

Engineering

Land Surveying

Economic Development

CITY OF FLOODWOOD

**WASTEWATER TREATMENT
FACILITY**

FACILITY PLAN

PROJECT NO. 19-559

FEBRUARY 2019

425 Grant Street
P.O. Box 656
Hibbing, MN 55746
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CITY OF FLOODWOOD

**WASTEWATER TREATMENT FACILITY
FACILITY PLAN**

February 2019

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

John D. Mattonen, P.E.

Date: _____ Reg. No. 23998

CITY OF FLOODWOOD

WASTEWATER TREATMENT FACILITY FACILITY PLAN PROJECT NO. 19-559

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Attachments

Floodwood WWT Planning Map

Floodwood Sanitary Sewer Collection System

Floodwood WWTF Existing Conditions

Floodwood WWTF Existing Facility Improvements Map

Floodwood WWTF Pond Expansion Location Map

Existing Pond Improvements Cost Estimate

Existing Pond Sludge Removal Cost Estimate

Pond Expansion Cost Estimate

1.0 PROJECT PLANNING AREA

1.1 Introduction

The purpose of this Wastewater Treatment Facility Plan is to report on the current status of the City of Floodwood's Wastewater Treatment Facility to determine needs that the facility will require for continued operation into the future.

The report will evaluate the existing conditions of the wastewater treatment facility and make recommendations for improvements. Estimated costs for the proposed improvements along with a project schedule are included.

1.2 Community Information

The City of Floodwood is located in northern Minnesota in Southwest St. Louis County approximately 40 miles west of Duluth on U.S. Highway 2.

A location map and USGS map follow this page.

The following is population data for the State of Minnesota, St. Louis County and the City of Floodwood.

1.3 Population

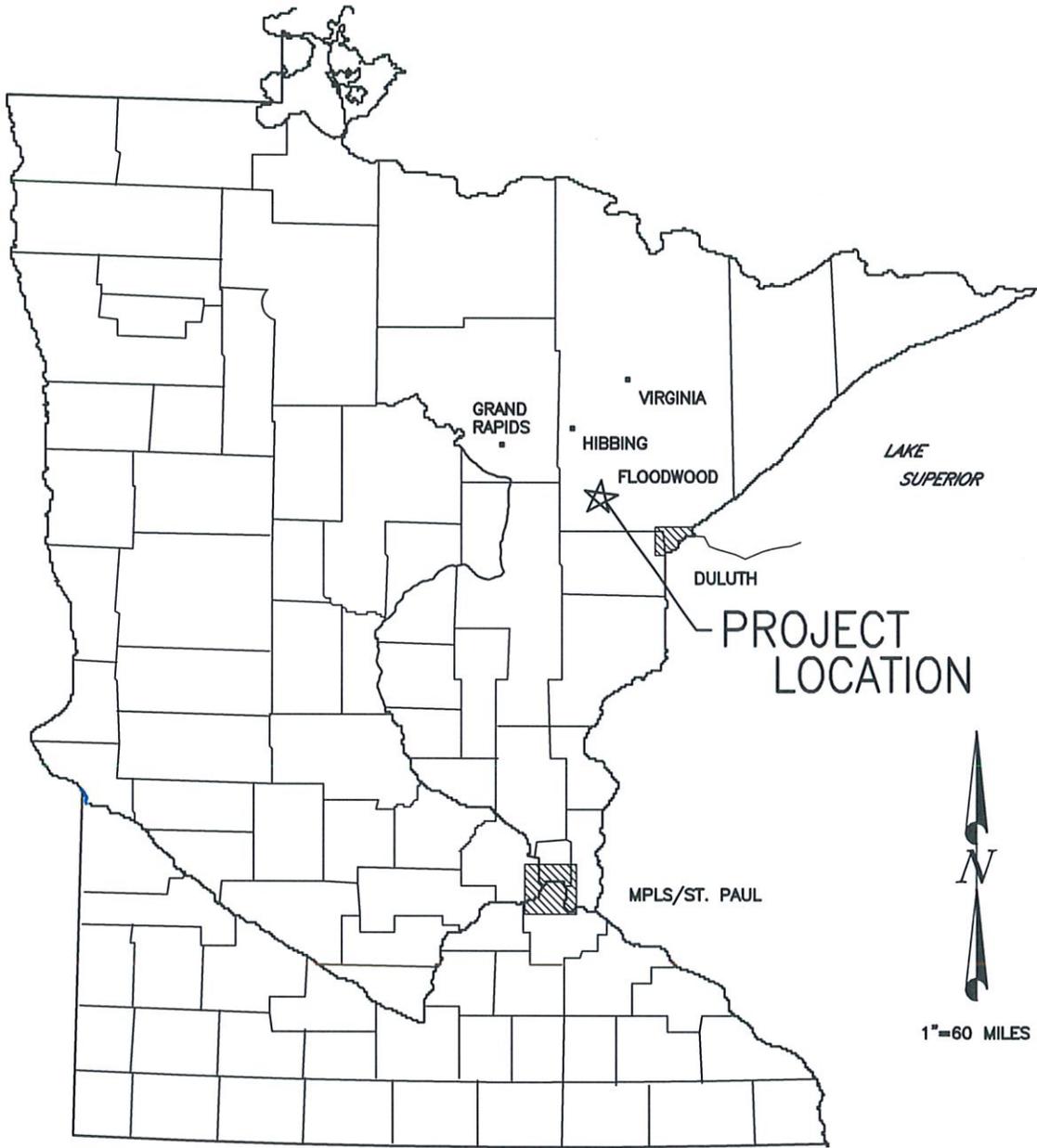
-	2000 ^(a)	2010 ^(a)	2017 ^(a)	2030	2038
State of Minnesota	4,919,479	5,303,925	5,490,726	5,974,304 ^(b)	6,149,090 ^(b)
St. Louis County	200,528	200,226	200,294	201,154 ^(b)	200,050 ^(b)
City of Floodwood	487	528	471	500 ^(c)	527 ^(c)

