WHITEFISH SOUTH WATER RESERVOIR PRELIMINARY ENGINEERING REPORT (PER)

For

City of Whitefish Montana

May 2025

Professional Certification

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Montana

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0.0 EXECUTIVE SUMMARY

This Preliminary Engineering Report (PER) is authorized by and prepared for the City of Whitefish (See Figure 0.1 on page 2 for location of Whitefish and project). The PER is developed according to the requirements of the *Uniform Application for Montana Public Facility Projects*[1]. Through this process the most beneficial and economical potable water project(s) will be evaluated and selected for construction. The guidance and requirements of the PER will ensure the project is compliant with all applicable Federal, State, County and local regulations.

The City of Whitefish incorporated in 1905 and is a historical railroad and logging community that has transitioned into a resort community over time. The local outdoor attractions of downhill and cross-country skiing, proximity to Glacier National Park, Whitefish lake, Flathead Lake, numerous other lakes, rivers and streams, wilderness areas, and extensive state and federal forests have made the community a popular second home location, tourist attraction, and vacation destination.

The community has experienced rapid growth over the last three decades including a large increase in seasonal population in the form of short and long-term rentals, short and long-stay hotels, and daily visitors from nearby communities. The seasonal population increase is greatest during the summertime with a smaller peak during the winter ski season.

0.1 Purpose

The City of Whitefish intends to address aging and undersized water infrastructure negatively affecting the southern end of the City. The City water system is storage-deficient, suffers water loss from aging cast iron pipes, and experiences high friction losses associated with finished water traveling almost 5 miles through various smaller water mains to reach the very southern end of the city. Main breaks have drained the water system, taking a significant amount of time for the system pressures and storage to recover.

According to DEQ Circular 1 Section 7.0.1.a, the recommended storage a city should have would be equal to the average day demand plus needed fire flow.[2] For Whitefish, this would be equal to 2.39 million gallons (MG) of storage (1.55 MG *plus* a 4-hour fire at 3,500 gallons per minute [gpm] or 0.84 MG). The City currently has 1.85 MG available in storage, leaving a deficit of 0.54 MG. The additional storage recommended would provide crucial emergency storage.

[1] *Uniform Application for Montana Public Facility Projects.* 13th Edition. Water, Wastewater and Solid Waste Action Coordinating Team. 2022.

[2] *Circular DEQ-1, Standards for Water Works.* Montana Department of Environmental Quality. 2024.

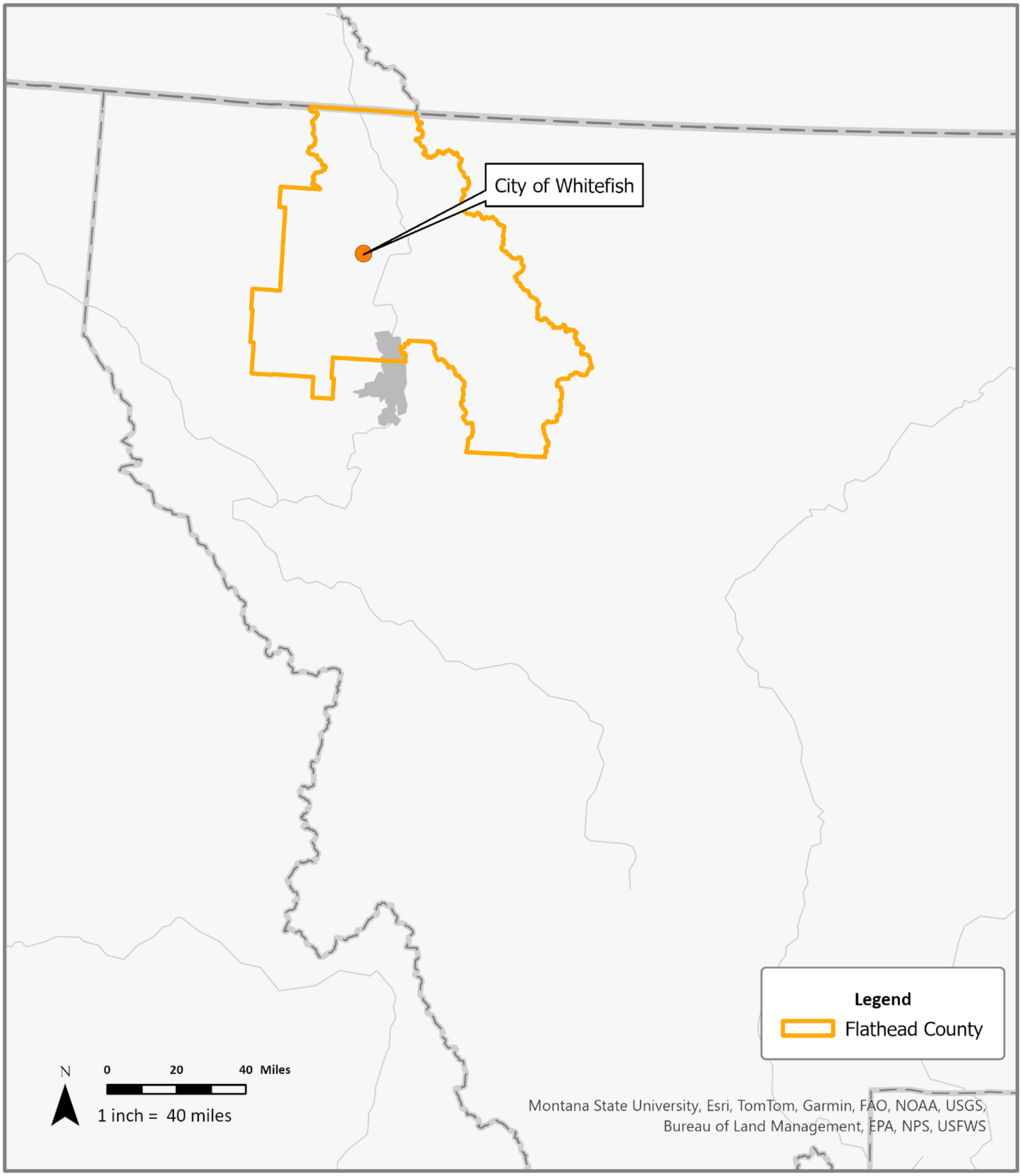

Figure 0.1 – Location Map

Emergency water storage is vital for system resilience, particularly in cities with few water sources, limited backup power, or exposure to natural disasters. Although the City has backup power, it relies on just two surface water sources, and the primary source is a forested watershed that is vulnerable to wildfires, thereby magnifying the need for additional storage. The area is also seismically active, underscoring the importance of maximizing emergency storage capacity.

In the event of earthquakes or wildfires, emergencies can occur with little or no warning and lead to prolonged service outages. Earthquakes may damage treatment facilities, rupture pipelines, and cause power outages. Wildfires can destroy infrastructure and create high water demand for firefighting. In both cases, emergency storage ensures water remains available when the treatment system is offline or demand exceeds capacity. Emergency storage helps maintain pressure and ensures service to critical facilities such as hospitals and emergency centers.

The importance of emergency storage was clearly demonstrated during a recent cold weather event. A major break occurred in a 12-inch main during an extended cold period in late winter, causing operators to scramble to locate and isolate valves, many of which were covered in snow, ice, or paved over.

The main break resulted in approximately 2.7 MG of finished water being lost and a significant pressure drop across multiple areas of the City, especially in the southern region farthest from the water treatment plant (WTP). Low water pressure from the break resulted in a 48-hour boil order for the entire potable water system. Although late February is one of the lowest water demand times of the year, it still took the water system approximately 20 hours to recover after the break had been isolated. The location, isolation, repair, testing and related costs totaled $32,000.

This situation was particularly concerning because the City's only hospital is in the southern part of the system. During the break, the hospital experienced a prolonged loss of water pressure, requiring the City to purchase bottled water for the hospital until pressure was restored and the boil order was rescinded. This break highlights the serious risks posed by inadequate emergency storage in vulnerable or distant parts of the distribution system.

The recommended alternative includes a 1.0 MG water storage tower, transmission supply line, and a new pump station, which would create a new pressure zone in the southern part of the City. The addition of the new water tower and pump station would allow the City additional time to respond to breaks while still providing water to critical customers, such as the hospital. If a similar break had occurred with the recommended alternative online, the southern part of the system could be isolated and would likely be able to provide water to the hospital and southern zone for up to 3 days, depending on the time of year and how full the tank was prior to the break. The additional water storage would buy valuable time for operators to locate and isolate any pipe breaks. The recommended project would allow the operators an additional 8 hours with a 1,500-gpm break.

The supply transmission main will remove approximately 1,500 feet of 6-inch leaking cast iron main from the city distribution system. This main is at least 70 years old and may contain lead gaskets and lead service connections.

The intent of this PER is to provide an analysis of the deficiencies in the existing water system, to make recommendations for correcting those deficiencies, and to demonstrate the community's financial need with respect to the implementation of those corrections. The PER evaluates different alternatives for providing storage solutions and delivering adequate pressure and flow to the southern end of the City in conformance with applicable regulations. Major components evaluated included ground and elevated storage reservoirs, pipelines, pumping stations, and automatic control valves (ACVs). Various other ancillary components are included in the project as required. For further information and details of alternatives see section 4.0 of this report.

0.2 Scope of Work

The phased project will include a new 1.0 MG elevated water storage reservoir, approximately 3,000 feet of 18-inch main for Phase I. Phase II will contain approximately 3,000 feet of 18-inch transmission main, booster station with backup power and a separate pressure reducing valve (PRV). The project will create a new pressure zone out of the main zone in the southern end of the city. See Figure 0.2 on the following page for an overview of the recommended alternative. The 18-inch portion of the project will replace 1,500 feet of 6-inch cast iron main from the City's water system.

0.3 Existing System

The City operates a 6.0 million gallon per day (MGD) surface WTP located north of the City on Reservoir Road. The plant treats raw water from Haskill Creek Tributaries and when required Whitefish Lake water.

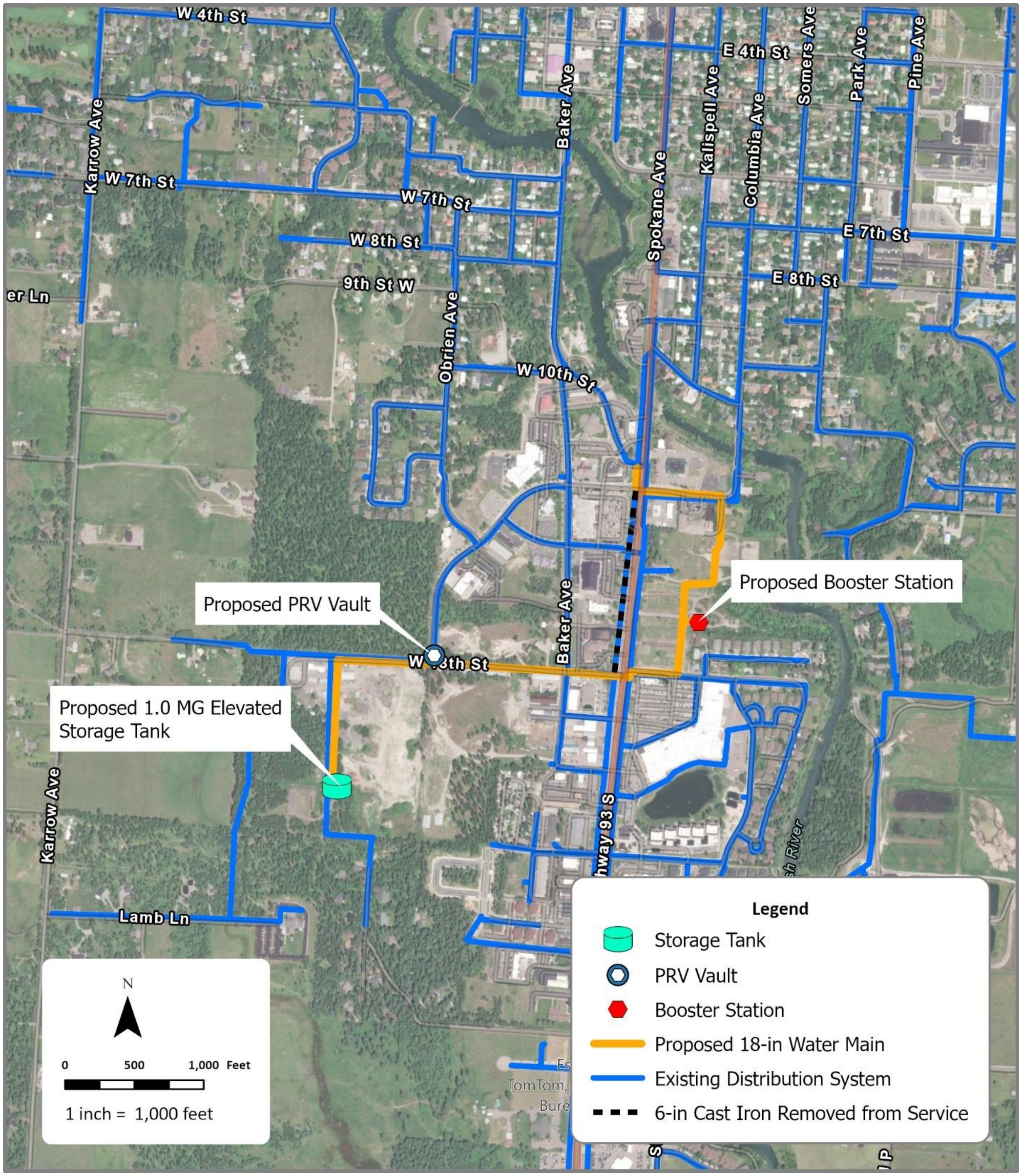

Figure 0.2 – Recommended Alternative

A 0.78 MG partially buried concrete reservoir located just west of WTP provides storage and contact time (CT) for disinfection. This 0.78 MG ground storage reservoir (GSR) sets the hydraulic grade line (HGL) of the main pressure zone. Additional 0.76 MG and 0.31 MG GSRs are located west of town on Grouse Mountain. The 0.76 MG Lower Grouse GSR is located in the lower Grouse Mountain west zone and the 0.31 MG Upper Grouse GSR is located in the upper Grouse Mountain zone.

The Suncrest, Lower Grouse, and Upper Grouse booster stations supply water to pressure zones above the main zone. The Lion Mountain and Grouse Mountain PRVs maintain appropriate pressures in areas below the upper zones.

Treated water is distributed throughout the system by a network of water mains ranging in size from 24-inch down to 6-inch. The oldest watermains in the City are more than 80 years old.

While there are several pressure zones with higher HGLs to the north and west, most of the city is in the main pressure zone on the WTP storage reservoir HGL. The project area is near the southern end of the city in the main pressure zone (See Figure 0.3 on the following page).

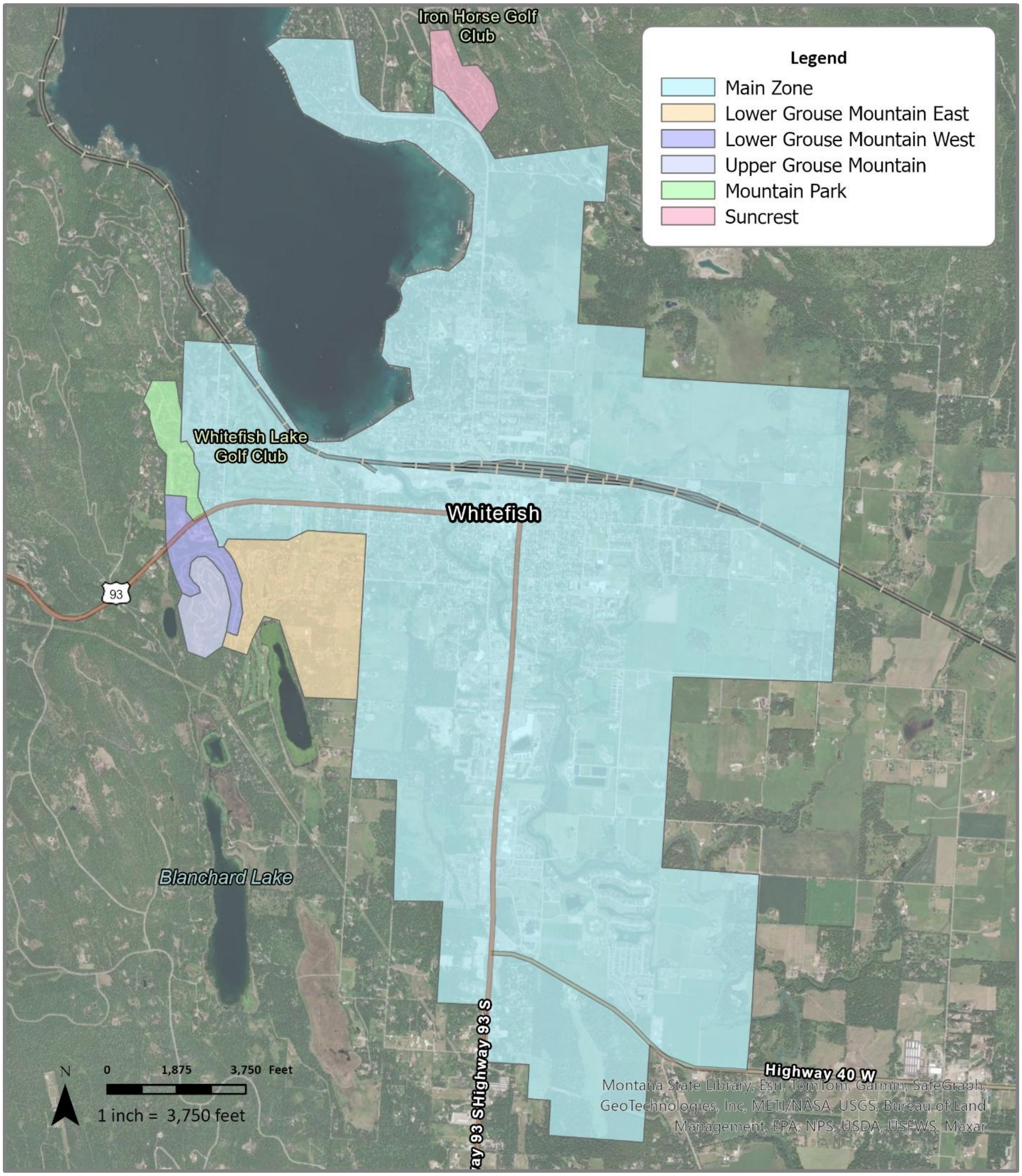

Figure 0.3 – Existing Pressure Zones

0.4 Alternatives Considered

The following alternatives were considered for this project:

- Alternative 1 – Do nothing
- Alternative 2 -1.5 MG ground storage at the WTP
- Alternative 3 – 1.0 MG elevated storage at City Shop site and a new booster station used to isolate the southern main zone from the northern main zone *(Preferred Alternative)*
- Alternative 4 – 1.0 MG elevated storage south of Highway 40, and a new booster station used to isolate the southern main zone from the northern main zone
- Alternative 5 – 1.5 MG ground storage south of the Highway 40 and near Highway 93, and a new booster station used to isolate the southern main zone from the northern main zone
- Alternative 6 – Upsized watermain from 12-inch to 18-inch along Spokane Avenue and Depot Street between the railyard and E 2nd Street.
- Alternative 7 – New 24-inch transmission pipeline around eastern flank of City, from southern end of Texas Avenue to the intersection of JP Road and Highway 93.

Note: Alternatives 2-5 assume the WTP firm capacity is upgraded from 5 MGD to 7 MGD by the year 2045.

See Section 4.0 of this report for detailed descriptions of these alternatives.

0.5 Summary of Recommended Improvements

The following alternatives were recommended for implementation:

- Water Storage
  - Alternative 3, Elevated Storage at City Shop site.
- Water Distribution
  - Alternative 3, Water Transmission Main routing along 18th Street and future Columbia Avenue.
- Pressure Zone
  - Alternative 3, Create a new southern pressure zone with booster station and PRV to control pressures.

The analysis resulted in developing the full project into four discrete components in two phases:

Phase I

- Water Tower Project – 1.0 MG Elevated Water Tower at the City-owned shop site.
- 18th Street Watermain – 18-inch watermain from Greenwood Avenue, across Spokane Avenue up 18th Street and south through City Shop Parcel to new elevated water tower. 8-inch watermain in W 15th street will be extended to connect with existing 8-inch on east side of Spokane Avenue. Existing 6-inch cast iron watermain on west side of Spokane Avenue between 13th street and 18th street will be abandoned and existing services from that line routed to existing 8-inch on east side of Spokane.

Phase II

- Columbia Avenue Watermain – 18-inch watermain from end of new 18-inch water main in Spokane north of 13th Street, east along 13th street to new Columbia Avenue alignment then south along new alignment to the end of the 18-inch main in Greenwood Avenue.
- Booster Station and PRV Project – New booster station with PRV adjacent to new 18-inch transmission main in proposed Columbia Avenue Alignment and a new PRV at the intersection of 18th Street and Flathead Avenue.

0.6 Total Project Estimated Cost

The total estimated project cost, including engineering, bidding, construction, contract administration, legal fees, easement and land acquisition, and contingency is approximately $21.0 million. This includes $15.7 million in construction costs, and $5.2 million in non-construction costs.

0.7 Funding

Funding for the project will be achieved through a combination of cash reserves, loans, and impact fees. The proposed funding breakdown is $3.0 million from cash reserves, $15.0 million from SRF loans, and $3.0 million from impact fees.

1.0 PROJECT PLANNING

1.1 Location

The project is located in the City of Whitefish in Flathead County, MT. Within the Public Land Survey System (PLSS), the project is located in Section 01 Township 30N Range 22W Montana PM and Section 36 Township 31N Range 22W Montana PM. The approximate elevation of the project area is 3050-ft.

An elevated water storage reservoir will be constructed at the City's maintenance shops at 545 W 18th Street. A new 18-inch water main will run from the new reservoir site east along 18th Street to HWY 93, tying into existing water mains along the way. A new booster station will be constructed north of Greenwood Drive on the east side of HWY 93. The parcel is privately owned, but the landowner has given preliminary agreement to provide the parcel for the City. The booster station will be connected to a new 18-inch water main running from Greenwood Drive north to 13th Street E. See Figure 0.2 on page 5 for an overview of the project and its extents. A topographic map is depicted in Figure 1.1 on page 12.

1.2 Environmental Resources

1.2.1 Land Resources

The City of Whitefish is located at the northern end of the Flathead Valley, on the south shore of Whitefish Lake. It is situated between the Whitefish and Salish mountain ranges and is surrounded by a mix of forests and agricultural lands.

The soils within the project area are generally composed of silt loams and stony loams.[3] See the soils map of the project area in Figure 1.2 on page 13 and reference the NRCS Soils Map in Appendix A for more information.

1.2.2 Floodplains

The project extents do not include any regulatory floodplains as determined by reference to the FEMA National Flood Hazard Layer.[4] See Figure 1.3 on page 14 for a map of nearby floodplains.

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[3] Natural Resources Conservation Service. "Web Soil Survey." https://websoilsurvey.nrcs.usda.gov/app/ (accessed April 1, 2025).

[4] Federal Emergency Management Agency. "National Flood Hazard Layer." https://www.fema.gov/flood-maps/national-flood-hazard-layer (accessed March 6, 2025).

1.2.3 Wetlands

The project extents do not include any wetlands as determined by consultation of the National Wetlands Inventory maintained by the U.S. Fish & Wildlife Service.[5] See Figure 1.4 on page 15 for a map of nearby wetlands.

[5] U.S. Fish & Wildlife Service. "National Wetlands Inventory." https://www.fws.gov/program/national-wetlands-inventory/wetlands-mapper (Accessed March 13, 2025).

