DRAFT

Great Lakes Water Authority

# 2023 WRRF CLEAN WATER STATE REVOLVING FUND PROJECT PLAN

APRIL 18, 2022

WADE TRIM

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| Acronyms | |
|---|---|
| AACE | Association for the Advancement of Cost Engineering |
| AOR | Allowable Operating Region |
| AWT | Advanced Water Treatment |
| BAF | Biologically Active Filtration |
| BDF | Biosolids Dryer Facility |
| Bio P | Biological Phosphorus |
| CFS | Cubic Feet Per Second |
| COF | Central Off-Load Facility |
| CSO | Combined Sewer Overflow |
| DRO | Detroit River Outfall |
| DWF | Dry Weather Facility |
| DWSD | Detroit Water and Sewer Department |
| EB | Electrical Building |
| FEMA | Federal Emergency Management Agency |
| GLWA | Great Lakes Water Authority |
| GPF | Grit Processing Facility |
| HGL | Hydraulic Grade Line |
| HI | Hydraulic Institute |
| HP | Horsepower |
| HPO | High Purity Oxygen |
| HVAC | Heating, Ventilation, and Air Conditioning |
| HVOF | High Velocity Oxygen Fuel |
| HWL | High Water Level |
| ILP | Intermediate Lift Pump |
| LWL | Low Water Level |
| MAU | Makeup Air Unit |
| MBR | Membrane Bioreactor |
| MCFS | Minimum Continuous Stable Flow |
| MDEQ | Michigan Department of Environmental Quality |
| MF | Microfiltration |
| MG | Million Gallons |
| mg/L | Milligrams per Liter |

| Acronyms | |
|---|---|
| MGD | Million Gallons Per Day |
| MI-EGLE | Michigan Department of Environment, Great Lakes, and Energy |
| MLP | Main Lift Pump |
| MNFI | Michigan Natural Features Inventory |
| NPDES | National Pollution Discharge Elimination System |
| NTP | Notice to Proceed |
| O&M | Operation and Maintenance |
| OM&R | Operations, Maintenance and Repair |
| OC | Organochloride |
| OPCC | Opinion of Probable Construction Costs |
| POA | Pull-Out-Assemblies |
| POR | Preferred Operating Region |
| RAS | Return Activate Sludge |
| RO | Reverse Osmosis |
| RPM | Revolutions Per Minute |
| RRO | Rouge River Outfall |
| SCR | Screenings Capture Ratio |
| SEMCOG | Southeast Council of Governments |
| SFE | Screened Final Effluent |
| SHPO | State Historic Preservation Office |
| SOTR | Standard Oxygen Transfer Rate |
| SRF | State Revolving Fund |
| SWD | Side Water Depth |
| TDH | Total Dynamic Head |
| THPO | Tribal Historic Preservation Office |
| TKN | Total Kjeldahl Nitrogen |
| TMDL | Total Maximum Daily Load |
| TRC | Total Residual Chlorine |
| USFWS | United States Fish and Wildlife Services |
| VFD | Variable Frequency Drive |
| VSD | Variable Speed Drive |
| VTSH | Vertical Turbine Solids Handling |

| Acronyms | |
|---|---|
| WAS | Waste Activated Sludge |
| WRRF | Water Resource Recovery Facility |
| WTT | Wade Trim Team |

Wade Trim has used text and data from the following sources in the development of this Project Plan:

| Summary of Additional Sources of Data for the Project Plan | |
|---|---|
| AECOM and DLZ | The Aeration Decks 1-2 Project |
| CDM | GLWA Wastewater Master Plan |
| MNFI | Endangered, Threatened, or Candidate Species Survey |
| NEORSCO | SFE Project |
| Hazen | PS-2 Rack and Grit Project |
| SEMCOG | Population Data |

# EXECUTIVE SUMMARY

The Great Lakes Water Authority (GLWA) provides regional wastewater collection, transport, and treatment services for approximately three million people in the City of Detroit and 76 other communities (see Figure ES-1). Wastewater from the service area is conveyed through a series of collection sewers, interceptors, and pump stations to the Water Resource Recovery Facility (WRRF) located in the southwest corner of the City of Detroit near the confluence of the Detroit and Rouge Rivers (Town 2 South, Range 11 East, Wayne County). The WRRF is the largest single-site wastewater reclamation facility in North America.

The discharge of treated wastewater from the WRRF is authorized under the National Pollutant Discharge Elimination System (NPDES) Permit No. MI0022802, issued on June 28, 2019, and effective on July 18, 2019. The GLWA has operational responsibility for the regional sewer system including the combined sewer overflow (CSO) control facilities and outfalls.

The City of Detroit and some of the older suburban communities utilize a combined sewer system to collect both sanitary wastewater and storm water runoff in a single pipe (see Figure ES-2). The newer suburban communities utilize a two-pipe system whereby the sanitary wastewater is transported through a sanitary sewer for treatment to a wastewater treatment plant and storm water drainage is conveyed and discharged directly to a receiving water with generally no treatment via a storm sewer. The combined sewer system within the City of Detroit is designed to convey the dry weather flow and a portion of wet weather flow to the WRRF for treatment. During significant storm events, sufficient flow can be generated such that the hydraulic capacity of the combined sewers and the treatment capacity of CSO control facilities is exceeded, and the excess flow is then discharged through one of the permitted combined sewer outfalls located along the Detroit and Rouge Rivers (see Figure ES-3). However, over 99% of the flow entering the GLWA system is treated to NPDES standards.

GLWA is pursuing State Revolving Fund (SRF) loans for four (4) projects at the WRRF. Each of these projects is critical to GLWA's ongoing efforts to efficiently treat wastewater to NDPES standards:

- Pump Station No. 1 Improvements (PS-1 Project) –The project includes rehabilitation and rebuild of eight existing main lift pumps (MLPs) and their motors; improvements to process piping; valve and gate replacements; implementation of elbow flow meters on one or all of the pumps; improvements to facility architectural features; relocation of electrical starters into a new building addition; instrumentation and controls enhancements including a new pump health monitoring system; structural improvements to facilitate operations and maintenance; mechanical plumbing improvements; heating, ventilation, and air conditioning (HVAC) improvements to achieve NFPA 820 "unclassified" spaces in the dry areas of the pump station; and site improvements.
- Aeration Decks 1-2 Modifications Project (Aeration Decks Project) – This project increases the overall efficiency and wet weather treatment capacity of the secondary treatment process at the WRRF. Improvements will include providing step-feed water introduction, replacing intermediate lift pumps (ILPs) 1 and 2, providing better hydraulic control at Aeration Decks 1 and 2, improving

the energy efficiency of the system by efficiently sizing the mixing and aeration equipment, and providing biological phosphorus (Bio P) removal to accommodate the pending, more stringent NPDES phosphorus standards

- Pump Station No. 2 Bar Racks Replacement and Grit Collection System Improvements (PS-2 Project) – This project includes improved solids removal to be achieved through the replacement of eight (8) three-quarter inch bar screens with ten (10) new screening units; existing aerated grit channels with new vortex grit systems and the additional of a new grit processing facility.
- Rehabilitation of the Screened Final Effluent (SFE) Pump Station Progressive Design Build Guarantee Project (SFE Project) – This project includes replacement of the existing SFE Pump Station with a more energy efficient pump station that will reduce the amount of potable water the WRRF uses and provide for process water redundancy for several of the processes.

This Project Plan identifies and describes the current condition of GLWA's relevant treatment process assets, provides documentation on the need for improvements, identifies alternatives that were evaluated, and describes the selected alternative. Evaluation of the alternatives was performed based on the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE's) guidelines for preparing a SRF Project Plan. A summary of the total, present worth and equivalent annual costs for implementing the selected alternatives is summarized in **Table ES-1**. The total costs include engineering and other costs needed to construct each of the improvements. An annual user impact was also determined.

**Table ES-1 Summary of Projects' Costs**

| Priority | Project | Annual User Impact Cost | SRF Funding Requested |
|---|---|---|---|
| 1A | PS-1 Project | $6.24 | $95,600,000 |
| 1B | Aeration Decks Project | $4.42 | $74,100,000 |
| 1C | PS-2 Project | $10.34 | $98,000,000 |
| 1D | SFE Project | $5.06 | $80,100,000 |
| | Total | $26.05 | $347,800,000 |

**Figure ES-1: GLWA Sewer Service Communities**

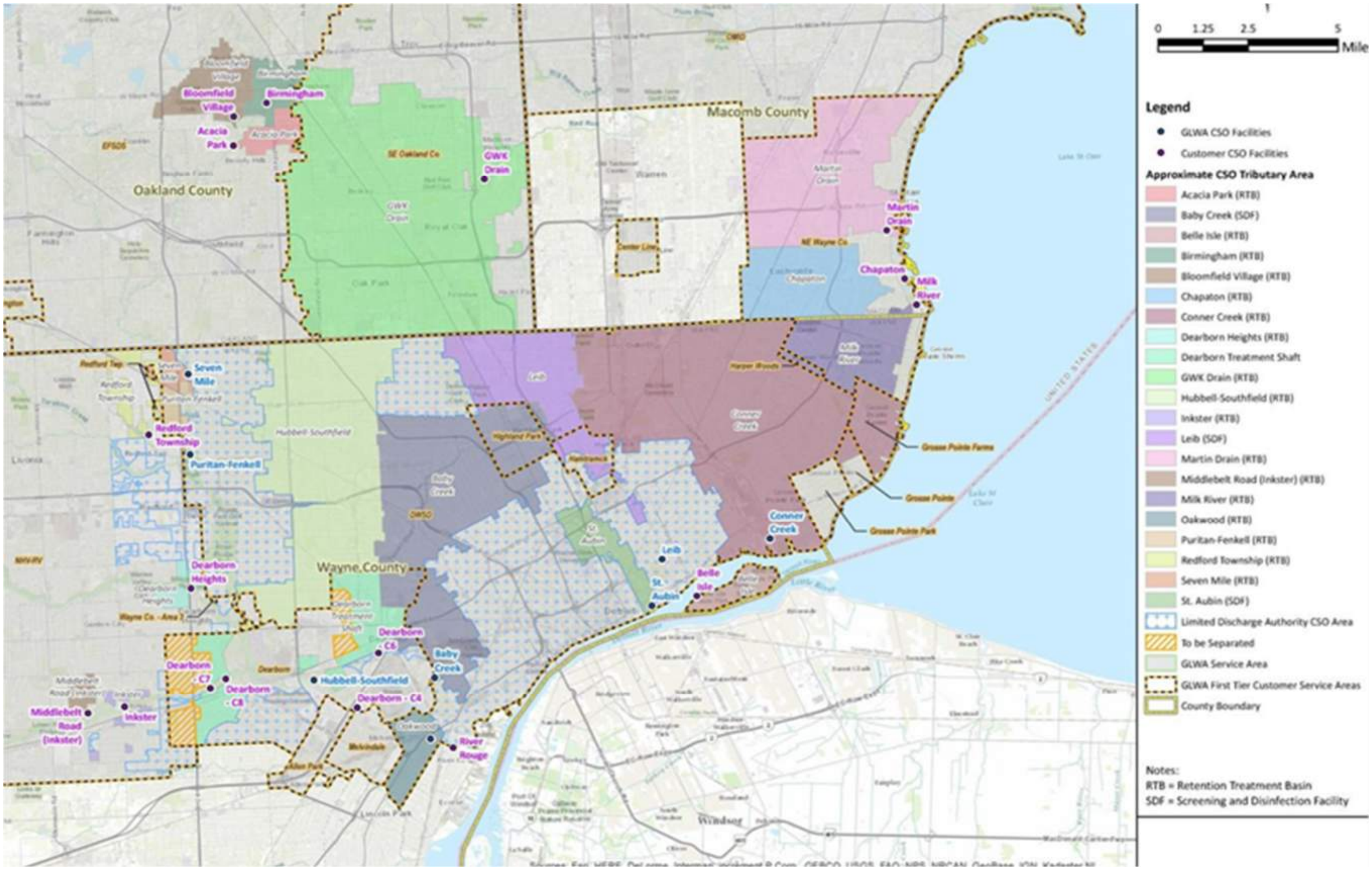


**Figure ES-2: Combined and Separated Sewer Service Diagram**

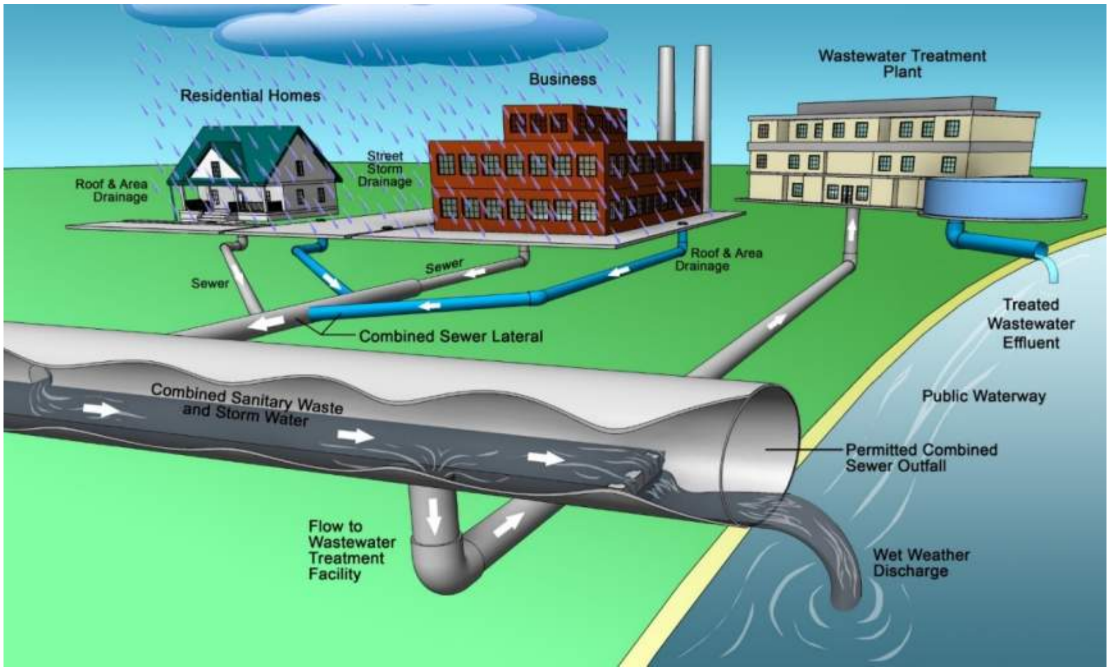
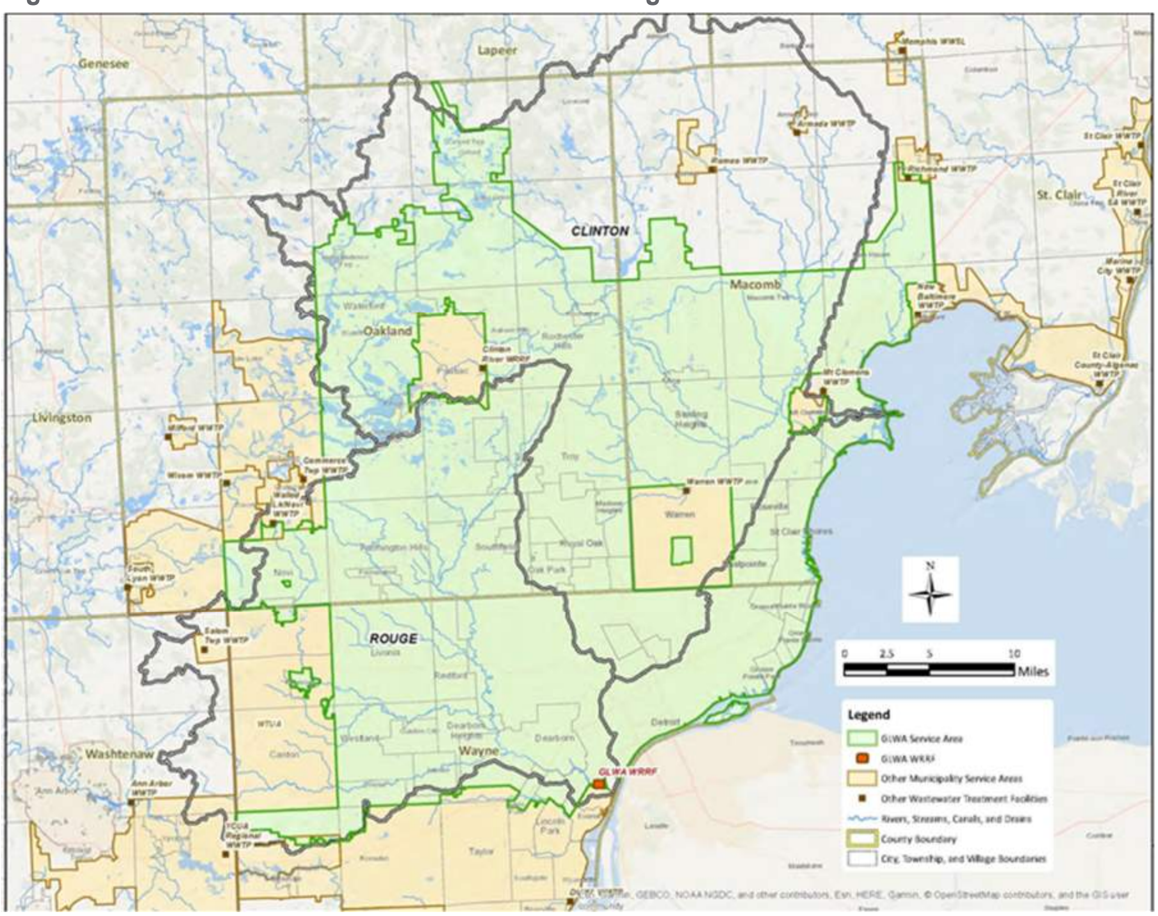



