

**AGENDA  
CITY OF CARO  
COMMITTEE OF THE WHOLE  
DECEMBER 7, 2023 at 5:30 P.M.**

**CALL TO ORDER**

**PUBLIC COMMENTS**

**BUSINESS ITEMS:**

1. WWTP Project
2. Well Project
3. Old Police Department Parking Lot
4. Annual Goals – City Manager

**ITEMS PENDING/POSTPONED:** None

**ADDITIONAL PUBLIC COMMENTS**

**MAYOR COMMENTS**

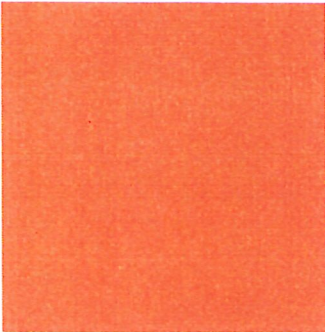
**ADJOURN**

---

# BASIS OF DESIGN FOR EQUIPMENT REPLACEMENT AND REHABILITATION

## CARO AREA WASTEWATER TREATMENT PLANT

**Draft: November 2023**  
HRC Job No. 20221089



## Table of Contents

TABLE OF CONTENTS.....	i
SECTION 1.0 — EXECUTIVE SUMMARY.....	1-1
SECTION 2.0 — EXISTING CONDITIONS / NEED FOR PROJECT.....	2-1
2.1 SYSTEM BACKGROUND.....	2-1
2.2 NEED FOR PROJECT.....	2-1
2.3 HIGHEST PRIORITY PROJECTS.....	2-2
2.4 SECOND PRIORITY PROJECTS.....	2-2
2.5 ADDITIONAL PRIORITY PROJECTS.....	2-3
SECTION 3.0 — DESIGN ELEMENTS.....	3-1
3.1 DESIGN CAPACITY.....	3-1
3.2 PRIMARY DIGESTER.....	3-1
3.3 UV DISINFECTION.....	3-1
3.4 LIFT STATION #8.....	3-2
3.5 SECONDARY CLARIFIERS.....	3-3
3.6 COLLECTION SYSTEM IMPROVEMENTS.....	3-4
SECTION 4.0 — ESTIMATED COST AND SCHEDULE.....	4-1
4.1 ENGINEER’S OPINION OF PROBABLE COST.....	4-1
4.2 PROJECT FUNDING SOURCES.....	4-1
APPENDIX A –NPDES Permit	

## SECTION 1.0 — EXECUTIVE SUMMARY

The City owns and operates the Caro Area WWTP, which was originally constructed in 1957 with primary treatment and a trickling filter for secondary treatment. In 1986, the trickling filter was replaced by a bio-disc secondary treatment system. That system was replaced with an oxidation ditch in 2008 as part of a major upgrade to the existing facility that also included a new grit system, a third secondary clarifier, pump and piping replacements, and electrical and communication improvements. No significant updates have been undertaken since 2008.

The WWTP provides preliminary, primary and secondary treatment and disinfection using chlorine gas for liquid flows. There is an equalization tank that provides temporary storage of peak wet weather flows. Solids removed undergo digestion in two reactors and then are placed in drying beds for dewatering before being hauled for land application and/or landfilling if needed. Primary and secondary anaerobic digesters and onsite sludge drying beds are also part of the overall operations of the facility for biosolids management. Digested and dried sludge is hauled and is land applied by outside vendors.

The City recently made a complete inspection of the WWTP and confirmed that several mechanical components of the plant are approaching the end of their expected service life and need to be replaced in order to provide reliable service in the future. Various equipment and systems need to be rehabilitated and/or replaced to sustain operation, meet regulatory requirements, and provide the required level of treatment for the service area.

New equipment has been analyzed for each system to be rehabilitated based on the expected influent wastewater characteristics and the desired performance criteria. Based on updated information provided in October 2023, we understand the priorities for the Project include the following:

- ≡ **Highest Priority (must be completed in near term to ensure reliable operation)**
  - Replace the existing Primary Digester cover, which is currently displaced.
  - Replace the existing chlorine disinfection system with UV disinfection system housed in a new building.
  - Lift Station #8 upgrade/replacement
- ≡ **Second Priority (needs to be completed for reliable operation but are somewhat lower priority if funding is an issue)**
  - Completely replace two (2) existing clarifier drives, mechanisms, baffles, & weirs and add two new Variable Frequency Drives (VFDs) to the existing pumps.
  - Replace existing Grit Removal System
  - New RAS/WAS pumps (all)
  - Provide new above-grade electrical and controls for the existing remote lift stations (some work already started). Also, replacement pumps, grinders, flow meters, etc. as needed.
  - Sanitary sewer extension to properties in business district that are currently served by failing septic fields
- ≡ **Additional Projects (projects that improve WWTP operation but could be deferred somewhat)**
  - New lab cabinets and equipment
  - Primary Tank supernatant storage
  - Pavement replacement and relocation of septic receiving station
  - Consideration for Secondary Clarifier covers and Drying bed cover

## **SECTION 2.0 — EXISTING CONDITIONS / NEED FOR PROJECT**

### **2.1 SYSTEM BACKGROUND**

#### **2.1.1 Caro Area Wastewater Treatment Plant**

The City owns and operates the original Caro Area WWTP, which was originally constructed in 1957 with Primary Treatment and a Trickling Filter for Secondary Treatment. In 1986, the Trickling Filter was replaced by a bio-disc Secondary Treatment System. That system was replaced with an Oxidation Ditch in 2008 as part of a major upgrade to the existing facility that also included a new Grit System, a third Secondary Clarifier, pump and piping replacements, and electrical and communication improvements. No significant updates have been undertaken since 2008.