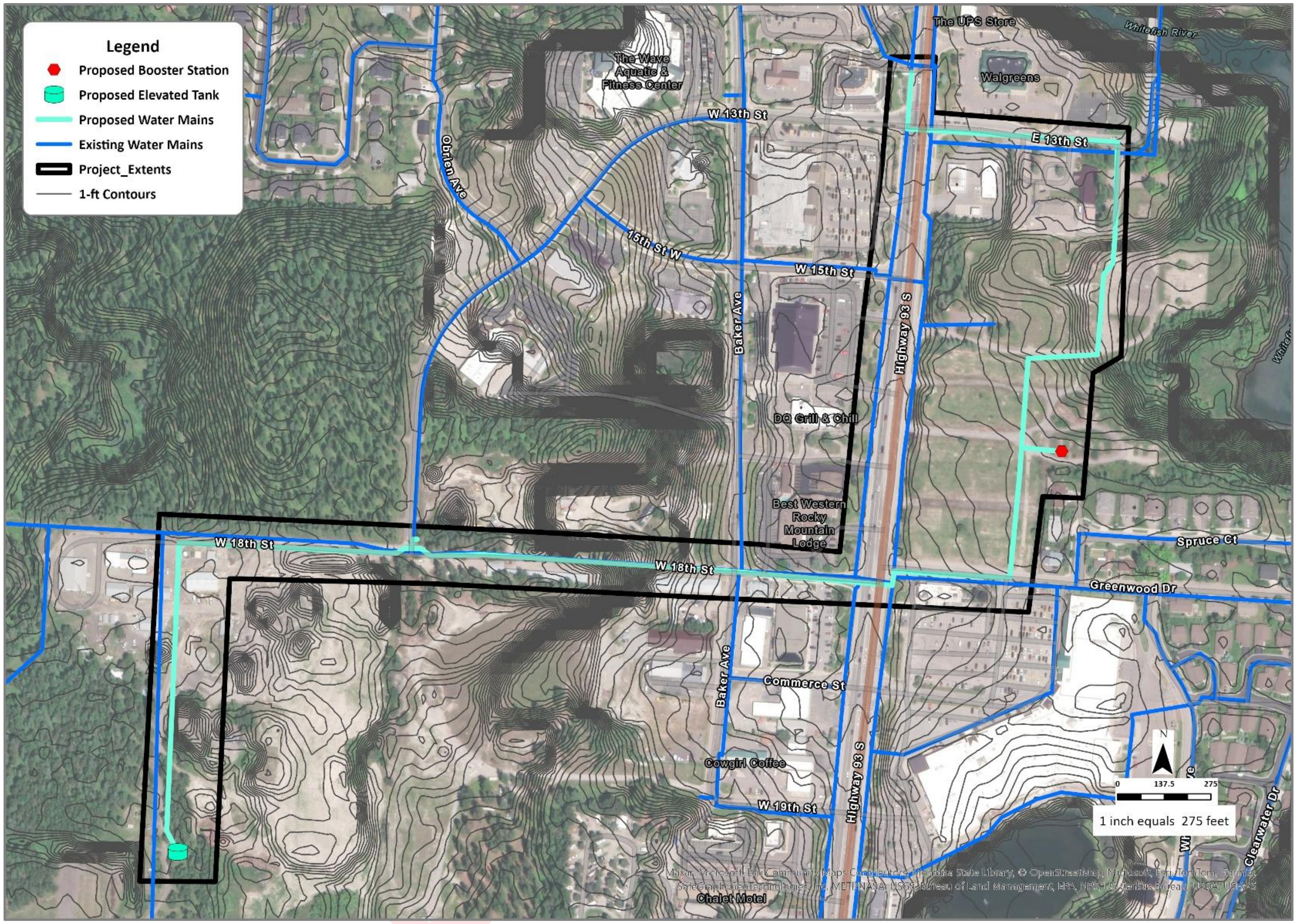

Figure 1.1 – Topographic Map

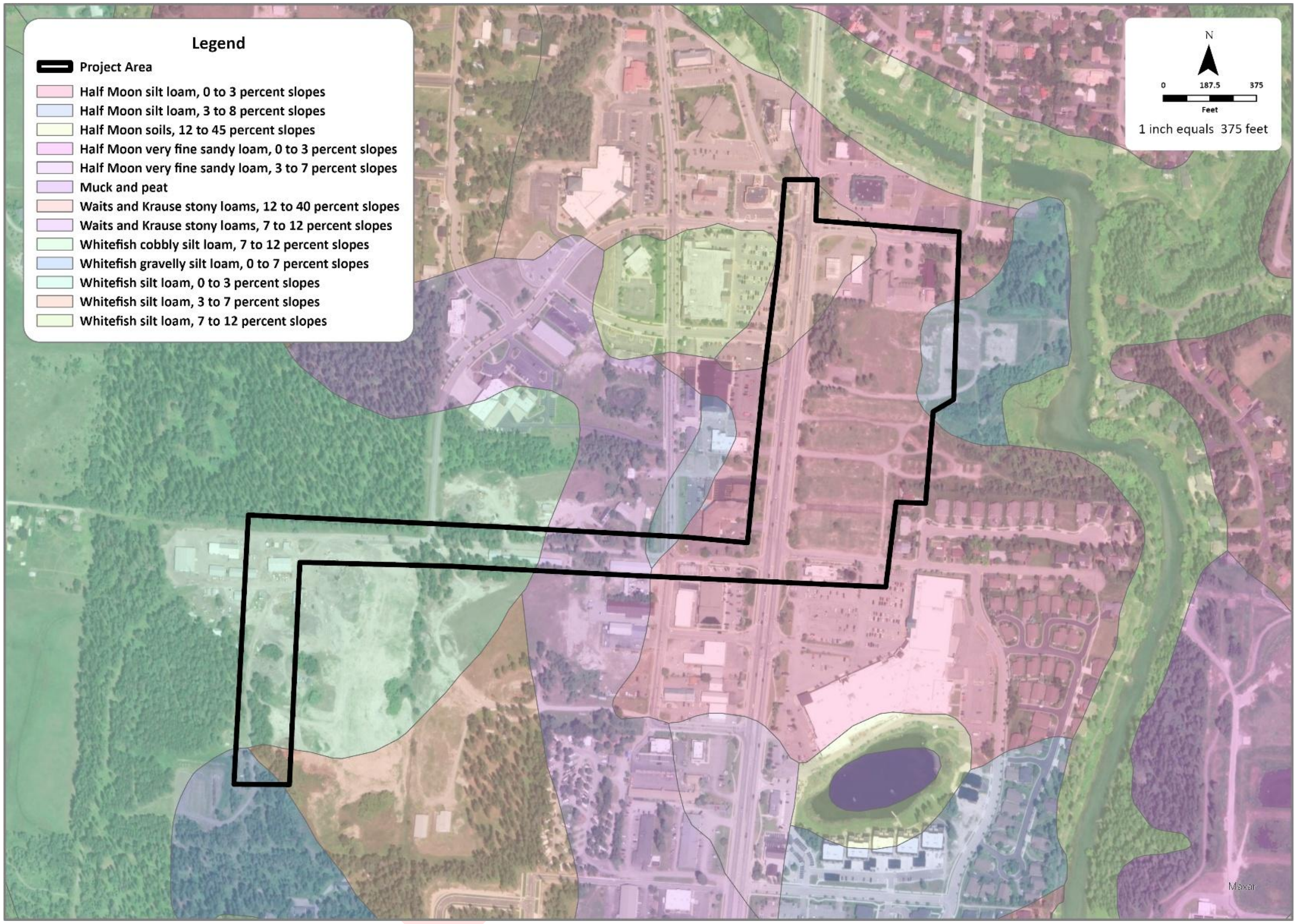

Figure 1.2 – Soils Map

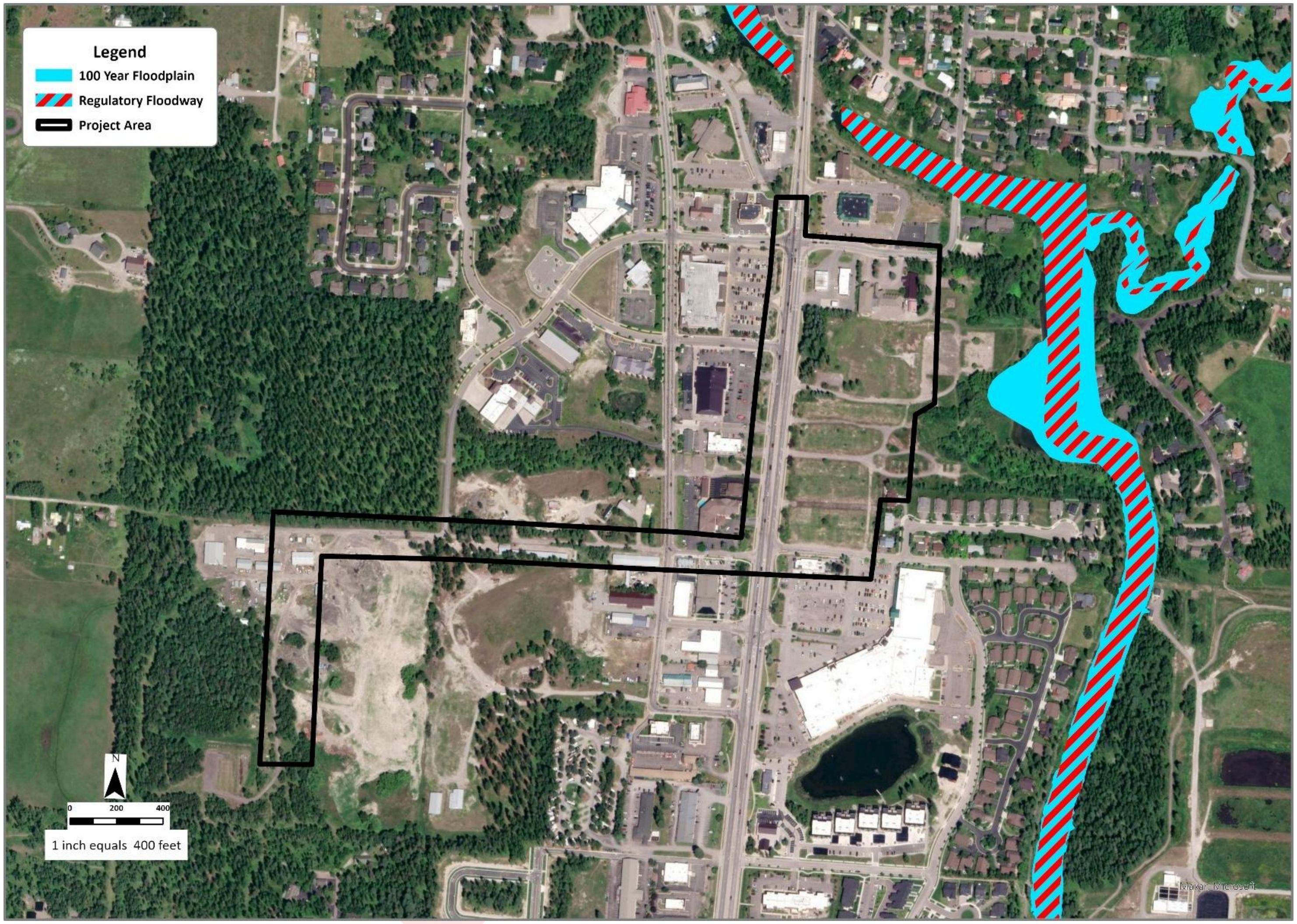

Figure 1.3 – Floodplain Map

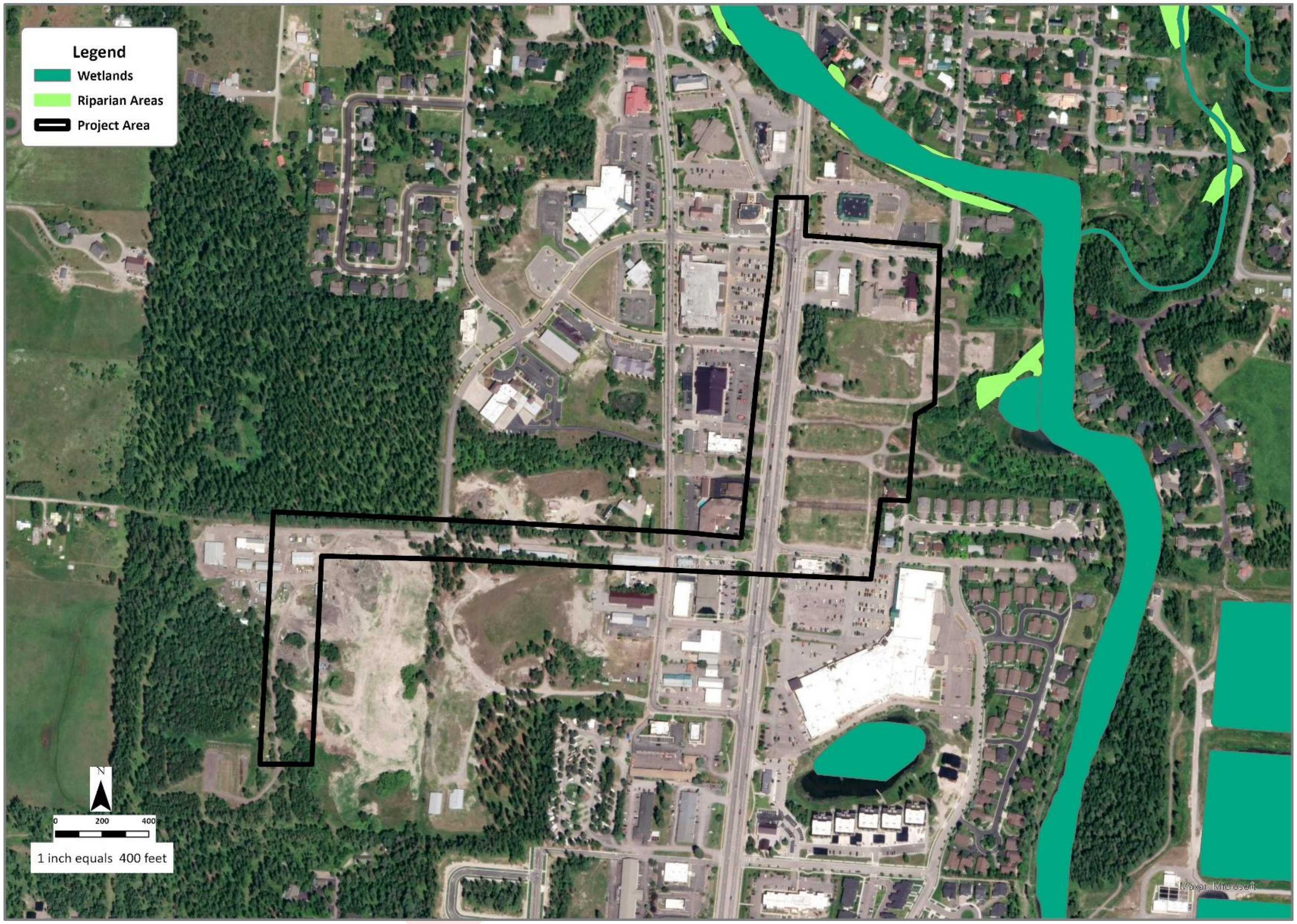

Figure 1.4 – Wetlands Map

1.2.4 Agricultural Lands

Significant portions of the project area have been designated as Prime Farmland or Farmland of Statewide Importance by the United States Department of Agriculture (USDA) [6] (See Figure 1.9 on page 20).

However, no part of the project area is currently used for agricultural production, and the entirety of the project area has been developed for residential, municipal, or transportation related uses. Figure 1.5 below shows a photograph from the 1970's of the proposed tower site (currently the location of the City maintenance shops).

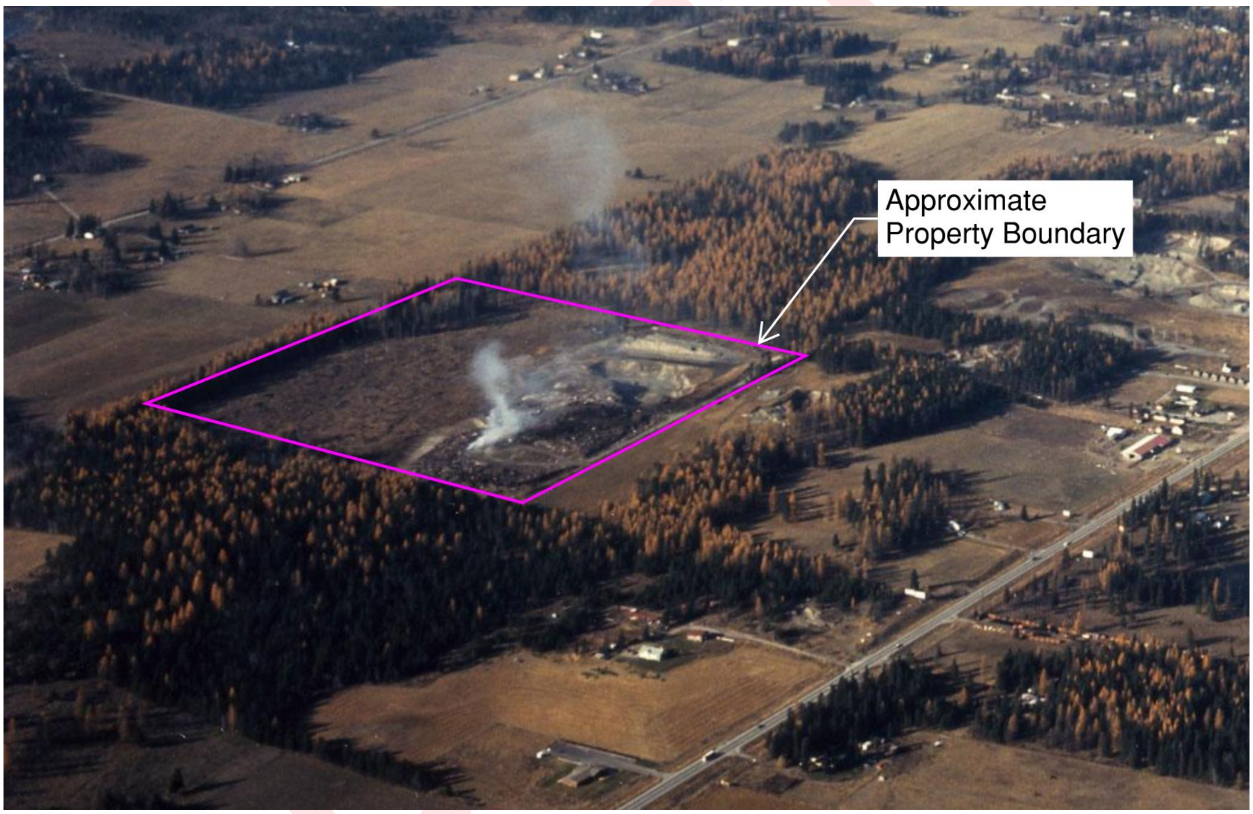

Photo Credit: Marion Lacy

Figure 1.5 – Proposed Tower Site (1970's)

[6] Natural Resources Conservation Service. "Web Soil Survey." https://websoilsurvey.nrcs.usda.gov/app/ (accessed April 1, 2025).

As can be seen in the photo on the previous page, the site of the proposed tower was once the location of the city dump. The area has not been used for agricultural production at any time since. The current land use of the property is depicted in Figure 1.6.

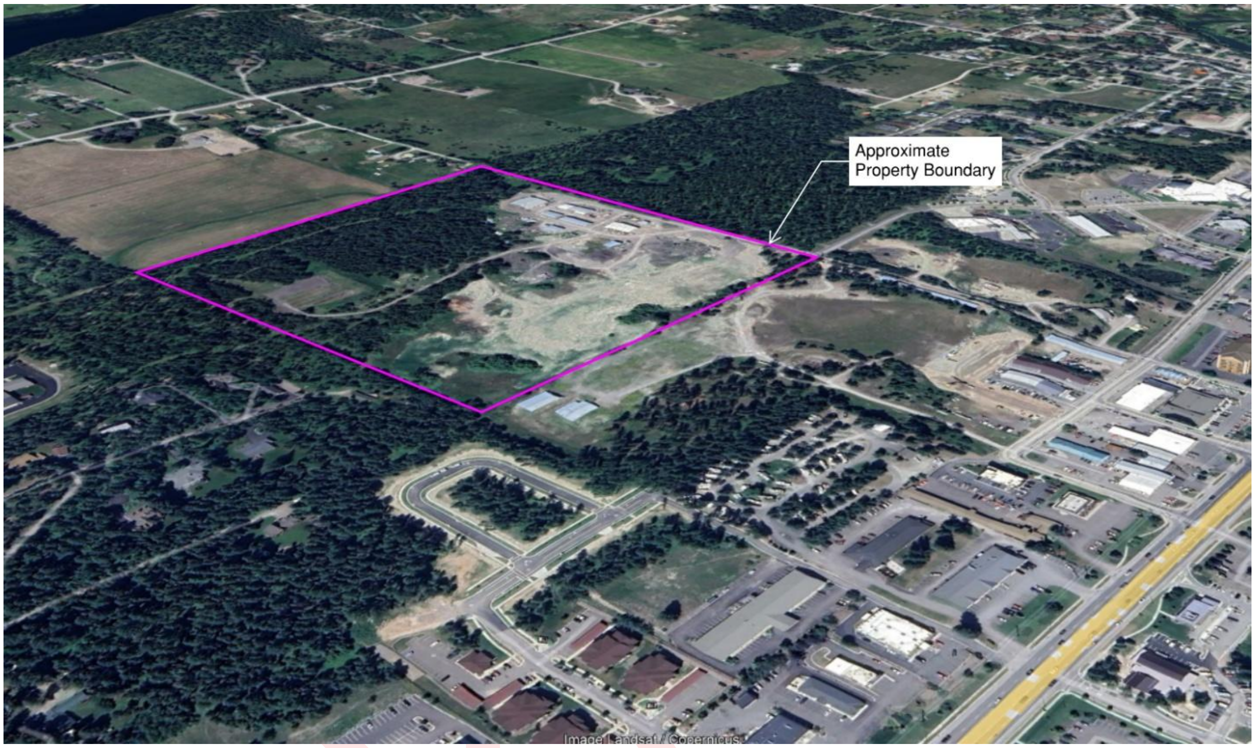

Photo Credit: Google Earth

Figure 1.6 – Proposed Tower Site (2025)

As shown in the above photo, the city shops are located on the upper right-hand side of the property, the former dump site in the lower-right area, and a woodland with existing shooting range (to be relocated) on the left side of the property.

The proposed location for the booster station is a property that was previously developed as a hospital and trailer park, as shown in Figure 1.7 below.

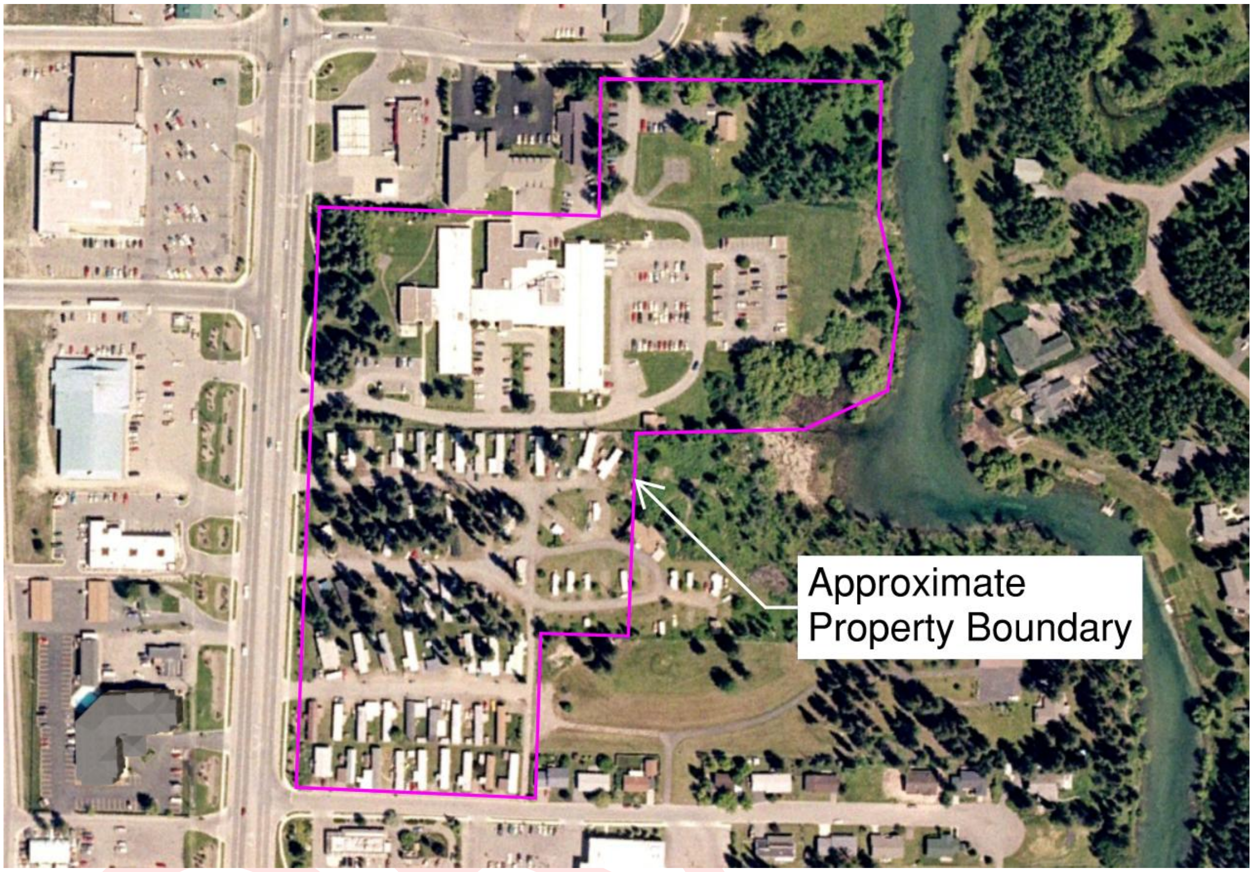

Photo credit: Google Earth.