(a) U.S. Census Bureau.

(b) Projections based on projected data from the State of Minnesota Demographic Center.

(c) For estimating purposes, a population growth is determined by assuming a straight-line projection increase per year for the 20-year planning period similar to the entire State of Minnesota projections. This future estimate aligns with historical changes of the City population.

2010 Median Household Income \$18,977.



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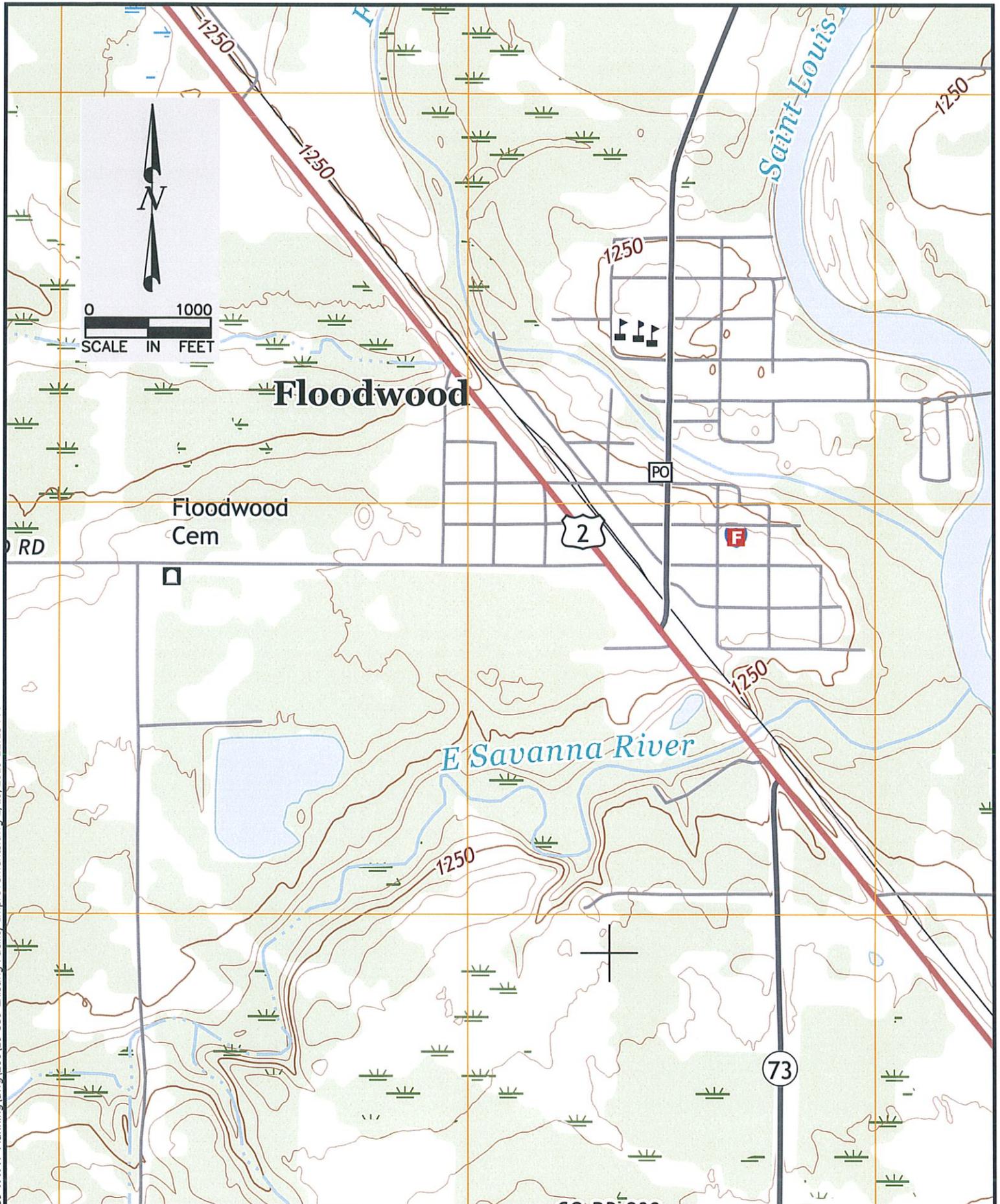
LOCATION MAP