The WWTP's design flow since 1986 has remained at approximately 1.2 Million Gallons per Day (MGD) with a peak hour flow of 3.0 MGD. The WWTP's approximate average annual flow is 0.635 MGD. This level of demand has been consistent for several years and is not expected to change in the foreseeable future. Only a small number of City residents and businesses are not currently connected to the sewer system.

The Caro Area WWTP serves primarily resident and commercial uses and does not receive the discharge of any type or quantity of substance which may cause interference with the operation of the treatment works; and, therefore, is not required to develop an industrial pretreatment program in accordance with Section 307 of the Federal Water Pollution Control Act.

The WWTP provides Preliminary, Secondary Treatment and Disinfection for liquid flows. There is an Equalization Tank that provides temporary storage of peak wet weather flows. Solids removed undergo digestion in two Digesters and then are placed in Sludge Drying Beds for dewatering before being hauled for land application and/or landfilling if needed. The WWTP's Residuals Management Plant is up to date.

#### **2.1.2 Caro Area Sanitary Sewer Collection System**

The City's sanitary collection system is a separated system, but does receive some wet weather flow in the form of inflow from home footing drains and infiltration of groundwater through the existing sewer system. It was generally constructed throughout the late 1950s and 1960s. The City has cleaned and inspected about 20% of its collection system sewers in the last ten years and continues to perform additional cleaning and inspection to address any operational and/or structural issues as they are identified and reduce inflow and infiltration into the system. The City continues to monitor and address inflow and infiltration but has not experienced any recent Sanitary Sewer Overflows and/or basement backups due to inflow and infiltration. There is an equalization basin provided at the WWTP to attenuate the wet weather flows on the treatment system.

The sanitary collection system contains a total of 11 lift stations. Sewage collected from the service area is treated at the WWTP to meet current effluent quality requirements prior to discharge into the Cass River.

### **2.2 NEED FOR PROJECT**

The City recently made a complete inspection of the WWTP's working components and developed a plan for rehabilitation and/or replacement of various equipment and systems required to sustain operation, meet permit requirements and the required level of service to its customers and the environment. While the WWTP and collection system regularly meets all permit conditions, if the identified deficiencies are not addressed, it would be much more difficult to continue to meet those standards and may result in enforcement actions by EGLE and/or impacts to water quality and public health.

A Project Plan was developed and submitted as part of an application for Clean Water State Revolving Funds (CWSRF,) which is a funding and financing program administered by EGLE, on April 28, 2023. The City was later notified that the Project Plan was prioritized for funding with a low interest loan (2% for a 20-year loan) for qualified projects in Fiscal Year 2024. The City must commit to a project milestone schedule by December 22, 2023 in order to proceed with the proposed financing.

Since that Project Plan was submitted, the need for projects and priorities that were included have been reviewed in more detail by the City staff and HRC. It should be noted that a new Superintendent for the WWTP was appointed in March of 2023 and there have been other staff changes since the submission of the Project Plan.

## **2.3 HIGHEST PRIORITY PROJECTS**

### **2.3.1 Digester Tanks**

The existing floating Primary Digester cover has become unlevel and needs to be removed and replaced. Bids were received to remove the existing floating cover for evaluation of its condition and a recommendation for rehabilitation or replacement. Due to the cost this work was not performed and the decision to remove and replace the cover with a new one was made. This work is necessary to ensure that the solids treatment and storage systems at the WWTP remains operational.

### **2.3.2 Disinfection System**

The existing Disinfection System provides chlorination/dechlorination in two parallel contact tanks, each with a volume of 11,845 gallons. Gas chlorine solution is used for disinfection and sulfur dioxide is used for dechlorination. The existing disinfection system is beyond its anticipated useful life and needs to be replaced. UV Disinfection is proposed for more efficient operation and to eliminate the need to purchase, store and handle chlorine gas, and its potential impact on receiving waters and safety to public and personnel.

### **2.3.3 Lift Station #8**

Lift Station #8 has equipment that is beyond its anticipated useful life and/or is not sized to accommodate new flows emanating from a splash pad that was added to an adjacent park. Its current location also makes it difficult to service and should be located to nearby City property with better access.

## **2.4 SECOND PRIORITY PROJECTS**

### **2.4.1 Secondary Clarifiers**

Effluent from the Oxidation Ditch flows to a splitter box which distributes the mixed liquor to the three (3) existing circular Secondary Clarifiers. Two of the units are 35 ft. diameter by 10 ft. side water depth and one unit is 35 ft. diameter by 12 ft. side water depth. Each unit is equipped with a sludge/scum collector mechanism and fiberglass weirs and baffles. Clarifiers #1 and #2 were constructed in 1985 and Clarifier #3 was constructed in 2008. All three tanks utilize center feed technology, with influent flow entering the center of the tanks through an influent pipe and exiting the tank around the circumference through a concrete trough.

