6. **Does the pump house have any safety concerns?**

Additional Comments: None, but equipment access is limited to NaOCl equipment.	2

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Good	2

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City interested in adding camera.	2

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Pump replaced in 2012 timeframe.	1

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good, full time pre-lube, which City would like to modify.	2

11. Rate the existing condition of the motor.

Additional Comments: Good, replaced in 2012 with pump, note that City cycles through all pumps in the winter to keep them functioning.	1

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	2

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Modification of pre-lube to only pre pump start. Needs valve to stop it from going into system and looping around to fill the tank. Want to add valve so it operates like Well 7 in this regard.	2

14. Describe any equipment access or maintenance concerns.

Additional Comments: Good	2

Chlorination System Assessment

15. **Is the chlorination equipment located in a separate room and vented to the outside?**

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. **Describe any water quality issues associated with the well.**

Additional Comments: NA	1

17. **Describe any water quantity concerns.**

Additional Comments: NA	1

Electrical Assessment

18. **Rate existing condition of motor controls.**

Additional Comments: Good, motor replaced in 2012.	1

19. **Rate existing condition of the electrical system.**

Additional Comments: Good, upgraded in 2003.	1

20. **Do control cabinets require open door venting to remain operational?**

Additional Comments: Good	1

21. **Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?**

Additional Comments: Yes, generator cannot run both and requires manual transfer to Well 5, but can an automatically come on in power failure.	1

22. **For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?**

Additional Comments: Yes, but can only run either Well 5 or Well 7.	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Manual water depth measure, manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	2

Facility Condition Assessment Survey

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?

Additional Comments: Ventilation needs to be upgraded to maintain building temperature limits.	3

2. Rate the existing condition of the facility structure lighting.

Additional Comments: Good	1

3. Rate the existing condition of the facility structure plumbing.

Additional Comments: Good, includes full time pre-lube system, which the City would like to modify.	1

4. Are there any structural deficiencies apparent at the pump house?

Additional Comments: CMU block structure in good condition. Flat roof, has membrane.	1

5. Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?

Additional Comments: 2 FDs, sufficient.	1

6. Does the pump house have any safety concerns?

Additional Comments: None, noted lock out tag requirement for maintenance of pump control valve.	1

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: On Police Department site, access restriction from Mullan Ave, difficult to get crane on site to pull pump, would require lane shut down on busy road. Consider adding a second access off of side street.	3

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site on PD site, City interested in added camera.	1

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Good	1

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good	1

11. Rate the existing condition of the motor.

Additional Comments: Good, motor had to be rewound, has soft start.	1

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	1

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Good	1

14. Describe any equipment access or maintenance concerns.

Additional Comments: Street access is limited as noted in Item 7.	1

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. Describe any water quality issues associated with the well.

Examples: Sand production, e-coli, turbidity

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: Motor rewound, facility has soft start.	1

19. Rate existing condition of the electrical system.

Additional Comments: Good	1

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Impacted by high building temperatures, see Item 1.	3

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, backup generator with automatic transfer switch and no	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Manual water depth measure, manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	1

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

---

1. Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?

Additional Comments: City concerned that potentially that ventilation cannot maintain building temperature limits, evaluate further with future facility upgrade.	2

2. Rate the existing condition of the facility structure lighting.

Additional Comments: Good	1

3. Rate the existing condition of the facility structure plumbing.

Additional Comments: Good	1

4. Are there any structural deficiencies apparent at the pump house?

Additional Comments: CMU block structure. Flat roof, has membrane.	1

5. Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?

Additional Comments: 2 FDs, sufficient.	1

6. Does the pump house have any safety concerns?

Additional Comments: None	1

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Good	1

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City interested in adding camera.	1

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Pump column repaired in 2005.	1

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good	1

11. Rate the existing condition of the motor.

Additional Comments: Good	1

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	1

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Good	1

14. Describe any equipment access or maintenance concerns.

Additional Comments: None	1

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: Good	1

19. Rate existing condition of the electrical system.

Additional Comments: Good	1

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	1

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, generator cannot run both and requires manual transfer to Well 5, but can an automatically come on in power failure.	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes, but can only run either Well 5 or Well 7.	1

23. **Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?**

Additional Comments: Electronic water depth measure, manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	1

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?

