Lolo RSID 901 Water System Preliminary Engineering Report

December 2021

Lolo RSID 901 Water System
Preliminary Engineering Report

December, 2021

I hereby certify that the Lolo Water System Preliminary Engineering Report was prepared by me or under my direct supervision and that I am a duly registered Engineer under the laws of the State of Montana.

MONTANA
CRAIG T. CAPRARA
10147 PE
REGISTERED
PROFESSIONAL ENGINEER

12/13/2021

Craig T. Caprara – Project Manager

I hereby certify that the Lolo Water System Preliminary Engineering Report was authorized by the Missoula County Commission and it has been duly reviewed and adopted by the Missoula County Commissioners on this 4th day of ~~December, 2021.~~ January, 2022.

By: Juanita Vero
6E45D36DCC41E9C2B2D512DC93A576B2 readysign

Name: Juanita Vero

Title: Commission Chair

Address: 200 W Broadway
Missoula, MT 59802

Table of Contents

List of Tables

List of Figures

Photos

1.0 Executive Summary

This Preliminary Engineering Report for the Lolo Rural Special Improvements District (RSID) water system was prepared with the following goals in mind;

- Estimate population growth and water demands for the next 20 years to 2040
- Create a hydraulic model of the water system to evaluate existing and future supply, capacity, storage, and fire flow.
- Identify system improvements that may be required to continue providing safe, reliable drinking water to the residents of Lolo
- Evaluate available funding strategies for identified capital improvement needs

The recommended projects are summarized in the table below.

Table E-1-1. Recommended Projects Summary

Need for the Project	Proposed Project	Category	Project Cost Estimate (2021)	Phase	Recommended Timeline
Additional water supply needed to meet MDEQ-1	Well Pump Upsize	Health, Sanitation and Security	$315,000	Phase 1	Near Term – 1 to 3 years
Additional water supply needed to meet MDEQ-1	New Well	Health, Sanitation and Security	$1,160,000	Phase 3	Long term – 5 to 10 years
System has significant non-revenue water	Leak Detection	Health, Sanitation and Security	$35,000 (first year)	Phase 1	Near Term – 1 to 3 years
Controls are outdated	Instrumentation and Controls	Health, Sanitation and Security	$95,000	Phase 2	Mid Term – 3 to 5 years
System has no water meters	Customer Meters – Feasibility Study	Health, Sanitation and Security	$10,000	Phase 2	Mid Term – 3 to 5 years
Existing wells do not have backup power	Backup Power for Water Supply	Health, Sanitation and Security	$54,000	Phase 2	Mid Term – 3 to 5 years
Compliance	AWIA – Risk and Resiliency Assessment	Health, Sanitation and Security	$15,000	Phase 1	Near Term – 1 to 3 years
Distribution System	Water main connection between the shopping center and Tyler Way; including a crossing under the railroad.	Health, Sanitation and Security	$171,000	Phase 1	Near Term – 1 to 3 years

Need for the Project	Proposed Project	Category	Project Cost Estimate (2021)	Phase	Recommended Timeline
Distribution System	Water main upsize along Ridgeway Dr. from PRV #6 to Barclay	Reasonable Growth	$337,000	Phase 3	Long term – 5 to 10 years
Distribution System	Water main upsize along Ridgeway Dr from PRV#4b to Cumberland	Reasonable Growth	$856,000	Phase 3	Long term – 5 to 10 years
Distribution System	Upsize 6-inch to 8-inch (Upper tank to Lower tank: Reservoir 1 down to St. John's, Claremont St., and Ridgeway Dr.), approximately 2,000 feet, plus 400 feet of new 8-inch along Ridgeway connecting 2 dead ends	Reasonable Growth	$409,000	Phase 3	Long term – 5 to 10 years
System resiliency and future growth	Water main extension along Farm Rd.	Reasonable Growth	$500,000	Phase 1	Near Term – 1 to 3 years (should be completed prior to upsizing wells 1 and 2)
Accommodate growth and development	Water main extension north on Highway 93 from Ridgeway to Bird Lane	Reasonable Growth	$1,330,000	Phase 3	Timeline based on growth and development
Accommodate growth and development	Water main extension west on Highway 12 from Stella Blue to Cow Catcher Rd.	Reasonable Growth	$1,490,000	Phase 3	Timeline based on growth and development
Accommodate growth and development	Water main extension from Tyler Way (near the old school) to Lewis and Clark on the west side of Highway 93	Reasonable Growth	$235,000	Phase 2 1	Mid Term – 3 to 5 years
Accommodate growth and development	New Storage Tank	Reasonable Growth	$850,000	Phase 3	Long Term – 5 to 10 years
Distribution System	Glacier Drive, upsize 564 LF of 6-inch AC to 12-inch on Glacier Drive from Well #1 to PRV #4a and 4b.	Aging Infrastructure	$212,000	Phase 1	Near Term – 1 to 3 years
Water system includes AC pipe that is nearing the end of its useful life	Annual Pipe Replacement	Aging Infrastructure	$200,000 per year	Phase 1	Near Term – 1 to 3 years

Need for the Project	Proposed Project	Category	Project Cost Estimate (2021)	Phase	Recommended Timeline
PRVs are aging, and do not have SCADA	PRV Replacement	Aging Infrastructure	$230,000 per PRV	Phase 2	Mid Term – 3 to 5 years
Tank coatings are nearing the end of their useful life	Tank coating	Aging Infrastructure	$370,000 (2 tanks)	Phase 3	Long Term – 5 to 10 years

The highest priority projects identified in this PER are described below.

1. Upsize Wells No. 1 and No. 2. In recent years, the system received favorable rulings on water rights, allowing wells No.1 and No. 2 to increase their pumping capacity from 700 and 800 gpm to 1,356 gpm each. This increase in pumping capacity is needed to meet MDEQ-1. Without this increase in pump capacity the system cannot supply maximum day demand with the largest pump out of service.

2. Farm Lane Water Main Extension: New 12-inch water main along Lewis and Clark Dr./Farm Lane, from Highway 93 to Ashton Loop (approx. 1,880 LF), including a crossing under the railroad tracks (boring or directional drilling). This is the highest priority project for the Lolo RSID because the additional capacity is necessary prior to upsizing wells 1 and 2, this water main will serve the new school, and this water main will increase fire flows on the east side. In addition, this will be the only redundant system connection across the railroad tracks. This line also improves water quality and fire flow by providing a larger loop for the eastern portion of the system.

3. Glacier Drive: 564 LF of 12-inch water main on Glacier Drive from Well #1 (east of the railroad) to PRV 4a and 4b. The existing water main is 6-inch asbestos concrete that has reached the end of its useful life. Two failures in this section have occurred in the past five years.

4. Shopping Center to Tyler Way: Connect the shopping center to Tyler Way (approx. 320 LF). This would create an additional crossing under the railroad that would add resiliency to the system. This 8-inch connection improves capacity and fire flow to the commercial area, health care facility and surrounding homes.

2.0 Project Planning

2.1 Introduction

This document provides an overview of the Lolo Rural Special Improvements District (RSID) 901 (the District) water system. With the help of Missoula County Staff and operators, the existing system has been documented and evaluated based on existing and projected populations and water demands out to year 2040. A hydraulic model of the system was created, issues were identified, and potential solutions have been identified, evaluated, and recommendations provided. A summary of proposed projects has been outlined with preliminary descriptions, layouts, and opinions of probable construction costs. The purpose of this preliminary engineering report (PER) is to describe and summarize work completed to evaluate the system and begin the planning process for system improvements.

2.2 Location

The town of Lolo is located on the mountainous western half of Montana in Missoula County at 3,199' above sea level. Lolo is a census designated place and is part of the Missoula Metropolitan Statistical Area. The town lies at the intersection of U.S. Highway 12 and U.S. Highway 93. Lolo is approximately 10 miles south of the City of Missoula at the confluence of the Bitterroot River and Lolo Creek. The planning area is primarily in Township 12N, Range 20W, Sections 22, 25, 26, 27, 36, 35, 34, 33 and 32 with a small portion in Township 11N, Range 20W, Sections 1, 2 and 3. An aerial photo of the Lolo area is shown in Figure 2-1 below, and Figure 2-2 shows the existing water system.

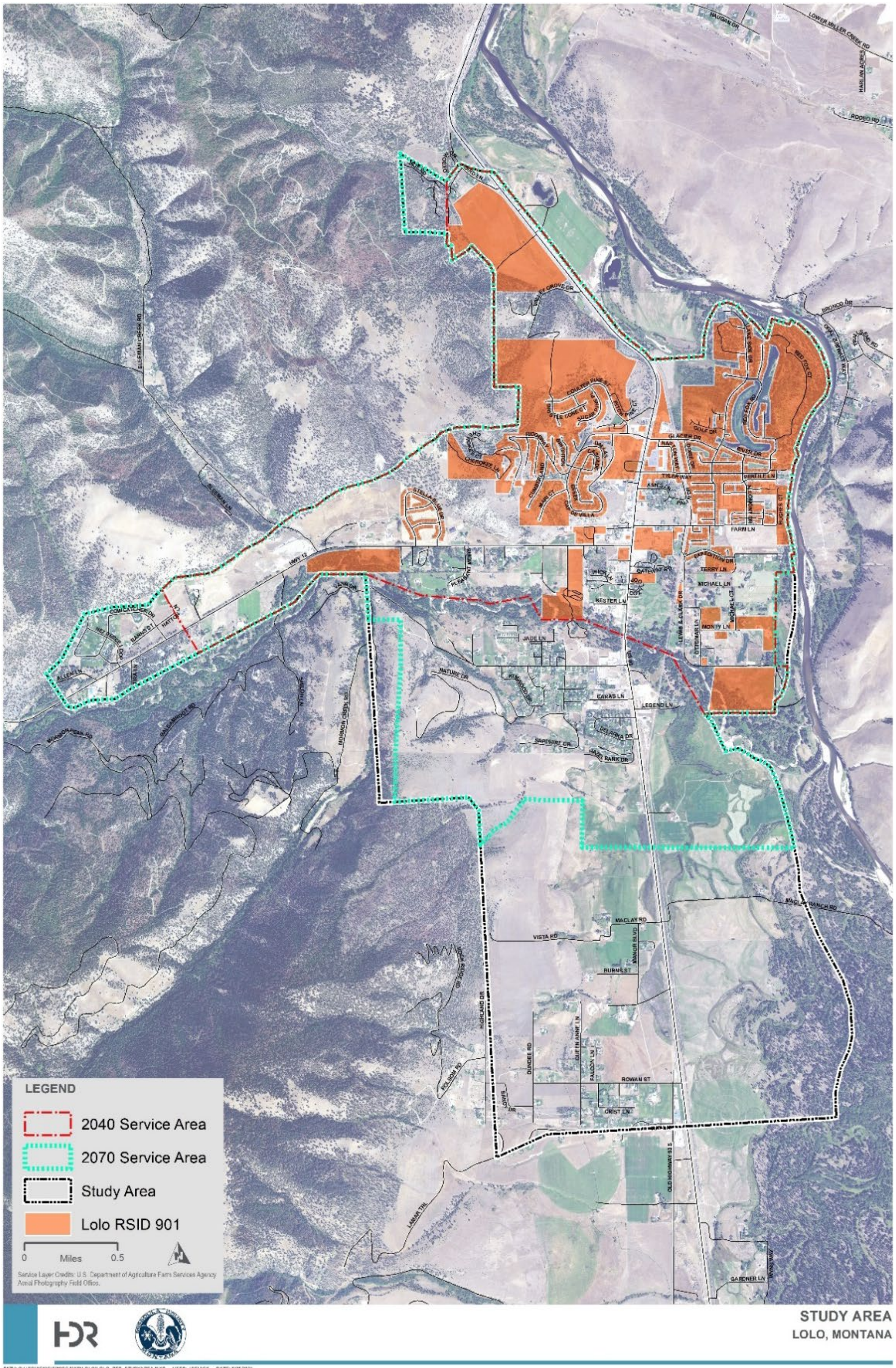


Figure 2-1: Lolo Study Area

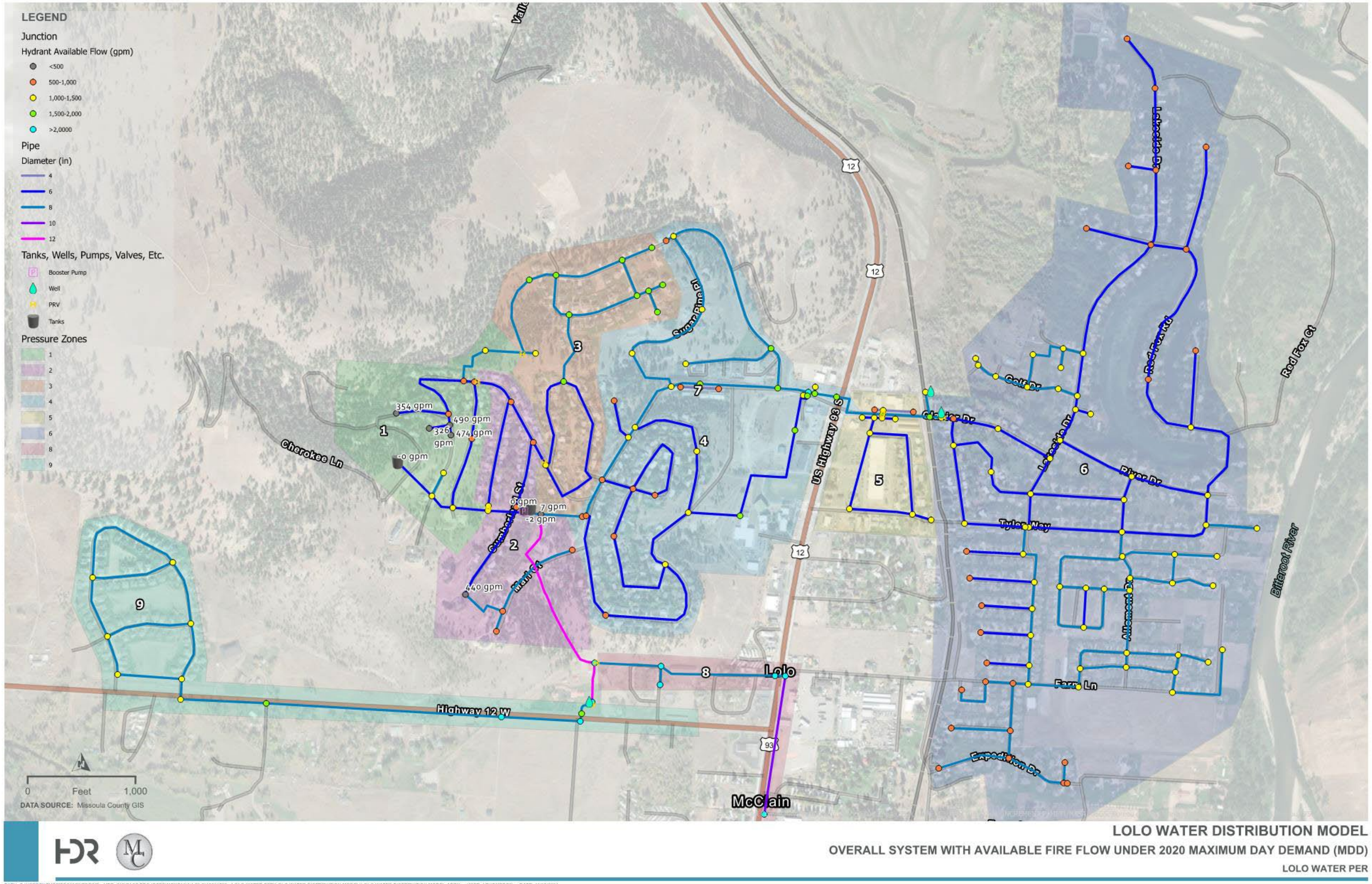


Figure 2-2: Existing Water System

2.3 Environmental Resources

Surface Water

The planning area is located in the Clark Fork River Basin. The major surface waters include the Bitterroot River and its tributaries. The Bitterroot River runs along the east side of Lolo, flowing south to north. Lolo Creek, a small tributary of the Bitterroot River, approaches Lolo from the west, flowing into the Bitterroot southeast of Lolo. Doyles Slough is a year-round pond that sits in the bend of the Bitterroot River in the northeast area of Lolo.

Groundwater

Groundwater is the sole source of drinking water supply for Lolo at this time, being supplied by three main wells. Lolo is at the north end of the Bitterroot River drainage basin which is roughly bordered by the Bitterroot Range on the west and the Sapphire Mountains on the east.

Floodplain

Federal Emergency Management Agency (FEMA) floodplain maps show the existence of the 100-year floodplain along the Bitterroot River within the planning area. This floodplain parallels the river channel. Portions of the existing water system are located within the 100-year floodplain, along the Bitterroot River. See the FEMA National Flood Hazard map in Figure 2-3 below.

