

# City of Escanaba Water System Improvements

Michigan Drinking Water State Revolving Fund Project Plan (2023)  
Volume 1 – Report Body

22-0320

May 3, 2023



1211 Ludington Street  
Escanaba, MI 49829

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## LIST OF ABBREVIATIONS

Abbreviation	Description	Abbreviation	Description
AC	Acre	O&M	Operation and Maintenance
AMP	Asset Management Plan	OMB	US Office Of Management And Budget
ASCE	American Society of Civil Engineers	PAC	Powdered Activated Carbon
AWWA	American Waterworks Association	PACL	Polyaluminum hydroxychloride
BOD	Biological Oxygen Demand	PFAS	Per- and polyfluoroalkyl substances
BRF	Business Risk Factor	POF	Probability of Failure
CAS or CI	Cast Iron Pipe	POSA	Plan of Study Area
CFM	Cubic Feet per Minute	POTW	Publically Owned Treatment Works
CFS	Cubic Feet Per Second	PPB	Parts per Billion
CI	Chlorine	PPD	Pounds Per Day
CIP	Capital Improvement Plan	PPM	Parts Per Million
CT	Contact Time	PRV	Pressure Reducing Valve
CUPPAD	Central U.P. Planning and Devel. Reg. Commission	PS	Pump Station
DBP	Disinfection Byproduct	PSI	Pounds Per Square Inch
DI or DIP	Ductile Iron Pipe	PVC	Polyvinyl Chloride (Pipe)
DO	Dissolved Oxygen	RRI	Repair, Replacement, and Improvements (Fund)
DWAM	Drinking Water Asset Management	RUS	Rural Utility Service (USDA RD)
DWSRF	Michigan Drinking Water State Revolving Fund	SAN	Sanitary Sewer
EDU	Equivalent Dwelling Unit	SAW	Michigan Stormwater, Asset Management, And Wastewater funding
EGLE	Mich. Dept. of Environment, Great Lakes, & Energy	SCADA	Supervisory Control And Data Acquisition
ENR	Engineering News-Record	SCFM	Standard Cubic Feet per Minute
EPA	US Environmental Protection Agency	SF	Square Foot
EPDM	Ethylene Propylene Diene Terpolymer	TSS	Total Suspended Solids
EUPPDR	Eastern U.P. Planning and Devel. Reg. Commission	STO	Storm Sewer
FPS	Feet per Second	SRF	Michigan State Revolving Loan Fund
FSP	Fiscal Sustainability Plan	SWD	Side Wall Depth
GAC	Granular Activated Carbon	TDH	Total Dynamic Head
GPCD	Gallons Per Capita Per Day	TRS	Trihalomethane Removal System
GPD	Gallons Per Day	TTHM	Total Trihalomethane
GPD/IN-MI	Gallons Per Day Per Inch Diameter Mile	TWST	Treated Water Storage Tanks
GPM	Gallons Per Minute	USACE	US Army Corps Of Engineers
HP	Horsepower	USDA RD	US Dept. Of Agriculture - Rural Development
HVAC	Heating, Ventilation, and Air Conditioning (System)	UV	Ultra Violet
ITA	Intent to Apply	VFD	Variable Frequency Drive
MDNR	Michigan Department of Natural Resources	WERF	Water Environment Research Foundation

Abbreviation	Description	Abbreviation	Description
MG	Million Gallons	WM	Watermain
MGD	Million Gallons Per Day	WPA	Works Progress Administration (early public works construction program)
MG/L	Milligrams Per Liter	WRC	Michigan Water Resources Commission
MH	Access Manhole	WS	Water Service
ML	Milliliter	WTP	Water Treatment Plant
MPN	Most Probable Number	WUPPDR	Western U.P. Planning and Devel. Reg. Commission
NEMA	National Electrical Manufacturers Association	WV	Water Valve
NEPA	National Environmental Policy Act	WWTF	Wastewater Treatment Facility
NH <sub>3</sub> -N	Ammonia Nitrogen	WWTP	Wastewater Treatment Plant
NPDES	National Pollutant Discharge Elimination System		
NPV	Net Present Value		
NRWA	National Rural Water Association		

## SUMMARY

### Project Background

This study (Project Plan) was authorized by the City of Escanaba via execution of a letter proposal on November 17, 2022. The purpose of the Project Plan is to evaluate needs and recommend alternatives for improvements to the City water distribution system.

The City of Escanaba is the responsible entity for the regionalized-municipal water treatment plant (WTP) and distribution system serving the City and a small portion of Wells Township. The entire service district lies within Delta County in Michigan's Upper Peninsula. The City's facilities include two elevated tanks, and concrete treated water storage at the WTP; these facilities and the distribution system is currently owned, operated, and maintained by the City. The distribution system includes over 450,000 ft of water main and includes hydrants, valves, and services. The City's water source is Lake Michigan's, Little Bay de Noc. The City has an active Source Water Protection Program that has been approved by EGLE and continues to make on-going efforts towards increased protection.

The primary goal of a WTP and distribution system is to protect the quality of the water supply and to protect public health. Ultimately, the driving force for this study and the potential construction of the recommended improvements is the protection and enhancement of the quality of the water supply to the service area.

### Summary of Project Need

Reliable operation of water distribution lines within the City of Escanaba's utility systems are imperative to protect the health and safety of the City's citizens and visitors. Traditional components may expose users to unsafe levels of contaminants. Deficient water mains can waste treated water and permit contamination of treated drinking water. Unplanned failures and downtime during repairs affects the ability of the distribution system to safely and adequately serve the system users. The City has a history of proactive public health protection; the City has had no health-based violations in the past five-years.

The state of Michigan recently changed its lead and copper drinking water rules to require water service material identification and possible replacement. The City is lawfully required to replace all lead-impacted service lines. Therefore, the City must absorb replacement costs for service lines on privately owned land to the meter within each house.

The City of Escanaba is requesting consideration by State of Michigan for a Drinking Water State Revolving Fund loan. This loan will make available funds for lead impacted service line replacements within the City's drinking water service areas; adding looping to the system reducing dead-ends; reducing galvanized water services feeding multiple users; and facility upgrades to the South Water Tank to maintain compliance. Coordinating improvements to multiple system assets such as facilities, water main, and water services (and other utility replacements such as sanitary sewer) will reduce service interruptions and expenses to the City. These upgrades are based on the City's Asset Management Plan, Capital Improvement Plan, and Water Reliability Study and will aim to address and improve water quality in the system. Bonding can make funds available for immediate use and allow incremental readiness and commodity rate increases to repay expense. The City is concurrently submitting a 2023 CWSRF Project Plan that has some overlap of LSLR and water main replacement in areas of sewer replacement.

#### Analysis of Alternatives

The principal alternatives for the distribution system are being considered as noted below:

##### Alternative 1: No Action

This alternative would also involve addressing aging pipeline issues on an emergency basis as deficiencies surface rather than implementing proactive preventive and strategic improvements. Pipeline capacity and reliability would continue to deteriorate.

##### Alternative 2: Replacement of Water Main and Lead Impacted Water Services, and Upgrades to South Water Tank

Replacement and upgrading where required of over 8,000 ft of water main prioritized as to condition via City records, City asset management and capital improvement plan, and personnel knowledge; this includes over 600 lead service line replacements, inclusion of looping throughout the City for increased water quality, and improvements to the South Eskimo Water Tank to maintain compliance to current drinking water standards.

#### Selected Alternative

Alternative 2 is considered the preferred alternative.

### Environmental Evaluation

The anticipated environmental impacts resulting from implementation of the selected alternative are relatively minor. There is no increase in the extent of the water system, and no major changes in terms of residuals or other material effects. Full detail may be found under the section labeled “Environmental Evaluation”.

### Mitigation Measures

Where adverse impacts due to installation of the recommended improvements cannot be avoided, mitigation measures will be implemented. Costs for mitigation measures were considered and included where applicable in project opinions of probable cost and included in construction contract documents. A full discussion of mitigation measures can be found in detail in section “Mitigation Measures”.

### Public Participation

A public meeting for this DWSRF Project Plan took place on April 6, 2023. Copies of public meeting advertising and minutes are included in Appendix E of the adopted final version of this Project Plan.



## PROJECT BACKGROUND

Construction is being considered to improve the existing water distribution system in the City of Escanaba. A major portion of the current water distribution system was installed during the early to mid-20th century, including the majority of private domestic services. The City of Escanaba is located in Delta County, on Little Bay de Noc in Michigan's Upper Peninsula. The City operates its own surface water intake and treatment plant. City of Escanaba provides drinking water within the City and to a small portion of Well Township. Near term development by Hannahville Indian Community north of the Escanaba River and long term needs in the City of Gladstone have potential to increase demand in the future. The total existing service area is approximately 7,860 acres, of which 295 acres are the currently serviced area of Wells Township.

The City of Escanaba has invested in water main replacements in recent years. Remaining portions of the original water system have undersized main, with many unreliable valves and hydrants. This makes it difficult to serve the community with a steady water supply. Older main is comprised of cast iron pipe, while recent replacements have been ductile iron.

The City recently underwent a comprehensive water asset management program and maintains its own GIS database. These efforts revealed problem areas that are to be scrutinized in this project plan. It is imperative for the City to have reliable water distribution lines to protect the health and safety of its citizens and visitors. Using knowledge gained from their water asset management program and information gathered from City personnel, a plan of continued utility replacement will be presented in this report. Further details of completed investments, projects in-progress, and planned improvements will be included in the following summary and analyses.