Additional Comments: Ventilation needs to be upgraded to maintain building temperature limits, difficult to keep cool like Well 2A, but does not have the electrical equipment issues other than the black out of the LCD screen.	3

2. Rate the existing condition of the facility structure lighting.

Additional Comments: Good	1

3. Rate the existing condition of the facility structure plumbing.

Additional Comments: Good	1

4. Are there any structural deficiencies apparent at the pump house?

Additional Comments: CMU block structure. Sloped roof, with metal roofing.	1

5. Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?

Additional Comments: 2 FDs, sufficient.	1

6. Does the pump house have any safety concerns?

Additional Comments: None	1

Site Assessment

7. **Rate the existing condition of the site and site accessibility.**

Additional Comments: Good	1

8. **Does the pump house and site provide protection from trespassers, vandals and saboteurs?**

Additional Comments: Good, fenced site.	1

Equipment Assessment

9. **Rate the existing condition of the pumps.**

Additional Comments: Good	1

10. **Rate the existing condition of the piping, valving, pressure gauges, meters and**

Additional Comments: Good	1

11. **Rate the existing condition of the motor.**

Additional Comments: Good, station includes soft start.	1

12. **Are pump, valving and motor components maintained at manufacturer reccomended schedules?**

Additional Comments: Follow maintenance schedule on the pump and motor.	1

13. **Describe any concerns regarding the operation of pumps, valves & piping.**

Additional Comments: Good	1

14. **Describe any equipment access or maintenance concerns.**

Additional Comments: Good	1

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: Good	1

19. Rate existing condition of the electrical system.

Additional Comments: Good	1

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Impacted by high building temperatures, see Item 1.	3

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, automated switch over.	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Electronic water depth measure (column of water), manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	1

Description:

The purpose of this questionnaire is to utilize operator knowledge about the well facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. **Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?**

Additional Comments: Good, limited use and does not see high temperatures.	1

2. **Rate the existing condition of the facility structure lighting.**

Additional Comments: Good	1

3. **Rate the existing condition of the facility structure plumbing.**

Additional Comments: Good	1

4. **Are there any structural deficiencies apparent at the pump house?**

Additional Comments: CMU block structure. Sloped roof, with metal roofing.	1

5. **Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?**

Additional Comments: 2 FDs, sufficient.	1

6. **Does the pump house have any safety concerns?**

Additional Comments: None	1

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Good	1

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City has camera on site but would like a second one pointed towards the tank, as noted with Well 2a, there are issues at time getting a video feed over the radio signal. There is an upgrade to the radio system planned that is anticipated to address this issue.	1

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Good	1

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good	1

11. Rate the existing condition of the motor.

Additional Comments: Good, station includes soft start.	1

12. Are pump, valving and motor components maintained at manufacturer reccomended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	1

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: Good	1

14. Describe any equipment access or maintenance concerns.

Additional Comments: Good	1

Chlorination System Assessment

15. Is the chlorination equipment located in a separate room and vented to the outside?

Additional Comments: Onsite NaOCl, solution tank vented to outside.	1

Water Assessment

16. Describe any water quality issues associated with the well.

Additional Comments: NA	1

17. Describe any water quantity concerns.

Additional Comments: NA	1

Electrical Assessment

18. Rate existing condition of motor controls.

Additional Comments: Good	1

19. Rate existing condition of the electrical system.

Additional Comments: Good	1

20. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	1

21. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, automated switch over.	1

22. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes	1

23. Does the well have; well water depth sensor?, discharge pressure sensor?, discharge flow sensor?

Additional Comments: Electronic water depth measure (column of water), manual/SCADA for pressure and flow meter SCADA (note that SCADA system is currently not able to record flow rate remotely).	1

Description:

The purpose of this questionnaire is to utilize operator knowledge about the booster pump station facilities to help establish a baseline condition assesment of each facility for the Water System Master Plan.

Instructions:

Please provide comments and a rating between 1 and 3 (1 = good or not applicable, 2 = average, 3 = poor) describing the condition in each question.