Several mechanical components of existing Clarifiers #1 and #2 are beyond the end of their expected service life and need to be replaced, which include the rotating equipment, weirs and baffles. Clarifier #3 includes a feed pump that is equipped with a Variable Frequency Drive (VFD.) VFDs should be added to Clarifier #1 and #2 to allow for improved operation and reduced energy consumption.

## 2.4.2 RAS & WAS Pumping

Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) pumping is currently provided by four (4) horizontal, solids handling pumps, each providing flow capacities of 335 GPM. These pumps are also called the "Secondary Sludge Pumps" and convey the solids settled at the Secondary Clarifiers and return them to the Oxidation Ditch to enhance the Secondary Treatment process. They are also used to periodically waste excess solids to the Solids Handling system for ultimate land application. These pumps are beyond their useful life and require replacement to ensure continued reliability and operational efficiency. One of the pumps currently has holes in the volute and needs to be replaced.

## 2.4.3 Replace Existing Grit Removal System

The existing grit removal system was installed in 2008, but due to the corrosive and difficult nature of the grit handled by the system, the system requires replacement as equipment has worn to an unacceptable condition. Ragging is an additional concern as there continues to be rags present in the collection system due to the number of hospital/care facilities in the area. The City continues to work with the community to try to prevent these from entering the collection and treatment system, but there continue to be issues for the collection system, Lift Stations and Preliminary Treatment System at the WWTP.

## 2.4.4 Remote Lift Stations

The sanitary collection system includes 11 existing lift stations. The existing electrical services and control panels were originally located inside the below-grade structures and should be moved above-grade to reduce the need for confined-space entry to access the controls and to reduce the potential of damage from flooding. This work has been started at several locations and should be completed at those sites as well as the remaining sites.

In addition, there are components of the individual lift stations that are beyond their anticipated useful life and/or require replacement or rehabilitation due to their condition. These components vary station to station but include assets such as pumps, grinders and/or flow meters.

## 2.5 ADDITIONAL PRIORITY PROJECTS

The following items are not included in the budget for the proposed upgrade Project. But are listed should any additional funding opportunities be made available.

### 2.5.1 Laboratory Cabinets and Equipment

The existing laboratory cabinets date to the 1950s and have significantly deteriorated and require replacement with chemical resistant units. Some of the laboratory equipment that is used to perform permit-required testing is also beyond the anticipated useful life and also requires replacement.

### 2.5.2 Primary Tank Supernatant Storage

The WWTP originally was equipped with five (5) rectangular Primary Settling Tanks that were used to remove solids from the flow. When the new Oxidation Ditch was constructed in 2008 to replace the former Rotating Biological Contactors, the Primary Settling Tanks were no longer required and were removed from service.

The concrete structures for the tanks appear to be in good condition, and so consideration was made to re-use the available tankage for storage of supernatant from the Digesters. This would allow for improved dewatering of the solids and reduce costs for hauling costs associated with land application.

### 2.5.3 Pavement Replacement and Septage Receiving

The existing service drives that provide personnel and vehicular access to the various equipment and facilities at the WWTP is failing and requires rehabilitation and/or replacement. The existing septage receiving station needs to be relocated to better service the public as several accidents have occurred damaging equipment and facilities in the vicinity. It would most efficient and economical to relocate the facility in conjunction with the paving project.

### 2.5.4 Secondary Clarifier Covers

Operators have reported significant issues with algae in all three (3) Secondary Clarifiers and have expressed interest in evaluating alternatives to prevent algae growth. Covers are available from various manufacturers to cover the weirs and prevent sunlight that triggers growth of algae.

### 2.5.5 Sludge Drying Bed Covers

The WWTP currently uses the Sludge Drying Beds for both dewatering solids emanating from the WWTP and solids emanating from the backwash of the filters at the City's Drinking Water Treatment Plant. The solids from the Drinking Water Treatment Plant tend to be high in arsenic (which naturally occurs in the drinking water wells and is removed by the Water Treatment Plant.) The solids emanating from the WWTP are stored in the drying beds until the growing season when they can be hauled off site land applied. The solids from the Drinking Water Plant backwash that contain arsenic are kept in specific beds and dried and hauled to a designated landfill for proper disposal. Adding covers over the drying beds would allow for improved dewatering by protecting the solids from rain and snow, which reduces the cost associated with land application and/or disposal.



## SECTION 3.0 — DESIGN ELEMENTS

### 3.1 DESIGN CAPACITY

The WWTP's design flow since 1986 has remained at approximately 1.2 Million Gallons per Day (MGD) with a peak hour flow of 3.0 MGD. The WWTP's approximate average annual flow is 0.635 MGD. This level of demand has been consistent for several years and is not expected to change in the foreseeable future. Only a small number of City residents and businesses are not currently connected to the sewer system.

### 3.2 PRIMARY DIGESTER

Several options were reviewed for replacement of the existing floating Primary Digester cover, including use of concrete, steel, aluminum and newer products available made of fiberglass-reinforced plastic (FRP.) A steel cover requires significant maintenance on the interior to protect it from the corrosive gasses present in the tank and therefore was not selected. For aluminum, there are concerns about expansion/contraction and maintaining a seal at the tank interface and the material is not typically used for anaerobic tank covers. For FRP, while there may be potential for this material, there are currently no installations of FRP covers on anaerobic digesters in the U.S. In addition, the exterior would require periodic coating to protect the cover from deterioration from UV (sunlight) exposure.