FLOODWOOD, MINNESOTA

PROJECT NUMBER

19-559

SHEET NUMBER



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FLOODWOOD WWTF
USGS MAP

FLOODWOOD, MINNESOTA

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1.4 Environmental Resources Present

The environmental resources present in the planning area that may pertain to the project include, land use, floodplain, wetlands, historical properties, biological resources, water quality, coastal resources, socio-economic/environmental justice issues and other factors pertaining to the project.

1.4.1 Land Use

Additional lands potentially necessary to the project could include the need for expansion of the treatment system. There is vacant City owned property adjacent to the existing wastewater facility. Use of this land is not anticipated to affect important farmlands.

1.4.2 Wetlands

Preliminary review of the lands potentially necessary for the project do not indicate any wetlands. Other areas for improvements are located within the existing wastewater facility and include previously improved areas and are not wetlands.

1.4.3 Floodplains

The project is not located within a floodplain. The City of Floodwood has Special Flood Hazard Areas, however the area of the project site is not included or mapped.

1.4.4 Historical Properties

The project site is an existing wastewater treatment facility and would not include any historical properties.

1.4.5 Biological Review

The project area is in previously disturbed areas or open areas. Some vegetation may be temporarily or permanently disturbed in the project area. Construction activity can affect biological resources, due to noise, or damage to habitat. The U.S. Fish and Wildlife Service indicates the Northern Long-eared bat may be present in the area. Impacts can be minimized or avoided

by performing tree clearing activities during the winter months when the bats are not typically in the area.

1.4.6 Water Quality

Construction activity may require an MPCA Construction Stormwater Permit for construction erosion and sediment control during the construction.

1.4.7 Coastal Resources

The City of Floodwood is not near any coastal resources.

1.4.8 Socio-Economic/Environmental Justice

The construction activities would not cause any socio-economic or environmental justice effects. Project components would benefit all social and economic classes equally.

1.4.9 Population Impacts

Completion of the project is not anticipated to negatively affect population trends and would provide for future project growth patterns.

2.0 EXISTING WASTEWATER COLLECTION AND TREATMENT FACILITY

2.1 Wastewater Collection System

The City of Floodwood's wastewater collection systems consist of approximately 28,000 feet of eight inch (8") and ten inch (10") PVC and VCP sanitary sewer collection lines, service pipes and 93 manholes. There is approximately 1,000 feet of small diameter force main serving 9 homes with individual grinder lift stations. A sanitary sewer collection system map is included in the attachments.

2.2 Wastewater Treatment Facility

The treatment facility consists of one lift station, approximately 5,900 feet of four inch (4") force main and a 2 cell stabilization pond system. This is a Class D facility.

The treatment facility has a controlled discharge (SD 001) to the East Savanna River, a Class 2B, 3C, 4A, 4B, 5, 6 water. The facility is designed to treat an average wet weather flow of 105,600 gallons per day with a five day carbonaceous biochemical oxygen demand (CBOD₅) concentration of 213 milligrams per liter (mg/l). The primary pond cell has a surface area of 11.2 acres and the secondary cell a surface area of 5.65 acres. The pond system provides a total detention time of 225 days at design flow. The facility was constructed in 1969 and placed on line in 1970. The facility is located in T51N, R20W, Section 7, Floodwood Township, St. Louis County, Minnesota.

2.3 Financial Status of Existing Facility

The annual operating and maintenance cost of the existing Floodwood sewer system is as follows:

	<u>2018</u>
Total Operation & Maintenance	\$86,000

The existing debt service for the Floodwood Wastewater System includes an annual total debt service of \$13,669 per year through the year 2027.

