

City of St. Ignace

Phase I – Water System Improvements

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

21-0084

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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
Cl	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 ₃ -N	Ammonia Nitrogen	WWTP	Wastewater Treatment Plant
NPDES	National Pollutant Discharge Elimination System		
NPV	Net Present Value		
NRWA	National Rural Water Association		

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SUMMARY

Project Background

This study (Project Plan) was authorized by the City of St. Ignace via execution of a letter proposal. The purpose of the Project Plan is to evaluate needs and recommend alternatives for improvements to the City's water system.

The City of St. Ignace is the responsible entity for the municipal water treatment plant (WTP) serving the City and the adjacent areas of Moran and St. Ignace Townships. The entire service district lies within Mackinac County in Michigan's Upper Peninsula. The City's facilities include a 500,000 gal in-ground concrete treated water storage tank at the WTP, one 300,000 gal steel standpipe with booster pumping at Marley Street, a 100,000 gal elevated storage tank on Second Street, and a 100,000 gal elevated storage tank in Evergreen Shores; these facilities and the distribution system are currently owned, operated, and maintained by the City. The distribution system includes about 200,000 ft of water main and includes hydrants, valves, and services. The City's water source is Lake Huron near the Straits of Mackinac.

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 the water distribution system within the City of St. Ignace's utility systems are imperative to protect the health and safety of the City's citizens and visitors. The City has been operating and maintaining the WTP effectively, but there are areas of escalating deterioration and obsolescence that require a larger, preventative replacement and rehabilitation effort. Operators, consultants, and regulators have collaborated on the proposed solutions for these areas of work.

Reliable operation of the water distribution lines within the City's utility systems directly impacts the health and safety of the City's citizens and visitors. Reliability and down-time during repairs of deficient water mains affects the ability to provide safe drinking water and poses maintenance issues. Many older water mains in the system have encrusted interiors to some degree which also adversely affects pressures in the system with decreased flushing velocity.

The bulk of the City's water lines are over 70 years old. Pipe and joint materials are not up to modern standards. Leaking joints, structural problems, and capacity issues require increasing operation, maintenance, and repair expenditures.

Corrections are made as failures occur which is not a financially responsible method of system asset management nor of operation/maintenance planning. Water main pipe material, insufficient looping, and inadequate shut-off valves increase repair time and inconvenience time to system users as well as diminished water quality.

Analysis of Alternatives

The principal alternatives are being considered as noted below:

Alternative 1: No Action

The WTP may continue to maintain operations, but escalating deterioration of existing equipment and structures risks inefficiency, additional hazards, and control failures. 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: Upgrade Existing Facilities and Replacement of Water Main

The rehabilitation of existing treatment systems can be done with relatively minor additions, modifications, and replacements. Replacement and upgrading where required of water lines over 70 years old prioritized as to condition via City records and personnel knowledge. This alternative includes emphasis on lines which coincide with aging or deficient water or sewer lines to allow combining projects and maximizing use of project funding for construction while minimizing environmental effects and disruption to the area citizens. Water main will be sized to meet 10 State Standards and AWWA. Routes where both water main and sanitary sewer replacements are proposed (plus maintaining service to customers) will require full road width reconstruction with curb and sidewalk replacement driven by the number of services (both water and sewer) to be replaced and reconnected. Any lead or lead impacted water services found during construction will be replaced.

Selected Alternative

Upgrade of Existing Facilities and Replacement of Watermain is considered the preferred alternative.

The fundamental effectiveness of the existing WTP and storage systems is not in need of major changes, but minor improvements can prevent decline and improve efficiency of current operations.

The recommended treatment option for St. Ignace is to Upgrade Facilities or rehabilitate unit processes, which includes:

- Replacement of the shorewell isolation valve with improvements to the pump station itself
- Upgrade low service pumps with variable frequency drive (VFD) controllers
- Rehabilitation of flocculation cells and drive replacement
- Rehabilitation of filter bed No. 2, including replacement of filter media
- Upgrade high service pumps with VFD controllers
- Coating of the existing TWST at the WTP and elevated storage tanks throughout the City
- Soda ash feed improvements, ensuring distribution system corrosion control efforts are maintained
- General WTP improvements and equipment upgrades to promote reliability, sustainability, and energy efficiency
- Replacement of existing lighting fixtures for more energy efficient fixtures

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 hearing for this DWSRF Project Plan took place on **May 16, 2022**. Copies of public hearing advertising and minutes are included in Appendix E of the adopted final version of this Project Plan.

PROJECT BACKGROUND

This study (Project Plan) was authorized by the City of St. Ignace via execution of a letter proposal. The purpose of the Project Plan is to evaluate needs and recommend alternatives for improvements on the City's water system.

Previous studies for the City provided the majority of the background information presented here: the *2016 Water System Reliability Study* by C2AE, the *2017 Water Asset Management Plan* by C2AE, and the *2020 Water Asset Management Plan* by NRWA.

Delineation of Study Area

The City of St. Ignace is located on the eastern end of Michigan's Upper Peninsula, on the north shore of the Straits of Mackinac between Lake Huron and Lake Michigan. It sits on the north end of the Mackinac Bridge. The City serves as the county seat of Mackinac County. The City itself takes up approximately 1,700 acres located in Township 40N and Range 4W.

The economic base of the study area is primarily tourism relying on water related recreational opportunities and historic/archaeological sites. The City is an important archaeological area both for original Native American inhabitants and later development as a fur trading site in the late 1600s.

The City of St. Ignace is a Home Rule City, while Moran and St. Ignace Townships are General Law Townships. They therefore have the authority to finance, construct, and operate a public water utility. The City of St. Ignace currently provides water service to the eastern side of Moran Township, primarily for commercial interests along Highway US-2. The City also provides services to southern St. Ignace Township in the Evergreen Shores area, and the Kewadin Casino and Mackinac Straits Health System both north of the City. Although some service area growth could take place within undeveloped parts of the City, the more likely areas are extensions into these Townships.

The area of study is within the legal boundaries of the City of St. Ignace (see Figure 1 and Figure 2 on the next pages). Areas proposed for DWSRF consideration are within these boundaries.

Figure 1. Project Location



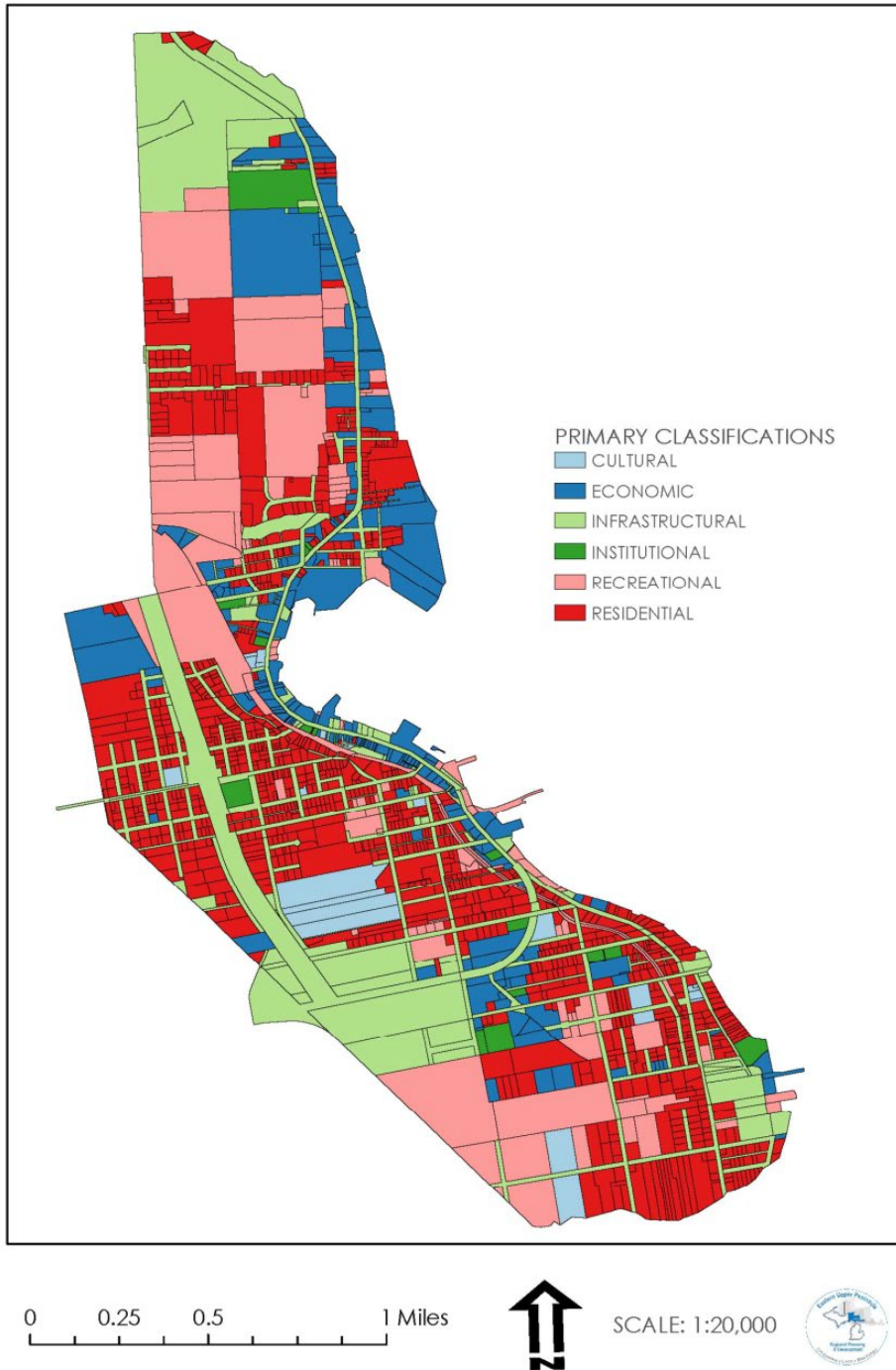
Land Use

Land within the City of St. Ignace is primarily residential and commercial, driven by tourism. Figure 3, from the City's Master Plan, shows the land use in the City.

Within Mackinac County the principal land use is forestry with approximately 90 percent of the land area forested. The majority of the forest land is owned and administered by the U.S. Forest Service or Michigan Department of Natural Resources. Developed land is predominantly residential and light commercial with less than one percent devoted to industrial use.

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Figure 3. Land Use



Population Projections

Population in the study area is expected to stabilize assuming the national and regional economies can recover and also stabilize. Population projections noted in Table 1, which follows, reflect the optimism that the regional economy will recover or at least halt its decline as the nationwide recession ends. Little influx of new growth is expected in the study area other than redistribution of commercial and residential patterns. The area depends heavily on tourism and it is anticipated that as the national economy recovers, tourism, jobs, and population will stabilize.

Table 1. Population Projections

Year	City of St. Ignace	St. Ignace Township	Moran Township	Mackinac County
1960	3,334	686	877	10,853
1970	2,892	551	779	9,660
1980	2,632	706	823	10,178
1990	2,568	932	838	10,674
2000	2,678	1,024	1,080	11,943
2010	2,452	939	994	11,113
2020 (a)	2,500	900	1,000	11,100
2030 (a)	2,500	900	1,000	11,100
2040 (a)	2,500	900	1,000	11,100

(a) 1960 to 2010 based on published US Census figures
2020 to 2040 assumes population stabilizing as economy stabilizes after nationwide recession

Water Demand

The St. Ignace’s water distribution system supplies water to 1,024 residential users within the City and 252 other users, such as industry, churches, schools, government buildings, small commercial, and apartment buildings. The City of St. Ignace records and bills water use for the City’s properties. The St. Ignace water system user counts broken down by Townships are shown in Table 2 and are based on numbers presented in the *2020 Water Asset Management* from NRWA.