The existing floating Primary Digester cover will be removed and replaced with a new cast-in-place conical concrete, fixed cover. The interior of the cover will be protectively coated which will require inspection and ultimately re-coating approximately every 7 to 10 years.

While the Primary Digester improvements are being constructed sludge will not be anaerobically digested. During construction temporary sludge dewatering will occur and the dewatered sludge disposed at a local landfill will be required.

### 3.3 UV DISINFECTION

#### 3.3.1 UV Testing & Design Criteria

Disinfection will be accomplished by Ultraviolet (UV) disinfection. Following secondary clarification, secondary effluent will be routed to a new UV Disinfection System. The system will consist of an open channel UV system to be constructed in one-half of the existing Chlorine Contact Tank. The UV system will include one bank consisting of three separate UV modules to provide system redundancy. The UV system will be packaged with one power distribution center and one system control center. The UV equipment will be removable from the channel while the system remains in service. The UV system will be sized to match the capacity of the secondary treatment system.

The following data applies:

≡ UV system peak flow capacity:.....	1.5 MGD
≡ Low flow rate: .....	0.3 MGD
≡ Total Suspended Solids (TSS).....	<30 mg/L
≡ BOD5 .....	<30 mg/L
≡ UV Design Transmittance: .....	65% minimum
≡ Total Number of UV Lamps: .....	8 per module (24 total)

The UV system control panel will transmit status and alarms to the WWTP SCADA systems

### 3.3.2 UV Channel Features

The UV channels will each be provided with the following features to aid in operation of the system:

- ≡ Channel drain: A drain with isolation valves will be provided to drain the channel where the UV bulbs are contained for periodic maintenance.
- ≡ Channel covers: The new UV channels will be covered with solid FRP covers to minimize algae growth
- ≡ Isolation Gate: An isolation gate will be provided upstream of the UV channel with a motor operator to open or close the gate, allowing the channel to be taken out of service. A concrete weir will be constructed downstream of the UV equipment to maintain an optimum water level through the bulbs.
- ≡ UV transmittance (UVT) monitor: A digital UVT monitor will be provided in the channel upstream of the UV modules to detect UV transmittance through the water and adjust lamp power levels to match the disinfection requirements to provide efficient operation and savings on electrical costs.
- ≡ New UV Building: A new building will be constructed to enclose the UV system and its appurtenances and will protect it from cold weather and provide a better environment for maintenance of the system.

### 3.3.3 Electrical & Controls

Electrical feed to the new UV system will come from a new MCC located in the primary control. The feed will be sized to provide power for the UV system and for new UV building lighting, ventilation and heating systems within the building. The electrical equipment for the new system will be housed within the new building above the UV channels.

Dual electrical feeds will be connected to the UV system power centers to provide for redundancy in case of a power failure. The new UV system will be integrated into the plant's existing SCADA system for flow monitoring and flow-paced dosing control. Dosing will be derived from the effluent flow rate as measured by the effluent flow meter.

A single PLC based controller will be provided in the UV control panel to separately control the UV intensity. The UV System control panel will be provided with a UPS in case of power failure. The UV System control panel and PLC will be connected to the existing WWTP SCADA system via fiber optic communications. The new fiber optic cable will connect the UV System control panel to the existing control panel located in the Equipment Building.

### 3.3.4 Structural Modifications

The new system will require reconfiguration of the existing Chlorine Contact Tanks. The sides of the tank will need to be narrowed to accommodate the size of the UV disinfection modules, allowing the equipment's light waves to permeate the entire cross-sectional flow of wastewater. The floor of the tanks will be raised to accommodate the vertical dimension of the UV modules. The top of the tank will be covered with solid FRP or aluminum panels with inspection hatches.

## 3.4 LIFT STATION #8

A new sanitary lift station will be constructed near the existing Lift Station #8 site on City property to replace the existing station, which is difficult to access, in a poor location and requires replacement of the existing equipment, much of which is beyond the anticipated useful life and undersized to accommodate flows from a nearby splash pad feature which was recently constructed in a nearby park.

It is proposed that the new station would consist of a new concrete wet well equipped with submersible pumps. An adjacent valve structure would enclose the check and isolation valves and a flow meter. New electrical power, an emergency back-up generator and controls and instrumentation would also be provided.

### **3.5 SECONDARY CLARIFIERS**

#### **3.5.1 Mechanisms**

Two (2) of the three (3) existing clarifiers are original to the WWTP's construction in the 1950s. It is recommended that existing Clarifiers #1 and #2 be upgraded with new mechanisms, walkways, drives, fiberglass weirs and baffles, and scum troughs. Replacement of the rotating mechanisms is recommended rather than rehabilitation because these should be replaced simultaneously with the drives.

A single fiberglass effluent weir will be constructed around the entire circumference for each of the new clarifiers to handle the average and peak weir loading limits. The new mechanisms will include an improved scum removal system and sludge withdrawal system. New scum baffles and a scum removal arm will be installed on each of the new clarifiers and ramped up from the main water surface to a common collection point and discharge trough. Scum boxes, scum discharge piping, and skimmer assemblies should be replaced in all clarifiers.