Figure 1.7 – Proposed Booster Site (2004)

As can be seen in the photo, the entirety of the property has been previously developed. It is currently a vacant lot and is slated for re-development in the near future. No part of the property has been used for agricultural purposes in recent decades.

Figure 1.8 below shows an arial photo from 2024 that shows the current state of the proposed booster station site.

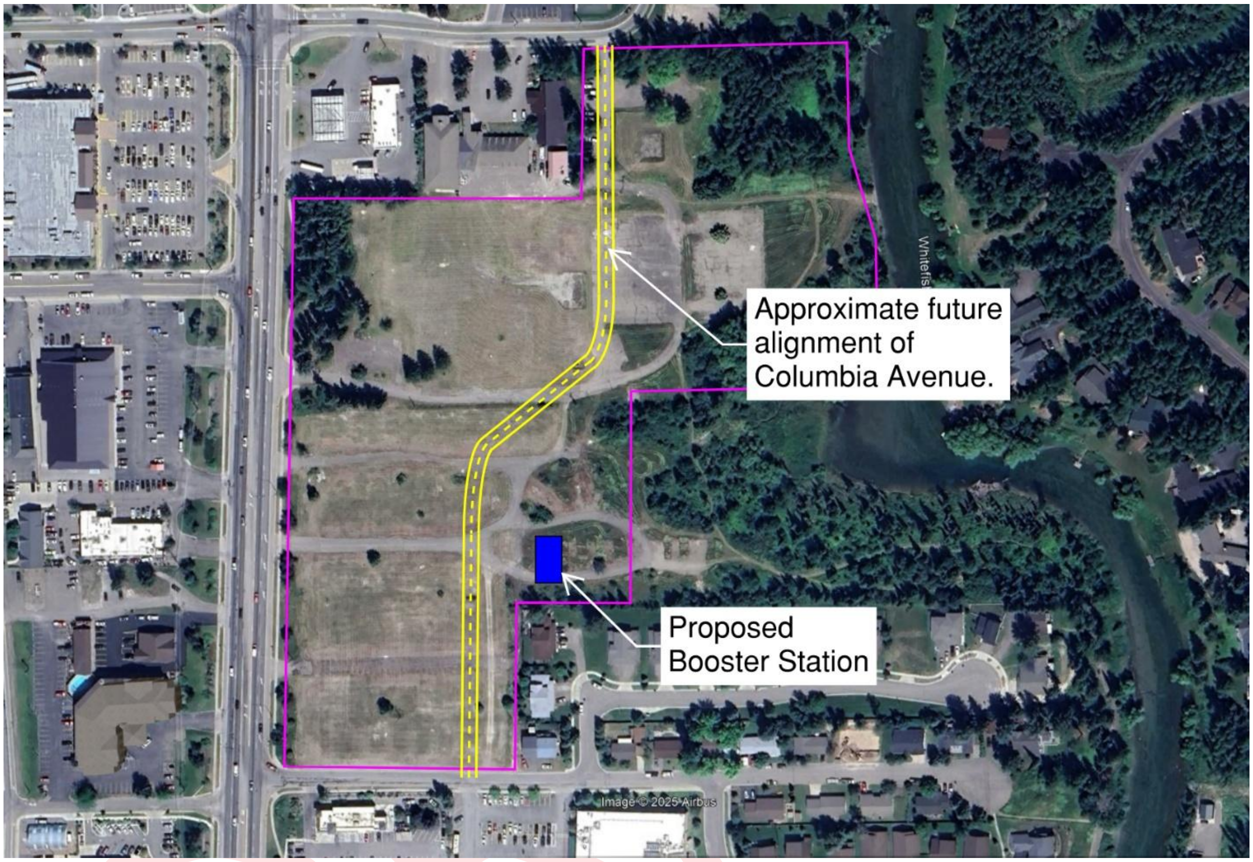

Photo credit: Google Earth.

Figure 1.8 – Proposed Booster Site (2024)

The site will be re-developed as a bio-medical research facility and residential district, and Columbia Avenue will be extended through the property as a part of that re-development project. A small portion of the property has been set aside for the proposed booster station. The water transmission main will be located in the Columbia Avenue right-of-way (ROW).

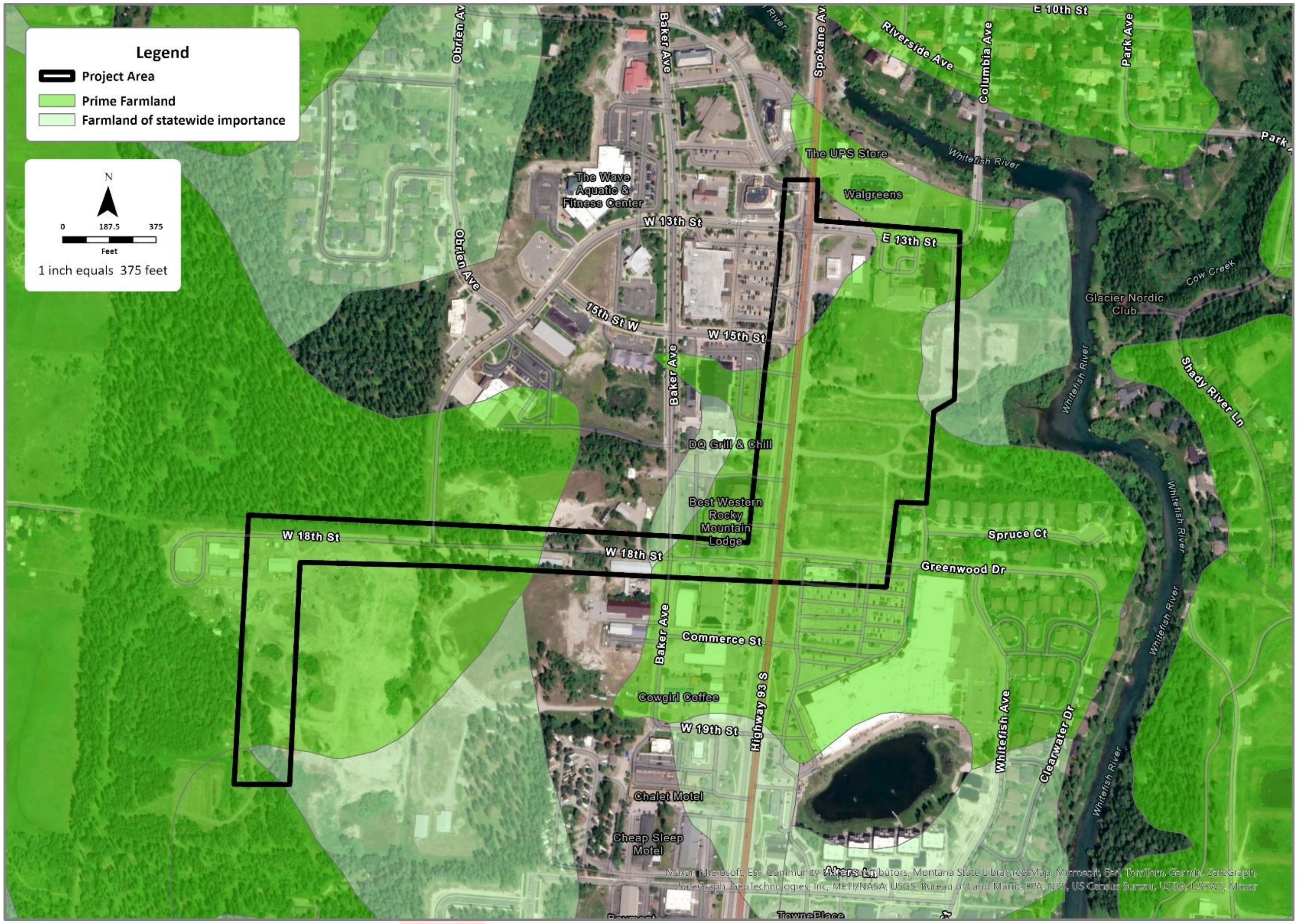

Figure 1.9 – Farmland Map

1.2.5 Endangered Animal and Plant Species

There are no endangered species with current ranges that exist within the project area as determined by consultation of the U.S. Fish and Wildlife Service Environmental Conservation Online System (ECOS). [7]

1.2.6 Sage Grouse

The range of the greater sage grouse does not coincide with the project area or its surroundings [8](see Figure 1.10 on the following page). The greater sage grouse is native to the sage-brush steppe of eastern Montana and is not found in northwestern Montana.

1.2.7 Historic Sites

There are no historic sites located within the project boundaries as determined by consulting the National Register of Historic Places maintained by the National Park Service of the U.S. Department of the Interior.[9]

1.2.8 Hazardous Facilities

There are no hazardous facilities located within the project area as determined by in-person site visits and discussion with City staff.

[7] U.S. Fish & Wildlife Service. “Environmental Conservation Online System.” https://ecos.fws.gov/ecp/ (Accessed March 28, 2025).

[8] Montana Department of Natural Resources and Conservation. “Montana Sage Grouse Habitat Conservation Map.” https://sagegrouse.mt.gov/ProgramMap (Accessed April 1, 2025).

[9] National Park Service. “National Register of Historic Places.” https://www.nps.gov/subjects/nationalregister/index.htm (Accessed April 1, 2025).

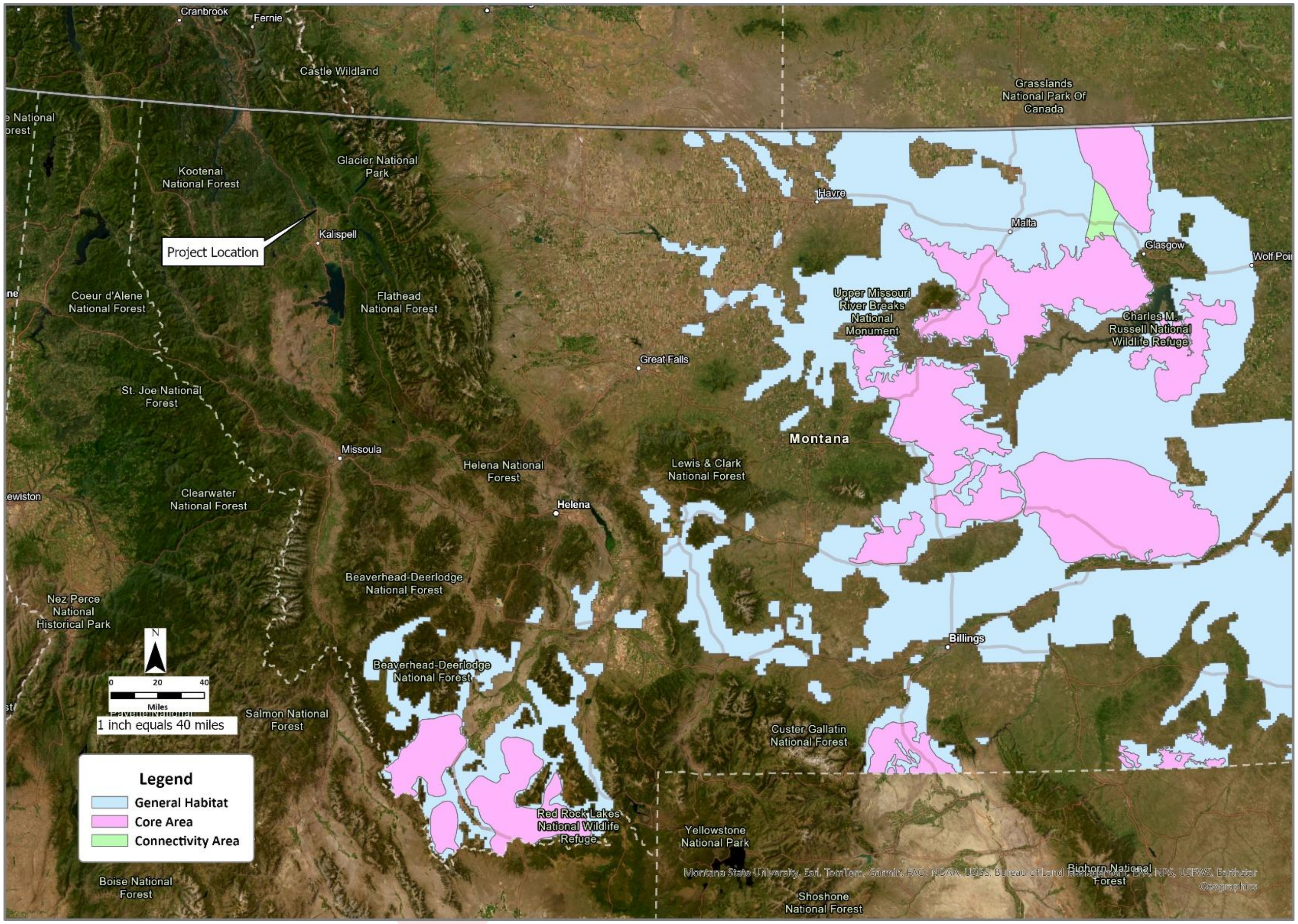

Figure 1.10 – Sage Grouse Range Map

1.3 Population Trends

1.3.1 Historic Growth

The population of the City of Whitefish as determined by the decennial census conducted by the U.S. Census Bureau[10] is shown in Table , below.

Table 1.1 – Historical Population of Whitefish

Year	Population	Percent Increase	Average Yearly Growth Over Previous 10 Years
1990	4368	-	-
2000	5032	15%	1.5%
2010	6357	26%	2.6%
2020	7751	22%	2.2%
2023*	9163	18%	6.1%

**Estimated by U.S. Census Bureau.*

As can be seen in the table, Whitefish experienced an annual growth rate of about 1.5% in the 1990's, about 2.6% in the 2000's and 2010's, and about 6.1% in the three years following 2020.

1.3.2 Projected Growth

For the present report, a constant growth rate of 1.5% was considered. The projected population growth under this scenario is shown in Table below.

Table 1.2 – Projected Population of Whitefish

Year	Full-Time Residents	Seasonal Population	Total Population
2023	8,893	2,668	11,561
2025	9,161	2,748	11,909
2030	9,869	2,961	12,830
2035	10,632	3,190	13,822
2040	11,454	3,436	14,890
2045	12,339	3,702	16,041

[10] United States Census Bureau. "Decennial Census of Population and Housing." https://www.census.gov/programs-surveys/decennial-census.html (Accessed April 1, 2025).

For the water demand analysis conducted in this report it was assumed that full-time residents account for only 70% of the population during peak visitation periods, following the methodology of the Vision Whitefish 2045 growth policy update.[11] Thus, based on a 1.5% annual growth rate and taking the abovementioned assumption regarding seasonal population into account, the City of Whitefish will need the infrastructure to support approximately 16,000 residents by 2045.

1.4 Community Engagement

To be provided.

[11] City of Whitefish. "Vision Whitefish 2045 Growth Policy Update." https://engagewhitefish.com/vision-whitefish-2045 (Accessed April 1, 2025).

2.0 EXISTING FACILITIES

2.1 Location Map

The location of existing water distribution facilities in the City of Whitefish are shown in Figure 2.1 and Figure 2.2 on pages 26 and 27 respectively.

2.2 History

The dates of construction, renovation, expansion and removal from service of major water distribution system components are shown in Table , below.

Table 2.1 – Water Facility History

Facility	Construction	Renovation	Expansion	Removal from Service
Cast Iron Water Mains	1930 – 1950	-	-	continuous
Water Treatment Plant	1999	-	2021	-
Suncrest Booster Station	1992		-	-
Lower Grouse Reservoir	1978	-	-	-
Upper Grouse Reservoir	1997	2023	-	-
Lower Grouse Booster Station	1997	-	-	-
Upper Grouse Booster Station	1997	-	-	-
Mountain Park Booster	1994	-	-	2012
Grouse Mountain PRV	Unknown		-	-
Lion Mountain PRV	Unknown	-	-	-
Whitefish Lake Intake Structure	1998	-	2023	-
1st Creek Intake Structure	1920's	-	-	1970's
2nd Creek Intake Structure	1920's	2012	-	-
3rd Creek Intake Structure	1920's	2012	-	-
Raw Water Reservoir	1920's	-	-	-
Hydro-Electric Plant	1987	2012	-	-

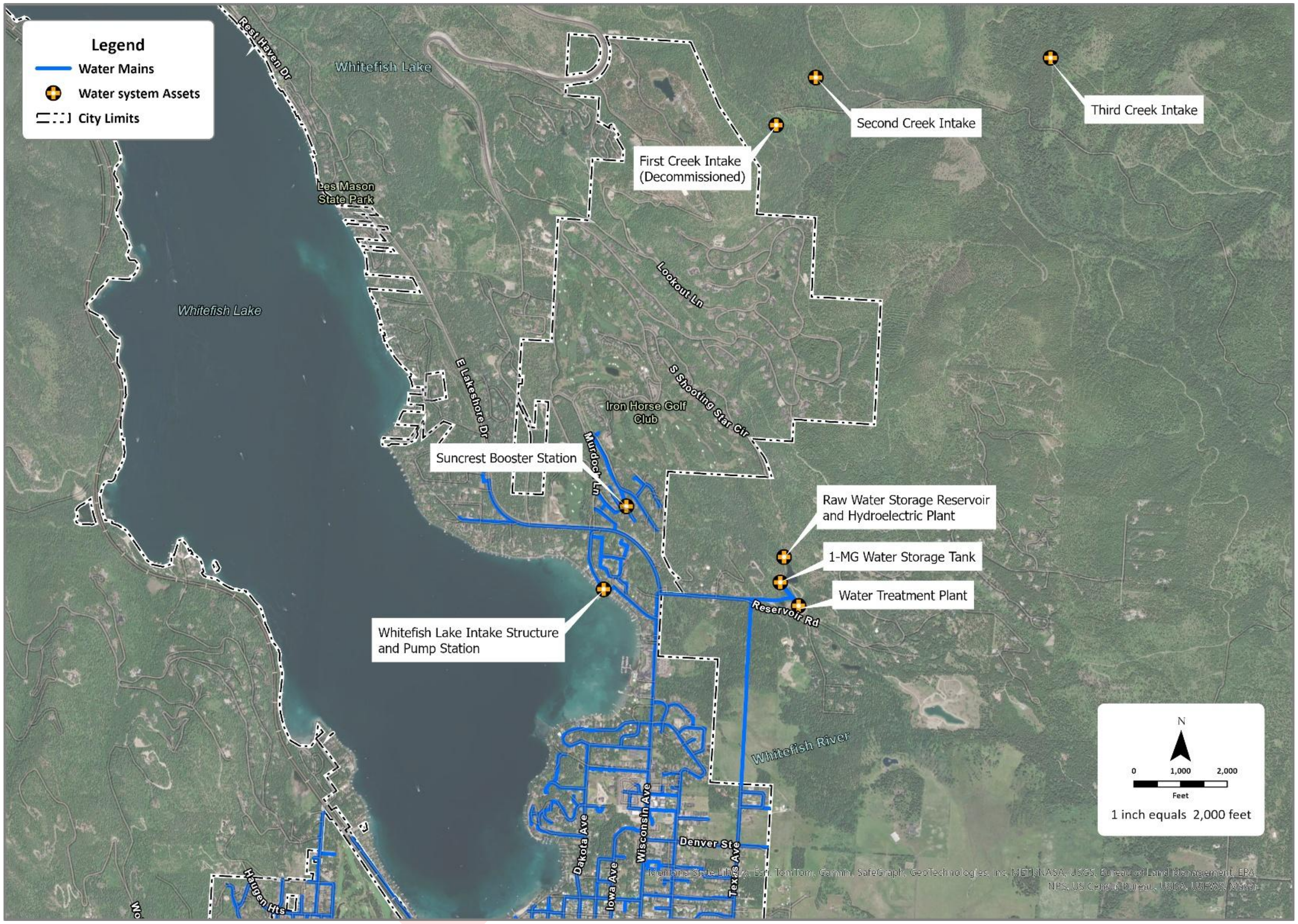

Figure 2.1 – Existing Facilities (North Half)

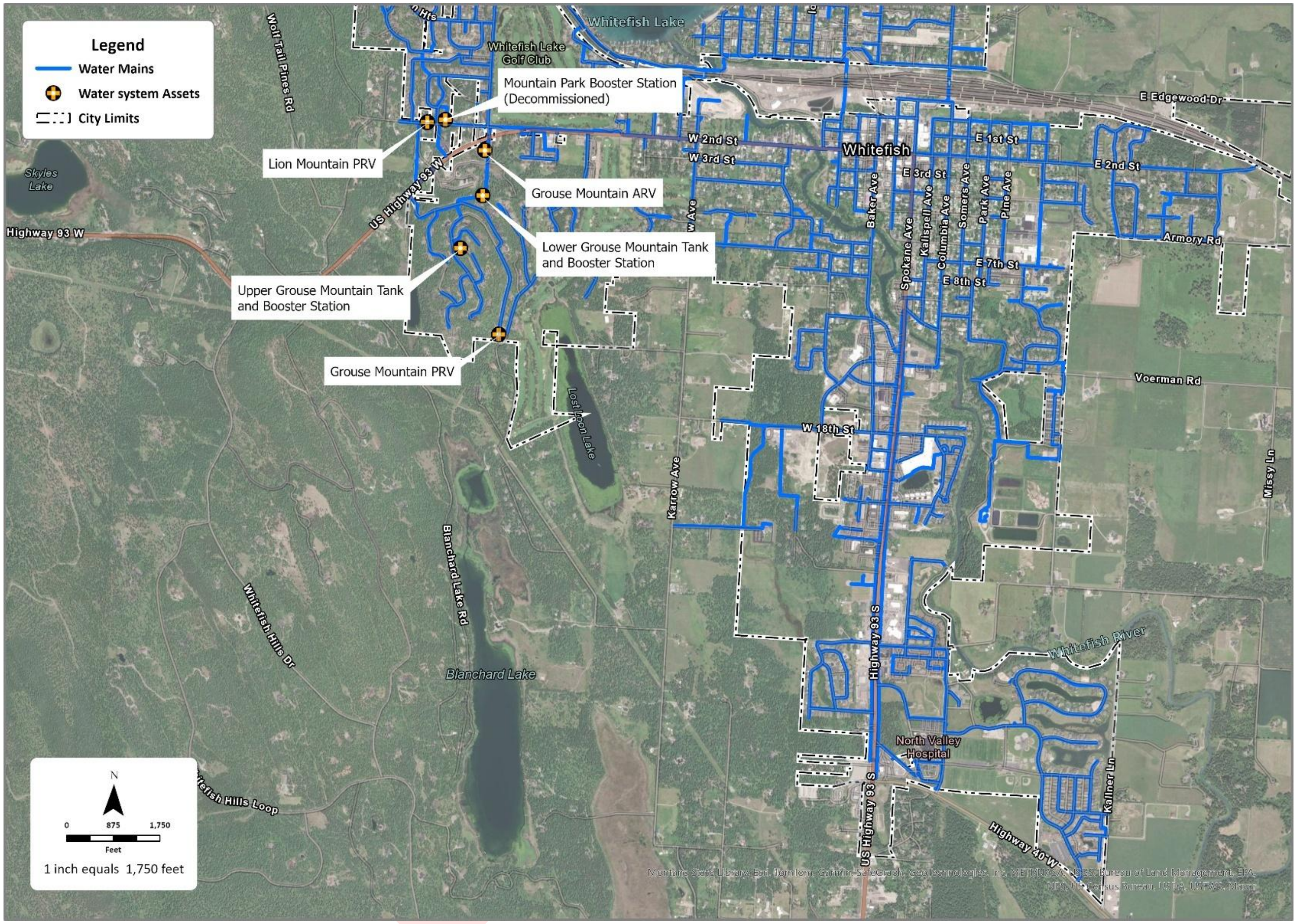

Figure 2.2 – Existing Facilities (South Half)

2.3 Condition of Existing Facilities

2.3.1 Water Sources

The principal source of water for the community of Whitefish consists of two diversion structures located on tributaries to Haskill Creek on the lower slopes of Big Mountain. These diversion structures are known as the Second Creek and Third Creek diversions. These diversion structures consist of PVC intake pipes that direct water through concrete screen box structures. After passing through the screen boxes, the water travels downslope in permastrand pipe to the hydro-electric generating station at the head of the raw water reservoir. The abovementioned pipes and structures are in good condition.