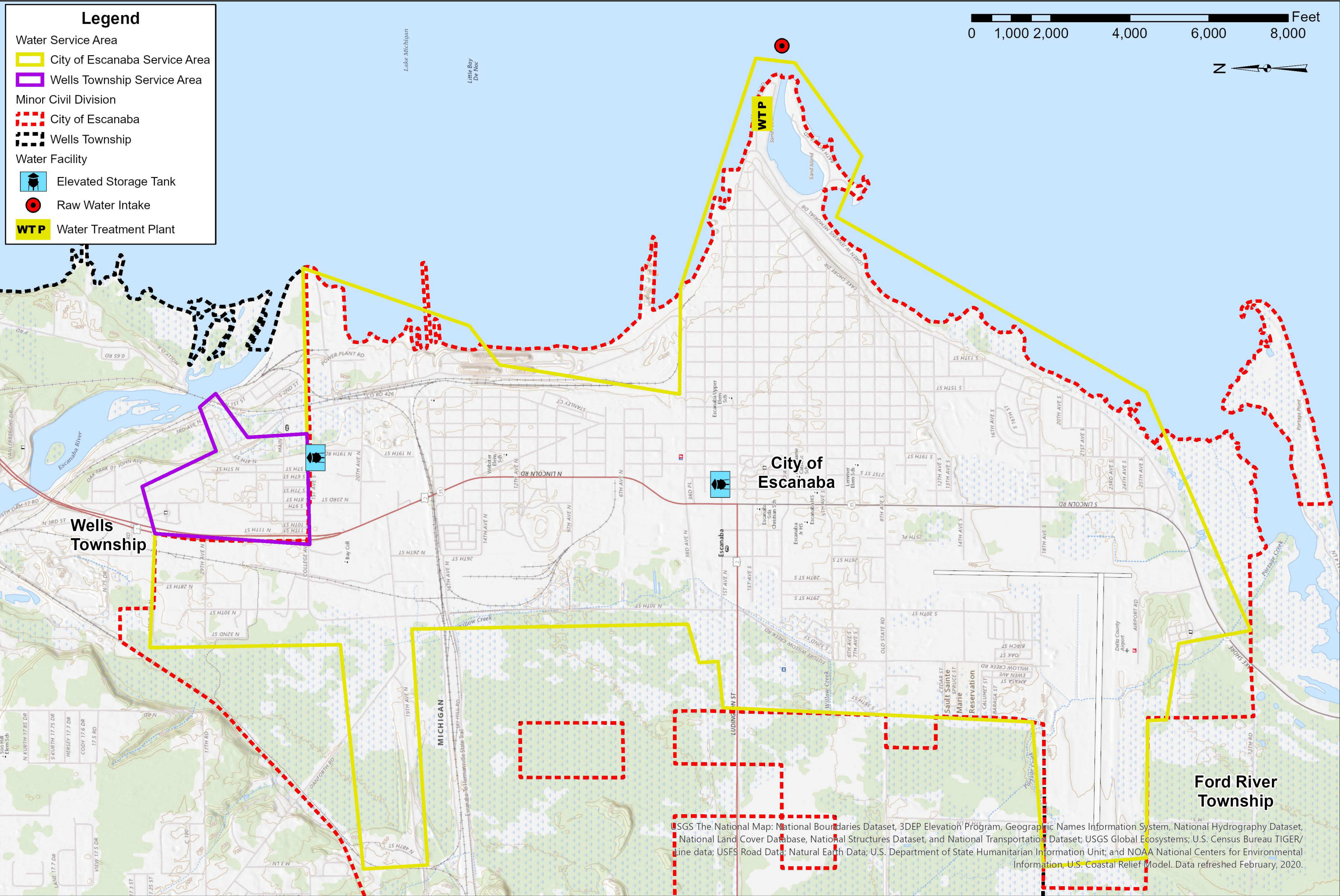
### Delineation of Study Area

The area of study (see Figure 1 and Figure 2) is within the current water service district of the City of Escanaba and Wells Township.

Figure 1. Project Location





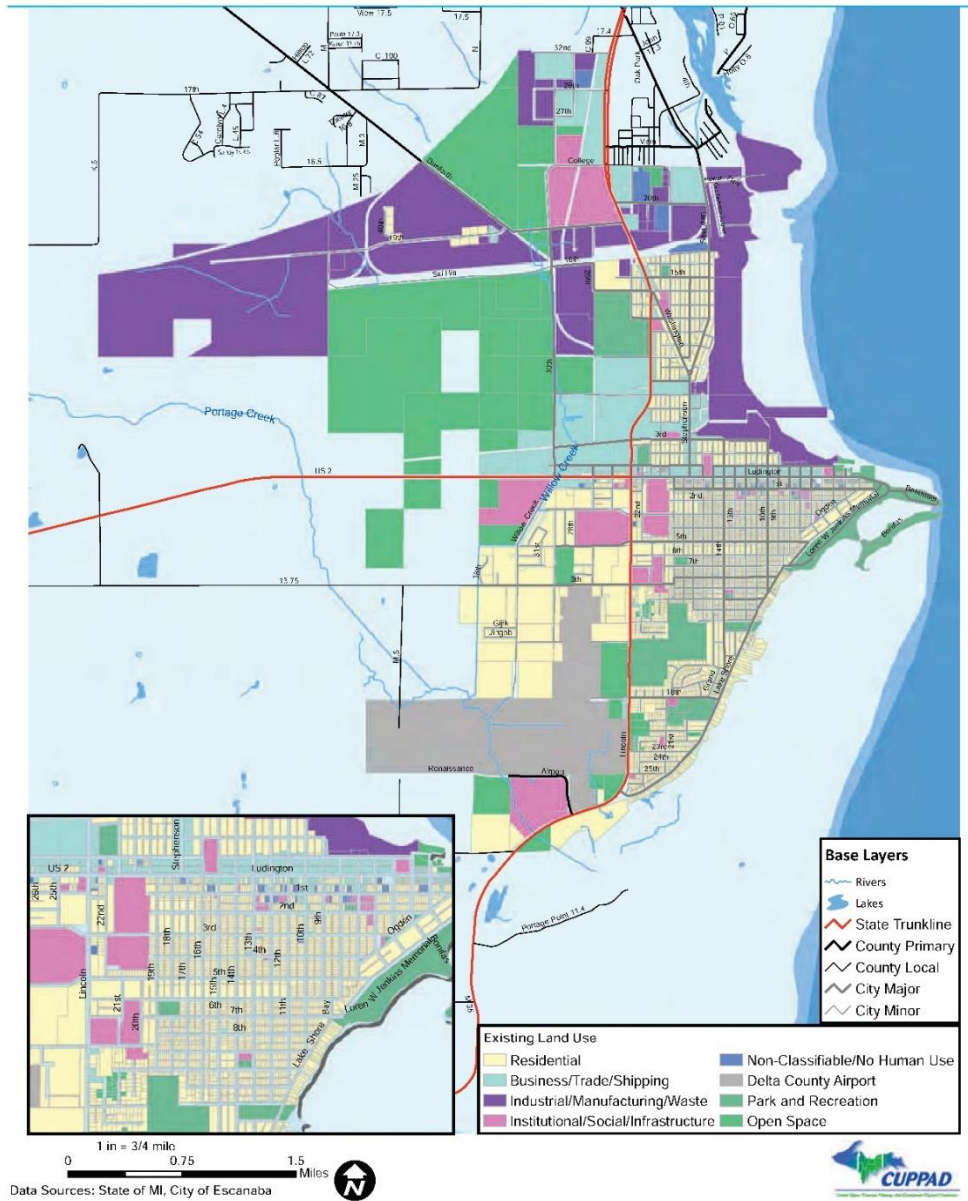


USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.



## Land Use

Land within the City of Escanaba (see Figure 3) is primarily residential and commercial, with small areas of industrial development.



**Map 22: City of Escanaba, Existing Land Uses**

Escanaba Master Plan

Figure 3. Land Use

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### Population Projections

The City of Escanaba and surrounding areas have experienced significant population loss in recent years. The following table reports census numbers in the prior four decades and forecasts a population stabilization in the near future. The service area includes approximately 4,874 residential equivalent users (REUs).

Table 1. Population Projections

Entity (a)	1980	1990	2000	2010	2020	2030	2040
City of Escanaba	14,830	13,705	13,119	12,616	12,450	12,450	12,450
Delta County	38,947	37,780	38,520	37,069	36,903	36,903	36,903
Wells Township	5,181	5,159	5,044	5,115	5,160	5,160	5,160

(a) 1960 to 2020 based on published US Census figures  
2020 to 2040 assumes population stabilizing as economy stabilizes after nationwide recession

### Water Demand

The Escanaba water distribution system supplies water to 4,874 customers within the city and 776 other customers, such as industry, churches, schools, government buildings, small commercial, and apartment buildings. The City of Escanaba records and bills water use for City of Escanaba properties. The following table illustrates the billable and accounted water summary customer base and typical annual demand within the City's water system (using 2016/17 data).

Table 2. Water Demand

Description	Usage (gal)	Customers
Monthly Billed Usage By User Category (gal)		
-Residential		4,874
-Commercial		653
-Industrial		21
-Governmental/Institutional		102
-Total Billed Water	386,964,000	5,650
Unaccounted Water, Not Billed	7,878,000	
Adjusted Annual Accounted Water	394,842,000	
Approximate Billable Flow Per Capita (gpcd)	83	
Annual High Service Pumpage (gal)	689,164,000	
Lost or Unaccounted Water (gal)	294,323,000	
Lost or Unaccounted Water Percent	42.7	

Table Notes:

1. Table 2 is based on 2016/2017 lost water data from Escanaba WTP

The following table illustrates the City's Water Demand Projections as estimated in the 2017 Water Asset Management Plan.

Table 3. Water Demand Projections

Flow Description	5 Year (MGD)	20 year (MGD)
Average Annual	2.27	2.72
Maximum Month Summer	3.00	3.07
Maximum Month Winter	2.32	2.39
Maximum Day Summer	3.76	4.50
Maximum Day Winter With Let Runs	2.72	2.81
Peak Hour	6.76	8.11

Notes:

1. Demand projections are for high service pumping or WTP production.
2. Future Demand Flow includes existing Wells Township customers and potential Development north of the Escanaba River.
3. Future Maximum Day flows to Gladstone is estimated at 1.0 MGD. This is not included in the Escanaba 20 year water planning.

Evaluating the data in Table 2 and Table 3 the following observations and conclusions were made:

- The annual volume of water pumped was approximately 689 MG. This was an average daily system production requirement of 2.12 MGD. This includes the accounted and unaccounted fractions. This number does include let runs, which were higher than normal in the winters of 2014/15 and 2015/16.
- The ratio of maximum daily production to average daily production for the period of 2014 through 2017 was 1.65 in the summer and 1.27.
- It is noted that the high maximum day and monthly average flows result from warm weather periods and represent high rates of lawn and garden water use.
- Let runs do not appear to be contributing significantly to water production needs in Escanaba.
- The average per capita pumped high service water was approximately 148 gpd for 2016/2017. The average per capital billed water for the same period was 83 gpd. The unaccounted water percent was approximately 43%.