#### **3.5.2 Electrical & Controls**

A new stainless steel drive control panel will be provided on the bridge of each of the clarifiers and will include a local disconnect with short circuit protection, a motor starter, 480 to 120 volt fused control transformer, a door mounted Local-Off-Remote selector switch and local Start-Stop pushbutton switches with Running and Over-torque indicating lights. Provisions for remote monitoring and control of each drive from the plant SCADA system will be provided. New rigid galvanized steel conduit and wiring will be provided from the control building, and then outside and underground to each new drive control panel, transitioning to PVC coated rigid galvanized steel conduit for the underground portion of the run. The new master PLC panel will be connected to the existing plant SCADA control panel.

#### **3.5.3 Structural**

A structural inspection of the clarifiers tank and gallery will be performed to provide a condition assessment of the base slab, walls, grout topping, stairs, guardrail embedment, and joints. Based on the findings from the structural inspection, HRC will prepare drawings and specifications prescribing rehabilitation of the structural elements. The rehabilitation scope may include the following:

- ≡ A program of crack repair would likely be instituted based on the findings of the inspection that would provide for epoxy pressure injection grouting of cracks in the walls and/or base slabs larger than 1/16" in width and coating of smaller cracks to prevent additional deterioration.
- ≡ The existing grout layer may be removed and replaced for clarifiers #1 and #2 to provide even clearance for the new mechanisms and to provide means for a thorough inspection of the base slab to confirm the structural integrity.
- ≡ Retrofitting the clarifier's wall to support the new mechanisms bridge. The clarifier bridges, including the guardrail, kick plate, grating and structural framing should be replaced per standard practice when replacing existing clarifier drives and mechanisms.
- ≡ Removing and replacing the expansion joints between the clarifier tanks and gallery.
- ≡ Partial demolition of the bottom stair treads and replace in kind with steel stringers with concrete pan treads.

### 3.5.4 RAS & WAS PUMPING

The existing Secondary Sludge pumps will be replaced in-kind with four (4) horizontal, solids handling pumps, each providing flow capacities of 335 GPM. This is required as the pumps are experiencing operational issues, including one of the pumps having holes in the volute.

### 3.5.5 GRIT REMOVAL SYSTEM

The existing Grit Removal system was installed in 2007, but due to the harsh nature of the grit on the equipment, much of the equipment is worn and requires replacement. The grit system will generally be replaced in-kind as it performed well and a 15-year useful life is typical for this type of system. However, HRC will look for improved materials and equipment that may offer additional features and/or longevity.

## 3.6 COLLECTION SYSTEM IMPROVEMENTS

The existing electrical services and control panels for the 11 sanitary lift stations will be moved above-grade and installed on a new equipment rack to reduce the need for confined-space entry to access the controls and reduce the potential for damage from flooding. A site visit was made in early October with HRC's electrical staff to review each site. We noted the following work items that would be included:

- ≡ It was noted that communication panels have been constructed and installed at each of the sites. The communication panels have spare inputs for future connection of existing singles to be monitored.
- ≡ It was noted that new electrical Pump Control Panels had been constructed at several pump station sites (PS Nos. 3, 4, 5, and 7) This included a new electrical power, control and communication panel built at grade (above-ground) adjacent to the existing stations. HRC noted that the wiring of the new panels did not appear to separate intrinsically safe wiring from power wiring, which is required by code to prevent possible arcing, sparking, or abnormal heating of wiring that may cause combustion of wet well gases. It is recommended this be corrected as part of the work. The City would like to have similar electrical work completed at the remaining stations (Nos 1, 2, 6, 9, 10, and 11)
- ≡ New sanitary pumps are required at Pump Station Sites (PS Nos. 1, 2, 7, 9,11)
- ≡ Generators at Pump Station Sites (PS Nos. 2, 3, 4, 5, 6, 7, 8, 9, 11) require break-away covers for Generator Emergency Shutdown switch.

There is some overlap with the previously-described SCADA system project. Work would be coordinated between the SCADA upgrades and the individual Lift Station improvements.

- ≡ The City's SCADA system, which provides remote control and operational information of the pump stations, requires upgrades to modify the existing screens to display the information for each of the remote sites.
  - Stations will need to be upgraded to monitor generator and ATS status and alarm conditions.
  - Lift Station #1 upgrades include: new Control Cabinet, upgrade Generator and ATS for monitoring, monitor existing Bar Screen Control Panel, new level transducer and float switches in wet well.
  - Lift Station #2 upgrades include: new above grade Control Cabinet, upgrade pumps to 7.5 HP, new flowmeter, monitoring of ATS and Generator, electrical upgrades in drywell including local control of pumps.
  - Lift Station #3 upgrades include: electrical upgrades in drywell to include local control of pumps.
  - Lift Station #4 upgrades include: new above grade Control Cabinet, update conduit, wire, lighting, receptacles, and local control of pumps in drywell, Generator and ATS monitoring.