Current wastewater rates area as follows:

Effective March 1, 2019	
Sewer Base Fee	\$20.40
Plus, per 1,000 gallons	\$ 3.70
Average Residential Monthly Fee	\$34.00

2.4 System Users

There is a total of 325 connections to the wastewater system. Included are a total of 270 residential, 4 multi-family and 51 small commercial users. Current average daily water usage is 42,000 gallons per day.

Residential water use, as estimated by the City, is 30,000 gallons per day.

Commercial water use is then estimated to be 12,000 gallons per day.

Equivalent dwelling unit (EDU) calculations are as follows:

270 residential	270 EDU's
4 multi-family	8 EDU's

$30,000 \text{ gallons per day} / 278 \text{ EDU's} = 108 \text{ gallons per day per EDU.}$

Commercial usage $12,000 \text{ gallons/day} / 108 \text{ gallons/day/residential EDU} = 11 \text{ EDU's.}$

Total EDU's	<u>EDU's</u>
270 residential	270
4 multi-family	8
Commercial	<u>111</u>
Total	389 EDU's

3.0 EXISTING AND FUTURE FLOWS

3.1 Existing Flows

Existing flows for the past 3 years (2016, 2017, 2018) were received from the City of Floodwood. Three flow conditions critical to design and operation of a wastewater treatment facility include Average Dry Weather Flow (ADWF), Average Wet Weather Flow (AWWF) and Peak Hourly Wet Weather Flow (PHWWF) and are described below.

Average dry weather flow (ADWF) is the daily average flow when the ground water is at or near normal and a runoff condition is not occurring.

Average wet weather flow (AWWF), or peak month flow, is the average flow for the wettest ~~30~~ consecutive days for _____.

Peak hourly wet weather flow (PHWWF) is the peak flow during the peak hour of the day when the ground water is high and a five-year, one hour storm event is occurring.

The planning period for wastewater treatment facilities is typically 20 years. The evaluation included within for Floodwood will be based on the year 2038.

Summarized flows for the years 2016, 2017 and 2018 for the facility are as shown in Table _____.

Flows in Million Gallons Per Day (MGD)			
Month	2016	2017	2018
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Total			
Average			

Based on Table ____, current existing flow data is:

Average Daily Flow _____ gallons per day

Average Dry Weather Flow _____ gallons per day

Average Wet Weather Flow _____ gallons per day

Peak Hourly Flow _____ gallons per day

3.2 Future Flows

Based on potential population projections the following is a summary of the projected 2038 wastewater flow.

Existing Average Wet Weather Flow _____

Population Increase
 (_____ people @ 100 gallons
 Per capita per day)

Allowance for Industrial/Commercial _____

Future Average Wet Weather Flow _____

4.0 WASTEWATER TREATMENT ALTERNATIVES

4.1 Existing Facility Conditions

The following is a summary of a review of the components of the Floodwood Wastewater Treatment Facility.

In review of each component, the age, physical condition, operational performances, future needs of the components and the estimated costs were evaluated. To determine the extent of the proposed improvements, each component will be reviewed separately. The detailed cost estimates are shown in Appendix "B".

The following life expectancy table was used as a guide for the rehabilitation or replacement of equipment at the Floodwood facility unless the current condition of the equipment required rehabilitation or replacement.

Item	Life Expectancy	Year Due for Replacement
		Original Component
Piping – Pipes, Valves, Manholes, Etc.	50 Years	2020
Control Structures	40 Years	2010
Access Road	30 Years	2000
Pond Grading	100 Years	2070
Fencing	40 Years	2010

4.1.1 Control Structures

Floodwood's Wastewater Treatment Facility includes 4 control structures used to operate, transfer between ponds and discharge treated wastewater. These structures are connected to the pond system with eight inch (8") diameter pipes.

In the past years the structures have had general maintenance and repairs completed to allow them to operate the pond system. In 2005 two structures were repaired with a monofom manhole sealing system to maintain the integrity of the structures. The structures do not have any valves before or after the inlet or outlet between the ponds or outfall, and are continuously underwater.

The structures were originally constructed with shear gates at the bottom of the structure below the low water pond operating depth. The MPCA has suggested removal of these shear gates when possible.

In March 2018 the bottom of Control Structure 4 broke causing a release of wastewater into the ground. In June of 2018 a repair was completed to Control Structure 4 to repair the broken areas of the concrete structure and allow it to return to normal operation.

All of the structures have reached their design life and should be considered for replacement due to their age.

4.1.2 Pond Piping, Valves, Manholes

The Floodwood Wastewater Treatment Facility includes piping and manholes. Piping is used to distribute wastewater to either pond upon arrival, transfer wastewater between ponds and to discharge treated wastewater to the outfall.