Table 2. User Counts

Class	Size (in.)	City of St. Ignace		Moran Township		St. Ignace Township	
		Customers	Average Use / 1,000 gal	Customers	Average Use / 1,000 gal	Customers	Average Use / 1,000 gal
Residential	3/4	1023	2.7	62	3.2	177	2.8
Commercial	3/4	139	3.9	19	5.6	14	4.3
Commercial	1	48	9.7	9	15.6	8	10.8
Commercial	1 1/2	21	35.7	8	62.7	0	0
Commercial	2	27	48.1	2	74.1	0	0
Commercial	3	4	60.9	0	0	1	767

The following table illustrates the billable and accounted water summary customer base and typical annual demand within the City’s water system (using data from the *2016 Water Reliability Study*).

Table 3. Water Demand

Description	Usage	No. of Customers
Annual Billed Usage By User Category (gal)		
<i>Residential</i>	52,196,000	1,259
<i>Non Residential</i>	66,371,000	314
<i>Total Annual Billable Flow (gal)</i>	118,567,000	1,573
Monthly Billable Flow Per EDU (gal/mon)	3,455	NA
Accounted Water Not Billed (gal/yr)	85,067,000	NA
Unaccounted Water (gal/yr)	17,500,000	NA
Unaccounted Water	8%	NA
Total Treated Water (gal/yr)	221,165,000	NA

Table 4 illustrates the City’s water demand projections as estimated in the *2016 Water Reliability Study*. The 5 and 20-year projections are estimated assuming a one percent annual increase in flow.

Table 4. Water Demand Projections

Flow Description	5 Year (MGD)	20 year (MGD)
Average Annual	0.68	0.78
Maximum Month Summer	0.88	1.01
Maximum Month Winter	1.01	1.15
Maximum Day Summer	1.20	1.33
Maximum Day Winter with Let Runs	1.15	1.28
Peak Hour	1.80	2.00

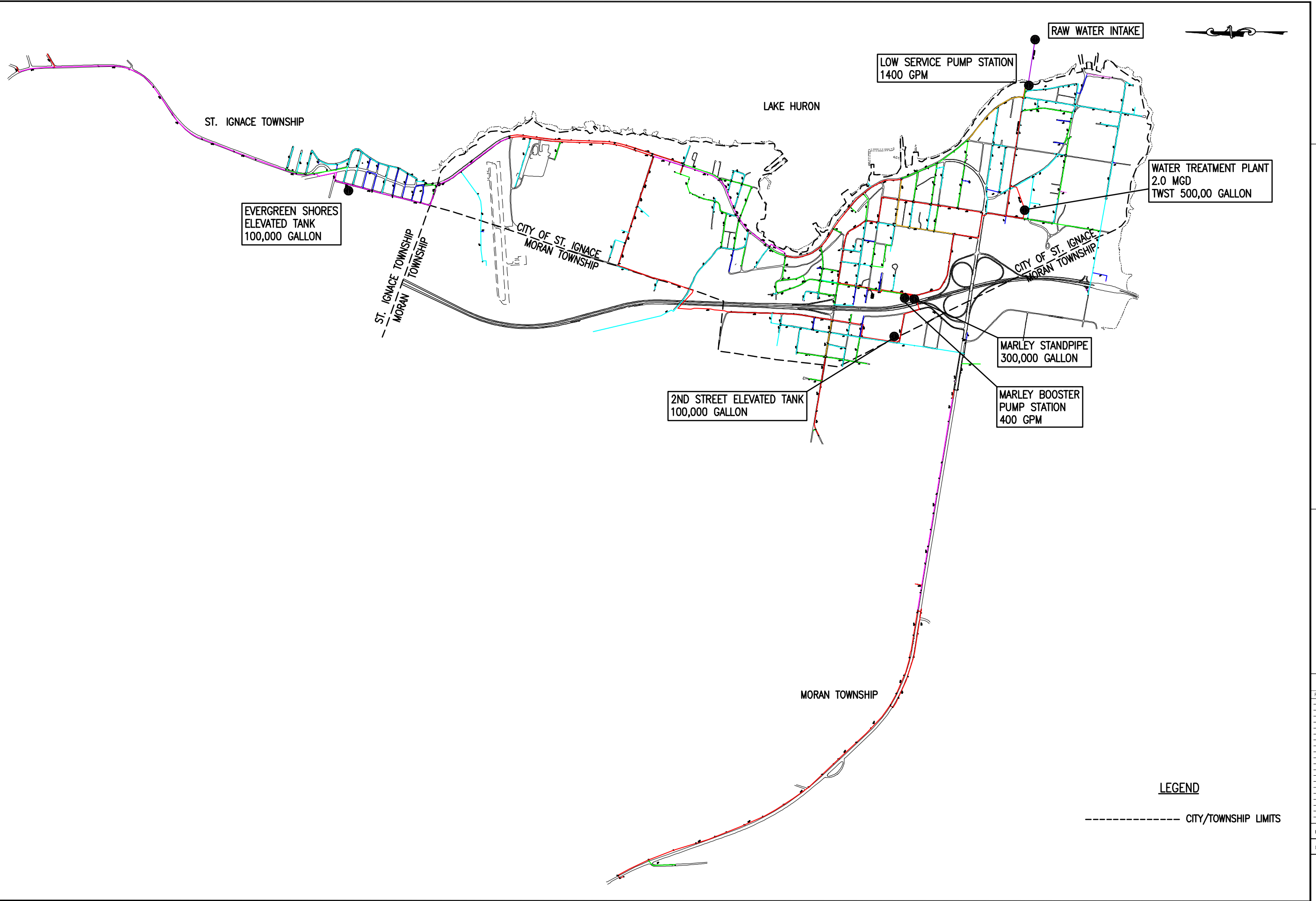
Evaluating the data in Table 3 and Table 4 the following observations and conclusions were made:

- Winter maximum day flows are based on 2014 to 2015 data which included maximum levels of let runs due to the historically cold winter conditions and water main freezing.
- Demand projections are for treated water. It is proposed that an allowance of 20,000 gpd be made to provide for water use in the treatment process.

Existing Facilities

The City of St. Ignace owns and operates a public water system serving the City and portions of Moran and St. Ignace Townships. Figure 4 on the following page provides a map of the existing water distribution system and location of the facilities. The system includes:

- A Lake Huron surface water source
- Low Service Pump Station to convey raw water from the shorewell to the WTP
- Direct filtration surface WTP
- 500,000 gal concrete treated water storage tank and high service pumping
- 300,000 gal Standpipe and booster pumping system serving the central low pressure district at Marley Street
- 100,000 gal Evergreen Shores elevated tank serving the northern portion of the low pressure district including St. Ignace Township
- 100,000 gal Second Street elevated storage tank serving the high pressure district of City and Moran Township
- A system of underground transmission and distribution piping



**CITY OF ST. IGNACE, MICHIGAN
DWSRF PHASE I**

MACKINAC COUNTY, MICHIGAN

**FIGURE 4:
EXISTING WATER SYSTEM AND
FACILITIES**

REVISIONS

REV	DESCRIPTION	DATE

PROJ.#: 210076

DATE: MARCH 2021

SHEET

PRELIMINARY

NOTES:
1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF ENVIRONMENT AND NATURE PRESERVATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
3. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF HEALTH SERVICE STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
4. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF CORRECTIONS STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
5. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF TREASURY STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
6. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF EDUCATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
7. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF SOCIAL SERVICES STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
8. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF ENERGY STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
9. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF LABOR STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
10. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF HUMAN SERVICES STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
11. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF COMMUNITY DEVELOPMENT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
12. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF REVENUE AND OCCUPATIONAL TAX ADMINISTRATION STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
13. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF AGING STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
14. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF TECHNOLOGY STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
15. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF BUSINESS AND ECONOMIC DEVELOPMENT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
16. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF CULTURAL AFFAIRS AND SPECIAL SERVICES STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
17. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF POLICE AND SHERIFFS STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
18. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF FIRE SERVICES STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
19. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF JUVENILE SERVICES STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.
20. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE MICHIGAN DEPARTMENT OF CORRECTIONS AND OTHER INSTITUTIONS STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS.

Raw Water Intake and Shorewell

The water source is Lake Huron; raw water is drawn through a 24-inch intake pipe constructed in 1953. The intake crib located approximately 560 ft off shore at the east extension of Bertrand Street. The intake bell is in approximately 20 ft of water and the top of the intake opening is at elevation 559.0 ft per original drawings. The entire service district lies within Mackinac County in Michigan's Upper Peninsula.

The intake bell is furnished with a screw down plate cover that was intended to act as shutoff if necessary. The City has normally not had frazil ice problems and raw water quality is excellent. The intake location is protected with large rip rap around the intake bell and over the pipe.

The intake was last inspected by City divers in 2003. At that time all intake structures were in very good condition. The interior of the intake pipe was not inspected. Although shorewell drawdown data has not been collected, the capacity of the intake is not felt to be a problem based on levels during peak low service pumping events.

The intake is connected at the east end of Bertrand Street to a concrete shorewell and low service pump station. The shorewell structure is 29 ft long by 21 ft wide and 20.5 ft deep. The structure is divided and gated to function in halves. Two vertical, manual raw water screens approximately 2.5 ft wide provide approximately 50 sf of screening area each at moderate lake levels.

Three 800 gpm vertical turbine type low service pumps draw suction from the shorewell and pump to the WTP at Church Street. Pumps were installed in 1981. Pump testing in January 2014, by Northern Pump and Well, documented pumping capacities to be between 620 and 800 gpm at 150 ft TDH pumping against a throttled discharge valve at the WTP. Results of this testing suggest that pumping capacities are near expected levels. Theoretical capacity based on the original 800 gpm at 132 ft TDH duty point would suggest that the firm pumping capacity is 1400 to 1600 gpm. Actual field testing by Northern Pump and Well was conducted with the WTP throttling valve partially closed, thereby not helping to confirm the estimation of firm capacity. The low service pumping capacity dictates the maximum production rate at the WTP. Based on discussion with operators it is felt that the actual firm pumping capacity is approximately 1400 gpm. This should be verified prior to the need to produce water at the 20-year future rates.

The WTP normally produces water at a low service pumping rate of 600 to 1000 gpm to meet most current demand conditions. At higher production rates the treated water storage tanks (TWST) fills and treatment must be suspended until

room is created in the clearwell by high service pumping demands. Higher treatment rates today may enable shorter production shifts, and treatment rates of 1400 gpm are definitely needed to meet 20-year future needs.

The rate of raw water pumping is controlled by throttling the discharge at the WTP meter manhole. The valve is older and its reliability is reported to be declining. Installation of variable frequency drives on the low service pumps (and removal of the throttle valve) will eliminate the need for throttling, provide enhanced control of the raw water flow, and require less reliance on the old meter valve.

The building housing the low service pumps is a concrete block/brick superstructure with a wood truss roof and asphalt shingles constructed in 1980. The structure is in very good condition.

Water Treatment Plant

A site plan of the existing WTP can be found in Figure 5; below is a description.