- Lift Station #5 upgrades include: new above grade Control Cabinet, update conduit, wire, lighting, receptacles, and local control of pumps in drywell, Generator and ATS monitoring.
- Lift Station #6 upgrades include: new Control Cabinet, new main service switch, electrical conduit, wire, receptacle, flowmeter in drywell, Generator and ATS monitoring.
- Lift Station #7 upgrades include: upgrade electrical service to the site including new service entrance switch, Generator and ATS monitoring, electrical upgrades in the drywell for local control of pumps.
- Lift Station #8 upgrades: this station to be relocated and replaced in its entirety, see information above.
- Lift Station #9 upgrades include: new Control Cabinet, Generator and ATS monitoring, new float switches in wet well.
- Lift Station #10 upgrades include: new Control Cabinet, new flowmeter. This station can be controlled and monitored from the WWTP.
- Lift Station #11 upgrades include: new Control Cabinet, new level transducer and float switches in wet well, Generator and ATS monitoring.

### 3.6.1 Sanitary Sewer Extension

There is a small area in the City of Caro's commercial district that is not currently served by the sanitary collection system, and the existing on-site septic tanks have caused issues for the owners. The City is proposing to extend sanitary sewers to these properties to allow for connection to the Caro Area Sanitary system.

## **SECTION 4.0 — ESTIMATED COST AND SCHEDULE**

### **4.1 ENGINEER'S OPINION OF PROBABLE COST**

The table on the next page provides a breakdown of the Engineer's Opinion of Probable cost for the Highest and Second Priority projects. The total Project Cost is estimated to be \$14,000,000, which includes design, construction, and administration of the Project. This estimate does also include some contingencies for any additional items of work required and cost escalation due to the current bid climate in Michigan.

### **4.2 PROJECT FUNDING SOURCES**

On May 1, 2023, the City submitted a Project Plan for funding through EGLE's FY2024 Clean Water State Revolving Fund (SRF) Program, and had a sufficient score to qualify for a low interest loan through the Program. The FY2024 Program was very competitive due to additional potential grant funding made available through the federal American Rescue Plan (ARP) and Build Infrastructure Legislation (BIL) programs. While the City did not score high enough to qualify for grant funding, the low interest loan rate offered to Caro is 2.0%, which will provide significant savings as compared to a bond issued under the current market rates (assumed 5% to 6%, depending on financial and other issues.) The loan interest rate offered to the City is lower than the typical, current loan rate of 2.5% through CWSRF because the City was found to be "overburdened," meaning that wastewater costs exceed 1% of the annual median income rate of the service area.

HRC recommends the City accept the loan, and to do so will require that a "milestone" schedule be accepted and committed to by the City for development of Plans and Specifications and Bidding the Project. The Project would be bid in May of 2024, and the City previously received a proposal from HRC to do this work.



ENGINEER'S OPINION OF PROBABLE PROJECT COST

Bloomfield Hills, MI

Telephone: (248) 454-6300

PROJECT: Alternative 1A: Rehabilitation and Replacement of Existing Facilities

DATE: 11/1/2023

LOCATION: Caro Area POTW

PROJECT NO. 20221089

BASIS FOR ESTIMATE:  CONCEPTUAL  PRELIMINARY  FINAL

ESTIMATOR: SLD

WORK: Improvements to Existing WWTP Equipment

CHECKED BY: TGM

New Electrical and Communication for Lift Stations

CURRENT ENR: 13473

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
<b>HIGHEST PRIORITY</b>					
1a	Replace Existing Primary Digester Cover & Solids Upgrades	1	LS	\$1,426,000	\$1,426,000
2a	UV Disinfection System and Building	1	LS	\$1,764,000	\$1,764,000
2b	New UV Building	1	LS	\$560,000	\$560,000
3	Lift Station #8 Upgrade/Replacement	1	LS	\$1,000,000	\$1,000,000
<b>Subtotal Highest Priority</b>					<b>\$4,750,000</b>
<b>SECOND PRIORITY</b>					
1	Rehabilitate Two Secondary Clarifiers and Primary Deck	1	LS	\$1,170,000	\$1,170,000
2	Replace Existing Grit Removal System	1	LS	\$400,000	\$400,000
3	New RAS/WAS Pumps (four)	4	EA	\$20,000	\$80,000
4a	Lift Station Upgrades, Electrical and SCADA	1	LS	\$352,000	\$352,000
4b	Lift Stations Two New Pumps and Four Flow meters	1	LS	\$200,000	\$200,000
5	New Sanitary Sewer Extension	1	LS	\$1,000,000	\$1,000,000
<b>Subtotal Second Priority</b>					<b>\$3,202,000</b>
<b>Unit Cost Subtotal</b>					<b>\$7,952,000</b>
<i>Contractor General Conditions, Overhead and Permits</i>		10	%		\$795,000
<i>Contingencies</i>		25	%		\$1,988,000
<b>Construction Subtotal</b>					<b>\$10,735,000</b>
<i>Asset Management CCTV of Sewers</i>		1	LS		\$100,000
<i>Engineering, Legal, and Administration</i>		25	%		\$2,684,000
<i>Escalation</i>		4	%		\$429,000
<b>TOTAL PROJECT COST</b>					<b>\$14,000,000</b>