**Figure ES-3: GLWA Sewer Service Divided into Rouge River and Detroit River Areas**



# 1.0 PROJECT BACKGROUND

## 1.1 Introduction and Purpose

This document has been prepared in accordance with the planning guidelines adopted by MI-EGLE for the SRF low interest loan program. It is the intent of GLWA to seek low interest loan assistance under the SRF program for the recommended work.

The purpose of this document is to describe the necessary improvements for the four (4) projects at the WRRF that GLWA is proposing to undertake with SRF funding to provide efficient and reliable operations at the facility. GLWA has identified that these projects each have a priority ranking for which is most important. This Project Plan provides information on the status of the current WRRF operations related to the following four (4) proposed projects listed in priority order:

- Priority 1A - Pump Station No. 1 Improvements (PS-1 Project): The project includes rehabilitation and rebuild of eight existing main lift pumps (MLPs) and their motors; improvements to process piping; valve and gate replacements; implementation of elbow flow meters on one or all of the pumps; improvements to facility architectural features; relocation of electrical starters into a new building addition; instrumentation and controls enhancements including a new pump health monitoring system; structural improvements to facilitate operations and maintenance; mechanical plumbing improvements; heating, ventilation, and air conditioning (HVAC) improvements to achieve NFPA 820 “unclassified” spaces in the dry areas of the pump station; and site improvements.
- Priority 1B - Aeration Decks 1-2 Modifications Project (Aeration Decks Project): This project increases the overall efficiency and wet weather treatment capacity of the secondary treatment process at the WRRF. Improvements will include providing step-feed water introduction, replacing intermediate lift pumps (ILPs) 1 and 2, providing better hydraulic control at Aeration Decks 1 and 2, improving the energy efficiency of the system by efficiently sizing the mixing and aeration equipment, and providing biological phosphorus (Bio P) removal to accommodate the pending, more stringent NPDES phosphorus standards, a description of why the proposed improvements are needed, an evaluation of alternatives for each project, and a description of the recommended alternative. This includes expected environmental impacts, cost estimates for each project, societal impacts, mitigation of impacts, and other technical considerations. This Project Plan also serves as the basis for public review and comment on the proposed work in accordance with the public participation requirements of the SRF program.
- Priority 1C - Pump Station No. 2 Bar Racks Replacement and Grit Collection System Improvements (PS-2 Project): This project includes improved solids removal to be achieved through the replacement of eight (8) three-quarter inch bar screens with ten (10) new fine screening units; existing aerated grit channels with new vortex grit systems and the additional of a new grit processing facility.
- Priority 1D - Rehabilitation of the Screened Final Effluent (SFE) Pump Station Progressive Design Build Guarantee Project (SFE Project): This project includes replacement of the existing SFE Pump

Station with a more energy efficient pump station that will reduce the amount of potable water the WRRF uses and provide for process water redundancy for several of the processes.

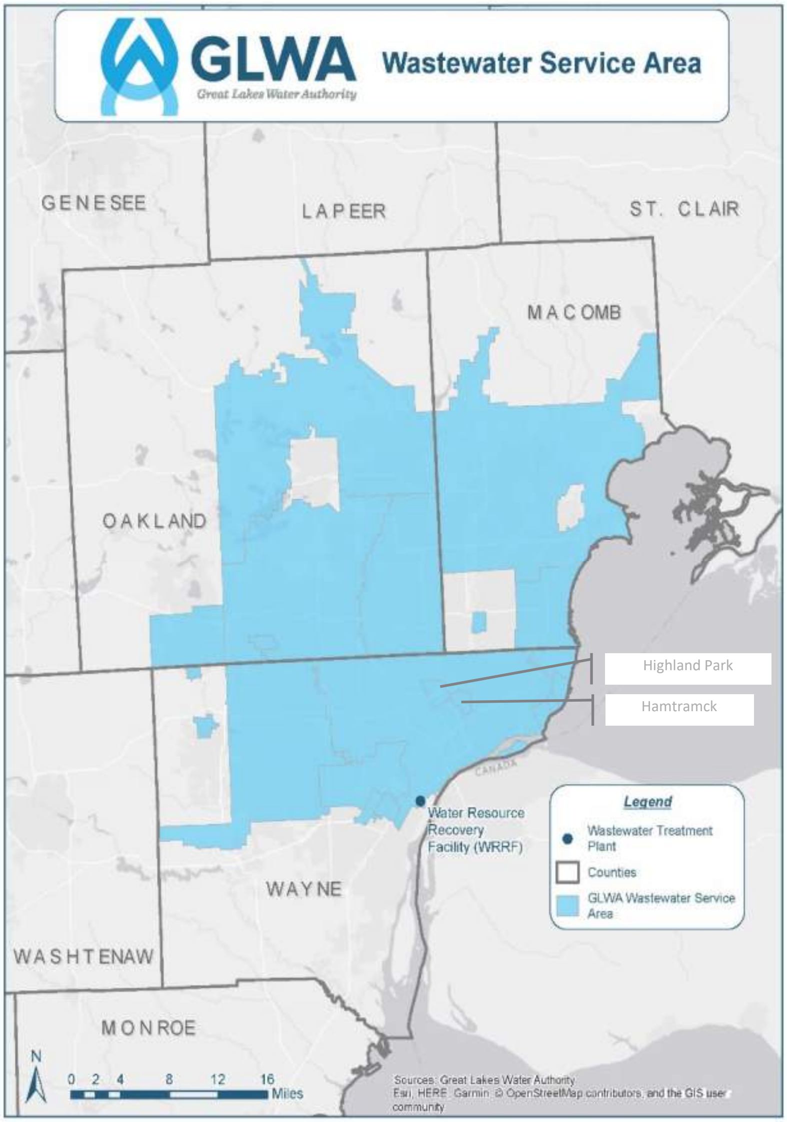
The proposed project areas within the WRRF boundary are shown below as Figure 1-1.

Figure 1-1: GLWA Sewer System Service Area


## 1.2 Delineation of Study Area

GLWA's wastewater service area includes the City of Detroit; 76 suburban communities; and Highland Park and Hamtramck, which are separate communities located completely within the City's corporate Boundary as shown in Figure 1-2. The study area encompasses approximately 88,876 acres in the City of Detroit with a service population of approximately three million residents plus considerable commercial and industrial activity. Of this area, slightly less than half (39,300 acres) is in the Rouge River drainage area. The remainder (49,576 acres) is tributary to the Detroit River. The service area for the surrounding communities includes 188,024 acres in Wayne County, 308,913 acres in Oakland County, and 162,242 acres in Macomb County.

**Figure 1-2: GLWA Sewer System Service Area**




## 1.3 Cultural Resources

To complete the required Michigan State Historic Preservation Office (SHPO) consultation, consultation request letters were sent to the 12 Federally designated tribes in Michigan for their comment. At this time, no responses from this Tribal Historic Preservation Office (THPO) letter have been received. These letters and email correspondence can be found in Appendix G. A draft Application for SHPO Section 106 Consultation is included in Appendix A. A subconsultant has been retained, which meets the 36 CFR Part 61 qualifications for archaeologists, to complete the required archaeological literature review. Their report will be completed 30 days after receiving the archaeological files from the SHPO. The architectural review will be completed during the same period as the literature review. Within five (5) days of receiving the archaeological literature review, the complete Section 106 consultation application will be submitted to the SHPO with the project's determination of effect. The SHPO typically responds to these applications within 60 days. All Cultural Evaluation Resources will be placed into Appendix A when received.

## 1.4 The Natural Environment

### 1.4.1 Air Quality

There are currently no air quality issues caused by or experienced at the GLWA WRRF. During construction of any of the projects in this project plan it is possible that heavy machinery could perpetuate air-born dust. Procedures to minimize dust and other air-born particles caused by construction will be put into place as part of the contract documents. Further mitigation will be discussed in the project specific mitigation sections.

### 1.4.2 Wetlands

Based on inspection of available National Wetland Inventory maps containing the GLWA WRRF and the surrounding area, there are no wetlands that will be disturbed by the construction of any of the proposed projects in this project plan. The available map is available in Appendix B.

### 1.4.3 Coastal Zones

There are no coastal zones within the influence of the projects contained in this project plan.

### 1.4.4 Floodplains

Based on inspection of the available Federal Emergency Management Agency (FEMA) FIRMette floodplain maps, there are no floodplains within the GLWA WRRF site. The available FIRMette maps are available in Appendix B.

### 1.4.5 Natural or Wild and Scenic Rivers

There are two rivers adjacent to the GLWA WRRF. These are the Rouge River and the Detroit River. Neither of these rivers are within the WRRF boundary and the WRRF does not impact either of the rivers' banks. Therefore, the projects within this project plan will have no effect on any natural or wild and scenic rivers. A map of surface waters surrounding the GLWA WRRF is available in Appendix B. Water quality issues of the surrounding area are discussed in Section 2.2.

### 1.4.6 Major Surface Waters

There are two major surface waters surrounding the GLWA WRRF. These are the Rouge River and the Detroit River. The WRRF boundary does not include any area of these waters or their banks. Based on this determination the projects within this project plan will have no effect on any surface waters. A map of the surrounding surface waters is available in Appendix B. Water quality issues of the surrounding area are discussed in Section 2.2.

### 1.4.7 Topography

The GLWA WRRF is a fully developed site and is considered flat from a topographical perspective. Ground disturbance for any work relating to the projects within this project plan will either be for proposed buildings or be temporary and will not result in any changes to the existing topography of the site.

### 1.4.8 Soils and Geology

All excavation for the projects contained within this project plan will take place in previously disturbed areas at the GLWA WRRF. It is expected that all soils encountered while excavating will be backfill materials from previous disturbances. If encountered, unsuitable soils, such as peat or marl, will be removed and replaced with appropriate granular backfill material. These materials and backfilling procedures will be detailed in the contract documents for each project.

### 1.4.9 Agricultural Resources

The GLWA WRRF is a fully developed area. There are no prime agricultural lands within the WRRF boundary or the surrounding area. Therefore, there will be no effect on agricultural resources from any of the projects within this project plan.

### 1.4.10 Endangered Species

A request was sent to the Michigan Natural Features Inventory (MNFI) for a Rare Species Review of the project boundary and the surrounding area. This correspondence can be found in Appendix G. According to the MNFI, there are multiple species of plants and animals registered as threatened, endangered, and special concern. To see the full list of species, refer to the MNFI response in Appendix B. This MNFI review has concluded several at-risk species have been documented within 1.5 miles of the project area and it is possible that negative impacts may occur. It was noted that the section of the Rouge River near the project area is a Group 2 mussel stream which means that state threatened, or state endangered mussels are expected to occur here and that certain surveys and possibly relocation procedures apply. MNFI also provided Section 7 comments in this review and indicated that the proposed project falls within the range of nine (9) federally listed/proposed/candidate species that have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Wayne County, Michigan. Of these species four (4) are federally endangered, four (4) are federally threatened and one (1) is a considered species.

Species identified as federally endangered are the Indiana bat (*Myotis sodalist*), northern riffleshell (*Epioblasma torulosa-angiana*), piping plover (*Charadrius melodus)* and the rayed bean mussel (*villosa fabalis*). It is noted that there are documented occurrences of the northern riffleshell within 1.5 miles of the project site and it was identified that there are suitable habitats within 1.5 miles of the site for the Indiana bat and the rayed bean mussel. There does not appear to be a suitable habitat within 1.5 miles of the project site for the piping plover.

Species identified as federally threatened are the northern long-eared bat (*M. septentrionalis*), eastern prairie fringed orchid (*Platanthera leucophaea*), rufa red night (*Calidris canutus rufa*), and the eastern massasauga rattlesnake (*Sistrurus catenatus*). It was identified that there appears to be a suitable habitat within 1.5 miles of the project site for the rufa red knot. There does not appear to be a suitable habitat for the eastern prairie fringed orchid or the eastern massasauga rattlesnake within 1.5 mile of the project site. While there are no known hibernacula or roost trees that have been documented within 1.5 miles of the project site, it is within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS). In addition, suitable habitat does exist within 1.5 miles of the project.

As of December 15, 2020, the USFWS announced that listing the monarch butterfly (*Danaus plexipus*s) as endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions.

Work will not occur near a waterway, a woodlot within 1 to 3 miles of a waterway, wet prairies or meadows, or caves. The improvements made to the facilities within the project area determined to not have an impact on the Rouge River, which is a habitat for state threatened, or state endangered mussels. The full MNFI report can be found in Appendix B.

## 1.5 Land Use

Since its construction, the GLWA WRRF has been designated as heavy industrial land use. The official designated zoning is M4 or “Intensive Industrial District”. The zoning map containing the GLWA WRRF is available in Appendix C. There are currently no plans by GLWA to change this zoning designation. The zoning is expected to remain the same for the 20-year planning period of the projects contained within this project plan.

## 1.6 Population Projections

The GLWA WRRF service area includes the City of Detroit and several other suburban communities as shown in Figure 1-. The study area is approximately 88,876 acres. Southeast Michigan Council of Governments (SEMCOG) census data for 2020 shows a total population of 2,988,481. SEMCOG also provided population projection for 2040 and 2045 which are 3,084,387 and 3,112,149, respectively.

The total population data provide by SEMCOG for southeastern Michigan is presented in Table 1-1.

