Village of Maple Rapids
Water System Improvements

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

23-0064

May 12, 2023

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Lansing, MI 48933

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1. BACKGROUND

This Project Planning Document was authorized by the Village of Maple Rapids via the Qualifications Based Selection (QBS) process in accordance with the Michigan Department of Environment, Great Lakes & Energy (EGLE) Drinking Water Revolving Fund (DWSRF) Program.

Study and Service Areas

The Village of Maple Rapids is situated along the Maple River in Section 5 of Essex Township in the northwest part of Clinton County in south central Michigan; refer to Figure 1 Project Location and Study/Service Area on the following page, which shows the Village boundary. Maple Rapids is located approximately fifteen miles northwest of the City of St. Johns and seven miles west of US-127.

The most significant natural resource within the Village is the Maple River, which flows southwesterly through the Village, and the corresponding Maple River State Game Area with regulated floodplain and wetland areas contiguous to the Maple River. In addition to the undevelopable areas north of and adjacent to the Maple River, there are also several undeveloped areas south of the Maple River, which are currently zoned agricultural. As such, approximately 70-75 percent of the land within the Village limits is undeveloped.

The Maple River lies at approximately elevation 650 feet with ground elevations across the developed portion of the Village ranging from approximately 670 to 700 feet. Peck Drain, which is a county drain, also meanders through the developed portion of the Village and eventually outlets to the Maple River near the Maple Avenue Bridge.

For purposes of this DWSRF Project Planning Document, the study/service area was defined during discussions with the Village of Maple Rapids and generally corresponds to the developed area of the Village. The study/service area is located south of the Maple River/Maple River State Game Area (i.e., and the regulated floodplain and wetland areas). Figure 1 Project Location and Study/Service Area on the following page illustrates the study/service area boundary.

The community is primarily single family residential with several multi-family housing units and a downtown/commercial area. Water service is via a network of primarily 6-inch cast iron water main and two water supply wells; a standpipe provides water storage.

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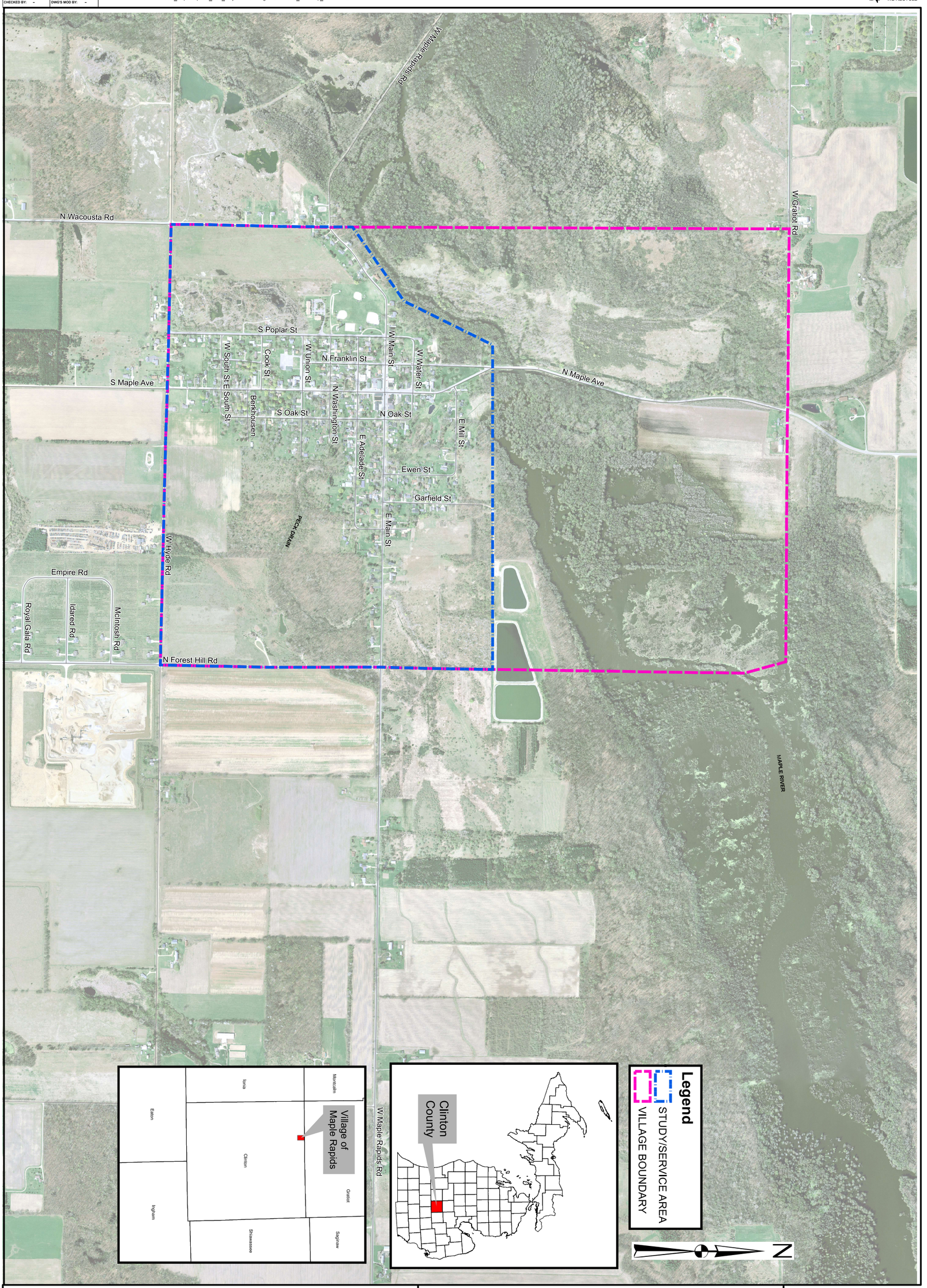