- The monthly billable flow per EDU for Escanaba in 2016/17 was 3,516 gallons. We typically predict between 3500 and 5000 gallons per month per residence.

### Existing Facilities

The City has owned and operated the municipal system since its inception in the 1870s. The system presently includes:

- Two Little Bay de Noc (Green Bay, Lake Michigan) surface water intakes with cribs.
- 8.0 MGD Surface Water Treatment Plant (WTP) including raw water pumping, coagulation/flocculation, settling, high rate gravity filtration, support systems.
- 1,000,000-gallon concrete treated water storage
- High Service Pumping
- 500,000 Gallon north elevated tank
- 500,000 Gallon south elevated tank
- A system of underground transmission and distribution mains including, pipe, hydrants, valves, and services.

The water source is Lake Michigan's, Little Bay de Noc, and raw water is drawn through one 24-inch intake pipe and one 30-inch intake pipe. Intake cribs are located approximately 500 and 1,000 feet of shore respectively. The entire service district lies within Delta County in Michigan's Upper Peninsula.

The present WTP was constructed and upgraded over years with major projects in 1950, 1972, 1996, 2002, 2008, and 2010. The treatment structures are largely 67 years old with a majority of piping and process equipment being 45 years old. Electrical and Control system are newer.

The WTP currently is undergoing an upgrade project which includes:

#### Division 'A' – DWSRF Miscellaneous Improvements

- High Service Pumping Improvements
- Existing Reservoir Improvements
- Chemical Feed Improvements
- Rapid Mixing Upgrades
- High Service Suction Line Replacement
- Carbon Building Rehabilitation
- Sludge Bed Upgrades



and Division 'B' – CDBG Treated Water Storage Reservoir:

- A 0.5 MG Treated Water Storage Reservoir
- Piping and Associated Appurtenances for Connection to WTP

### Water Distribution System

A very large share of the buried water pipe in the Escanaba is older than 75 years and significant portion is older than 97 years. A breakdown of the buried water main by size is:

4" –	56,325 ft.
6" –	176,001 ft.
8" –	65,780 ft.
10" –	58,963 ft.
12" –	98,824 ft.
<u>16" –</u>	<u>19,445 ft.</u>
Total –	477,348 ft.

There are also 817 Hydrants and 169,810 ft of water service. Approximately, 3,779 ft of 2-inch waters service or main has been identified from records. Most of this is service. City crews are researching actual quantities of main and service. Early estimates suggest that approximately 800 ft of 2-inch water main may exist. Replacement of this is high priority.

The following maps includes assets within the project area as described in this section:

- Figure 4. Existing Water System
- Figure 5. Water Main Pipe Age
- Figure 6. Water Main Pipe Size
- Figure 7. Water Main Material

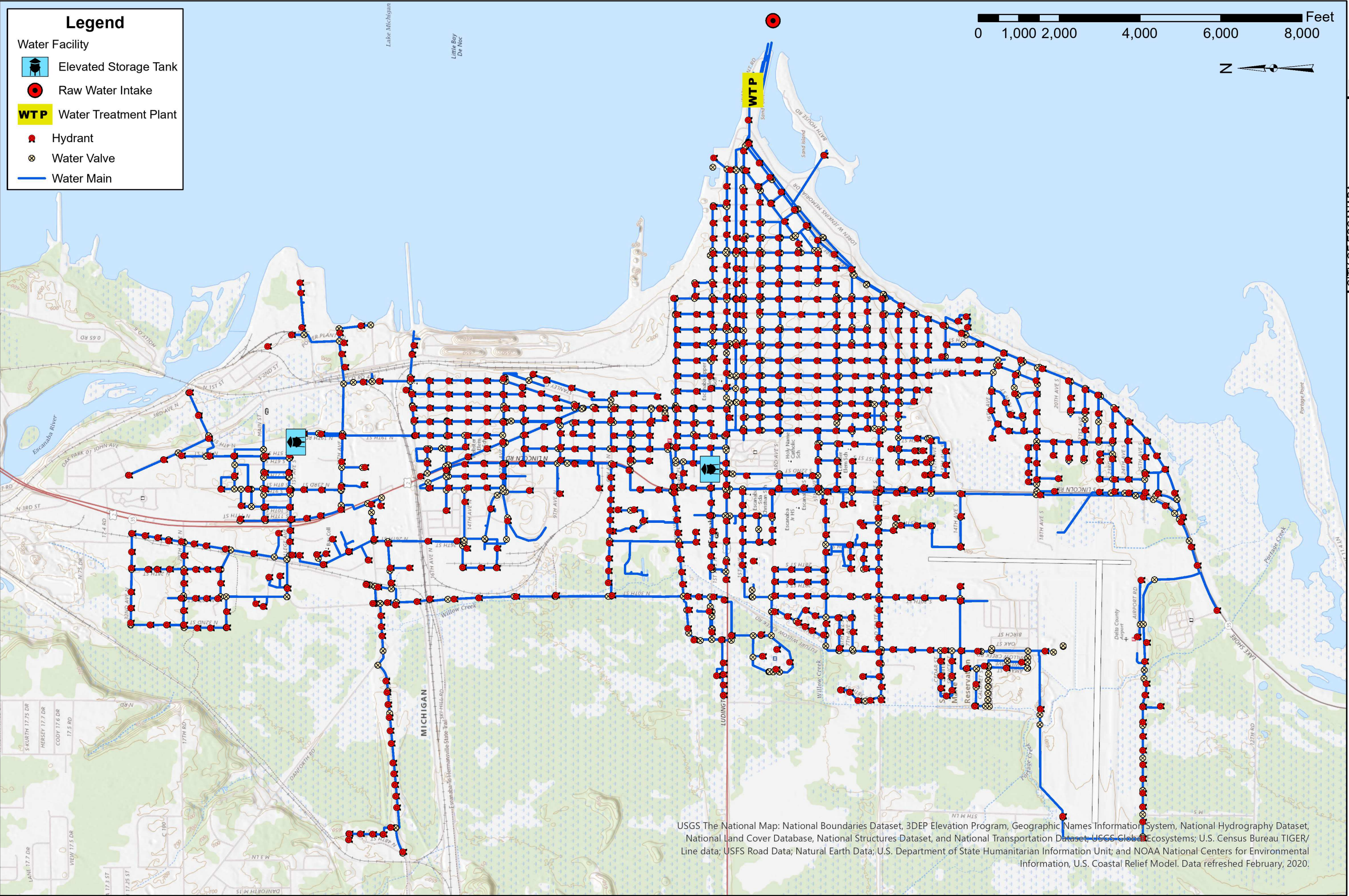
### Water Service Lines and Meters

Recent publicity related to lead and copper in drinking water is leading to important changes in distribution system operation and management. Lead and Copper levels in the City are well below EPA requirements and the City is doing a very good job managing this aspect of the treatment. The City is in the process with identifying and removing lead goosenecks/connected galvanized services. Figure 8 outlines the suspected lead-impacted services in red.





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### Legend

- Elevated Storage Tank
- Raw Water Intake
- Water Treatment Plant
- Hydrant
- Water Valve
- Water Main

0 1,000 2,000 4,000 6,000 8,000 Feet

USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.



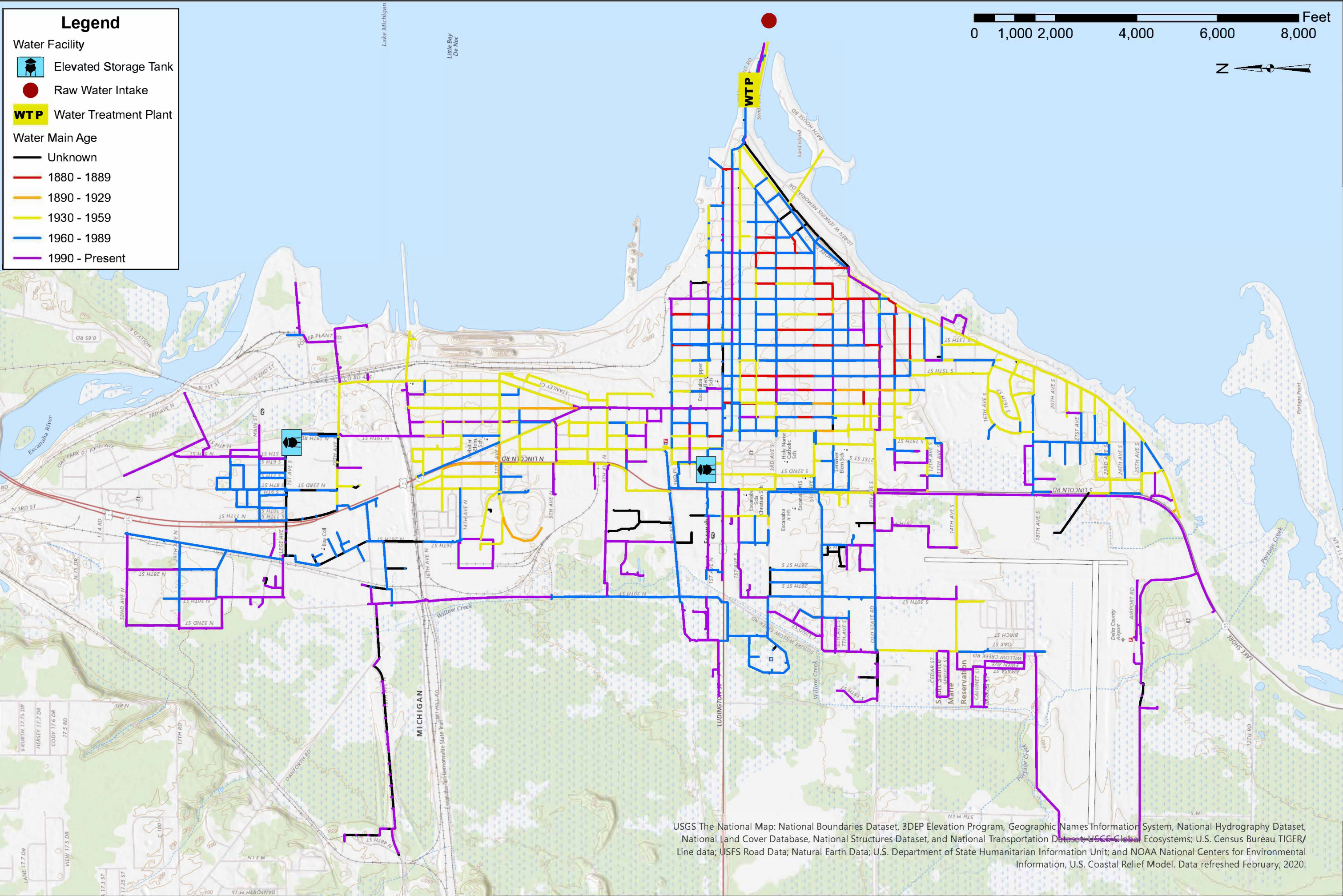
CITY OF ESCANABA  
 PROJECT: 20-0023  
 DELTA COUNTY, MICHIGAN