Rapid Mix

St. Ignace feeds liquid Alum as primary coagulant and rapid mixing is accomplished with two 10-inch diameter by 30-inch long static mixers operating in series. Static mixers use the energy of moving liquid passing through counter flow shear vanes to mix the alum in a short detention time. Flow velocities through the mixers are 2.8 and 5.7 fps at pumping rates of 600 and 1400 gpm respectively.

Static mixer energy design was reviewed with a current reputable manufacturer, Kinetics. It was confirmed that at pumping rates of 600 gpm and higher, the energy profile through the 10-inch mixer is appropriate for alum coagulation. At 600 gpm the proprietary design software recommended a minimum number of two mixing vanes which is appropriate for the 30-inch length. Power mixing does not have significant potential to increase coagulation performance.

Flocculation:

Alum flocculation in St. Ignace is provided in four 12 ft by 12 ft tanks operated as two parallel trains of two tanks each. Each tank has a volume of 14,000 gal. Flocculation time is 53 minutes at 1050 gpm (one LS pump) and 40 minutes at 1400 gpm (two pumps). Flocculation energy is provided by one vertical shaft, variable speed, propeller flocculator in each tank (four total). Flocculators were installed in 1993. Gates are provided to allow serpentine tapered energy profile through flocculation as a treatment variation.

Gravity Filters:

Four 12 ft by 12 ft influent split, rising head, and high rate gravity filters receive flow from flocculation. The total filter area is 576 sf which results in a filtration rate of 2.43 gpm per sf at peak treatment rates of 1400 gpm. Influent flow from flocculation is evenly split to each of the four filters by an overflow weir arrangement in the split structure prior to the filters. The filters utilize a dual sand and anthracite media on a sintered plastic media (Leopold IMS) retaining surface. Rotating arm surface wash systems are used on each filter. Backwash is by means of one end suction centrifugal pump with a capacity of 2800 gpm. Backup wash water supply is provided by means of an interconnection to the high service piping. The filtration system was constructed in 1993.

In 2015, St. Ignace began the process of rebuilding each of the four filters. Filter No. 1 was first. The wall coatings were replaced, underdrains were inspected, and media was replaced. The final media selection as recommended by EGLE was 12-inch of sand and 18-inch of anthracite. Underdrains of Filter No. 3 were found to be sound and only required replacement of a small amount of surface gap sealant. Filters No. 2 and 4 are yet to be rebuilt.

In Spring of 2016, Filter No. 3 was rebuilt. The same improvements were made but it was determined that a media retaining surface rebuild was also necessary. All IMS cap surfaces were removed, underdrains were thoroughly cleaned, and caps were replaced to manufacture specifications. Significant amount of media was removed from the underdrain. The rebuild used 12-inch of 0.45 to 0.55 mm sand and 18-inch of 1.0 to 1.1 mm anthracite.

Filters are generally performing well. The design filtration rate of 2.43 gpm is relatively low and it may be possible in the future to obtain approval for increased filtration capacity with appropriate full scale pilot work approved by EGLE.

Treated Water Storage:

One 500,000 gal rectangular, concrete, treated water storage tank is present at St Ignace. The tank is 68 ft long by 66 ft wide with 16 ft SWD and was constructed in 1981. Inter-tank cement masonry baffling was installed in 1994 to improve CT value for disinfection. The tank is center-divided for redundancy and ease of maintenance. EGLE guidelines require the tank to be operated with at least eight feet of water to maintain CT disinfection values. High service pumps draw water directly from the TWST. The tank was last inspected in 1994 and was in good condition at that time.

High Service Pumping

St. Ignace has four vertical turbine high service pumps which draw suction from the clearwell/TWST and pump to the distribution system. The pumps were originally rated at 800 gpm at 208 ft TDH. This sizing was based on two criteria:

- Provide capacity to discharge the nominal pump rate with three units operating in parallel to the low pressure district (2400 gpm firm capacity to Marley Street).
- Discharge direct to the Second Street elevated tank.

Testing of High Service Pumps by Northern Pump and Well in 2014 adjusted for suction head considerations suggest the capacity today is approximately 1010 gpm at 85 ft TDH. One pump was underperforming and it was rebuilt in 2016 to a two stage pump.

Waste Washwater Lagoons

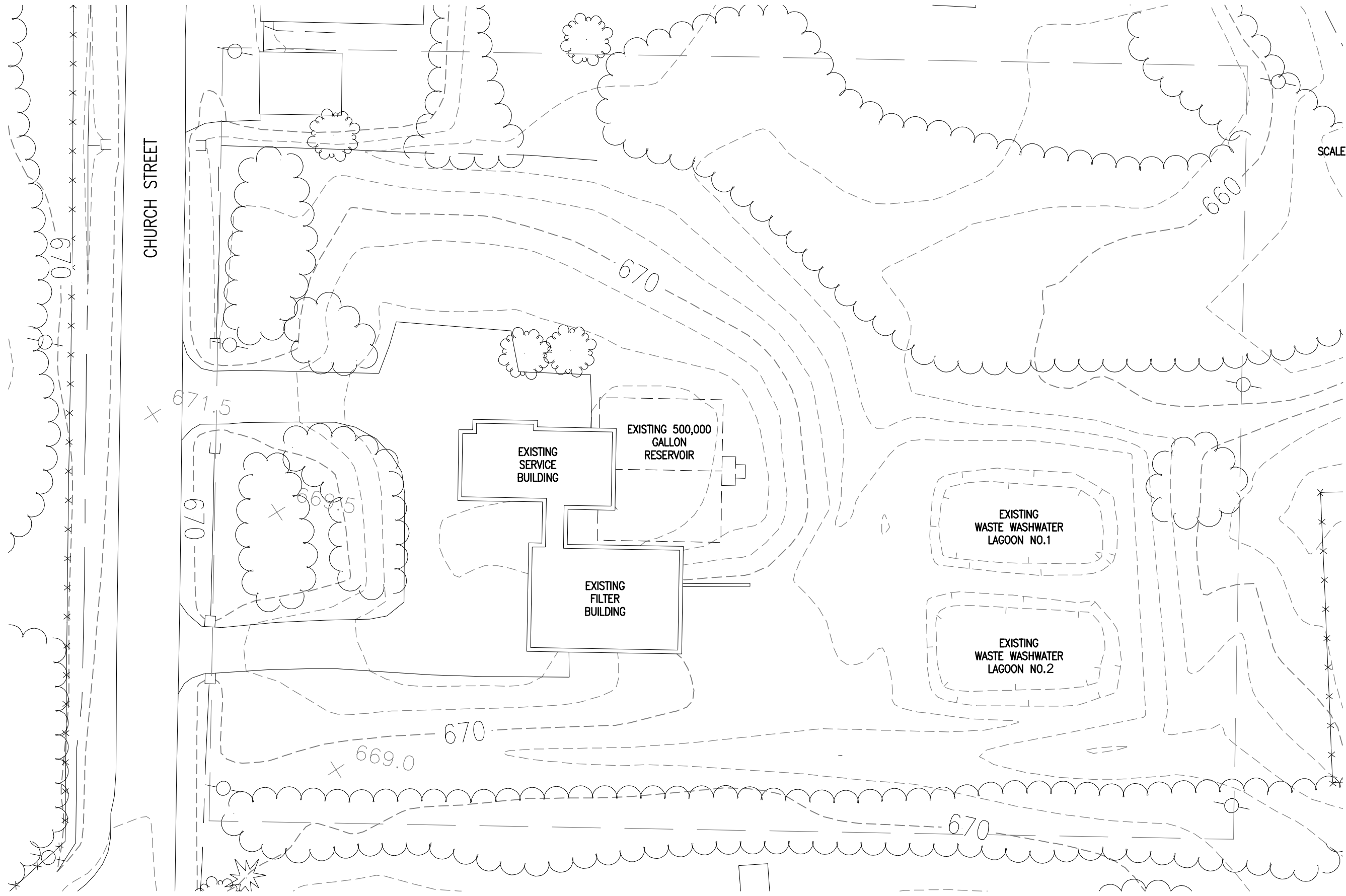
Two waste wash water lagoons are used for storage of backwash water and employ disposal by exfiltration to ground. Each lagoon is 92 ft long by 52 ft wide at maximum liquid surface. The maximum SWD is 7.0 ft. Lagoon piping allows the option to decant and discharge to the sanitary sewer.

The total liquid volume of each lagoon is 122,000 gal. A typical backwash volume may be 20,000 gal. The lagoons if empty of liquid and solids could store approximately ten backwashes.

The lagoons are operated in exfiltration mode in summer. In winter, the lagoons are operated as backwash equalization.



PROJECT: WASTE WATER TREATMENT PLANT FOR THE CITY OF ST. IGNACE, MICHIGAN
 DRAWING: EXISTING WATER TREATMENT PLANT SITE
 DATE: 03/2021



SCALE: 1"=50'



CITY OF ST. IGNACE, MICHIGAN
 DWSRF PHASE I
 MACOMB COUNTY, MICHIGAN

FIGURE 5
 EXISTING WATER TREATMENT PLANT SITE

REVISIONS		
REV	DESCRIPTION	DATE

PROJ.#: 210076
 DATE: MARCH 2021

Water Distribution System

The system includes a high pressure district serving the higher elevations along I-75 and all of Moran Township to the west on US 2. The Second Street elevated tanks is the storage for the high pressure district. The low pressure district includes the major low lying portion of the City, the Evergreen Shores development and all St. Ignace Township to the North. The high and low pressure districts are isolated with valves along LeMotte and South Airport Road. The total approximate water service district for the St. Ignace system is 1952 acres or 3.05 square miles.

A breakdown of the water distribution system by watermain material and size is provided in Table 5 and Table 6 below. The majority of the City’s watermains are 6-to 16-inch diameter cast iron and ductile iron pipe. It is estimated that 34 percent of the water main is older than 1955.

Table 5. Water Distribution System by Material

Water Main Material	Percentage of System
Cast Iron	20 to 30
Ductile Iron	70 to 80
PVC	Undetermined