Pump House Facility Assessment

1. **Rate the existing condition of the facility structure ventilation. Does building require open doors or supplemental ventilation to stay cool?**

Additional Comments: Good, upgraded in 2003.	2

2. **Rate the existing condition of the facility structure lighting.**

Additional Comments: Good	2

3. **Rate the existing condition of the facility structure plumbing.**

Additional Comments: Good, but paint peeling in places.	2

4. **Are there any structural deficiencies apparent at the pump house?**

Additional Comments: CMU block structure in good condition. Sloped roof, with metal roofing upgraded in 2003. Added hoist I-Beam system to pull pumps.	2

5. **Does the pump house need floor drains, is ponding water an issue, are pipe chases flooded?**

Additional Comments: 2 FDs, sufficient.	2

6. **Does the pump house have any safety concerns?**

Additional Comments: Tight, move electrical panels to generator building.	2

Site Assessment

7. Rate the existing condition of the site and site accessibility.

Additional Comments: Good, but tight.	2

8. Does the pump house and site provide protection from trespassers, vandals and saboteurs?

Additional Comments: Fenced site, City interested in added a camera on site.	2

Equipment Assessment

9. Rate the existing condition of the pumps.

Additional Comments: Good, redone pump seals regularly.	2

10. Rate the existing condition of the piping, valving, pressure gauges, meters and

Additional Comments: Good	2

11. Rate the existing condition of the motors.

Additional Comments: Good, VFD on Pump 2 is not used, creates pressure surging iss	2

12. Are pump, valving and motor components maintained at manufacturer recommended schedules?

Additional Comments: Follow maintenance schedule on the pump and motor.	2

13. Describe any concerns regarding the operation of pumps, valves & piping.

Additional Comments: VFD does not function, caused too much fluctuation for nearby customers.	2

14. Describe any equipment access or maintenance concerns.

Additional Comments: Limited access.	2

Electrical Assessment

15. Rate existing condition of motor controls.

Additional Comments: Motor controls replaced in 2012.	1

16. Rate existing condition of the electrical system.

Additional Comments: Good	1

17. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	1

18. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, with automatic switch over and notification.	1

19. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes	1

20. Does the boost pump station have; discharge pressure sensor?, discharge flow sensor?

Additional Comments: Manual/SCADA for pressure and flow meter SCADA.	1

Electrical Assessment

15. Rate existing condition of motor controls.

Additional Comments: Motor controls replaced in 2012.	1

16. Rate existing condition of the electrical system.

Additional Comments: Good	1

17. Do control cabinets require open door venting to remain operational?

Additional Comments: Good	1

18. Is facility generator backed? Is switchover automatic? Are operators notified of this condition via SCADA callout?

Additional Comments: Yes, with automatic switch over and notification.	1

19. For generator backed facilities; is the generator/ATS able to power all wells and booster pumps simultaneously?

Additional Comments: Yes	1

20. Does the boost pump station have; discharge pressure sensor?, discharge flow sensor?

Additional Comments: Manual/SCADA for pressure and flow meter SCADA.	1

Liquid Engineering Corporation

Steel Potable Water Reservoir Inspection Report (ROV)

Job Number: 50003
Inspector: Z. Harmon
Utility: City of Post Falls
Tank Name: North Tank
Date: 10/03/2016
ROV Team: 10

Interior Condition Findings

Roof Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Coating Condition ☑ Good ☐ Fair ☐ Poor Comments: Some coating failure on upper panels

5 locations noted in video.

Wall Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
~~Support Column Condition ☐ Good ☐ Fair ☐ Poor Comments:~~
~~Column Coating Condition ☐ Good ☐ Fair ☐ Poor Comments:~~
Plumbing Condition ☑ Good ☐ Fair ☐ Poor Comments:
Ladder Condition ☐ Good ☐ Fair ☐ Poor Comments: No internal ladder
Cathodic Protection Installed ☐ Yes ☑ No Comments:
Visible Leaking ☐ Yes ☑ No Comments:

Exterior Condition Findings

Vent Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Hatch Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Foundation Condition ☑ Good ☐ Fair ☐ Poor Comments:
Ladder Condition ☑ Good ☐ Fair ☐ Poor Comments:
Plumbing Condition ☑ Good ☐ Fair ☐ Poor Comments:
Visible Leaking ☐ Yes ☑ No Comments:

Additional Comments

Upon inspection of the tank I found it to be in good overall condition. The roof, Vent and overflow were all in excellent condition with no signs of corrosion. Upon viewing the upper wall panels I found areas of coating failure that are leading to corrosion. It is still a small enough area that it is not a cause for concern at this point. Upon viewing the inlet pipe I did find some corrosion occurring on the connecting flanges but still minor. Upon viewing the floor I found little to no sediment with only staining to note. The outlet pipe was in good working condition. The 5 O'Clock manway had some corrosion forming on the bottom lip and I recommend you just re-evaluate at your next inspection. All in all the tank was in good working condition with no sign of immediate repair.