FIGURE 4. WATER DISTRIBUTION SYSTEM





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CITY OF ESCANABA  
PROJECT: 20-0023  
DELTA COUNTY, MICHIGAN

WATER DISTRIBUTION SYSTEM  
WATER MAIN AGE

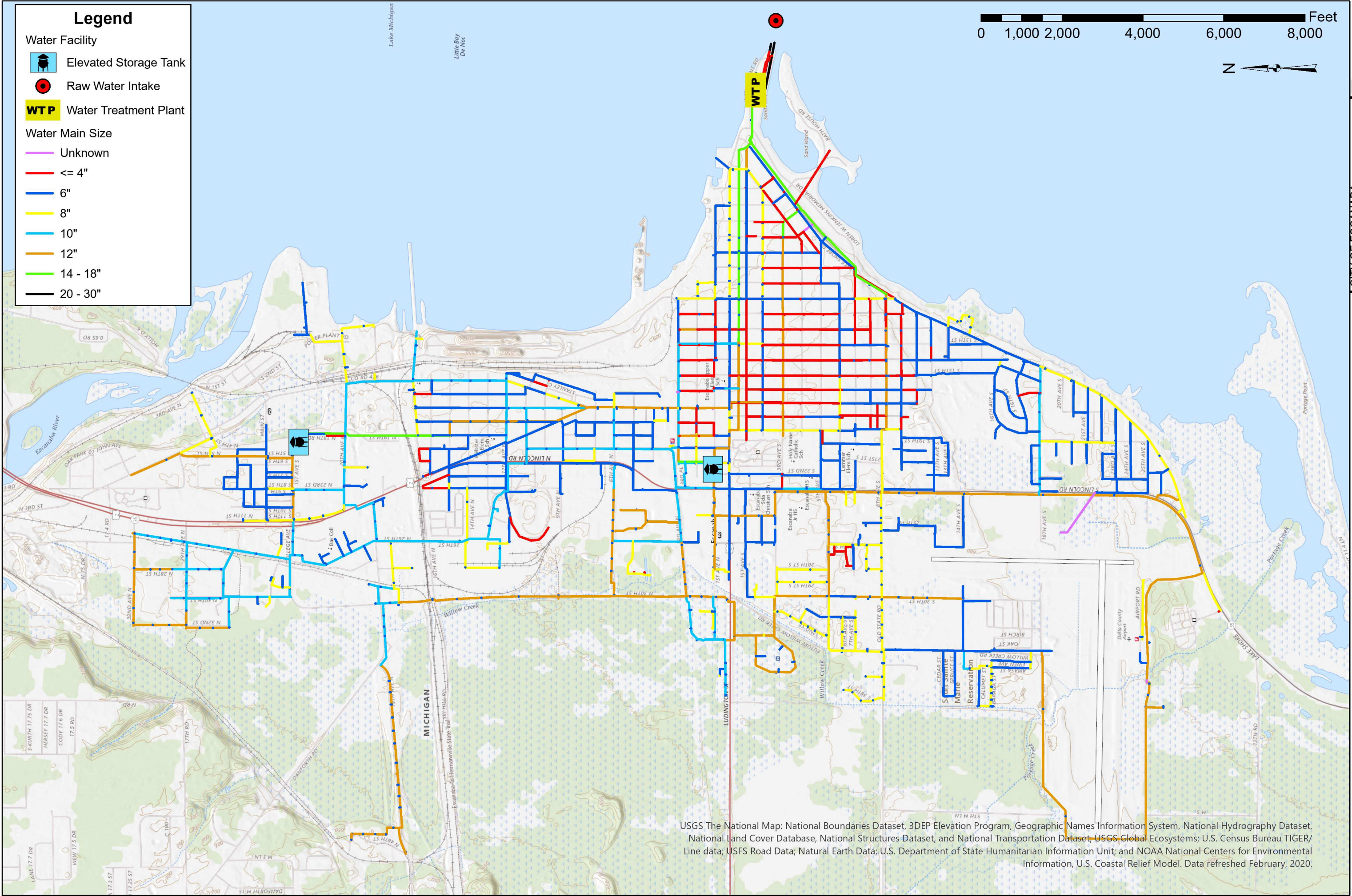
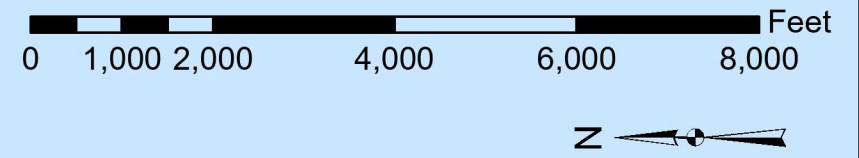




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### Legend

- Water Facility**
  - Elevated Storage Tank
  - Raw Water Intake
  - Water Treatment Plant
- Water Main Size**
  - Unknown
  - ≤ 4"
  - 6"
  - 8"
  - 10"
  - 12"
  - 14 - 18"
  - 20 - 30"



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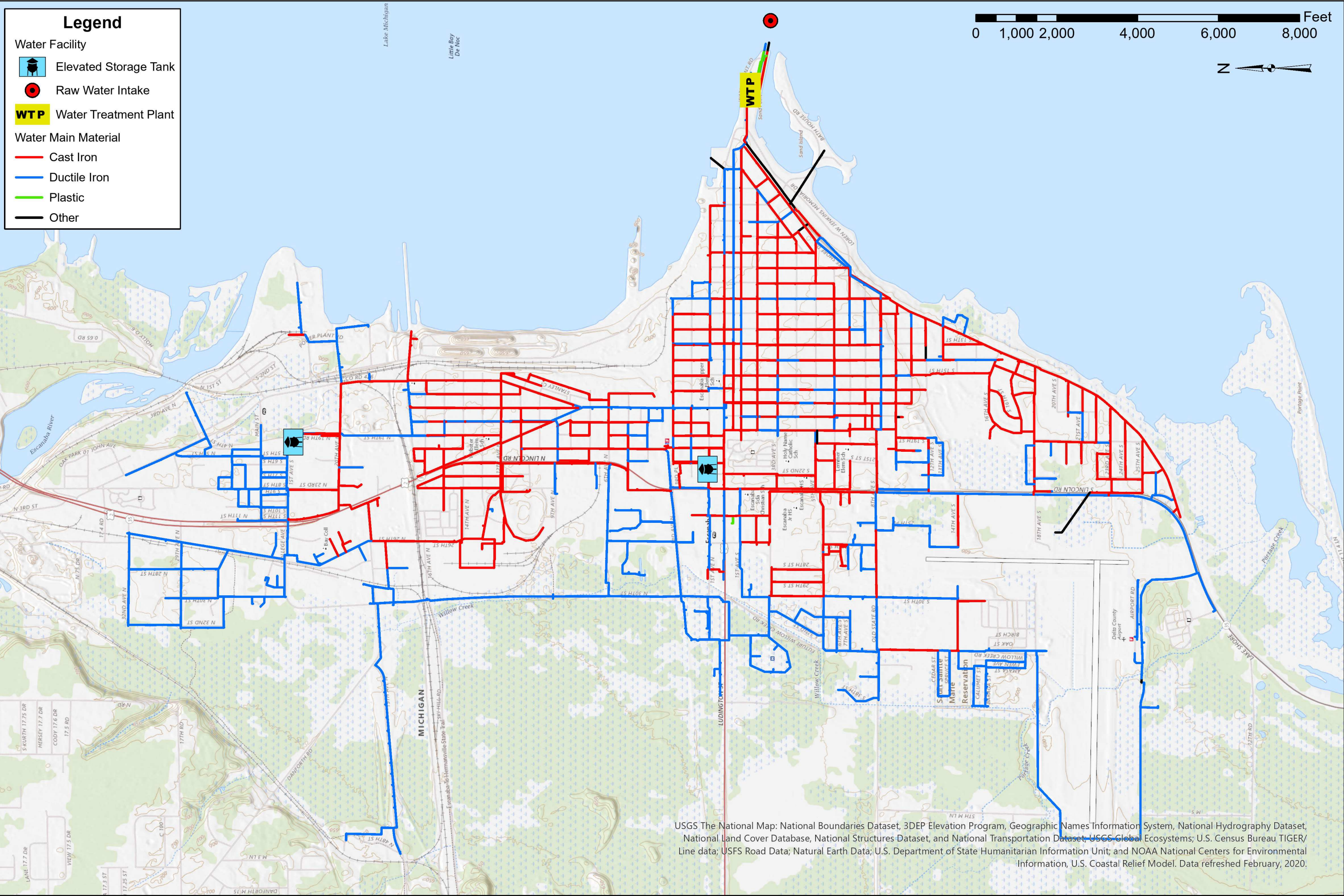
CITY OF ESCANABA  
**PROJECT: 20-0023**  
 DELTA COUNTY, MICHIGAN