Piping from Structure 1 to the outfall, and between Structure 1 and Structure 2 was televised in 2018. During the televising, piping between Structure 1, Manhole 1 and the outfall was noted to be in fair to good condition. Piping between Structure 1 and Structure 2 was unable to be televised due to bends or blockages encountered. It is our understanding that the piping between Structure 1 and Structure 2 has not been in service for many years due to an unknown problem. Manhole 1, located between Structure 1 and the outfall, is in poor condition.

Piping between Structure 1 and Structure 3 appears to be in good condition. This piping cannot be televised because it is always underwater. There have been no known operational issues with this piping.

Due to the age and unknown condition of the pipe between Structure 2 and Manhole 1, this piping should be replaced to be able to resume operation of

this piping and operation of the pond system to allow a discharge directly from the primary pond when applicable.

4.1.3 Pond Grading/Earthwork

Floodwood's wastewater ponds were constructed in 1969/1970. The pond system includes earthwork grading to construct the dikes holding the wastewater. Maintenance of the earthwork generally consists of mowing, vegetation control, varmint control, access roadway maintenance and general review of the slopes.

The existing gravel access road is in need of regrading and new aggregate surfacing to provide an acceptable driving surface for general maintenance, access and observations. The exterior earthen dikes are in need of minor grading to smooth out the surface for ease of maintenance mowing.

Following the breakage of the bottom of Control Structure 4, MPCA staff suggest an evaluation of soil stability, including berm/dike stability is warranted in the vicinity of Structure 4 due to the volume of wastewater discharged. Observations of the berm over the past year have not indicated any stability concerns.

4.1.4 Fencing

Fencing around the facility provides warning and safety for the wastewater facility. There is approximately 4,000 feet of fence surrounding the pond system. Generally, the fencing is considered in good condition. About 10 years ago improvements and repairs were completed to approximately 50% of the fencing that required improvements.

Improvements to the fencing at this time will generally be limited to an area where piping is proposed to be replaced.

4.1.5 Access Road

Along the top of the pond dikes an access road exists to allow normal operation and maintenance access to the ponds. This access roadway is in poor condition inhibiting access to the pond system.

4.1.6 Pond Sludge

Preliminary measurements of sludge in the ponds were taken in 2019. The primary pond measurements indicated 4 to 5 inches of a hard sludge above the top clay layer of pond bottom. Secondary pond measurements indicated 3 inches of a soft sludge, above 5 to 6 inches of a hard sludge above the top clay layer of pond bottom. Previous sludge removal has occurred in the primary pond approximately 30 years ago. No sludge removal in the secondary ponds has been known to occur. The original plans indicate the pond bottoms were constructed at an elevation of 1257. Control Structures 2, 3 and 4 were constructed such that the minimum elevation of water discharge is at elevation 1258. Further accumulation of sludge could result in future solids being released during a discharge. Cleaning of the pond bottom could provide an increase of capacity, and would return the pond back to normal operational depth by removal of sludge to the original pond bottom.

4.1.7 Lift Stations

Floodwood's wastewater treatment system includes a main lift station located in the east central portion of the City. This main lift station collects all the wastewater from the City's collection system and pumps it to the wastewater treatment facility. Over the years controls, pumps and other related items have been replaced. At this time there are no needs at the main lift station.

In the northern part of the City, there are 9 homes connected to the collection system that utilize individual grinder pump stations. These lift stations include a single pump that pumps wastewater to a small diameter force main connected to the main sanitary sewer collection system. These stations are approximately 15 years old. The individual grinder stations have been operating successfully.

4.2 WASTEWATER TREATMENT SYSTEM IMPROVEMENTS

4.2.1 Control Structures

The control structures age, past maintenance and repairs, conditions and recent problems lead to a need to replace the control structures to allow continuation of the normal operation of the treatment system and provide acceptable wastewater treatment for the future.

Replacing each of the four control structures would involve removal of the existing structure and replacing with a new reinforced concrete structure similar to the existing. Valves would be added as applicable to the piping to allow the structures to be operated and maintained more effectively.

Removal and replacement of the control structures would be completed such that the existing pond liner would not be disturbed. Replacing the control structures is an immediate need to allow continued operation of the facility.

4.2.2 Pond Piping, Valves and Manholes

The pond piping provides proper operation of the wastewater treatment facility. Due to the condition of the piping between Structure 1 and Manhole 2, this piping should be replaced with new pipe. The condition of Manhole 1 indicates the need to replace this manhole. Replacing this piping and the manhole is an immediate need to allow continued operation of the facility.

4.2.3 Pond Grading/Earthwork

Minor pond grading of the top of the dikes, and exterior slopes should be completed. The existing access roadway should be improved. Various areas along the exterior dike slopes need minor grading to smooth out minor erosion, varmint holes and other areas that have become rough for ease of maintenance mowing. A geotechnical evaluation of the berm/dike stability has been suggested by MPCA staff and is included in the recommendations. Completion of this minor grading work is an immediate need to allow continued operation of the facility.