**Table 1-1: SEMCOG Population Data for Southeastern Michigan**

| Population and Households | Census 2020 | Census 2010 | Change 2010-2020 | Pct Change 2010-2020 | SEMCOG Jul 2021 | SEMCOG 2045 |
|---|---|---|---|---|---|---|
| **Total Population** | 4,830,489 | 4,704,809 | 125,680 | 2.7% | 4,837,632 | 5,104,922 |
| **Group Quarters Population** | 70,402 | 66,202 | 4,200 | 6.3% | 70,573 | 98,975 |
| **Household Population** | 4,760,087 | 4,638,607 | 121,480 | 2.6% | 4,767,059 | 5,005,947 |
| **Housing Units** | 2,087,258 | 2,060,785 | 26,473 | 1.3% | 2,096,952 | - |
| **Households (Occupied Units)** | 1,936,635 | 1,844,785 | 91,850 | 5.0% | 1,945,229 | 2,080,015 |
| **Residential Vacancy Rate** | 7.2% | 10.5% | -3.3% | - | 7.2% | - |
| **Average Household Size** | 2.46 | 2.51 | -0.06 | - | 2.45 | 2.41 |

Source: **U.S. Census Bureau** and **SEMCOG 2045 Regional Development Forecast**

## 1.7 Economic Characteristics

Detroit has an unemployment rate above regional averages. High unemployment rates have been a chronic problem in the areas surrounding the central business district. Compared to the regional averages, the City has a relatively low percentage of its population employed in professional occupations and has a higher than average incidence of unskilled workers. Prime employment categories include civil services, banking, real estate, and insurance. The median household income was found to be $30,894 based on 2020 U.S. Census data provided by SEMCOG. Based on population data and trends provided by SEMCOG, the population in southeastern Michigan is expected to increase at a steady rate in the 20-year planning period.

## 1.8 Existing Facilities

Overall descriptions of the WRRF various processes are presented as a part of this section. In depth descriptions of the WRRF process systems relevant to each of the four (4) proposed projects, which are the subjects of this Project Plan, are presented in Sections 4.0 through 7.0.

### 1.8.1 Method of Wastewater Treatment

GLWA is responsible for operation of one of the largest municipal WRRFs in the United States. The plant was initially placed into service in 1940 when it used primary treatment to remove approximately 50-70% of pollutants. The original plant also provided dewatering and incineration of the solids. In the 1970s, secondary treatment facilities were added to provide a higher degree of treatment. Solids handling facilities were added as the capacity of the plant expanded. The combination of primary and secondary treatment at the WRRF removes more than 85% of incoming pollutants, meeting and exceeding federal and state requirements.

The major processes at the WRRF include influent pumping which lifts the wastewater into the WRRF; primary treatment, which involves removal of material suspended in the wastewater (suspended solids); secondary treatment, which involves biological processes to remove pollutants which reduce the oxygen content (carbonaceous biochemical oxygen demand) in the Detroit River; disinfection, which involves the addition of chlorine to kill harmful bacteria; phosphorous removal, which involves the addition of chemicals to reduce the concentration of phosphorus, which has adverse impacts on the quality of water in the Detroit River and the downstream lakes; and solids handling and disposal, which involves the management and ultimate disposal of solid materials (sludge, ash, grit, and screenings), that are byproducts of wastewater treatment.

Wastewater from the Jefferson and Oakwood interceptors reaches the WRRF from PS-1, where eight (8) pumps lift the wastewater into the WRRF to begin the treatment process. PS-2, which came into operation in 1994, pumps water from GLWA's third major interceptor, the NI-EA, as well as a portion of the Oakwood Interceptor. PS-2 contains eight (8) pumps, each with a design capacity of 107 million gallons per day (MGD). Six (6) of the pumps have variable frequency drives, while two (2) have constant speed drives.

Raw wastewater is pumped to eight (8) mechanically cleaned bar screens at PS-1 and eight (8) at PS-2, where solids larger than 1 inch at the PS-1 and larger than 3/4 inch at PS-2 are removed from the flow. Screenings are conveyed to a dumpster, which is then trucked to a landfill for disposal. After screening, the raw wastewater flows through eight (8) grit removal channels at each of the pump stations, where the flow is slowed to allow heavier inorganic solids such as sand, grit, and gravel to settle. The settled grit is removed by a conveyor system. Grit from PS-1 is typically incinerated and grit from PS-2 is landfilled, although grit from PS-1 is landfilled occasionally.

12 rectangular and six (6) circular clarifiers provide primary clarification. All dry weather flow receives primary and secondary treatment and is disinfected prior to discharge. All wet weather flow, up to 930 MGD, receives primary and secondary treatment with disinfection prior to discharge.

Wet weather flow greater than 930 MGD, receives primary treatment and disinfection up to the discharge capacity of the Detroit River Outfall (DRO) (approximately 1,100 MGD). All remaining wet weather flows are discharged through the Rouge River Outfall (RRO) up to the 1,700 MGD capacity of the WRRF. The flow entering the plant is not metered but the influent volumes are estimated from pump operating curves. Effluent from the primary clarifiers is pumped to secondary treatment by a combination of five (5) pumps located in the Intermediate Lift Pump Station and proceeds through the remainder of the plant by gravity. All five (5) pumps have variable speed drive units.

The initial stage of secondary treatment consists of four (4) activated sludge aeration basins, all utilizing high purity oxygen (HPO). Prior to 2004, one of the activated sludge aeration basins utilized forced air. However, it was enclosed with construction of a new concrete deck and converted from air to HPO. Microorganisms in the activated sludge basins utilize HPO to treat wastewater. GLWA purchases HPO from an outside entity, Praxair, to provide the primary source of oxygen.

GLWA operates 25 secondary clarifiers to settle out the biological mass after the aeration process. For purposes of defining firm capacity, two (2) of the 25 clarifiers are available to be out of service for preventative maintenance.

Chlorine is used for disinfection of the final effluent discharged to the Detroit River through the DRO (Outfall 049). The current plant effluent chlorine feed disinfection system has been in operation since 2003, and chlorine is fed into the treatment facility effluent to meet effluent bacteria limits. The permit establishes a daily maximum limit on total residual chlorine in the effluent of 0.11 milligrams per liter (mg/L), and the disinfection system includes dechlorination facilities to meet this effluent limit.

The RRO (Outfall 050) is currently used during wet weather-induced high flow events when hydraulic conditions at the plant necessitate. Because discharges from the existing RRO are not currently disinfected, a Design-Build project to reconfigure the SE and PE conduits to disinfect and dechlorinate all discharges to the Rouge River is currently ongoing. The new outfall configuration will provide the hydraulic capacity to discharge 1,700 MGD of treated effluent and will meet effluent limits for bacteria and total residual chlorine (TRC).

To protect downstream water quality in the Detroit River and Lake Erie, phosphorous is removed from the treated wastewater prior to discharge. The monthly average discharge limit for total phosphorus is 0.7 mg/L for flows receiving secondary treatment since January 2015. Since October 2015, the six-month growing seasonal (April – September) average maximum limit for secondary treatment is 0.6 mg/L for phosphorous. By adding ferrous or ferric salts to the influent wastewater, the phosphorous is precipitated from the flow and settles in the primary clarifiers, so it can be processed with the primary sludge. A new ferric chloride feed system was installed at PS-1 and PS-2 in early 2003 to enhance phosphorous removal. Ferric chloride is added directly into the flow prior to it entering the primary clarifiers. While GLWA has made significant strides in phosphorous removal at the WRRF, more stringent phosphorus limits will be included in an upcoming NPDES Permit, lowering the allowable phosphorous limit to 0.4 mg/L.

### 1.8.2 Method of Sludge Handling

Solids handling and disposal at the WRRF include sludge thickening, sludge blending, storage, belt filtration, centrifuging, incineration, ash disposal, and chemical stabilization. To adequately treat wastewater, solids contained in the wastewater must either be removed or converted to more stable forms. Both of these methods are utilized at the WRRF through sedimentation, biological treatment, incineration, and lime stabilization and landfilling. Solids handling, and disposal are a critical aspect of plant operation, and GLWA is engaged in an ongoing program to improve the capacity and reliability of its sludge processing and disposal facilities.

The 12 gravity sludge thickeners (six (6) in Complex A and six (6) in Complex B), and six (6) storage tanks thicken and inline blend both the primary and secondary sludges for optimum dewatering characteristics and store the contents until they are pumped to dewatering facilities. The capacity of these facilities is adequate for current loading rates. Eight (8) (four (4) in Complex A and four (4) in Complex B) thickeners have been rehabilitated, including the replacement of pumps.

Sludge is dewatered at three (3) locations in the plant. Complex I contain ten (10) belt filter presses, and Complex II contains 12 belt filter presses (Upper Level) and four (4) centrifuges (Lower Level) for dewatering sludge prior to incineration or off-site disposal. All 22 belt filter presses have been recently replaced in their entirety in Complex I and Complex II under Contract PC- 787. The four (4) Sharples centrifuges in Complex II have also been completely refurbished.

Incineration of blended dewatered sludge takes place in two (2) complexes containing a total of 14 multiple hearth incinerators: six (6) in Complex I and eight (8) in Complex II. Air quality standards for incinerator emissions require periodic testing of the emissions from the incinerators, which are regulated by a renewable operating permit issued by MDEQ. GLWA also utilizes the Central Off-load Facility (COF), a truck loading process which produces lime-stabilized sludge cake to be hauled to landfill for disposal.

GLWA has recently constructed a Biosolids Dryer Facility (BDF) directly across W. Jefferson Avenue from the WRRF, which was put in operation in August 2015. This BDF, which has a design capacity of approximately 400 dry tons per day, consists of four thermal dryer trains. Blended primary and secondary liquid sludge is pumped from the existing WRRF sludge storage tanks by sludge feed pumps through one of two underground force mains. This blended liquid sludge is being dewatered at the new BDF in one (1) of eight (8) centrifuges and the dewatered sludge processed through one of four (4) triple-pass thermal dryers. The dried product is conveyed to one (1) of four (4) storage silos, where the material is offloaded to trucks for transport to customers. The product is being utilized by famers in the Midwest and used primarily as fertilizer.

### 1.8.3 Design Capacity

Wastewater flows in the GLWA system have been analyzed in the past for both dry and wet periods. For purposes of the analysis, dry weather flows were determined based on an examination of water consumption, and metering data. Historical data collected over a three (3) year period in the 1990s showed a typical average consumption of 517 MGD. This value was used for planning purposes as an expected reasonable consumption value for the region over the 20-year planning period. Current consumption is reduced because of the overall economic downturn in the service area, but some recovery is expected as the economy stabilizes and eventually recovers. The 517 MGD reflects water production rates with adjustments for those municipalities who receive water from GLWA, but who do not discharge wastewater into the system. Adjustments have also been made, where appropriate, to account for communities such as Highland Park which discharge wastewater to the system, but which previously furnished their own domestic water supply. For planning purposes, an estimated 90% of the 517 MGD was assumed to be returned to the sewer system as wastewater. This flow quantity is then coupled with the estimated infiltration and inflow for the system to generate the total average dry weather flow. This approach includes industrial flows from a few facilities, which furnish their own water supply.

The WRRF has a primary treatment capacity of 1700 MGD, secondary treatment of 930 MGD. Wet weather flow greater than 930 MGD receives primary treatment and disinfection up to the discharge capacity of the DRO (approximately 1,100 MGD). All remaining wet weather flows are discharged through the RRO up to the 1,700 MGD capacity of the WRRF.

The limit on the current secondary treatment capacity is the hydraulic capacity of the secondary Aeration Decks. This process has been identified as a candidate for a proposed project to increase the treatment capacity. If the aeration decks secondary treatment capacity is increased, the wet weather secondary treatment capacity of the WRRF will increase as well.

### 1.8.4 Existing Pump Stations

GLWA relies on nine (9) pumping stations that are located throughout the collection system as listed in Table 1-2. The pumping stations are used to lift the wastewater from the low points in the sewer system in order to convey it by gravity the rest of the way to the WRRF. All nine (9) pumping stations are designed to convey combined sanitary and storm flows.

Major stations are normally controlled remotely from GLWA's System Control Center via a telemetering system, but they can also be controlled locally. The major stations in the system include Bluehill, Conner Creek, Fairview, Freud, Northeast, Oakwood, and Woodmere. The remaining stations, Belle Isle and Fischer are referred to as minor stations; and they operate in the local automatic mode, controlled by level sensors. In addition to the nine (9) pumping stations, the Lighthouse Point Pumping Station and Brennan Pools also contribute flow to the system but are currently under the jurisdiction of the City of Detroit Recreation Department. Bluehill, Woodmere and Brennan Pools pump stations are managed by DWSD.

**Table 1-2: List of System Pump Stations**

| Station | Date Placed in Service | Type | Operator |
|---|---|---|---|
| Belle Isle | 1920s | Combined | DWSD |
| Bluehill | 1940s | Combined | DWSD |
| Conner Creek | 1928 | Combined | GLWA |
| Fairview | 1914 | Combined | GLWA |

| Station | Date Placed in Service | Type | Operator |
|---|---|---|---|
| Fischer | 1940s | Combined | GLWA |
| Freud | 1950s | Combined | GLWA |
| Northeast | 1960s | Combined | GLWA |
| Oakwood | 1921 | Combined | GLWA |
| Woodmere | 1958 | Combined | DWSD |

GLWA relies on four (4) major pump stations at the WRRF: Pump Station 1, Pump Station 2, the Intermediate Lift Pump Station, and the SFE Pump Station. Wastewater from the Jefferson and Oakwood interceptors reaches the WRRF from PS-1, where eight (8) pumps lift the wastewater into the WRRF to begin the treatment process. PS-2 pumps water from GLWA's third major interceptor, the NI-EA, as well as a portion of the Oakwood Interceptor. PS-2 contains eight (8) pumps, each with a design capacity of 107 MGD. Six (6) of the pumps have variable frequency drives, while two (2) have constant speed drives.

Effluent from the primary clarifiers is pumped to secondary treatment by a combination of five (5) pumps located in the Intermediate Lift Pump Station and proceeds through the remainder of the plant by gravity. All five (5) pumps have variable speed drive units. The aeration decks receive effluent from this pump station.

The existing SFE pump station provides SFE for various operations throughout the plant. The original capacity of the eight (8) pumps in the station, 124 MGD, far exceeds current average demand of 23 MGD.

### 1.8.5 Combined Sewer Overflow Facilities

GLWA began to construct CSO control projects in the 1990's. The first facilities were undertaken as part of the National Wet Weather Demonstration Grant Project for the Rouge River Basin, which helped finance CSO control facilities within Oakland County, Wayne County, Dearborn, as well as the City of Detroit. DWSD completed its original Long Term COS Control Plan in 1996 and has prepared updates in 2008 and 2010. Detroit has undertaken numerous CSO control projects recommended in the long-Term Plan within both the Rouge River and Detroit River watersheds. The NPDES permit effective May 1, 2013, has recognized the substantial progress in controlling CSO.

GLWA has also installed in-system storage devices at 33 locations throughout the collection system to utilize excess pipe capacity to retain wet weather flows during small storm events. The in-system storage gates operate in a manner similar to those which were installed under the Rouge River National Wet Weather Demonstration Project.

GLWA has also installed an instrumentation and control system to provide real time information to system operators on flow levels, pump conditions, and overflow status. The information can be used to manage wet weather flows to maximize transport and treatment, and to minimize untreated CSO discharges. A summary of the CSO treatment facilities which are in service is shown as Table 1-3.

**Table 1-3: Summary of GLWA CSO Treatment Facilities**

| CSO Treatment Facility | Size/Flow Rate | Completion Date |
|---|---|---|
| Hubbell-Southfield Basin | 22 MG | 1998 |
| Puritan-Fenkell Basin | 2.8 MG | 1998 |
| Seven Mile Basin | 2.2 MG | 1998 |
| Baby Creek Facility | 5,200 CFS | 2006 |
| Oakwood Basin & Pump Station | 9.0 MG | 2012 |
| Conner Creek Basin | 30 MG | 2005 |
| Leib Screening & Disinfection | 2,000 CFS | 2003 |
| St. Aubin Screening & Disinfection | 321 CFS | 2003 |
| Belle Isle Basin | 0.3 MG | 2007 |

### 1.8.6 Operation and Maintenance Issues

The GLWA WRRF has been successfully operated and maintained (O&M) for decades. None of the projects included herein are intended to address O&M "issues" that prevent the operation of the WRRF. Rather, these projects are intended to address operational and maintenance improvement opportunities associated with new technology, and aging components. The project will improve reliability, ease of maintenance, and operational efficiency. The specific O&M improvement opportunities are discussed with in Sections 4.0 through 7.0 under the Project Need for each project.