**WATER DISTRIBUTION SYSTEM**  
**WATER MAIN SIZE**





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**Legend**

**Water Facility**

- Elevated Storage Tank
- Raw Water Intake
- Water Treatment Plant

**Water Main Material**

- Cast Iron
- Ductile Iron
- Plastic
- Other

0 1,000 2,000 4,000 6,000 8,000 Feet



CITY OF ESCANABA  
PROJECT: 20-0023  
DELTA COUNTY, MICHIGAN

**WATER DISTRIBUTION SYSTEM  
WATER MAIN MATERIAL**

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### Legend

#### Water Facility

Elevated Storage Tank

Raw Water Intake

Water Treatment Plant

Water Main

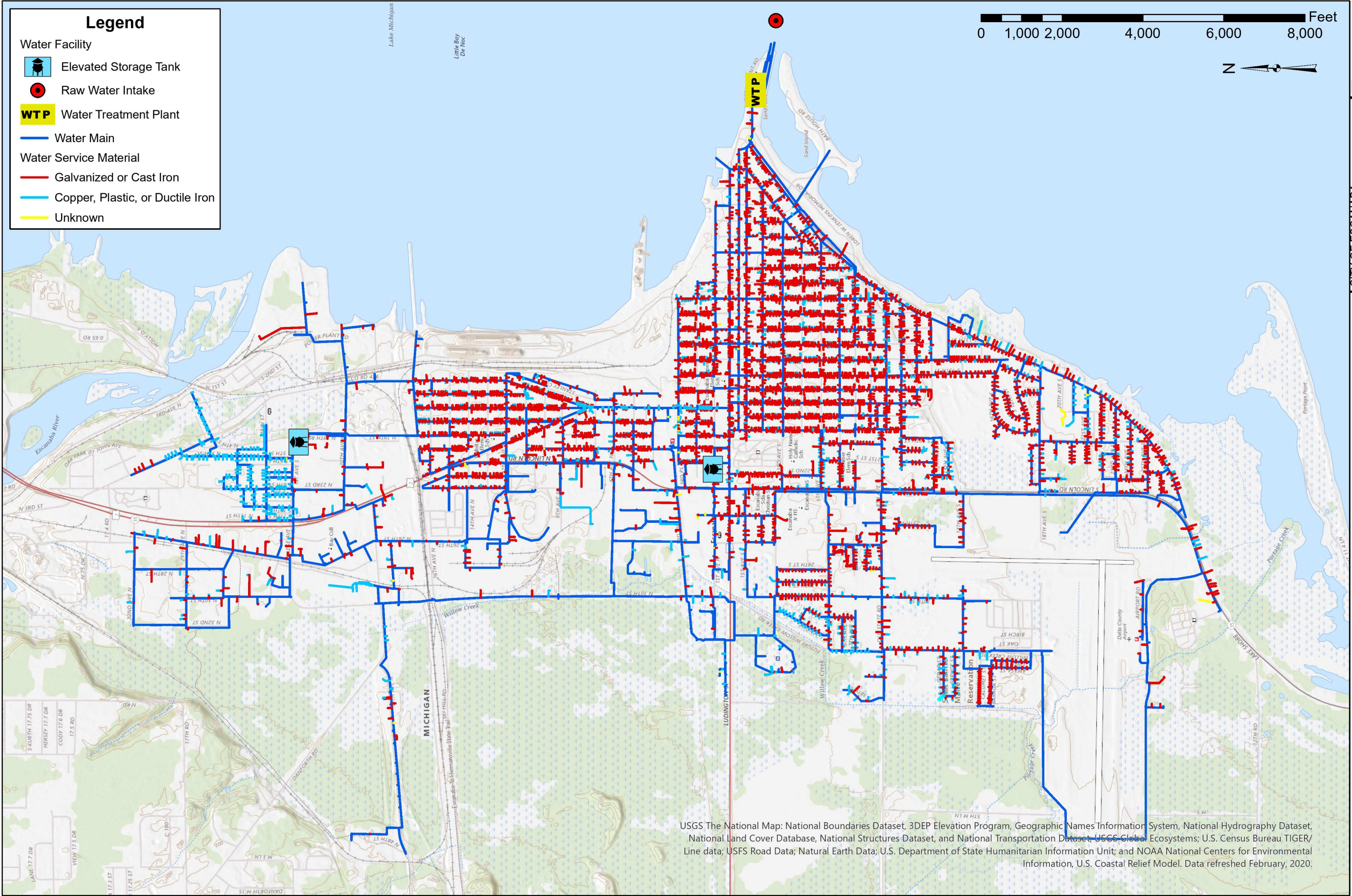
#### Water Service Material

Galvanized or Cast Iron

Copper, Plastic, or Ductile Iron

Unknown

0 1,000 2,000 4,000 6,000 8,000 Feet



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.



CITY OF ESCANABA  
PROJECT: 20-0023  
DELTA COUNTY, MICHIGAN

WATER DISTRIBUTION SYSTEM  
WATER SERVICE MATERIAL



## Summary of Project Need

Reliable operation of water distribution lines within the City of Escanaba's utility systems is imperative to protect the health and safety of the City's citizens and visitors. Traditional lead and cast iron components may expose users to unsafe levels of exposure. Deficient water mains can waste treated water and permit contamination of treated drinking water. Unplanned failures and downtime during repairs affects the ability of the distribution system to safely and adequately serve the system users.

The state of Michigan recently changed its lead and copper drinking water rules to require water service material identification and possible replacement. The City must absorb replacement costs for service lines on privately owned land to the meter within each house.

A large portion of Escanaba's original water pipes and structures are at least 90 years old and pipe and joint materials are not up to modern standards. Leaking joints, structural problems, and capacity issues require increasing operation, maintenance, and repair expenditures. Many older hydrants are 4-inch diameter, raising questions about their effective fire capacity. As these repairs and replacements are made, the City is lawfully required to replace all discovered lead-impacted service lines.

## Compliance with Drinking Water Standards

The City is in compliance with the drinking water standards as defined in the Administrative Rules for Act 399 and has no record of acute violation or non-compliance with regulations. However, periodic Sanitary Survey reports have suggested several of the improvements included in the alternates.

## Orders or Enforcement Actions

The City does not currently have any court or enforcement order against it.

## Drinking Water Quality Problems

The City has maintained high water quality.

## Projected Needs for the Next 20 Years

The Capital Improvement Plan for the City currently includes water projects allocated over ten year periods and can be found in Appendix D (developed as part of the 2016 Capital and 2018 Asset Management Plans, as amended in 2020).

Inventory efforts indicate that a significant amount of water main is older than 75 years. Accumulated debris in older pipe may prevent proper operation of valves, as it may wedge in the valve seat and prevent a proper seal. This could limit the ability of the City to develop a proper operations and maintenance valve exercising schedule in the future. Water main that is undersized and very old may be considered for replacement as part of this project.

#### Exploratory Well Investigations/Well Site Selection/Test Well Drilling Procedures

This project will not require exploratory well investigation or site selection because existing water sources are providing high quality water within a regional network.



## ANALYSIS OF ALTERNATIVES

The City has invested in regular maintenance, asset management, and capital improvements planning for their water treatment and distribution system. This Project Plan examines several alternatives for development in the next five to twenty years.

### Potential Alternatives

#### No Action

The City currently maintains high quality water treatment and distribution, including many assets that have extended beyond their design life because of excellent maintenance. Without making capital improvements, preventative maintenance will transition to managing increasingly expensive and less predictable failures and inefficiencies. Fractured and damaged coatings throughout the water system may be patched, but ultimately will allow leaks and irregular corrosion. This alternative would also involve addressing aging pipeline issues on an emergency basis as deficiencies surface rather than implementing proactive preventive and strategic improvements. Pipeline capacity and reliability would continue to deteriorate.

#### Optimum Performance of Existing Facilities

The City has been working toward optimizing its water system for many years. Water issues now facing the City will require repair and/or replacement of aging pipelines. Optimization of Existing Facilities is an ongoing effort at the City. The City maintains detailed records of asset management, budget, and capital improvements, and has historically been able to reduce required man-hours at the plant from three shifts to two. Based on evaluations of age, reliability, and treatment performance, the City is working as efficiently as possible with existing facilities and a large capital investment will be necessary for further improvement.

#### Regional Alternatives

The City of Escanaba WTP serves the City limits of Escanaba and a small portion of Wells Township adjacent to the north limits. The nearest distribution system is in the City of Gladstone. This is seven miles away with one large river crossing, the Escanaba River. Near term development by Hannahville Indian Community north of the Escanaba River and long term needs in the City of Gladstone have potential to increase demand in the future. At this time, it is not considered feasible for Gladstone to be serviced from Escanaba and for Escanaba to plan to service the City of Gladstone. The City believes the existing regional service district can be somewhat expanded, but no neighboring facility can provide an adequate supply of water for the City of Escanaba. Rendering this alternative not a feasible choice.

## Principal Alternatives

### Alternative 1: No Action

Not implementing a corrective measures project at this time while attempting to correct deficiencies in the system over time as maintenance budgets will allow.

### Alternative 2: Replacement of Water Main and Lead Impacted Water Services, and Upgrades to South Water Tank

Replacement and upgrading where required of over 8,000 ft of water main prioritized as to condition via City records, City asset management and capital improvement plan, and personnel knowledge; this includes over 600 lead service line replacements, inclusion of looping throughout the City for increased water quality, and improvements to the South Eskimo Water Tank to maintain compliance to current drinking water standards.

## PRINCIPAL ALTERNATIVES

### Monetary Evaluation

The construction costs (see Table 4) on the next page used in this analysis are based on previous work done in Escanaba and neighboring communities. Costs have been adjusted based on ENR index and typical engineering and administrative fee rates.

For detailed water main replacement, please see Appendix A for a complete list of linear feet of pipe to be replaced and the construction costs that are associated with each street. Bid tabulations were compared and averaged to yield unit costs basis tables for main replacement. These unit prices were then applied to pipe length in the various priority levels, producing a final unit price determination table. Water main in Priority 2 are considered to be “wish list” items if budget allows for additional blocks of water main replacement. As part of the five-year capital improvements for the City, the City has incorporated the water main in the US2 corridor through the City estimated at \$5.5 million; this is to coincide with the upcoming MDOT construction project.

An average cost per lead service line replacement (on average 60 lineal feet) from the 2022 DWSRF bidding in the City of Escanaba was used for estimating replacement of water services in this project and escalated for a total of \$16,000 per full water service replacement. These costs are included in the total construction cost provided in the following table and are broken out for budgeting purposes. Coordination of LSLR work in areas of on-going construction such as water main replacement in this project and sewer main replacement under the 2023 CWSRF Project Plan will aim to reduce restoration costs.