The hydro-electric plant provides renewable energy that the City sells to the local electric utility company. This facility was originally constructed in the 1980's but saw only a brief period of service before being disabled by a lightning strike. [12]The facility was subsequently rebuilt in 2012 and has since been in good working order since.

After passing through the hydro-electric plant, water is collected in the raw water reservoir just downstream, which consists of an unlined, elongated pond feature. Water is held back by an earthen dam with an overflow that directs water to Viking Creek. The raw water reservoir and associated structures are generally in good condition.

The secondary source of water for the community is Whitefish Lake. This source is utilized by means of an intake pipe lying on the lakebed that draws water into a quadplex pumping station. The water is then pumped upgradient to the WTP, which is located on the lower slopes of Big Mountain just below the raw water reservoir. The water is pumped directly into the treatment plant and does not pass through the raw water reservoir, although if an excess of water is pumped from the lake, it may backflow out of the treatment plant and into the reservoir. The lake intake, pumping station, and associated pipeline are generally in good condition. The City owns a mobile generator capable of operating the entire pumping plant, allowances have been made to allow for connection of the mobile generator to the plant. The lake pump station is used to augment flows from Haskill Creek when the creek cannot meet the needed flow for the City.

[12] M. Baldwin, "City's hydro power plant now online," *Whitefish Pilot,* Sept. 2012.

Haskill Creek water is the preferred water source as it is delivered by gravity to the plant, generates power at the raw water reservoir and is of a pristine quality that requires minimal filtering, chemicals, and treatment.

2.3.2 Treatment Plant

The treatment process in place at the WTP includes clarification, filtration, primary disinfection, and secondary disinfection.[13]

Clarification is accomplished by means of contact adsorption clarifiers (CACs), and filtration is achieved through mixed media filtration. These processes are contained in proprietary Trident treatment units. Six of these units are currently in operation at the plant, providing a firm capacity of 5.0 mgd (each unit having an individual capacity of 1.0 mgd). These units are in good condition. One filter is taken offline each winter and refurbished prior to higher demands in the spring, summer and fall.

Primary and secondary disinfection is accomplished by injecting chlorine gas into the clarified and filtered water. Primary disinfection residence time is achieved by means of a baffling system in the finished water storage tank near the plant. After primary disinfection is complete, the water passes through a valve house into the distribution system. A chlorine residual is maintained throughout the distribution system to achieve secondary disinfection. The chlorine gas storage and injection system are in good condition.

The WTP has a diesel backup power generator sized to run the entire system. The generator is well maintained and in good operating condition.

2.3.3 Distribution Network

The distribution system contains pipes ranging from 6-inches to 18-inches in diameter. The pipes range from a few years old to many decades old and consist of a variety of materials including cast iron, galvanized steel, asbestos concrete, ductile iron, and PVC. The cast iron pipe is generally in good condition but requires replacement due failing lead gaskets and numerous lead whips. Losses throughout the distribution system are estimated at approximately 24% as of 2022.[14]

[13] Morrison Maierle. "Water Source and Treatment Capacity Expansion Project," 2020.

[14] City of Whitefish, "2015-2023 losses." Distributed by City of Whitefish. (accessed May 5th 2025).

At least one significant bottleneck has been identified in the system, where two runs of 18-inch pipe are connected by a 12-inch pipe, the 12-inch pipe is in the north end of Spokane Avenue. Bottlenecks such as this cause a loss of hydraulic efficiency.

2.3.1 Automatic Control Valves

Several pressure zones are maintained throughout the system by means of pressure reducing valves (PRVs) and pumping stations. There are currently two PRVs operating in the distribution system.

The Grouse Mountain PRV is located on the south side of Grouse Mountain, and maintains a pressure drop from the lower Grouse Mountain west zone to the lower Grouse Mountain east zone (see Figure 0.3 on page 7). This PRV is only partially functional, with the primary valve being disabled and all flow passing through the fire-flow bypass valve.

The Lion Mountain PRV creates a pressure drop between the lower Grouse Mountain west zone and the Mountain Park zone to the north. This PRV is in good condition.

2.3.2 Pumping Stations

Pumping stations are used in several locations throughout the distribution system to provide service to areas of higher elevation. There are currently three pumping stations in the distribution system.

The Suncrest Pumping station is located to the west of the WTP, at the base of Big Mountain. This pumping station is inadequate for maintaining fire flow in its pressure zone due to suction side pressure deficiencies. The low suction-side pressure also causes cavitation issues with the high flow fire pump.

The Lower Grouse pumping station is used to convey water from the Lower Grouse tank to the Upper Grouse tank. This pumping station is generally in good condition, although it is undersized and struggles to keep the upper Grouse tank full during periods of peak demand. The lower Grouse pumping station has no backup generator.

The Upper Grouse pumping station provides service to residential structures located near the top of Gouse Mountain, above the upper Grouse tank. The pumping station is in generally good condition, although the shingle roof is overgrown with moss.

2.3.3 Storage Tanks

The nominal capacities of the existing storage tanks within the system are summarized in Table below.

Table 2.2 – Existing Storage Tank Capacities

Reservoir	Capacity (Gallons)
Water Treatment Plant	780,000
Lower Grouse Mountain	760,000
Upper Grouse Mountain	310,000
Total	**1,850,000**

The WTP tank is generally in good condition. The concrete lid of the tank exhibits some superficial cracking.

Lower Grouse Mountain tank is an unlined, painted-steel GSR and is generally in good condition. Some lichen is growing on the sides of the tank, one of the yard valves is difficult to operate, and the ladder on the side of the tank poses some safety hazard due to lack of cage extending to the ground.

Upper Grouse Mountain tank is an unlined, concrete GSR generally in good condition. The access hatch for the tank cannot be locked due to corrosion damage to the hatch. During overflow events, water flows into an adjacent private property and inundates the access drive. Lightning strikes occasionally disable communications facilities at the tank.

2.4 Financial Status of any Existing Facilities

2.4.1 Utility Revenues

The Water Fund expects to generate $6.14 million in revenues for FY25, with their most reliable and substantial source being service charges (i.e., metered water sales). These sources are expected to generate $4.36 million of that total, with the remainder coming from a variety of other sources, including intergovernmental grants, investment earnings, taxes, and bonds.

The City's Resort Tax will contribute $.97 million to the Water Fund in FY25; however, this funding is earmarked to pay off debt related to the Haskill Basin Pond Project, which is set to mature in FY25. As such, no additional Resort Tax contributions are expected to be made to the Water Fund.

The City's revenues have varied over the last several years, with the main factors being the infrequent addition of Intergovernmental Grants, Bonds, Resort Tax Contributions. When solely accounting for reliable revenues, such as Service Charges, Miscellaneous, and Investment Earnings, the City's annual totals range from $4.16 million in FY22 to $4.57 million in FY25. The variation is attributed to increased water demand from growth and varying annual water use. Table 2.3 provides a summary of the City's revenues dating back to FY22.

Table 2.3 - Summary of City Revenues (FY22 to FY25)

Item	Actual FY22	Actual FY23	Actual FY24	Budget FY25
Intergovernmental (Grants)	$.00 M	$1.45 M	$.00 M	$.60 M
Service Charges	$4.12 M	$4.36 M	$4.36 M	$4.36 M
Miscellaneous	$.00 M	$.00 M	$.00 M	$.00 M
Investment Earnings	$.04 M	$.13 M	$.29 M	$.20 M
Other Sources (Revenue and Haskill Bonds)	$2.59 M	$1.63 M	$1.63 M	$.97 M
Total Revenues	$6.76 M	$7.57 M	$6.28 M	$6.14 M
% Change from the Prior Year:	-	*12%*	*-17%*	*-2%*
Reliable Revenues (Charges, Misc., Invest.)	$4.16 M	$4.49 M	$4.65 M	$4.57 M
% Change from the Prior Year:	-	*8%*	*4%*	*-2%*

The City also manages a separate Water Impact Fee Fund, which has generated between $307,142 (FY24) and $538,833 (FY22) over the last three years. Impact Fee income has been relatively consistent given prevalent community growth. The City's current Impact Fee reserve is $2.4 million, with plans to partially spend that amount in FY25, resulting in an end balance of $1.63 million.

2.4.2 Utility Expenditures

The Water Fund's annual expenditures include personnel costs, materials and services, capital, debt service, and other financing uses (i.e., transfers). In total, expenditures have ranged between $4.79 million (FY24) to $7.80 million (FY23) over the last several years. The high year-to-year variations are attributed to capital spending, with the remaining more essential day-to-day expenses staying more constant. Table 2.4 on the following page provides a summary of the City's expenditures from FY22 to FY25.

Table 2.4 - Summary of City Expenditures (FY22 to FY25)

Item	Actual FY22	Actual FY23	Actual FY24	Budget FY25
Personnel	$1.13 M	$1.22 M	$1.10 M	$1.41 M
Materials and Services	$.81 M	$.98 M	$1.02 M	$1.24 M
Capital	$2.39 M	$3.25 M	$.22 M	$2.83 M
Debt Service	$1.73 M	$1.83 M	$1.92 M	$1.36 M
Other Financing Uses	$.18 M	$.52 M	$.53 M	$.45 M
Total Expenditures	$6.23 M	$7.80 M	$4.79 M	$7.29 M
% Change from the Prior Year:	-	*25%*	*-39%*	*52%*
Expenditures (Less Capital and Haskill)	$2.76 M	$3.40 M	$3.32 M	$3.78 M
% Change from the Prior Year:	-	*23%*	*-2%*	*14%*

2.4.3 Tabulation of Users and Rate Schedule

The City's service charge structure includes fixed and volumetric rates, and several distinct User Categories. The User Categories include customers 'Inside City', 'Outside City', 'Pressure Zone', and 'Irrigation'. Within each user category, charges vary based on the size of water meter, ranging from 5/8" to 4". The City does not differentiate service charges based on customer class, such as residential and commercial. One nuance is that the City's typical residential meter is 3/4", not 5/8" as more commonly found in Montana. Table 2.5 provides a listing of the City's meter counts by size.

Table 2.5 - Water Meter Counts by Size

#	Meter Size	Count
1	5/8"	1,377
2	3/4"	2,463
3	1"	1,480
4	1 1/2"	208
5	2"	126
6	3"	18
7	4"	6
8	No Meter	1
9	Sewer Meter	4
	Total:	*5,683*

Table 2.6 provides a listing of the City's meter counts by customer class.

Table 2.6 - Water Meter Counts by Customer Class

#	Customer Class	Count
1	Commercial	542
2	Irrigation	815
3	Re-Use Account #	48
4	Res & Commercial	6
5	Residential	4,214
6	Test - City Use Only	6
7	Vacant Lot	50
8	Water Fountain	2
	Total:	*5,683*

Table 2.7 provides a summary of the City's service charge structure and monthly fees for a select group of User Categories.

Table 2.7 - Rate Structure and Example Monthly Charges

Item	Inside City (3/4")	Outside City (3/4")	Inside City (2")	Outside City (2")
Fixed Fee ($)	$37.80	$47.60	$263.90	$307.70
Volumetric Fee ($)	$3.96	$5.82	$3.96	$5.82
Charge (6,000 Gal./Month)	$61.56	$82.52	$287.66	$342.62

The City's Median Household Income (MHI) is $71,110 based on data compiled from the 2019-2023 American Community Survey (ACS)[15] and hosted by the Montana Department of Commerce (Commerce). The Montana Statewide MHI from the same data set is $66,341, resulting in the City having a comparative MHI of 107% of the statewide benchmark.

Commerce has a target water rate-to-income ratio of 1.4%. Given the City's MHI, their target rate is $82.96. The City's current FY25 charge for a typical residential customer (i.e., ¾" base charge + 6,000 gallons) is $61.56. This equates to an affordability ratio of 1.04% of the City's MHI. Aligning the City's service charges with the 1.4% Commerce benchmark equates to approximately $21.40 of additional capacity or roughly 35%.

The City has several sizable capital projects scheduled and plans to increase service charges on a more regular basis. For the purposes of this PER, it was assumed that the project would increase

[15] Data USA. "

pressures in the southern extent of the distribution network to match the level of service being provided to the rest of the service area. Given this, it is assumed that the project costs will be applied evenly across the existing User Categories. Given the size of the project, it may benefit the City to update its current Rate Study and Cost of Service Analysis (COSA) to determine more granular service charge impacts.

A service charge projection based on a sustained community growth service charge of 1.5% and annual service charge increases of 3.0% were used to estimate how incomes may change over the next several years. Table 2.8 includes the results of this projection, concluding with a FY30 service charge revenue estimate of $5.70 million.

Table 2.8 - Estimated Service Charge Revenue

Item	FY26	FY27	FY28	FY29	FY30
Rate Increase Escalator	1.030	1.030	1.030	1.030	1.030
Community Growth Escalator	1.015	1.015	1.015	1.015	1.015
Service Charge Revenue ($)	$4.77 M	$4.99 M	$5.22 M	$5.46 M	$5.70 M

2.4.4 Operating Expenses

The City's FY25 Budget includes $3.10 million for Personnel, Operations & Maintenance, and Transfers. Table 2.9 includes the results of an operating budget projection for the next five years. A 3% annual cost escalator was used over the period to account for inflation, and it was assumed that no major staffing or level of service changes would occur.

Table 2.9 - Projected Operating Budget

Item	FY26	FY27	FY28	FY29	FY30
Cost Escalator	1.030	1.030	1.030	1.030	1.030
Personnel ($)	$1.46 M	$1.50 M	$1.54 M	$1.59 M	$1.64 M
O&M ($)	$1.27 M	$1.31 M	$1.35 M	$1.39 M	$1.43 M
Transfers ($)	$.46 M	$.47 M	$.49 M	$.50 M	$.52 M
Total Operating ($)	$3.19 M	$3.28 M	$3.38 M	$3.48 M	$3.59 M

2.4.5 Existing Debt Service

The City has six existing loans/bonds secured by their Water Fund. At the peak, debt service payment will be $.68 million (FY25), with tapering payments occurring until FY41. Figure 2.3 shows the City's existing debt service over time.

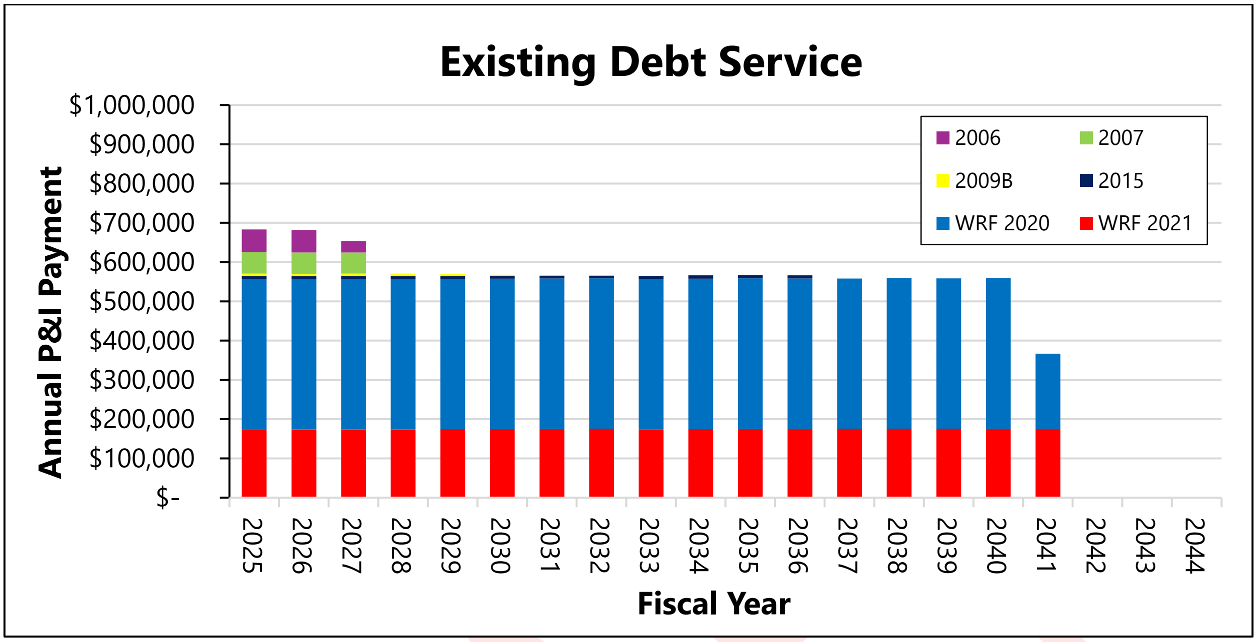

Figure 2.3 - Existing Debt Service

The City's existing debt obligations are notable, given that their two largest loans will not mature for over 15-years if they are paid off using current schedules. This potentially presents short- and mid-term borrowing challenges that will require consideration when considering new debt.

2.4.6 Capital Improvement Plan

Planning for the City's Capital Improvement Plan (CIP) is completed through an annual process. Total CIP investment varies each year and includes a mix of infrastructure repair, replacements, or equipment acquisition. CIP projects are often co-funded from cash, loan, and grants, which can vary per project size, cost, and available cash flow. In some cases, impact fees are also used to pay qualified project costs associated with expansion. The City's annual spending on capital projects in the water fund is about $1.5 million per year when accounting for existing debt service (~$600,000) and cash-funded capital ($1.0 million).

2.4.7 Depreciation

The City does not incorporate depreciation into its budgeting process; however, it is considered when developing annual CIPs to ensure sufficient reinvestment into the water system.

2.4.8 Required Reserve Accounts

The City's FY25 Budget includes two types of reserve: (1) Debt Service and (2) Unrestricted Working Capital. The City's estimated FY25 year-end Debt Service balance is $.74 million, and its Unrestricted Working Capital balance is $7.69 million.

2.4.9 Financial Capacity

The City is aware that service charge increases are necessary to manage inflation/cost escalation, in addition to adding sufficient new capacity to fully fund its existing CIP and costs associated with this Project.

The City appears to have sufficient room to increase service charges without causing local affordability challenges based on Commerce benchmarks and their local MHI, with the potential to generate $1.7 million in additional revenue per year before surpassing the established threshold.

2.5 Water/Energy/Waste Audits

A leak detection study was completed by the City most recently in 2018. The associated report is attached in Appendix XX. The City has been tracking water losses in the distribution system since 2015, and as aging pipelines are gradually replaced throughout the City, losses have decreased substantially. Water losses were approximately 31% during 2015 and were reduced to 24% in 2022. [16]

[16] City of Whitefish, "2015-2023 losses." Distributed by City of Whitefish. (accessed May 5th 2025).

3.0 NEED FOR PROJECT

3.1 Health, Sanitation, and Security

The expansion of the water distribution system is essential for the health and wellbeing of the citizens of the City of Whitefish as the community continues to grow at a rapid pace. However, the existing system has known deficiencies that may impact the health and well-being of the citizens of Whitefish during an emergency or pipe break. The City has been documented to not have sufficient storage to meet acceptable emergency standards set out under *DEQ Circular 1* Section 7.0.1.a. The City is susceptible to wildfire and earthquake risks, which emphasize the need to have sufficient emergency storage. Fires and other natural disasters can have a direct impact on the health and security of the residents of Whitefish. Maintaining a sufficient emergency storage volume will directly benefit the residents of the City and allow for more rapid recovery from emergencies.

- The lack of adequate storage capacity was evident during a water main break even that occurred in February of 2017. The break occurred under Baker Avenue around 11:00 pm on the 26th and the primary finished water storage tank for the City (located at the water treatment plant) began to drop rapidly. By 2:00 am on the 27th the tank was almost empty and remained so for about 5 hours even with the treatment plant running at maximum capacity. Only when the main break was isolated around 6:45 am on the morning of the 27th did the tank begin to refill. The tank was at full capacity again at around 4:00 am on the 28th.

Figure 3.1 shows a timeline of the main break. All data was taken from City records.

The addition of the 1 MG tower would have kept the WTP tank from completely draining for at least another 2-3 hours during this large break which would allow operators valuable time to locate valves. Preventing the distribution system from draining completely is crucial to maintaining public health for multiple reasons:

- If the system drains completely, negative pressures likely occur in multiple areas of the city, which may result in untreated or contaminated water being pulled into the distribution system, which can lead to customers drinking unsafe drinking water.
- Once a distribution system drains, a large amount of air can be pulled into the system, resulting in a significant amount of time needed to refill the system and return water service to all customers. Pressures can also be reduced as air trapped in the system can reduce the carrying capacity of the system.

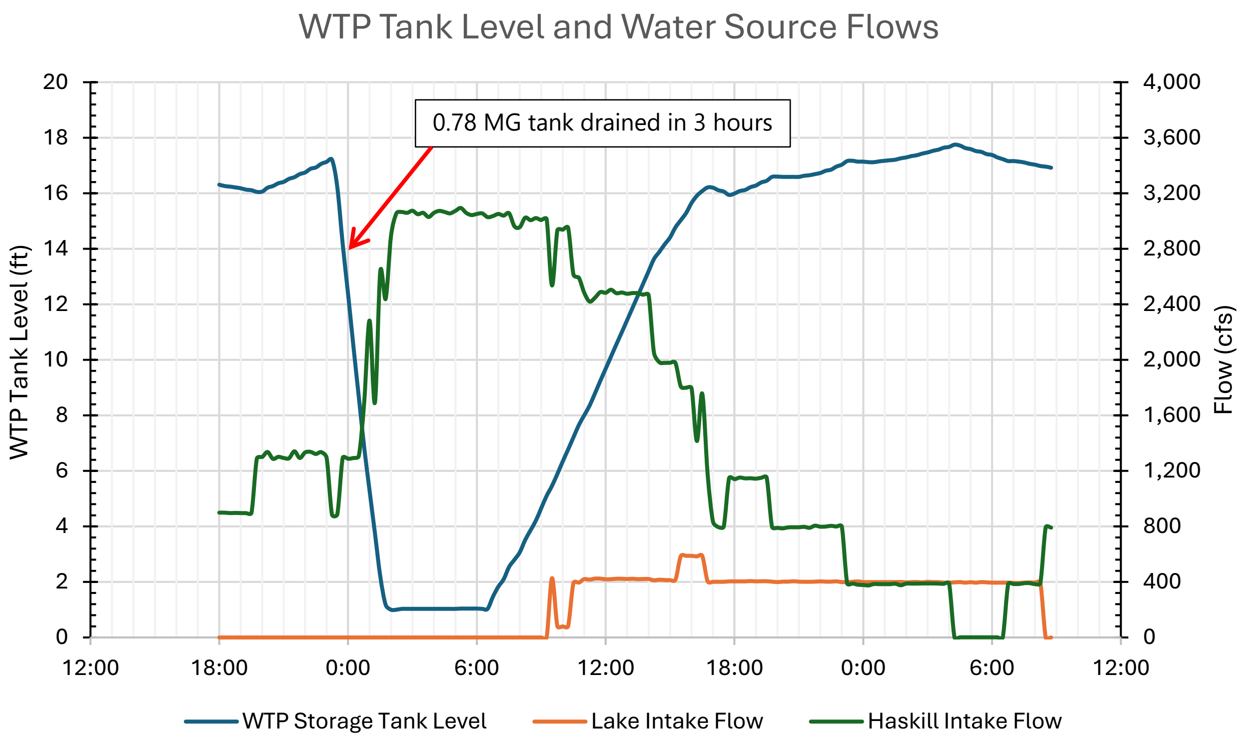

Figure 3.1 – Watermain Break Timeline

It is evident from the main break data that the current storage capacity of the system leaves the community vulnerable in emergency situations, particularly when viewed in the context of the system's aging and fragile pipe network.

3.2 Adequate Storage

The City is currently storage-deficient, as noted by a study performed by AE2S in 2019.[17] The most recent update to the City's master plan performed by AE2S continues to show a need for additional storage in accordance with the recommendations found in *DEQ Circular 1* Section 7.0.1.a. which states that the minimum allowable storage must be equal to the average day demand plus fire flow demand, or 2.39 MG for the current Whitefish system. The system currently has 1.85 MG of storage, leaving a 0.54 MG deficit.