### 1.8.7 Climate Resiliency

The WRRF has been designed to provide climate resiliency for all operating processes. All operating equipment and processes including all electrical aspects that are susceptible to temperature fluctuation are maintained in properly temperature controlled and ventilated areas. This provides for the ability to maintain proper operation and treatment through any change internally and from the environment.

All critical process at the WRRF have the ability to run off backup power if the need arises. The backup generators are maintained regularly as part of the preventative maintenance schedule. This gives the plant operating security in the event of a climate related outage as well as outages to the primary electrical supply.

## 1.9 Fiscal Sustainability Plan

GLWA has implemented an asset management program which captures the inventory of the assets included in this Project Plan. A complete inventory can be made available upon request. Table 1-4 summarizes the critical assets by project. The poor condition and performance of these assets is the impetus for these projects and is described in the "Project Need" section of each project. The Fiscal Sustainability Certification form is included in Appendix D.

**Table 1-4: Summary of Critical Assets**

| PS-1 Project | PS-2 Project | Aeration Deck Project | SFE Project |
|---|---|---|---|
| Main Lift Pumps 1-8 | Isolation Gates | Mixers/Aerators | SFE Pumps |
| Discharge Gate Valves 1-8 | Screens | Level Controllers | Secondary Water Systems (low, medium, and high pressure) |
| Inlet Gates 1-8 | Grit Removal and Processing Systems | Instrumentation and Controls | |
| MLP Starters, Controls, and Back-up Systems | Screenings Building HVAC and Plumbing | | |
| PS-1 HVAC and Plumbing | Valves and Drains | | |

# 2.0 SUMMARY OF PROJECT NEED

The contents of Section 2.0 are general needs common to the four projects. A more detailed description of specific project needs for the individual projects is included in Sections 4.2, 5.2, 6.2, and 7.2.

## 2.1 Regulatory Compliance Status

The current NPDES Permit in place for the GLWA WRRF can be found in Appendix E. GLWA is currently in compliance with all requirements set forth by the NPDES Permit.

There are currently no active Administrative Consent Orders or Amended Active Consent Orders placed on GLWA for the WRRF.

## 2.2 Water Quality Issues

### 2.2.1 Detroit River

The Detroit River is intensively developed, with extensive urban, commercial, and industrial complexes, particularly on the U.S. side. Over the past several decades significant improvements have been made in controlling conventional pollutant point sources in the Detroit River especially for discharges of oil and grease, and nutrients. Concentrations of other conventional pollutants including chloride, ammonia and phenols have declined substantially.

Problems remain, however, with regard to certain toxic organics and metals. The Detroit River is the furthest downstream of the Upper Great Lakes Connecting Channels, and environmental conditions are impacted by upstream pollutant loadings as well as those contributed directly to the river and via tributaries to the river. Water and sediment entering the head of the Detroit River are subject to contamination from the St. Clair River (organic hydrocarbons, volatile organics, and mercury) and the Clinton River (PCBs, heavy metals and P).

The levels of mercury in Detroit River sediments remain a concern, despite improvements in industrial treatment facilities. Overall, aquatic biota, especially bottom dwelling organisms, show some impact from contamination of Detroit River sediments with organic and inorganic substances. Normal macrobenthic communities were found upstream of Zug Island and along the entire Canadian shoreline. Severely impacted communities were noted to occur along and immediately downstream of Zug Island. Communities displaying intermediate impacts were found along the remainder of the U.S. shore.

Data on contaminant levels in fish from the Detroit River is insufficient to determine trends; however, limited research has indicated high levels of PCBs and chlordane residues and gradual reductions in levels of DDT residues. Increased incidence of fish tumors have been detected in the lower river.

The concentrations of several parameters were identified as exceeding Michigan Rule 57 criteria or Great Lakes Water Quality Objectives at one or more locations in the Detroit River: PCB's, hexachlorobenzene, PAHs, lead, and mercury.

P concentrations in the river are below relevant guidelines, but the Detroit River is a contributor of P to Lake Erie. P concentrations from the GLWA WRRF have been consistently below authorized levels as set forth in GLWA's NPDES Permit. Mean concentrations of cadmium, copper, mercury, nickel, and zinc were significantly higher in the lower river, indicative of inputs from sources along the river. PCBs clearly show an increase in downstream concentrations with increase greatest on the U.S. shore. Organochlorine (OC) pesticides (e.g., chlordane, DDT, and dieldrin) were found in the upper river, however, significantly higher OC levels have been observed at many downstream stations. The MDEQ completed a Total Maximum Daily Load (TMDL) study for E Coli in the Detroit River in 2007. The purpose of these TMDL studies is to establish controls on pollutant sources so as to achieve in-stream water quality goals.

A review of the USGS 6-minute interval flow data for the Detroit River at Fort Wayne from October 2008 through August 2017, showed that the Detroit River had an average flow of 191,560 cubic feet per second (CFS). During the period the river flow had a range of minimum 22,700 CFS to a maximum 286,000 CFS with a 95 percent exceedance flow of 154,000 CFS.

### 2.2.2 Rouge River

The Rouge River is also intensively developed, with little vacant land within the drainage area in the City of Detroit other than designated recreational areas and parks. North of the confluence of the Middle Branch, the development is primarily residential with small commercial outcroppings and a substantial area designated as park land along the riverbanks. After traversing the City of Dearborn, the River emerges into a predominantly industrialized portion within the City of Detroit until it outlets to the Detroit River near Zug Island.

Relatively poor water quality has been documented in the Rouge River by numerous studies and publications including the Rouge River National Wet Weather Demonstration Project, the Remedial Action Plan and various water quality assessments performed by MDEQ and others. However, recent monitoring shows that there has been measurable improvement in many areas for some pollutant parameters. These changes are most likely the result of CSO control facilities and storm water management efforts throughout the watershed.

The River receives municipal and industrial discharges as well as intermittent combined sewer overflows and stormwater discharges during and after wet weather periods. Biological investigations document that pollutant tolerant species predominate in the River, and that sludge beds are a problem.

High fecal coliform levels have been measured during both wet and dry weather periods, and the River has little assimilative capacity due to its shallow depth, slow velocity, and relatively low re-aeration rates. High concentrations of dissolved solids and Biochemical Oxygen Demand have been recorded. P levels were identified to exceed recommended state levels for tributary streams.

Toxic pollutants have been observed in samples from the Rouge River, particularly in sediments. The River supports a limited aquatic fishery of pollutant tolerant species and is considered to be a significant tributary load to the Detroit River and the Great Lakes.

The MDEQ completed two TMDL studies in 2007 for the Rouge River for Biota and E Coli. The E Coli TMDL was revised in 2011 to incorporate the allowable bacteria loadings from GLWA recommended CSO control facilities as identified in the modified NPDES Permit issued to GLWA. The purpose of these TMDL studies is to establish controls on pollutant sources so as to achieve in-stream water quality goals.

In addition to the Detroit and Rouge Rivers, several small tributary water courses are also located in the service area. These include Fox Creek, Conner Creek, and Baby Creek. Historically, these small tributaries provided drainage from areas within the City of Detroit to the Rouge and Detroit Rivers. As Detroit became more and more urbanized and developed, these tributaries have been enclosed over much of their length. Today, the water bodies consist of short channels at the outlet of the historic watershed. During dry weather periods, the enclosed drains from these areas are connected to the wastewater collection system. For this reason, the open water channels tend to be relatively stagnant bodies of water except during wet weather periods. These channels typically exhibit poor water quality as a result of sediment deposition and oxygen depletion, and relatively little interaction with the downstream receiving body.

## 2.3 Project Needs for the Next 20 Years

The project needs documented in Sections 4.2, 5.2, 6.2, and 7.2 capture some of the most immediate needs at the WRRF. However, GLWA has identified additional project needs at the WRRF that will address operation and capacity needs based on the 20-year population projection. A list of these identified projects is shown as a table in Appendix F. This table has been taken from the GLWA 2020 Wastewater Master Plan. GLWA will continue to identify and implement projects that maintain and improve the treatment of wastewater at the WRRF.

# 3.0 ALTERNATIVE EVALUATION APPROACH

Project teams explored "Potential Alternatives" including the Regional Alternative and No Action Alternative to identify those that would provide a viable solution to the Projects' Needs for the next 20 years. Those that were deemed viable were further analyzed as "Principal Alternatives". The costs and impacts of Principal Alternatives were evaluated as described in Section 3.3. The Regional and "No Action" alternatives are discussed below because they are not viable, and, therefore, not included in the evaluation with the Principal Alternatives.

## 3.1 Regional Alternative

GLWA operates the regional WRRF that receives wastewater from several counties in the region. The proposed improvements presented in this Project Plan are all within the WRRF property. The City of Detroit and numerous surrounding communities are serviced by GLWA. Therefore, a Regional Alternative in the context of this Project Plan is not applicable.

## 3.2 No Action Alternative

The "No Action" alternatives would not address the process problems experienced by the plant operators, identified in the 2016 Need Assessment Report, and discussed in the subsequent sections of this Project Plan. Not addressing the problems would erode the reliability and ability of GLWA to meet current and future NPDES permit requirements. The "No Action" alternative is not considered viable and is not pursued further.

## 3.3 Principal Alternatives

A summary of the principal alternatives is presented for each project in Sections 4.0 through 7.0. The needs assessment of the principal alternatives was performed with the goal of achieving optimal performance. The approach considers the long-term impacts of the projects.

### 3.3.1 Optimal Performance

These alternatives differ in approach and cost and were each evaluated by the consultant and GLWA with the goal of obtaining "optimal performance" of the existing facilities. In every case, optimal performance required more than operational change; it required equipment replacement or a new process. The comprehensive approach to the evaluation determined whether the replaced equipment would be of the same type/style/technology as the existing, such as the replacement of the pull-out-assemblies (POAs) on the MLPs at PS-1 and the use of bar screens at PS-2, or entirely new technology, such as the addition of step-feed and anaerobic zones in the Aeration Deck Project. In some cases, optimal performance required more than the replacement of existing equipment. For example, the PS-2 Project includes the addition of a new grit processing facility. Operational changes and training are incorporated into and result from the improvements.

### 3.3.2 Principal Alternatives Approach

The evaluation of principal alternatives takes into consideration not only financial impact of the project, but also the potential environmental impacts to ensure that the project is sustainable. The Principal Alternatives serve the same immediate customers and provide the same end-of-planning-period capacity.

For the purposes of this analysis, the present worth for each alternative considered was based on a 20-year loan at a discount rate of 1.875% used in the calculation of interest during construction and present worth factors. An interest rate of 1.4% is used in the calculation of interest during construction and replacement costs. Salvage values of structures and equipment were determined by using straight line depreciation. It was assumed that interest during construction may be significant and, therefore, may influence the choice of alternatives and, therefore, are included in the monetary evaluation. As a result, interest is calculated as one half of the product of the construction period (in years), the total capital expenditures (in dollars), and the discount rate.

OM&R Costs are estimated to capture the net change in operations, maintenance and repair costs when compared to GLWA's existing costs. GLWA has conservatively assumed zero additional cost for O&MR where new processes/equipment are replacing existing high-cost processes/equipment. In reality, most of the improvements included in these projects will greatly reduce OM&R costs, i.e. result in a net negative when compared to existing costs. Some of the projects include processes/equipment that do not replace existing processes/equipment, and the associated annual cost is included in the Present Worth (Lifecycle Cost) Calculations (Appendix H). Any other approach would inaccurately affect the User Impact Cost calculation.

Present worth, used to compare alternatives, includes the initial capital, operation, maintenance, and replacement costs. The present worth calculation takes salvage value at the end of the 20-year planning period into account.

GLWA is a water and wastewater service wholesaler. For the purposes of estimating "User Impact Costs" this Project Plan assumes approximately 3 million customers in the service area. According to the SEMCOG, the average household size, as reflected in the 2020 census, was 2.4 occupants. Using this census data and the population assumption, approximately 1,136,500 households are estimated in the service area.

# 4.0 PRIORITY 1A - PUMP STATION 1 IMPROVEMENTS (PS-1 PROJECT)

## 4.1 Delineation of PS-1 Project Area

The PS-1 Project Area is contained entirely within area that has been previously disturbed by significant construction. Figure 4-1 depicts the project's limits. Most of the work is equipment replacement/refurbishment within the PS-1 building and Electrical Building 2 (EB-2). The building addition and the site/civil work is on top of existing pump connecting flumes depicted in Figure 4-2.