The South Eskimo Water Tank was inspected in 2022 by Dixon Engineering (see Appendix D) and found the current overflow pipe is non-compliant. This project will also route the overflow pipe to direct the water to a storm drain connecting to the storm system. The surrounding valving and pipes will also be replaced during excavation.

Table 4. Construction Cost Estimate

Label	Location	Length (ft)	Cost
<b>Priority 1</b>			
W1	South Water Tank Improvements	500	\$618,400
W2	2nd Ave N (N 18th to 19th St)	360	\$305,900
W3	N 11th St (2nd to 3rd Ave N)	500	\$644,200
W5	S 2nd St (Ludington ST to 1st Ave S)	450	\$382,300
W6	2nd Ave S (S 8th to 9th St)	450	\$557,700
W8	S 7th St (2nd to 3rd Ave S)	520	\$604,700
W9	S 6th St (2nd to 3rd Ave S)	520	\$481,900
W12	S 11th St (5th to 6th Ave S)	475	\$574,100
W13	S 10th St (5th Ave S to Lake Shore Dr)	1,850	\$1,862,200
W15	6th Ave S (S 9th to 10th St)	450	\$470,000
W16	8th Ave S (S 16th to 17th St)	350	\$351,900
W19	S 4th St (1st to 2nd Ave S)	410	\$373,700
W20	2nd Ave N (N 11th to 13th St)	780	\$739,700
W21	2nd Ave N (N 16th to Stephenson Ave)	420	\$362,700
LSLR	Additional LSLR of 450 Services	0	\$7,740,000
<i>Total</i>		<i>8,035</i>	<i>\$16,069,400</i>
<i>Lead Service Line Replacement of 611 Services (of Total Cost)</i>			<i>\$10,509,200</i>
<b>Priority 2 (Wish List)</b>			
V4	S 17th St (Ludington St to 2nd Ave S)	900	\$853,400
V7	S 9th St (2nd to 3rd Ave S)	520	\$674,800
V10	S 12th St (3rd to 5th Ave S)	1,050	\$1,390,200
V11	Ogden Ave (S 7th to 4th St)	1,500	\$1,422,600
V14	S 9th St (5th to 6th Ave S)	500	\$538,900
V17	10th Ave S (S 15th St to Lake Shore Dr)	1,800	\$1,882,100
V18	S 4th St (Ogden Ave to Lake Shore Dr)	400	\$332,000
V22	Buck Inn Loop	3,700	\$2,720,300
V23	N 30th St (Danforth Rd to College Ave)	2,400	\$1,147,700
<i>Total</i>		<i>12,770</i>	<i>\$10,962,000</i>
<b>US2 Corridor (Future)</b>			
MDOT	US2 Corridor	13,700	\$5,507,200
<i>Total</i>		<i>13,700</i>	<i>\$5,507,200</i>

A present worth analysis is also included in Table 5 below for Priority 1. Because Escanaba is a disadvantaged community, they are eligible for a 40-year loan/bond term. Alternative 2 is proposed as one project under one 40-year loan. The bond schedule and operating budget can be found in Appendix A. The anticipated savings in operating expenses is represented in Appendix A as negative “O&M impacts.” Likewise, the “no action” alternative indicates escalating expenses as utility rates increase and energy efficiency decreases. O&M impacts presented reflect decreased costs in City budget for thawing water services/main and replacing broken water services. Salvage value is only considered for the construction cost of the lead service and water mains.

Table 5. Present Worth Analysis

Item	Description	Alternative 1: No Action	Alternative 2: Replacement
1	Construction Costs	\$0	\$16,069,400
2	Engineering, Legal, Administration, Planning, and Contingencies	\$0	\$3,929,000
3	Total Capital Cost	\$0	\$19,998,400
4	Total Annual O&M Change	\$0	-\$10,000
5	Present Worth of O&M Costs	\$0	-\$312,000
6	Salvage Value	\$0	\$7,999,360
7	Present Worth of Salvage Value	\$0	\$8,624,000
8	Total Present Worth	\$0	\$11,686,400

Table row description for Table 5:

1. Construction costs developed by AMP and detailed in Appendix A.
2. Project support fees based on a percentage of construction costs; typical rate 30%. Table 7 further breaks this total cost down for Alternative 2.
3. Capital costs are sum of 1 and 2.
4. O&M costs are based on the full budget, adding or subtracting impacts at the WTP and throughout the distribution system.
5. Present value of O&M costs for 20 years at -0.25% (per 2022 USDA/SRF guidance).
6. Land considered permanent, 50-year life for piping and valves, 50-year life for structures, 20-year life for repairs, and 20-year life for equipment.
7. Present worth of line 6 at -0.25% interest for 20 years.
8. Total of items 3 and 5 minus 7.

## Environmental Evaluation

The City has considered the impact of these recommended improvements. The areas most affected have already been impacted by the original construction of the facilities. The necessary disruption due to construction must be performed with conservation in mind. EGLE has not classified the project as either equivalency or non-equivalency; a preliminary environmental review has been completed. Please refer to Appendix C for more detail.

## Cultural resources

The City of Escanaba has identified a number of cultural priorities and resources, including the historic downtown area, and recreational opportunities on the lakefront. These facilities will require lead and galvanized pipe replacement to remain in operation. Correspondence with the State Historic Preservation Office and Tribal Historic Preservation Office relative to this Project Plan can be found in Part 2 and 3 Appendix C, respectively. No long term impact is expected.

## The Natural Environment

- **Climate:** Climate in the Escanaba area along the shore of Little Bay de Noc and Lake Michigan is semi-marine in nature. The large water bodies temper the winter cold and summer heat (except when the bay is frozen). Average annual temperature is 43°F, generally ranging from 15° to 66°F. Average seasonal rainfall ranges from 26 to 37 inches. Average seasonal snowfall is 51 inches.
- **Air quality:** Other than temporary impacts from running construction equipment and fugitive dust, air quality will not be affected by the project. Construction related dust will be minimized through contract enforcement of mitigation measures such as watering.
- **Wetlands:** A wetland map with the service area is shown in Part 16C of Appendix C. Although wetlands are in the outlined area, it is not anticipated that there will be any activity in these wetland nor negative impacts to the wetlands.
- **Coastal Zone:** The City of Escanaba is located along the shorelands of Little Bay De Noc of Lake Michigan. It is not anticipated that the project plan construction or operation will affect any shoreland included in the Coastal Barrier Resource System. A map showing the project location in the vicinity of any shoreland included Coastal Barrier Resource System is in Part 16D of Appendix C.
- **Floodplains:** Maps of the City's service area is outlined on the FEMA floodplain maps in Part 16B of Appendix C. Although some of the floodplain areas are within the service area, it is not anticipated that the construction of this project will permanently affect the floodplains. Construction will be in previously disturbed and developed areas.

- Natural or Wild and Scenic Rivers: There are no designated natural or wild and scenic rivers in the study area. Maps are shown in Part 14 of Appendix C.
- Surface Waters: The City itself has no natural or artificial water bodies. The study area is however dominated by Little Bay de Noc and the Escanaba and Ford Rivers
- Agricultural Resources: The City of Escanaba has no prime farmland; a map of the existing land use from the City's 2016 Master Plan is shown in Part 5 of Appendix C.
- Sensitive Species and Habitat: Sensitive habitat in the study area is centered on Little Bay de Noc and nearby rivers and associated shoreline/wetlands. There are several listed threatened or endangered species within Delta County; correspondence with State and Federal Endangered species coordinators can be found in Part 10 of Appendix C.

### Mitigation

Planned improvements are not likely to incur any negative environmental impacts. No mitigation will be required beyond typical soil erosion and sediment control measures.

### Implementability and Public Participation

The required replacement of water service lines on private property is a concern for City of Escanaba residents. Replacing all galvanized services by the year 2050 will require an exhaustive use of public financing and effort. Concerns from citizens, City Council and City employees have motivated this application for DWSRF lending.

### Technical Considerations

The proposed work will be an extension of construction materials and methods used for many years around the City utilizing either conventional directional drilled/pulled or open-cut installation.

### Residuals

No proposed alternative will generate residuals.

### Contamination

The proposed water improvements must consider site contamination and material contamination. The project limits reflect a commitment by the City of Escanaba to avoid potential contaminated sites.

### New/Increased Water Withdrawals

No proposed alternative includes new or increased water withdrawals.