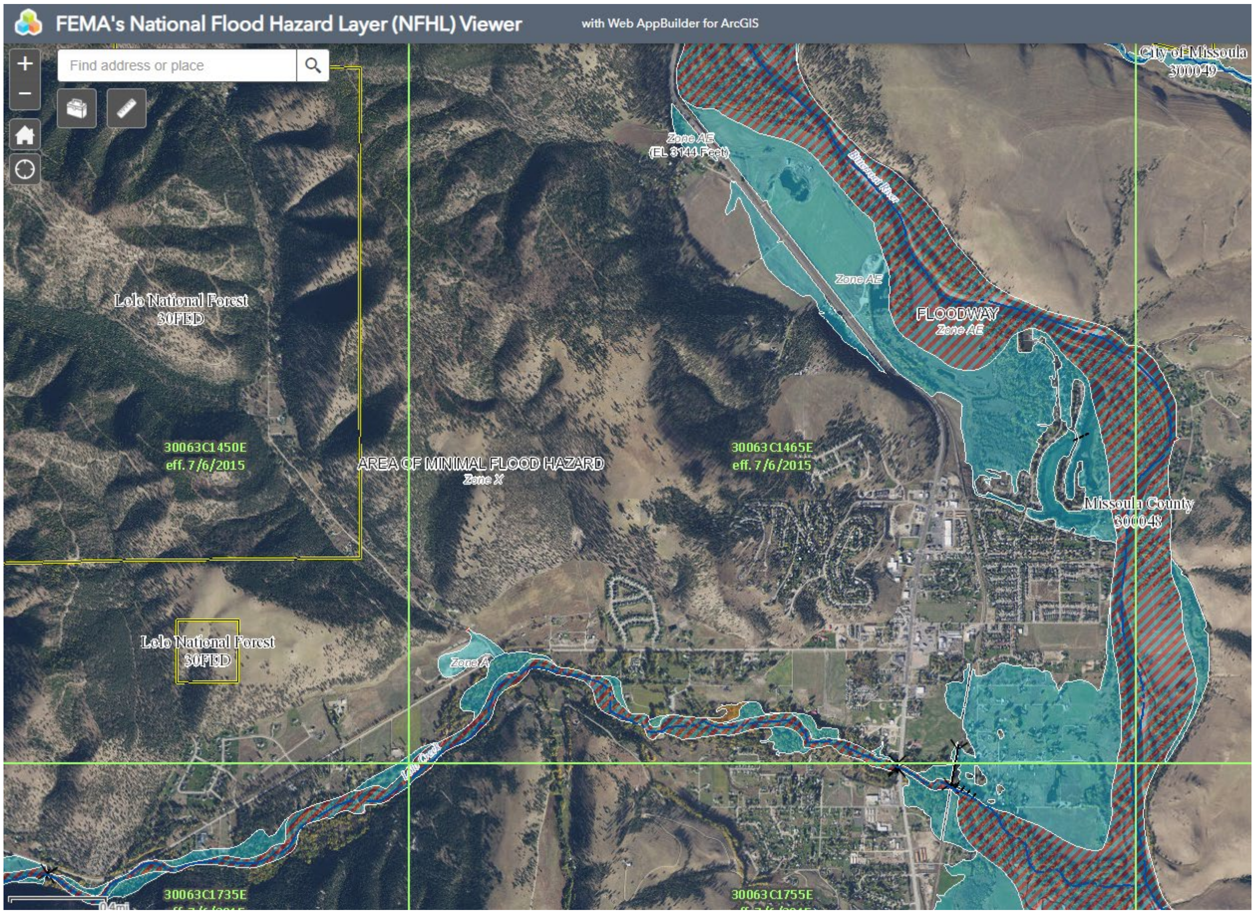
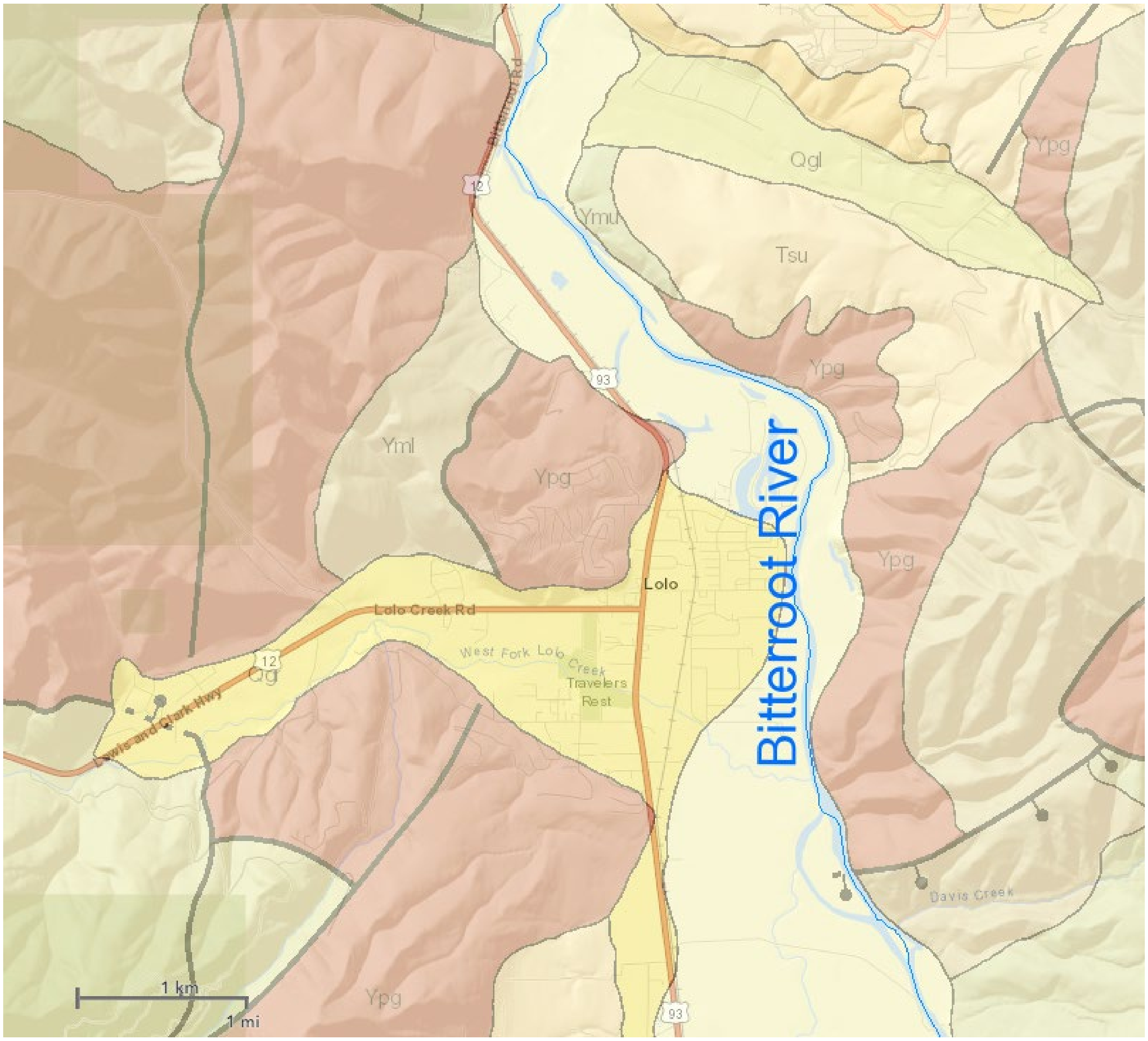


Figure 2-3: FEMA Floodplain Map

Source: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html

Geology and Soils

Lolo is split up into 3 main geological areas; Bitterroot River, Lolo Creek, and the hillside. Along the Bitterroot River the soils are gravel, sand, silt and clay deposits of the river channel and floodplain. In the Lolo Creek drainage and fan there are variable deposits that range from pebble to boulder size and include sand, silt and clay. The hillside is predominantly limestone and dolomitic limestone with siltite partings. See Figure 2-4 below.

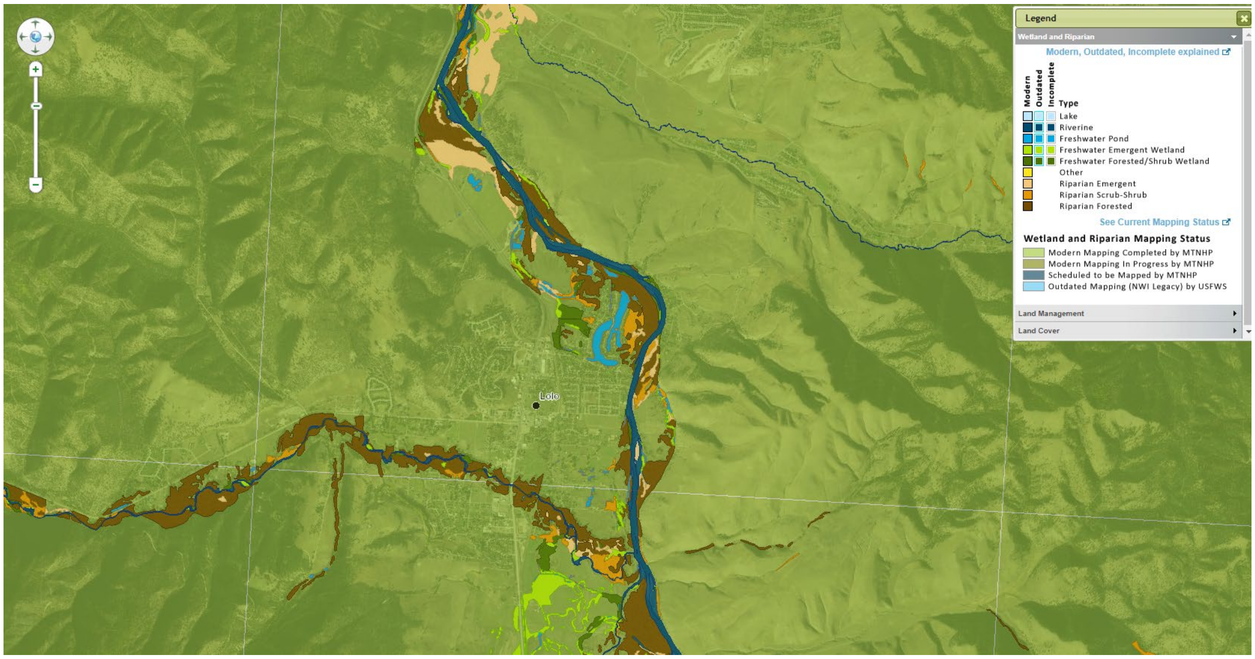


Source: https://mbmg.mtech.edu/mapper/mapper.asp?view=Wells&

Figure 2-4: Lolo Geology

Wetlands

Most of the Lolo water system resides outside wetland areas. The Lolo Creek bed is very narrow and primarily forested riparian area. Along the Bitterroot River, a portion of the existing and future service area is forested riparian area with a scattering of scrub-shrub and emergent riparian areas and forested and emergent wetlands. See the Natural Heritage Map Viewer image in Figure 2-5 below.



Source: http://mtnhp.org/mapviewer/?t=8

Figure 2-5: Wetlands Map

Wildlife

The areas in and around Lolo are home to many large mammals including grizzly bear, black bear, cougar, timber wolf, mountain goat, bighorn sheep, elk, moose, and mule deer, in addition to smaller mammals, and numerous bird species. There are a number of conservation easements on the surrounding land, and a new 832-acre easement called the Maclay Ranch easement located 1.5 miles south of Lolo is currently underway. This will allow for an east-west corridor for wildlife moving between the Bitterroot and Sapphire mountains, across U.S. Highway 93. The Bitterroot River drainage is home to westslope cutthroat, rainbow, brown, brook, and bull trout.

2.4 Existing and Future Population Projections

The purpose of this section is to identify current population and water demands and project future conditions.

Study Area

Since the 2004 Water System Facility Study, the areas of Lolo experiencing the greatest growth and development include: the area north of Ridgeway Dr., the Lolo Creek Trails addition on Highway 12, and the Allomont Dr. area on the east side of town. Over the next 20 years development is expected to expand to Valley Grove Drive to the north, Cowcatcher Drive to the west, West Fork Lolo Creek to the south, and the Bitterroot River floodplain to the east. By 2070 this area may expand to Moe Road to the north, Allen Lane to the west, Maclay Ranch Conservation Easement to the south and the Bitterroot River floodplain to the east. The areas of expected growth rely on Highway 93 and Highway 12 as the main traffic corridors and have ample developable land for expansion.

Population

Missoula County provided the following population growth data and projections. This data comes from the 2000, 2010 and 2020 census data, in combination with data provided by eRemi Consultant. These numbers were used to calculate the average annual growth rate between the years 2000 and 2020. The average annual growth rate for Missoula County is 1.10%. By using this growth rate, and those provided by eRemi Consultants, it is estimated that Missoula County will grow to a population of 140,339 by 2040.

To acquire the population projection for Lolo, the County utilized the population estimates for the census designated place (CDP) of Lolo for the year 2020. These numbers were used to calculate Lolo's percentage of Missoula County population, which is around 3.73 percent. Then the County determined what percentage of population growth in the county applied to Lolo specifically. The County used a combination of data including an average annual growth rate of 0.94% along with projection rates provided by eRemi Consultants and determined that in 2040 Lolo will have a population of 5,688; an increase of 1,289 people from the 2020 population.

Between the years 2010 and 2020, Lolo saw a -.07% population growth rate. This means that there was no population growth with a very slight decline in population. This is a significant departure from the previous decade. Between 2000 and 2010 Lolo saw an annual growth rate of 1.95 percent, where the population went from 3,708 people to 4,430 people. It is therefore important to take both growth rates into consideration when projecting the communities population in the future. The County assumes that Lolo will likely grow in population in the coming decades, but it will be at a more modest rate than we have seen in the past.

Table 2-1 summarizes existing and projected population for the proposed Lolo RSID 901 service Area.

Figure 2-1 shows the existing service area of the water system as well as the projected 2040 service area boundary. The 2040 service area population assumes the rate of growth in customers is equal to the population growth rate. Table 2-1 shows the population projections provided by Missoula County and the water service area projected population.

Table 2-1: Existing and Projected Population

	Lolo CDP Population	Service Population	Housing	Service Area Land (acre)	Service Area Pop./ac.	Service Area acres/house
2020	4,399	3,500	1,400	816	4.3	0.58
2025	4,690	3,733	1,493	1,100	3.4	0.74
2030	5,001	3,983	1,593	1,482	2.7	0.93
2035	5,332	4,248	1,699	1,998	2.1	1.18
2040	5,688	4,532	1,812	2,695	1.7	1.49

2.5 Existing and Future Water Demands

Water demands in Lolo include residential with uses such as bathing, drinking, cooking, and watering. Industrial water services include Lolo Creek Distillery and Lolo Peak Brewery and Grill. Commercial uses include the schools, shopping center and medical clinic, and commercial businesses. Water services are also categorized by service pipe size. In addition to water use, leakage in the distribution system must be accounted for and included in the water demand.

Existing Water Demand

Table 2-2 summarizes water production data for the last five years. Table 2-3 summarizes the quantity of water pumped from the lower reservoirs to the upper reservoir for the last five years. The current (2020) annual use is 290,138,000 gallons. This equates to an average daily flow of 793,000 gallons or 550 gallons per minute (gpm). The maximum daily use for the system occurred in August 2020 and was 2,670,000 gallons or 1,854 gpm. The maximum daily demand has averaged 3.21 times the average daily demand over the 5 year period reported in Table 2-2. The historical peaking factor for the system as reported in the 1988 and 2004 Water System Analysis Reports was 3.0.

The current (2020) annual flow at the booster station is 62,518,000 gallons. This equates to an average daily flow of 171,000 gallons or 119 gpm. The maximum day flow for the booster station in 2020 was 429,000 gallons or 298 gpm. The maximum daily demand has averaged 3.15 times the average daily demand over the 5-year period reported in Table 2-3. The historical peaking factors for the booster station reported in the 1988 and 2004 Water System Analysis Reports were 3.13 and 3.59, respectively.

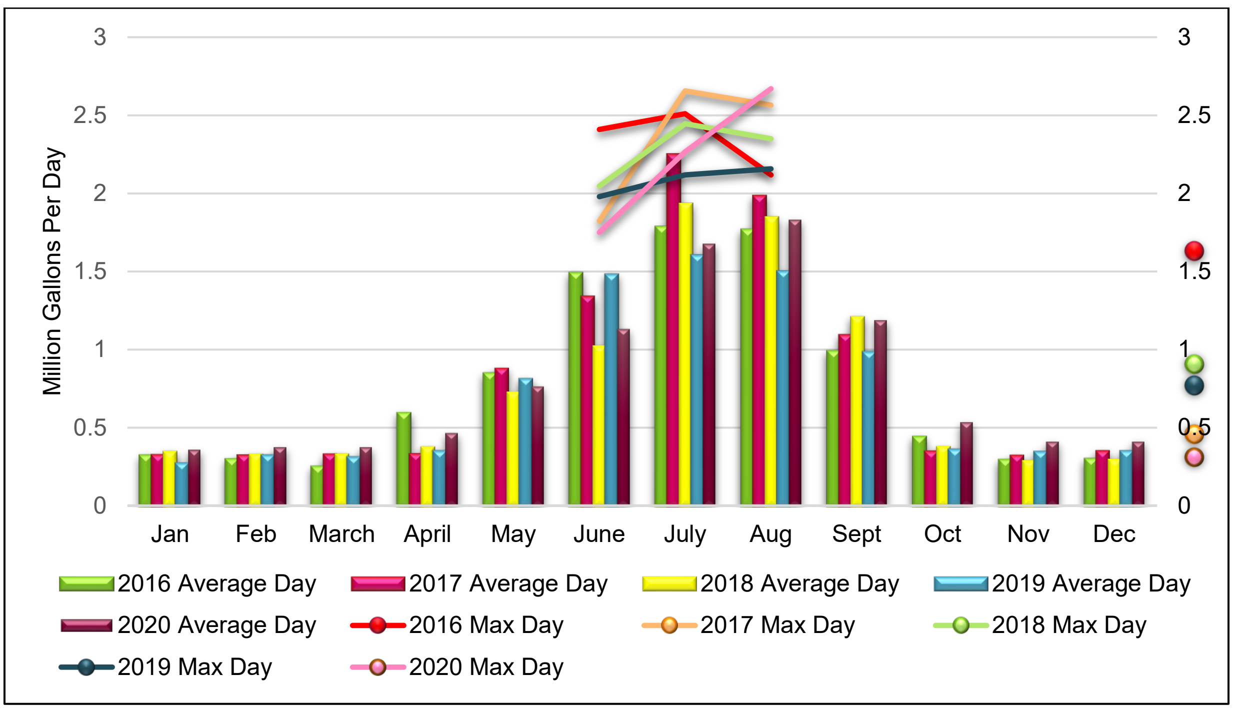


Figure 2-6: Water Production, Average Day and Max Day, 2016 to 2020

Table 2-2: Water Production Data Summary (MGD)

Month	2016			2017			2018			2019			2020		
	Avg. Day	Max Day	Total Mo.	Avg. Day	Max Day	Total Mo.	Avg. Day	Max Day	Total Mo.	Avg. Day	Max Day	Total Mo.	Avg. Day	Max Day	Total Mo.
Jan	0.321	-	9.957	0.322	-	9.986	0.344	-	10.671	0.270	-	8.363	0.355	-	10.995
Feb	0.296	-	8.583	0.320	-	8.968	0.325	-	9.108	0.320	-	8.967	0.372	-	10.419
March	0.250	-	7.752	0.328	-	10.168	0.327	-	10.132	0.309	-	9.567	0.371	-	11.508
April	0.592	-	17.747	0.329	-	9.882	0.372	-	11.173	0.348	-	10.451	0.463	-	13.893
May	0.845	-	26.184	0.875	-	27.136	0.722	-	22.388	0.808	-	25.042	0.763	-	23.655
June	1.486	2.409	44.589	1.335	1.823	40.051	1.017	2.047	30.495	1.477	1.979	44.296	1.132	1.750	33.971
July	1.783	2.510	55.286	2.245	2.656	69.609	1.930	2.446	59.832	1.600	2.119	49.601	1.675	2.266	51.924
Aug	1.764	2.118	54.681	1.978	2.565	61.316	1.844	2.350	57.164	1.498	2.157	46.441	1.830	2.670	56.733
Sept	0.988	-	29.634	1.090	-	32.688	1.205	-	36.146	0.980	-	29.411	1.187	-	35.621
Oct	0.440	-	13.639	0.346	-	10.733	0.374	-	11.585	0.358	-	11.103	0.532	-	16.507
Nov	0.293	-	8.776	0.319	-	9.562	0.284	-	8.525	0.344	-	10.307	0.408	-	12.242
Dec	0.299	-	9.270	0.347	-	10.759	0.292	-	9.056	0.348	-	10.775	0.409	-	12.671
Avg. Day	0.782			0.822			0.755			0.722			0.793		
Max Day	2.510			2.656			2.446			2.157			2.670		
Avg Mo.	23.841			25.071			23.023			22.027			24.178		
Max Month	55.286			69.609			59.832			49.601			56.733		
Total Year	286.098			300.856			276.275			264.324			290.138		

Source: Lolo water system operations staff

Table 2-3: Booster Pumping Station Water Summary (MGD)

Month	2016		2017		2018		2019		2020	
	Avg. Day	Total Mo.	Avg. Day	Total Mo.	Avg. Day	Total Mo.	Avg. Day	Total Mo.	Avg. Day	Total Mo.
Jan	0.046	1.43	0.064	1.985	0.073	2.265	0.059	1.836	0.089	2.767
Feb	0.046	1.331	0.048	1.336	0.074	2.062	0.061	1.709	0.093	2.59

Month	2016		2017		2018		2019		2020	
March	0.049	1.504	0.048	1.493	0.076	2.346	0.065	2.005	0.094	2.899
April	0.102	3.045	0.063	1.896	0.088	2.647	0.077	2.295	0.114	3.43
May	0.140	4.353	0.154	4.768	0.150	4.651	0.175	5.418	0.172	5.324
June	0.281	8.419	0.239	7.166	0.194	5.811	0.280	8.392	0.236	7.092
July	0.342	10.608	0.434	13.442	0.385	11.921	0.310	9.622	0.340	10.529
Aug	0.340	10.544	0.373	11.564	0.346	10.723	0.286	8.869	0.371	11.499
Sept	0.170	5.086	0.192	5.767	0.214	6.421	0.178	5.33	0.237	7.108
Oct	0.058	1.81	0.071	2.209	0.068	2.12	0.053	1.63	0.117	3.64
Nov	0.047	1.418	0.068	2.033	0.056	1.692	0.088	2.646	0.093	2.8
Dec	0.055	1.716	0.075	2.317	0.059	1.83	0.090	2.787	0.092	2.84
Avg. Day	0.140		0.153		0.149		0.144		0.171	
Max Day	0.506		0.500		0.481		0.456		0.429	
Avg Month	4.272		4.665		4.541		4.378		5.210	
Max Month	10.608		13.442		11.921		9.622		11.499	
Total Year	51.264		55.976		54.489		52.539		62.518	

The District has a current water sprinkling regulation that is in effect year round. This regulation limits the sprinkling from 6:00am to 12:00pm and 6:00pm to 12:00am each day with odd number addresses using odd days only and even number addresses using even days only.