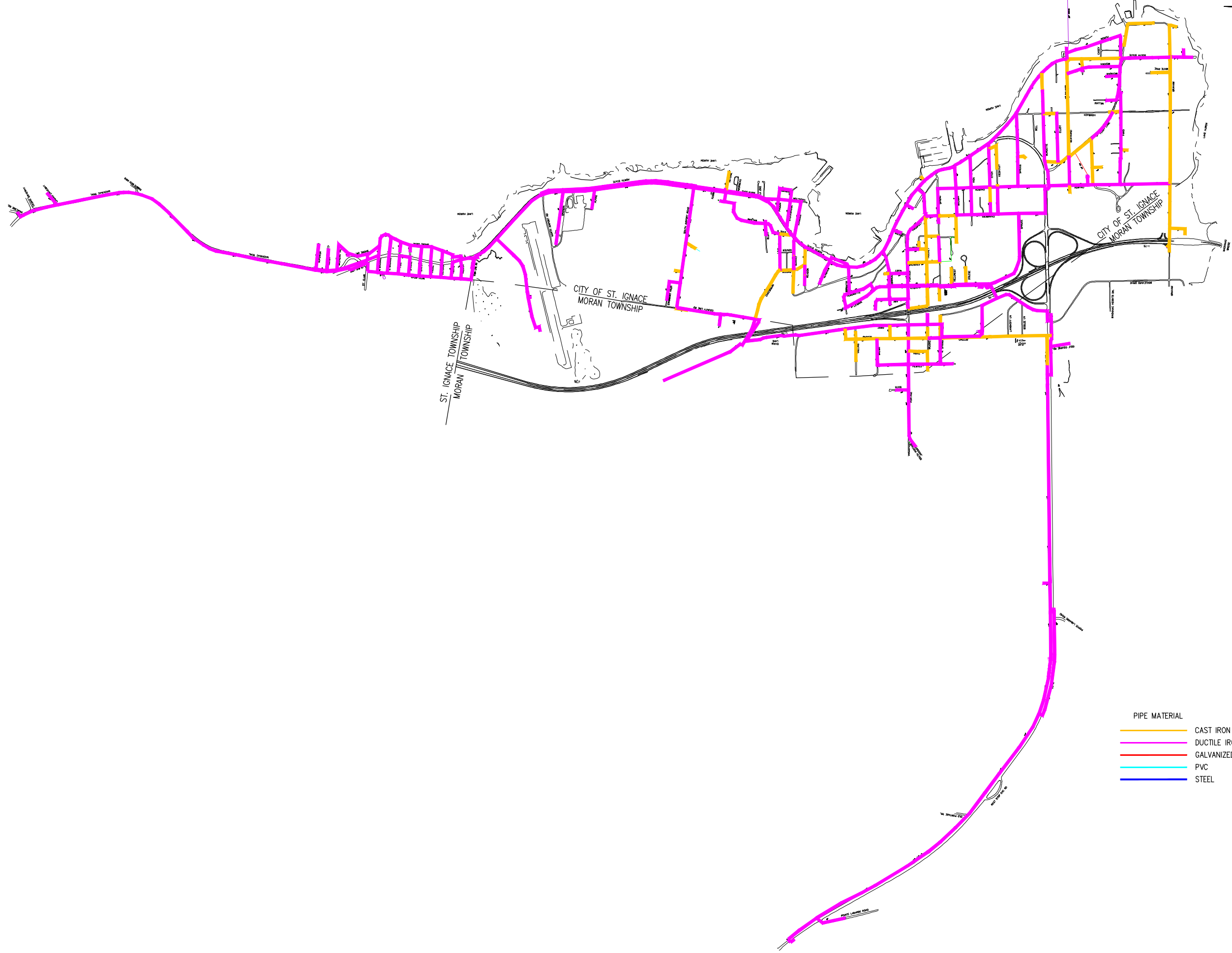
Table 6. Water Distribution System by Size

Water Main Size (Diameter)	Length (ft)
4-inch	11,000
6-inch	68,000
8-inch	36,200
10-inch	5,800
12-inch	58,700
14-inch	3,500
16-inch	26,200
Total	199,400

In general, the water distribution system has been upgraded to a great extent over the last 30 to 40 years and now contains a large portion of newer ductile iron watermains. Significant portion of older cast iron watermains do remain for local distribution. PVC watermain material has not generally been used in St. Ignace. Hydrants and valves have been upgraded as watermain is replaced over the last 40 years and are in good condition on an overall basis. Figure 6, Figure 7, and Figure 8 illustrate the water main material, size, and installation years.



PLOTTED BY: H:\PROJECTS\ANALYSIS\20220219\AM
 C:\Users\mrburke\Documents\2100084\PROJECTS\2022\0219\PROJECTS\WATERMAIN\PRELIMINARY\WATERMAIN.PRELIMINARY.dwg -- WATER MAIN - PIPE MATERIAL
 DESIGNED BY: JACOB BURKE
 APPROVED BY:
 CHECKED BY:



CITY OF ST. IGNACE, MICHIGAN
DWSRF PHASE 1
MACQUINAC COUNTY, MICHIGAN

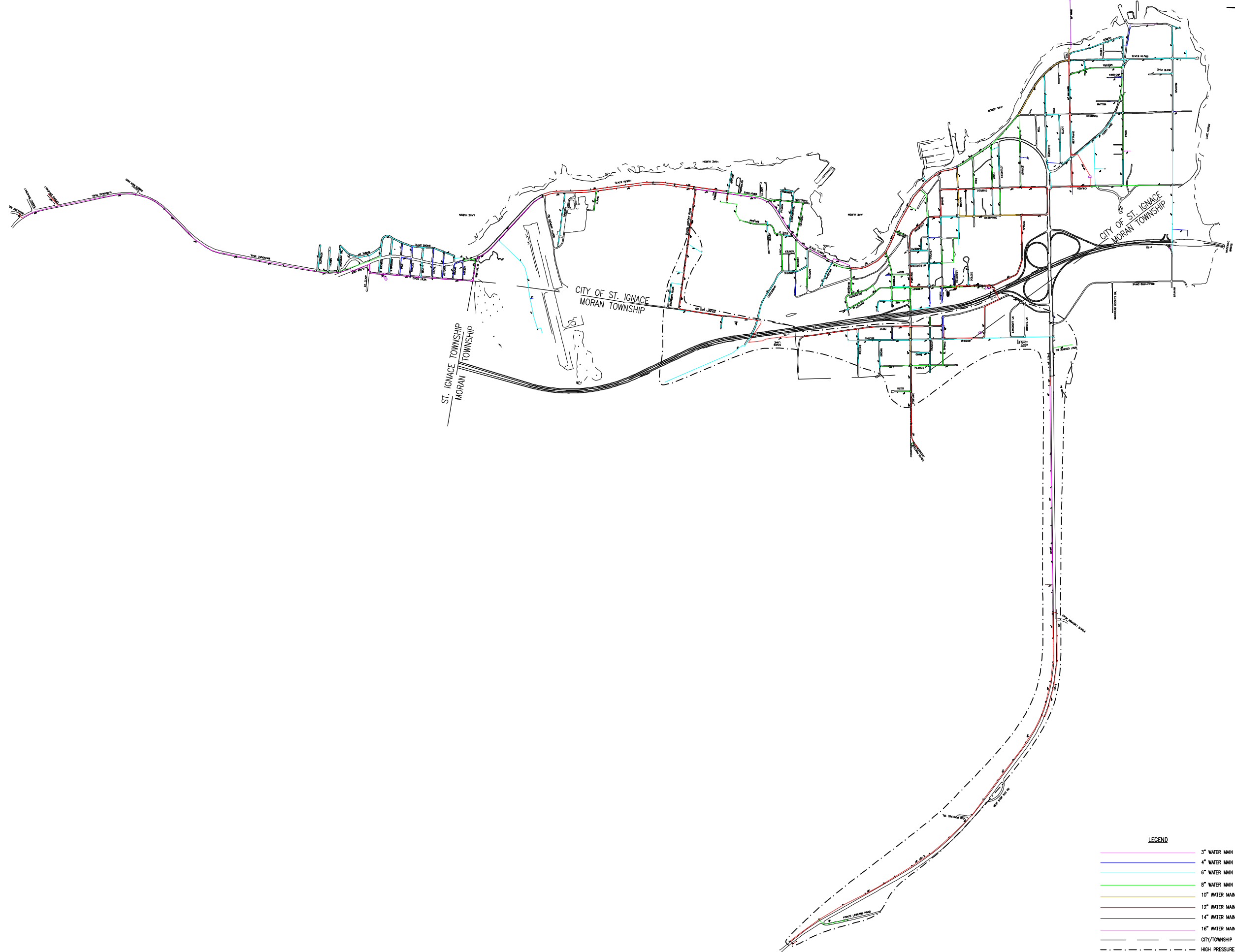
FIGURE 6:
 WATER MAIN PIPE
 MATERIAL

REVISIONS

REV	DESCRIPTION	DATE

PROJ. #: 210084
 DATE: FEBRUARY 2022

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 DESIGNED BY: COLLETT, T.M. 2/17/2022 1:58 AM
 CHECKED BY: COLLETT, T.M. 2/17/2022 1:58 AM
 APPPROVED BY:



LEGEND

- 3" WATER MAIN
- 4" WATER MAIN
- 6" WATER MAIN
- 8" WATER MAIN
- 10" WATER MAIN
- 12" WATER MAIN
- 14" WATER MAIN
- 16" WATER MAIN
- CITY/TOWNSHIP LIMITS
- - - HIGH PRESSURE - LOW PRESSURE BOUNDARY

CITY OF ST. IGNACE, MICHIGAN
DWSRF PHASE 1
MACKINAC COUNTY, MICHIGAN

FIGURE 7:
WATER MAIN PIPE SIZE

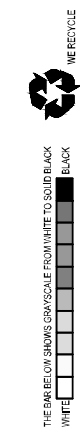
REVISIONS

REV	DESCRIPTION	DATE

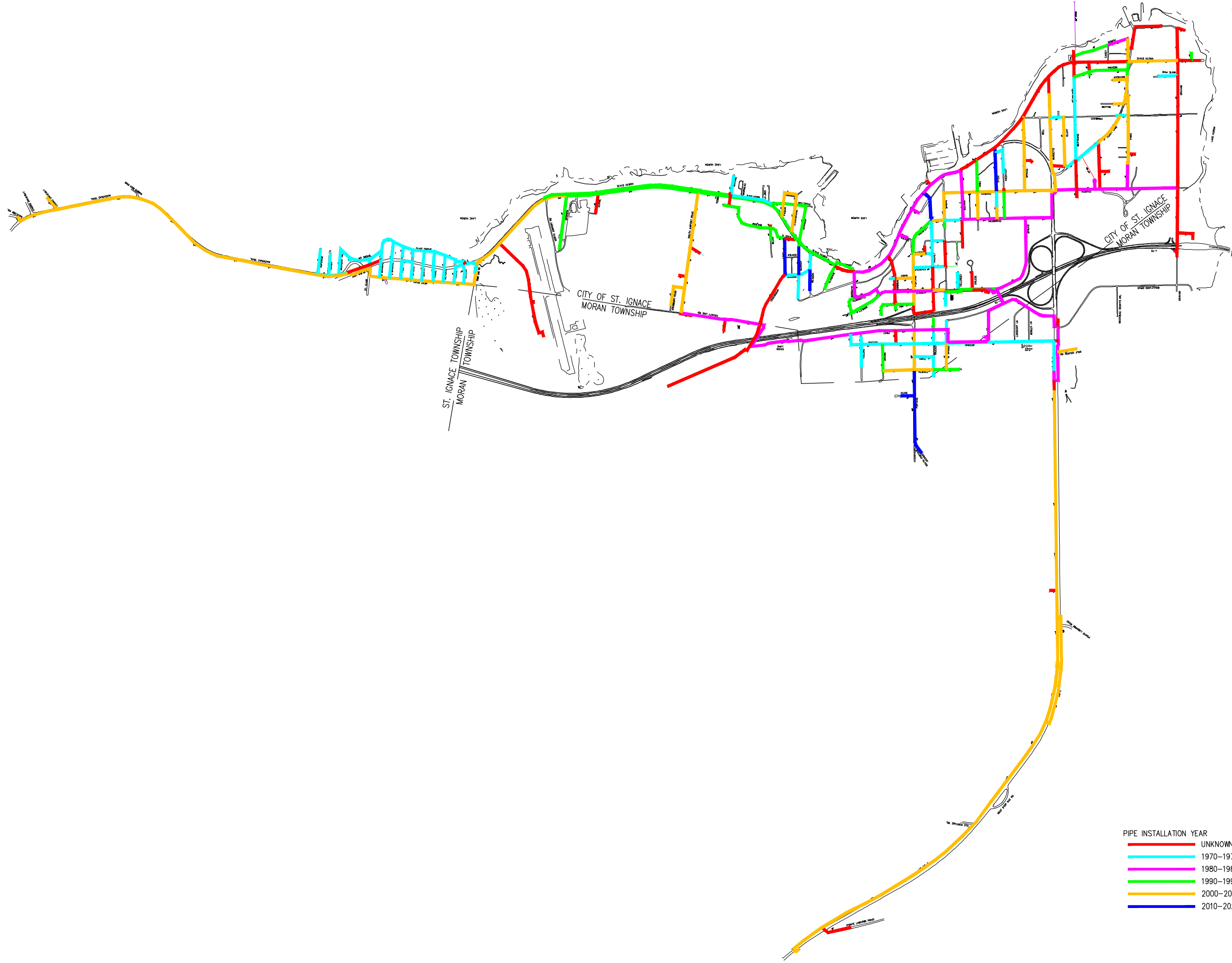
PROJ.#: 210084
 DATE: FEBRUARY 2022

SHEET

1



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DESIGNED BY: COLLETTA, S.M.
CHECKED BY:



PIPE INSTALLATION YEAR

- UNKNOWN
- 1970-1979
- 1980-1989
- 1990-1999
- 2000-2009
- 2010-2021



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CITY OF ST. IGNACE, MICHIGAN DWSRF PHASE 1

LACUMING COUNTY, MICHIGAN

FIGURE 8:
WATER INSTALLATION
YEAR

REVISIONS		
REV	DESCRIPTION	DATE

PROJ.# 210084
DATE: FEBRUARY 2022

SHEET
1

A number of locations exist with dead end 6-and 4-inch older watermains. It is a policy of the City to replace, connect, and loop these segments to provide better water quality and flushing velocities.