**City of Caro  
Sewer Fund Projects Financed over 20 Years**

Fiscal Year	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
<b>Cash Flows From Operating Activities</b>											
Receipts from customers and users	\$ 1,702,511	\$ 1,753,586	\$ 1,823,730	\$ 1,878,442	\$ 1,953,579	\$ 2,012,187	\$ 2,092,674	\$ 2,155,454	\$ 2,241,673	\$ 2,308,923	\$ 2,401,280
Payments to suppliers	(713,839)	(749,531)	(787,007)	(826,358)	(867,676)	(911,060)	(956,613)	(1,004,443)	(1,054,665)	(1,107,399)	(1,162,769)
Payments to employees	(378,285)	(389,634)	(405,219)	(421,428)	(438,285)	(455,816)	(474,049)	(493,011)	(512,731)	(533,240)	(554,570)
Net cash provided by operating activities	610,387	614,422	631,503	630,656	647,619	645,311	662,013	658,001	674,276	668,284	683,941
<b>Cash Flows From Capital &amp; Related Financing Activities:</b>											
Purchases/Construction of Capital Assets	(331,262)	0	(75,000)	(14,000,000)	0	0	0	0	0	0	0
Financing from outside sources	0	0	0	14,000,000	0	0	0	0	0	0	0
Principal Payment on debt (2007)	(390,000)	(395,000)	(405,000)	(410,000)	(420,000)	(427,114)	0	0	0	0	0
Interest paid on debt (2007)	(39,766)	(33,428)	(27,009)	(20,428)	(13,766)	(6,941)	0	0	0	0	0
Principal Payment on debt (new)	0	0	0	(576,194)	(587,718)	(599,472)	(611,461)	(623,691)	(636,165)	(648,888)	(661,866)
Interest paid on debt (new)	0	0	0	(280,000)	(268,476)	(256,722)	(244,732)	(232,503)	(220,029)	(207,306)	(194,328)
Net cash provided (used) by capital & related finance activities	(761,028)	(428,428)	(507,009)	(1,286,622)	(1,289,960)	(1,290,249)	(856,193)	(856,194)	(856,194)	(856,194)	(856,194)
<b>Cash Flows From Investing Activities</b>											
Interest received	20,033	40,066	20,000	16,000	15,000	10,000	5,000	0	0	0	0
Net cash provided by investing activities	20,033	40,066	20,000	16,000	15,000	10,000	5,000	0	0	0	0
<b>Net increase in cash and cash equivalents</b>	(130,608)	226,060	144,494	(639,966)	(627,341)	(634,938)	(189,180)	(198,193)	(181,918)	(187,910)	(172,253)
<b>Cash &amp; Cash Equivalents at beginning of year</b>	2,152,225	2,021,617	2,247,677	2,392,171	1,752,205	1,124,864	489,926	300,746	102,553	-79,365	-267,275
<b>Cash &amp; Cash Equivalents at end of year</b>	\$ 2,021,617	\$ 2,247,677	\$ 2,392,171	\$ 1,752,205	\$ 1,124,864	\$ 489,926	\$ 300,746	\$ 102,553	\$ (79,365)	\$ (267,275)	\$ (439,528)



**Assumptions:**

Alternating 3% and 4% increase in sewer rates each year  
5% increase in supplies each year  
4% increase in payments to employees  
SCADA Upgrade in 24/25  
20 year pay off of the State Revolving Loan at 2%

Total Pay Back over 20 years 17,123,881.08  
Interest over the life of the loan 3,123,881.08  
Yearly payments 856,194.05

**City of Caro  
Sewer Fund Projects Financed over 30 Years**

Fiscal Year	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32	32/33
<b>Cash Flows From Operating Activities</b>											
Receipts from customers and users	\$ 1,702,511	\$ 1,753,586	\$ 1,823,730	\$ 1,878,442	\$ 1,953,579	\$ 2,012,187	\$ 2,092,674	\$ 2,155,454	\$ 2,241,673	\$ 2,308,923	\$ 2,401,280
Payments to suppliers	(713,839)	(749,531)	(787,007)	(826,358)	(867,676)	(911,060)	(956,613)	(1,004,443)	(1,054,665)	(1,107,399)	(1,162,769)
Payments to employees	(378,285)	(389,634)	(405,219)	(421,428)	(438,285)	(455,816)	(474,049)	(493,011)	(512,731)	(533,240)	(554,570)
Net cash provided by operating activities	610,387	614,422	631,503	630,656	647,619	645,311	662,013	658,001	674,276	668,284	683,941
<b>Cash Flows From Capital &amp; Related Financing Activities:</b>											
Purchases/Construction of Capital Assets	(331,262)	0	(75,000)	(14,000,000)	0	0	0	0	0	0	0
Financing from outside sources	0	0	0	14,000,000	0	0	0	0	0	0	0
Principal Payment on debt (2007)	(390,000)	(395,000)	(405,000)	(410,000)	(420,000)	(427,114)	0	0	0	0	0
Interest paid on debt (2007)	(39,766)	(33,428)	(27,009)	(20,428)	(13,766)	(6,941)	0	0	0	0	0
Principal Payment on debt (new)	0	0	0	(345,099)	(352,001)	(359,041)	(366,222)	(373,546)	(381,017)	(388,637)	(396,410)
Interest paid on debt (new)	0	0	0	(280,000)	(273,098)	(266,058)	(258,877)	(251,553)	(244,082)	(236,461)	(228,689)
Net cash provided (used) by capital & related finance activities	(761,028)	(428,428)	(507,009)	(1,055,527)	(1,058,865)	(1,059,154)	(625,099)	(625,099)	(625,099)	(625,099)	(625,099)
<b>Cash Flows From Investing Activities</b>											
Interest received	20,033	40,066	20,000	20,000	15,000	14,000	15,000	15,000	15,000	15,000	15,000
Net cash provided by investing activities	20,033	40,066	20,000	20,000	15,000	14,000	15,000	15,000	15,000	15,000	15,000
<b>Net increase in cash and cash equivalents</b>	(130,608)	226,060	144,494	(404,871)	(396,246)	(399,842)	51,914	47,902	64,177	58,185	73,842
<b>Cash &amp; Cash Equivalents at beginning of year</b>	2,152,225	2,021,617	2,247,677	2,392,171	1,987,300	1,591,054	1,191,212	1,243,126	1,291,027	1,355,204	1,413,389
<b>Cash &amp; Cash Equivalents at end of year</b>	\$ 2,021,617	\$ 2,247,677	\$ 2,392,171	\$ 1,987,300	\$ 1,591,054	\$ 1,191,212	\$ 1,243,126	\$ 1,291,027	\$ 1,355,204	\$ 1,413,389	\$ 1,487,232