Summer time use can be 5.5 times higher than winter water use. Reducing irrigation demand would be one strategy to conserve water.

Typical winter month (November through February) daily flows have averaged 330,000 GPD over the last five years. Typical summer month (July and August) daily flows have averaged 1,815,000 GPD over the last five years. Examination of sewer flow records at the wastewater treatment plant shows that there is no significant difference between summer and winter flows. This indicates there is no significant increase in domestic water usage (with inflows excluded) from the winter to the summer and that the increase in water use during the summer months is due to irrigation.

Non-Revenue Water

Non-revenue water can place a significant demand on the system. In order to determine the extent that leakage may be occurring within the system, a comparison was made between the average daily water use for the winter months (November through February) and the sewer influent from the same period. Table 2-4 shows the comparison in these flows.

Table 2-4: Non-Revenue Water Analysis Data

Average Daily Water Production and Sewer Flow (GPD) for November through February					
	2016	**2017**	**2018**	**2019**	**2020**
Water Production	304,000	327,000	310,000	320,000	385,000
Metered Sewer Flow	250,000	242,000	238,000	236,000	250,000
Average Infiltration[1]	32,000	32,000	32,000	32,000	32,000
Estimated Actual Sewer Flow	218,000	210,000	206,000	204,000	218,000
Estimated Non-revenue Water (Water Production – Actual Sewer Flow)	86,000 (28%)	117,000 (36%)	104,000 (33%)	116,000 (36%)	167,000 (43%)

[1]Per the Lolo RSID Wastewater Facility Plan, January 2000.

Typically, we would expect the sewer flows to be slightly higher than the water use because even though a small amount of water is used that doesn't make it to the sewer system, there is groundwater infiltration into the sewer system. It is difficult to accurately quantify the amount of water leaking from the system, so a variety of methods are used to estimate the leakage and look for changes over time. The data in Table 2-4 indicates that leakage may be increasing over time. From 2001 to 2003 the leakage estimates ranged between 80,000 and 110,000 gallons per day (2004 Lolo RSID 901 – Water System Facility Study, HDR) and averaged 96,000 GPD compared to the 118,000 GPD average over the past five years. Figure 2-7 graphs estimated leakage over time as reported in this report and in the 2004 Lolo RSID 901 – Water System Facility Study (not the gap in years between 2003 and 2016).

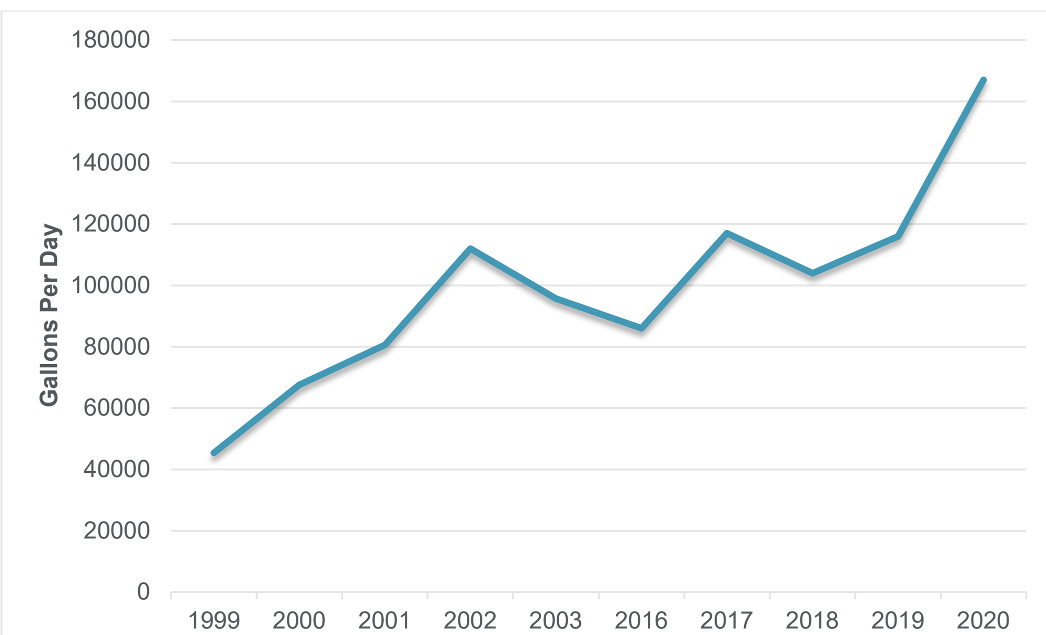


Figure 2-7: Estimated Non-Revenue Water, 1999 to 2020

Another approach is to compare the average expected usage with the actual usage. There are approximately 1,400 equivalent dwelling units (EDU's) in the system. The average sewer flows (adjusted for infiltration) ranged between 204,000 and 218,000 GPD, this equates to a usage between 145 and 155 GPD per dwelling unit. Typical values for EDU sewer flow would be expected to fall between 200-350 GPD. If a usage of 200 GPD per dwelling unit value is used for 2020 data, the leakage rate would be approximately 105,000 GPD. This equates to approximately 30 percent of the total water produced.

Reducing non-revenue water could help offset water demands in the future.

It is important to note that this leakage analysis is an estimate and is in part based on estimated values for average infiltration. The 1998 wastewater facility plan noted an average sewer infiltration value of 32,000 gpd. The sewer infiltration is expected to increase with system age and would suggest leakage greater than those stated above. The absence of meters makes it impossible to accurately determine the amount of water lost due to leakage.

Future Water Demands

The 2020 water production (including leakage) results in an average day demand of 227 gallons per capita per day (GPCD) and a maximum day demand of 763 GPCD. Table 2-5 presents projected population served by the water system and estimated water demand to 2040.

Table 2-5: Projected Water Demand

Year	Service Area Population	Average Day Demand (GPD)	Maximum Day Demand (GPD)
2020	3,500	794,500	2,670,500
2025	3,733	847,391	2,848,279
2030	3,983	904,141	3,039,029
2035	4,248	964,296	3,241,224
2040	4,532	1,028,764	3,457,916

Notes:
1. Population values are based on the assumption that the service area is extended to the 2040 service area boundary in Figure 2-1 and serves the 2040 projected service area population.

Fire Flow

The fire flow is the largest demand on a system and is critical in the evaluation of storage capacity. According to Montana Department of Environmental Quality Circular-1 (2018), fire flow should meet the recommendations of the fire protection agency in which the water system is being developed, or in the absence of such a recommendation, the fire code adopted by the State of Montana. For Lolo, the Missoula Rural Fire District is the local fire protection agency and the 2018 International Fire Code (2018) has been adopted by the State of Montana. Residential fire flow is based on square footage of the house and the presence of an automatic sprinkler system. Buildings other than residential are based on the square footage of the building and construction materials. These are presented in Table 2-6.

Table 2-6: Fire Flows

Land Uses	Fire Flow (GPM)	Duration (Hours)
Residential Single Family	1,000	1
Building other than one- and two-family dwellings	1,500	2

Source: International Fire Code, 2012, with input from Missoula Rural Fire District Deputy Fire Marshal/Captain Peter V. Giardino

2.6 Community Engagement

The draft and final version of this report have been presented at several Lolo town council meetings as well as Missoula County Commissioner meetings; the agenda for these meetings is advertised and they are open to the public.

2.7 Existing Water Rights

Missoula County owns 5 active water rights for Lolo RSID #901, see summary Table 2-7. All water rights are for groundwater, use a well as a means of diversion, and are intended for municipal use.

In recent years, the water rights for Wells No. 1 and No. 2 have been increased to 1,356 gpm each (in past years they were limited to a water right of 850 and 700 gpm and this is the capacity of the existing pumps). Adjustments to the place of use (POU) are currently under review; the 2070 planning area and proposed place of use is shown in Figure 2-1.

Table 2-7: Water Rights Summary

Water Right	Water Right Type	Enforceable Priority Date	Flow Rate (GPM)	Volume (AF)
76H 1196 00 (Well No. 1)	Statement of Claim	7/24/1969	1,356	2,183
76H 27837 00 (Well No. 2)	Provisional Permit	3/10/1980	1,356	2,186.9
76H 29923 00	Ground Water Certificate	3/10/1980	75	61
76H 80142 00	Provisional Permit	1/3/1992	-	74
76H 95036 00 (Well No. 3)	Provisional Permit	7/27/1995	1,200	1,586
Total	**-**	**-**	**4,143**	**6,090.9**

The 2019 Water Rights Needs Assessment concluded that the Lolo RSID 901 could see a build out of 17,000 people by 2070 with a water demand of 286 gpcd, this equates to a 2070 water right need of 5,486 acre-feet per year or 1,391 acre-feet of new water rights.

3.0 Existing Facilities

3.1 Introduction

Water for the Lolo RSID 901 District is supplied by three deep production wells (Wells No. 1, No.2 and No. 3). Three steel reservoirs provide storage. A single booster pumping station pumps water from Pressure Zone No. 2 to Pressure Zone No. 1. A total of nine pressure zones exist in the system. The distribution system consists of 6-inch and 8-inch water mains of asbestos cement and PVC.

3.2 Condition of Existing Facilities

Water Supply

All water for the system is supplied by groundwater that is pumped from the ground into the storage and distribution system.

WELL NO. 1

Well No. 1 is located just east of the Montana Rail Link railroad tracks and just north of the intersection of Glacier Drive and Dorie Drive. The 154-foot-deep well was drilled in 1969 and consists of an 18-inch steel casing to 117 feet, and a 304 stainless steel Wire Wound Johnson Well Screen from 117 to 137 feet and a solidly closed tail pipe from 137 to 154 feet. The well log indicates that the well has a rated capacity of 1,600 GPM. Actual test pumping reached 2,000 GPM at a drawdown of 59 feet. According to the Edward E Johnson Well Screen Company, the stainless steel well screen has a capacity of 1,400 GPM. The static water level is at 31 feet and draws down to 34 feet with the pump running. Well pump information is included in Table 3-1.

Photo 1. Well House No. 1

WELL NO. 2

Well No. 2 is located approximately 200 feet from Well No. 1, just east of the Montana Rail Link railroad tracks and just north of the intersection of Glacier Drive and Dorie Drive. The 107 foot deep well was drilled in 1975 and consists of 14-inch steel casing to 64 feet, a 14-inch stainless steel Johnson Watermark well screen from 64 to 89 feet and a 12-inch steel tailpipe with a solid steel plate bottom from 89 to 107 feet. The well log indicates that the well produced 1,356 GPM during a 4-hour pump test with a drawdown of 19 feet. The static water level in this well is approximately 20 feet and it experiences a drawdown of approximately 7 feet during pumping at 800 GPM. Well pump information is included in Table 3-1.

Photo 2. Well House No. 2

WELL NO. 3

Well No. 3 is located just north of Highway 12 approximately 1,600 feet west of the intersection of Highway 93 and Highway 12. The 115 foot deep well was drilled in 1995 and consists of a 16-inch steel casing to 115 feet with 3-inch by ½-inch perforations from 80 to 100 feet. The well log indicates that the well produced 1,600 GPM during a 24-hour pump test with a drawdown of 21 feet. The static water level in this well is approximately 17 feet and it experiences a drawdown of approximately 21 feet during pumping at 1,150 GPM. Well pump information is included in Table 3-1 Well No. 3 is the only well with backup power, a 200KW Cat generator.

Photo 3. Well House No. 3

EMERGENCY/SUPPLEMENTAL WELL

A 6-inch diameter test well was drilled near production Well No. 1 prior to drilling the larger well. The 87 foot deep well is 6-inches in diameter and was reported to have a test flow of 150 GPM. The well has a 5 horsepower submersible pump with a capacity of 60 GPM. The emergency well was disconnected from the distribution system in 2011. Staff removed pressure controls and tank, pipe and electrical connections. The pump remains in the well as a water source in case of extreme circumstances.

Table 3-1: Well Pump Data

Water Source	Pump Capacity (GPM)	Horsepower	Pump Type	Static Water Level (FT)	Auxiliary Power	Well Depth (FT)	Casing Diameter (IN)
Well No. 1	720	100	Vertical Turbine	31	No	154	18
Well No. 2	800	100	Vertical Turbine	20	No	107	14
Well No. 3	1050	125	Vertical Turbine	17	Yes	115	16
Emergency Well	60	5	Submersible	31	No	87	6
Notes: 1.) Well No. 1 and No. 2 can produce about 1,400 gpm when pumping at the same time.							

Water Storage

RESERVOIR NO. 1

Reservoir No. 1 is located just below Cumberland Street and has a floor elevation of 3,447 feet. An 8-inch water transmission line from Wells No. 1 and No. 2 and a separate 12-inch water transmission line from Well No. 3 supply the reservoir. The 12-inch connects to the 8" line from Wells 1 and 2 about 100 ft away from the tanks. Hence, both Reservoirs 1&3 are feed by an 8" pipeline. It is a 24-foot high, 30-foot diameter steel tank with an overall capacity of 125,000 gallons. The reservoir was constructed in 1969. It was painted inside and out in 1991 and is inspected annually by the Missoula County staff. No significant coating failure has been reported; however, it is recommended that re-coating be performed every 10-15 years. Reservoir data is summarized in Table 3-2.

Photo 4. Reservoir No. 1

RESERVOIR NO. 2

Reservoir No. 2 is located on top of the hill above Ridgeway and has a floor elevation of 3,673 feet. Water is pumped to the reservoir through a 6-inch transmission line from the booster pumping station. It is a 24-foot high, 30-foot diameter steel tank with an overall capacity of 125,000 gallons. The reservoir was constructed in 1971. It was painted inside and out in 1991 and is inspected annually by the Missoula County Staff. No significant coating failure has been reported; however, it is recommended that re-coating be performed every 10-15 years. Reservoir data is summarized in Table 3-2.

RESERVOIR NO. 3

Reservoir No. 3 is located adjacent to Reservoir No. 1 just below Cumberland Street and has a floor elevation of 3,447 feet. It is supplied via an 8-inch water transmission line from Well No. 3. It is a 30-foot high, 60-foot diameter steel tank with an overall capacity of 500,000 gallons. The reservoir was constructed in 1990. It has been inspected annually since it was constructed in 1991. Reservoir data is summarized in Table 3-2.

Table 3-2: Reservoir Data

Reservoir	Volume (GAL)	Depth (FT)	High Water Elevation	Footprint	Pressure Zone	Year Constructed	Construction
No. 1	125,000	24	3469.0	30 FT Dia.	2	1969	At grade, steel
No. 2	125,000	24	3695.0	30 FT Dia.	1	1971	At grade, steel
No. 3	500,000	30	3471.2	60 FT Dia.	2	1990	At grade, steel

Booster Pumping Station

The booster pumping station is located adjacent to Reservoir No. 1 and Reservoir No. 3, just below Cumberland Street. The booster pumps are used to transfer water from Reservoirs No. 1 and No. 3 in Pressure Zone No. 2 to Reservoir No. 2 in Zone No. 1 through a 6-inch transmission line. The original booster pumping station and pump were constructed in 1971 in conjunction with the construction of Reservoir No. 2. In 1979 an additional booster pump was added and placed in a bypass line to provide additional capacity to Zone No. 1. In 1988, a new 4-inch bypass line was installed to allow water from Reservoir No. 2 to transfer back to Reservoir No. 1. In 2018 the pumps were replaced with a Grundfos booster pump skid with two of three pumps installed, each rated for 550 gpm and electrical upgrades were completed. The two booster pumps alternate during periods of low demand. Both pumps can operate together during periods of high demand. The pumps discharge to Reservoir No. 2 (upper tank) through a 6” asbestos concrete pipe. Table 3-3 summarizes booster station pump data.

Table 3-3: Booster Pump Summary

Pumping Unit	Capacity (GPM)	Horsepower	Pump Type	Auxiliary Power
Booster Pump No. 1	550	40	In line centrifugal booster skid	Yes
Booster Pump No. 2	550	40	In line centrifugal booster skid	Yes
Combined Capacity	1,100			

Water Distribution

DISTRIBUTION MAINS

The distribution system consists of 6-inch and 8-inch asbestos cement and PVC piping that was installed beginning in 1969. There is a single 8-inch water main crossing the Montana Rail Link railroad tracks and Highway 93, which carries water from production Wells No. 1 and No. 2 to the water reservoirs. A 12-inch water main carries water from Well No. 3 to the reservoirs. A 2-inch line from the supplemental well is connected to a 6-inch main feeding the lower Lake View Addition and is therefore only useful for this lower area. A summary of pipe type by length is shown in Table 3-4.

Table 3-4: Pipe Type by Length

Pipe Type	Total Linear Feet
Asbestos Concrete Pipe	39,526
PE	1,000
PVC	72,023
Total	112,549

PRESSURE ZONES

Water service elevations range from 3,556 feet on the west end of the system to 3,146 feet on the east end providing a total elevation difference of 410 feet. This is equivalent to a pressure difference of 177 psi. The minimum desired operating pressure for residential areas with one- and two-story houses is 35 psi. A minimum pressure of 20 psi must be maintained to provide adequate pressure for fire flow. The Lolo RSID 901 water system is segregated into nine pressure zones separated by pressure reducing stations. Table 3-5 outlines system pressure zone data.

Table 3-5: Lolo Pressure Zones

Pressure Zone	Upstream Pressure (PSI)	Downstream Pressure (PSI)
1	5-130[1]	
2	70	45
3	70	47
4	5-130[2]	
5	84	61
6	125	60
7	125	63
8	110	68
9	116	82

Notes:
1. Zone is gravity fed by Storage Tank No. 2, pressure based on elevation change in area.
2. Zone is gravity fed by Storage Tanks No. 1 and 3, pressure based on elevation change in area.

PRESSURE REDUCING STATIONS

Pressure zone 1: This zone serves the area between the upper storage tank, Tank No. 2 and west of Claremont St. This zone does not have a pressure reducing station associated with it as houses are fed directly by gravity from the storage tank. Houses in this area that have low water pressure issues require a pressure tank and booster pump to boost the pressure.

Pressure zone 2: This zone serves Mari Court, Cumberland and Saint Johns road and has two pressure reducing valve (PRV) stations. The station at Ridgeway and Claremont Street has been abandoned in place and is used to isolate pressure zone 2 from pressure zone 1. The remaining PRV is a single 6-inch valve located at the end of Saint Johns road.

Pressure zone 3: This zone serves houses along Barclay, Brighto, Scotch Pine, Coulter Pine, Limber Pine, Bristle Cone and Loblolly. The PRV is a single 6-inch valve located near the intersection of Ridgeway and Barclay.