Due to inadequacies in the transmission and distribution system, a new tank may not fill completely overnight, particularly during peak day demands. The existing system will need

[17] Advanced Engineering and Environmental Services. "Water Tank Siting Technical Memorandum," 2019.

upgrades to use the full required storage, which can be seen in Figure 3.2. The proposed south tower would only be able to fill to around 34 ft, leaving 6 ft (150,000 gallons) of usable tank space unusable during the summer months. This problem is exacerbated with continued growth, particularly in the southern part of the system. Additionally, during winter, the tank's water level may not fluctuate enough to maintain acceptable water quality and prevent icing from occurring, which could damage the tank. The recommended alternative includes a pump station near the intersection of Greenwood Drive and Highway 93. The pump station would be designed to isolate the new south pressure zone and would control flow into and out of the new south pressure zone. The pump station would allow more control on how the tank's water level fluctuates.

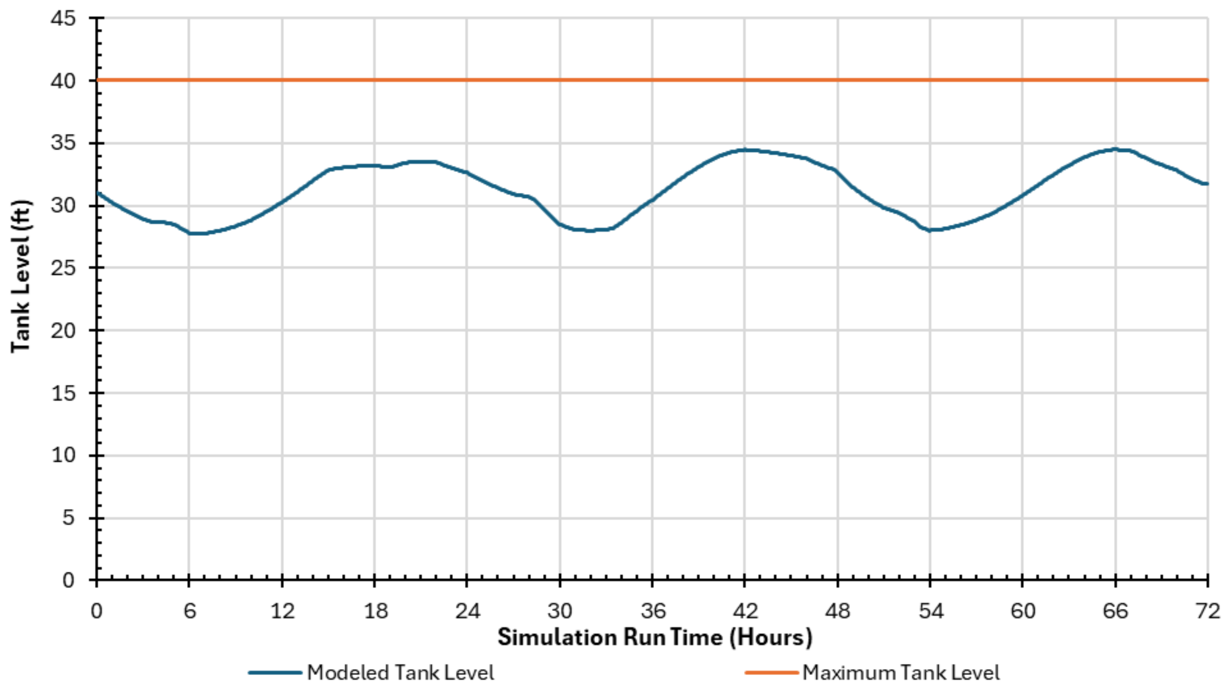

Figure 3.2 – Proposed South Tower Modeled Water Level (No Pump Station)

Additionally, the ability to provide adequate fire flows to the southern part of the City is also impacted by the large distance the water must travel while maintaining safe pressures in the distribution system (> 20 psi). Should a larger fire impacting multiple structures occur in the southern part of the City, the existing storage, located at the WTP and Lower Grouse Mountain, may not be able to provide large enough fire flow rates and simultaneously maintain safe water pressures in the system.

The recommended project would provide 1 MG of additional storage in the southern part of the distribution system as well as a pump station to isolate and better control the tank turnover rates needed to maintain adequate water quality, as well as enabling the tower to fill during peak day demands. Isolating the southern zone also provides a benefit should a large break occur in the main zone; the southern zone, which includes the City's main hospital, could still maintain operations for up to three days with the recommended storage and pump station project.

3.3 Water Transmission Capacity

While the existing transmission system is marginally adequate for non-emergency flow at this time, adding storage to plan for emergency storage reveals the transmission inadequacy as detailed above. The new storage reservoir will not fill completely overnight and over time the storage situation will become worse.

3.4 Water Quality

To ensure the City has the highest water quality possible, numerous water quality parameters associated with source water were evaluated for each alternative. Parameters considered included:

- Chlorine residual
- Aesthetic issues associated with water age such as;
    - Taste.
    - Odor.
- Aesthetic issues due to the mixing of highly mineralized groundwater with high quality surface water.
    - Taste
    - Odor
    - Visual characteristics;
        - Color
        - Deposition.
    - Deleterious issues associated with mixing highly mineralized groundwater with excellent quality surface water.
- Several alternatives considered suffered from water aging issues.

3.5 Aging Infrastructure

Significant portions of the existing distribution system are composed of aging cast iron pipe. Cast iron pipe has historically been a major component of finished water losses. The lead gaskets in these pipes are in a progressive state of failure, causing water to leak from the system into the surrounding soils. The City has a robust cast iron main program in place for almost a decade using Resort Tax monies to fund replacements. Over the last 10 years, the City has successfully replaced approximately 10,300 linear feet of cast iron mains.

Phase I of this project will remove connections to the 6-inch cast iron main and extend them under Spokane Avenue to a newer 8-inch C900 PVC main on the east side of the highway. This will abandon in place approximately 1,500 feet of leaky cast iron pipe installed in the 1950's. With this project all cast iron main south of the Whitefish River crossing and located in Spokane Avenue (Highway 93) ROW will be removed from service.

This pipeline is located along the west side of Spokane Avenue, the location places it in the Montana Department of Transportation (MDT) ROW. MDT access and standards are such that it can be difficult and expensive to place and maintain water facilities in the MDT ROW. Removal of this line from service will require City coordination with MDT, maintenance efforts and cost while connection to a larger main will provide access to an increase in flows.

Although the City is actively working to replace aging and failing pipes each year through their Cast Iron Replacement Program, a need still exists to offset these water losses through additional transmission and storage capacity, especially at the southern end of the distribution system.

In addition to leaks, the existing piping is generally undersized throughout the system for both current and future needs. The proposed transmission mains will help offset this inefficient design by providing high-capacity water transmission from the treatment plant at the north end of town to the proposed storage reservoir at the south end.

3.6 Reasonable Growth

The current water storage capacity of the system has been inadequate to meet emergency storage requirements and fire flow requirements since 2019 (AE2S, 2019). Emergency storage is defined as the volume required to provide a 24-hour reserve at the average day demand (ADD) and fire flow capacity is the volume to maintain a 3,750-gpm flow for 3 hours (As determined by a detailed fire flow analysis conducted by AE2S with the City of Whitefish Fire Department). These shortages are becoming more pronounced over time as the City continues to grow.

Figure 3.3, below, shows the results of the 2019 storage analysis by AE2S, in which an annual growth rate of 2.5% was assumed. This figure was then updated to reflect current 2025 master planning growth rate of 1.5%.

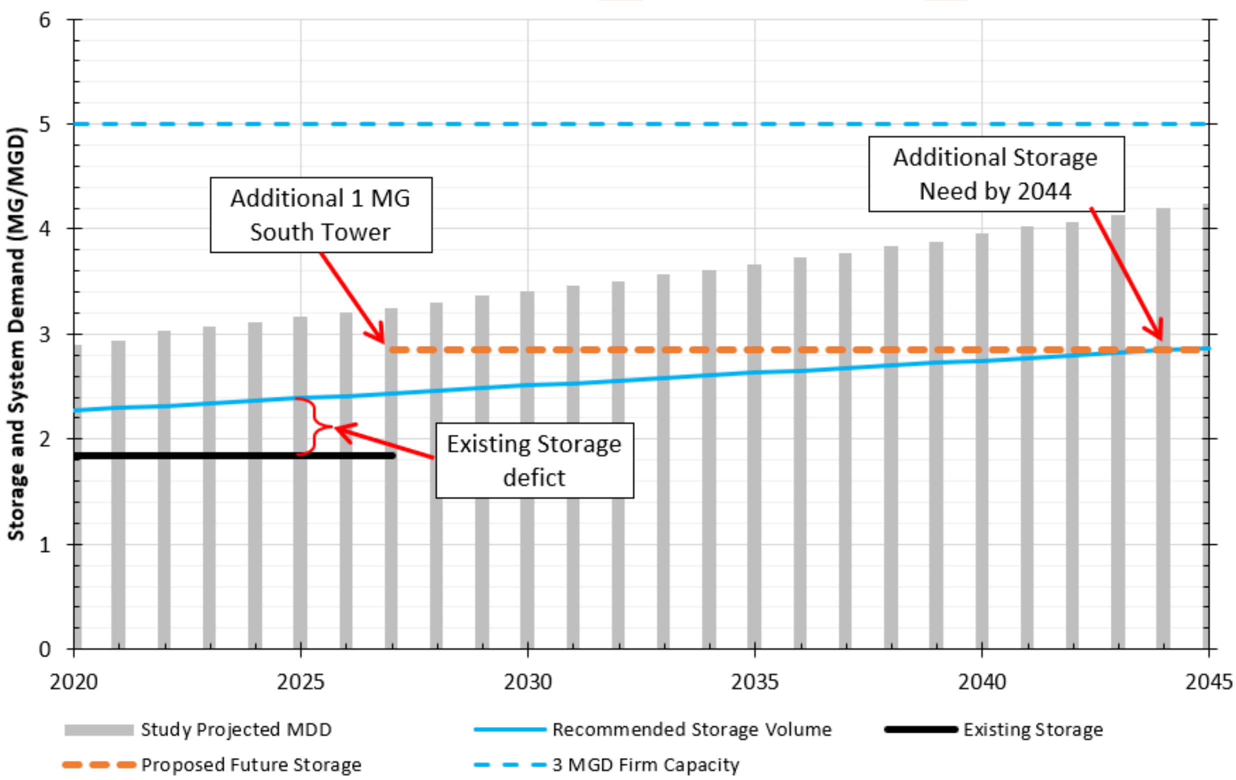

Figure 3.3 – Existing storage analysis

As can be seen in the figure, the City's water storage capacity was already inadequate to meet the emergency storage requirements at the time of the study. Whitefish experienced extremely rapid growth in the years following 2019, with an estimated population increase of 18.2%

between April 1, 2020 and July 1, 2023, according to U.S. Census Bureau estimates. This has made it even more urgent for the City to solve its water storage problem.

The situation is even more severe during the summer months, when peak irrigation demand coincides with the annual tourist season, causing water demand to increase substantially compared to the off-season.

In order to meet current storage requirements for the water distribution system, a 1.0-MG elevated storage reservoir and related infrastructure (including transmission main, booster station, and PRV vault) have been recommended to alleviate current and future storage requirements. This will allow the City to maintain adequate emergency and fire storage capacity, thereby protecting the health and safety of its residents.

This is in alignment with recommendations found in the 2006 Water Utility Plan that was prepared for the City by others.[18] In that report, the consultants recommended a 1.0-MG storage reservoir be constructed on the south side of the distribution system to meet future water demands and fire flow needs. It was anticipated that the new storage reservoir would need to be completed around the year 2025, based on water demand projections.

[18] HDR, Anderson-Montgomery. "Water Utility Plan," 2006.

4.0 ALTERNATIVES CONSIDERED

The previous sections of this report have illustrated the existing system and any deficiencies. This section discusses the potential alternatives that have been explored and the ways in which these alternatives may mitigate deficiencies in the existing system. Several potential storage locations and reservoir options were evaluated to meet the City's projected water storage needs.

The previous evaluation of this area[19] analyzed source water locations, volumes and flowrates for both surface and groundwater sources. With the completion of the WTP expansion in 2022 to 6 MGD with 5 MGD firm capacity with allowances to bring the WTP to 8 MGD & 7 MGD firm capacity in the future. With the expansion and allowances for future expansion of the WTP, groundwater as a source is not considered for this PER.

The AE2S TM also notes that all options considered with surface water require the creation of a new zone on the south end of town with a booster station to provide the lift needed to fill the new reservoir. The booster station size and location does not change with different alternatives. The Booster Station will have a PRV built into the station and an additional PRV will be located half a mile west of the Booster Station to allow for water to be transmitted back & forth between zones if required. The booster station will have multiple pumps, allowances for disinfection injection, and backup power.

4.1 Design Criteria

Alternatives need to satisfy most, if not all, of the following design criteria;

- Water pressures maintained above 50 psi, but not greater than 90 psi.
- Minimum pressure fluctuations of less than 20 psi from minimum to maximum day demands.
- Storage should be sized to provide both of the following, whichever is greater:
  - The minimum volume of water held in all of the City's storage must always be the greater of needed fire flow (3,500 gpm for 4 hours; 840,000 gallons) or a 12-hour reserve at ADD under maximum day demand conditions.
  - Total nominal storage capacity should be a minimum of fire demand (3,500 gpm for 4 hours; 840,000 gallons) plus one average day.

[19] Advanced Engineering and Environmental Services. "Water Tank Siting Technical Memorandum," 2019.

- Due to the relatively large distance the water must travel from the source to the southern part of the distribution system, the following parameters were developed for new transmission mains:
  - New piping should have headloss values less than 2 ft/1,000 ft for pipes 12-inches and larger.
  - Pipe velocities less than 3 ft/s in pipes 12-inches and greater.
- The system should increase fire flow capacity in targeted areas, primarily in the southern part of the distribution system.

4.2 Storage

Storage evaluation parameters include type (ground or elevated), location, and minimum size. The storage requirements, described above, and detailed in Figure 3.3 on page 43, show that there is currently a storage deficit. The addition of a 1.0 MG elevated tower provides adequate storage for roughly the next 20 years, assuming a 1.5% growth rate. A 1.5 MG GSR was also evaluated as it would provide adequate storage for the next 30 years, but at a reduced capital cost.

Reservoir parameters evaluated included;

- Reservoir material
- Cost
- Life cycle
- O&M costs
- Impacts on water age and water quality

Locations evaluated were;

- Ground Storage at the WTP
- Elevated Storage at the City Shop Parcel
- Elevated Storage south of the City
- Ground Storage south of the City

Location parameters evaluated included;

- Acquisition of the parcel
- Hydraulic performance of the location
  - The tank's ability to float with other tanks

  - Fire Flow improvements
  - Tank water quality impacts
- Distribution system water quality impacts

4.3 Transmission and Routing

All of the alternatives not located at the WTP require large transmission main(s) and a booster station to assist with filling the storage reservoir.

4.4 Alternatives

For each alternative, the effect on water age in the southern part of the distribution system was considered. Since Whitefish is several miles across in the north-south direction, and the WTP is in the far northeast area of town, the water age increases as it reaches the southern part of the distribution system. Additionally, the city's head range in the main pressure zone (set by the existing WTP reservoir) can only fluctuate a small amount over the course of the day as the high-water level (HWL) is only 18 ft in the WTP reservoir. The small head fluctuation makes it difficult to cycle the water in the proposed southern reservoirs with much deeper sidewater depths. Due to these two factors, water age in the storage reservoirs at sites other than at the WTP can increase dramatically in the winter.

To combat this water age problem, a proposed booster station is incorporated for the alternatives below for storage at sites within the southern main zone. Through the use of the proposed booster station, the southern part of the distribution system could be isolated, and the new reservoir would operate independently as an isolated zone.

The booster station also offers improved flexibility to the system. Since the new reservoirs would be designed and built to operate in the same head range as the main zone, the booster station could easily be bypassed temporarily for maintenance. The booster would also have the flexibility to allow backflow from the southern reservoir should a fire or other emergency occur that may require additional water in the northern zone.

- Alternative 1 – No action taken
- Alternative 2 - 1.5 MG ground storage at the WTP
- Alternative 3 – 1.0 MG elevated storage at the City Shop site, and a new booster station to isolate the southern main zone from the northern main zone ***(Recommended Alternative)***
- Alternative 4 – 1.0 MG elevated storage south of Highway 40, and a new booster station to isolate the southern main zone from the northern main zone

- Alternative 5 – 1.5 MG ground storage south of Highway 40 and adjacent to Highway 93, and a new booster station to isolate the southern main zone from the northern main zone
- Alternative 6 – Upsized water main from 12-in to 18-in along Spokane Avenue and Depot Street between the railyard and E 2nd Street.
- Alternative 7 – New 24-in transmission pipeline around eastern flank of City, from southern end of Texas Avenue to the intersection of JP Road and Highway 93.

4.4.1 Alternative 1 – Do Nothing

Description

This alternative does nothing, it will not incur any costs or raise utility rates. This alternative will not address storage deficiencies, fire flow issues or remove any cast iron main in poor condition from the distribution system.

4.4.2 Alternative 2 - 1.5 MG ground storage at the water treatment plant site

Description

This alternative consists of constructing a new 1.5 MG GSR located on City owned property adjacent to the existing 1.0 MG ground storage tank near the WTP as shown in Figure 4.1 on page 52. This alternative would address the increase in demand for water storage for the facilities, however, this alternative does not address emergency flow deficiencies to several locations in the south end of the City and does not remove cast iron pipe in poor condition. As shown in Table X-X, this alternative is more cost-friendly.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

See Figure 4.1 on page 52 for the approximate location of this proposed reservoir.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

Land Requirements

The storage reservoir location proposed in this alternative is set to be constructed on property owned by the City of Whitefish and will not require the acquisition of additional land or easements. The proposed tank would tie into the existing system by way of a 30" transmission line that connects to the existing storage tank at this site.

Potential Construction Problems

The required location and topography of the GSR will be challenging. The site is extremely steep and the subsurface conditions consist of rock. Excavation will be challenging.

Sustainability Considerations

- Water and Energy Efficiency
- Green Infrastructure
  - No green infrastructure is to be included in this alternative.
- Other

Estimated Cost

The estimated cost of this alternative includes the construction of the new GSR, new reservoir SCADA and electrical, connection to the existing system, and all anticipated associated costs. The costs for this alternative are summarized in Table 4.1.

Table 4.1 – Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 2

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
Construction Costs					
1	Storage Tank - 1.5 MG Ground Storage	1	LS	$2,900,000.00	$2,900,000.00
2	30-inch Transmission Main - to Existing Storage tank	200	LF	$1,500.00	$300,000.00
3	General Conditions	10%			$320,000.00
	Total Construction Costs				$3,500,000.00

Non-Construction Costs					
1	Easements and Parcel Acquisition	1	LS		$6,300.00
2	Construction Contingency	10%			$350,000.00
3	Preliminary and Final Engineering	15%			$525,000.00
4	Construction Administration	8%			$280,000.00
	Total Non-construction Costs				$1,200,000.00

	Total Project Cost	$4,700,000.00

Table 4.2 - Engineer's Opinion of OM&R for Alternative 2

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$5,000.00
2	Taxes	$1,500.00
3	Insurance	$1,000.00
4	Energy Cost (Fuel and/or Electrical)	$400.00
5	General Facility Repairs & Maintenance	$500.00
6	Monitoring & Testing	$100.00
7	Professional Services	$100.00
8	Tank Cleaning & Sealant Replacement	$600.00
9	Additional Services	$500.00
10	Miscellaneous	$500.00
	Total Estimated Annual O&M Costs	$10,200.00

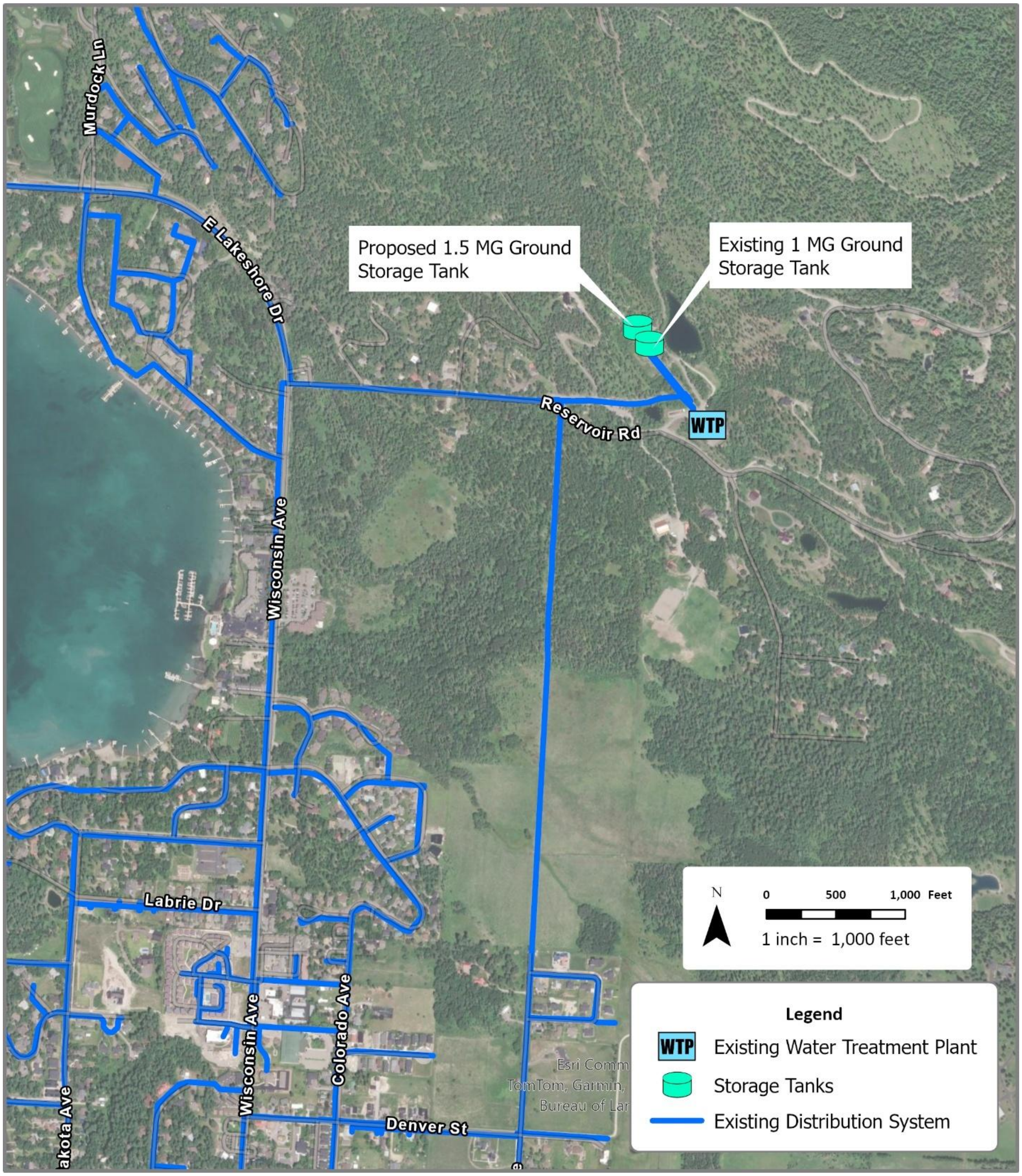

Figure 4.1 – Alternative 2

4.4.3 Alternative 3 – 1.0 MG elevated storage at the City-owned Shop Site and a new booster station

Description

This alternative consists of constructing a new 1.0 MG elevated storage reservoir at the City-owned shop site located on the southern side of town as shown in Figure 4.2 on page 56. Additionally, a new booster station, located at the corner of Highway 93 S and Greenwood Drive, is required for the reservoir to fill completely overnight during high demand times. The booster station will be designed to improve the flexibility the new reservoir and the existing system. The elevated storage reservoir would tie into an upgraded 18-inch transmission main that would run from the shop site, east down W 18th Street until Highway 93 S where it will tie into the existing distribution system. The Booster Station would tie into the existing distribution system with an 18-inch water main.

This alternative addresses the water storage deficiency, emergency flow deficiencies in the southern main zone, transmission capacity issues with the construction of additional storage in the south City area and removes cast iron pipe.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

See Figure 4.2 on page 56 for an approximate location of this proposed reservoir.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

Land Requirements

The location proposed for the storage reservoir in this alternative is set to be constructed on property owned by the City of Whitefish and will not require the acquisition of additional land or easements. The proposed 18-inch transmission line that would tie these improvements into the existing system is set to be within existing ROW easements along city maintained public roads. The Columbia Avenue 18-inch transmission line and the proposed booster station would require the acquisition of a easement through private property to tie into the existing system.

Potential Construction Problems

No potential construction problems are expected.