A map detailing recent watermain breaks within the City is provided in Appendix D. Watermain freezing during extended cold winters remains a problem in St. Ignace as it does in most Upper Peninsula communities. For this study the winters of 2014 and 2015 document the severest of conditions. Let runs are required to prevent freezing of mains. Overall system demand during the let run months equals or exceeds the peak summer months of tourism. This is a condition that will likely continue into the future. Let runs by address and by frost depth are provided in Appendix D.

Pumping and Storage Facilities

The City's water storage consists of a 500,000 gal in-ground concrete treated water storage tank at the WTP, one 300,000 gal steel standpipe with booster pumping at Marley Street, a 100,000 gal elevated storage tank at Second Street, and a 100,000 gal elevated storage tank in Evergreen Shores. Tank locations are shown on Figure 4 and on the study and service area Figure 2 contained with this report.

The WTP Treated Water Storage Tank is discussed in the previous section.

The Marley Street Standpipe is located at the intersection of Marley and High Streets. It is a 300,000 gal steel ground storage tank constructed in 1961. The tank was repainted inside and outside in 2009 under the observation of Dixon Engineering. It is due for a routine inspection. The Marley Street Booster Pump Station was constructed in 1981 and contains two 400 gpm booster pumps. The *2016 Water Reliability Study* recommended that a larger high capacity fire pump be installed in the No. 3 vacant pump slot. The reliability of Marley Street standpipe and booster pumping is high.

The Second Street (also West Side) elevated storage tank is located on Second Street at the intersection of High Street projected, west of I-75. This 100,000-gal double ellipse, multi-leg type elevated tank was constructed in 1981 and serves the high pressure district of St. Ignace. It was last painted inside and outside in 2001. Steel repairs were completed, an antenna railing was installed, and the interior ladder was replaced. It was last inspected in 2012, and minor ice damage repairs were recommended. The reliability of this tankage into the future is high.

The Evergreen Shores elevated storage tank is located in St. Ignace Township north of the City limits along West Road at South Mackinac. This 100,000-gal spheroidal elevated tank was constructed in 1970 and serves the low pressure district

at the northerly City limits and St. Ignace Township. The tank cracked in the 1990s due to high winds and was left empty until the extension to the Kewadin Casino in 2005. In 2007, the tank was raised 26.5 ft to increase pressures in the north end of the service district and to aid level control in the storage tanks. The tank is 150 ft high with an overflow elevation of 754.25 ft. The tank was repainted on the outside in 2008.

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 St. Ignace are well below EPA requirements and the City is doing a very good job managing this aspect of the treatment.

It is not believed that St. Ignace has full lead service leads. However, it is known that there is a small percentage of the system that still remains with galvanized services suspected of being connected to the main with lead. The City is in the process with identifying and removing lead goosenecks/connected galvanized services.

Summary of Project Need

The City of St. Ignace water treatment plant has a history of excellent performance and consistent maintenance since major construction in of water treatment and storage structures in 1981. Like any aging distribution system, deterioration from exposure, wear, and obsolescence requires periodic investment to maintain modern standards. Minor complaints have been brought forth from users, and operators have identified several areas with opportunity for improvement. The priority improvements among these are as follows:

- The shorewell gate valve has been unreliable in recent years and likely needs replacement. Low service pumps-variable frequency drives may be added to increase efficiency where the rate of raw water pumping is currently controlled by throttling the discharge at the WTP meter manhole, which relies heavily on the shorewell gate valve.
- Flocculators were installed in 1993 and have surpassed their design life. New, higher efficiency drives may be able to improve settling performance. Flocculation cell rehabilitation may also include wall resurfacing to protect structural concrete. A streaming current monitor has been proposed to aid in determining coagulant dose.
- Filter No. 2 is in need of rehabilitation, including underdrain inspection, wall coating, and media replacement. One new surface pump is needed, and backwash pump must be inspected.
- System users have reported very short duration pressure reductions which have traced to stoppage of high service pumps. Upon shutdown, dynamic waves are generated which produce short low and high pressure fluctuations.

This is most noted as pressure drops in shower or similar uses for a few seconds on pump shutdown. This can generally be controlled by extending the period over which the flow is stopped or reduced. Although current water control check valves help, it is recommended that high service pump variable frequency drives would help do two functions: further control low and high pressure waves and help match higher capacity pumps to normal daily demand needs.

- The 0.5 MG concrete TWST (or clearwell) was last inspected in 1994 and the City is planning to renovate protective coating of existing treated water storage tank.
- The three end-suction centrifugal sample pumps serving the raw water intake, filter influent, and filter effluent were installed in 1993 and are operating beyond their design life. The fourth sampling point at Finished Water does not require a pump. The laboratory requires some miscellaneous equipment, including a new eyewash/emergency shower and a benchtop turbidimeter.
- All chemical feed systems include redundancy of pumps and storage for the design capacity of 2.0 MGD. However, systems were installed in 1993 and most of the chemical feed interior plumbing is corroding and in need of replacement. Soda ash feed systems in particular have required maintenance and the State is encouraging updates to corrosion control, and the City has proposed new soda ash pumping equipment (two pumps).
- All distributed storage structures have been well maintained, including interior and exterior paint in 2001 (Second Street), 2008 (Evergreen Shores), and 2009 (Marley). Among these, Second Street storage tank alone showed minor ice damage in 2012. However, within the next several years each of these structures will require additional resurfacing, and minor mechanical improvements.
- Although infrastructure has been well maintained and performing well, the exposure to water and weather has deteriorated doors, fascia, brick, concrete, and other coatings throughout the water system. Rust and corrosion have begun to interfere with operability in some areas. The climate control and air exchange systems are pieced together over the course of several additions and upgrades and may not be entirely safe in areas like the chlorine room. Boiler, furnace, and thermostats are at the end of their design life, and lighting improvements are needed. The coordination of these necessary repairs and replacements will offer an opportunity for more comprehensive, energy efficient design.
- Reliable operation of the water distribution lines within the City's utility systems directly impacts the health and safety of the City's citizens and visitors. Reliability and down-time during repairs of deficient water mains affects the ability to provide safe drinking water and poses maintenance issues. Many older water mains in the system have encrusted interiors to some degree which also adversely affects pressures in the system.

- The bulk of the City's water lines are over 70 years old. Pipe and joint materials are not up to modern standards. Leaking joints, structural problems, and capacity issues require increasing operation, maintenance, and repair expenditures. Corrections are made as failures occur which is not a financially responsible method of system asset management nor of operation/maintenance planning. Water main pipe material, insufficient looping, and inadequate shut-off valves increase repair time and inconvenience to system users as well as diminished water quality.

Compliance with Drinking Water Standards

The City of St. Ignace 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, although minor complaints have noted irregularity in water pressure caused by the high service pumps. Alternative 2 addresses this issue.

Projected Needs for the Next 20 Years

The Capital Improvement Plan for the City of St. Ignace (developed as part of the *2016 Water Asset Management Plan* and included in *2020 Asset Management Plan*) currently includes water projects allocated over ten year periods starting in 2018 and can be found in Appendix D.

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 of St. Ignace 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 of St. Ignace 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. Intake control and high service pumping will continue to decline as pump damage escalates. Chemical feed may become irregular or even dangerous as corrosion equipment failures begin, and various equipment failures will require increasing observation and maintenance. 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 St. Ignace WTP. 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 St. Ignace currently operates as the centralized facility for City of St. Ignace, St. Ignace Township, and Moran Township. The plant is currently serving adjacent communities in the region, and therefore, regionalization will not be analyzed as a proposed alternative.

Upgrade of Existing Facilities

Selected equipment shall have greater energy efficiency versus original components. Equipment items are to be optimized and controlled via variable frequency drives (VFD) which will improve efficiency. Electric motors will be high efficiency types. A consolidated and more energy efficient HVAC system will also be installed at the WTP.

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 2A: Upgrade of Existing Facilities

St. Ignace has maintained their facilities to the best of their ability. The capital improvements proposed to meet current needs will increase efficiency, safety, and longevity of the City's water treatment infrastructure. The installation of variable speed drives on low service and high service pumps will decrease wear on pumps and allow smooth performance at both ends of the distribution system. Additional controls for intake, sampling, flocculation, and corrosion control will improve withdrawal and treatment stability. Resurfacing and rehabilitating corroded filter beds, storage tanks, lagoons, and buildings will extend the life of these facilities and prevent escalating maintenance demands. Overall energy efficiency can be improved by select upgrades of heating, cooling, sampling pumps, and miscellaneous equipment.

Alternative 2B: Replacement of Water Main

Replacement and upgrading where required of water lines over 70 years old prioritized as to condition via City records and personnel knowledge. This alternative includes emphasis on lines which coincide with aging or deficient water or sewer lines to allow combining projects and maximizing use of project funding for construction while minimizing environmental effects and disruption to the area citizens. Water main will be sized to meet 10 State Standards and AWWA and provide adequate flushing velocity for improved water quality. Routes where both water main and sanitary sewer replacements are proposed will require full road width reconstruction with curb and sidewalk replacement driven by the number of services (both water and sewer) to be replaced and reconnected. Any lead or lead impacted water services found during construction will be replaced.

PRINCIPAL ALTERNATIVES

Monetary Evaluation

The construction costs used in this analysis are based on previous work done in St. Ignace and neighboring communities. Costs have been adjusted based on ENR index and typical engineering and administrative fee rates. Construction costs for the facility improvements are shown in Table 7 and distribution system improvements in Table 8. Facility improvement detailed costs are provided in Appendix A; these costs were adjusted by about 25% from the scope defined in the 2021 DWSRF Project Plan to reflect recent trends in construction costs.