Pressure zone 4: This zone serves houses along Ridgeway, Cape De Villa, Sugar Pine, Pinyon Way, Cascade, Essex, and the lower portion of Coulter Pine. The zone does not have a PRV associated with it as it is gravity fed from Storage Tanks No. 1 and 3.

Pressure zone 5: This zone serves 5 multifamily buildings near the intersection of Ridgeway and Cap De Villa, the PRV size is not known and located near 121 Ridgeway Dr.

Pressure zone 6: This zone serves the commercial area at Highway 93 and Glacier Drive in addition to the multifamily buildings along Napton Way and is served by two stations, the north section has a 4-inch and a 2-inch (maintenance) PRV near the intersection of Bowman and Glacier, while the south section is served by a single 4-inch PRV.

Pressure zone 7: This zone serves all houses east of the railroad tracks. The PRV station has a single 6-inch and a single 2-inch valve located near the intersection of Glacier and Dorie.

Pressure zone 8: This zone serves businesses and houses along Lewis and Clark Drive (west of Highway 93), Lolo Vista Dr., and the east side of Highway 93 from Lewis and Clark Drive to Tractor Supply Company. The zone is served by a dual 6-inch and 3-inch PRV station at the west end of Lolo Vista Dr.

Pressure zone 9: This zone serves businesses and houses along Highway 12. The zone is served by a dual 6-inch and 2-inch PRV station located near Well No. 3.

SERVICE CONNECTIONS

There are approximately 772 service connections on the lower system (Pressure Zones No. 4, No. 5, No. 6, No. 7, and No. 8). Of these connections, four are 1-1/4-inch that serve a total of 88 apartment units, two are 3-inch connections that serve the main shopping center. Of the remaining 766, approximately 302 are 1-inch and 464 are ¾-inch. There are approximately 332 service connections in the upper system (Pressure Zones No. 1, No. 2, and No. 3). Of these, approximately 17 are 1-inch and 315 are 3/4 -inch.

Controls

Remote monitoring and control of the water system is accomplished with an Allen-Bradley digital telemetry system communicating via a UHF radio system provided by Esteem. A master station (MTU) and radio transceiver is located at the Wastewater Treatment Plant with remote stations (RTU) and radio transceivers at Reservoir No. 2, the booster pumping station, Well House No. 1 (Wells No. 1 and No. 2), and Well House No. 3. There is a single pressure transducer located at Reservoirs No. 1 and No. 3 and a single pressure transducer located a Reservoir No. 2.

The Reservoir No. 2 RTU transmits the reservoir level analog signal from the pressure transducer to the MTU located at the WWTP for control of the booster pumps. The Reservoir No. 2 and No. 3 RTU transmits the reservoir level analog signal from the pressure transducer to the MTU for control of Well Pumps No. 1, No. 2 and No. 3.

Some of the alarms displayed on the MTU include the following:

- Reservoir No. 2 High Level
- Reservoir No. 2 Low Level
- Reservoir No. 2 Power/Data Fail
- Reservoir No. 1 and No. 3 High Level
- Reservoir No. 1 and No. 3 Low Level
- Reservoir No. 1 and No. 3 Power/Data Fail
- Well Pump No. 1 and No. 3 Power/Data Fail
- Well Pump No. 3 Power/Data Fail

An annunciator panel locate at the WWTP displays the following water system alarms:

- Reservoir No. 2 High Level
- Reservoir No. 2 Low Level
- Reservoir No. 1 and No. 3 High Level
- Reservoir No. 1 and No. 3 Low Level

An auto-dialer located at the WWTP calls operations staff upon un-acknowledged high and low water level alarms for Reservoirs No. 1, No. 2, and No. 3. A UPS (uninterruptible power source) is connected to the control system and provides approximately 12 hours of backup power upon main power failure. The RTU's have approximately 3 hours of backup battery life upon power failure.

During periods of low demand, Well Pumps No. 1, No. 2, and No. 3 alternate operation. During periods of high demand all three can operate at the same time. During periods of low demand, Booster Pumps No. 1 and No. 2 alternate operation. During periods of high demand both booster pumps can operate at the same time.

The current operational control system is configured as follows:

When the level in Reservoir No. 2 drops to the 19.5-foot mark the system calls for the booster station pump skid to start. Pumps are controlled by VFDs connected to a pressure transducer. The skid system will ramp pump speed up and down depending on a pressure setpoint entered into the system. Currently 106 psi. If system demand exceeds the pumping capabilities (can not maintain 106 psi) of the lead pump, the lag pump will start. When the reservoir level reaches 22.0 ft the MTU sends a signal to the pump skid to shut down. The overflow alarm is activated at the 22.4-foot mark and low-level alarm is activated at 12 feet.

When the level in Reservoirs No. 1 and No. 3 drops to the 19.4-foot mark the system calls for the lead well pump to start. The first lag pump is called to start when the level reaches the 17.4-foot mark. The second lag pump is called to start when the level reaches the 16.5-foot mark. The lead pump will then shutdown when the level reaches the 21.3-foot mark, the first lag pump will shutdown when the level reaches the 21.5-foot mark and the second lag pump will shut down when the level reaches 21.7 feet. The overflow alarm is activated at 22.4 feet and the low-level alarm is activated at 12 feet.

The system instrumentation and controls are outdated and none of the PRV's have SCADA. A system evaluation is recommended to determine specific updates necessary.

A schematic of the system is shown in Figure 3-1.

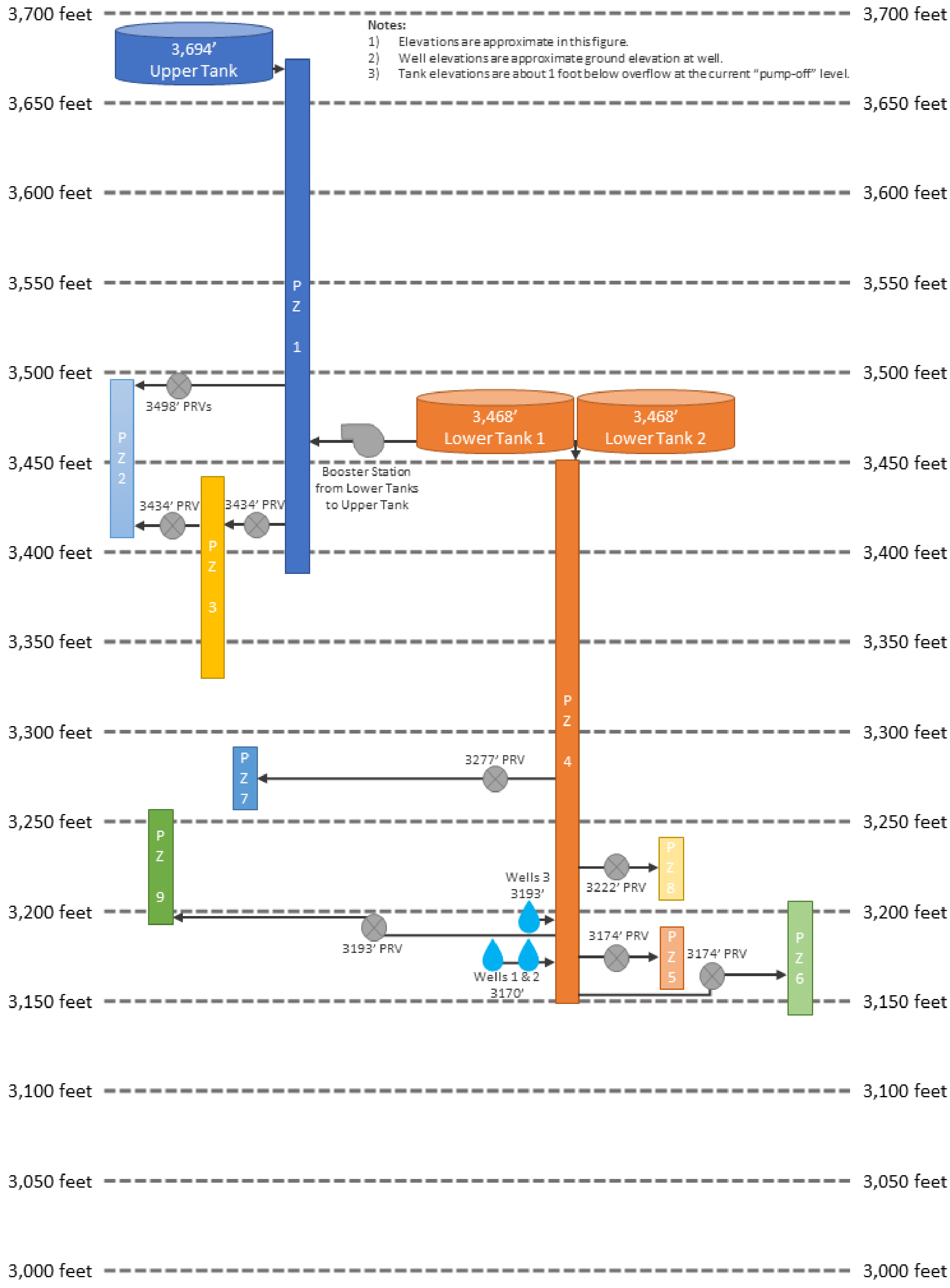


Figure 3-1: Water System Schematic

2.2 Existing and Future Regulations

Regulations play an important role in the planning and operation of a water utility. The purpose of this section is to discuss current and future regulations and their applicability to the Lolo RSID 901 Water System.

Current Regulations

As a group, the purpose of the current drinking water regulations is to ensure that drinking water is safe from microbial, chemical, and radiological contamination. Compliance with the rules requires each water system not only produce water that meets the regulated water quality standards, but also meets specific monitoring requirements and treatment techniques.

Current regulations that will impact the Lolo water system and its practices are listed below and briefly summarized. Some of these rules regulate contaminants or set up treatment techniques that must be met by water treatment plants and would only apply should Lolo choose to add a surface water source. In addition, there is a long list of organic and inorganic chemicals that are regulated with maximum contaminant levels in drinking water. Sampling for this suite of contaminants is part of the routine monitoring for all water systems. On a day-to-day basis, many of these contaminants are not a major concern for Lolo.

LEAD AND COPPER RULE AND REVISIONS (LCR)

The Lead and Copper Rule (LCR) and its 2019 revisions require utilities to have a corrosion control strategy if they exceed the action level, compile a complete lead service line inventory, require greater replacement of lead service lines, and require sampling at schools and childcare facilities. The LCR can have a significant impact on sampling, analytical and operating costs, as well as a substantial capital cost for treatment facilities. Water treatment processes must incorporate treatment schemes which ensure that stable, non-corrosive water is produced. If source water is corrosive, chemical addition can be employed for pH and/or alkalinity adjustment, calcium adjustment, or to inhibit corrosion. The new action level for lead is exceeded if more than 10 percent of the targeted tap samples are greater than 0.010 mg/L. The action level for copper is exceeded if more than 10 percent of the targeted tap samples are greater than 1.3 mg/L. If the action levels are exceeded, the corrosion control strategy must be reviewed and adjusted to reduce lead and copper levels at the tap.

Applicability to Lolo

The 2019 changes to the Lead and Copper Rule requiring attention include compiling a complete lead service line inventory, an increase in replacement of lead service lines and sampling at schools and childcare facilities. Based on Consumer Confidence Reports from 2015 to 2019 the reduced action level for lead does not require any operational changes.

REVISED TOTAL COLIFORM RULE (RTCR)

The Revised Total Coliform Rule took effect in 2016, building upon the 1989 Total Coliform Rule (TCR), which limited the number of positive total coliform samples allowed each month in the distribution system. The RTCR replaced the limits set in the TCR with a treatment technique that requires system assessment if monitoring results indicate the system is vulnerable to contamination and requires problems identified during the assessment to be corrected. The assessment is broken into two levels, Level 1 examines the source water, treatment, distribution system and facilities, and relevant operational practices. A Level 1 assessment is triggered if sampling resulting in one of the following scenarios:

1. For systems collecting 40 or more sample per month, the number of total coliform positive samples exceed 5.0% of the total coliform sample collected for the month (including routine and repeat samples).
2. For systems collecting fewer than 40 samples per month, there are two or more total coliform-positive samples in the same month (either routine or repeat).
3. For any system, the system fails to take every required repeat sample after any single routine total coliform-positive sample.

Level 2 is a more detailed investigation of the elements analyzed in the Level 1 assessment and a more detailed review of available information, likely involving engagement of additional parties and expertise. A Level 2 assessment is triggered in any one of the following scenarios:

1. An E. coli maximum contaminant level (MCL) violation.
2. Triggering of a second Level 1 assessment within a rolling 12-month period, unless the state has determined a likely cause for the situation that resulted in the initial Level 1 treatment technique trigger and establishes that the system has fully corrected the problem.
3. A system with approved reduced annual monitoring has a Level 1 treatment technique trigger in each of two consecutive years.

If a sanitary defect that could have caused the contamination is identified in either a Level 1 or Level 2 assessment, then corrective action is required. If no defect is found during either assessment, then proper documentation is required and the following best technologies, treatment techniques, or other means (a.k.a. best available technologies (BATs)) should be considered. The following BATs generally do not involve major construction or capital improvements and should be considered:

- Apply disinfection
- Change or update distribution system maintenance operations
- Perform unscheduled or spot flushing
- Implement sampler training
- Review sample siting plan
- Select appropriate sample sites
- Collect additional follow-up samples
- Institute boil water orders

Applicability to Lolo

The State of Montana has adopted the federal RTCR. Public notification is required when detections of total coliform are found. In addition to public notice, a system assessment and corrective action is required under the new RTCR. Lolo is in compliance with the State and Federal RTCR requirements.

RADIONUCLIDES RULE

The Radionuclides Rule sets MCLs for combined radium (Ra-226 and Ra-228) at 5 pCi/L, for Gross alpha at 15 pCi/L, for Uranium at 30 µg/L, and for beta/photon radioactivity at $\leq$ 4 millirem/year. This rule has generated an adjunct problem for some treatment facilities. When systems with significant levels of radionuclides practice enhanced coagulation, it is possible that the resultant sludge can have concentrations of radionuclides that can be problematic from a disposal standpoint.

Applicability to Lolo

Lolo is in compliance with all required radionuclides monitoring.

ARSENIC RULE

The Arsenic Rule sets a new MCL for arsenic at 10 µg/L with a compliance date of January 2006. The required monitoring for arsenic will occur in conjunction with other inorganic contaminant monitoring. For systems that have arsenic above 5 µg/L and below 10 µg/L, additional treatment is not required, but specific arsenic language must be included in the Consumer Confidence Report.

Applicability to Lolo

Lolo’s wells were tested three times in the past five year with no results above the reportable level.

CONSUMER CONFIDENCE REPORT (CCR) RULE

The Consumer Confidence Report (CCR) Rule requires every public water supply system to summarize information from regulatory compliance monitoring in a report that is sent to all customers once a year in July. The rule went into effect in 1998, with the first report due to customers in 1999. The CCR includes information on a system’s source water, levels of detected contaminants, compliance with drinking water rules, and some educational material.

Applicability to Lolo

The 2018 Consumer Confidence Report noted a violation for Nitrate as the measurement should have been taken in 2018 and the sample was taken on January 7, 2019. Nitrogen levels from 2015 to 2019 all measured less than 1.4 ppm while the maximum containment level is 10 ppm. All contamination levels measured have been below the maximum regulatory levels.

America’s Water Infrastructure Act (AWIA)

America’s Water Infrastructure Act (AWIA) also introduces new requirements that will affect Lolo. AWIA was signed into law in October 2018 and requires drinking water utilities serving at least 3,300 people to develop or update risk assessments and emergency response plans for their drinking water systems.

Under the act’s provisions, each community water system is required to evaluate the risks to its drinking water system and assess the relative resiliency thereof. The risk and resilience assessment is required to evaluate the following parameters:

1. The risks posed by natural hazards and malevolent acts

2. The resilience of the entire water system's infrastructure, including the system's pipes, conveyance equipment, treatment equipment, storage and distribution facilities, and any electronic equipment or automated systems
3. System monitoring practices
4. The system's financial infrastructure
5. Any chemical storage and handling practices
6. System operation and maintenance

America's Water Infrastructure Act of 2018 requires Lolo to complete a Risk and Resiliency Assessment by June 2021.

Water utilities must conduct their respective risk and resilience assessments and submit certification of completion to the EPA. Following the initial assessment certification, utilities will also need to reassess their systems and submit a recertification to the EPA every five years. The population served by the water system determines by when the initial assessment must be completed. Lolo's population falls into the 3,301 to 49,999 people category, and consequently Lolo will need to submit certification of its risk assessment completion no later than June 30, 2021.

Utilities are also required to develop or update an emergency response plan and certify its completion to the EPA no later than six months after submitting certification for their risk assessments. Therefore, Lolo is required to develop an emergency response plan and certify its completion no later than December 30, 2021. The emergency response plan must address the following:

1. Strategies to improve the system's resiliency, including physical security and cybersecurity if applicable
2. A response plan that can be implemented in the case of a natural disaster or malevolent act
3. Identify procedures and equipment to be used in the case of a natural disaster or malevolent act that threatens the water system infrastructure or drinking water source
4. Identify strategies that can be used to better foresee potential malevolent acts or natural disasters that could disrupt or harm the ability of the water system to deliver safe drinking water

Stage 2 DBP Rule

The EPA has set the MCLs at 80 micrograms per liter (µg/L) for TTHMs and 60 µg/L for HAA5. These numbers are computed on a locational running annual average (LRAA). For water systems sampling quarterly, the LRAA is an average of the last 4 quarters of data at each sampling location.

APPPLICABILITY TO LOLO

Lolo does not disinfect at this time and therefore is not required to monitor disinfection by-products or disinfectants. Should the system add disinfection in the future, the water utility will have to comply with this rule.

2.3 Future Regulations

Groundwater Rule

Microbial contamination has historically not been a concern for groundwater sources. Recent research, however, indicates that some groundwater can be a source of waterborne disease. EPA's proposed rule establishes multiple barriers to prevent bacteria and viruses that may be present in groundwater from entering a distribution system. Under the rule, groundwater will be assessed and systems at high risk for fecal contamination will be identified. The rule will also specify when corrective action will need to be taken.

Systems that currently chlorinate will be required to monitor residuals to ensure that 4-log virus inactivation is maintained. Systems that chlorinate at the well head as water enters the distribution system will be required to devise ways to maintain specified contact time between the disinfectant and water.

APPLICABILITY TO LOLO

Lolo does not currently chlorinate. This rule may require that the system be chlorinated in the future. If this is the case, investigation of contact time between the disinfectant and the water will need to be assessed.

Perfluoroalkyl (PFAS)

It is also likely that the EPA will continue its current trajectory of more strictly regulating PFAS. Perfluoroalkyl and polyfluoroalkyl substances, or PFAS, are synthetic chemicals that can persist in the environment and human bodies for long periods of time without breaking down. PFAS have been linked to numerous adverse human health effects and ecological impacts, and PFAS continue to come under increased regulatory scrutiny.

Common sources of PFAS compounds include food packaging, chemicals used for stain-resistant carpets, non-stick cookware, and water repellant coatings.

Perfluorooctane Sulfonate (PFOA) and Perfluorooctanoic Acid (PFOS) are two of the most common PFAS chemicals. EPA indicated that the agency would likely move to regulate the two chemicals under the provisions outlined in the Safe Drinking Water Act. Preliminary determinations to regulate PFOA and PFOS were announced by the EPA in February 2020. The agency is currently seeking public comment on the proposed regulatory determinations.

APPLICABILITY TO LOLO

Changing regulations and monitoring requirements could impact Lolo water system in the future.