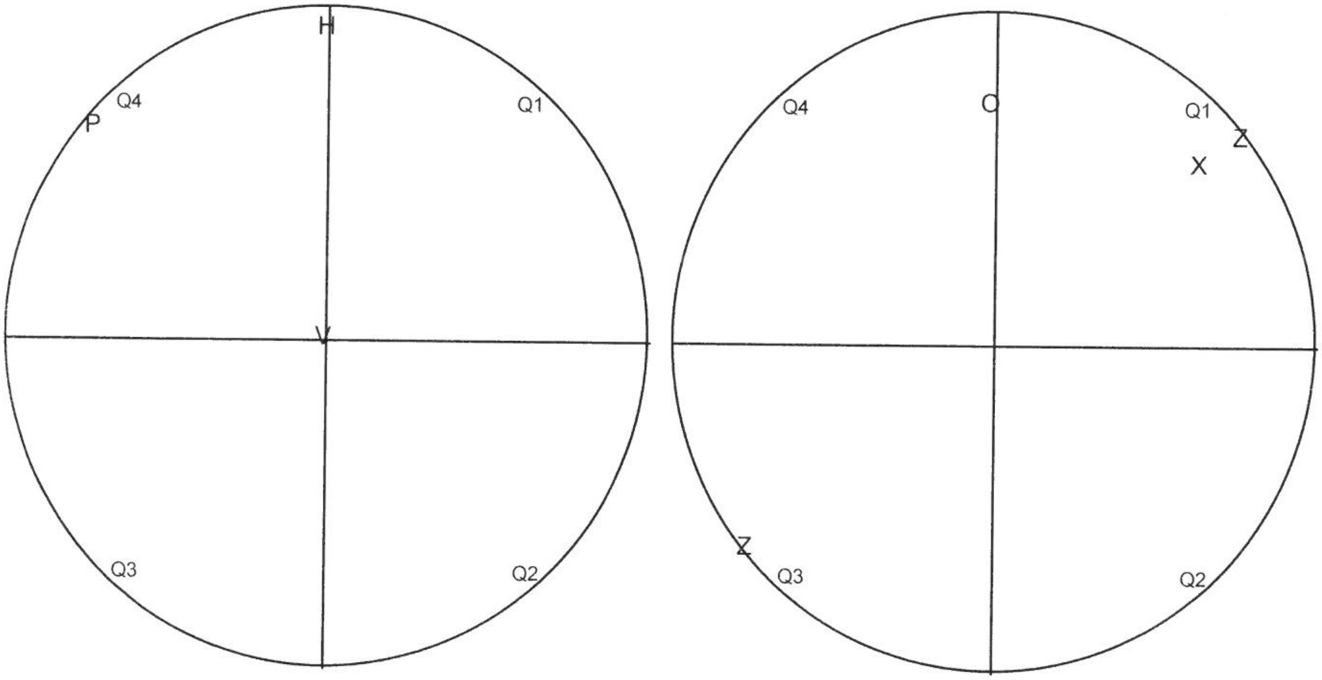
Liquid Engineering Corporation

Circular Tank Diagram / Information Worksheet (ROV)

Job Number: 50003
Inspector: Z. Harmon
Utility: City of Post Falls
Tank Name: North Tank
Date: 10/03/2016
ROV Team: 10

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Some spots of coating failure on high water mark			

ROOF **Testing and Discrepancy Locations** **FLOOR**



Marks on diagram denote placement of hatches and fixtures only.

Liquid Engineering Corporation

Steel Potable Water Reservoir Inspection Report (ROV)

Job Number: 50003
Inspector: Z. Haarmon
Utility: City of Post Falls
Tank Name: West Tank
Date: 10/03/2016
ROV Team: 10

Interior Condition Findings

Roof Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Coating Condition ☑ Good ☐ Fair ☐ Poor Comments: Small area of ccoating failure on upper ring panels

4 to 5 areas
1 midway down

Wall Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Floor Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
~~Support Column Condition ☐ Good ☐ Fair ☐ Poor Comments:~~
~~Column Coating Condition ☐ Good ☐ Fair ☐ Poor Comments:~~
Plumbing Condition ☑ Good ☐ Fair ☐ Poor Comments:
Ladder Condition ☐ Good ☐ Fair ☐ Poor Comments: no internal ladder
Cathodic Protection Installed ☐ Yes ☑ No Comments:
Visible Leaking ☐ Yes ☑ No Comments:

Exterior Condition Findings

Vent Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Roof Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Hatch Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Coating Condition ☑ Good ☐ Fair ☐ Poor Comments:
Wall Weld Condition ☑ Good ☐ Fair ☐ Poor Comments:
Foundation Condition ☑ Good ☐ Fair ☐ Poor Comments:
Ladder Condition ☑ Good ☐ Fair ☐ Poor Comments:
Plumbing Condition ☑ Good ☐ Fair ☐ Poor Comments:
Visible Leaking ☐ Yes ☑ No Comments:

Additional Comments

Upon inspection of the tank I found it to be in excellent condition. The roof, vent, hatch and overflow showed no signs of corrosion or coating failure. The upper ring panels had two spots of coating failure which will lead to corrosion over time but have not yet. The inlet pipe had some areas of corrosion on the connecting flanges but not enough to cause concern. Upon inspection of the bottom I found that the outlet was in excellent condition with no signs of corrosion. The manways also showed no signs of issue as well as the drain. I would estimate the tank had about ~~18~~" of sediment and was not enough to warrant a cleaning. All in all the tank is in good working condition.

1"

Disclaimer

Liquid Engineering does not provide consulting engineering services. Unless otherwise noted, the finding contained in this report were neither prepared nor reviewed by a licensed Professional Engineer, but are based on experience, training and visual examination of the Dive Maintenance Technician.

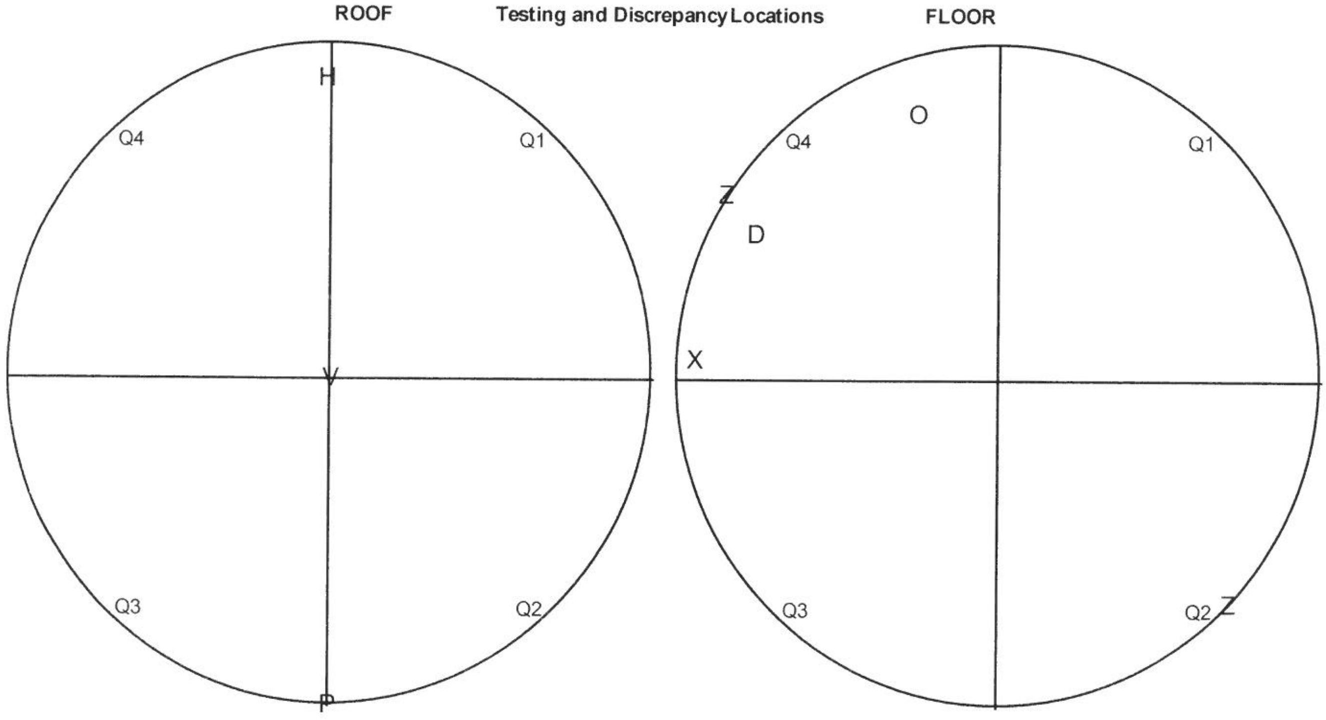
Liquid Engineering Corporation

Circular Tank Diagram / Information Worksheet (ROV)

Job Number: 50003
Inspector: Z. Harmon
Utility: City of Post Falls
Tank Name: West Tank
Date: 10/03/2016
ROV Team: 10

Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4
Some spots of coating failure onupper ring panels			

Testing and Discrepancy Locations



Marks on diagram denote placement of hatches and fixtures only.