Table 7. Construction Cost Estimate for Alternative 2A - Facility Improvements

Description	Cost Estimate
Low Service Pumps-Variable Speed Drives	\$66,000
Streaming Current Monitor	\$26,000
Filter No. 2 Rehabilitation	\$85,000
Flocculation Cell Rehabilitation	\$240,000
Equipment Rehabilitation	\$210,000
High Service Pump Variable Speed Drives	\$110,000
Protective Coating-Existing Treated Water Storage Tank	\$210,000
Sample Pumps	\$25,000
Soda Ash, Pumping	\$25,000
Filter, Service Building, Low Service Booster, General Rehabilitation	\$150,000
Miscellaneous Equipment	\$5,000
Water Tower Upgrades	\$750,000
Shorewell Improvements	\$55,000
Total Construction Cost	\$1,957,000

For detailed water main replacement, please see Appendix A for a complete list of linear feet of pipe to be replace 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. As part of Priority 1, an allowance for lead-impacted services encountered on the project is established at \$6,000 per service (estimated five services) for a total of \$30,000.

Table 8. Construction Cost Estimate for Alternative 2B – Water Distribution System Improvements

Priority 1 - Construction Costs Only		
A1 Boundary Rd from S Airport Rd to 300 ft S Water - \$34,900	A2 PRV on S Airport Rd Water - \$14,100	A3 E Goudreau St from I75 to I75 BL and Mary St from Goudreau St North Sewer - 1,470'; Water - 1,210' Sewer - \$526,400; Water - \$405,400
A4 N Marley St from E Goudrea St to Old Portage Rd Sewer - 470'; Water - 480' Sewer - \$172,100; Water - \$152,600	A5 Mary St from Goudrea to Old Portage Rd Sewer - 460'; Water - 480' Sewer - \$166,100; Water - \$147,900	A6 N 2nd St from Collins St to Spring St) Sewer - 660'; Water - 2,150' Sewer - \$260,200; Water - \$592,400
A7 Fountain St from E Truckey St to E Spring St Water - 330' Water - \$91,500	A8 Fountain St. from Old Portage Rd to E Truckey St. Sewer - 400'; Water - 490' Sewer - \$139,100; Water - \$127,500	A9 Joseph St from Old Portage St to E Truckey St Sewer - 310'; Water - 490' Sewer - \$120,800; Water - \$127,000
A10 Dickinson St from Joseph St to E Truckey St Sewer - 540'; Water - 500' Sewer - \$147,100; Water - \$123,700	A11 Dickinson St from E Truckey St to E Spring St Water - 330' Water - \$91,500	A12 E Truckey St from Dickinson St to Chambers St Sewer - 420'; Water - 520' Sewer - \$168,800; Water - \$166,500
A13 McCann St from Chambers St to West of Dickinson St Water - 710' Water - \$193,500	A14 S Marley Street from Spring St to Tank Water - 250' Water - \$125,000	A15 Dock 3 St from Graham Ave to Ferry Ln; From Ferry and Dock 3 St to Huron St Water - 1,720' Water - \$678,300
Allowance for Lead Impact Water Service Replacements throughout Project Area (5 @ \$6,000 each) Water -\$30,000		Priority 1 Total Sewer - 4,730'; Water - 9,660' Sewer - \$1,701,000; Water - \$3,102,000

Priority 2 - Construction Costs Only		
<p>B1 Alley South of Collins St from N 2nd to 1st St Sewer - 300'; Water - 300' Sewer - \$63,900; Water - \$58,900</p>	<p>B2 N 1st St from Collins St to North of Old Portage Rd Sewer - 870'; Water - ' Sewer - \$309,900</p>	<p>B3 Goudreau St from N 2nd to 1st St Sewer - 340'; Water - 340' Sewer - \$98,000; Water - \$92,400</p>
<p>B4 Spring St from S 2nd St to S 1st St(I75) Sewer - 530'; Water - 590' Sewer - \$168,500; Water - \$145,300</p>	<p>B5 Truckey St & Spring St from Marley to NI75 including sewer between streets Sewer - 1,180'; Water - 870' Sewer - \$358,200; Water - \$234,300</p>	<p>B6 E Truckey St from Marley St to Fountain St Water - 590' Water - \$156,600</p>
<p>B7 E Truckey St from Fountain St to Dickinson St Water - 660' Water - \$210,400</p>	<p>B8 S State St from Ferry Ln to Graham Ave Water - 1,260' Water - \$420,500</p>	<p>Priority 2 Total Sewer - 3,220'; Water - 4,610' Sewer - \$999,000; Water - \$1,319,000</p>
Priority 3 - Construction Costs Only		
<p>C1 Antoine St. (I75 & East to Lake) Water - 520' Water - \$142,900</p>	<p>C2 Lemotte St & Lake Ave to Lemotte St & Reagon St to Reagon St and I75 Water - 1,110' Water - \$298,600</p>	<p>C3 Keightley St from Church St to 500 ft east Water - 400' Water - \$111,900</p>
<p>C4 Bertrand St Hombach to Ferry Ln Water - 1,110' Water - \$298,600</p>		<p>Priority 3 Total Water - 3,140' Water - \$852,000</p>
Priority 4 - Construction Costs Only		
<p>D1 S Marley St from the Marley Tank to Chambers St Water - 2,230' Water - \$623,000</p>	<p>D2 Graham Ave from S State St to Strats Park Access Water - 3,220' Water - \$853,900</p>	<p>Priority 4 Total Water - 5,450' Water - \$1,477,000</p>

A present worth analysis is also included in Table 9 below. Because St. Ignace is a disadvantaged community, they are eligible for a 40-year loan/bond term. Both Alternative 2A and 2B will be proposed as one project under one 40-year loan. The bond schedule, operating expense, and salvage values can be found in Appendix A. O&M impacts were assumed to affect plant operations only for this analysis. Variable frequency drives will likely have a significant effect on energy use. 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.

Table 9. Present Worth Analysis

Item	Description	Alternative 1: No Action	Alternative 2A: Upgrade Existing Facilities	Alternative 2B: Replacement of Water Main
1	Construction Costs	\$0	\$1,957,000	\$6,750,000
2	Engineering, Legal, Administration, Planning, and Contingencies	\$0	\$543,000	\$2,000,000
3	Total Capital Cost	\$0	\$2,500,000	\$8,750,000
4	Total Annual O&M Change	\$0	-\$91,400	-\$5,000
5	Present Worth of O&M Costs	\$0	\$3,851,000	\$211,000
6	Salvage Value	\$0	\$250,000	\$1,750,000
7	Present Worth of Salvage Value	\$0	\$277,000	\$1,935,000
8	Total Present Worth	\$0	\$5,256,000	\$7,026,000

Table row description for Table 9:

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 11 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 30 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 40 years.
8. Total of items 3 and 5 minus 7.

Environmental Evaluation

The City of St. Ignace 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. A cursory environmental review has been performed and the findings are included within Appendix C. Based on the DWSRF Intent to Apply (ITA) Meeting for this project, the project has been classified as a non-equivalency project, therefore no further review is needed as part of the project plan.

Cultural resources

Significant historical and archaeological sites are common in St. Ignace, one of the oldest continuously inhabited sites in North America. The St. Ignace area has a long standing commitment to historic preservation, which is a major part of the area's tourism driven economy. The proposed construction will be within existing facilities and previously disturbed areas. It is expected that there will be no long term impact.

The Natural Environment

- **Climate:** St. Ignace has an average annual rainfall of 27 inches and an average snowfall of 60 inches. January average low temperature is 12° F, while July average high temperature is 75° F. The area is sometimes described as having short cool summers and long cold winters. The long winters typically drive frost depths to 4 ft or beyond which must be considered in any proposed underground construction. Winter season construction is often difficult and sometimes impossible depending on the activity. In general, exterior construction comes to a halt by November 15. Lake Huron and the Straits of Mackinac, whose shorelines are adjacent the project areas, generally has a tempering effect on the weather, but can sometimes contribute to weather extremes.
- **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:** Although there are scattered pockets and areas of wetlands in the project area (City), none are expected to be impacted by the project.
- **Coastal Zone:** Activities within the Coastal Zone Management Area would be permitted during the design process as needed.
- **Floodplains:** Floodplains or high water marks exist along the shoreline of the Straits of Mackinac. It is anticipated that the proposed project will not impact any floodplains.

- Natural or Wild and Scenic Rivers: There are no designated natural or wild and scenic rivers in the study area.
- Surface Waters: The study area is surrounded on the east and south by the Straits of Mackinac and East Moran Bay on Lake Huron. The downtown waterfront is on East Moran Bay. A small shallow lake also encroaches on the northwestern City limits. No work is anticipated near existing surface waters.
- Agricultural Resources: There is no designated prime agricultural land in the service/planning area.
- Sensitive Species and Habitat: There is no sensitive habitat in the project area nor are there any threatened or endangered species in the project area.

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 City of St. Ignace has completed large construction projects over the past several decades. All are openly discussed at public Commission meetings, including with cost impacts. The Project Plan was advertised and displayed for citizen review for one month prior to a formal Public Hearing. The City contracted with an engineering design consultant (C2AE) for assistance in the planning process and will utilize quality based selection for their design consultant as required by the DWSRF. They will also contract a bond counsel for assistance in arranging project funding.

Technical Considerations

The selected alternative will comply with Act 399 and be designed to meet standards recommended in “Recommended Standards for Waterworks,” including sufficient pumping capacity, stand-by power, redundant controls and treatment, adequate storage volume.

Residuals

Improved flocculation and coagulant use will likely improve water quality and increase residuals, but no significant material change is expected.

Contamination

The proposed water improvements at the Water Treatment Plant are within the facility itself. Additional improvements throughout the distribution system are located within existing right-of-ways. It is unlikely that construction work will encounter contaminated sites, but contractors must be careful to control painting, removal, and other destructive activities to avoid contaminating the environment.

New/Increased Water Withdrawals

No proposed alternative includes new or increased water withdrawals.

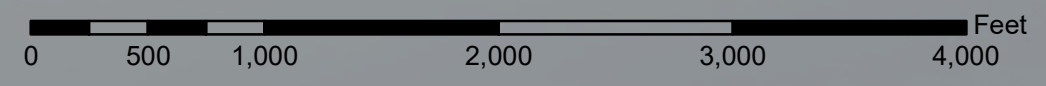
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SELECTED ALTERNATIVE