Sustainability Considerations

- Water and Energy Efficiency
- Green Infrastructure
- Other

Estimated Cost

The estimated cost of this alternative includes the construction of the new elevated storage reservoir, new reservoir SCADA and electrical, a new booster station with two pumps and two PRV stations, connection to the existing system, and all anticipated associated costs. The costs for this alternative are summarized in Table 4.3.

Table 4.3 – Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 3

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
Construction Costs					
1	Storage Tank - 1.0 MG Elevated Storage	1	LS	$6,600,000.00	$6,600,000.00
2	18-inch Transmission Main	6000	LF	$700.00	$4,467,000.00
3	Booster Station	1	LS	$3,183,244.75	$3,183,000.00
4	General Conditions	10%			$1,425,000.00
	Subtotal				$15,700,000.00
Non-Construction Costs					
1	Easements and Parcel Acquisition	1	LS		$50,000.00
2	Construction Contingency	10%			$1,570,000.00
3	Preliminary and Final Engineering	15%			$2,355,000.00
4	Construction Administration	8%			$1,256,000.00
	Total Non-construction Costs				$5,200,000.00
	Total Project Cost				$21,000,000.00

Table 4.4 – Engineer's Opinion of OM&R Costs for Alternative 3

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$34,500.00
2	Taxes	$5,000.00
3	Insurance	$1,500.00
4	Energy Cost (Fuel and/or Electrical)	$225,500.00
5	General Facility Repairs & Maintenance	$7,500.00
6	Mileage	$1,200.00
7	Monitoring & Testing	$100.00
8	Inspection	$2,300.00
9	Short Lived Asset Maintenance/Replacement	$30,500.00
10	Tank Cleaning & Sealant Replacement	$43,300.00
11	Additional Services	$1,500.00
12	Miscellaneous	$1,500.00
	Total Estimated Annual O&M Costs	$354,500.00

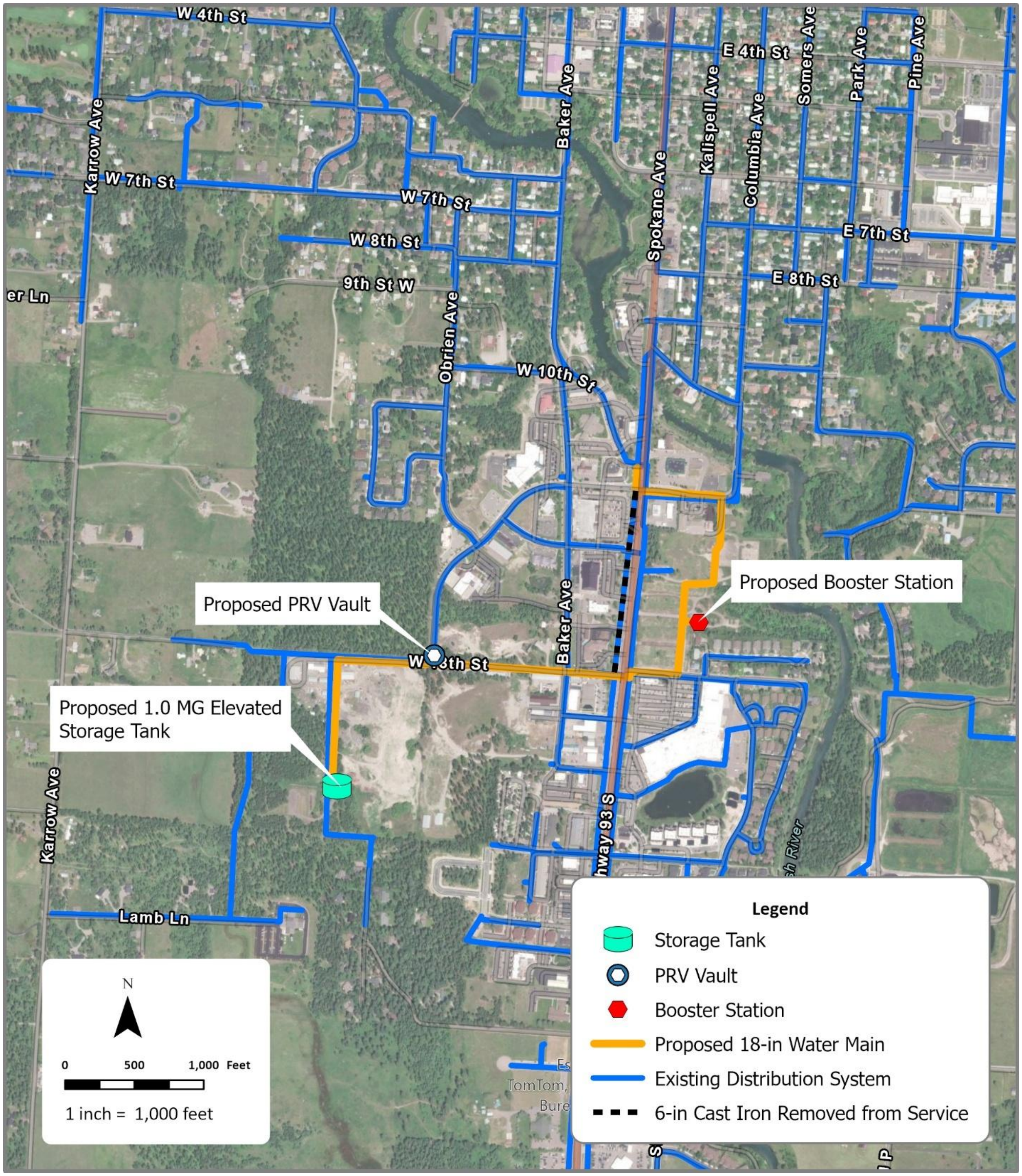

Figure 4.2 – Alternative 3 (Recommended Alternative)

4.4.4 Alternative 4 – 1.0 MG elevated storage one half mile south of the city, and a new booster station

Description

This alternative consists of constructing a new 1.0 MG elevated storage reservoir located in the southern main zone just south of Highway 40 W and East of Highway 93 S on private land as shown in Figure 4.3 on page 60. This alternative includes a 16-inch transmission main that would tie the new storage reservoir into the existing distribution system as well as a new 18-inch transmission main that would tie in the proposed booster station, located at the corner of Highway 93 S and Greenwood Drive. The 8-inch watermain in W 15th street will be extended to connect with existing 8-inch on east side of Spokane Avenue. Existing 6-inch cast iron watermain on west side of Spokane Avenue between 13th street and 18th street will be abandoned and existing services from that line routed to existing 8-inch on east side of Spokane.

This alternative addresses the water storage deficiency, emergency flow deficiencies in the southern main zone, transmission capacity issues with the construction of additional storage in the south City area, and removes cast iron main. However, this alternative suffers from excessive water aging issues with previous studies indicating a wintertime water age exceeding 50 days.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

See Figure 4.3 on page 60 for an approximate location of this proposed reservoir.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

The elevated storage reservoir of alternative 4 is set to be located at a site that would require tree clearing for the tower and the transmission main that would run through forested land that has historically been used for agricultural purposes.

Land Requirements

Alternative 4 will require the purchase of private property at the site of the elevated storage tank and permanent and construction easement from the tank north to Highway 40.

Potential Construction Problems

No known construction problems exist.

Sustainability Considerations

- Water and Energy Efficiency
- Green Infrastructure
- Other

Estimated Cost

The estimated cost of this alternative includes the construction of the new elevated storage reservoir, new reservoir SCADA and electrical, a new booster station with two pumps and two PRV stations, connection to the existing system, and all anticipated associated costs. The costs for this alternative are summarized in Table 4.5.

Table 4.5 - Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 4

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Construction Costs				
1	Storage Tank - 1.0 MG Elevated Storage	1	LS	$6,600,000.00	$6,600,000.00
2	16-inch Transmission Main	3200	LF	$659.16	$2,109,000.00
3	18-inch Transmission Main	2800	LF	$722.18	$2,022,000.00
4	Booster Station	1	LS	$3,183,244.75	$3,183,000.00
5	General Conditions	10%			$1,391,000.00
	Subtotal				$15,300,000.00

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Non-Construction Costs				
1	Easements and Parcel Acquisition	1	LS		$200,000.00
2	Construction Contingency	10%			$1,530,000.00
3	Preliminary and Final Engineering	15%			$2,295,000.00
4	Construction Administration	8%			$1,224,000.00
	Total Non-construction Costs				$5,200,000.00

	Total Project Cost	$20,500,000.00

Table 4.6 - Engineer's Opinion of Probable OM&R Costs for Alternative 4

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$34,500.00
2	Taxes	$5,000.00
3	Insurance	$1,500.00
4	Energy Cost (Fuel and/or Electrical)	$225,500.00
5	General Facility Repairs & Maintenance	$7,500.00
6	Mileage	$1,400.00
7	Monitoring & Testing	$100.00
8	Inspection	$2,300.00
9	Short Lived Asset Maintenance/Replacement	$30,500.00
10	Tank Cleaning & Sealant Replacement	$43,300.00
11	Additional Services	$1,500.00
12	Miscellaneous	$1,500.00
	Total Estimated Annual O&M Costs	$354,700.00

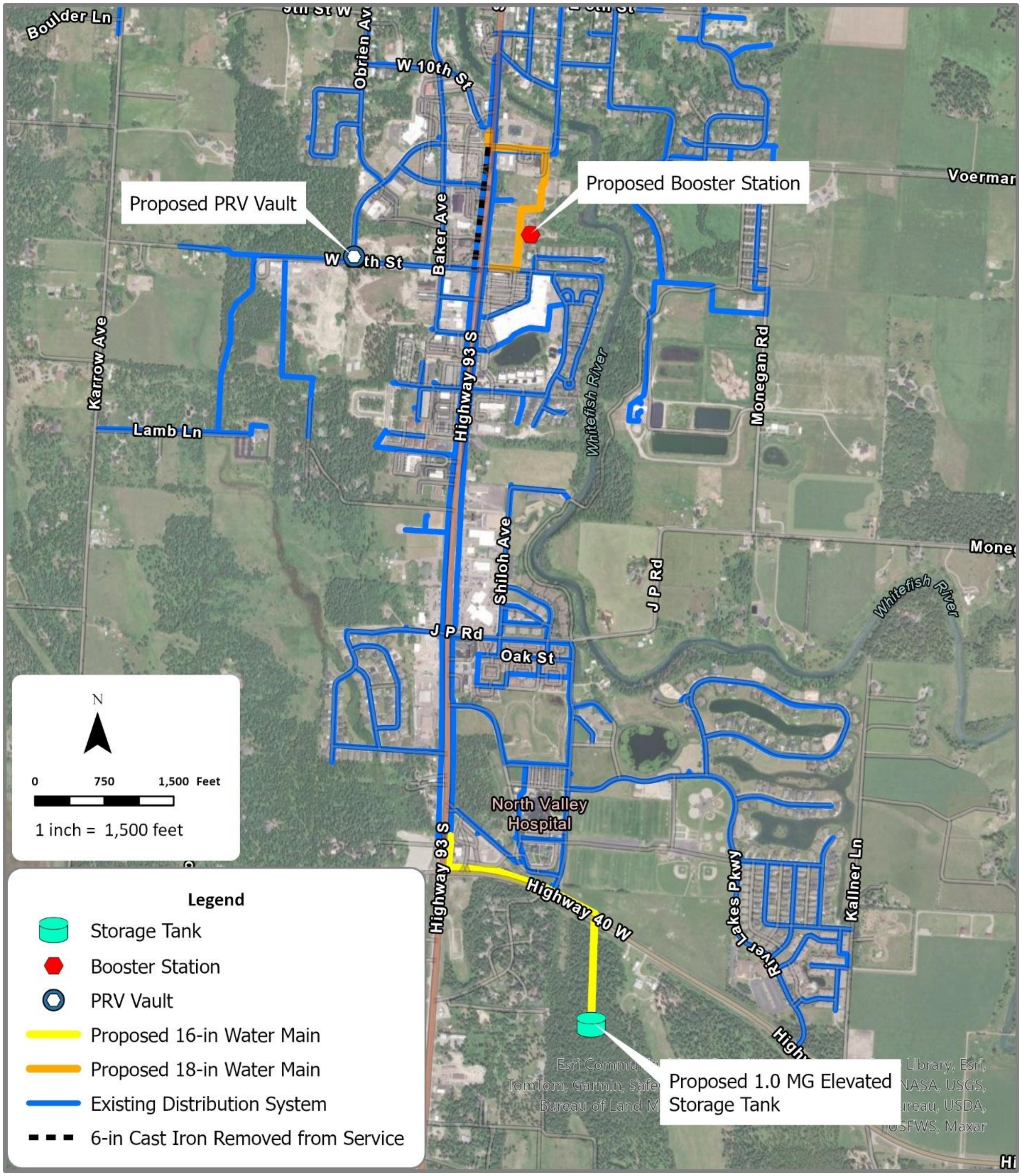

Figure 4.3 – Alternative 4

4.4.5 Alternative 5 – 1.5 MG ground storage located south of Highway 40 and adjacent to Highway 93, and new booster station

Description

This alternative consists of constructing a new 1.5 MG GSR at site D as shown in Figure 4.4 on page 64. This alternative includes a 16-inch transmission main that would tie the new storage reservoir into the existing distribution system as well as a new 18-inch transmission main that would tie in the proposed booster station, located at the corner of Highway 93 S and Greenwood Drive. The 8-inch watermain in W 15th street will be extended to connect with existing 8-inch on east side of Spokane Avenue. Existing 6-inch cast iron watermain on west side of Spokane Avenue between 13th street and 18th street will be abandoned and existing services from that line routed to existing 8-inch on east side of Spokane.

This alternative addresses the water storage deficiency, emergency flow deficiencies in the southern main zone, transmission capacity issues with the construction of additional storage in the south City area, and removes cast iron main. However, this alternative suffers from excessive water aging issues with previous studies indicating a wintertime water age exceeding 50 days.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

Figure 4.4 on page 64 for an approximate location of this proposed reservoir.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

The elevated storage reservoir of alternative 5 is set to be located at a site that would require tree clearing for the tower and a small portion of the transmission main that would run through forested land that has historically been used for agricultural purposes.

Land Requirements

Alternative 5 will require the purchase of private property at the site of the elevated storage tank and permanent and construction easement acquisition for the pipeline where it lies on private property.

Potential Construction Problems

No known construction problems exist.

Sustainability Considerations

- Water and Energy Efficiency
- Green Infrastructure
- Other

Estimated Cost

The estimated cost of this alternative includes the construction of the new GSR, new reservoir SCADA and electrical, a new booster station with two pumps and two PRV stations, connection to the existing system, and all anticipated associated costs. The costs for this alternative are summarized in Table 4.7.

Table 4.7 - Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 5

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Construction Costs				
1	Storage Tank - 1.5 MG Ground Storage	1	LS	$2,900,000.00	$2,900,000.00
2	16-inch Transmission Main	6800	LF	$677.79	$4,609,000.00
3	18-inch Transmission Main	2800	LF	$722.18	$2,022,000.00
4	Booster Station	1	LS	$3,183,244.75	$3,183,200.00
5	General Conditions	10%			$1,271,400.00
	Subtotal				$14,000,000.00
	Non-Construction Costs				
1	Easements and Parcel Acquisition	1	LS		$300,000.00
2	Construction Contingency	10%			$1,400,000.00
3	Preliminary and Final Engineering	15%			$2,100,000.00
4	Construction Administration	8%			$1,120,000.00
	Total Non-construction Costs				$4,900,000.00
	Total Project Cost				$18,900,000.00

Table 4.8 - Engineer's Opinion of Probable OM&R Costs for Alternative 5

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$32,000.00
2	Taxes	$5,000.00
3	Insurance	$1,500.00
4	Energy Cost (Fuel and/or Electrical)	$225,500.00
5	General Facility Repairs & Maintenance	$7,500.00
6	Mileage	$1,500.00
7	Monitoring & Testing	$100.00
8	Inspection	$2,300.00
9	Short Lived Asset Maintenance/Replacement	$30,500.00
10	Tank Cleaning & Sealant Replacement	$43,300.00
11	Additional Services	$1,500.00
12	Miscellaneous	$1,500.00
	Total Estimated Annual O&M Costs	$352,300.00

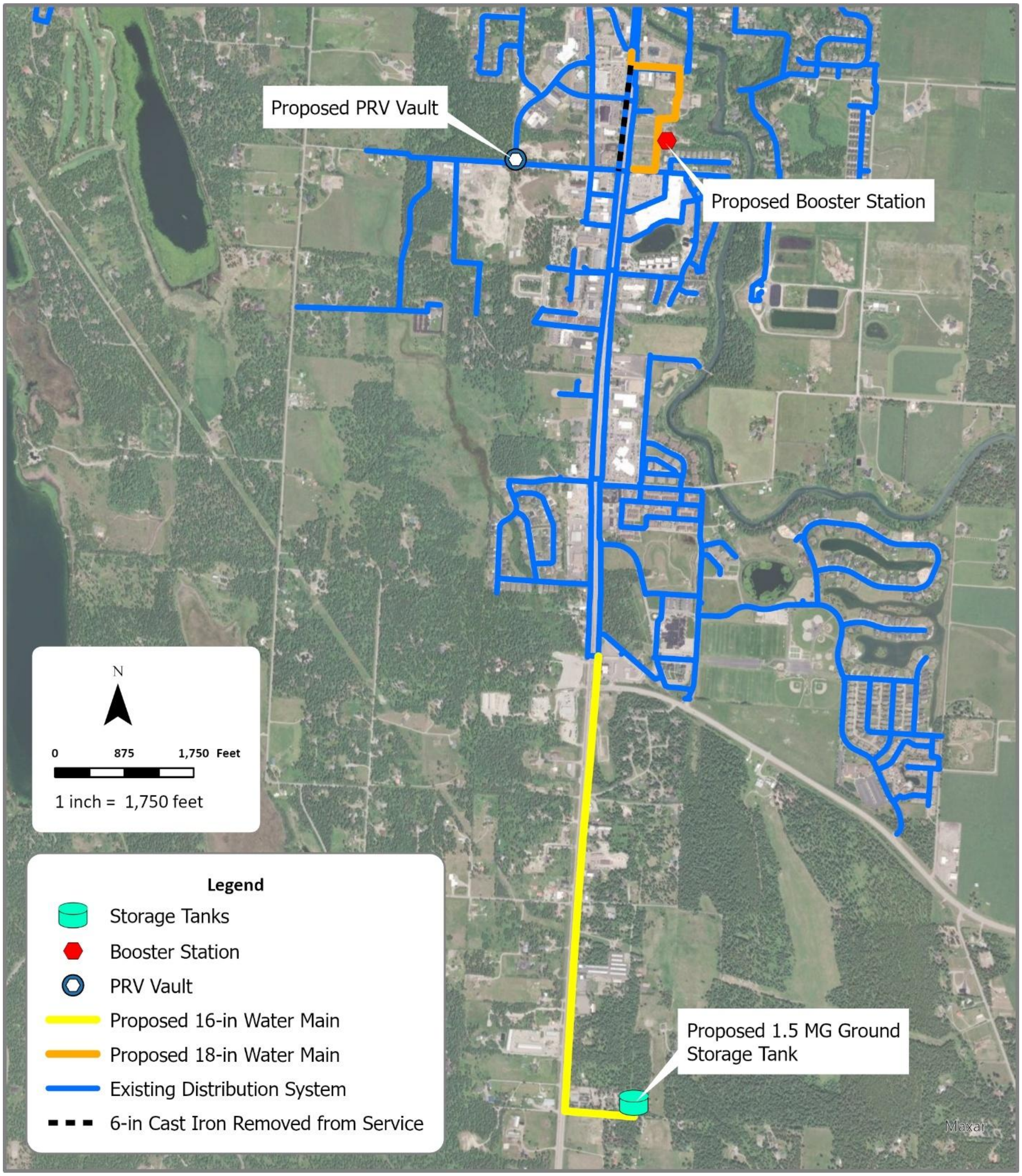

Figure 4.4 – Alternative 5

4.4.6 Alternative 6 – 18-in Water Main connecting Texas Ave Crossing and Spokane Ave

Description

This alternative consists of constructing a new 18-in watermain along Depot Street and Columbia Avenue as shown in Figure 4.5 on page 68. This would provide a continuous 18-in pipeline from the WTP to the south end of town, overcoming a 12-in bottleneck that currently exists in this location.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

See Figure 4.5 on page 68 for an approximate location of this proposed pipeline.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

Land Requirements

This pipeline would replace existing water main in the City ROW, so no land acquisition would be required for this alternative.

Potential Construction Problems

This pipeline will run adjacent to the Whitefish Middle School, extra attention with respect to vehicle and pedestrian traffic will need to be reviewed to protect the public.

Sustainability Considerations

- Water and Energy Efficiency
    - This alternative would provide energy savings as no additional pump station would be needed.
- Green Infrastructure
- Other

Estimated Cost

The estimated cost of this alternative includes decommissioning and demolishing the existing 12-in water main, construction, testing, and commissioning of a new 18-in water main, connections to the existing system, and all associated engineering, permitting, and administrative requirements for the construction project. The costs for this alternative are summarized in Table 4.9.

Table 4.9 - Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 6

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Construction Costs				
1	18-in Pipeline Construction	1700	LF	$844.48	$1,435,600.00
2	General Requirements	10%			$143,600.00
	Total Construction Cost				$1,600,000.00

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Non-Construction Costs				
1	Construction Contingency	10%			$160,000.00
2	Preliminary and Final Engineering	15%			$264,000.00
3	Construction Administration	8%			$140,800.00
	Total Non-Construction Costs				$600,000.00

	Total Project Cost	$2,200,000.00

Table 4.10 - Engineer's Opinion of OM&R for Alternative 6

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$500.00
2	Taxes	$500.00
3	Insurance	$500.00
4	Energy Cost (Fuel and/or Electrical)	$375.00
5	Pipeline annual maintenance	$0.00
6	Monitoring & Testing	$100.00
7	Additional Services	$500.00
8	Miscellaneous	$500.00
	Total Estimated Annual O&M Costs	$3,000.00

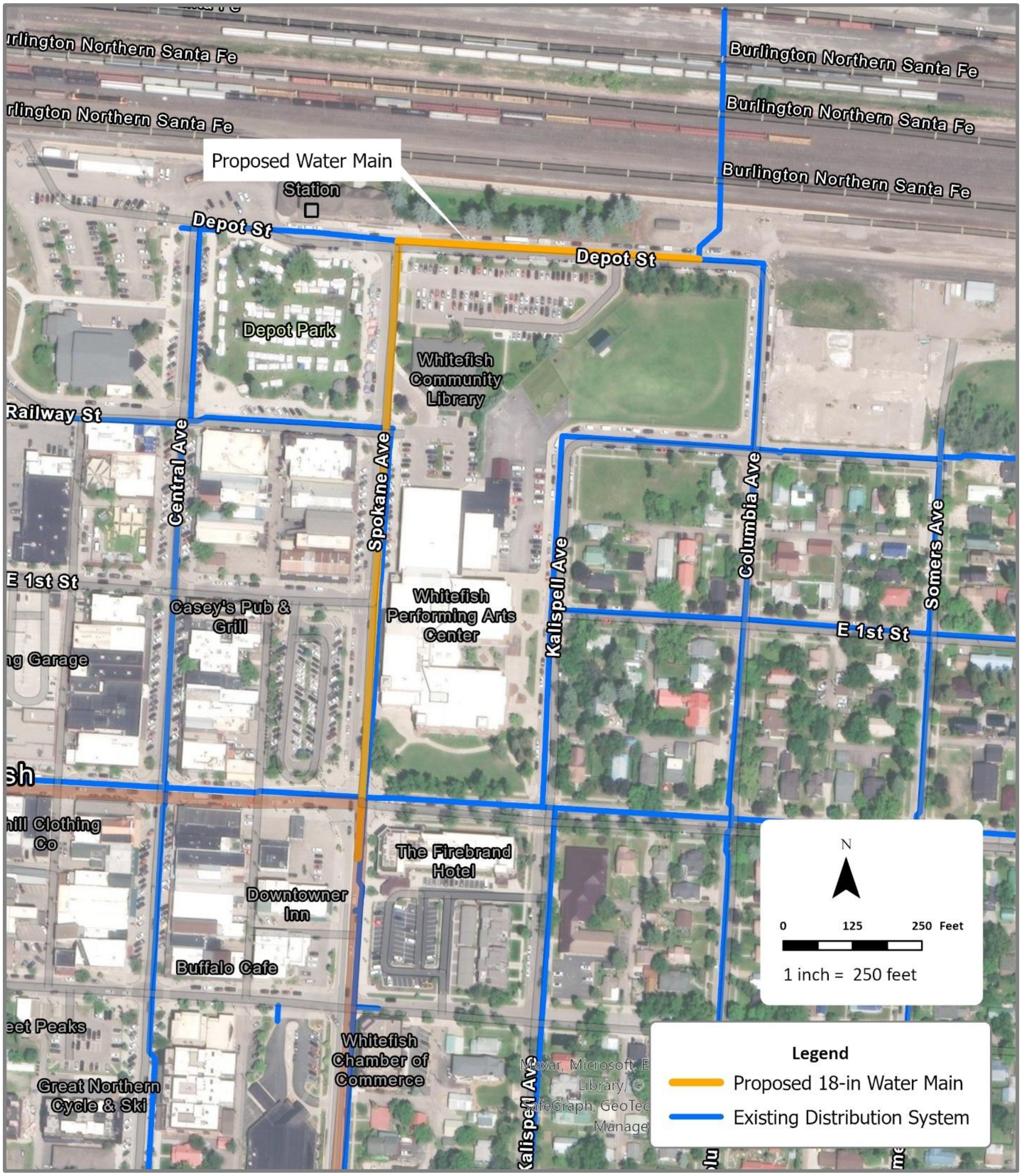

Figure 4.5 – Alternative 6

4.4.7 Alternative 7 – 24-in Water Main Around East Side of City

Description

This alternative consists of constructing a new 24-in watermain around the east side of the City as shown in Figure 4.6 on page 72. This would provide increased flow to the southern end of the City, bypassing various sections of existing 12-in and 8-in pipe.