FIGURE 1
PROJECT LOCATION AND STUDY/SERVICE AREA

VILLAGE OF MAPLE RAPIDS
DWSRF PROJECT PLANNING DOCUMENT
CLINTON COUNTY, MICHIGAN

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Population

Table 1 Population Statics includes the U. S. Census population data for the Village of Maple Rapids and the population projections for the twenty year planning period.

Table 1. Population Statistics

Entity	U.S. Census Population					Population Projections	
	1980	1990	2000	2010	2020	2030	2040
Maple Rapids Village	683	680	643	672	573	625	675

(1) For 2030-2040 Village of Maple Rapids, population projections based on an increase of approximately 50 people/10-year period, or approximately 1%/year to re-establish the 2010 population.

According to the U. S. Census, from 2010 to 2020 the Village of Maple Rapids experienced an approximately 15 percent decrease in population, while prior to 2010 the population was relatively stable. Based on discussions with the Village, it is anticipated that the character of the community will remain essentially the same. As such, the population projections for the twenty year planning period assume the population decline from 2010 to 2020 will be re-established by 2040.

Existing Environment Evaluation

The following discussion describes the existing environment within the study/service area including a brief evaluation to determine whether or not elements are present and impacted by the proposed project. Per discussion with and subsequent direction from EGLE, the respective jurisdictional agencies will be contacted later in the Project Planning Document process, if required.

A. Cultural and Historical Resources

The proposed construction activities will occur within exiting public road rights-of-way and on existing Village-owned property where no impacts to historical or cultural resources are anticipated.

B. Air Quality

On average, with an Air Quality Index of approximately 30, the air quality in the Village is considered good. During construction, short term impacts due to equipment operations (i.e., emissions) and construction activities (i.e., dust) will be limited to the various construction sites.

C. Wetlands

According to EGLE Wetlands Map Viewer, Part 303 Final Wetlands Inventory, NWI and MIRIS Maps, existing wetlands are located along the Maple River north of the study/service area. The proposed construction activities, which will occur within existing public road rights-of-way and on previously disturbed Village property, are situated outside of wetlands areas.

D. Great Lakes Shoreland, Coastal Zones, and Coastal Management Areas – Not Applicable.

E. Floodplains

According to FEMA National Flood Hazard Layer (NFHL) Viewer, the 100-year floodplain parallels the Maple River and is located north of the study/service area. The proposed construction activities are located outside of the 100-year floodplain boundary.

F. Natural or Wild and Scenic River – Not Applicable.

G. Major Surface Waters

The Maple River flows southwesterly through the undevelopable portion of the Village and is located north of the study/service area. A USGS Staff Gage is installed at the Maple Avenue Bridge.