Figure 4-1: PS-1 Project Limits

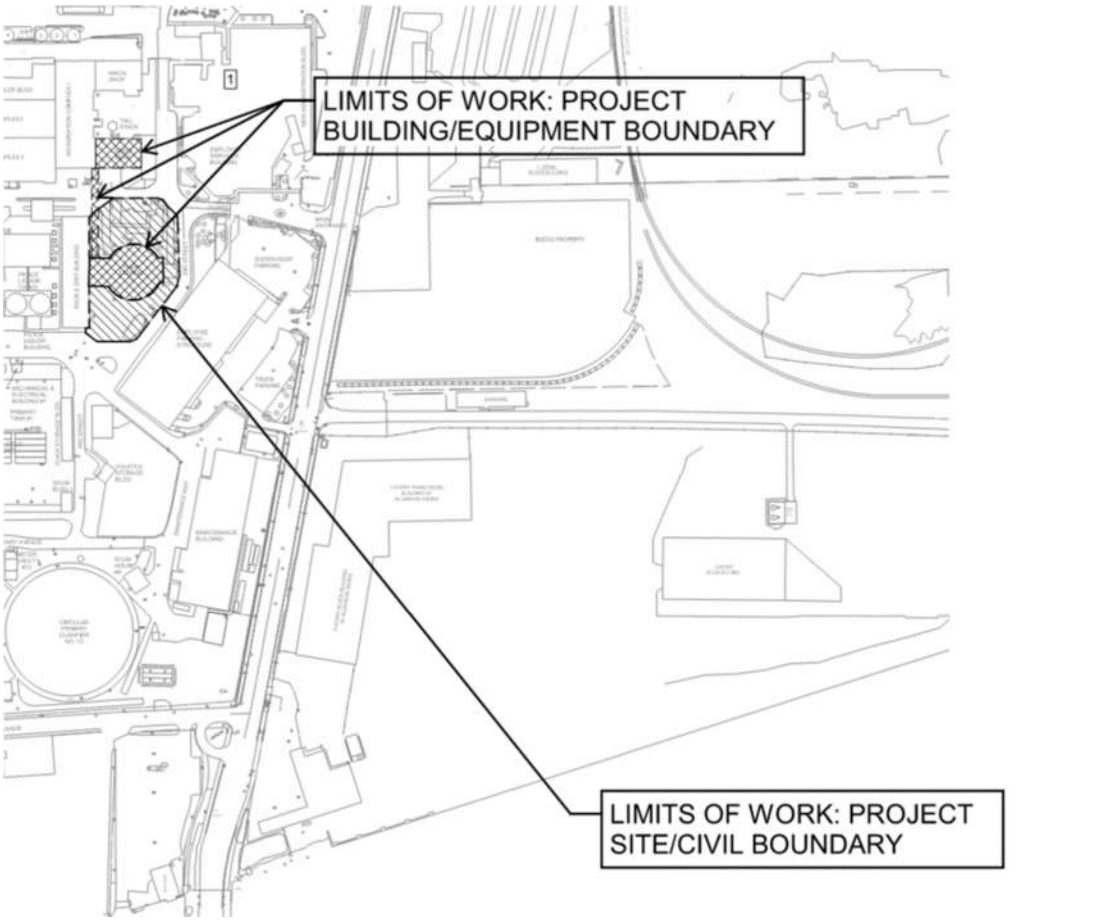
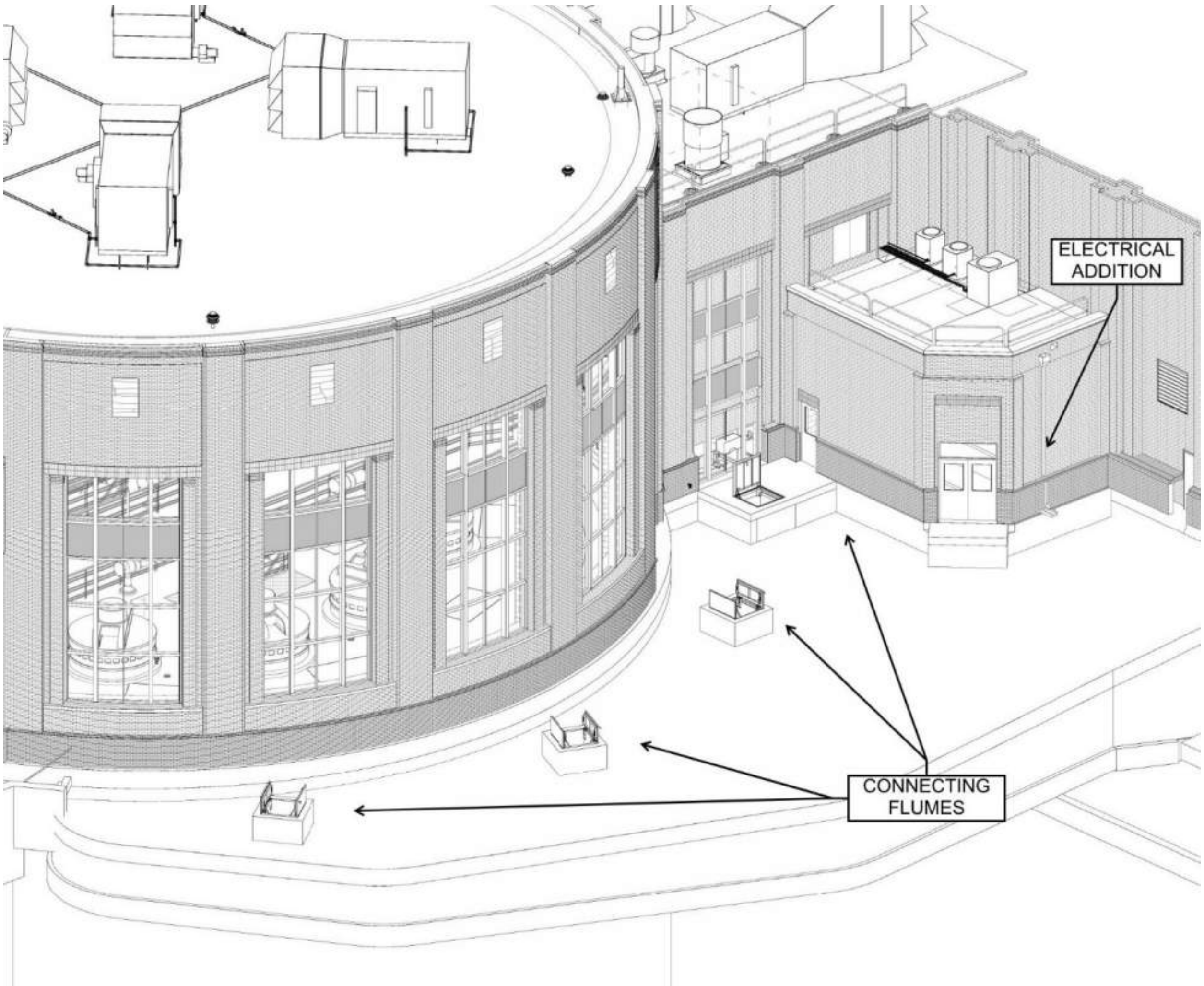


**Figure 4-2: PS-1 Electrical Building Addition Constructed Over Existing Connecting Flumes**




## 4.2 Summary of PS-1 Project Need

PS-1 is over 80 years old and is the primary pump station that conveys up to 1,200 MGD of sewage. Improvements are needed to ensure reliable service of the pumping equipment and to extend the estimated useful life of the station for another 20 years. Failure of PS-1 could result in overflow of dry weather and combined sewage to the Detroit and Rouge Rivers and violations of the NPDES permit.

Major goals of the PS-1 Project include:

- Provide NDPES required firm capacity
- Rehabilitate the pumps to run within the manufacturers' recommended operating ranges
- Meet Hydraulic Institute (HI) recommendations for suction intake conditions
- Decrease electrical consumption
- Right size utilities and mechanical systems
- Provide for a minimum design life of 20 years for the process equipment and building

- Improve the pump station's ability to address grit entering the wet well
- Improve the pump station's ability to meter flow
- Reduce the number of steps needed to properly operate the pump station
- Improve ability of O&M staff to access and disassemble the pumps

Site visits and testing to assess the existing building and equipment were conducted in 2019 and 2020 by the Wade Trim Team (WTT). Interviews were also held with engineering and operations staff to understand the performance and issues related to the facility. Components were evaluated to determine if they could provide an additional 20 years of service. Likelihood of Failure scoring in various condition assessment categories were applied. The needs assessment identified the following opportunities to improve operations, maintenance, and extend useful life:

- Rehabilitate or replace the main lift pumps (MLPs) and their motors
- Improvements to process piping
- Valve and gate replacements
- Implementation of elbow flow meters on one or all of the pumps
- Improvements to facility architectural features
- Relocation of electrical starters
- Instrumentation and controls enhancements including a new pump health monitoring system
- Structural improvements to facilitate operations and maintenance
- Mechanical plumbing improvements
- Heating, ventilation, and air conditioning (HVAC) improvements to achieve NFPA 820 "unclassified" spaces in the dry areas of the pump station
- Site/civil improvements

## 4.3 Technical Considerations for the PS-1 Project Alternatives

The EGLE SRF Project Plan Preparation Guidance requires alternative evaluations include the following considerations, if applicable:

- Infiltration and Inflow (I/I) Removal
- Structural Integrity
- Sludge & Residuals
- Industrial Pre-Treatment
- Growth Capacity
- Areas Currently Without Sewers
- Reliability
- Alternative Sites and Routings
- Combined Sewer Overflows
- Contamination at the Project Site
- Green Project Reserve

The above considerations are not applicable to the PS-1 Project except for Structural Integrity, Growth Capacity, Reliability, and Combined Sewer Overflows.

### 4.3.1 Structural Integrity

The PS-1 Project scope includes the structural improvements necessary to extend the useful life of the pump station another 20 years or more.

### 4.3.2 Growth Capacity

PS-1 maximum capacity meets that of the PS-1 Rack and Grit system and exceeds that of the primary and secondary treatment systems (when combined with PS-2 capacity). If the downstream systems' capacities are increased and service demand increases, the maximum capacity of PS-1 should be revisited. The improvements will increase the reliability of the plant for performance during dry and wet weather events.

### 4.3.3 Reliability

Making the improvements to the pumps and motor is a necessary part in ensuring the plant's operation for the next twenty years. These improvements to the pump and motors will reduce inefficiencies that occur during wet and dry weather events increasing the reliability of the system. Replacing aging equipment will decrease the probability of major malfunctions and increase the reliability of the plant.

### 4.3.4 Combined Sewer Overflows

Increasing the reliability of the pumps will reduce the likelihood of a pump being out of service during a major wet weather event, thus decreasing the likelihood of combined sewer overflows.

## 4.4 Analysis of Alternatives for the PS-1 Project

A summary of the potential alternatives is presented in this section. These alternatives differ in approach and cost and were each evaluated by the consultant and GLWA. Each of the alternatives is described in this section.

Pump and motor rehabilitation alternatives were developed and evaluated for potential improvements. This evaluation focused on the following considerations:

- Current condition of the existing pumps and motors
- Ability to provide for a minimum of 20 years of additional life expectancy
- Variable or constant speed selection
- Capital and O&M costs

The alternatives considered were:

- Alternative 1 – Rehabilitate the Existing Pumps and Motors
- Alternative 2 – Replace with New Constant Speed Driven Pumps and Motors
- Alternative 3 – Replace with New Variable Speed Driven Pumps and Motors

### 4.4.1 Alternative 1 – Rehabilitate the Existing Pumps and Motors

Rehabilitation of the existing pumps and motors was proven to be a viable alternative after comprehensive condition assessments. Measurements of the pumps' casing thickness revealed that the pump casings had 20 years or more remaining life based on material loss projections. Therefore, the entire pump did not need to be replaced. Rather, new POAs, wear rings, grit dams, shaft covers, etc., could extend the remaining life of the pump and provide improved performance. To reduce maintenance, oil lubricated bearings will be replaced grease lubricated bearings, where possible. The rigorous motor testing identified the need to rebuild the brushed synchronous motors including the stator, rotor, exciter, bearings, and shaft. The rehabilitation will be different for each motor as some of the motors have been recently repaired. The rehabilitation for the motor will include both basic and advanced reconditioning, as necessary.

Advantages of this alternative include the following:

- Lower initial capital cost compared to new motor alternatives
- GLWA staff is familiar with the pumps' and motors' maintenance requirements
- Retains synchronous low speed motor best for this application as it provides low power factor and high torque
- Extends expected service life for 20 years

The original manufacturer of the existing pumps was contacted regarding this alternative because they are the only source for replacement POAs and other pump components. They provided costs for the rehabilitation, and since the existing motors would be rebuilt, they were willing to provide a minimal warranty on the performance of the pumps.

Costs for this alternative are included in Appendix H.

### 4.4.2 Alternative 2 – Replace with New Constant Speed Driven Pumps and Motors

Alternative 2 replaces the pumps (casings, pull-out assemblies, drive shaft, steady bearings, etc.) with new in-kind pumps and replaces the brushed synchronous motors with standard induction motors (referred to as asynchronous motors and squirrel cage induction motors).

Five pump manufacturers were contacted regarding this alternative. Three of the manufacturers responded with pump selections and pricing. A number of the selections from were prototypes, whose pump curves are scaled up from model pumps. This means that the proposed pump curves are calculated from the performance of smaller model pumps because these manufacturers have not built a pump of a size required for PS-1. The current manufacturer has verbally indicated that they have the castings for the original pumps and can provide new pump casings to match the existing pump capacities. As of the date of this Project Plan, one of the contacted manufacturers has responded that they can provide these pumps, but they have not provided selections or pricing. Another two (2) of the manufacturers have not responded did not respond. To reduce maintenance effort, GLWA strongly preferred spit-case greased bearings. The lubrication methods varied by pump manufacturer and bearing.

Regarding the new motor, the stator of the standard induction motor is like that of the synchronous motor, but it differs in the rotor construction as the slip rings are not required because the windings are permanently short circuited. This makes the standard induction motor simpler and easier to operate as it only has an AC supply. Shown below as Table 4-1 is a list of common differences between the standard induction motor and a synchronous motor.

**Table 4-1 Differences between Induction and Synchronous Motor**

| | Standard Induction Motor | Synchronous Motor |
|---|---|---|
| Speed | Always less than the synchronous speed | Always runs at synchronous speed. The speed is independent of load and stays constant |
| Power Supply | Stator winding is energized from an AC source | Armature (stator) winding of the synchronous motor is energized from an AC source and its field winding from a DC source |
| Starting | Self-starting torque | Generally, not self-starting; an amortisseur winding will make the synchronous motor self-starting like the induction motor |
| Usage | Used for driving mechanical loads only | Used for power factor correction in addition to supplying torque to drive mechanical loads |
| Power Factor Control | No (always lagging) | Yes (can lead and lag) |
| Efficiency | Average | High |

The advantages and disadvantages of new standard induction motors are listed below.

Advantages:

- Will ensure a service life of more than 20 years
- Lowest initial capital cost of the new motor alternatives
- Less maintenance as compared to existing motors
- Could operate with a variable frequency drive
- Simple, rugged construction and reliable, less complex than a synchronous motor

Disadvantages:

- Less efficient than synchronous motors
- Operate under lagging power factor and during light load conditions power factor; may require correction capacitors
- Poor starting torque and high starting currents

- Not favorable if new pump is selected
- Lower pump capacity due to operating at less than synchronous speed

Costs for this alternative are included in Appendix H.

### 4.4.3 Alternative 3 – Replace with New Variable Speed Driven Pumps and Motors

This alternative builds on Pump Alternative 2 and consists of providing new pumps and motors that match the design capacities of the existing pumps and providing variable speed capability to four of the pumps to control their flow rate.

To assess the benefits of variable speed drives (VSDs), an analysis was performed to determine the approximate range of speeds over which the pumps could be operated. Because the current manufacturer is the only one of the responding manufacturers who has produced pumps of this type and size, their pump curves were used for this analysis. The following factors impacted the predicted turndown range of VSDs:

- The pump flow vs head (Q-H) curves and the system curves are relatively flat. This means that any reduction in speed will result in a significant reduction in flow. Every pump has a minimum continuous stable flow (MCSF), so reducing the speed of PS-1 pumps will result in the operating point rapidly approaching MCSF.
- The Preferred Operating Region (POR), as defined by HI 9.6.3, is narrowed because of the moderately high specific speeds of these pumps. Operation within the POR does not substantially degrade the hydraulic efficiency or operational reliability of the pump.
- The Allowable Operating Region (AOR) is defined by the pump manufacturer and is a range of flows outside of the POR over which the service life of the pump is still acceptable. The AOR is narrowed because of the relatively high suction specific speed of the pumps, which further limits turndown of the pumps.
- The range of speeds is narrower as the wet well elevation decreases, which increases the total head of the pump and moves the operating point closer to MCSF.

As presented in Table 4-2, the analysis determined the following minimum speed limits, based on the pump curves. Minimum speeds are based on a wet well water elevation of 73 feet and could be lower at higher wet well elevations.