**Assumptions:**

Alternating 3% and 4% increase in sewer rates each year  
5% increase in supplies each year  
4% increase in payments to employees  
SCADA Upgrade in 24/25  
30 year pay off of the State Revolving Loan at 2%

Total Pay Back over 20 years 18,752,967.36  
Interest over the life of the loan 4,752,967.36  
Yearly payment 625,098.91

City of Caro							
Water Fund Cash Flow Projections							
Fiscal Year	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Cash Flows From Operating Activities							
Receipts from customers and users	\$ 1,293,762	\$ 1,332,575	\$ 1,385,878	\$ 1,427,454	\$ 1,484,552	\$ 1,529,089	\$ 1,590,252
Payments to suppliers	(605,313)	(906,750)	(641,632)	(673,714)	(707,399)	(742,769)	(779,908)
Payments to employees	(244,474)	(251,808)	(261,881)	(272,356)	(283,250)	(294,580)	(306,363)
Net cash provided by operating activities	443,975	174,017	482,365	481,385	493,903	491,740	503,982
Cash Flows From Capital & Related Financing Activities:							
Purchases/Construction of Capital Assets	0	0	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)
Financing from outside sources	0	0	0	0	0	0	0
Principal Payment on debt	(100,000)	(105,000)	(105,000)	(103,215)	0	0	0
Interest paid on debt	(7,718)	(5,540)	(3,309)	(1,097)	0	0	0
Principal Payment on debt (new)	0	0	0	0	0	0	0
Interest paid on debt (new)	0	0	0	0	0	0	0
Net cash provided (used) by capital & related finance activities	(107,718)	(110,540)	(608,309)	(604,312)	(500,000)	(500,000)	(500,000)
Cash Flows From Investing Activities							
Interest received	26,641	53,282	20,000	20,000	20,000	20,000	20,000
Net cash provided by investing activities	26,641	53,282	20,000	20,000	20,000	20,000	20,000
Net increase in cash and cash equivalents	362,898	116,758	(105,944)	(102,927)	13,903	11,740	23,982
Cash & Cash Equivalents at beginning of year	2,350,461	2,713,359	2,830,117	2,724,174	2,621,247	2,635,150	2,646,890
Cash & Cash Equivalents at end of year	\$ 2,713,359	\$ 2,830,117	\$ 2,724,174	\$ 2,621,247	\$ 2,635,150	\$ 2,646,890	\$ 2,670,871

City of Caro					
Water Fund Cash Flow Projections					
Fiscal Year	29/30	30/31	31/32	32/33	
Cash Flows From Operating Activities					
Receipts from customers and users	\$ 1,637,960	\$ 1,703,478	\$ 1,754,583	\$ 1,824,766	
Payments to suppliers	(818,903)	(859,848)	(902,841)	(947,983)	
Payments to employees	(318,618)	(331,362)	(344,617)	(358,402)	
Net cash provided by operating activities	500,439	512,268	507,125	518,382	
Cash Flows From Capital & Related Financing Activities:					
Purchases/Construction of Capital Assets	(500,000)	(500,000)	(500,000)	(500,000)	
Financing from outside sources	0	0	0	0	
Principal Payment on debt	0	0	0	0	
Interest paid on debt	0	0	0	0	
Principal Payment on debt (new)	0	0	0	0	
Interest paid on debt (new)	0	0	0	0	
Net cash provided (used) by capital & related finance activities	(500,000)	(500,000)	(500,000)	(500,000)	
Cash Flows From Investing Activities					
Interest received	20,000	20,000	20,000	20,000	
Net cash provided by investing activities	20,000	20,000	20,000	20,000	
Net increase in cash and cash equivalents	20,439	32,268	27,125	38,382	
Cash & Cash Equivalents at beginning of year	2,670,871	2,691,311	2,723,578	2,750,704	
Cash & Cash Equivalents at end of year	\$ 2,691,311	\$ 2,723,578	\$ 2,750,704	\$ 2,789,085	