Contaminant Candidate List and unregulated Contaminant Monitoring

EPA has an ongoing requirement to maintain a list of contaminants that may be of concern in drinking water. The contaminant candidate list includes some contaminants for which there are insufficient analytical methods and some that are suspected to be in water but in unknown quantities. For those contaminants that do not have analytical methods, research has been initiated by EPA to develop methods. The unregulated contaminant monitoring program provides EPA with a vehicle for developing an occurrence database for those contaminants that are suspected to be in water. These programs, along with the regular 6-year review of existing regulations, will continue into the future to provide EPA with information for determining what additional regulations should be developed.

APPLICABILITY TO LOLO

Changing regulations and monitoring requirements could impact Lolo water system in the future.

4.0 Need for Project

In this section, the need for each project will be described by system component (supply, storage, distribution, etc.), and in subsequent sections these needs will be categorized to match the PER outline as "health, sanitation, and security, aging infrastructure, and reasonable growth".

4.1 Future Demand Forecast

The future demand within the system is primarily dependent upon population within the service area. Table 4-1 compiles the pertinent results from the previous sections that will be used for quantifying the need for future projects.

Table 4-1: Population and Demand Forecast

Year	Lolo CDP Population	Service Area Population	Average Day Demand (GPD)	Maximum Day Demand (GPD)
2020	4,399	3,500	794,500	2,670,500
2025	4,690	3,733	847,391	2,848,279
2030	5,001	3,983	904,141	3,039,029
2035	5,332	4,248	964,296	3,241,224
2040	5,688	4,532	1,028,764	3,457,916

4.2 Water Supply

Lolo was successful in re-establishing water rights allowing wells 1 and 2 to be upsized If upsized, the system would meet max day demand to approximately year 2040.

The existing water supply wells, as outlined in Table 3-1 above, have a total pumping capacity of 2,450 GPM, or 3,528,000 GPD, if run continuously. The capacity of the system per MDEQ Circular-1 must equal or exceed the maximum day demand with the largest producing well out of service. The current pumping capacity of the system with the largest well out of service (Well No. 3) is 1,400 GPM or 2,016,000 GPD. Comparing these values with demands outlined in Table 2-5 shows that the maximum day demand is currently exceeded by about 455 gpm. Once wells No. 1 and No. 2 are upsized and able to pump their full water right of 1,356 gpm each, then the system will be in compliance with MDEQ-1 and the firm capacity will be 2,406 gpm or 3,464,640 gallons per day. Under this condition the maximum day demand wouldn't be exceeded until 2040 or later.

4.3 Water Storage

Water storage requirements are typically categorized as follows;

- Operational storage. The purpose of operational storage (or equalization storage) is to provide supply to meet peak hour water demands. Over any 24-hour period, water demands will vary and operational storage helps the system meet these normal daily diurnal fluctuations in demand. During periods of high demand, the water level in a storage facility will typically drop as water flows into the system to meet the demand. During period of low demand, such as nighttime hours, reservoirs are filled in preparation for the diurnal high demand flow conditions of the next day.
- Emergency storage. The purpose of emergency storage is to meet short-term emergency supply needs. An emergency is an unforeseen or unplanned event that may cause a water shortage in the system.
- Fire storage is the volume of water required to meet firefighting needs and varies depending upon the type of development or land use that is served in each pressure zone. For example, single family residential development may require 1,000 gpm for 2 hours or 120,000 gallons of fire storage.

The following recommendation is from the DEQ Water Works Standards:

- Storage facilities must be sufficient, as determined from engineering studies, to supplement source capacity to satisfy all system demands occurring on the maximum day, plus fire flow demands where fire protection is provided.

It is recommended that the DEQ standard for reservoir sizing be used in this Water System Master Plan. From Section 7.01 of the DEQ standard:

- a. The minimum allowable storage must be equal to the average day demand plus fire flow demand, as defined below, where fire protection is provided.
- b. Any volume less than that required under a. above must be accompanied by a Storage Sizing Engineering Analysis, as defined in the glossary. Large non-residential demands must be accompanied by an Emergency Storage Sizing Engineering Analysis and may require additional storage to meet system demands.
- c. Where fire protection is provided, fire flow demand must satisfy the governing fire protection agency recommendation, or without such a recommendation, the fire code adopted by the State of Montana.
- d. Each pressure zone of systems with multiple pressure zones must be analyzed separately and provided with sufficient storage to satisfy the above requirements.
- e. Excessive storage capacity should be avoided to prevent water quality deterioration and potential freezing problems.

The storage analysis assumes a 1,500 GPM fire flow (this was provided by the Missoula Rural Fire District fire marshal/captain as the minimum standard), maximum day demand flow, and the well pumps operating with the largest pump out of service for a 2-hour period. The storage volume used in the analysis is the equalizing and emergency storage for all three storage tanks, the volume from the lead pump level to one foot above the bottom of the tank.

Figure 4-1 shows the existing system net demand (max day demand plus fire flow minus firm well supply) compared to the total storage.

Figure 4-2 uses the same method but assumes that well pumps 1 and 2 are upsized to 1,356 GPM each. In this case the total supply is based on well 1 or 2 out of service, as these would be the largest pumps in the system. Upsizing the pumps leads to a reduced net demand on the storage.

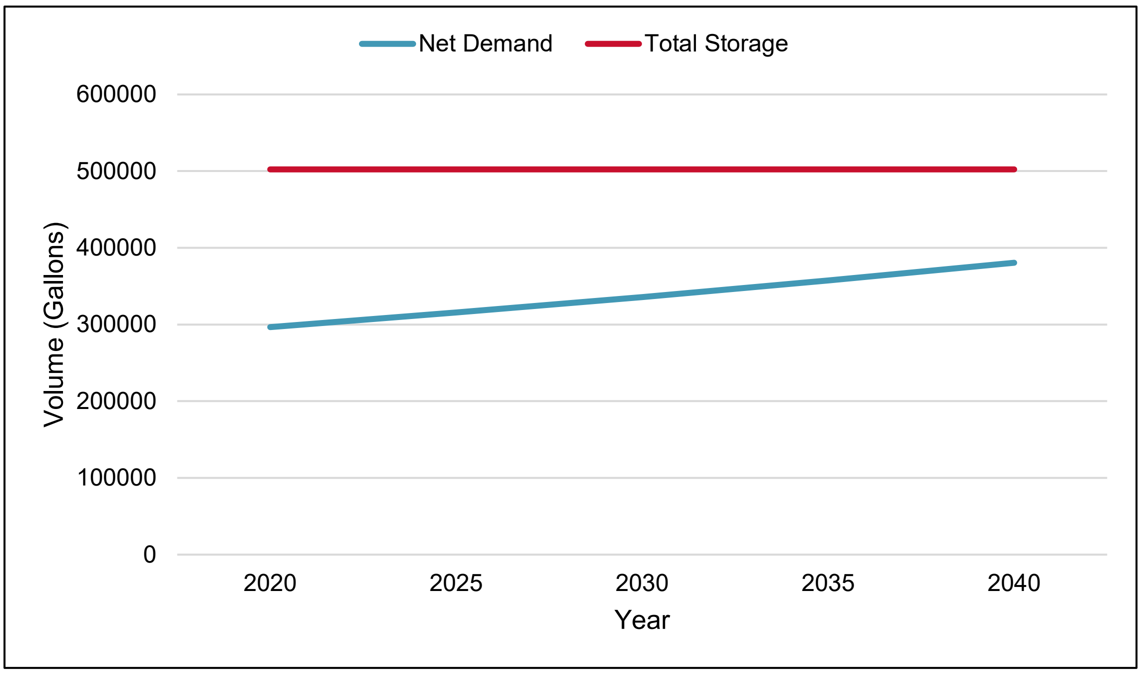


Figure 4-1: Existing System Storage Analysis

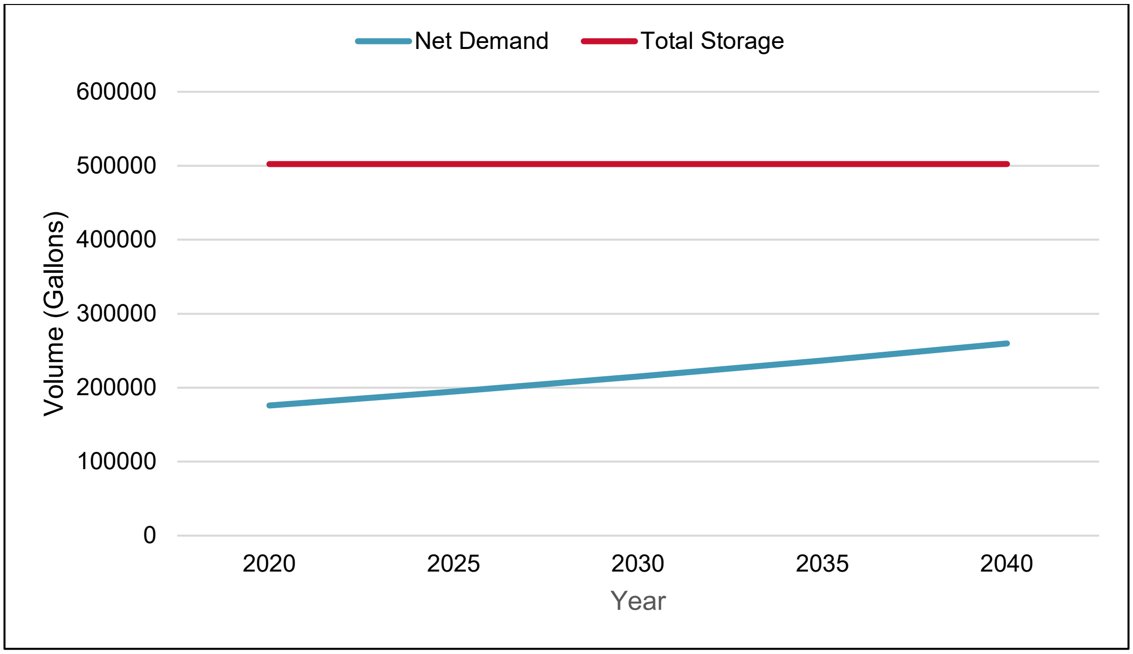


Figure 4-2: Storage Analysis with Increased Well Production

The upper area of the system is served solely by storage reservoir no. 2 and the booster pumps. This area can be analyzed as a sub area of the system. This area serves approximately 115 houses (287 people) currently and is assumed to have an annual growth equaling that of the system. The fire flow used has been modified for residential flows of 1,000 GPM for 60 minutes, this is the minimum fire flow allowed in the International Fire Code for single-family residences only. Figure 4-3 summarizes the analysis and shows storage to be adequate through 2040, or a maximum of 360 houses.

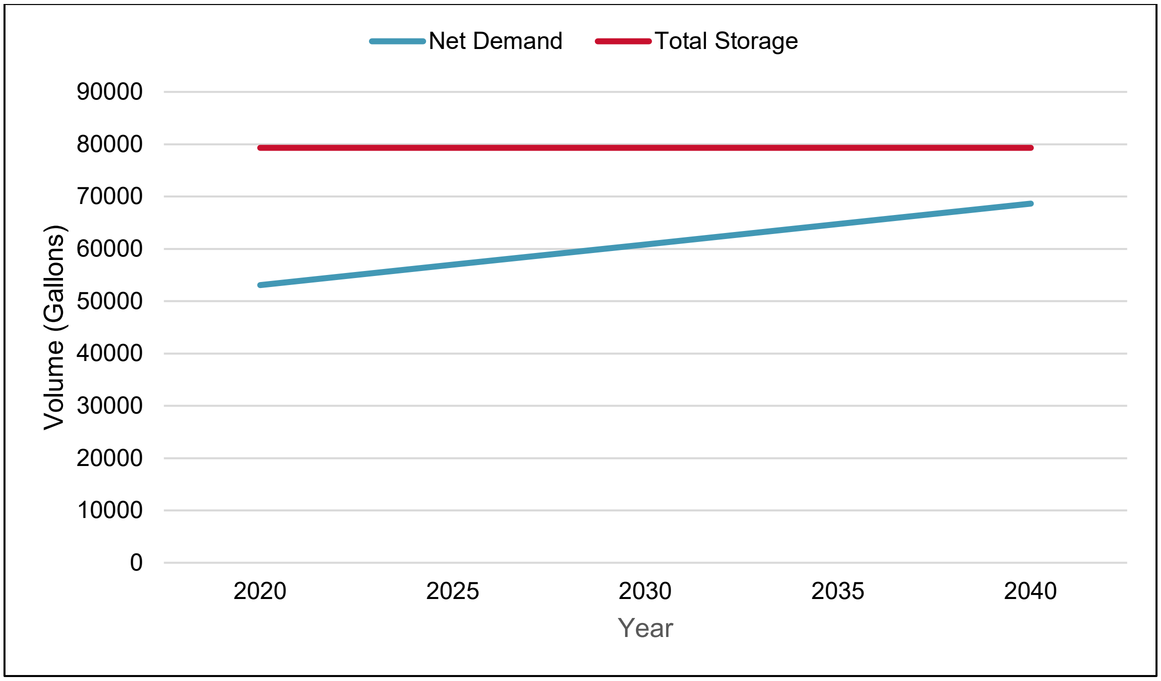


Figure 4-3: Upper Zone Storage Analysis

Future Water Storage

This analysis was completed assuming wells 1 and 2 are upsized to 1,356 gpm, and that the required fire flow is 1,500 gpm for 2 hours. Lolo's water storage should be sufficient through the planning period. If the fire flow requirement were increased to 3,500 gpm for 2 hours, Lolo would need additional supply around year 2040.

Table 4-2: Preliminary Water Storage Sizing Analysis

Year	Fire Demand (GPM)	Peak Demand (GPM)[1]	Total Demand (GPM)[2]	Total Supply (GPM)[3]	Net Demand (Gallons)[4]	Total Storage (Gallons)[5]	Excess/Deficit Storage (Gallons)
2020	1500	2372	3872	2406	175934	502294	326360
2025	1500	2530	4030	2406	194923	502294	307370
2030	1500	2699	4199	2406	215180	502294	287113
2035	1500	2879	4379	2406	236788	502294	265505
2040	1500	3071	4571	2406	259838	502294	242456
2045	1500	3276	4776	2406	284425	502294	217868
2050	1500	3495	4995	2406	310653	502294	191641
2055	1500	3728	5228	2406	338630	502294	163664
2060	1500	3977	5477	2406	368473	502294	133820
2065	1500	4242	5742	2406	400308	502294	101985
2070	1500	4525	6025	2406	434266	502294	68027
2075	1500	4827	6327	2406	470490	502294	31803
2080	1500	5149	6649	2406	509131	502294	-6837

Notes:

1.) The maximum day demand experienced by the system in recent years was on August 22, 2013 of 2.963 million gallons. This was converted to a per person peak day, then applied to projected population growth.
2.) Peak demand plus fire.
3.) This value assumes wells 1 and 2 have been upsized to 1,356 gpm.
4.) Peak day demand plus fire flow minus firm well supply capacity for 2 hours.
5.) Total storage is the total available storage (equalizing storage plus emergency storage)

Booster Pumps

As determined by the storage analysis above the pumps are adequately sized to meet fire demands of the upper system. One point of concern is the 6” asbestos cement discharge piping, this is a single point of failure for the upper system and is nearing the end of its expected life.

4.4 Water Distribution

Original portions of the distribution system are at the end of their design life of 50 years[1]. Because the distribution system consists of asbestos cement pipe, consideration should be given to water testing for asbestos fibers, as this is a potential hazard to public health. AC pipe

[1] Water Research Foundation Report 4093, Long Term Performance of Asbestos Cement Pipe, provides data on the life span of AC pipe, as well as best practices for determining remaining pipe life, and removal and rehabilitation practices.

undergoes gradual degradation in the form of corrosion (i.e., internal calcium leaching due to conveyed water and/or external leaching due to groundwater). Such leaching leads to reduction in effective cross-section, which results in pipe softening and loss of mechanical strength. Lolo water system staff should consider taking pipe samples during leak repairs, and having those samples tested to better understand the condition of the AC pipe.

A strategy should be put in place to replace aging infrastructure that is nearing the end of its design life. An annual replacement goal can help mitigate the number and cost of emergency repairs of pipe failures.

PRVs

There are no recommendations for changes to the PRV settings resulting from the water model analysis. Pressure settings are easily fine-tuned by operations staff if complaints are received from customers. However, the PRV's are aging and all but two were installed with the original system and have not been ungraded. None of the PRV's are connected to SCADA. The PRV serving the shopping center only has one valve and must be shut down completely to perform any maintenance work.

Meters

It is recommended that flow meters be installed on all water service connections added to the system in the future. Consideration should be given to adding flow meters to existing service connections. Lolo should consider conducting a feasibility study to evaluate new meters and meter reading technology, costs, as well as potential water savings associated with the implementation of a meter program.

Existing infrastructure does not provide a backbone for future development to the extents of the 2040 planning area, see Figure 2-1.

4.5 Water Model

Lolo has not had a hydraulic model to analyze the system in the past. As part of this PER, a hydraulic model was created and used to evaluate existing and future water demands and proposed system improvements. The hydraulic model is in InfoWater Pro. In order to create the model, system construction drawings, County survey data and mapping, instrumentation and equipment operating curves and set points, fire flow test records and water production records were collected.

Scenarios & Results

The system was modeled under steady-state operation at two distinct points in time, the years 2020 and 2040. Results from the model will be presented in two ways, fire flow available and pressure/velocity. The available fire flow was analyzed under an average day demand condition. The 2020 and 2040 pressures and velocities were analyzed under both the average day and maximum day demands.

FIRE FLOW

In residential areas of Lolo the goal fire flow is greater than 1,000 gallons per minute (GPM) for a duration of one hour, in commercial areas the fire flow is 1,500 GPM for two hours.

Figure 4-4 shows the existing available fire flow for the system. Generally, the existing system meets the fire flows. Two areas have less than 500 GPM of fire flow, at the top of the system nearest Reservoir No. 2 and at the extent of the system north near the Wastewater Treatment Plant.

Figure 4-5 shows the available fire flow for the system under 2040 demands without any improvements to the system. The two areas mentioned above grow to effect larger areas, and an additional area at the dead ends of the system to the south begin to see reduced fire flows.