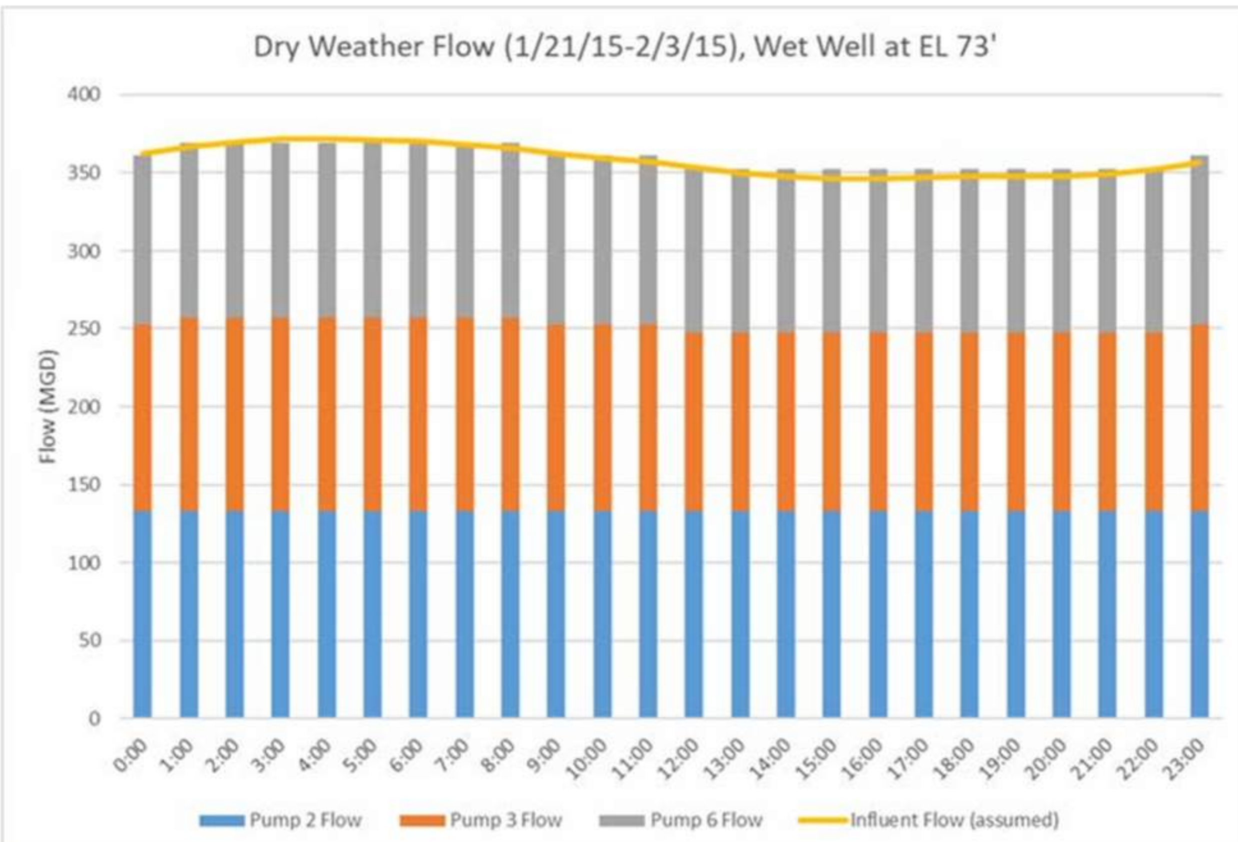
**Table 4-2** Minimum Pump Speeds for Pump Station No.1

| Pump No. | Minimum Speed (as % of full speed) |
|---|---|
| 1 and 8 | 94.5% |
| 2, 3, 6, and 7 | 94.5% |

| Pump No. | Minimum Speed (as % of full speed) |
|---|---|
| 4 and 5 | 92.5% |

This alternative increases the operational flexibility of the pump station by allowing better control of the wet well elevation, particularly at low elevations during times of collection system maintenance. Figure 4-3 illustrates that the wet well elevation could be maintained at elevation of 73 feet during dry weather flows without having to turn pumps on and off, by controlling the speed of two of the medium sized (Pumps 2, 3, 6, or 7). For this reason, Pump Alternative 3 assumes that the two small pumps (Pumps 4 and 5) and two of the medium pumps will be provided with variable speed drives.

**Figure 4-3: Analysis of Ability of VSD to Maintain Flows During Typical Dry Weather Flow Conditions**




The options for the lubrication systems for this alternative are the same as for Alternative 2.

The benefit of the superior control at low wet well elevations was offset by the additional capital cost and estimated increase in O&M cost associated with the VSD equipment. The pump station has operated successfully using combinations of the three pump sizes for over 80 years. After considering the cost-benefit balance, GLWA decided VSDs were not their best interest.

Costs for this alternative are included in Appendix H.

### 4.4.4 Monetary Evaluation and Alternative Evaluation

Cost and non-cost factors were included in the selection of the alternative that best satisfied the needs of the project. The monetary evaluation comparing the present worth of the alternatives is included in Appendix H. Many of the project needs were satisfied with improvements that did not require alternative evaluation. For example, updates to the structure, architectural components, electrical components, HVAC, plumbing, and I&C, etc. will improve operations, reduce maintenance effort, and extend the useful life of the pump station.

## 4.5 Selected Alternative for the PS-1 Project

### 4.5.1 Project Description

Rehabilitation of the existing pumps and motors, Alternative 1, was determined to be the most cost-effective solution to extend the remaining useful life of the pump station to 20 years. A condition assessment of the pumps revealed that the pump casings had adequate remaining life (i.e., the entire pump did not need to be replaced). The original pumps and pump station were designed to have the POAs replaced periodically, and this can be done at a much lower cost than full pump replacement. Other pump components such as grit dams and shaft end covers would be replaced, as necessary. The constant speed motors, already some of the most efficient available, could also be rebuilt at a lower cost than providing new motors. All eight (8) motors would be completely rehabilitated. The major components that would typically be considered as a part of a complete rebuild of the brush type synchronous motors include stator, rotor, exciter, bearings, and shaft.

The original manufacturer of the existing pumps was contacted regarding this alternative. They provided the POA that is installed on Pump 8 and also new POAs for Pumps 1 and 4 that are warehoused by GLWA. They provided costs for new POAs. The new POAs feature:

- New carbon steel pump shaft, pump bearing, bearing housing, and removable pump shaft half coupling.
- Type CA6NM cast stainless steel impeller with suction-end and case head wear rings made from ASTM A184 (167-229 BHN) steel.
- Suction head and casing head stationary wear rings constructed from ASTM 182 (300-360 BHN) steel.

The rehabilitation will be different for each motor as some of the motors have been recently repaired. The rehabilitation for the motor will include both basic and advanced reconditioning as necessary. Basic reconditioning requires completely disassembling the unit, conducting a thorough inspection, cleaning of all components, and conducting an oven dry of the rotor and stator. All damage uncovered during the inspection process would be repaired. This level would apply to motors that have been recently reconditioned or repaired. Advanced reconditioning includes complete reconditioning of the stator and rotor rewind (replace all windings and insulation) and bearing replacement. This would include all motors regardless of whether they have been recently repaired or reconditioned.

The selected alternative includes the following additional improvements to address operations, maintenance, and extend useful life of the entire pump station:

- Improvements to process piping
- Valve and gate replacements
- Implementation of elbow flow meters on one or all of the pumps
- Improvements to facility architectural features
- Relocation of electrical starters
- Instrumentation and controls enhancements including a new pump health monitoring system
- Structural improvements to facilitate operations and maintenance
- Mechanical plumbing improvements
- HVAC improvements to achieve NFPA 820 “unclassified” spaces in the dry areas of the pump station
- Site/civil improvements

### 4.5.2 Project Schedule

The PS 1 project is currently at the 100% Design Milestone. The Project Schedule for Pump Station 1 Improvements is shown below as Table 4-3. GLWA has decided to prepurchase the discharge gate valves and make-up Air units (MAU). Construction of the improvements will be started once a Contractor is selected.

**Table 4-3: PS-1 Project Milestone Schedule**

| Milestone | Milestone Date |
|---|---|
| Equipment Prepurchase | Q2 2022 |
| Construction Begins | Q1 2023 |
| Final Completion | Q4 2027 |

### 4.5.3 Cost Estimate

An opinion of probable construction costs (OPCC) was developed for the Pump Station 1 Improvements project based on the 100% design submittal. To meet CIP goals, GLWA is pre-purchasing seven (7) MAUs and eight (8) discharge gate valves with actuators. The OPCC and estimated cost of the pre-purchased equipment is included in Appendix H along with the Present Worth (Lifecycle Cost) Calculation.

### 4.5.4 Implementability of Selected Alternative

GLWA has the appropriate Management, Engineering, and Maintenance and Operational staff to implement this proposed project and has implemented many projects with similar budget amounts in its history. They also have the ability to obtain technical support as needed for design and planning of the project. If this project is funded from MI-EGLE with low interest loan funding, GLWA is ready to implement, construct, operate, and maintain the proposed project.

### 4.5.5 User Costs

User Impact Costs are included in the Present Worth (Lifecycle Cost) Calculation included in Appendix H.

### 4.5.6 Useful Life Evaluation

The evaluation of the selected alternative took into consideration the expected useful life of the proposed project components. Typical useful life spans for each project aspect were given based on either known lifespan, such as process equipment where a lifespan can be provided by a manufacturer, or standard item lifespan that have been accepted, such as the useful life of a structure. The structural components constructed in this project are expected to have a useful life of 50 years. The site civil work and the proposed process equipment both have an estimated useful life of 20 years. The electrical, instrumentation, and controls have a useful life of 15 years. Estimated useful life is used in the Present Worth (Lifecyle Cost) Calculations presented in Appendix H.

### 4.5.7 Analysis of Impacts

#### Direct Impacts

The construction of the Pump Station 1 Improvements is not expected to have an adverse impact on archaeological, cultural, or historical areas. The construction for this project will occur within the WRRF boundaries and in areas that have been previously disturbed. This project is not anticipated to detrimentally affect water quality, air quality, wetlands, endangered species, wild and scenic rivers, or unique agricultural lands in the area.

The total user costs have been evaluated on an individual project basis and can be found in Appendix H. These evaluations returned a total user cost impact that is not unreasonably high and so it is not considered an adverse direct impact from the implementation of this project.

#### Indirect Impacts

The improvements made as part of the Pump Station 1 Improvements Project are not expected to have an impact on the growth and development capacity in the surrounding residential, commercial, or industrial areas. The project is also not anticipated to have an impact on cultural, human, social, or economic resources in the surrounding area.

### Cumulative Impacts

The proposed Pump Station 1 Improvements will increase the functional life of the plant by 20 years by replacing and rehabilitating critical equipment. Proper functionality of the pump station will reduce the likelihood of combined sewer overflows and allow GLWA to meet the NPDES permit capacity requirements.

## 4.5.8 Mitigation of the Selected Alternative

Where adverse impacts cannot be avoided, mitigation methods will be implemented. Mitigating measures for the projects such as soil erosion control, if required, will be utilized as necessary and in accordance with applicable laws. Details will be further specified in the construction contract documents used for the project.

### Short-Term Mitigation

The Pump Station 1 Improvements Project is expected to have unavoidable short-term impacts due to construction activities such as dust, noise, and traffic. Efforts to minimize dust such as giving plant paving and access drives used in the construction area a dust-preventive treatment or periodically watering these areas will be implemented. Work will be scheduled and conducted in a manner to minimize the level of noise escaping the site, especially at nights and on weekends. These measures will be detailed in the contract project specifications.

### Long-Term Mitigation

The Pump Station 1 Improvements Project is not expected to have adverse long-term impacts. Therefore, no long-term mitigation is expected for this project.

### Indirect Impact Mitigation

The Pump Station 1 Improvements will not require mitigative measures for indirect impacts. The construction of the Pump Station 1 Improvements is located within the boundaries of the WRRF and does not promote growth in the surrounding areas that are not serviced by GLWA.

# 5.0 PRIORITY 1B - AERATION DECKS 1-2 MODIFICATIONS PROJECT (AERATION DECKS PROJECT)

## 5.1 Delineation of Aeration Decks Project Area

The Aeration Decks Project will improve the efficiency and wet weather treatment capacity of the secondary treatment process. It will provide better hydraulic control at Aeration Decks 1 and 2, improve the energy efficiency of the system, and provide biological phosphorus removal to accommodate more stringent NPDES standards at the GLWA WRRF. Actuated and modulating slide gates will be installed at Bays 01, 03, 05, and 07, and existing surface aerators in Bays 01, 02, and 03 will be replaced with 20 HP mixers, and surface aerators in Bays 04 through 10 will be replaced with new surface aerators at Aeration Decks 1 and 2. Automatic open-close gates will be added to the Bay 10 weir in Aeration Decks 1 and 2. Furthermore the pumps in the Intermediate Lift Pumps Station will be replaced with new pumps. Figure 5-1 depicts the limits of construction for the Aeration Decks 1 and 2 improvements and Figure 5-2 displays the existing layout of the Aeration Decks.

Figure 5-1: Aeration Decks 1 And 2 Project Limits

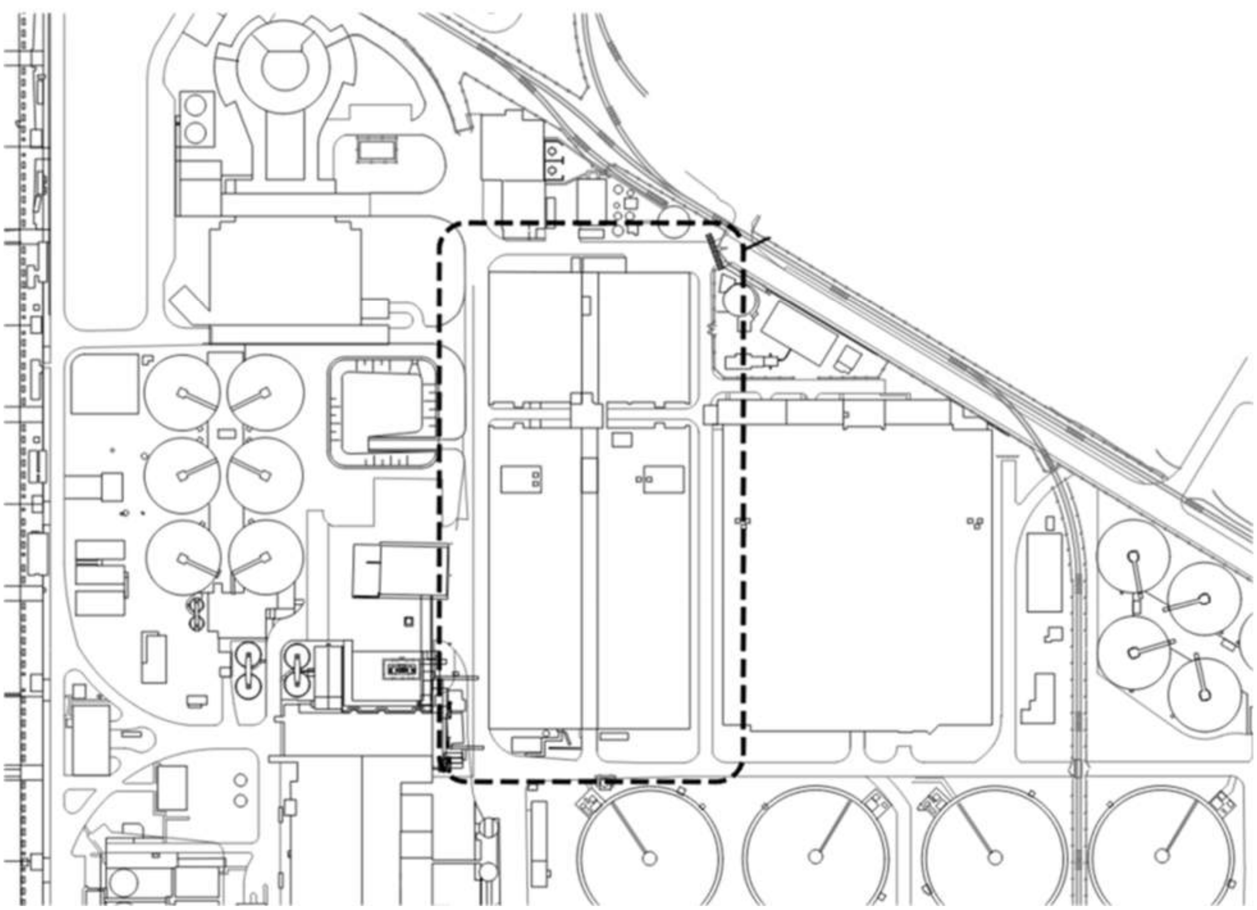
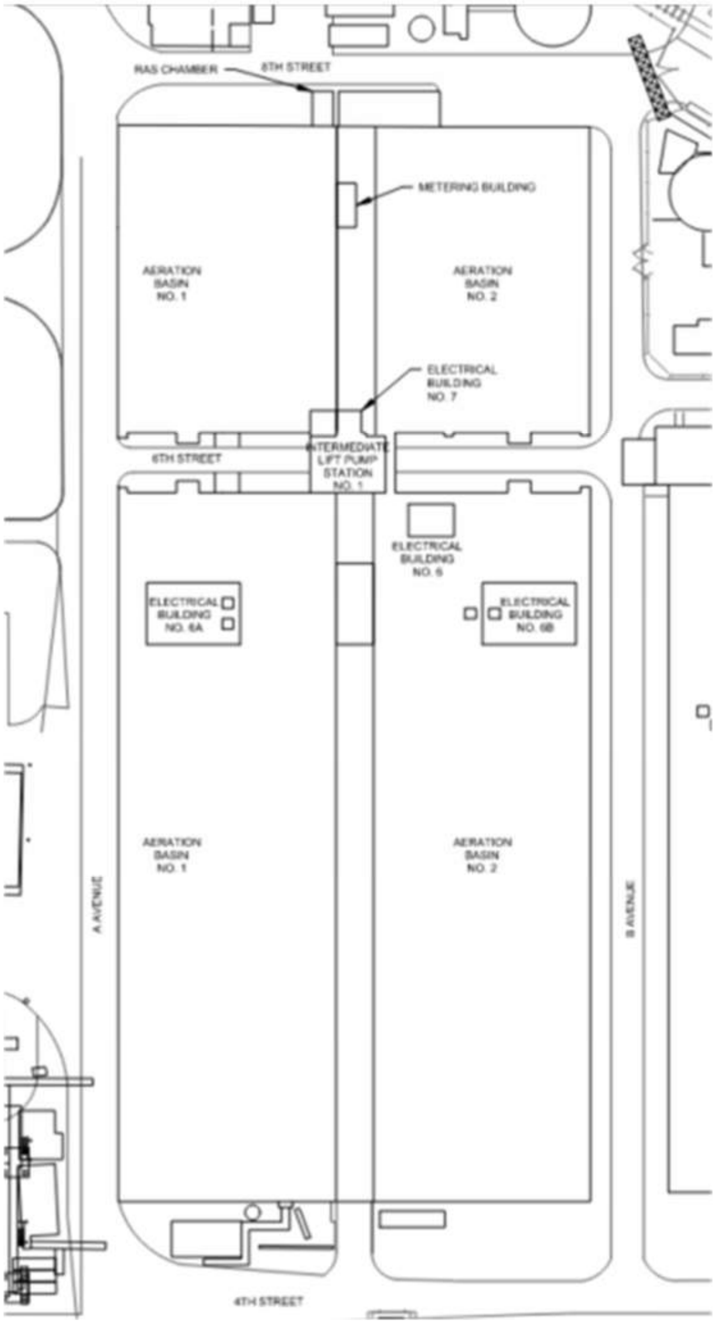