Design Criteria

See Section 4.1 for the standard design criteria that was used to develop this alternative.

Map

See Figure 4.6 on page 72 for an approximate location of this proposed pipeline.

Environmental Impacts

Minimal, short-term environmental impacts during construction are anticipated to occur, specifically associated with noise which can be mitigated through properly executed construction practices.

Dewatering water will need to be disposed of in an approved fashion that does not negatively impact the environment in and adjacent to the project area.

Land Requirements

This pipeline would generally be installed in existing rights-of-way, some of which would be in the City limits, and some of which would be in Flathead County jurisdiction. Although no land acquisition would be necessary for the pipeline construction, a section of utility and construction easement would need to be obtained from private landowners. Additionally, the proposed pipeline would involve boring under a BNSF rail line and crossing the Whitefish River.

Potential Construction Problems

Areas on the east side of the Whitefish River are known to have very high groundwater. Construction would need to consider dewatering and disposal of water from excavations. Additionally, saturated ground will require extra attention to safe excavation techniques and worker safety during construction.

Coordination with the BNSF can require extended time frame for approvals from the railroad.

Sustainability Considerations

- Water and Energy Efficiency
    - This alternative would provide energy savings as no additional pump station would be needed.
- Green Infrastructure
- Other

Estimated Cost

The estimated cost of this alternative includes decommissioning and demolishing existing water main, construction, testing, and commissioning of a new 24-in water main, connections to the existing system, and all associated engineering, permitting, and administrative requirements for the construction project. Additional costs for the pipeline installation include boring under a railroad and crossing a river. The costs for this alternative is summarized in Table 4.11.

Table 4.11 - Engineer's Opinion of Probable Construction Costs (EOPCC) for Alternative 7

Opinion of Probable Cost
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	QTY	UNITS	UNIT PRICE	TOTAL
	Construction Costs				
1	24-in Pipeline Construction	23000	LF	$1,190.76	$27,387,600.00
2	General Requirements	10%			$2,738,800.00
	Total Construction Cost				$30,100,000.00
	Non-Construction Costs				
1	Easements and Parcel Acquisition	1	LS		$6,000.00
2	Construction Contingency	10%			$3,010,000.00
3	Preliminary and Final Engineering	15%			$4,966,500.00
4	Construction Administration	8%			$2,648,800.00
	Total Non-Construction Costs				$10,600,000.00
	Total Project Cost				$40,700,000.00

Table 4.12 - Engineer's Opinion of Probable OM&R Costs for Alternative 7

Opinion of Probable Annual Operation & Maintenance Costs
Whitefish South Water Tank PER

#	ITEM DESCRIPTION	Estimated Cost/YR
1	Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)	$5,000.00
2	Taxes	$1,000.00
3	Insurance	$1,000.00
4	Energy Cost (Fuel and/or Electrical)	$375.00
5	Pipeline annual maintenance	$0.00
6	Monitoring & Testing	$100.00
7	Additional Services	$500.00
8	Miscellaneous	$500.00
	Total Estimated Annual O&M Costs	$8,475.00

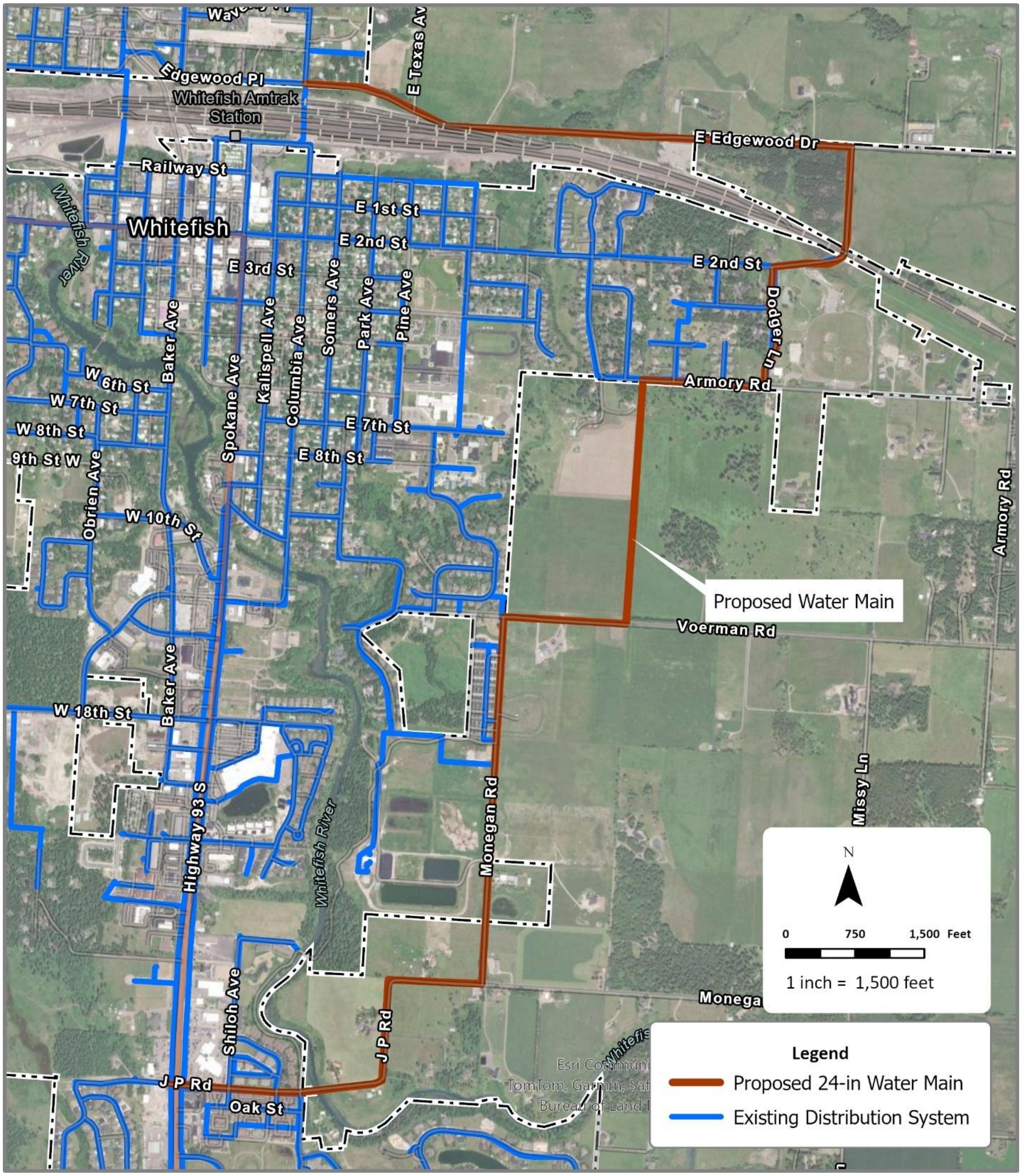

Figure 4.6 – Alternative 7

4.5 Summary of Estimated Costs

This section provides a summary of the probable construction and capital costs associated with the implementation of each alternative. Alternative 4 (storage option south of Highway 40) has the lowest capital cost, followed by Alternative 1 (storage at the WTP).

The estimated costs associated with operations and maintenance for the different alternatives are summarized in Table X-X. The primary difference between the alternatives is between elevated and GSRs. Elevated reservoirs require more costly inspection and coatings maintenance than the GSRs. Over 50 years, the O&M costs may be as much as four times higher for the elevated reservoirs than for the GSRs. With continued maintenance, both elevated tanks and GSRs should have useful lives potentially over 100 years.

Table 4.13 – Estimated Capital Costs Summary

Whitefish South Water Tank
Whitefish, MT
Estimated Capital Costs Summary

Alternative	Total Estimated Capital Cost
1	-
2	$4,700,000.00
3	$21,000,000.00
4	$20,500,000.00
5	$18,900,000.00
6	$2,200,000.00
7	$40,700,000.00

Table 4.14 – Estimated OM&R Costs Summary

Whitefish South Water Tank
Whitefish, MT
Estimated OM&R Costs Summary

Alternative	Total Estimated Cost
1	-
2	$10,000.00
3	$354,500.00
4	$354,700.00
5	$352,300.00
6	$3,000.00
7	$8,500.00

5.0 SELECTION OF AN ALTERNATIVE

A systematic selection of an alternative was performed by considering both life cycle costs and non-monetary factors (i.e. environmental and social factors). These two aspects of the selection process are detailed below.

5.1 Life Cycle Cost Analysis

A life cycle cost analysis was performed for each alternative. The analysis considered capital costs, annual O&M costs over the service life of the facilities, and estimated salvage value. The planning period used was 20 years, and the salvage value was based on salvage of structural steel from proposed water tanks. The results of this analysis are shown in Table below.

Table 5.1 – Life Cycle Cost Analysis

Alt	Capital Cost	Annual O&M Cost	Single Payment Present Worth of Annual O&M Cost	Salvage Value	Net Present Value
1	$ -	$ -	$ -	$ -	$ -
2	$ 4,700,000.00	$ 10,000.00	$ 163,000.00	$ 97,000.00	$ 4,800,000.00
3	$ 20,900,000.00	$ 354,000.00	$ 5,686,000.00	$ 116,000.00	$ 26,500,000.00
4	$ 20,500,000.00	$ 355,000.00	$ 5,689,000.00	$ 116,000.00	$ 26,100,000.00
5	$ 18,900,000.00	$ 352,000.00	$ 5,650,000.00	$ 97,000.00	$ 24,500,000.00
6	$ 2,200,000.00	$ 3,000.00	$ 48,000.00	$ -	$ 2,200,000.00
7	$ 40,700,000.00	$ 8,000.00	$ 136,000.00	$ -	$ 40,800,000.00

The life cycle analysis indicates that the cheapest alternative over the 20 year planning period is alternative 6. However, the only technically feasible alternative considered is alternative 3 and, as will be discussed further in the following section, a number of non-monetary factors come into play and must be considered alongside the life-cycle cost analysis.

5.2 Non-monetary Factors

The non-monetary factors that distinguish each alternative are technical in nature. Each alternative consists of conventional potable water infrastructure including storage tanks, pipelines, pumping stations, and automatic control valves. No unusual community or environmental impacts are anticipated. No special operator training requirements are anticipated.

The non-monetary factors that were considered in selecting an alternative included storage needs, distribution system pressure needs, water age considerations, and whether or not the project facilitated the removal of obsolete cast iron water main from the distribution system.

In order to provide a systematic selection of an alternative a decision matrix was developed. The matrix ranks each alternative according to weighted categories, as summarized in Table .

Table 5.2 – Scoring Weights

Category	Scoring Weight
Meets Storage Needs	10
Meets Pressure Needs	8
Maintains Adequate Water Age	6
Cast Iron Pipe Removal	3

Storage needs was given the highest weight because it is the most critical deficiency in the existing system. Without adequate storage, including emergency storage, the system is vulnerable in emergency situations such as main breaks. Critical facilities, such as hospitals, could be left without water in an emergency if adequate storage is not present in the system.

Pressure needs were given the second highest weight because without adequate pressure the system will not function optimally, especially during high demand periods. In severe cases, very low system pressure could allow infiltration from surrounding soils, leading to contamination of the distribution system.

Ensuring water age does not become an issue is also a high priority. Water that resides in the distribution system for too long will not maintain the required residual concentrations of disinfection chemicals, putting the public health at significant risk. Additionally, water that has exceeded the appropriate age can develop odor and taste issues.

Finally, cast iron pipe removal was scored lowest, not because it is unimportant, but because it is relatively less urgent than the other priorities that were scored higher. The legacy cast iron pipe in the distribution system is prone to breakages and leaks. Additionally, gaskets used on pipes from that era often contained lead, which is a public health concern.

These scores were applied to each alternative and summed to generate a composite score, as displayed in Table 5.3 on the following page.

Table 5.3 – Alternative Selection Decision Matrix

Alternative	Meets Storage Need	Meets Pressure Need	Adequate Water Age	Cast Iron Pipe Removal	Composite Score
1	0	0	0	0	0
2	10	0	6	0	16
3	10	8	6	3	27
4	10	8	0	3	21
5	10	8	0	3	21
6	0	0	6	0	6
7	0	8	6	0	14

Alternative 3 is the only alternative that satisfies all parameters including storage, pressure, water age, and removal of cast iron pipe. Thus, although Alternative 3 is not the lowest-cost option considered, it is the only technically feasible alternative. On the basis of technical requirements for performance of the system and public health and safety, alternative 3 has been selected as the recommended alternative.

6.0 PROPOSED PROJECT (Recommended Alternative)

The recommended alternative is Alternative 3, the details of which are described below.

6.1 Preliminary Project Design

6.1.1 Drinking Water

6.1.1.1 Storage

A 1.0-MG storage tank is proposed to be constructed at W 18th Street on a parcel own by the City. The storage tank will be welded carbon steel with a single pedestal concrete or steel support structure. Tank foundation will be either mat slab, engineered aggregate piers, or cast-in-place concrete piers. The proposed tower will be located in a new southern pressure zone (see Figure 6.1 on page 80).

6.1.1.2 Pumping Stations

A three-pump booster station is proposed to be constructed near Spruce Court, adjacent to the alignment of the future Columbia Avenue extension. This booster station will facilitate the filling of the proposed 1.0-MG storage tank after breaking the existing distribution system main pressure zone into two a north zone and a south zone.

The booster station will be light-frame wood construction with shallow concrete foundation. Space will be provided for a pipe gallery, electrical room, and chemical storage room (for future chlorine residual supplement if required). An interior backup generator will be provided for the facility.

The station will initially have two 30hp inline vertical turbine pumps, with space for a future third pump. The process pipe system is designed for three 70 hp inline vertical turbine pumps at full system capacity. Interior process piping will be ductile iron, ranging in size from 8-in to 18-in. Gate valves and butterfly valves will be provided to isolate the various system components, and automatic control valves will regulate pressure. Check valves will be incorporated to prevent backflow when booster pumps are idle, and flowmeters will record flow through the facility. See Figure 6.2 on page 81 for a preliminary rendering of proposed process piping and building layout. The initial sizing of the backup generator will be for the facility with three 30 hp pumps. The generator room will be sized to accommodate a generator that will handle the facility with three 70 hp pumps.

6.1.1.3 Distribution Layout

A new 18-in polyvinylchloride (PVC) water main is proposed to be constructed to convey water from the existing distribution system to the proposed 1.0-MG elevated storage tank. The 18-in water line will run west from the intersection of HWY 93 and 18^{th} Street to the site of the proposed storage tank. An air relief valve (ARV) will be constructed at the high point along 18^{th} Street between Baker Avenue and Flathead Avenue.

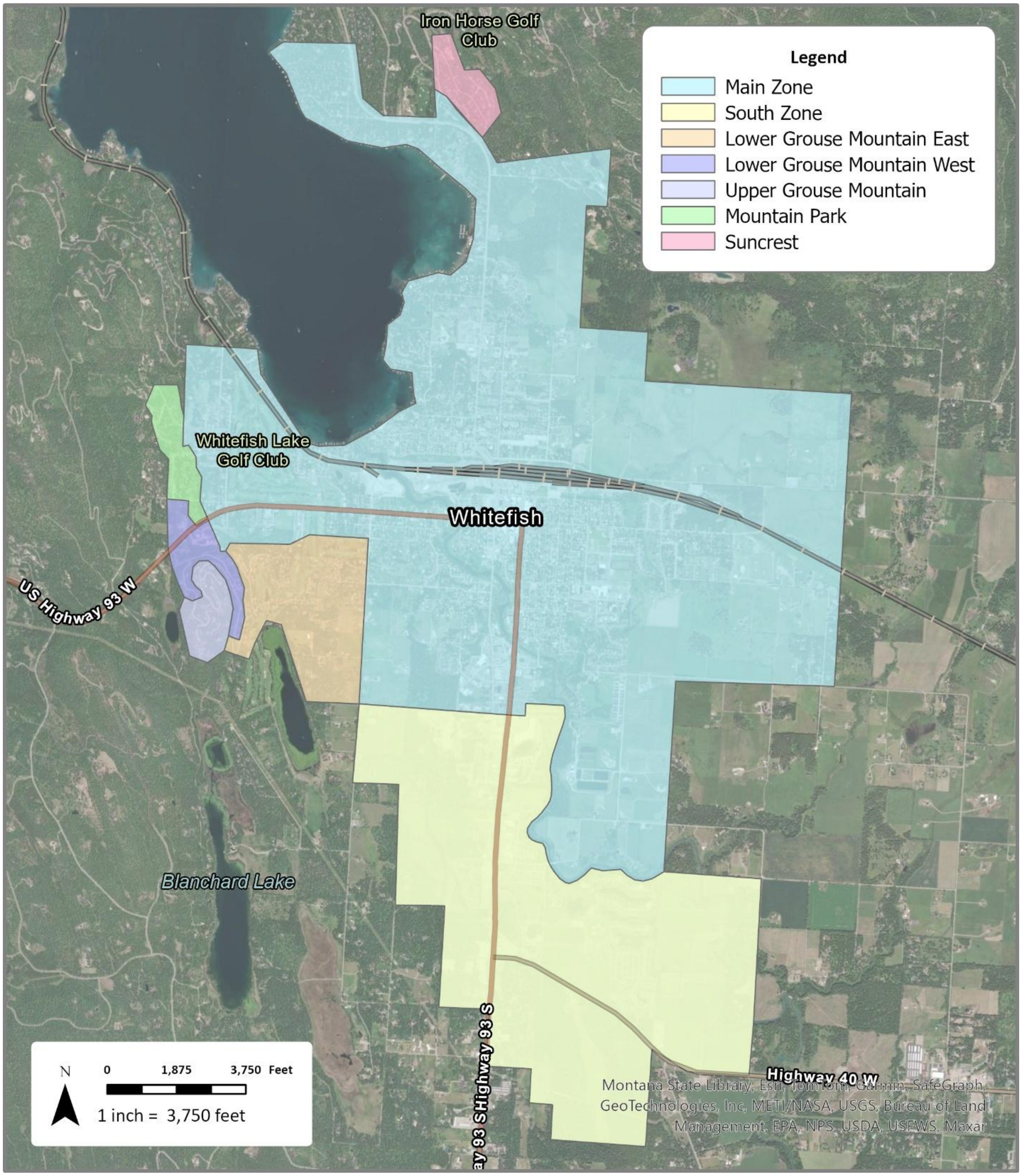

Figure 6.1 – Proposed Pressure Zones

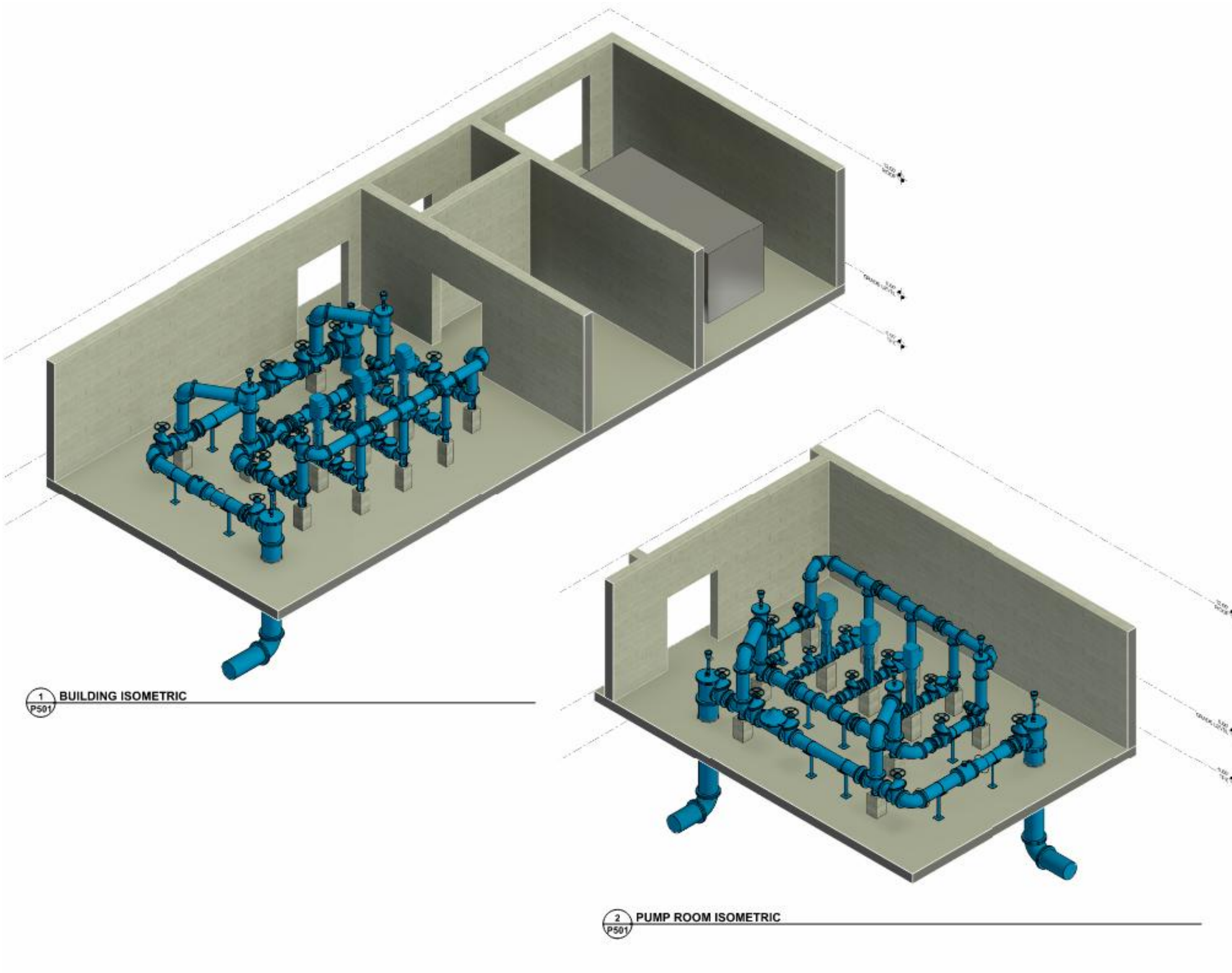

Figure 6.2 – Preliminary Booster Station Rendering

A new 18-in PVC water main is proposed to be constructed to connect the proposed booster station to the new north and south pressure zones. The 18-in water line will run south from the intersection of HWY 93 and 13th Street to the intersection of HWY 93 and Greenwood Drive. (See Figure 6.3 on the following page).

After construction of the proposed 18-in water main and booster station, the existing 6-in cast iron water main running along the west side of HWY 93 from 13th Street to 18th Street will be abandoned in place. Additionally, the existing 12-in water main in Baker Avenue will be cut and capped just north of 18th Street. Finally, a new offline pressure-reducing valve (PRV) is proposed to be constructed just north of 18th Street alongside the existing 12-in water main in Flathead Avenue.

Abandoning the 6-in cast iron main, cutting the 12-in main at Bake Avenue, and installing the PRV vault at Flathead Avenue effectively separate the main pressure zone of the distribution system into two new zones. The only points of interflow between the two new zones will be the new booster station and the new PRV at Flathead Avenue.