4.2.4 Pond Cleaning

Preliminary measurements of sludge in the primary and secondary pond bottoms encountered 4 to 6 inches of sludge in the bottom of the ponds. Removal and disposal of the accumulated sludge and settled soils would allow the ponds to return to the treating the original design flows. Removal of an average of 4 inches of sludge in the primary pond would increase the capacity of the primary pond by approximately 1 million gallons. Removal of an average of 6 inches of sludge in the secondary ponds would increase the capacity of the secondary pond by approximately 900,000 gallons. A total of 1,900,000 gallons, based on the 105,600 gallons per day design flow equates to approximately 18 days of flow. Removal of accumulated sludge would return the pond bottom to the original pond bottom. Removal of accumulated sludge is an immediate need to allow continued operation of the facility.

4.2.5. Lift Stations

Improvements to the main lift station is not necessary at this time. It is recommended that the City continue to monitor lift station operation and budget for future pump and control replacement.

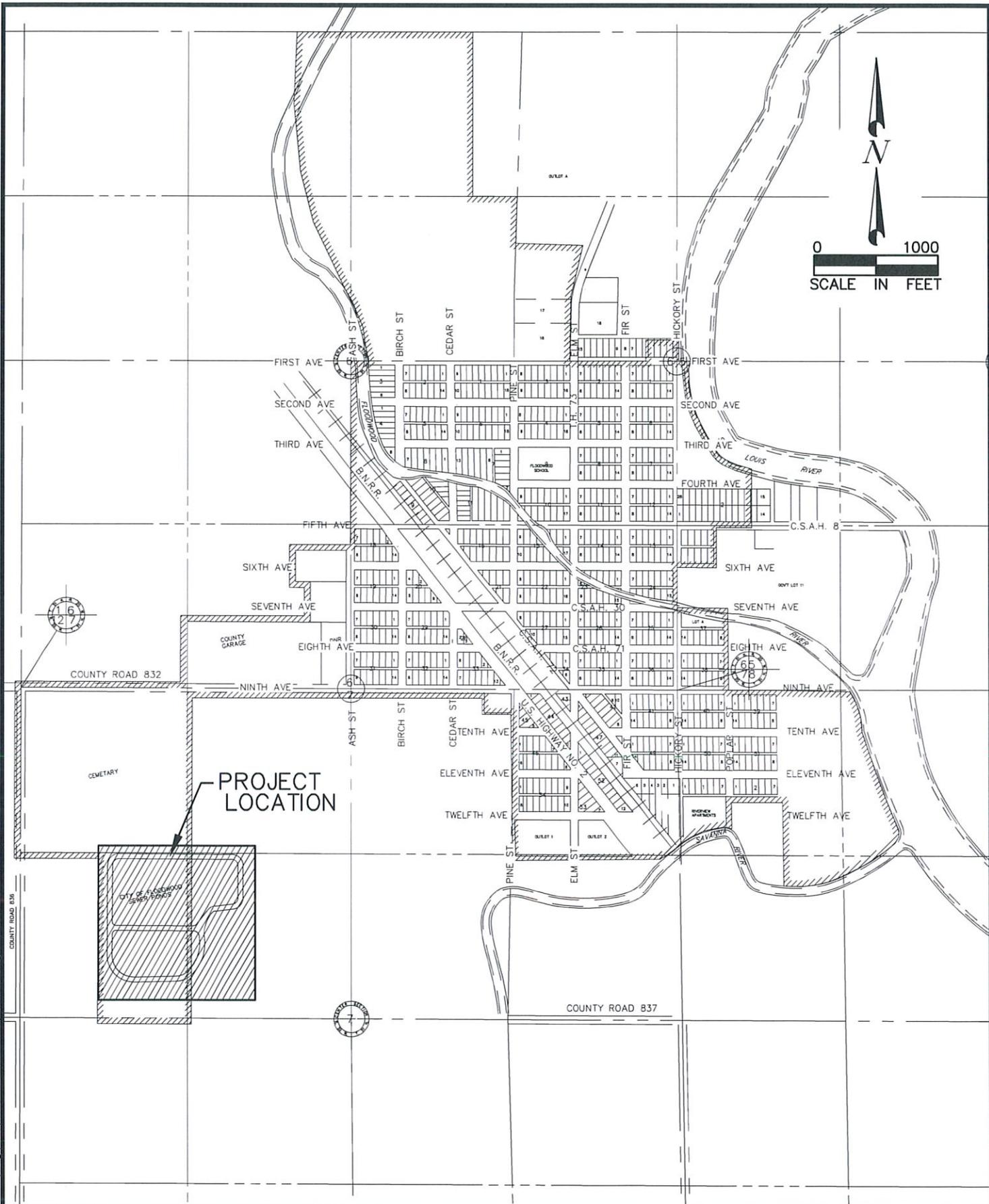
Improvements to the individual grinder pump stations are not necessary at this time. It is recommended that the City have on hand a replacement pump at all times to allow replacing or repairing a failed pump if necessary. The City should plan for future budgeting to replace controls and other components within the next 10 years.