**Figure 5-2: Existing Layout of Aeration Decks 1 And 2**




## 5.2 Summary of Aeration Deck Project Need

The secondary treatment process is the capacity limiting process at the WRRF. Changes to the HPO activated sludge system are needed to optimize the aeration system's performance and accommodate more stringent phosphorus limits that will be included in an upcoming NPDES Permit. Furthermore, the Aeration Decks are in need of structural repair. These changes include better control flow (contact time) for dry and wet weather flows by controlling water tank levels and the opportunity to utilize biological phosphorus removal to meet the pending NPDES Permit limits. Previous reports and interviews with O&M staff identified the following opportunities to improve O&M:

- Increasing the existing hydraulic treatment capacity beyond 930 MGD will improve treatment and water quality in the region
- The existing level control weirs are not used in the aeration decks and there is currently no passive way to control the level or the flow
- The surface aerators in the first two bays of each Aeration Decks 1 and 2 are either shut down or removed
- Decks 1 and 2 have feed channels configured for step-feed, though these are not used
- Plant staff has reported that the surface aerator glycol seals fail every three months and vent out pure oxygen
- Foaming issues were occasionally observed
- The decks have 2,500 HP intermediate lift pipes (ILPs) that transfer Primary Effluent Activated Sludge (PEAS) to the Aeration Decks, and the condition of the motors is unknown and will be assessed under the scope of this project
- Additionally, Bio P removal will need to be accommodated to achieve a final effluent phosphorus concentration of 0.4 mg/L
- Structural rehabilitation of the aeration decks

The following main objectives for the Aeration Deck Project were identified to address the project's needs:

- Increase the overall efficiency and wet weather treatment capacity of the secondary treatment process by providing step-feed and improving the performance efficiency of the ILP Station No. 1 by replacing ILPs 1 and 2
- Provide better hydraulic control at Aeration Decks 1 and 2
- Validate the model and provide SOTR distribution estimates
- Improve the energy efficiency of the system by efficiently sizing the mixing and aeration equipment
- Provide Bio P removal to accommodate the more stringent NPDES standards
- Extend the remaining useful life of the Aeration Decks through structural repair

By increasing the efficiency, both the performance and reliability of the secondary treatment process can be improved. The increased capacity will also prepare the system for projected increased flows from service population growth. Currently, the secondary treatment system can handle 930 MGD but historical data has indicated that flows up to 1600 MGD have been observed at this facility. It is noted that GLWA intends to treat all the wet weather flow entering WRRF through the secondary treatment system. Since the secondary treatment process is a HPO activated sludge process, it is important to be able to control the flow to give the water time for the proper chemical reaction to occur.

## 5.3 Technical Considerations for the Aeration Decks Project Alternatives

The EGLE SRF Project Plan Preparation Guidance requires alternative evaluations include the following considerations, if applicable:

- Infiltration and Inflow (I/I) Removal
- Structural Integrity
- Sludge and Residuals
- Industrial Pre-Treatment
- Growth Capacity
- Areas Currently Without Sewers
- Reliability
- Alternative Sites and Routings
- Combined Sewer Overflows
- Contamination at the Project Site
- Green Project Reserve

The above considerations are not applicable to the Aeration Decks Project except for Structural Integrity, Sludge and Residuals, Growth Capacity, Reliability, and Green Project Reserve. Green Project Reserve is addressed in Section 5.5.4.

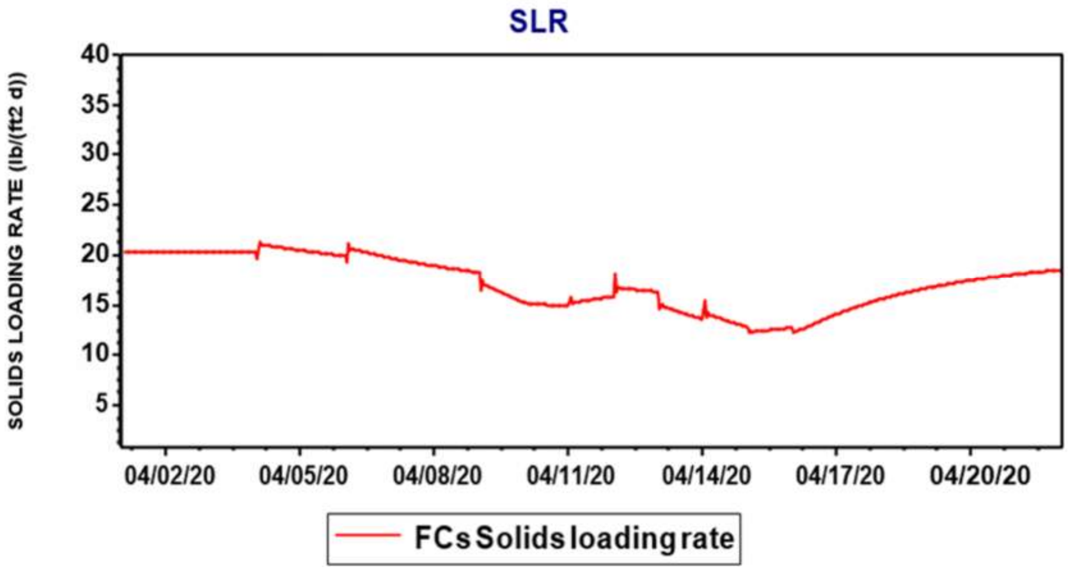
### 5.3.1 Structural Integrity

The Aeration Decks Project scope includes the structural improvements necessary to extend the useful life of remaining structural components another 20 years or more.

### 5.3.2 Sludge and Residuals

Of the eight (8) alternatives evaluated as part of the Aeration Decks Project, only Alternative 3 - Step-Feed will have any impact on the sludge and residuals. The historical secondary clarifier analysis showed good performance at or below about 20 lbs/d/ft$^2$, so design simulations aimed to stay at about that loading or less. Several step-feed modes were simulated, all of which encompassed some degree of the “solids-holdup” process, in which secondary influent flow was sent to downstream Bays while Bay 1 received RAS only or some mixture of RAS and a portion of secondary influent. The benefits of this solids-holdup process include a lowering of aeration deck effluent mixed liquor suspended solids, thereby lowering the secondary clarifier solids loading rate (SLR), while at the same time, RAS solids are safely stored in upstream Bays, protected from wet weather flow. The secondary clarifier SLR is shown in Figure 5-3, where it stayed under 20 lbs/d/ft$^2$ for the duration of the storm event.

**Figure 5-3: Dynamic Wet Weather Step-Feed Secondary Solids Loading Rate Response**




Step feed will have a positive impact on sludge and residuals.

### 5.3.3 Growth Capacity

The selected alternative takes under consideration more stringent NPDES standards for effluent phosphorus and the anticipated population growth. In the future, the NPDES phosphorus limit will be reduced to 0.4 mg/L from the current summer limit of 0.6 mg/L and winter weather limit of 0.7 mg/L. The 2020 Wastewater Master Plan contained projections for 2045 raw wastewater flows and loadings for each of the influent interceptors. While ammonia was not included in the Wastewater Master Plan projections, it was added for process modelling purposes. The total projected ammonia loading was proportionally increased per the same increase as the other available projected nutrient, total phosphorus. Table 5-1 and Table 5-2 show that values determined to be the projected annual flow and loadings, and the maximum month flow and loadings respectively. Based upon the projected annual average loading and maximum month loadings, the selected alternative will treat the flow.

**Table 5-1 Projected 2045 Annual Average Wastewater Flow and Loadings**

| Parameter | Unit | | | Jefferson | | | Oakwood | | | NIEA | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow | (MGD) | | (%) | | 225 | 34% | | 212 | 32% | | 225 | 34% | | 662 | 100% |
| TSS | (mg/L) | (lbs/d) | (%) | 104 | 196,033 | 25% | 114 | 201,549 | 26% | 208 | 390,418 | 50% | 143 | 788,000 | 100% |
| BOD | (mg/L) | (lbs/d) | (%) | 71 | 133,955 | 22% | 104 | 183,499 | 30% | 159 | 298,546 | 48% | 112 | 616,000 | 100% |
| NH4-N | (mg/L) | (lbs/d) | (%) | 6.6 | 12,387 | 17% | 14.5 | 25,693 | 35% | 19.2 | 36,115 | 49% | 13.4 | 74,196 | 100% |
| TP | (mg/L) | (lbs/d) | (%) | 1.8 | 3,288 | 23% | 2.4 | 4,304 | 30% | 3.7 | 6,908 | 48% | 2.6 | 14,500 | 100% |

**Table 5-2 Projected 2045 Maximum Month Loadings at an Annual Average Flow**

| Parameter | Unit | | | Jefferson | | | Oakwood | | | NIEA | | | Total | | PF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow | (MGD) | | (%) | | 225 | 34% | | 212 | 32% | | 225 | 34% | | 662 | 1.00 |
| TSS | (mg/L) | (lbs/d) | (%) | 136 | 254,744 | 25% | 148 | 261,911 | 26% | 270 | 507,345 | 50% | 185 | 1,024,000 | 1.30 |
| BOD | (mg/L) | (lbs/d) | (%) | 88 | 164,835 | 22% | 128 | 225,799 | 30% | 196 | 367,366 | 48% | 137 | 758,000 | 1.23 |
| NH4-N | (mg/L) | (lbs/d) | (%) | 7.3 | 13,669 | 17% | 16.0 | 28,351 | 35% | 21.2 | 39,851 | 49% | 14.8 | 81,871 | 1.10 |
| TP | (mg/L) | (lbs/d) | (%) | 1.9 | 3,628 | 23% | 2.7 | 4,749 | 30% | 4.1 | 7,623 | 48% | 2.9 | 16,000 | 1.10 |

### 5.3.4 Reliability

Reliability was considered in the evaluation of the possible alternatives. As stated in the Aeration Deck Project Need, some of the aerators were either shut down or removed. The installation of new mixers and aerators will not only improve the reliability of equipment, but also the reliability of the secondary system's effectiveness. Similarly, the change from manual flow/level control to passive or automatic control should improve the reliability of the secondary effluent quality. The selected alternative includes replacement of the new intermediate lift pumps to addresses the reliability concerns of the existing pumps.

## 5.4 Analysis of Alternatives for the Aeration Decks Project

This section discusses several possible alternatives that were determined to be unviable or less-than-optimal. These alternatives were not considered "Principal" alternatives, i.e., they did not receive economic analysis. However, they are included herein to demonstrate the due diligence that was completed in generation and evaluation of possible alternatives. The engineer's opinion of construction costs was prepared for the "Selected Alternative", (which included the combination of Alternative 1C – Hybrid Mixers/Aerators, Alternative 2C – Weir Modification Three Stage Weir, Alternative 3 – Step Feed, and Alternative 4 – Intermediate Lift Pump Replacement) along with other improvements. The selected alternative's costs were included in the present worth (lifecycle cost) analysis.

### 5.4.1 Alternative 1 – Alternatives for Mixing and Aeration

A model was developed to investigate and optimize chemical and biological phosphorus removal, estimate oxygenation requirements to evaluate potential aeration equipment upgrades, and investigate wet weather step-feed operation. Modeling the facility provided an accurate accounting of secondary solids production, phosphorus removal performance, oxygen demand, secondary clarifier solids loading, biosolids processing, and side-stream recycle streams. Table 5-3 displays the estimated the overall HPO usage and power estimation for the aerators. These power estimations do not reflect the minimum power demands to provide mixing (only for oxygen transfer).

**Table 5-3: Estimated Overall HPO Usage and Power Estimations**

| Aeration Deck 1 or 2 Bay | Unit | Minimum Day Loadings | | Annual Average Loadings | | Maximum Month Loadings | | Wet-Weather Step-Feed Peaks | |
|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Summer | Winter | Summer | Winter | Summer | Winter | Summer |
| HPO Usage | (Ton /d) | 27.0 | 28.9 | 44.1 | 47.0 | 55.1 | 56.0 | 52.5 | 53.3 |
| Bay 4 | (hp) | 117 | 123 | 192 | 202 | 235 | 244 | 183 | 184 |
| Bay 5 | (hp) | 46 | 50 | 79 | 82 | 105 | 110 | 110 | 111 |
| Bay 6 | (hp) | 42 | 49 | 69 | 77 | 86 | 91 | 81 | 82 |

| Aeration Deck 1 or 2 Bay | Unit | Minimum Day Loadings | | Annual Average Loadings | | Maximum Month Loadings | | Wet-Weather Step-Feed Peaks | |
|---|---|---|---|---|---|---|---|---|---|
| | | Winter | Summer | Winter | Summer | Winter | Summer | Winter | Summer |
| Bay 7 | (hp) | 46 | 54 | 71 | 86 | 89 | 95 | 70 | 71 |
| Bay 8 | (hp) | 56 | 67 | 88 | 109 | 110 | 120 | 87 | 89 |
| Bay 9 | (hp) | 76 | 93 | 124 | 155 | 155 | 177 | 117 | 121 |
| Bay 10 | (hp) | 83 | 92 | 141 | 155 | 175 | 181 | 174 | 184 |
| Total | (hp) | 467 | 529 | 763 | 865 | 954 | 1,018 | 822 | 840 |

Typical power requirements for maintaining completely mixed reactor conditions with mechanical surface aerators vary from 0.75 to 1.5 HP/1000 $ft^3$. Each Bay of Aeration Decks 1 and 2 requires a minimum of two 75 hp surface aerators to provide adequate mixing, which comes out to 0.63 HP/1000 $ft^3$. As such, the existing surface aerator sizes have been compared to the maximum power demands to provide both oxygen transfer and mixing in **Table 5-4.** The aerators in Bay 1 of both Aeration Decks 1 and 2 have been shut down to provide an anaerobic selector at the head of the decks.