After abandoning the existing 6-in cast iron main along HWY 93, the existing water services that are currently served by that main will be re-routed to the existing 8-in water main on the east side of HWY 93.

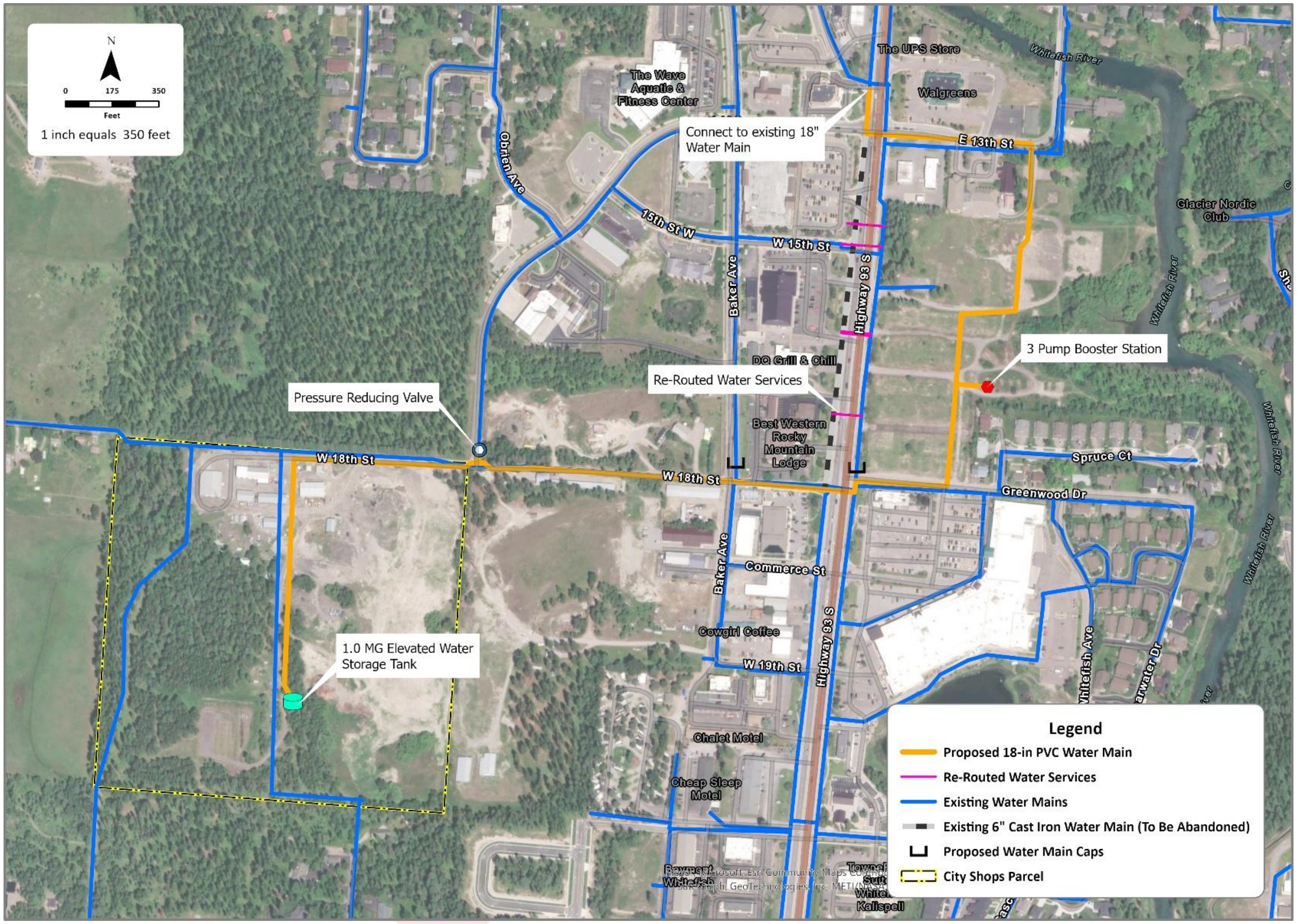

Figure 6.3 – Recommended Alternative Overview

6.2 Project Schedule

Table 6.1 below shows the proposed project schedule.

Table 6.1 – Proposed Project Schedule

Item	Anticipated Date of Completion
Uniform Application Submittal	May 2025
Uniform application Review	June 2025
Advertisement for Bid	August 2025
Award of Construction Contract	September 2025
Initiation of Construction	September 2025
Substantial Completion	October 2028
Final Completion	November 2028
Initiation of Operation	November 2028

The proposed dates are approximate and based on estimated timelines for regulatory reviews, final design, and construction.

6.3 Permit Requirements

- City of Whitefish Public ROW Permit
    - Permit for excavation activities in the City ROW. Issued by City of Whitefish, to be obtained by Contractor.
- City of Whitefish Building Permit
    - Permit to construct buildings or structures inside the city limits. Addresses electrical and plumbing portions of the permit. Issued by City of Whitefish, to be obtained by Contractor.
- General Permit for Storm Water Discharges Associated with Construction Activity
    - National pollution discharge elimination system (NPDES) permit issued by State of Montana (as authorized by EPA), to be obtained by the Contractor.
- Montana Department Encroachment Permit
    - Permit for excavation and construction activities in the MDOT ROW. Issued by MDT, to be obtained by the Contractor.
- Montana Department of Transportation Occupancy Permit
    - Permit for occupancy in the MDT ROW for public utilities. Issued by MDT, Obtained by Owner or Owners representative for the Owner.

6.4 Sustainability Considerations

6.4.1 Water and Energy Efficiency

The recommended alternative will improve water efficiency by replacing aging and leaking cast iron pipes with new PVC pipes, thereby reducing losses in the water distribution system.

6.4.2 Green Infrastructure

The project does not include stormwater infrastructure other than a small culvert to facilitate drainage under the access road at the elevated storage tank site.

6.4.3 Other

The recommended alternative will boost the resiliency of the City's distribution system by bringing the system's storage capacity into compliance with DEQ regulations. Adequate storage is important for resiliency because extreme weather events and other emergency situations may disable one or more of the City's water sources. During such an event, additional storage is helpful because it provides more time to bring the water source back online without causing an acute water shortage in the city.

6.5 Long and Short-Lived Assets

The Project includes Long and Short-Lived assets. The primary long-lived assets include the elevated storage tank, piping, and fittings, which are all expected to have a service life well beyond 30 years, as denoted in Table 6.2. The primary assets included in this Project will equal or exceed the 20-year loan term. The City will also plan to factor these assets into their annual depreciation investments, and account for them in future master planning efforts, especially when they near the end of their life cycle in several decades.

Table 6.2 - Anticipated Long-Lived Assets

Permanent Project Components	Expected Service Life
Elevated Storage Tank	30-40 years
18" PVC Transmission Line	50-100 years
Pipe Fittings	50 years
Booster Station Structure	40-50 years

The Project also includes a variety of Short-Lived Assets, that will require planning and replacement at an earlier interval. These assets are expected to need repair or replacement in less than 30 years. Like the Long-Term Assets, these components will need to be factored into future capital planning and budgeting processes, especially as the City monitors the adequacy of its reserves in the mid-term, especially in the event one of these components fails prematurely.

In total, the Short-Lived assets total $76,500 (2025 $) and represent a relatively incidental portion of the upfront Project costs and the City's annual operating budget. The City expects to reasonably absorb these future expenses into its regular capital replacement program or be able to cash fund with existing reserves, in the event they need to be replaced in an emergency. Table 6.3 includes a listing of the Project's Short-Lived Assets.

Table 6.3 - Estimated Short-Lived Assets

Type	Asset	Quantity	2025 Installed Cost	2055 Cost of Replacement
Pumps and Appurtenances	Vertical Turbine 30 HP Pumps	2	$25,000.00	$140,339.69
	Gate Valves DI	8	$2,250.00	$315,764.29
	Air Vacs & Valves DI	4	$2,250.00	$315,764.29
Instrumentation	PLC's	3	$2,000.00	$16,841
& Controls	Ethernet Switch	1	$2,500.00	$7,017
(SCADA)	Touch Panel	1	$2,500.00	$7,017
Electrical	Control Panel	1	$40,000.00	$112,272
		Total:	$76,500	$915,015

6.6 Funding Strategy

6.6.1 Funding Sources

The City has reviewed various Project funding strategies and has formulated a co-funding approach comprised of cash reserves, impact fees, and service charge (i.e., rate revenue) backed debt. The Project's primary funding source is a planned to be a $15.0 million loan from the Drinking Water State Revolving Fund (DWSRF), representing 71.4% of the estimated Project budget, with impact fees and cash reserves equally sharing the remaining 28.6%. Table 6.4 provides additional details regarding the City's various funding sources planned for the Project.

Table 6.4 - Proposed Project Funding Sources

Funding Source	Total	% of Total
Cash Reserves	$3.0 M	14.3%
Loan Contribution	$15.0 M	71.4%
Impact Fees	$3.0 M	14.3%
Total Project Cost:	*$21.0 M*	*100%*

The City also plans to apply for several grants, including those available from the DNRC (i.e., RRG) and Department of Commerce (i.e., MCEP) to offset the local cost burden of the proposed work; however, these grant awards are not guaranteed, and are omitted from the following funding analysis to remain conservative. Similarly, principal forgiveness from DWSRF is a priority for the City; however, awarded amounts can vary based on qualification and availability at the time of loan contracting. Given this, this potential contribution to the Project has also been omitted.

The City expects a relatively uniform funding need for the Project, requiring approximately $5.3 million per year over four years to maintain positive cash flow for the design and construction phases of the work.

Given the Project's timeline, it is expected that the City's overall debt service will escalate over several years, which will afford them time to phase out existing debt service, increase service charges, and add new connections to accommodate the increasing financial burden on the Water Fund. Table 6.5 provides details regarding the City's planned funding schedule.

Table 6.5 - Projected Project Funding Requirements

Year	Cash Reserves	Impact Fees	Loan	Total Funding
2026	$.75 M	$.75 M	$3.75 M	$5.25 M
2027	$.75 M	$.75 M	$3.75 M	$5.25 M
2028	$.75 M	$.75 M	$3.75 M	$5.25 M
2029	$.75 M	$.75 M	$3.75 M	$5.25 M
Total:	$3.00 M	$3.00 M	$15.00 M	$21.00 M

6.6.2 Funding Alternatives

The City has reviewed several potential loan sources beyond DWSRF, including USDA Rural Development (RD), United States Environmental Protection Agency (US EPA) Water Infrastructure Finance Act (WIFIA), and traditional financing.

They City has opted to proceed with DWSRF as its prioritized loan source given the favorable loan terms that exist. Current DWSRF interest rates are fixed at 2.5% for 20-year loans; however, they are subject to change based on timing, revolving fund capacity, and finalized borrowing terms.

City Staff consulted USDA as a potential funding source and were told that they are no longer qualified given their rapid growth and related population demographic. WIFIA was also vetted as an option; however, it was decided that the Project's timeline would be an inhibitor of pursuing this loan source.

The City is well-versed in acquiring DWSRF funding and expects the invocation of State and Federal crosscutters, including Build America Buy America (BABA), National Environmental Policy

Act (NEPA), and Davis-Bacon Wages. Given the planning-level nature of the cost-estimates contained within this PER, it is assumed that escalation associated with these requirements are incorporated.

A scenario was developed to estimate the City's annual debt service and understand how those costs would impact the Water Fund's broader financial picture in the event they borrow the full $15.0 million from DWSRF. Key assumptions included a fixed interest rate of 2.5%, a loan term of 20 years, a disbursement of $3.75 million for four consecutive years, and the first P&I payment occurring in FY27. This scenario does not factor in the Cost of Issuance (COI) of the loan, which is typically around 1-2%.

The analysis showed that an annual debt obligation would start in FY27 at $240,552 and peak at just over $962,207 by FY30. Payments would continue annually at $962,207 until FY47, then taper until the loan fully matures in FY49.

The existing new debt service is expected to peak and remain consistent between FY30 and FY40, with annual payments totaling $1.5 million per year. Figure 6.4 shows the Project's estimated new debt service added to the City's existing debt schedule.

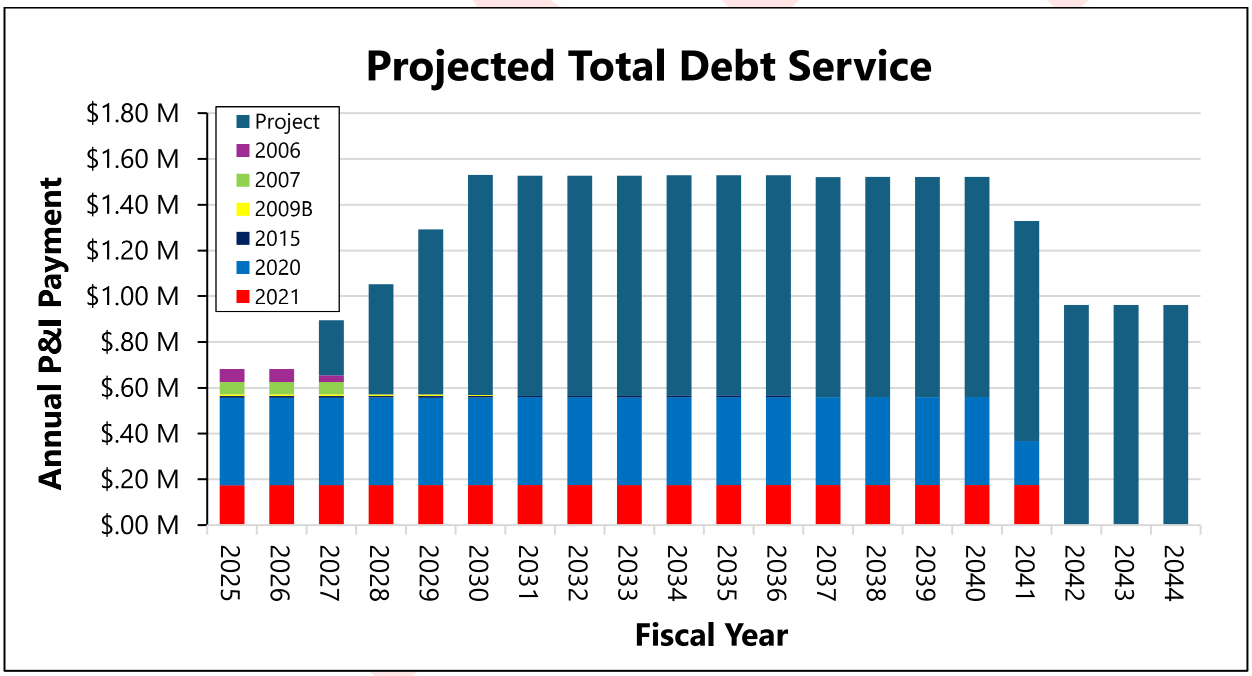

Figure 6.4 - Projected Debt Service

6.6.3 Operation and Maintenance Costs

The Project generally includes a new tank, transmission line, and booster station. Various new expenses are expected because of the operation and maintenance of these new system components, including personnel, insurance, energy, inspection, cleaning, and monitoring. In total, operation and maintenance costs are estimated at $354,500 per year. This represents an 11.2% increase in the City's existing operating budget, as detailed in Table 6.6.

Table 6.6 - Projected Operation and Maintenance Costs

FY25 O&M	New Project O&M	Adjusted O&M	Percent Increase
$3.1 M	$.35 M	$3.45 M	11.5%

The City completes regular service charge reviews and plans to factor this O&M increase into future operating expense projections. In general, there may be a few areas where City staff's current workload may be reduced given the new infrastructure; however, O&M impacts from this Project are a primary additive in nature and will require careful consideration during future financial planning and the City's annual budget process.

6.6.4 Total Project Costs

Assuming a 75-year life on the Project, annual depreciation is approximately $296,000 per year (2025 $). This amount is used as the baseline annual reserve amount. The annual payment required to cover O&M, Debt Service, and Reserves is $1.6 million, as detailed in Table 6.7.

Table 6.7 - Annual Project Budget Summary

Item	Total
Annual O&M	$354,500
Debt Service	$962,207
Reserve Contributions	$280,000
Total:	$1,596,607

6.6.5 New Debt Capacity

DWSRF requires a debt coverage of 110% to secure a loan. To estimate the City's borrowing capacity and determine how they will ultimately afford the Project, three debt coverage scenarios were analyzed using the following key assumptions:

- The Planning Timeframe extends from FY26 to FY30.
- Growth equals 1.5% per year.
- Service charges increase by 3% annually.
- Inflation of 3% is uniformly applied to all expense categories.

- Debt coverage is equal to expenses subtracted from revenues, then divided by debt.
- Cash-funded capital includes spending approximately $1.0 million per year.
- Project O&M costs of $354,500 start in FY26 and grow at 3% like the other expenses.

The first scenario analyzed is referred to as 'Baseline', which includes the City's current revenues, expenses, and debt obligations. This scenario omits cash-funded capital. Under 'Baseline', the City maintains adequate coverage of 110%, ranging from 233% in FY26 to 372% in FY30. These percentages indicate that the City can take on some level of new debt.

The second scenario analyzed is referred to 'Baseline with Project', which includes the City's current revenues, expenses, existing debt service, and new Project debt service. This scenario also omits cash-funded capital. Under 'Baseline with Project', the City maintains adequate coverage of 110%, ranging from 181% in FY26 to 112% in FY30. FY30 represents the trough as the Project's phased debt service fully accumulates, with a positive rebound occurring in FY31 and onward. These borderline percentages indicate that the City may be able to afford the Project with the assumptions listed above; however, it will be limited to what other cash-funded capital is possible in the short and mid-term.

The third scenario analyzed is referred to 'Baseline with Project and Cash-Funded Capital', which includes the City's current revenues, expenses, existing debt obligations, new Project debt service, and cash-funded capital. Under 'Baseline with Project and Cash Funded Capital', the City does not maintain adequate coverage of 110%. The trough is in FY27 at 24% and the coverage does not climb above 110% until FY37. These low percentages indicate that the City may be overleveraged under this scenario and a more substantial rate increase(s) would be necessary if they elect to fund the Project and all cash-funded capital.

Figure 6.5 provides a chart that details the results from the three debt coverage scenarios.

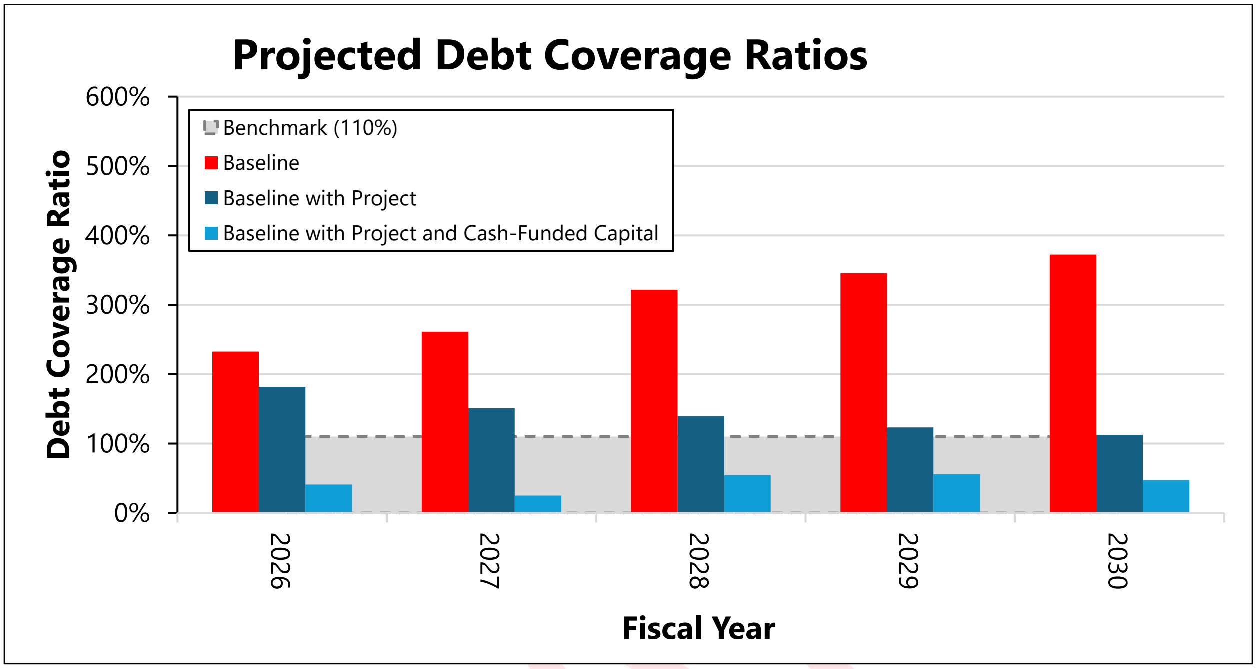

Figure 6.5 - Projected Debt Coverage Ratios

The scenarios provide insights into the City's overall funding capacity for the Project. If the City wants to complete the Project in addition to other cash-funded capital projects over the planning timeframe, a more substantial service charge increase(s) beyond the 3% inflationary amounts modeled are likely warranted. If the City opts to defer all other cash-funded capital projects in the short term to use that capacity to pay Project costs, the City could likely maintain an adequate debt coverage ratio if they complete inflationary service charge increases, the Project does not go over budget, and community growth over 1.5% occurs annually.

6.6.6 Debt Repayment

The City has been proactive in its financial planning for the Project. They have included a $16.0 million expense in their most recent CIP, including a plan to use a combination of cash reserves, impact fees, and loans to fund the total. The recommended Project is estimated to cost $21.0 million, higher than their initial estimates.

Given this, the City plans to primarily utilize service charges to make up the difference in cost. In total, the overall service charge increase will be in the range of 15% or more over the next five years (average of 3% annually), with a chance rate approaching a 35% total increase depending on other water system needs the City prioritizes. The exact increase percentage is challenging to state with confidence given several unknowns, which will have an impact on the Project's funding strategy. Thes unknowns include:

- Final Project scope, costs, and timing after future design iterations and reviews.
- Level of principal forgiveness applied to the loan.
- Total grant awards from DNRC, Commerce, and others.
- Reprioritization or deferral of other cash funded capital projects by the City.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The City of Whitefish faces significant issues with lack of storage, undersized mains and replacement of Cast Iron pipe that primarily affect the southern end of the city. The preferred alternative consisting of elevated storage at the City shop site, booster station, PRV and supply lines addresses all the problems as defined in Section 0.1 Purpose of this report. The successful completion of this project addresses all issues as defined upon completion and extending throughout the 20-year planning horizon. A successful project also will protect the health and safety of the residents and visitors of the City of Whitefish for years to come.

The Project will require a comprehensive funding package to complete. The primary recommended solution is to pursue a DWSRF loan and maximize available low-interest and principal forgiveness terms that are available. It is recommended that the City apply early to avoid design and construction schedule impacts. Another key funding recommendation includes the pursuit of State-level grant sources, such as DNRC RRG and Commerce MCEP. The final recommendation is to consider completing an in-depth rate analysis to better understand how the Project costs and prolonged payback period will impact the City's broader Water Fund financial picture, especially as it relates to completing cash-funded capital projects.

This document is produced in conformance with the requirements of the *Uniform Application for Montana Public Facility Project,* this document:

- Defines pertinent problems affecting City.
- Reviews the existing City socioeconomic, physical, financial and other characteristics.
- Provides a range of alternatives to solving the defined problems.
- Analyzes the alternatives for technical and financial feasibility.
- Provides a recommendation for a selected, viable alternative.
- Provides recommendations for funding of the selected alternative.

Appendix A – NRCS Soils Map

Soil Map—Upper Flathead Valley Area, Montana
(South Tank Project Area)

Map Scale: 1:6,620 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 300, 600, 1200, 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Upper Flathead Valley Area, Montana
Survey Area Data: Version 21, Aug 28, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 31, 2021—Oct 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ha	Half Moon silt loam, 0 to 3 percent slopes	19.7	55.0%
Hb	Half Moon silt loam, 3 to 8 percent slopes	1.6	4.4%
Wm	Waits and Krause stony loams, 7 to 12 percent slopes	1.6	4.6%
Wn	Waits and Krause stony loams, 12 to 40 percent slopes	3.7	10.3%
Wv	Whitefish gravelly silt loam, 0 to 7 percent slopes	0.4	1.1%
Wza	Whitefish silt loam, 0 to 3 percent slopes	8.5	23.6%
Wzb	Whitefish silt loam, 3 to 7 percent slopes	0.4	1.1%
Totals for Area of Interest		**35.9**	**100.0%**