H. Topography

The Maple River is at approximately elevation 650 feet with ground elevations across the study/service area ranging from approximately 670 to 700 feet and sloping toward the Maple River.

I. Geology

The local geology consists of glacial outwash and gravel and postglacial alluvium.

J. Soil Types

The soils within the study/service area consist primarily of Boyer Complex (BoB), which are well drained soils characteristically formed in sand and loamy drift underlain by sand or gravelly sand outwash. While the soils do not present any constructability issues, appropriate temporary control measures will be employed to ensure that run-off and airborne dust impacts caused by construction activities will be minimized; best management practices with regard to the potential for wind erosion during construction will be utilized.

K. Agricultural Resources

There are no prime or unique farmlands located within the study/service area.

L. Fauna and Flora

The study/service area is residential and commercial in nature. No impacts to fauna and/or flora are anticipated within the residential and/or commercial areas.

Existing System

The Village of Maple Rapids constructed its first water system, including a 30,000 gallon elevated water storage tank in the 1920's. A new water well was installed in 1966; a second new water well was installed and many of the water mains were replaced in 1977. The original elevated storage tank was demolished in 1994 after the existing 148,000-gallon standpipe/ground storage tank was constructed. Figure 2 Existing Water System on the following page shows the existing water system including water supply wells, standpipe, and water main with hydrants and valves.

The Village water supply consists of two 500 gallons per minute (gpm) drift wells, which are installed at an average depth of approximately 170 feet. Each of the water supply wells is housed within its own well house and is equipped with a vertical turbine pump, a magnetic flow meter, a chemical treatment system with sodium hypochlorite for disinfection, and standby power via a natural gas fueled right angle drive engine. Additionally, portable generators are used to operate the chlorine pumps in the event of a power failure. Since 2000, the Village has contracted with Peerless-Midwest, Inc. to inspect the wells and test the pumps and to complete well/pump repairs as required.

The Village's water storage consists of a 130-foot tall by 14-foot diameter standpipe/ground storage tank with a nominal storage volume of 148,000 gallons. The standpipe was constructed in 1994 by Municipal & Industrial Storage to replace a 1927 vintage 30,000 gallon elevated storage tank. The A.O. Smith Aquastore standpipe consists of interior and exterior baked-on glass coated steel plates caulked and bolted together, and is equipped with a cathodic protection system; the concrete floor was recently coated/sealed with an asphalt-extended polyurethane material. The Village contracts with Nelson Tank Engineering & Consulting, Inc. to conduct regular inspections of the standpipe, which are completed in accordance with AWWA D101, and provides recommendations for maintenance/repairs and corresponding costs.

The standpipe/ground storage tank normally operates from 111-120 feet (above the ground), which provides 48-52 pounds per square inch (psi) of pressure. Based on a minimum system pressure of 20 psi, the usable storage volume (of the standpipe) is approximately 63,000 gallons.