APPENDIX D

Appendix D

Cost Estimating Methodology

D.1 Introduction

This appendix summarizes the approach used in development of unit costs and project costs used in the Capital Improvement Plan (CIP) for the City of Post Falls (City) Water System Master Plan (WSMP).

D.2 Cost Estimating

The probable costs estimated for each improvement are based on average costs from the 2017 RSMeans Heavy Construction Cost Data (RSMeans), City input, construction costs for similar projects across the Northwest, and local contractor and supplier rates. All costs identified in this section reference U.S. dollars. The *Engineering News Record Construction Cost Index* basis is 10,823 (20-City Average, Sept. 2017).

Project cost estimates were prepared in accordance with the guidelines of AACE International. (AACE International Recommended Practice No. 56R-08 Cost Estimate Classification System - As Applied For The Building and General Construction Industries - TCM Framework: 7.3 - Cost Estimating and Budgeting Rev. December 31, 2011). The project cost estimates in this WSMP are categorized Class 5, as defined by AACE International:

> *Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. As such, some companies and organizations have elected to determine that due to the inherent inaccuracies, such estimates cannot be classified in a conventional and systemic manner.*
>
> *Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc.*
>
> *Typical accuracy ranges for Class 5 estimates are -20% to -30% on the low side, and +30% to +50% on the high side, depending on the construction complexity of the project, appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks.*

All project descriptions and cost estimates in this WSMP represent planning-level accuracy and opinions of costs (+50 percent, -30 percent). During the design phase of each improvement project, project definition, scope, and specific information (e.g., pipe diameter and length) should be verified. The final cost of individual projects will depend on actual labor and material costs, site conditions, competitive market conditions, regulatory requirements, project schedule and other factors. Because of these factors, project feasibility and risks must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding.

The project costs presented in this WSMP include estimated construction costs, and allowances for permitting, legal, administrative, and engineering fees. A contingency factor is also added to each cost to help account for any unanticipated components of the project costs. Construction costs are based on the preliminary concepts and layouts of the water system components developed during the system analysis.

Total estimated project costs were developed through a progression of steps and multiple methodologies. The steps included development of component unit costs, construction costs and, finally, project costs. The component unit cost includes the sum of materials, labor and equipment of a project's basic features. The construction cost is the sum of component costs and mark-ups to determine the probable cost of construction (i.e., the contractor bid price). The project cost is the sum of construction costs with additional cost allowances for engineering, legal and administrative fees to determine the total project cost to the City.

The following costs are not included:

- Land or right-of-way acquisition
- Maintenance expenses
- Operation expenses

D.3 Component Unit Costs

D.3.1 Pipelines

The estimates for water system pipelines include the costs for pipe, valves, fittings, water connections, and special pipe crossings. The pipe material assumed for waterlines was C900 PVC (6- to 12-inch) or PVC C905 (greater than 12-inch) with push on joints.

D.3.2 Pipe

For all pipeline installations including new and replacement projects, the water pipeline costs per linear foot is based on a cover depth of four feet and includes:

- Excavation
- Waste of material associated with the trenching (which includes haul, load, and dump fees)
- Imported bedding and zone material
- Native backfill (which includes minimal haul and compaction of material)
- Testing and disinfection

As the diameter of pipe and the trench width increase, the costs also increase. Therefore, a specific cost has been identified for each pipe diameter. See **Table 1** for costs per linear foot of pipe.

Table 1
Water Pipeline Costs per Linear Foot

Pipe Diameter (inch)	Cost ($/linear foot)
6	22
8	28
10	36
12	45
16	63
18	81

D.3.2.1 Valves and Fittings

To account for fittings and valves an additional 30 percent of pipeline cost is added.

D.3.2.2 Water Connections

New and replacement water connections are assumed at an additional 10 percent of pipeline costs.