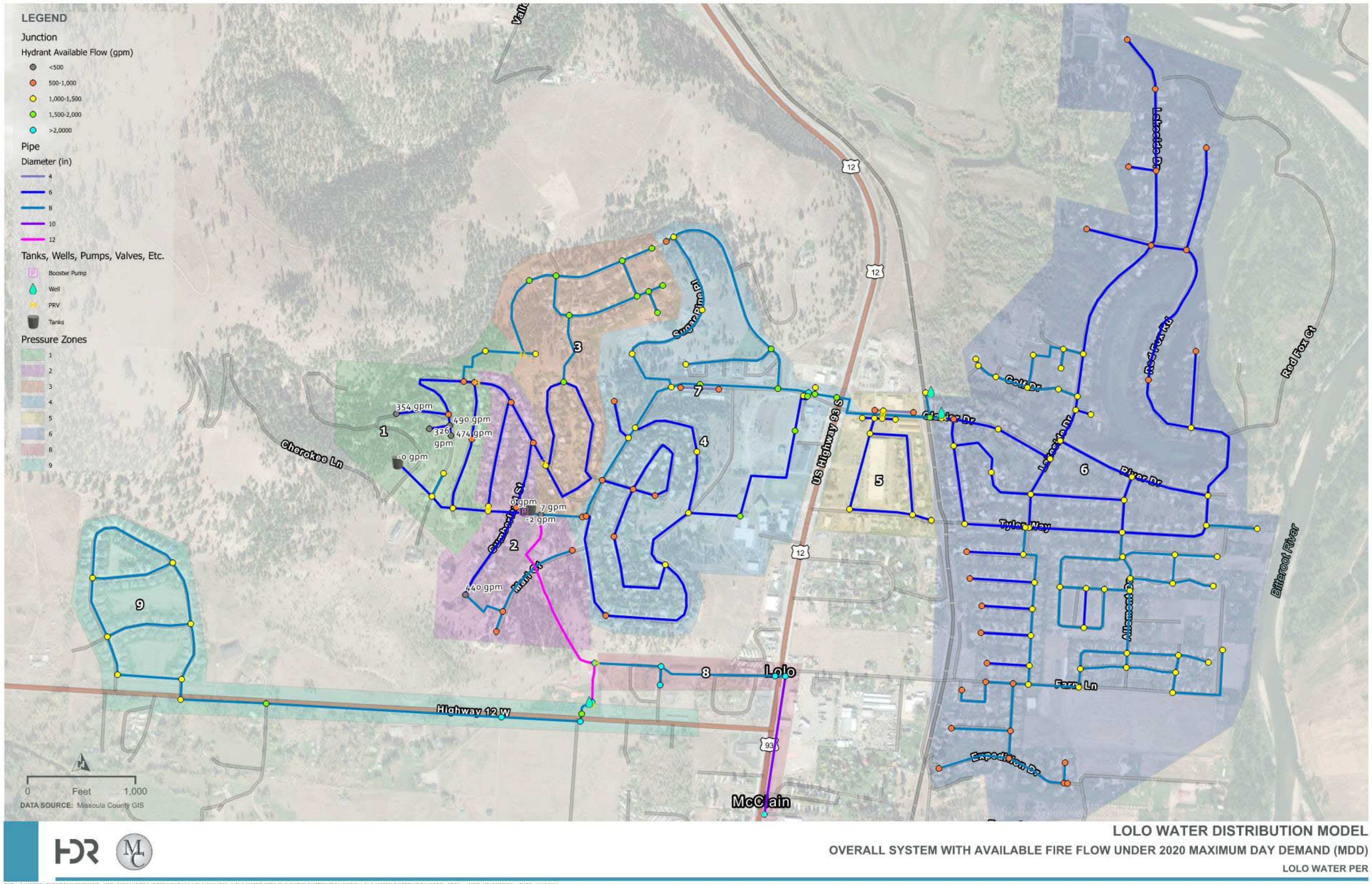


Figure 4-4: 2020 Available Fire Flow

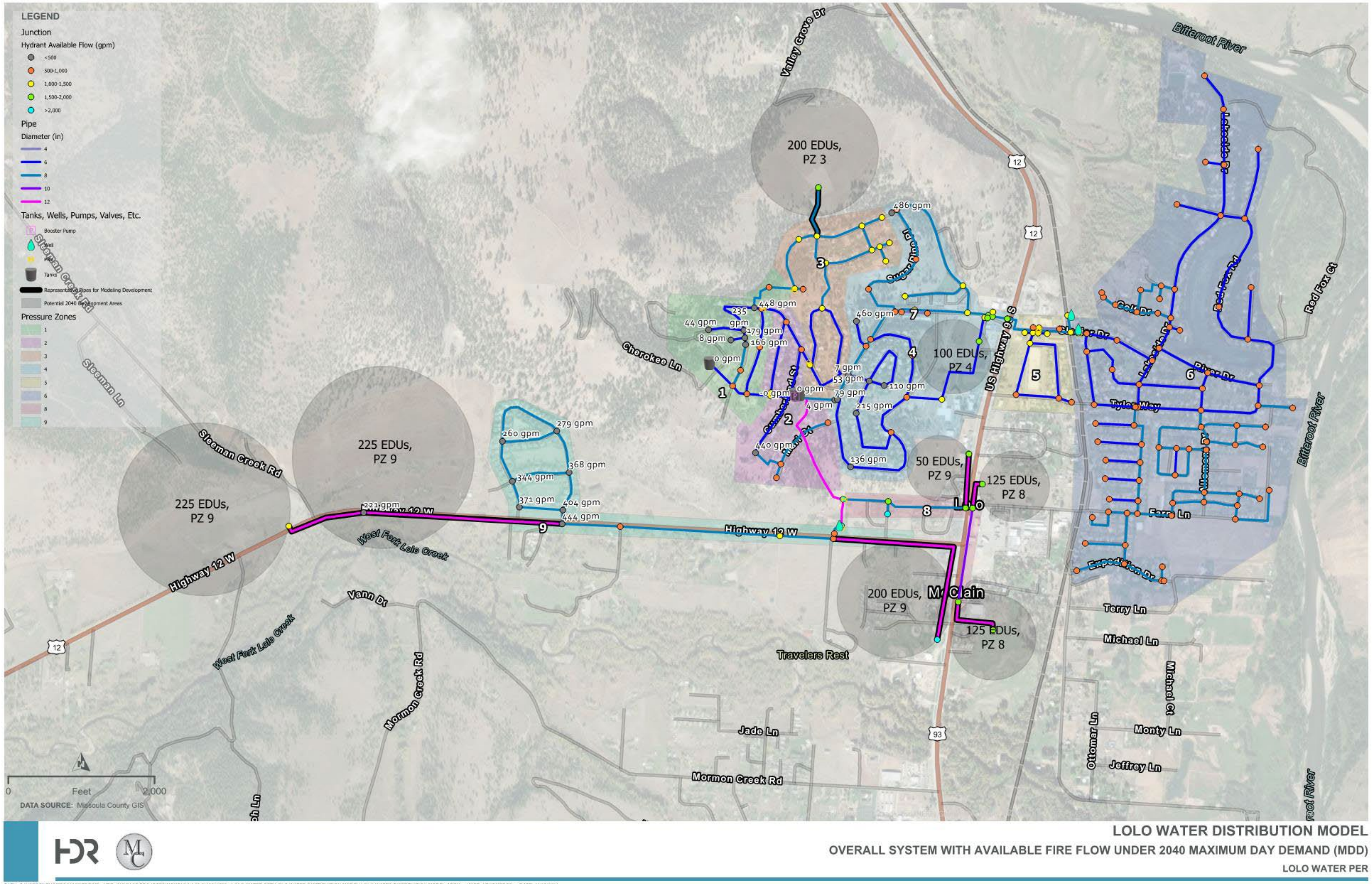


Figure 4-5: 2040 Available Fire Flow

PRESSURE AND VELOCITY

The target water pressure for a water service connection is approximately 40 to 80 pounds per square inch (PSI). Accommodations such as a booster pump or pressure reducing valve can be added on a service by service basis for areas that fall outside of this range. Such accommodations are needed when pressure is less than 20 PSI or greater than 80 PSI. The target flow velocity in a distribution system is less than 5 feet per second (FPS), 5-10 FPS is within reason, but service pressure begins to reduce in the area of high velocity. Velocities greater than 10 FPS can cause damage to the system.

The following pages include a number of figures that display the findings of the hydraulic modeling efforts. A discussion of those findings is included below.

Figure 4-6 shows the pressure and velocity results for the existing system under 2020 conditions. Under average day demand, the velocities in the pipe are below 5 FPS and few locations were found to have pressures greater than 120 PSI, the actual maximum pressure was found to be approximately 130 PSI.

Figure 4-7 shows 2020 maximum day demand, and the main concern is a slightly elevated velocity in the main line just below Storage Tanks No. 1 and 3 along Ridgeway. Generally, the system is in good condition to meet the demands of 2020.

Figure 4-8 shows the pressure and velocity results for the existing system under 2040 conditions. Under average day demand, the velocities in the pipe are below 5 FPS and few locations were found to have pressures greater than 120 PSI, the actual maximum pressure was found to be approximately 130 PSI.

Figure 4-9 shows the 2040 maximum day demand and many issues are found. Nearly half of the system has low pressure, and the main line along Glacier and Ridgeway Drive has velocities greater than 10 FPS. Generally, the existing system (without improvements) is not equipped to meet the projected maximum day water demands of 2040.