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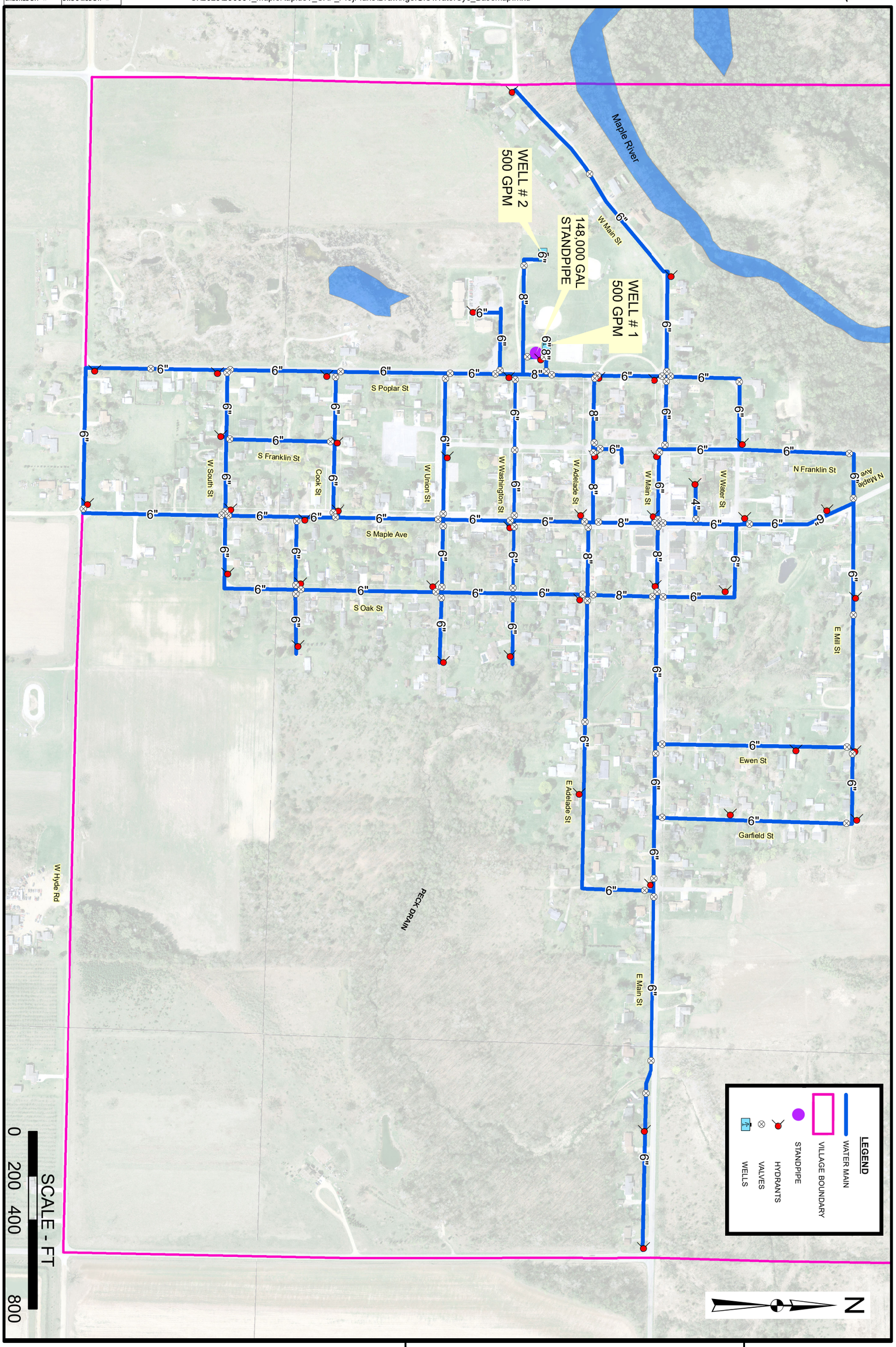

FIGURE 2
EXISTING WATER SYSTEM MAP

VILLAGE OF MAPLE RAPIDS
DWSRF PROJECT PLANNING DOCUMENT
CLINTON COUNTY, MICHIGAN

Three mercoid pressure switches control the pumps, which alternate lead/lag, to fill the standpipe and feed the water distribution system. Normally, Well #1 fills the standpipe from the top while Well #2 fills from the bottom and concurrently feeds the distribution system. Similarly, Well #1 call also fill from the bottom and feed the distribution system. Filling the standpipe from the top and bottom promotes blending/better water turnover in the standpipe.

The Village constructed its first water distribution system in the 1920's. Due to the age, size, material, and condition of the system, many of the water mains were replaced in 1977. The project also included replacing the Village-owned section of each water service located within the public rights-of-way. The majority of the Village's water mains are 6-inch diameter cast iron with some 8-inch cast iron water main adjacent to the wellfield/standpipe. Hydrants are inspected and flushed in the fall of each year; hydrants are also typically flushed in the spring as schedules allow.

The Village averages approximately two water main breaks annually and suspects there may be additional leaks that have not surfaced due to the local geology and existing sandy gravelly soils. Via its Michigan Rural Water Association (MRWA) membership, the Village has teamed with MRWA to conduct a leak survey of the water distribution system. The scheduling of the survey is anticipated to be in 2023.

The water system serves 268 Village customers and four Essex Township customers and recently completed a meter replacement program, which also included installation of meters in the municipal facilities. The Village has confirmed that 69 of the water services are copper from the public water main to the building; therefore, approximately 200 are lead water services.
The Village completed a Wellhead Protection Plan (WHPP), which was approved by EGLE (formally MDEQ) in 2003.