4.2.6 Capacity

4.2.7 Project Schedule

Acceptance of Facility Plan	February 2019
Prepare Plans and Specifications	October 2019 – December 2019
Submit Plans and Specifications for Regulatory Review	March 2020
Secure Funding/Financing	April 2020
Bid and Award Construction Contract	May 2020
Begin Construction	June 2020
Complete Construction	October 2020

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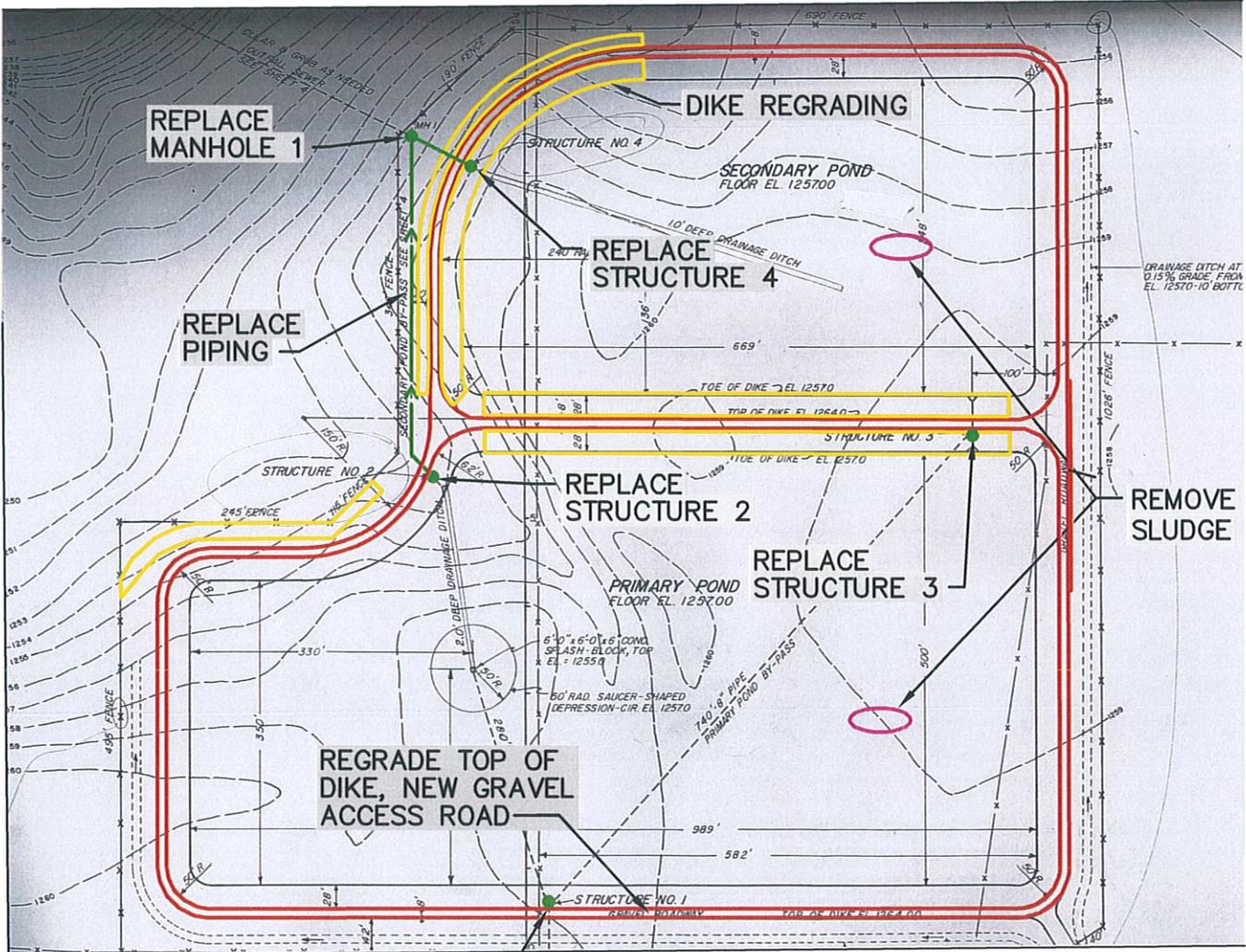
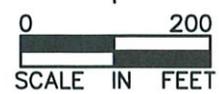
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PROJECT NUMBER