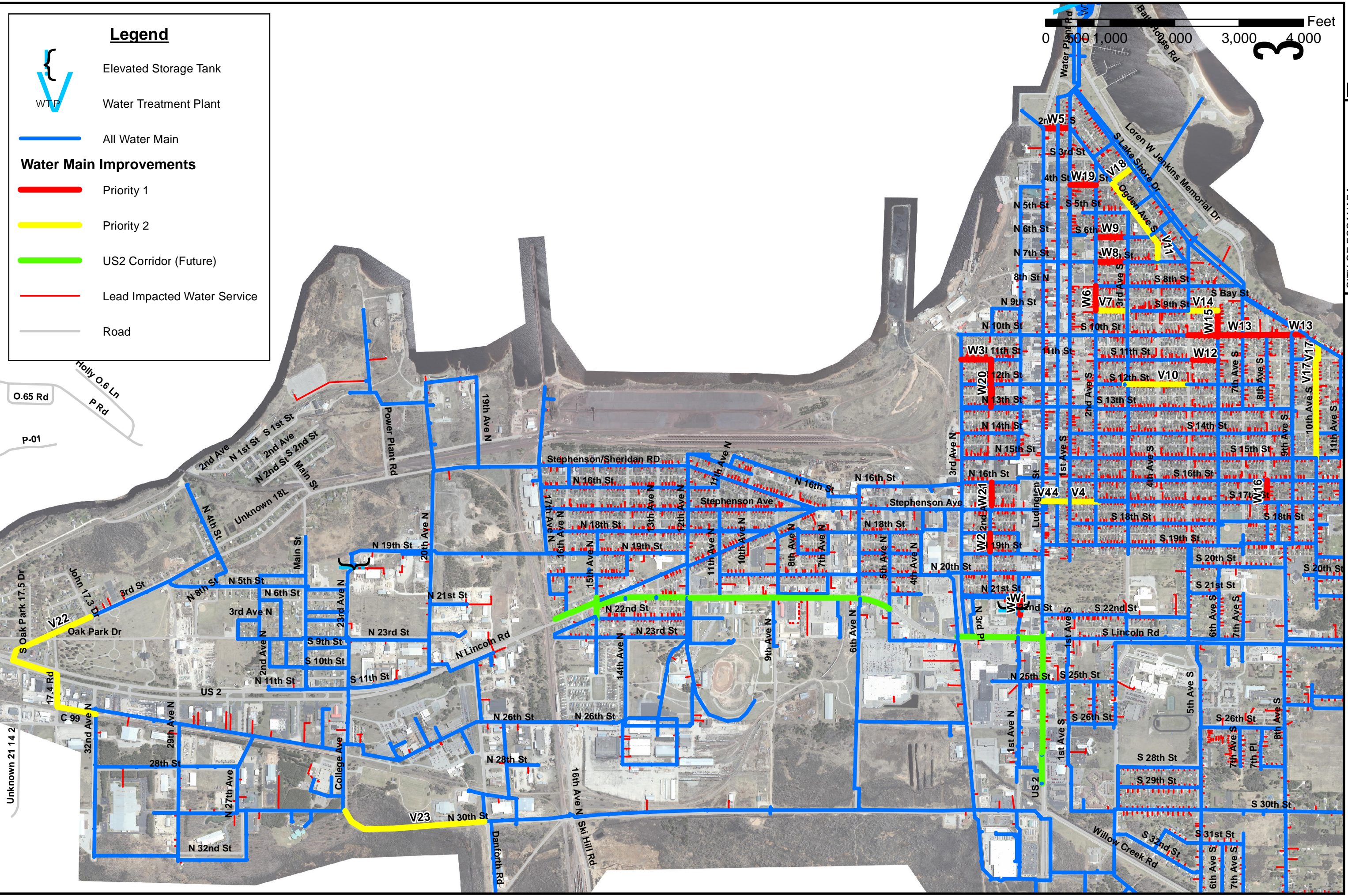
## SELECTED ALTERNATIVE

The option to Replace Water Main and Lead Impacted Services (Alternative 2) is the selected alternative based on positive impacts and limited options. Due to the nature of the existing infrastructure and the scope of the proposed project, replacement is the viable option. Water asset management efforts have shown an aging system that does not effectively serve the City. Design will meet current EGLE, AWWA, and local standards with planned mitigation of environmental issues developed during the design and permitting process. The City will ultimately own and operate the portions of the main line water distribution system where project funding is spent.

Figure 9 provides the water main replacement priorities. It is assumed that all lead impacted water services will be replaced along the water main improvement routes. Further lead impacted water service replacement will be prioritized using Figure 10. Areas where looping will be added include V18, W19, W20, W21, V22, and V23. In the areas of W19, W20, and W21, these are undersized (one-to-two-inch) galvanized water lines feeding multiple houses; these lines will be upgraded to the standard eight-inch water main tying in to water main on each sides for looping and increased water quality while replacing lead impacted water services.



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**Legend**

- Elevated Storage Tank
- Water Treatment Plant
- All Water Main

**Water Main Improvements**

- Priority 1
- Priority 2
- US2 Corridor (Future)
- Lead Impacted Water Service
- Road

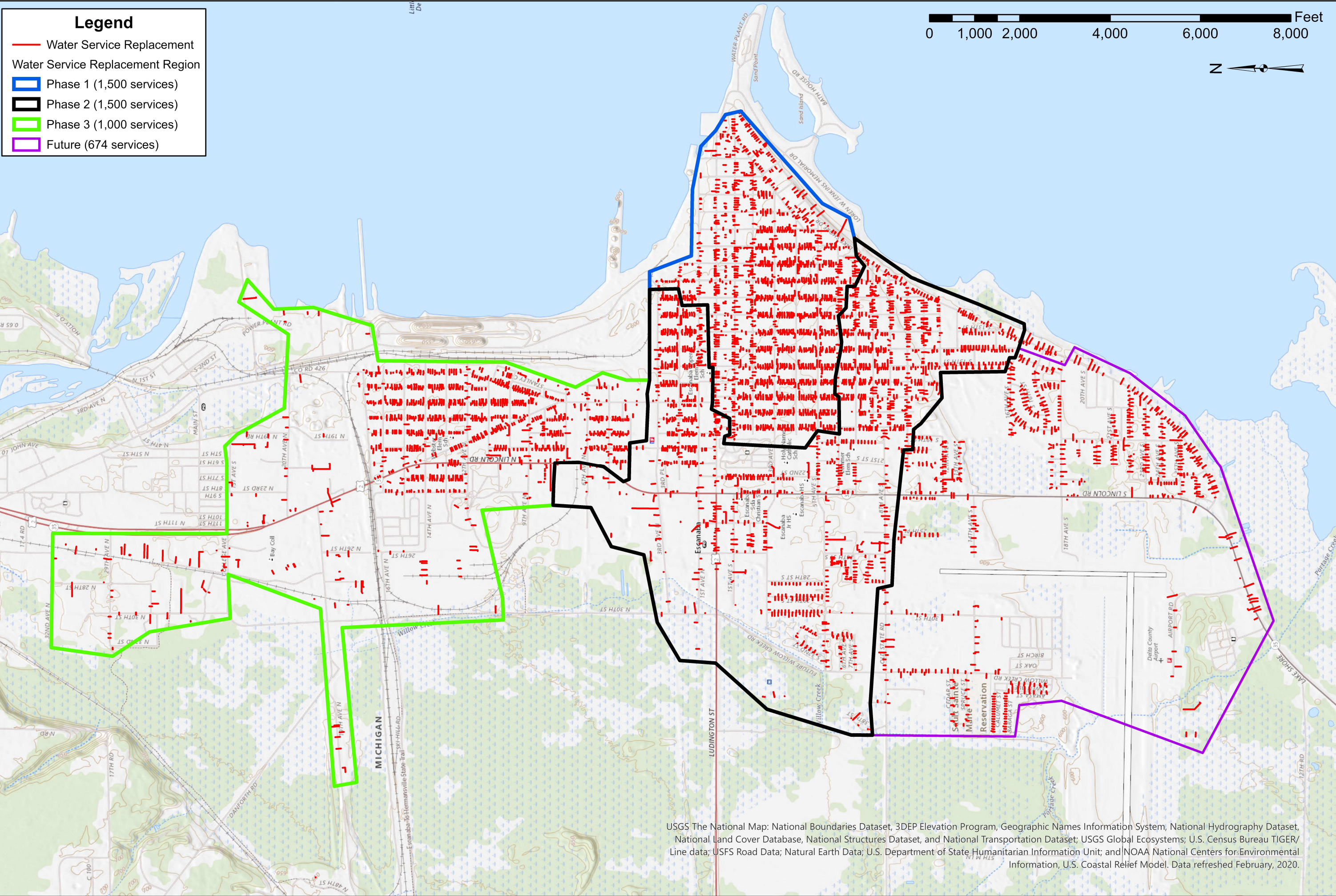


**FIGURE 9: PROPOSED PROJECT PRIORITIES  
WATER MAIN IMPROVEMENTS**



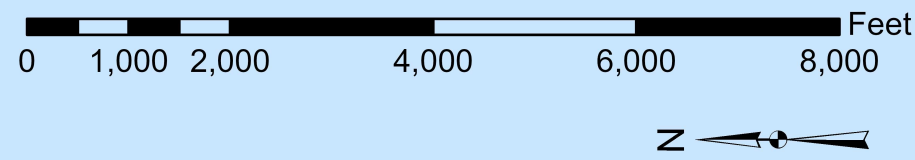


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### Legend

- Water Service Replacement
- Water Service Replacement Region
- Phase 1 (1,500 services)
- Phase 2 (1,500 services)
- Phase 3 (1,000 services)
- Future (674 services)



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed February, 2020.



CITY OF ESCANABA  
**PROJECT: 20-0023**  
 DELTA COUNTY, MICHIGAN

**WATER REPLACEMENT REGIONS  
 BY PRIORITY**



## Design Parameters

The work completed as part of this project will improve the City of Escanaba's ability to meet drinking water standards, including corrections to meet ASTM, AWWA, and ANSI/NSF standards (60 or 61). Water main will be sized to meet 10 State Standards and AWWA, and in some areas upsized to 8-inch or looped to provide adequate flushing velocity for improved water quality and redundancy.

Water services must be free of lead components or galvanized materials likely to have been affected by lead in compliance with the 2011 Reduction of Lead in Drinking Water Act and State of Michigan Lead and Copper Rule. Each water service should be individually metered. All galvanized and lead pipe segments from the water main to the first shut off or to the first 18-inches into the house will be replaced in these water services with copper. Water services that were not originally installed deep enough (with six feet of cover/below frost depth) will be installed deeper or insulation will be used to prevent the pipes from freezing.

## Hydrogeological Analysis

Because the proposed improvements do not include any changes to water source wells, no hydrogeological analysis is included in this report.

## Finalization of Well Design

No well design is necessary for the proposed water system improvements.

## Maps

The following is a summary of the figures presented in the report:

- Figure 4. Existing Water System
- Figure 5. Water Main Pipe Age
- Figure 6. Water Main Pipe Size
- Figure 7. Water Main Material
- Figure 8. Water Service Material
- Figure 9. Proposed Project Priorities – Water Main Improvements
- Figure 10. Water Replacement Regions by Priority

### Schedule for Design and Construction

The schedule for design and construction is presented in Table 6.

Table 6. Project Schedule

Item	Target
DWSRF Application Submittal	Summer 2023
DWSRF Acceptance	Summer 2023
Funding Commitment	Summer 2023
Start Design	Winter 2023
Land & Easements Acquisition	Not Applicable
Permits	Spring 2024
Advertise for Bids	Spring 2024
Funding Closing	Spring 2024
Contract Award	Spring 2024
Construction	Summer 2024
Substantial Completion	Fall 2026
Final Completion & Initiate Operation	Fall 2026

### Cost Estimate

A brief summary of planning, design, and construction costs is included below in Table 7 for Phase 1.