Need for the Project

Packaged Water Booster Pump Station at Standpipe

In 1990, the Village teamed with an engineering consultant to identify and evaluate water storage alternatives. Based on both monetary and non-monetary factors, a standpipe located adjacent to Well #1 was determined to be the most practicable alternative. As such, the standpipe was constructed prior to demolition of the 1920's vintage elevated tank.

Furthermore, the standpipe alternative also referenced a future water booster pump to increase system pressures and usable water storage during peak demand times, as well as to improve fire flow conditions.

New Offset Well #1

Well #1 was constructed in 1966; per Peerless-Midwest, Inc.'s experience, the service life of a regularly maintained well is approximately 50-60 years. In 2000, Peerless-Midwest, Inc. video inspected Well #1 and noted a hole in the screen; however, there is no documentation as to the cause of the hole or how long the hole has existed. Sometime prior to 2000, Well #1 was equipped with a soft start control to reduce the potential for disturbing/pumping sand adjacent to the hole in the screen. Based on Peerless-Midwest, Inc.'s well/pump expertise and the age and condition of the existing well, there is a significant risk associated with cleaning Well #1. Additionally, to maintain compliance with the Safe Drinking Water Act 399, Part 12 Reliability rules, a minimum of two wells are required for a Type I (municipal) water supply system.

Well House #1 and #2 Electrical Upgrades

Well Houses #1 and #2 were constructed in 1966 and 1977, respectively, and have been well maintained. However, the well house electrical systems have exceeded their service lives.

Water Storage/Standpipe Rehabilitation

The standpipe is almost 30 years old and is in good structural condition. The interior and exterior glass coatings are in good condition with minor signs of failure; the exterior coating is faded. The sealant is showing signs of deterioration (i.e., dried out and cracked from exposure to the sun) and has resulted in some seam failures (i.e., leaks), which have been temporarily repaired; the Village continues to monitor the leaks/repairs.

Water Main Replacement

The water main in Main St. from Poplar St. to Ashland St. and in Poplar St. from Main St. to Hyde Rd. is primarily 6-inch cast iron and is almost 50 years old. The Village has documented several breaks along these water mains.

Water Main Loop Construction

A previous study(s) reference eliminating the dead end 6-inch water main at West Main St. and Wacousta Rd. via looping the water main from near Well #2 to West Main St. and Wacousta Rd. to improve water system operations, including pressure and fire flow. viable

Lead Service Line Replacement

To comply with the Michigan LCR, the Village is required to replace approximately 200 lead service lines from the public water main to the building plumbing at the first shut-off valve inside the building or 18 inches inside the building.

2. ANALYSIS OF ALTERNATIVES

No Action

Recognizing the general age and condition of the water system components, No Action is not a viable alternative.

Optimum Performance of Existing System

As described in the previous sections, the existing water system, including the wells, standpipe, and water mains, is well maintained. The Village is coordinating with Michigan Rural Water Associations (MRWA) to conduct a leak survey; however, while identifying and repairing leaks will promote optimum performance of the existing water system, the other improvements will also be required.

Regionalization

There are no regional alternatives.

Alternative 1 – Water System Improvements

Packaged Water Booster Pump Station at Standpipe

A water booster pump station will be installed at the standpipe and integrated into the standpipe and well control operations scheme. Figure 3 Proposed Water System Improvements on the following page illustrates the proposed improvements.

New Offset Well #1

A new offset well will be constructed adjacent to Well #1 in the existing wellfield.

Well House # 1 and #2 Electrical Upgrades

The electrical systems, including, but not limited to the lighting and HVAC will be replaced/updated based on current codes/regulations.

Water Storage/Standpipe Rehabilitation

The standpipe/ground storage tank is almost 30 years old and is in good structural condition. The interior and exterior glass coatings are in good condition with minor signs of failure; the exterior coating is faded. The sealant is showing signs of deterioration (i.e., dried out and cracked from exposure to the sun) and has resulted in some seam failures (i.e., leaks), which have been temporarily repaired; the Village continues to monitor the leaks/repairs.