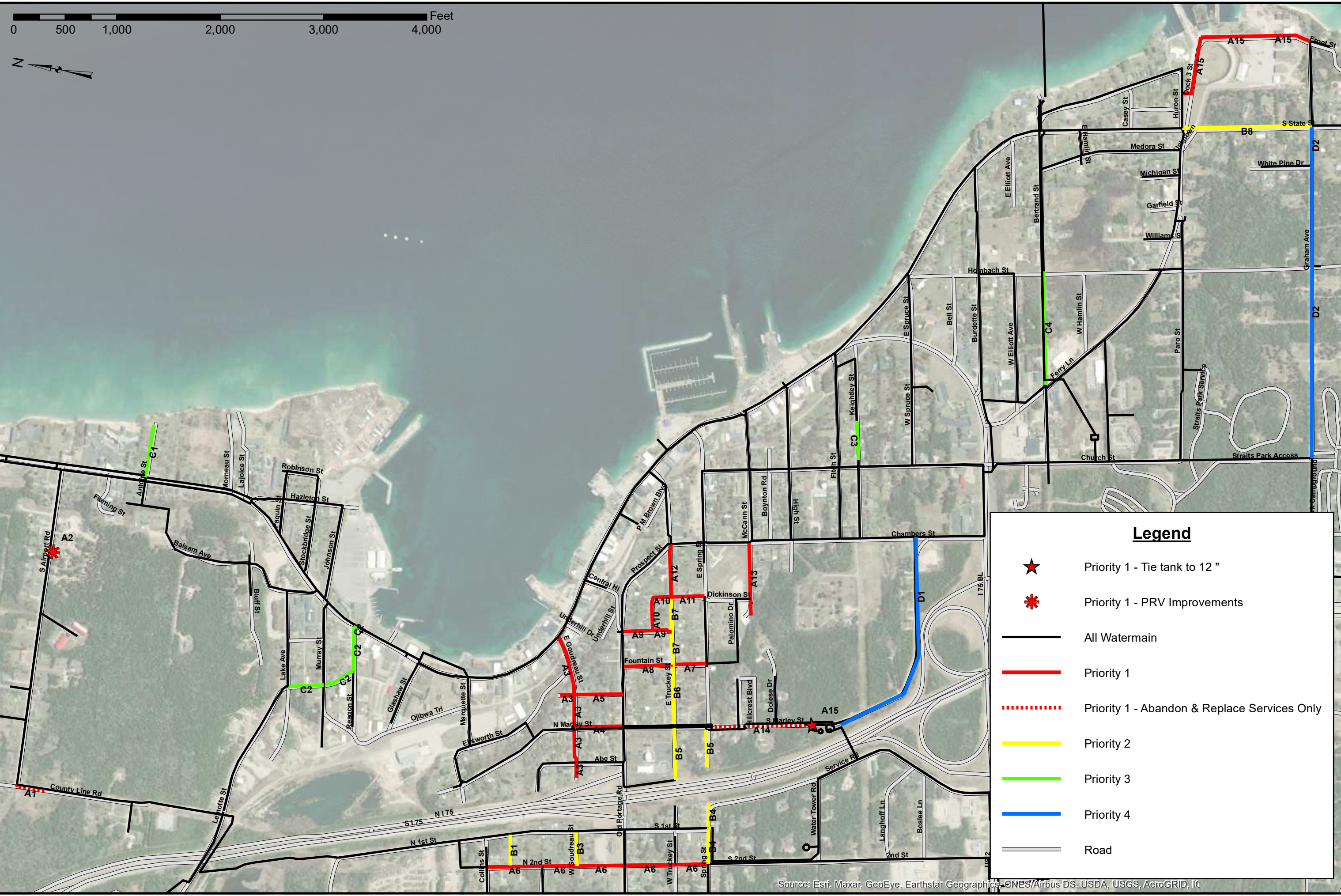
The option to Upgrade Facilities and Replace Water Main (Alternative 2) is the selected alternative based on positive impacts and cost effectiveness.

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. St. Ignace will ultimately own and operate the portions of the water distribution system where project funding is spent.

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Legend

- Priority 1 - Tie tank to 12"
- Priority 1 - PRV Improvements
- All Watermain
- Priority 1
- Priority 1 - Abandon & Replace Services Only
- Priority 2
- Priority 3
- Priority 4
- Road

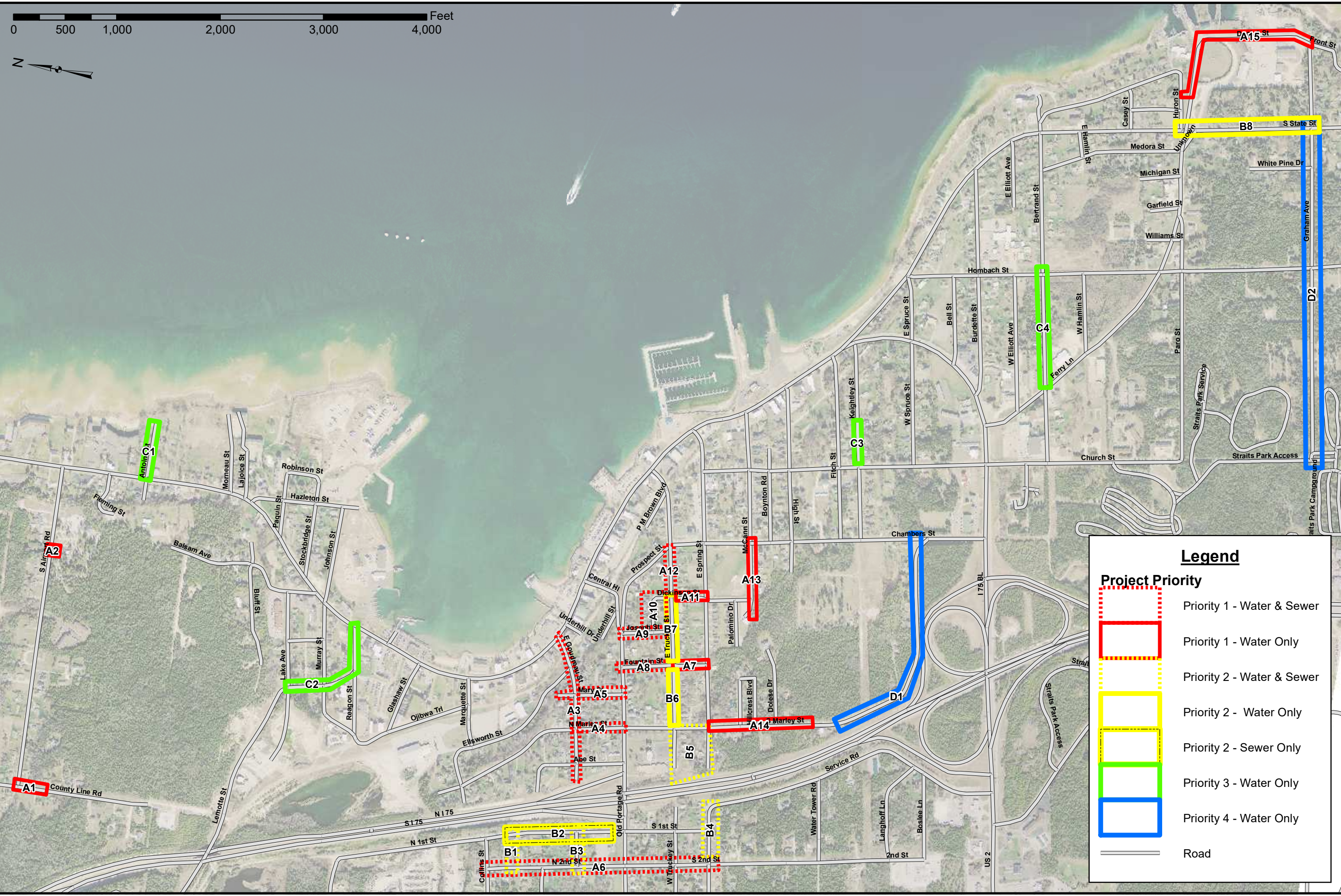
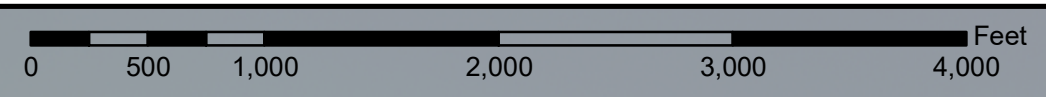
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IC



CITY OF ST. IGNACE
SRF PROJECT PLAN
PROJECT: 18-0084 & 85
MACKINAC COUNTY, MICHIGAN









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

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Legend

Project Priority

-  Priority 1 - Water & Sewer
-  Priority 1 - Water Only
-  Priority 2 - Water & Sewer
-  Priority 2 - Water Only
-  Priority 2 - Sewer Only
-  Priority 3 - Water Only
-  Priority 4 - Water Only
-  Road



CITY OF ST. IGNACE
USDA RD WASTEWATER
PROJECT: 18-0085
MACKINAC COUNTY, MICHIGAN

**FIGURE 10: PROPOSED PROJECT PRIORITIES
COMBINED UTILITIES**

Figure 11 and Figure 12 on the following pages detail the facility improvements and improvement locations. The City understands the operations and maintenance of the existing system, and with relatively minor upgrades, can increase treatment and distribution efficiency and reliability.

The recommended treatment option for St. Ignace is to Upgrade Facilities or rehabilitate unit processes, which includes:

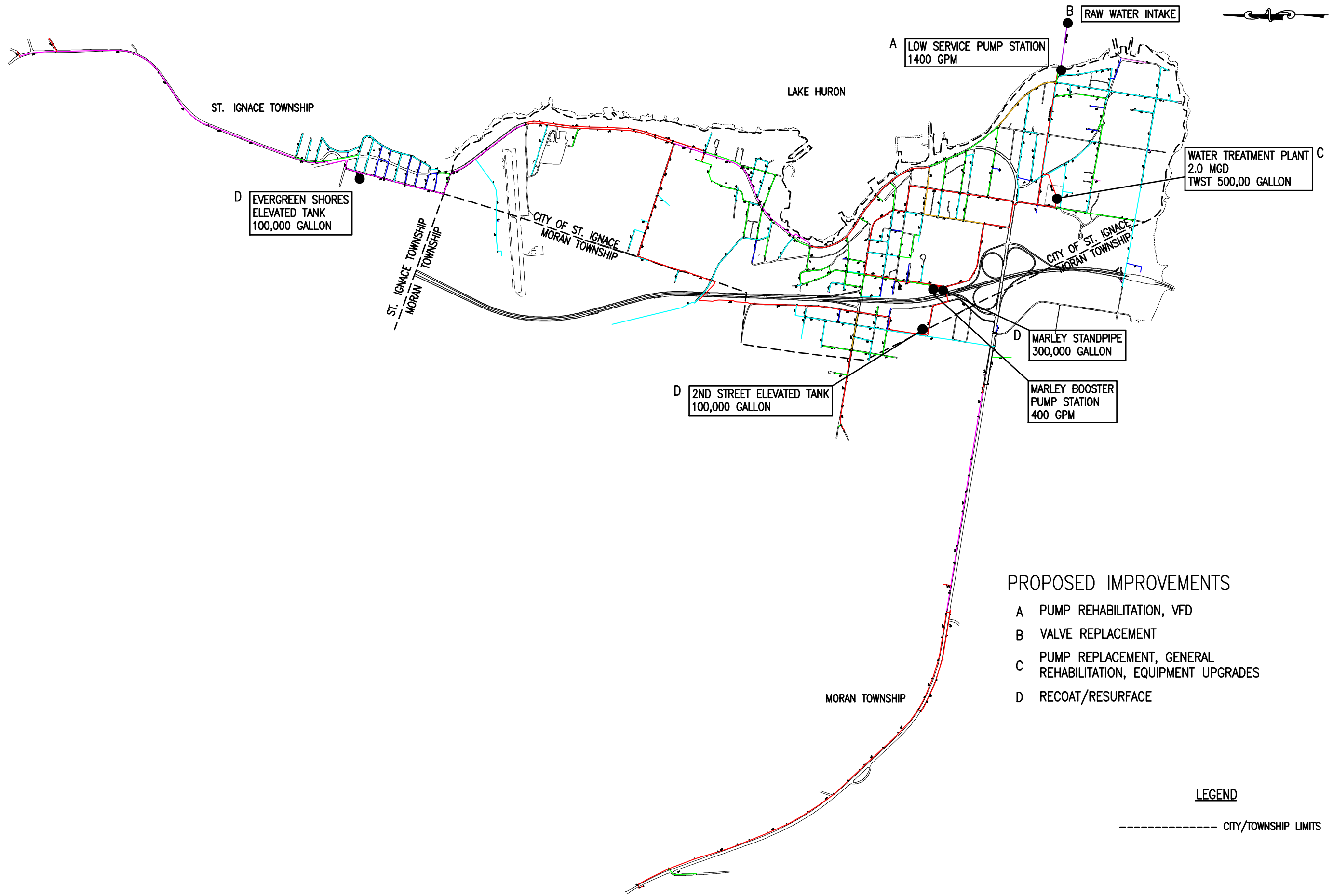
- Replacement of the shorewell isolation vale with improvements to the pump station itself
- Upgrade low service pumps with variable frequency drive (VFD) controllers
- Rehabilitation of flocculation cells and drive replacement
- Rehabilitation of filter bed No. 2, including replacement of filter media
- Upgrade high service pumps with VFD controllers
- Coating of the existing TWST at the WTP and elevated storage tanks throughout the City
- Soda ash feed improvements, ensuring distribution system corrosion control efforts are maintained
- General WTP improvements and equipment upgrades to promote reliability, sustainability, and energy efficiency



REVISIONS

REV	DESCRIPTION	DATE

PROJ. # 210076
DATE MARCH 2021



PROJECT: 210076 - DWSRF PHASE I
 DRAWING: 11 - PROPOSED FACILITY IMPROVEMENT LOCATIONS
 DATE: 03/2021
 SCALE: AS SHOWN
 AUTHOR: JLD
 CHECKED: JLD
 APPROVED: JLD

Design Parameters

The work completed as part of this project will allow the City to update and repair existing treatment systems without requiring drastic changes to design or treatment. Additional controls such as variable frequency drives and valves will improve control, but without changing existing flow paths. Resurfacing and direct replacement of expired equipment will prevent escalating deterioration or emergency failures in the years ahead. This rehabilitation is informed by 10 State Standards, AWWA, and the regular contact and monitoring from State agencies.