18-456

SHEET NUMBER



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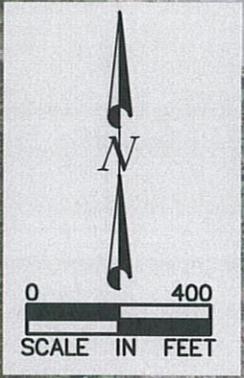


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**FLOODWOOD WWTF
EXISTING FACILITY IMPROVEMENTS
FLOODWOOD, MINNESOTA**

PROJECT NUMBER	19-559
SHEET NUMBER	

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FLOODWOOD WWTF POND EXPANSION

FLOODWOOD, MINNESOTA

PROJECT NUMBER

18-456

SHEET NUMBER



CITY OF FLOODWOOD

EXISTING POND IMPROVEMENTS

PROJECT NO. 19-559

February 7, 2019

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
CLEARING AND GRUBBING	0.50	ACRES	\$3,000.00	\$1,500.00
REMOVE FENCE	400	LIN. FT.	\$2.00	\$800.00
REMOVE PIPING	860	LIN. FT.	\$8.00	\$6,880.00
REMOVE MANHOLE	1	EACH	\$500.00	\$500.00
REMOVE CONTROL STRUCTURE	3	EACH	\$1,000.00	\$3,000.00
MINOR EXTERIOR DIKE GRADING	750	CU. YD.	\$6.00	\$4,500.00
AGGREGATE BASE CLASS 5	600	CU. YD.	\$25.00	\$15,000.00
MANHOLE	1	EACH	\$6,000.00	\$6,000.00
CONTROL STRUCTURE	3	EACH	\$15,000.00	\$45,000.00
PIPING CONTROL VALVES	6	EACH	\$8,000.00	\$48,000.00
POND PIPING	860	LIN. FT.	\$60.00	\$51,600.00
FENCING	400	LIN. FT.	\$10.00	\$4,000.00
SEEDING	3	ACRES	\$3,000.00	\$9,000.00
DIKE STABILITY ANALYSIS	1	L.S.	\$35,000.00	\$35,000.00

TOTAL PROBABLE CONSTRUCTION COST	\$230,780.00
CONTINGENCIES	\$23,078.00
LEGAL, FISCAL, AND ENGINEERING	\$41,540.40
TOTAL PROBABLE PROJECT COST	<u>\$295,398.40</u>

SAY	\$295,400
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CITY OF FLOODWOOD

EXISTING POND SLUDGE REMOVAL

PROJECT NO. 19-559

February 7, 2019

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
WATER TRANSFER	1	L.S.	\$20,000.00	\$20,000.00
SLUDGE REMOVAL	8,000	CU. YD.	\$15.50	\$124,000.00
TOTAL PROBABLE CONSTRUCTION COST				\$144,000.00
CONTINGENCIES				\$14,400.00
LEGAL, FISCAL, AND ENGINEERING				\$25,920.00
TOTAL PROBABLE PROJECT COST				\$184,320.00
			SAY	\$184,400



CITY OF FLOODWOOD

WASTEWATER TREATMENT FACILITY
POND EXPANSION

PROJECT NO. 19-559

February 7, 2019

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

ITEM	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
CLEARING AND GRUBBING	8	ACRES	\$2,000.00	\$16,000.00
EXCAVATION	25,000	CU. YD.	\$6.00	\$150,000.00
POND LINER	5	ACRES	\$30,000.00	\$150,000.00
GEOTEXTILE	4,600	SQ. YD.	\$3.00	\$13,800.00
RIP RAP	1,800	CU. YD.	\$30.00	\$54,000.00
CONTROL STRUCTURE	3	EACH	\$7,000.00	\$21,000.00
POND PIPING	1,500	LIN. FT.	\$50.00	\$75,000.00
SEEDING	4	ACRES	\$1,800.00	\$7,200.00
FENCING	2,000	LIN. FT.	\$8.00	\$16,000.00
POND WATER BALANCE	3	EACH	\$10,000.00	\$30,000.00
DIKE GRAVEL	500	CU. YD.	\$20.00	\$10,000.00
BOAT RAMP	1	EACH	\$25,000.00	\$25,000.00
				\$0.00

TOTAL PROBABLE CONSTRUCTION COST	\$568,000.00
CONTINGENCIES	\$56,800.00
LEGAL, FISCAL, AND ENGINEERING	\$102,240.00
TOTAL PROBABLE PROJECT COST	\$727,040.00

SAY	\$727,100
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