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LEGEND
- WATER MAIN
- VILLAGE BOUNDARY
- STANDPIPE
- HYDRANTS
- VALVES
- WELLS

N

WATER MAIN REPLACEMENT AND ROAD RECONSTRUCTION

WELL # 1
500 GPM

148,000 GAL STANDPIPE

WELL # 2
500 GPM

WATER MAIN LOOP CONSTRUCTION

WATER MAIN REPLACEMENT

PACKAGED WATER BOOSTER PUMP STATION

NEW OFFSET WELL # 1

WELL HOUSE # 1 AND # 2 ELECTRICAL UPGRADES

WATER STORAGE/STANDPIPE REHABILITATION

LEAD SERVICE LINE REPLACEMENT THROUGHOUT THE VILLAGE

Maple River
N Maple Ave
N Franklin St
E Mill St
Ewen St
Garfield St
W Water St
W Main St
E Main St
W Adelade St
E Adelade St
W Washington St
W Union St
S Maple Ave
S Oak St
Cook St
S Franklin St
W South St
PECK DRAIN
W Hyde Rd

SCALE - FT
0 200 400 800

VILLAGE OF MAPLE RAPIDS
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CLINTON COUNTY, MICHIGAN

FIGURE 3
PROPOSED WATER SYSTEM IMPROVEMENTS

Water Main Replacement

New larger ductile iron water main, including approximately 2,400 feet in Main St. (i.e., under the street) from Poplar St. to Ashland St. and approximately 2,600 feet in Poplar St. (i.e., outside of the street) from Main St. to Hyde Rd., will improve the integrity and operation of the water system.

Water Main Loop Construction

Approximately 1,100 feet of water main will be constructed to complete the water main loop from near Well #2 to the dead end water main at West Main St. and Wacousta Rd.

Lead Service Line Replacement

The Village will replace approximately 200 lead service lines in accordance with the Michigan LCR.

Monetary Evaluation

A construction cost opinion was prepared from recent bid tabulations and is summarized in Table 2 Construction Cost Opinion below.

Table 2. Construction Cost Opinion

Item	Description	Cost Opinion
1	Packaged Water Booster Pump Station at Standpipe	$250,000
2	New Offset Well #1	$170,000
3	Well House #1 and #2 Electrical Upgrades	$45,000
4	Water Storage/Standpipe Rehabilitation	$140,000
5	Water Main Replacement	$1,135,000
6	Water Main Loop Construction	$170,000
7	Lead Service Line Replacement	$1,200,000
8	Road Reconstruction	$465,000
Construction Cost Opinion		$3,575,000

Environmental Evaluation

As discussed with EGLE, the Environmental Evaluation will be completed later in the Project Planning Document process.

Technical Considerations

The selected alternative will comply with Act 399 and be designed to meet standards recommended in "Recommended Standards for Waterworks."

3. SELECTED ALTERNATIVE

The selected alternative includes installing a new water booster pump station at the standpipe, constructing a new offset well adjacent to Well #1, upgrading the electrical systems in Well House #1 and #2, replacing water main in Main St. and Poplar St., looping the water main from near Well #2 to West Main St. and Wacousta Rd., and replacing approximately 200 lead service lines.

Design Parameters

For the pump station, the capacity will be designed for. The pipelines will be designed with the flow capacities needs in mind.

Useful Life

The useful lives for the proposed improvements are noted below:

- Water Booster Pump Station including pumps, electrical/instrumentation controls – 25-30 years
- Water main – 50-75 years
- Service leads – 40-75 years
- Well- 50-60 years

Schedule for Design and Construction

Table 3. Project Schedule

Description	Target Timeframe
DWSRF Project Planning Document Submittal	June 2023
DWSRF Acceptance	Fall 2023
Funding Commitment	Fall 2023
Start Design	Fall/Winter 2023
Permits	Fall 2023
Advertise for Bids	Winter 2023-2024
Funding Closing	Spring 2024
Contract Award	Spring 2024
Construction	2024-2025
Substantial Completion	Summer 2025
Final Completion & Initiate Operation	Fall 2025

Cost Summary

The total project cost opinion is summarized in Table 4 Project Cost Summary below.

Table 4. Project Cost Summary

Description	Cost Opinion
Construction	$3,575,000
DWSRF Project Planning Document	$38,000
Engineering – Design, Bidding, Construction	$825,000
Administrative / Legal	$80,000
Contingencies	$682,000
Total Project Cost	$5,200,000

Table 5 User Costs demonstrates the impact on user rates based on the proposed project. The breakdown assumes a 20-year debt service on the bond at an interest rate of 2.75% (FY 2024 per Overburdened Calculation Spreadsheet).