D.3.2.3 Special Pipe Crossings

Special pipe crossings are required for crossing the river, railroads and highways, or areas where traditional open cut construction is not possible. To approximate the cost of trenchless construction for crossings, bid tabs were reviewed and $1,400 per linear foot of crossing length was added to the cost.

A summary of additional pipeline costs is provided in **Table 2**.

Table 2
Additional Pipeline Costs

Additional Pipeline Cost Factor	Additional Factor
Valves and Fittings	30%
Water Service Connections	10%
Special Pipe Crossings	$1,400 per linear foot of crossing

D.3.3 Surface Restoration

Surface restoration of construction sites is required to complete every project. As with the pipe installation costs, the surface restoration costs increase with the size of pipe, due to the larger trench that will need to be excavated. Therefore, a unit surface restoration cost has been developed for each pipe diameter. **Table 3** tabulates costs for surface restoration. The tables are separated to define costs associated with local and arterial asphalt roadways. The surface restoration is developed from local supplier and RSMeans costs.

Table 3
Surface Restoration Costs per Linear Foot

Pipe Diameter (inch)	Surface Condition Cost ($/linear foot)	
	Arterial[1]	Local[2]
6	63	43
8	63	43
10	63	43
12	63	43
16	63	43
18	63	43

Notes:

1. Road repair and replacement along trench. 6-inch asphalt and 8 inches of ¾-inch minus.
2. Road repair and replacement along trench. 2.5-inch asphalt and 8 inches of ¾-inch minus.

D.3.4 Facility

Facility project costs were developed for each individual facility project based on previous City projects and other similar projects in the Northwest. For each facility, the project cost includes basic site, civil, mechanical, electrical, and instrumentation and control facilities.

D.4 Construction Cost Allowances

The construction cost is the sum of pipe cost and adders, labor, equipment, mobilization, contractor's overhead and profit, and contingency for each project.

D.4.1 Traffic Control

Traffic control will be required for all projects that occur in roadways. The cost and level of effort for traffic control should be evaluated based on the scope and size of each project and as local conditions at the time of construction dictate. For planning purposes, the cost of traffic control is estimated at 5 percent for low traffic control areas in local streets or 10 percent for high traffic control areas in arterial streets depending on project location. Traffic control mark-up accounts for the cost of signage, flagging and temporary barriers, street widening, pavement markings, lane delineators and lighting at flagging locations.

D.4.2 Erosion Control

Erosion control will be required for all projects. For planning purposes, the erosion control is estimated at 1 percent of the construction costs for low erosion control and 3 percent for high erosion control (MS4 permit areas). Erosion control mark-up accounts for materials and practices to protect adjacent property, storm water systems, and surface water in accordance with regulatory requirements. The level of effort and cost for erosion control depends on the size and scope of a project, and the local conditions at the time of construction.

D.4.3 Contractor Overhead and Profit

A 15 percent mark-up accounts for the contractor's indirect project costs and anticipated profit.

D.4.4 Mobilization

A 10 percent mobilization mark-up accounts for the cost of the contractor's administrative and direct expenses to mobilize equipment, materials, and labor to the work site.

D.4.5 Contingency

A 30 percent increase was added in each project's construction cost to account for a contingency factor to cover the uncertainties inherent to planning-level development. The contingency is provided to account for factors such as:

- Unanticipated utilities
- Relocation and connection to existing infrastructure
- Minor elements of work not addressed in component unit cost development
- Details of construction
- Changes in site conditions
- Variability in construction bid climate

The contingency excludes:

- Major scope changes such as end product specification, capacities, and location of project
- Extraordinary events such as strikes or natural disasters
- Management reserves
- Escalation and currency effects

A summary of construction mark-ups is provided in **Table 4**.

Table 4
Additional Construction Costs

Additional Cost Factor	Percent
Low Traffic Control	5%
High Traffic Control	10%
Low Erosion Control	1%
High Erosion Control	3%
Contractor Overhead and Profit	15%
Mobilization	10%
Contingency	30%

D.5 Total Project Cost

The total project cost is the sum of construction cost with additional cost allowances for legal, administrative, and engineering fees. **Table 5**, shown below, presents the cost allowances for each additional project cost. The engineering costs include design and surveying. Construction administration is the cost associated with managing the construction of the project.

Table 5
Summary of Additional Costs

Additional Cost Factor	Percent
Legal/Admin. Coordination	10%
Engineering Design	15%
Construction Engineering	5%

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