The following is a description and design basis for major proposed improvements all associated with the selected alternative Upgrade Facilities. Additional detail can be found in the supporting cost opinions in Appendix A. Please note that the facility costs provided in Appendix A have been adjusted by 25% in this project plan due to recent trends in construction costs. Below is an item by item description of improvements.

Shorewell Pump Station Improvements

The shorewell pump station and low service pumps it houses are a critical component to the City's production of potable water. The station provides water to the WTP to be distributed to the community via the high service pumps. As mentioned in the existing facilities section, the shorewell draws suction from Lake Huron via the 24-inch intake. There is a 24-inch intake valve that isolates the shorewell from the lake. The shorewell is divided into two chambers, with sluice gates allowing for isolation of chambers. In order to maintain these gates and the two chambers, the 24-inch intake valve must be operable. The intake valve has become unreliable and is recommended to be replaced.

The shorewell pump station superstructure was constructed during the early 1980s. Pump station walls are constructed of 8-inch masonry block with 4-inch face brick; the building has a footprint area of 29 ft by 21 ft. Approximately 3 ft of the lower brick fascia has spalled off due to exposure to moisture. Spalled or damaged brick is to be removed and replaced. It is recommended to improve the floor drain system to protect the rehabbed brick fascia.

Low Service Pumps VFD Upgrades

The shorewell pump station houses three, 3 stage line shaft, vertical turbine low service pumps, rated for 800 gpm at 130 ft TDH with 40 Hp motors. Pumps were installed during the early 1980s and have been maintained periodically since installation. To improve efficiency and operational flexibility, it is recommended to install VFD controllers on the pumps. These controllers will reduce reliance on the throttling valve, located at the meter pit near the WTP, currently utilized to adjust for seasonal usage.

Flocculation Tanks Rehabilitation

The WTP Service building holds the flocculation tanks, which is comprised of four 12 ft by 12 ft tanks. Tanks are operated as two parallel trains; each tank has a volume of 14,000 gal. Tanks are poured in place concrete, which were installed in 1993. To protect the structural integrity of the tanks, it is recommended to blast and recoat all four tanks. Flocculation drive energy is provided by one vertical shaft, variable speed, propeller flocculator mechanisms for each tank which are also from 1993 and should be replaced. A streaming current monitor will be integrated to better inform coagulant dosing.

Filter Bed Rehabilitation

Four 12 ft by 12 ft influent split, rising head, and concrete structure high rate gravity filters receive flow from flocculation. Filter area is 576 sf, with a filtration rate of 2.43 gpm per sf at peak treatment rates of 1,400 gpm. Filters utilize dual media filtration, sand and anthracite media on a sintered plastic media retaining surface. Filter No. 2 is original from the 1993 project and in need of recoating, similar to the flocculation tanks. Media shall be replaced at that time ensuring reliable filtration. Faulty valves are to be replaced in-kind. See Appendix A for more details.

High Service Pumps and VFD Upgrades

City WTP has four discharge line-shaft, vertical turbine high service pumps, which draw suction from the clearwell/TWST and distributed potable water the City. The pumping system is aging and requires upgrades. To improve the reliability and flexibility of operation of the pumps, it is recommended to install and integrate a VFD controller on each pump (four total). Two pumps have been serviced recently, but the remaining two require inspection/rebuilding. Pump capacity should be reviewed/confirmed after rebuilding; pumps were initially rated at 800 gpm at 208 ft TDH, with 60 Hp motors, but are suggested to be nominally less per the *2016 Water Reliability Study*. The City currently experiences hydraulic hammer when pumps are brought offline. The hydraulic hammer causes surging in the distribution system, as well as pressure drop. The VFDs will reduce the hammering on the system, while in addition to a reduction in excessive wear on the system, by allowing slow starting of pumps or ramping of pump.

Treated Water Storage Tank and Elevated Storage Tank Coatings

To protect the integrity of storage tankage throughout the City, it is recommended to inspect and apply new coatings accordingly. Exposure to chlorinated water over time, as well as extreme weather may degrade the condition of the tanks. The elevated tanks also require minor upgrades to the level sensors for better operation.

Soda Ash Pumping Improvements

Soda ash is utilized at the WTP for stabilization and corrosion control within the distribution system. The system is comprised of an 800 gal solution batch tank with mixer, level sensors, two 0 to 104 GPH soda ash metering pumps, with three feed points (high service bay inlet gates, flow split to filters, and filter effluent well). The meter pumps and various fittings/connections are deteriorated and in need of replacement. New pumps will allow for more accurate control of chemical feed.

General WTP Improvements

Various components of the WTP require upgrades to ensure water quality for the City of St. Ignace.

- Sample pump replacement: Three end-suction centrifugal, sample pumps collect samples from the raw water, flocculation tank effluent chamber, and final effluent. These pumps were installed in 1993 and require replacement.
- Chemical Feed Piping: Various chemical feed (alum, soda ash, and chlorination) piping and miscellaneous process piping have become deteriorated and are in need of replacement.
- Chlorine Room: For safety reasons, the chlorine room needs new lighting, heater, emergency shower/eye wash station, and exhaust fan.
- Lab Equipment: One benchtop turbidimeter, ensuring accurate measurement of production water.
- Equipment Rehabilitation: One of the existing surface pumps will be replaced and backwash pumps will be inspected/rehabilitated. These pumps are a key component to the filtration system, to ensure filters are clean and functioning properly.
- Miscellaneous repairs and protections: Repairs and protections are needed to be added to (eight) deteriorated doors, concrete, and other coatings throughout the water system. Climate control, heating, and ventilation equipment rehabilitation/replacement including the boiler and 12 unit heaters throughout the WTP, and energy efficient lighting can be implemented during this same construction effort to coordinate and minimize disruptions to service.

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 existing service area, water system, and facilities can be found in Figure 2, and Figure 4, and Figure 5. Proposed water main improvements can be found in Figure 9, facilities for improvements are shown in Figure 11, and improvements at the WTP can be found in Figure 12.

Schedule for Design and Construction

The schedule for design and construction is present in Table 10 below.

Table 10. Project Schedule

Item	Target
DWSRF Application Submittal	Summer 2022
DWSRF Acceptance	Summer 2022
Funding Commitment	Summer 2022
Start Design	Winter 2022
Land & Easements Acquisition	Not Applicable
Permits	Spring 2023
Advertise for Bids	Spring 2023
Funding Closing	Spring 2023
Contract Award	Spring 2023
Construction	Summer 2023
Substantial Completion	Fall 2024
Final Completion & Initiate Operation	Fall 2024

Cost Estimate

A brief summary of planning, design, and construction costs is included below in Table 11.

Table 11. Project Cost Summary

Item	Estimated Cost
Construction	\$8,707,000
Administration, Legal, Bonding, Permits, & Miscellaneous	\$107,000
Planning	\$34,000
Design	\$832,000
Bidding	\$19,000
General Engineering During Construction	\$262,000
Post Construction Services	\$19,000
Resident Project Representative	\$330,000
Additional Services – Design Related	\$100,000
Additional Services – Construction Related	\$202,000
Engineering Total	\$1,798,000
Contingencies	\$638,000
Total Project Cost	\$11,250,000

User Costs

Table 12 demonstrates the impact on user rates that may be possible with a project of this size. This breakdown assumes a 40-year debt service on the bond at an interest rate of 1.875% for one loan on both *Alternative 2A – Upgrade of Existing Facilities* and for *Alternative 2B – Replacement of Water Main* (2022 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 12 below:

Table 12. User Costs

Description	Value
DWSRF Loan Amount	\$11,250,000
Anticipated Interest Rate	2.125%
Term	40 Years
Annual Debt Service	\$402,290
Monthly Debt Service	\$33,524
Estimated System EDUs	2,617
User Rate Impact / EDU / month	\$12.81

These components will be submitted to EGLE for funding under the Green Project Reserve. It is possible that principal forgiveness may exist for components which qualify for the Green Project Reserve. Items such as, but not limited to, variable frequency drives for the high and low service pumps which have a construction cost of \$178,400 associated with

the two improvements. If green project reserve qualifying projects are to be funded at 50%, approximately \$89,200 would be forgiven.

Disadvantaged Community

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

Ability to Implement the Selected Alternative

The City of St. Ignace is incorporated as a Home Rule City in the State of Michigan. The City has successfully implemented water system improvements projects over the past 50 years. The City has shown it has the legal, institutional, technical, financial and managerial resources to accomplish implementation of the recommended alternatives.

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ENVIRONMENTAL EVALUATION

A cursory environmental review has been performed and the findings are included within Appendix C. Based on the ITA Meeting for this project, the Project has been classified as a non-equivalency project, therefore no further review is needed as part of the project plan.

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 stilling 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.

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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.
- **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 identified the project segments evaluated in this report 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.

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PUBLIC PARTICIPATION

Public Meeting

The City of St. Ignace 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. User rate increases due in part to planned action outlined in this project plan were discussed at a City Council meeting on June 7, 2021 and **May 16, 2022**.

Public Hearing

An initial public hearing (web based due to COVID 19 and in-person at the Little Bear East Arena in St. Ignace) on the information presented in this report for *Alternative 2A – Upgrade of Existing Facilities* was held during a regular City Council meeting on June 7, 2021. An additional public hearing was held on **May 16, 2022** to incorporate an expanded scope of water main replacement (Alternative 2B). Written transcripts are included in Appendix E.

Public Hearing Advertisement

An advertisement was placed in the St. Ignace News 30 days prior to the Public Hearing for the Alternative 2A on May 6, 2021 and again the following week, advertising the formal public hearing. The advertisement for the Public Hearing on Alternative 2B was advertised on **April 13, 2022**. Simultaneously to the advertisement publication, copies of the project plan were made available to the public at City Hall and on the City's website. Appendix E has the advertisement copies.

Public Hearing Transcript

A full transcript of the public hearing is available in Appendix E.

Public Hearing Comments

Comments are summarized in Appendix E with a full transcript.

Comments Received and Answered

No written comments were received prior to the Public Hearing.

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 of St. Ignace commission on June 7, 2021 **and May 16, 2022**.