Table 5. User Costs

Description	Existing	Proposed Project	Total
DWSRF Loan Amount		$5,200,000	
Anticipated Interest Rate		2.75%	
Term		20 Years	
Annual Debt Service		$341,493	
Monthly Debt Service		$28,458	
Estimated System REUs	285	285	285
User Rate Impact / REU / Month	$20.67	$99.85	$120.52
User Rate Impact / REU / Quarter	$62.00	$299.56	$361.56

An "*Overburdened Community Status Determination Worksheet"* was completed and is included in Appendix A. The Village of Maple Rapids qualifies as an Overburdened Community.

Implementability

The Village owns and operates the water system, including the water supply wells, the standpipe, and the distribution system, and therefore has the authority to implement the selected alternative.

4. ENVIRONMENTAL AND PUBLIC HEALTH IMPACTS

The analysis of environmental impacts includes:

- Direct impacts, which are related to the construction and operation of the project
- Indirect impacts, which are project induced and/or facilitated
- Cumulative impacts, which increase in magnitude over time, or which result from individually minor but collectively significant actions occurring over time.

Direct Impacts

Construction Impacts

Construction activity impacts will be short-term relative to dust, noise, and traffic disruptions. At each of the project locations, including the wells and standpipe/water booster pump station, and public rights-of-way for the water main, the work will occur in previously disturbed areas.

Operational Impacts

Operationally, existing Well #1 will remain in service while the new offset well is constructed, the standpipe will be drained in order to complete the interior and exterior rehabilitation work, water main installation is planned to be parallel to the existing mains in order to keep the existing mains live during the construction of the new mains, and individual water services will be shut off temporarily while the service leads are replaced.

Social Impacts

The proposed improvements will not require the relocation of any area residents and may employ several local people throughout the duration of construction. Adverse impacts from a human, social or economic standpoint would be limited to an increase in user charges, while long-term impacts will be positive through increased efficiency and reliability of the water system. Construction is not anticipated to have any adverse effect on historical, archeological, or recreational areas.

Indirect Impacts

Land Development

The proposed improvements will occur on previously disturbed areas or rights-of-way and should not induce changes in rate, density, or type of land development.

Land Use

The proposed improvements are not expected to change current land use patterns.

Air and Water Quality

Air and water quality changes associated with development are expected to be non-existent.

Natural Areas and Sensitive Features

The proposed improvements should have no impact on natural areas and sensitive features.

Cultural, Human, Social, and Economic Resources

Impacts generated by the proposed improvements on cultural, human, social, and/or economic resources can only be considered beneficial. Continued efficient and reliable operation of the Village's utility system(s) contributes to a stable infrastructure promoting public health and safety.

Area Aesthetics

The proposed improvements will have no adverse impacts on the area aesthetics.

Resource Consumption

No additional or increased resource consumption will occur due to the proposed improvements.

Cumulative Impacts

There will be no adverse cumulative impacts since the proposed improvements are generally in-kind replacement and/or rehabilitation.

5. MITIGATION

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

Mitigation of Short-Term Impacts

The contract documents for the proposed improvements will outline the requirements for traffic control, dewatering, safety measures and techniques to accomplish effective dust and noise pollution control, as well as soil erosion and sedimentation control. The soil erosion and sedimentation control plan will include a project schedule, control details, location of rivers, storm water structures, site restoration, etc.

Mitigation of Long-Term Impacts

The proposed improvements will be constructed adjacent to water system components in previously disturbed areas. As such, there should be no long-term impacts due to siting.

Mitigation of Indirect Impacts

The Village of Maple Rapids has ordinances in place to control development.

6. PUBLIC PARTICIPATION

Public Meeting

The Village of Maple Rapids held a formal public meeting to present the proposed improvements included in this Project Planning Document on May 24, 2023 at the Village Community Center.

Public Meeting Advertisement

The advertisement for the public meeting was posted on the Village of Maple Rapids website on May 12, 2023 in accordance with the minimum ten-day prior notification requirement. Concurrently, a copy of the Project Planning Document was made available to the public on the Village website and at the Village Offices. A copy of the advertisement for the public meeting is included in Appendix B.

Public Meeting Summary

A copy of the public meeting summary is included in Appendix B.

Adoption of Project Planning Document

The Project Planning Document was adopted, via resolution, by the Village of Maple Rapids on May 24, 2023. A copy of the resolution is included in Appendix B.