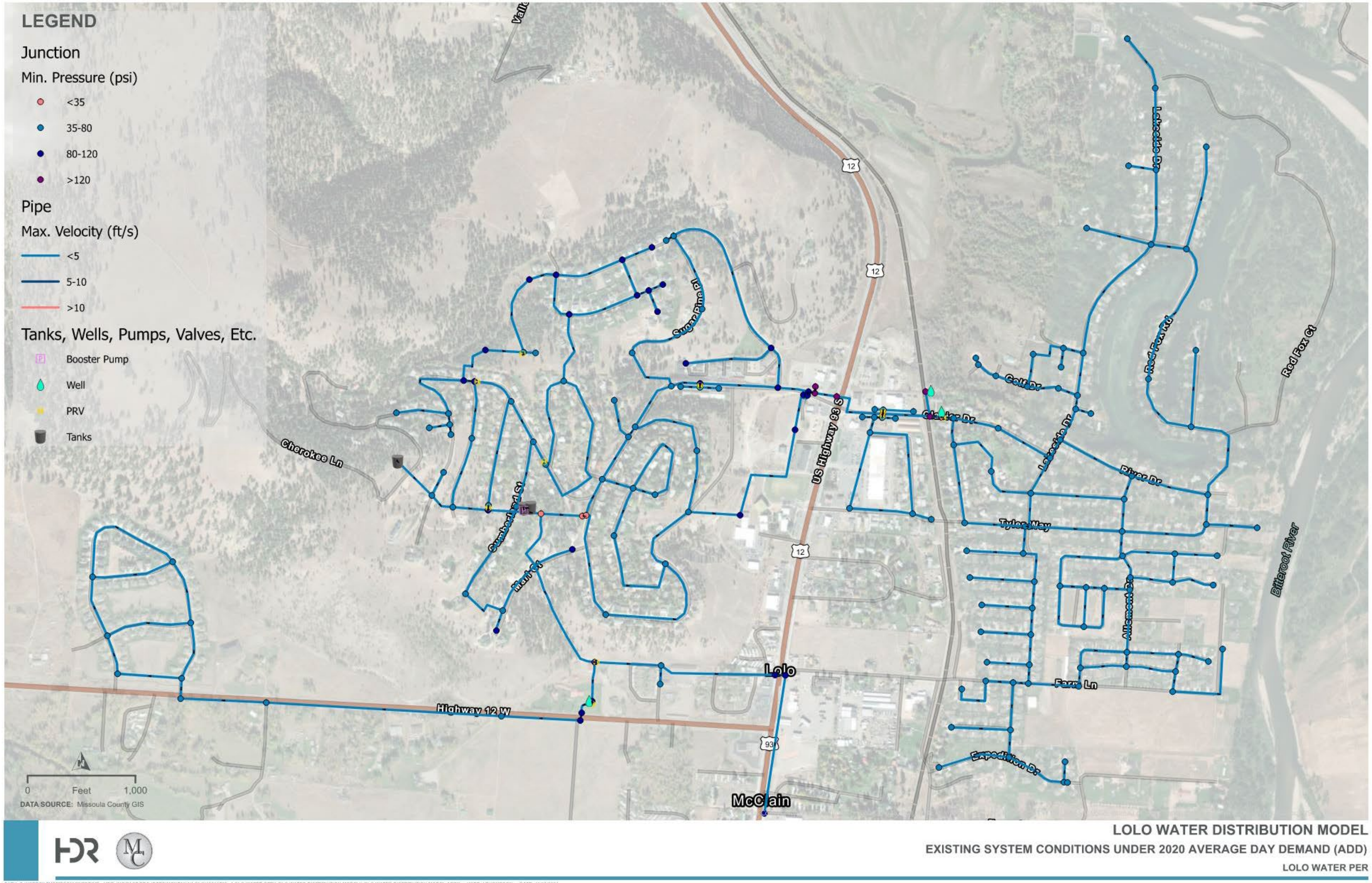


Figure 4-6: 2020 Average Day Demand

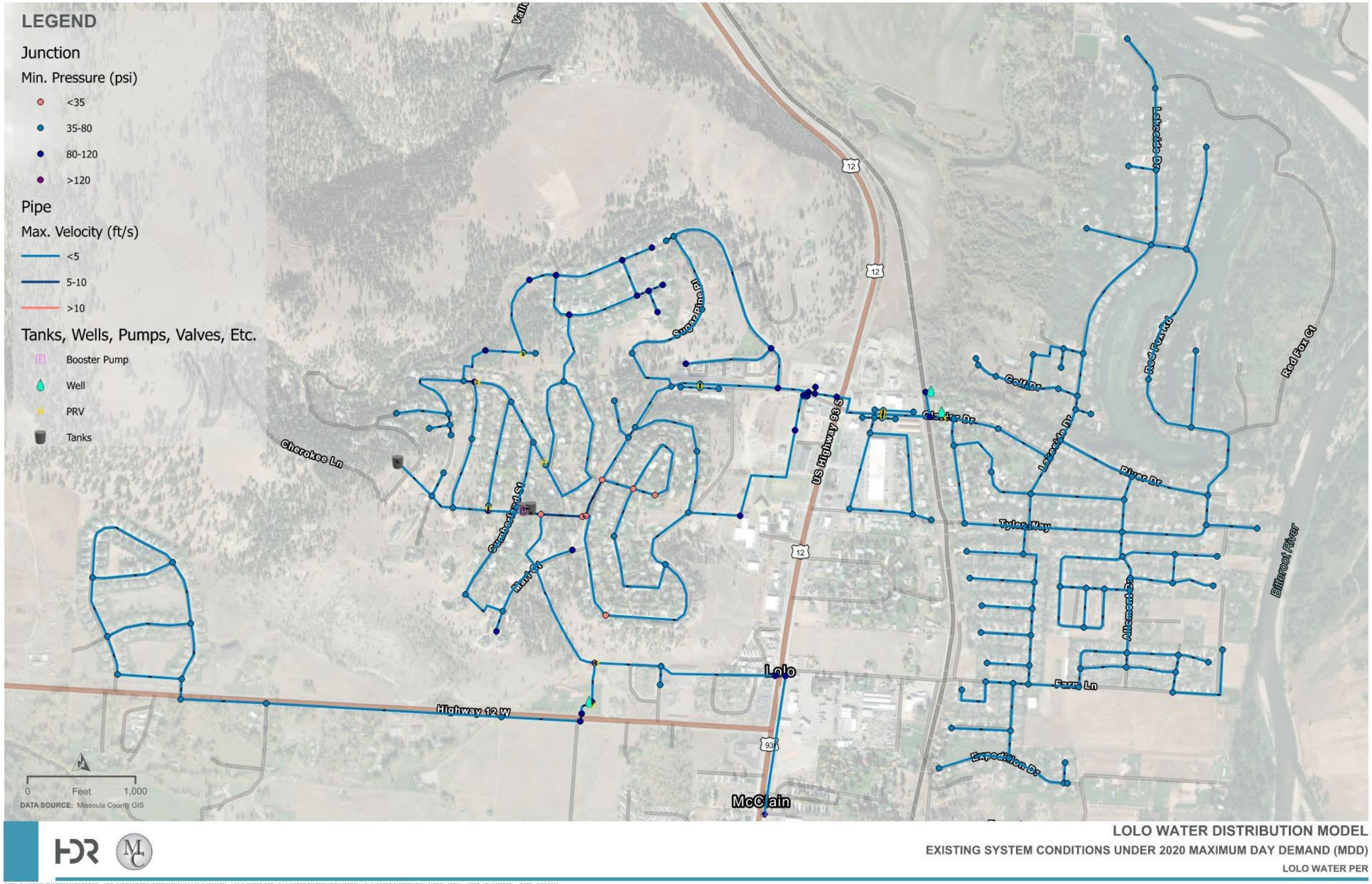


Figure 4-7: 2020 Maximum Day Demand

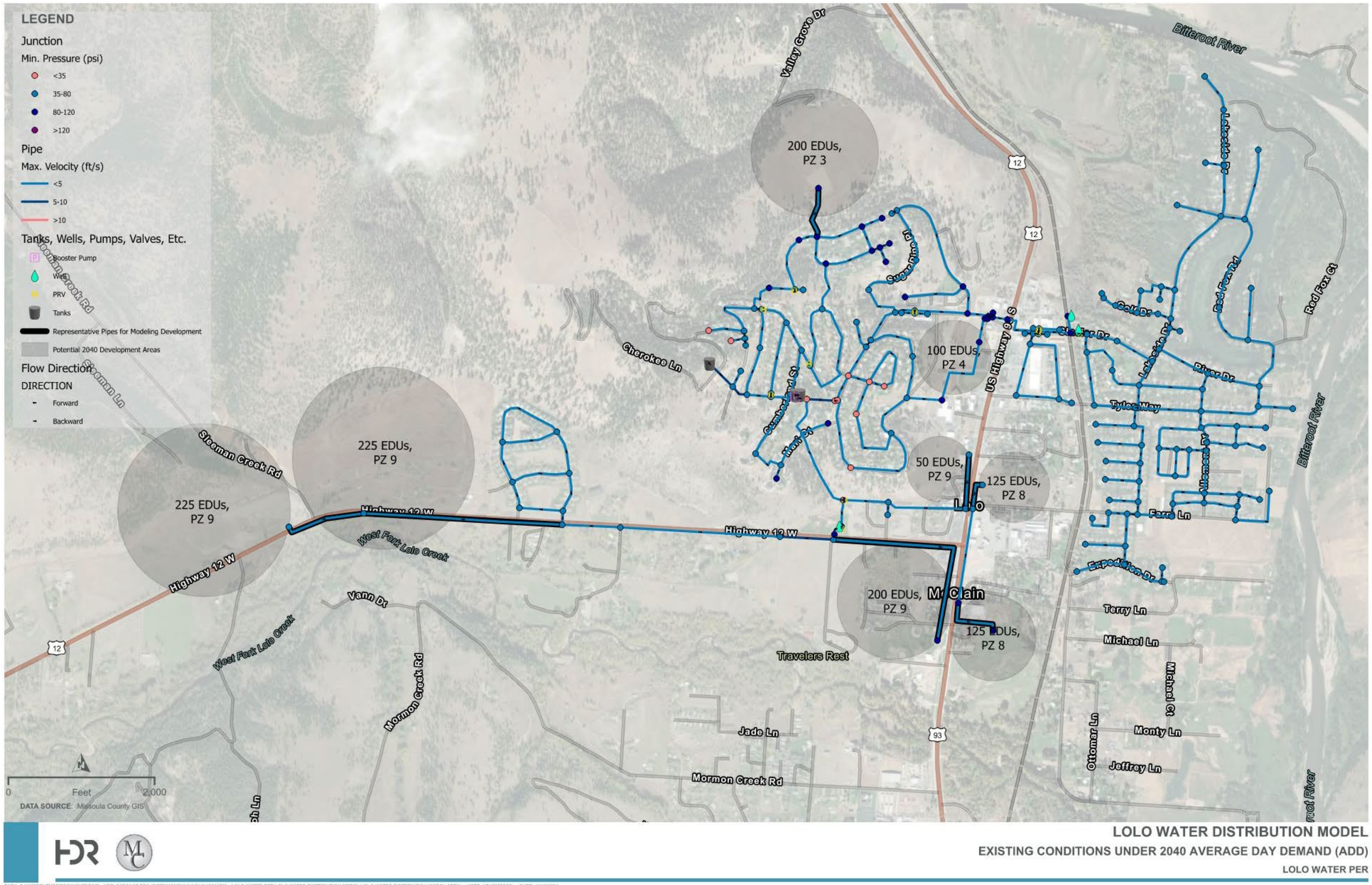


Figure 4-8: 2040 Average Day Demand

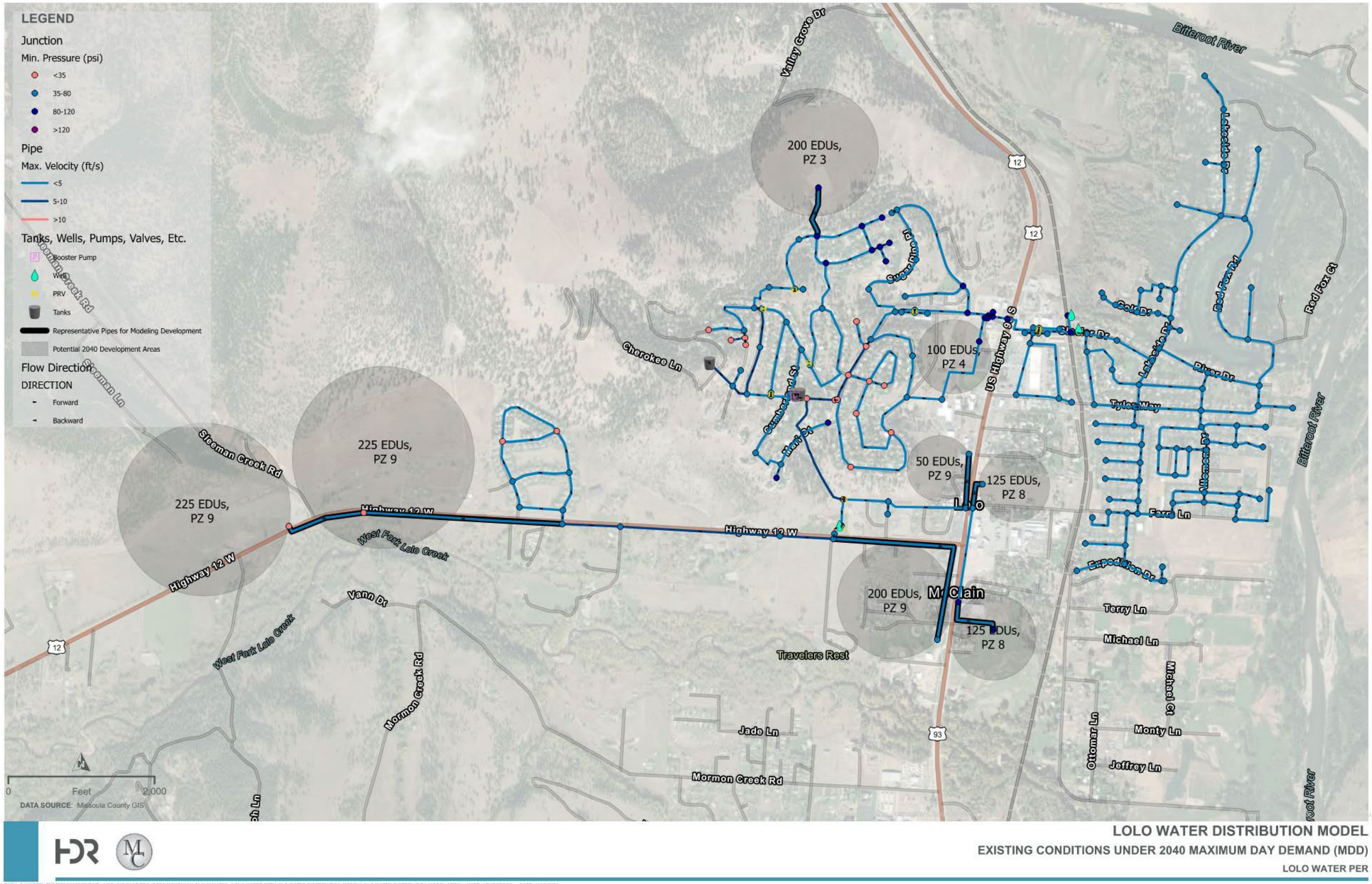


Figure 4-9: 2040 Maximum Day Demand

5.0 Alternatives Considered

This section identifies alternatives for the deficient areas found in previous sections. Each alternative includes a description of the alternative, estimated construction cost and evaluation criteria score.

5.1 Water Supply

Description

The existing water supply has been found to be deficient under Montana Department of Environmental Quality Circular 1 Chapter 3 Section 3.2.1.1 Source capacity part a:

> "The total developed ground water source capacity for systems utilizing gravity storage or pumped storage, unless otherwise specified by MDEQ, must equal or exceed the design maximum day demand with the largest producing well out of service. Storage must comply with the requirements of 7.0.1."

The current production capacity with the largest well out of service is 1,400 GPM, while the maximum day demand is 1,854 GPM.

No Action

The no action alternative would not allow for any additional developments that are reviewed by DEQ to join the system as the requirement above would not be met.

Upsize Existing Wells and Add Backup Power

Recent water rights litigation increased the available water rights of wells 1 and 2 to 1,356 GPM each; however, the existing pumps must be upgraded in order to reach that capacity. Once the capacity is increased the firm capacity of the system (largest pump out of service) would increase to 2,406 GPM. This will satisfy the DEQ source capacity requirement out to 2040 depending upon the growth in water demand coupled with conservation and leak reduction efforts. The estimated cost of upsizing both wells is $310,000. Wells 1 and 2 do not have backup power and the existing sites are not conducive to a permanent generator. However, the wells could be equipped with transfer switches to support a portable generator. The estimated cost of adding a portable generator is $54,000.

Install New Well

To meet the requirements of DEQ Circular 1 over the 20-year planning period, the firm well production capacity for the system must be greater than or equal to 3,000 GPM. This alternative will be evaluated under the assumption that wells 1 and 2 have been upsized to 1,356 GPM each. Adding a new well capable of producing 1,356 GPM or more would increase the capacity with the largest pump out of service by 1,356 GPM to 3,762 GPM. The estimated cost of a new well is $1,160,000, this cost does not include any new water rights that may be required to support a new well.

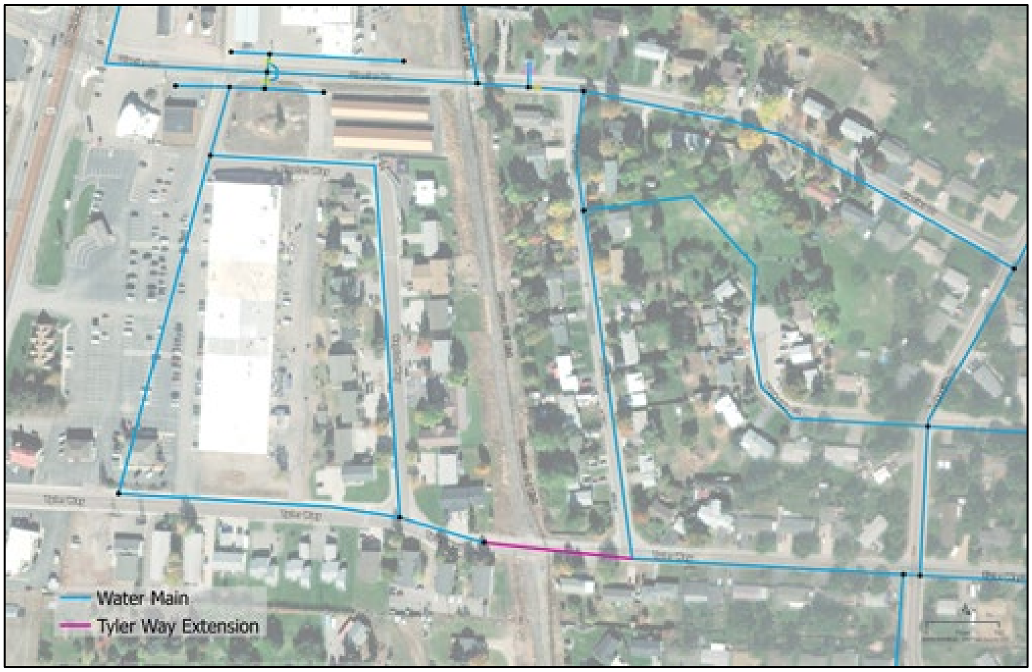
5.2 Water Mains

As the number of customers continues to grow, the water system will need upgrades to adequately serve existing and future customers.

To meet future demands and provide adequate fire flows, the following water mains are recommended;

- New 12-inch water main along Lewis and Clark Dr. / Farm Lane, from Highway 93 to Ashton Loop (for hydraulic reasons this should be completed prior to upsizing wells 1 and 2), approximately 1,880 feet. The estimated cost of this project is $505,000. See figure below.

- Water main connection between the shopping center and Tyler Way; including a crossing under the railroad. The estimated cost of this project is $171,000. See figure below.

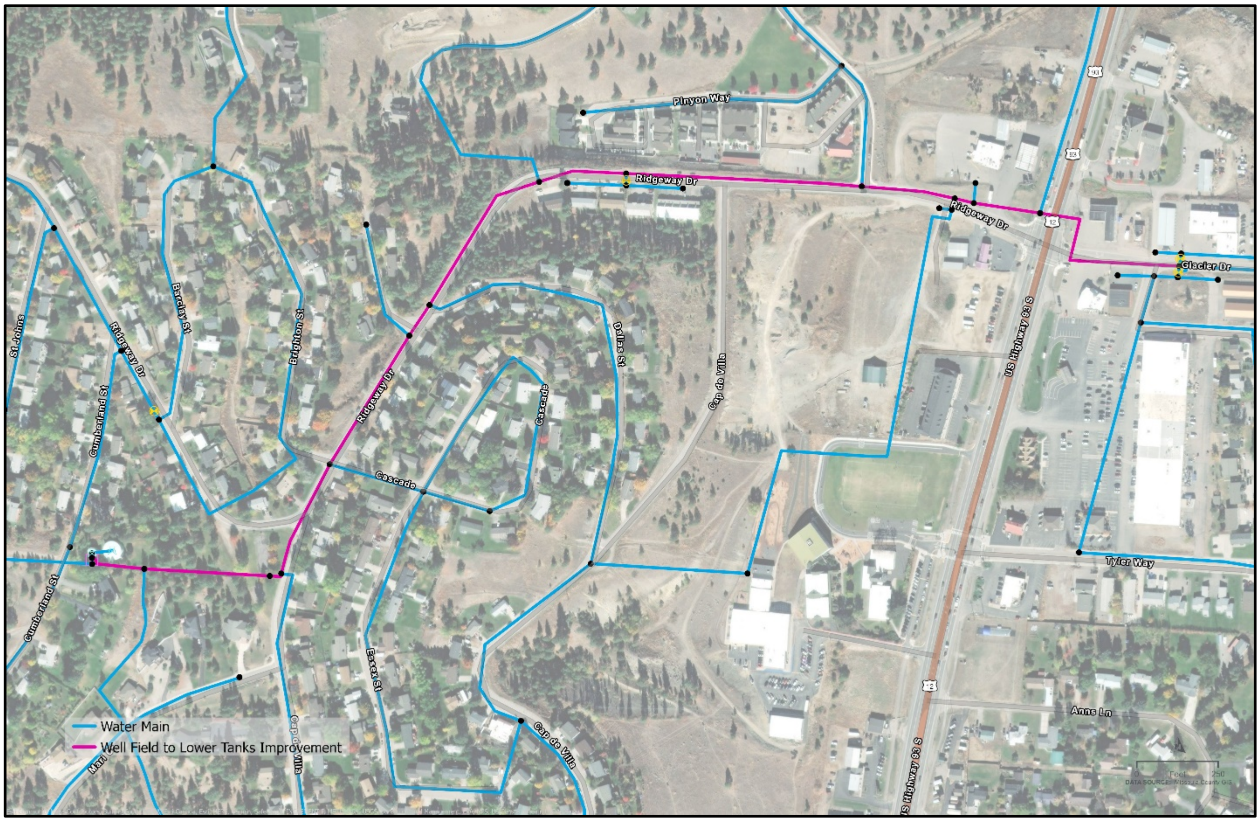


In order to accommodate future growth and development, the following water mains are recommended;

- A new 12-inch water main along Highway 12 from Stella Blue Dr. to Cow Catcher Dr., approximately 8,400 feet. The estimated cost of this project is approx. $1,490,000.
- A new 12-inch water main along Highway 93 north from Ridgeway Dr. to Bird Lane, approximately 6,930 feet. The estimated cost of this project is approx. $1,330,000.
- A new 12-inch water main along the east side of Highway 93 from the old school to Lewis and Clark Drive, approximately 1,500 feet. This is highly desirable developable property that is currently not served by water or sewer. The estimated cost of this project is approx. $235,000.

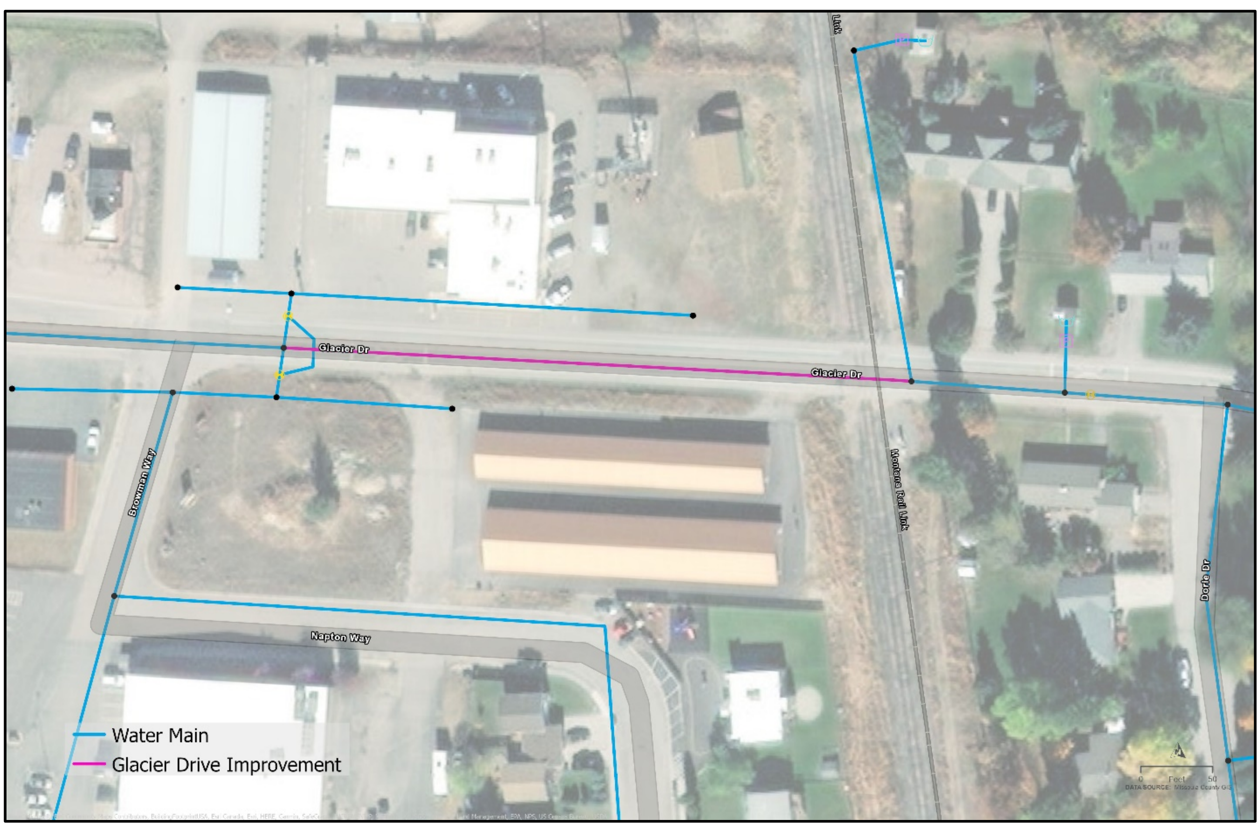
To adequately handle future (2040) projected water demands and stay within design parameters for pressure and velocity, the following water main upgrades are recommended:

- Upsize watermain along Ridgeway Dr. from PRV #4a and b up the hill to the lower water storage tank (just below Cumberland St.) to a 12-inch, about 4,200 feet. The estimated cost of this project is $855,000. See figure below.



- Upsize the water main from PRV #6 to Ridgeway Drive near Barclay Street to a 12-inch, approximately 1,500 feet. The estimated cost of this project is $337,000.
- Upsize 6-inch to 8-inch (Upper tank to Lower tank: Reservoir 1 down to St. John's, Claremont St., and Ridgeway Dr.), approximately 2,000 feet, plus 400 feet of new 8-inch along Ridgeway connecting 2 dead ends. The estimated cost of this project is $409,000. See figure below.

- Upsize 400 feet of water main along Glacier Drive from PRV's 4a and b to the east side of the railroad tracks. The estimated cost of this project is $213,000. See figure below.



- It is recommended that the Lolo water system implement an annual water main replacement program in order to replace infrastructure that is at the end of its useful life; this will allow the system to reduce main breaks and leakage.

5.3 Water Storage

The water storage analysis presented above shows that the system may need additional storage to meet fire flow requirements in the future. A new tank was evaluated in the hydraulic model; it was located at the same hydraulic level as the lower tanks in the system and placed up on the hill above a proposed development along Highway 12. The estimated cost of this project is approx. $850,000.

Figures 5-1 and 5-2 show average and maximum day demands, with the system improvements described, in 2040. Hydrant flows and pipe velocities are improved throughout the system.

Table 5-1: Alternatives Considered

System Component	Alternatives	Consequence of Not Doing the Project	Design Criteria	Environmental Impacts	Land Requirements	Potential Construction Problems	Water and Energy Efficiency / Green Infrastructure
Water Supply	• Do Nothing • Upsize Wells 1 and 2 • Build a new well	Currently cannot meet MDEQ-1 for supply	MDEQ-1, 3.2.1.1	Additional water withdrawn from the aquifer.	A new well site would be needed for a new well	Locating a well site and finding adequate groundwater resources will be required.	Variable Frequency Drives (VFDs) should be considered on all new and upsized wells as this may save energy and improve efficiency.
Distribution	A number of projects have been identified as described in Section 5.0	As population grows and demand increases, the water system will encounter capacity issues (high velocities, high headloss, etc.) and be unable to meet desired fire flow requirements.	MDEQ – Circular 1	No significant long term environmental impacts. There will be short term impacts from construction activities including dust and noise. A stormwater discharge permit may be required.	Identified improvements are primarily in the right-of-way.	There are two water main projects that will require boring and jacking or directional drilling under the railroad.	Replacing aging water mains will reduce leakage and water loss.
PRV	PRVs are aging and do not have SCADA	PRVs will continue to age and fail	MDEQ – Circular 1	No significant long term environmental impacts.	PRV's are located in the right-of-way. If they are moved out of the right-of-way, land acquisition may be required.	Existing PRV's are in the right-of-way. Adding SCADA may require siting an antenna and electrical/power. Moving the PRV's out of the right-of-way may include land acquisition.	The project will be designed with life cycle costs included in order to choose the best alternative.
Water Storage	• Do Nothing • Start planning for a new water tank	Lolo may have hard time keeping up with demands on peak days in the next few years	MDEQ-1, 7.0	No significant long term environmental impacts. There will be short term impacts from construction activities including dust and noise. A stormwater discharge permit may be required.	Potential tank sites will need to be evaluated and a new site procured by the County	Tank can be constructed using normal construction practices.	The tank location will need to be sited to function hydraulically with the existing system tanks and minimize pumping and energy costs.
Customer Meters	• Do Nothing • Install meters on all new construction • Install meters on all customers, new and existing	Unable to accurately measure or predict customer's water usage. Unable to measure non-revenue water. Unable to enact an effective water conservation program, or locate leaks, or allow customers to monitor their own water usage.	Industry best practices	No significant environmental impacts.	No land would be required since meters would either go in the building or in a meter pit in the right of way	Certain homes present challenges for adding a meter; these may include finding a suitable location, repairing finish work, access issues, etc.	Unmetered customers typically used two or three times the amount of water as metered customers. Therefore, metering customers will reduce water usage and water waste.