Table 7. Project Cost Summary

Item	Estimated Cost
Construction	\$16,069,400
Administration, Legal, Bonding, Permits, & Miscellaneous	\$190,000
Planning	\$15,000
Design	\$603,000
Bidding	\$49,000
General Engineering During Construction	\$354,000
Post Construction Services	\$57,000
Resident Project Representative	\$804,000
Additional Services – Design Related	\$89,000
Additional Services – Construction Related	\$177,000
Engineering Total	\$2,148,000
Contingencies	\$1,591,000
<i>Total Project Cost</i>	\$19,998,400

### User Costs

Table 8 demonstrates the impact on user rates that may be possible with a project of this size for Phase 1. This breakdown assumes a 40-year debt service on the bond at an interest rate of 1.875% (2023 interest rates). O&M is expected to decrease, but will be maintained at existing rate for conservative budgeting. Expected user rate impact is noted in Table 8 below:

Table 8. User Costs

Description	Value
DWSRF Loan Amount	\$19,998,400
Anticipated Interest Rate	1.875%
Term	40 Years
Annual Debt Service	\$715,125
Monthly Debt Service	\$59,594
Estimated System REUs	8,141
User Rate Impact / REUs / month	\$7.32

### Overburdened Community

A “Overburdened Community Status Determination Worksheet” is included with the final project plan submittal (see Appendix B). According to guidelines, the City does qualify as a significantly disadvantaged community considering their current and projected debt service, median household income, and user rates.

### Ability to Implement the Selected Alternative

The proposed improvements are within the City of Escanaba’s legal authority, managerial capability, and financial means. The City of Escanaba has extensive experience regarding replacement and rehabilitation within existing right-of-way or easements generated for previous projects. The City will need to follow EGLE guidance and local plumbing code regarding service replacements on private property. The City has experience from two past (and ongoing) lead impacted service line replacement projects to gain planning and implementation techniques from.

## ENVIRONMENTAL EVALUATION

EGLE has not classified the project as either equivalency or non-equivalency; a preliminary environmental review has been completed. Please refer to Appendix C for more detail.

### Historical/Archaeological/Tribal Resources

Construction of water system improvements is not anticipated to have any adverse effect on historical, archaeological, geological, or recreational areas. Excavation in previously unexcavated areas is very limited. As is standard with City utility projects, construction contracts will contain archaeological discovery procedures to be followed in the event of unanticipated discoveries.

### Water Quality

Neither surface water nor groundwater quality is expected to be adversely affected by the project. Mitigation measures to control construction run-off will be required by the contract documents. No water withdrawal or dewatering is necessary except for temporary dewatering during construction. Any required construction excavation dewatering will be monitored and on a level with typical construction activities in the area. Discharge water will be stilled if necessary as part of contract and permit required sedimentation control measures.

When individual projects are designed, contaminated areas will be avoided via utility routing where possible. When construction may infringe on impacted areas, a FOIA request for these sites will be made, EGLE permitting will be pursued if appropriate, and mitigation and safety measures will be required by contractor via construction documents.

### Land/Water Interface

No significant impact is expected on floodplain, wetlands, shorelands, or streams. No crossings of creeks or rivers are planned under the recommended project.

### Endangered Species

The project should have no impact on endangered species. If needed, mitigation measures will be coordinated with EGLE during the design process and permits pursued where needed.

### Agricultural Land

This project is unlikely to negatively impact or remove agricultural land or open space.

### Social/Economic Impact

The project will create short-term economic benefits in areas of construction employment and materials supply. No relocation of residents or businesses is expected to result from the project. Long-term human, social and economic impacts will be positive through increased efficiency, reliability, and capacity in area utility infrastructure. There are emotional and community benefits to water security, for example: reducing anxiety, improving gastrointestinal health and brain development, improving hygiene and quality of life.

### Construction/Operational Impact

Construction activity impacts will be short term and are not expected to be unusual for utility facility construction. Construction related dust will be minimized through contract enforcement of mitigation measures such as watering. Where applicable, contract documents will require construction methods and disturbed areas to be minimized regarding their impact to the site and neighboring areas. Details will be developed during the design and permitting process. Implementing the improvements will reduce overall system operation and maintenance efforts.

### Indirect Impacts

- Development: The project segments will take place on previously disturbed areas and should not induce changes in rate, density, or type of land development.
- Land Use: The project is not expected to change current land use patterns.
- Air and Water Quality: Air and water quality changes stemming from primary and secondary development are expected to be temporary and minor to non-existent.
- Natural Areas and Sensitive Features: It is anticipated that the project should have no impact on natural areas and sensitive features. Mitigation measures will be coordinated with EGLE during the design process and permits will be pursued as needed in these areas.
- Secondary Growth: Secondary growth is also not expected to be spurred by the project other than that affected by any well run and maintained utility system.
- Aesthetics: The project will produce no overall permanent damage to existing area aesthetics; all work is underground and the surface will be restored to previous state. Minor construction damage will be more than offset by - project restoration efforts.



- Resource Consumption: No additional or increased resource consumption will occur due to these projects other than during construction; material consumption during construction could not be considered significant or excessive. Fuel for operating construction equipment and various piping materials would be the primary materials consumed.

## MITIGATION MEASURES

Where adverse impacts due to installation of the recommended improvements cannot be avoided, mitigation measures will be implemented. Costs for mitigation measures were considered and included where applicable in project opinions of probable cost. Mitigation measures needed during construction will be included in construction contract documents.

### Short-Term Construction Related Mitigation

- **General Construction:** Construction problems anticipated include groundwater control and areas of inferior structural/pipe bedding and backfill soil material. These are normal occurrences with construction in the area and prior planning/design will create a situation where these problems will pose no significant difficulties for qualified contractors.
- **Construction Spoils:** Disposal of construction spoils in wetlands, floodplains, shorelines or other sensitive areas will be prohibited. It is anticipated that spoil disposal areas and methods will need to be permitted. All spoils will be disposed of off-site at an approved location.
- **Transportation Issues:** Any traffic disruptions that occur (such as equipment deliveries or construction related traffic) will be organized and controlled to minimize disruption of local, transient and emergency traffic. Construction related traffic will be regulated by construction contract language and City ordinances/policy. All needed barriers and signing will be in conformance with applicable MUTCD standards. Disruption is expected to be minor and localized to the construction sites.
- **Contaminated Soil:** If needed or discovered, contaminated soil and/or construction dewatering discharge will be planned and budgeted for with methods covered under project construction specifications. This project does not anticipate encountering contaminated soils or groundwater.
- **Wetlands:** The project segments will not infringe on any designated wetland areas.
- **Stream Crossings:** No stream crossings are anticipated under the proposed work.
- **Endangered and Threatened Species:** It is anticipated that the project should have no impact on natural areas and sensitive features. Mitigation measures will be coordinated with EGLE during the design process and permits will be pursued if needed in these areas.
- **Permitting:** Permitting will be obtained during the design process. Construction documents will require the contractor to obtain needed erosion control permits.

- **Safety:** All work will be required to comply with Federal, State and local laws governing activities, safeguards, devices and protective equipment. Minimum requirements are defined by the U.S. Department of Labor and the Michigan Occupational Safety and Health Act.
- **Dust and Noise:** Construction dust and noise will be required to be kept to a minimum. No on-site burning will be allowed. Use of water or other suppressants will be used to control fugitive dust and prevent violation of Rule 901 and contractors will be required to use gas engine muffled exhausts.
- **Erosion:** Soil Erosion and Sedimentation Control permits will be required for the project. Site-specific mitigation measures will be addressed during design and included in the construction contract documents. At a minimum, mitigation measures will include a silt fence as needed along the work site perimeter.
- **Restoration:** Damaged curbing, driveway and sidewalk surfaces will be restored to equal or better condition in accordance with best management practices. All disturbed site soil will be restored with topsoil, seed, fertilizer, and mulch.
- **Utilities:** Disruption of utilities during construction will be kept to the minimum necessary to allow new installations. Repairs will be made in a timely manner. Construction documents will require advance warnings and contain time limits.
- **Valuable Features:** Implementation of the selected alternative is not expected to significantly impact more extensive or valuable existing features such as mature vegetation.

#### Mitigation of Long-Term Impacts

- **General Construction:** The City does not expect any long-term impacts from the general construction activities.
- **Siting Descriptions:** Work will be confined to existing disturbed locations.
- **Operational Impacts:** Long-term operational issues will not be adversely changed by the projects; rather, operations should be enhanced through new more reliable equipment, structures, and general accessibility.

#### Mitigation of Indirect Impacts

- **Master Planning and Zoning:** Long range planning by the City was reviewed and all impacts take place within the developed City streets and would have no effect on planning and zoning in the community. The work will not impact historical features, agricultural land, or sensitive features.

- Ordinances: Local ordinances are in place regarding minimum construction and operation standards and site erosion control. Wetlands, floodplains, and other sensitive habitats are protected by State laws and permitting procedures.
- Land Requirements: None needed for the recommended alternatives.
- Socio-economic and Environmental Justice Issues: Costs and less tangible impacts such as construction traffic would have no disproportionate impact any area group. Impacts are spread evenly amongst community collection system users.
- Noise: Construction dust and noise will be kept to a minimum via construction contract requirements.

## PUBLIC PARTICIPATION

### Public Meeting

The Escanaba water system needs and generic potential fixes have been openly noted at several City Council meetings over the past decade. The Council has held several open council meetings over the past years where there were discussions and approved studies both at the WTP and regarding the distribution system.

### Public Meeting

A public meeting on the information presented in this report was held during a regular City Council meeting on April 6, 2023. A written transcript is included in Appendix E.

### Public Meeting Advertisement

An advertisement was placed in the Escanaba Daily Press on March 20, 2023 to the public meeting, advertising the formal public meeting. Simultaneously to the advertisement publication, copies of the project plan were made available to the public at the Water Treatment Plant, at City Hall, and on the City's website. Appendix E has the advertisement copies.

### Public Meeting Summary

A full transcript of the public meeting is available in Appendix E. Comments are summarized in Appendix E with a full transcript. No written comments were received prior to the public meeting.

### Adoption of the Project Plan

Agency and/or Owner preliminary review comments were incorporated into the final version of this Project Plan. The plan was adopted by the City Commission on April 6, 2023