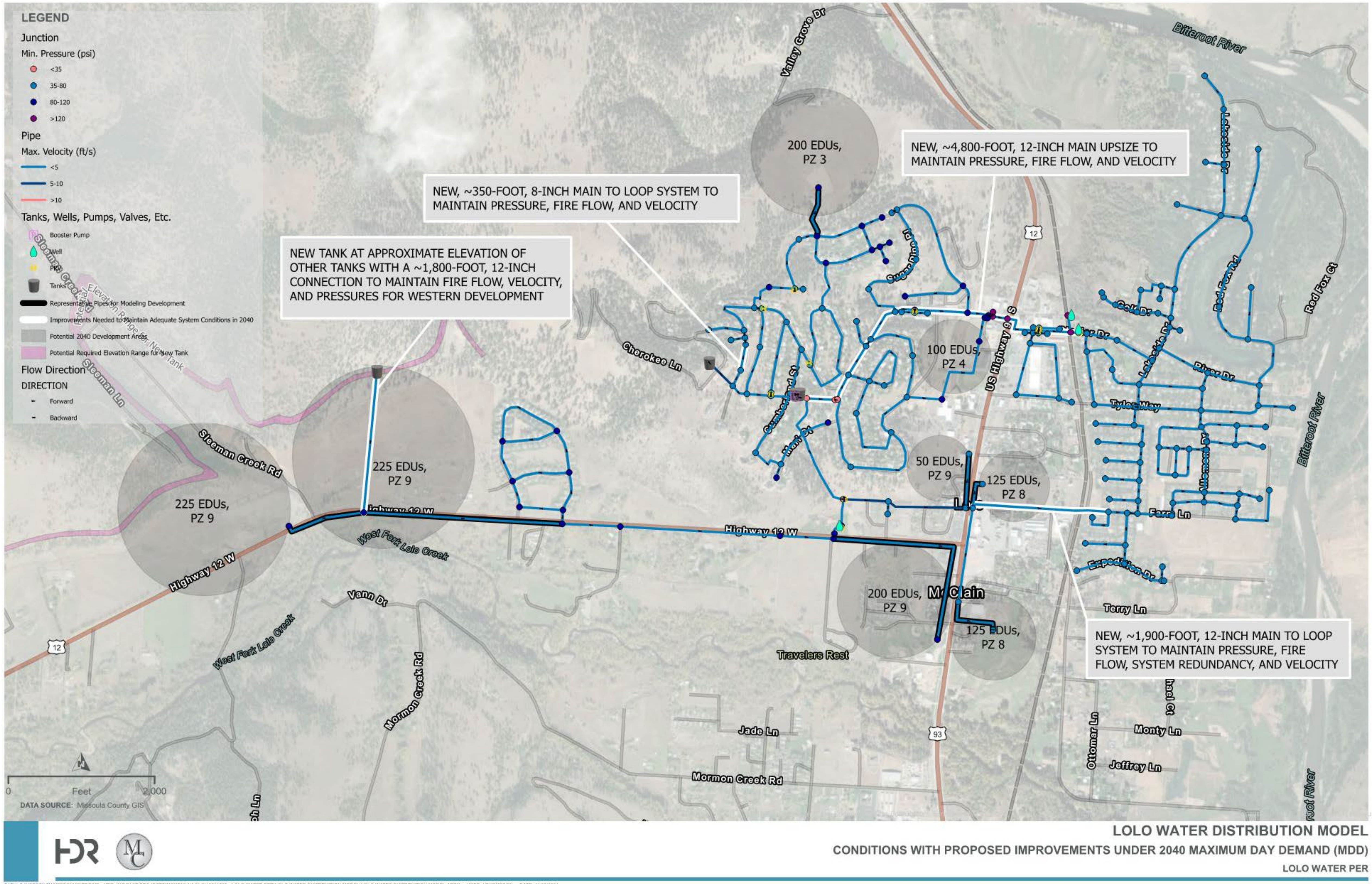


Figure 5-1: 2040 Average Day Demand with System Improvements

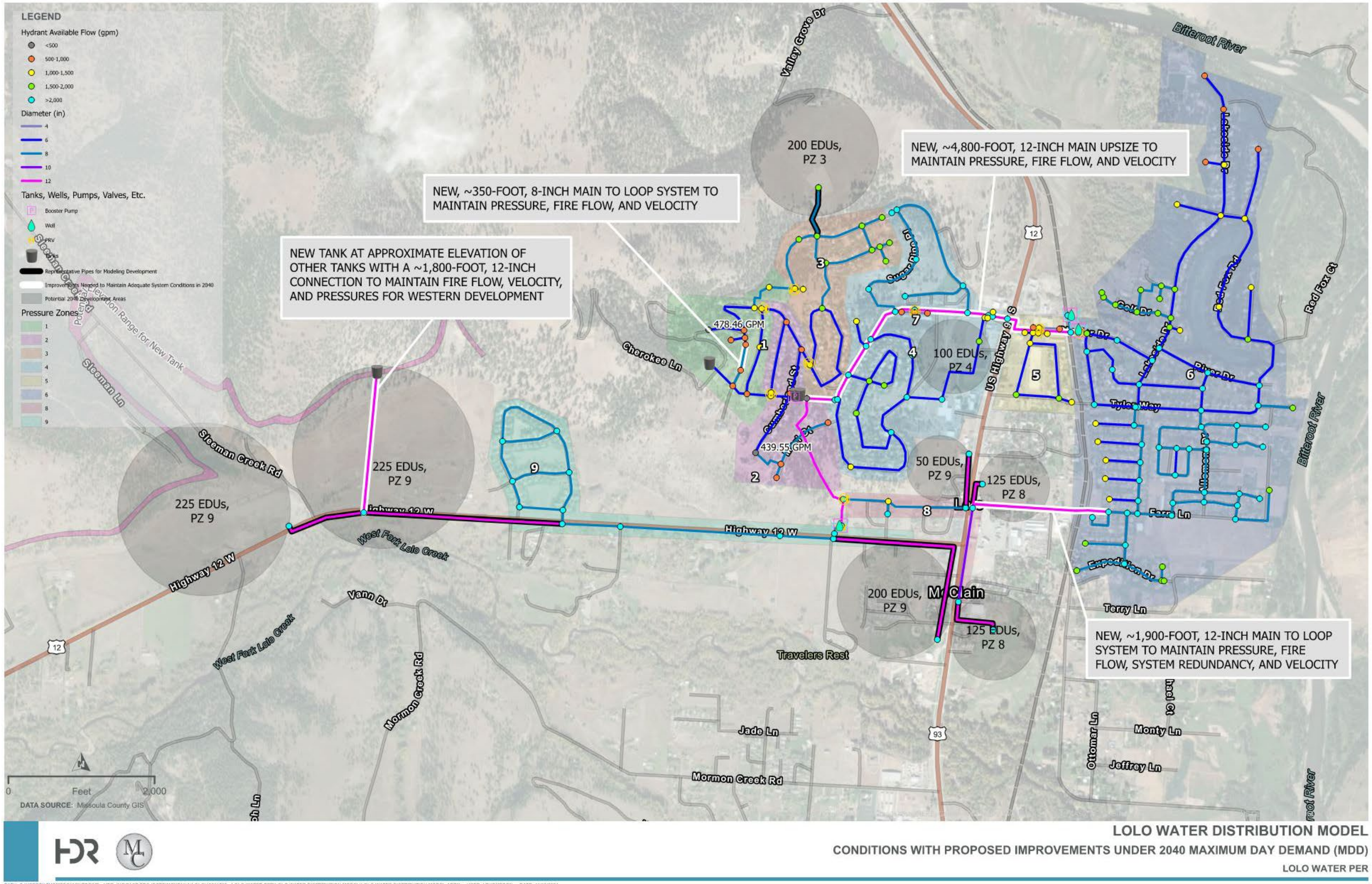


Figure 5-2: 2040 Maximum Day Demand with System Improvements

6.0 Selection of an Alternative

Many of these projects have a ‘do nothing’ alternative. The ‘do nothing’ alternative does not solve the problem or meet the project need. In addition to estimated construction costs, life cycle costs were included in the total project costs.

7.0 Proposed Projects

The proposed projects, alternatives, estimated project costs, and recommended timelines are include in Table 7-1.

Table 7-1: Proposed Projects Summary

Need for the Project	Proposed Project	Category	Alternatives Considered	Recommended Alternative	Project Cost Estimate (2021)	Recommended Timeline	Comments
Additional water supply needed to meet MDEQ-1	Well Pump Upsize (predicated on a favorable water rights judgement)	Health, Sanitation and Security	• Do nothing • Upsize well pumps 1 and 2	Upsize well pumps 1 and 2 after water rights judgement and after Farm Lane Improvements	$315,000	Phase 1 Near Term – 1 to 3 years	Current max day demands can exceed supply.
Additional water supply needed to meet MDEQ-1	New Well	Health, Sanitation and Security	• Do nothing • Add new well	Begin the process of siting a new well, including the acquisition of additional water rights as needed	$1,160,000	Phase 3 Long term – 5 to 10 years	If wells 1 and 2 are upsized, the system may still exceed max day by 2037.
System has significant non-revenue water	Leak Detection	Health, Sanitation and Security	• Do nothing • Implement a leak detection program, this could include acoustic sounding, isolating areas, or conducting nighttime reservoir fall studies There are a variety of consultants and different technologies that could be used.	Implement a leak detection program, this could include acoustic sounding, isolating areas, or conducting nighttime reservoir fall studies	$35,000 (first year)	Phase 1 Near Term – 1 to 3 years	System leakage may be as high as 160,000 gallons per day or 28% to 43% of production.
Controls are outdated	Instrumentation and Controls	Health, Sanitation and Security	• Do nothing • Update instrumentation and controls	Update instrumentation and controls	$95,000	Phase 2 Mid Term – 3 to 5 years	

Need for the Project	Proposed Project	Category	Alternatives Considered	Recommended Alternative	Project Cost Estimate (2021)	Recommended Timeline	Comments
System has no water meters	Customer Meters	Health, Sanitation and Security	• Do nothing • Meter new customers only • Meter new and existing customers • Conduct a feasibility study to evaluate meter technologies, prices, and potential water use reductions.	Begin a metering program by first conducting a feasibility study to evaluate meters and meter reading technologies, prices, etc.	$10,000	Phase 2 Mid Term – 3 to 5 years	Metering is a best practice that allows the utility and customers to quantify use as well as non-revenue water.
Existing wells do not have backup powers	Backup Power for Water Supply	Health, Sanitation and Security	• Do Nothing • In conjunction with the planned upgrades at Well 1 and Well 2, the County should consider upgrades that would allow for a portable generator to run either well in the event of a prolonged power outage.	In conjunction with the planned upgrades at Well 1 and Well 2, the County should consider upgrades that would allow for a portable generator to run either well in the event of a prolonged power outage.	$54,000	Phase 2 Mid Term – 3 to 5 years	Well 3 is the only location with backup power
Compliance	AWIA – Risk and Resiliency Assessment	Health, Sanitation and Security	• Do nothing • Complete the RRA	Complete the RRA and certify by June 30, 2021 to be in compliance with AWIA	$15,000	Phase 1 Near Term – 1 to 3 years	Must be certified by June 30, 2021
Distribution System	Water main upsize along Ridgeway from PRV #6 to Barclay	Reasonable Growth / Aging Infrastructure	• Do nothing • Upsize water main	Upsize water main	$337,000	Phase 3 Long term – 5 to 10 years	Critical water main for moving water up the hill; future scenarios show high velocities and high headloss without upsizing.

Need for the Project	Proposed Project	Category	Alternatives Considered	Recommended Alternative	Project Cost Estimate (2021)	Recommended Timeline	Comments
Distribution System	Water main upsize along Ridgeway Dr. from PRV #5 to Cumberland	Reasonable Growth / Aging Infrastructure	• Do nothing • Upsize water main	Upsize water main	$856,000	Phase 3 Long term – 5 to 10 years	
Distribution System	Upsize 6-inch to 8-inch (Upper tank to Lower tank: Reservoir 1 down to St. John's, Claremont St., and Ridgeway Dr.), approx. 2,000 feet, plus 400 feet of new 8-inch along Ridgeway connecting 2 dead ends.	Reasonable Growth / Aging Infrastructure	• Do nothing • Upsize water main	Upsize water main	$409,000	Phase 3 Long term – 5 to 10 years	
System resiliency and future growth	Water main extension along Farm Rd.	Reasonable Growth	• Do nothing • Install 8-inch • Install 12-inch	Install 12-inch	$505,000	Near Term – 1 to 3 years (should be completed prior to upsizing wells 1 and 2)	This main extension will provide a redundant line under Highway 93 and serve the new school and increase fire flows on the east side
Accommodate growth and development	Water main extension north on Highway 93 from Ridgeway to Bird Lane	Reasonable Growth	• Do nothing • Install 12-inch	Install 12-inch	$1,330,000	Phase 3 Timeline based on growth and development	Development driven, could be funded by impact fees

Need for the Project	Proposed Project	Category	Alternatives Considered	Recommended Alternative	Project Cost Estimate (2021)	Recommended Timeline	Comments
Accommodate growth and development	Water main extension west on Highway 12 from Stella Blue to Cow Catcher Rd.	Reasonable Growth	• Do nothing • Install 12-inch	Install 12-inch	$1,490,000	Phase 3 Timeline based on growth and development	Development driven, could be funded by impact fees
Accommodate growth and development	Water main extension from Tyler Way (near the old school) to Lewis and Clark on the west side of Highway 93	Reasonable Growth	• Do nothing • Install 12-inch	Install 12-inch	$235,000	Phase 1 Near Term – 1 to 3 years	This is prime developable land that does not currently have access to water or sewer.
Accommodate growth and development	New Storage Tank	Reasonable Growth	• Do nothing	Begin planning for a new water storage tank.	$850,000	Phase 3 Long Term – 5 to 10 years	
This water main is AC, nearing the end of its useful life, and experience high pressures from the well – this is a critical main	Glacier Drive, upsize 564 LF of 6-inch AC to 12-inch on Glacier Drive from Well #1 to PRV #4a and 4b.	Aging Infrastructure	• Do nothing • Replace piping	Replace piping	$212,000	Phase 1 Near Term – 1 to 3 years	
Water system includes AC pipe that is nearing the end of its useful life	Annual Pipe Replacement	Aging Infrastructure	• Do nothing • Plan and implement an annual pipe replacement program	Plan and implement an annual pipe replacement program	$200,000 (annual)	Phase 1 Near Term – 1 to 3 years	The system includes AC pipe nearing the end of its useful life
PRVs are aging, and do not have SCADA	PRV Replacement	Aging Infrastructure	• Do nothing • Replace or rehabilitate PRV's	Identify high priority PRV's for rehabilitation or repair	$230,000	Phase 2 Mid Term – 3 to 5 years	

Need for the Project	Proposed Project	Category	Alternatives Considered	Recommended Alternative	Project Cost Estimate (2021)	Recommended Timeline	Comments
Tank coatings are nearing the end of their useful life	Tank coating	Aging Infrastructure	• Do Nothing • Continue monitoring • Re-coat both tanks	Continue monitoring	$370,000 (2 tanks)	Phase 3 Long Term – 5 to 10 years	Coating may be past their useful life, but they are inspected annually and no issues have been reported.

8.0 Conclusions and Recommendations

Lolo is a growing community and improvements to the water system are needed to continue to provide high quality water service to its customers. Project recommendations are included in Table 8-1.

Table 8-1. Recommended Projects Summary

Need for the Project	Proposed Project	Category	Project Cost Estimate (2021)	Phase	Recommended Timeline
Additional water supply needed to meet MDEQ-1	Well Pump Upsize (predicated on a favorable water rights judgement)	Health, Sanitation and Security	$315,000	Phase 1	Near Term – 1 to 3 years
Additional water supply needed to meet MDEQ-1	New Well	Health, Sanitation and Security	$1,160,000	Phase 3	Long term – 5 to 10 years
System has significant non-revenue water	Leak Detection	Health, Sanitation and Security	$35,000 (first year)	Phase 1	Near Term – 1 to 3 years
Controls are outdated	Instrumentation and Controls	Health, Sanitation and Security	$95,000	Phase 2	Mid Term – 3 to 5 years
System has no water meters	Customer Meters – Feasibility Study	Health, Sanitation and Security	$10,000	Phase 2	Mid Term – 3 to 5 years
Existing wells do not have backup power	Backup Power for Water Supply	Health, Sanitation and Security	$54,000	Phase 2	Mid Term – 3 to 5 years
Compliance	AWIA – Risk and Resiliency Assessment	Health, Sanitation and Security	$15,000	Phase 1	Near Term – 1 to 3 years
Distribution System	Water main connection between the shopping center and Tyler Way; including a crossing under the railroad.	Health, Sanitation and Security	$171,000	Phase 1	Near Term – 1 to 3 years
Distribution System	Water main upsize along Ridgeway Dr. from PRV #6 to Barclay	Reasonable Growth / Aging Infrastructure	$337,000	Phase 3	Long term – 5 to 10 years
Distribution System	Water main upsize along Ridgeway Dr from PRV#5 to Cumberland	Reasonable Growth / Aging Infrastructure	$856,000	Phase 3	Long term – 5 to 10 years

Need for the Project	Proposed Project	Category	Project Cost Estimate (2021)	Phase	Recommended Timeline
Distribution System	Upsize 6-inch to 8-inch (Upper tank to Lower tank: Reservoir 1 down to St. John's, Claremont St., and Ridgeway Dr.), approximately 2,000 feet, plus 400 feet of new 8-inch along Ridgeway connecting 2 dead ends	Reasonable Growth / Aging Infrastructure	$409,000	Phase 3	Long term – 5 to 10 years
System resiliency and future growth	Water main extension along Farm Rd.	Reasonable Growth	$505,000	Phase 1	Near Term – 1 to 3 years (should be completed prior to upsizing wells 1 and 2)
Accommodate growth and development	Water main extension north on Highway 93 from Ridgeway to Bird Lane	Reasonable Growth	$1,330,000	Phase 3	Timeline based on growth and development
Accommodate growth and development	Water main extension west on Highway 12 from Stella Blue to Cow Catcher Rd.	Reasonable Growth	$1,490,000	Phase 3	Timeline based on growth and development
Accommodate growth and development	Water main extension from Tyler Way (near the old school) to Lewis and Clark on the west side of Highway 93	Reasonable Growth	$235,000	Phase 2	Mid Term – 3 to 5 years
Accommodate growth and development	New Storage Tank	Reasonable Growth	$850,000	Phase 3	Long Term – 5 to 10 years
This water main is AC, nearing the end of its useful life, and experience high pressures from the well – this is a critical main.	Glacier Drive, upsize 564 LF of 6-inch AC to 12-inch on Glacier Drive from Well #1 to PRV #4a and 4b.	Aging Infrastructure	$212,000	Phase 1	Near Term – 1 to 3 years
Water system includes AC pipe that is nearing the end of its useful life	Annual Pipe Replacement	Aging Infrastructure	$200,000 per year	Phase 1	Near Term – 1 to 3 years
PRVs are aging, and do not have SCADA	PRV Replacement	Aging Infrastructure	$230,000	Phase 2	Mid Term – 3 to 5 years
Tank coatings are nearing the end of their useful life	Tank coating	Aging Infrastructure	$370,000 (2 tanks)	Phase 3	Long Term – 5 to 10 years