**Table 5-4: Aerator Sizes Compared to Maximum Power Demands**

| Bay | Aerator Size (HP) | Number of Units | Installed Power per Deck (HP) | Recommended Aerator Power (HP) |
|---|---|---|---|---|
| Bay 1 | 150 | 2 | 300 | Anaerobic |
| Bay 2 | 100 | 2 | 200 | Anaerobic |
| Bay 3 | 100 | 2 | 200 | Anaerobic |
| Bay 4 | 100 | 2 | 200 | 300 |
| Bay 5 | 100 | 2 | 200 | 150 |
| Bay 6 | 75 | 2 | 150 | 150 |
| Bay 7 | 75 | 2 | 150 | 150 |
| Bay 8 | 75 | 2 | 150 | 150 |
| Bay 9 | 75 | 2 | 150 | 200 |
| Bay 10 | 100 & 25 | 2 | 125 | 200 |
| Total | --- | 20 | 1,825 | 1,300 |

### Alternative 1A – Surface Aerators

Alternative 1A - Surface Aerators investigates complete replacement of the existing surface aerators. The age of the existing surface aerator combined with the likely completion date for upgrades makes replacement a more viable option than rehabilitation. **Table 5-5** illustrates the sizes for the replacement surface aerators that meet the estimated power demand. **Table 5-6** displays the HPO usage for this alternative.

**Table 5-5: Size of Replacement Surface Aerator**

| Bay | Oxygen Transfer Power (HP) | Selected Aerator Size (HP) | Number of Units | New Installed Power per Deck (HP) |
|---|---|---|---|---|
| Bay 4 | 244 | 150 | 2 | 300 |
| Bay 5 | 110 | 75 | 2 | 150 |
| Bay 6 | 91 | 75 | 2 | 150 |
| Bay 7 | 95 | 75 | 2 | 150 |
| Bay 8 | 120 | 75 | 2 | 150 |
| Bay 9 | 177 | 100 | 2 | 200 |
| Bay 10 | 181 | 100 | 2 | 200 |
| Total | 1,018 | --- | 20 | 1,300 |

**Table 5-6: Estimated Overall HPO Usage per Bay**

| Bay | Unit | Surface Aerators HPO Required |
|---|---|---|
| Bay 4 | (Ton/d) | 15.9 |
| Bay 5 | (Ton/d) | 6.5 |
| Bay 6 | (Ton/d) | 5.0 |
| Bay 7 | (Ton/d) | 4.4 |
| Bay 8 | (Ton/d) | 4.2 |
| Bay 9 | (Ton/d) | 4.1 |
| Bay 10 | (Ton/d) | 4.0 |
| HPO usage | (Ton/d) | 44.1 |

Modeling revealed that Alternative 1C – Hybrid Mixers/Aerators had significant process advantages over this alternative. Therefore, a full engineer's opinion of probable costs was not prepared. This was not considered a "Principal Alternative".

### Alternative 1B –Mixers/Aerators

Alternative 1B –Mixers/Aerators considers replacing the existing surface aerators with submerged hyperboloid mixer/aerators. Like the existing aerators, the system includes a motor and gear box mounted on top of the aeration decks. A shaft rotates a hyperboloid- shaped mixer body near the bottom of the reactor basin. HPO gas is dispersed out of a circular ring sparger under the mixer body. Blades attached to the bottom of the mixer body shear the HPO gas into fine bubbles and disperse it throughout the basin. This technology is especially applicable in GLWA's case because the HPO gas from the pipeline, as reported in the Master Plan, is at 17–18 psi. The aeration decks operate at a side water depth of 30 feet, which translates to a required gas discharge pressure of at least 13 psi. Figure 5-4 and Figure 5-5 illustrate the Hyperclassic mixer/aerator and reactor configuration, respectively.

**Figure 5-4: Hyperclassic Mixer/Aerators in an HPO Reactor Basin**

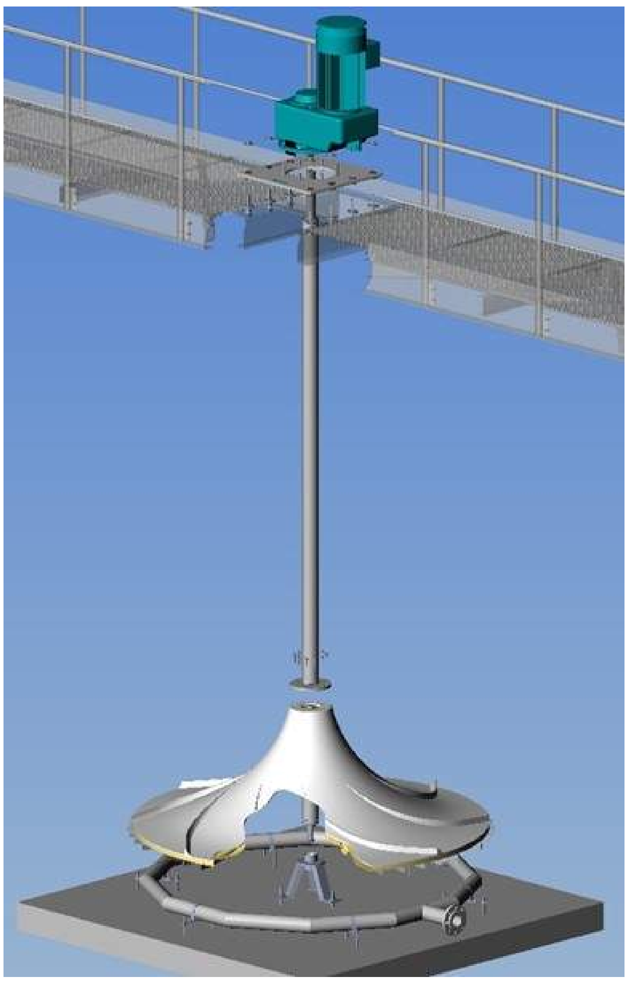
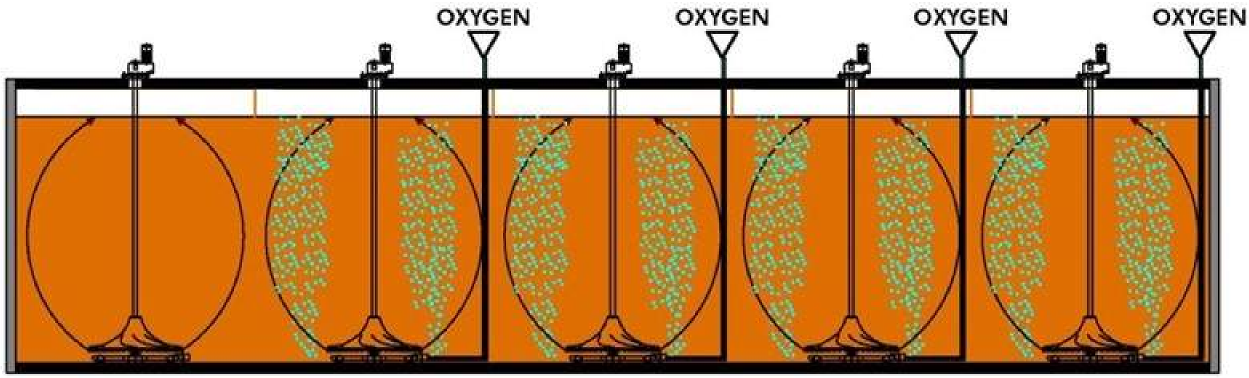


Figure 5-5: Hyperclassic Mixer/Aerator




Each mixer/aerator would require HPO gas drop-leg piping and a flow control valve, which is quite common for diffused aeration systems with multiple diffuser grids. A major advantage that the mixer/aerators have over surface aerators is that they require significantly less power. However, while the mixer/aerators provide very good oxygen transfer efficiency, the technology can only provide oxygen transfer under the water surface. The disadvantage is that the off-gas, which still has a fair amount of oxygen, cannot be utilized in downstream Bays as with surface aerators. As such, an HPO system that employs all mixer/aerators requires more HPO gas than surface aerators. An estimation on power usage is shown in Table 5-7 while HPO usage is in Table 5-8.

Table 5-7: Estimated Mixer/Aerator Power Usage

| Bay | Unit | Mixer/Aerators |
|---|---|---|
| Bay 4 | (HP) | 100 |
| Bay 5 | (HP) | 100 |
| Bay 6 | (HP) | 100 |
| Bay 7 | (HP) | 100 |
| Bay 8 | (HP) | 100 |
| Bay 9 | (HP) | 100 |
| Bay 10 | (HP) | 40 |
| Total | (HP) | 640 |

Table 5-8: Estimated Overall HPO Usage per Bay

| Bay | Unit | Mixe/Aerators HPO Required |
|---|---|---|
| Bay 4 | (Ton/d) | 31.0 |
| Bay 5 | (Ton/d) | 9.8 |
| Bay 6 | (Ton/d) | 7.2 |

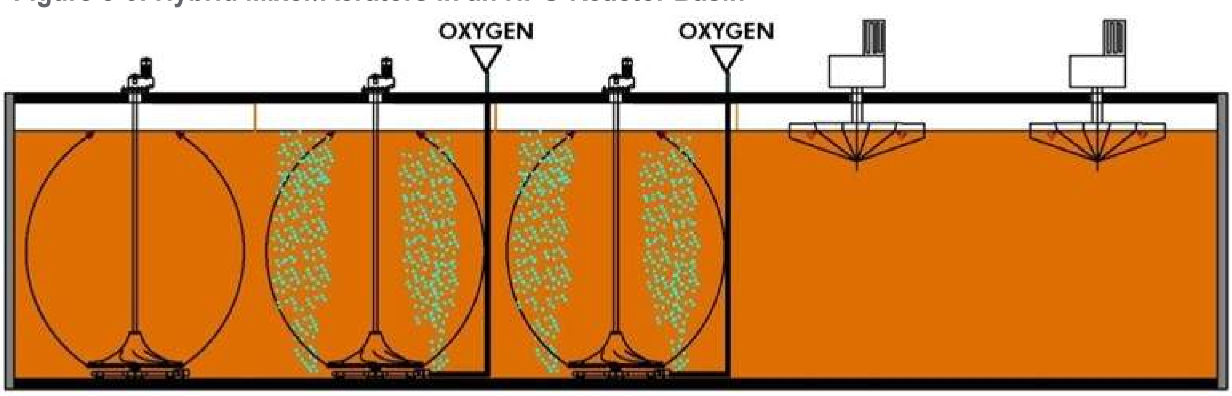
| Bay | Unit | Mixe/Aerators HPO Required |
|---|---|---|
| Bay 7 | (Ton/d) | 6.1 |
| Bay 8 | (Ton/d) | 5.3 |
| Bay 9 | (Ton/d) | 5.0 |
| Bay 10 | (Ton/d) | 4.5 |
| HPO usage | (Ton/d) | 68.8 |

Modeling revealed that Alternative 1C – Hybrid Mixers/Aerators had significant process advantages over this alternative. Therefore, a full engineer's opinion of probable costs was not prepared. This was not considered a "Principal Alternative".

### Alternative 1C – Hybrid Mixers/Aerators

Alternative 1C investigates a hybrid aeration system where the first two aerobic Bays (Bays 4 and 5) would be aerated with mixer/aerators to save on power consumption while providing very good oxygen transfer. The off-gas from these Bays, rather than being wasted to the atmosphere, would be utilized in downstream Bays 6 – 10 with conventional surface aerators. Bays 4 and 5 would employ HPO drop-leg piping and control valves, while a third HPO injection location, either at the existing location at Bay 1, or a new injection location at Bay 6, would be employed to provide additional HPO for Bays 6 – 10 if the off- gas from Bays 4 and 5 were inadequate for the downstream Bays. An abbreviated reactor configuration that shows an anaerobic Bay, two mixer/aerator Bays, and two surface aerator Bays has been illustrated in Figure 5-6. Table 5-9 and Table 5-10 show the estimated power and HPO demands for the Hybrid Mixers/Aerators alternative.

Figure 5-6: Hybrid Mixer/Aerators in an HPO Reactor Basin



| Table 5-9: Estimated Mixer/Aerator Power Usage | | |
|---|---|---|
| Bay | Unit | Hybrid Mixers/Aerators |
| Bay 4 | (HP) | 100 |
| Bay 5 | (HP) | 100 |
| Bay 6 | (HP) | 150 |
| Bay 7 | (HP) | 150 |
| Bay 8 | (HP) | 150 |
| Bay 9 | (HP) | 150 |
| Bay 10 | (HP) | 150 |
| Total | (HP) | 950 |

| Table 5-10: Estimated Overall HPO Usage and HPO Off-Gas per Bay | | | |
|---|---|---|---|
| Bay | Unit | Hybrid | |
| | | HPO Required | HPO Off-gas |
| Bay 4 | (Ton/d) | 31.0 | 17.9 |
| Bay 5 | (Ton/d) | 9.8 | 4.8 |
| Bay 6 | (Ton/d) | | Sum of off-gas (22.7 Ton/d) is enough to satisfy HPO surface aerator demand of bays 6 - 10 (21.7 Ton/d) |
| Bay 7 | (Ton/d) | | |
| Bay 8 | (Ton/d) | | |
| Bay 9 | (Ton/d) | | |
| Bay 10 | (Ton/d) | | |
| HPO usage | (Ton/d) | 40.8 | |

Modeling revealed that this alternative significant process advantages over the other mixing/aeration alternatives. The engineer's opinion of probable costs included this alternative along with the selected solutions for water level control, pumping, LED lighting, a green snow melt system, and solar panels. However, the costs for this alternative were not analyzed separately from the other selected alternatives.

### 5.4.2 Alternative 2 – Measurement and Control of Water Surface Elevation in the Aeration Decks

The existing aerators in the facility are limited to a relatively narrow water level range in the Aeration Deck Bays. The system is reportedly able to tolerate a variation of 6 inches. Estimates from the analysis indicate that the failure point appears to be just over 5 inches (Note: this is an estimate only, and no actual documentation is available), implying that the Aeration Deck level system control cannot maintain a narrow enough water level. This is especially evident at low flows when up to 175 MGD (instantaneous) of clean water must be recycled to the Decks to artificially maintain a higher minimum water level. The level control system relies on submerging the weir and using downstream flow control valves to stabilize the level at the weir outlet. Restoring the system to a free-discharge weir would eliminate the need to manually operate the weir outlet water level and give the weir complete, passive control of the bioreactor water levels. The challenge is to configure the weir to induce the 'correct' water level at both the low and high extremes of flow with as little automation, and continuous monitoring and modulation as possible.

The existing weir is about 300 feet long per reactor, and the maximum gap between minimum and maximum flow is well above the 5- or 6-inch limit of the aerators. This indicates that the weir is either too long for the low flows, or too short for the high flows. In theory, a long enough fixed weir could limit the difference in water level as narrow as desired by lowering both the high and low water levels, but such a weir would be excessively long, and would not fit in the space available. Conversely, a weir short enough to increase the minimum flow water level would also raise the high flow water level by a similar amount.

The key to limiting the flow-induced water level variations in the Aeration Decks lies in narrowing the hydraulic loading rate range at the effluent weir, without adding more weir length. If the loading rates at low flow and high flow are closer together, the depths of flow over the weir, and thus the minimum and maximum water level in the tank, will also be closer together, narrowing the gap.

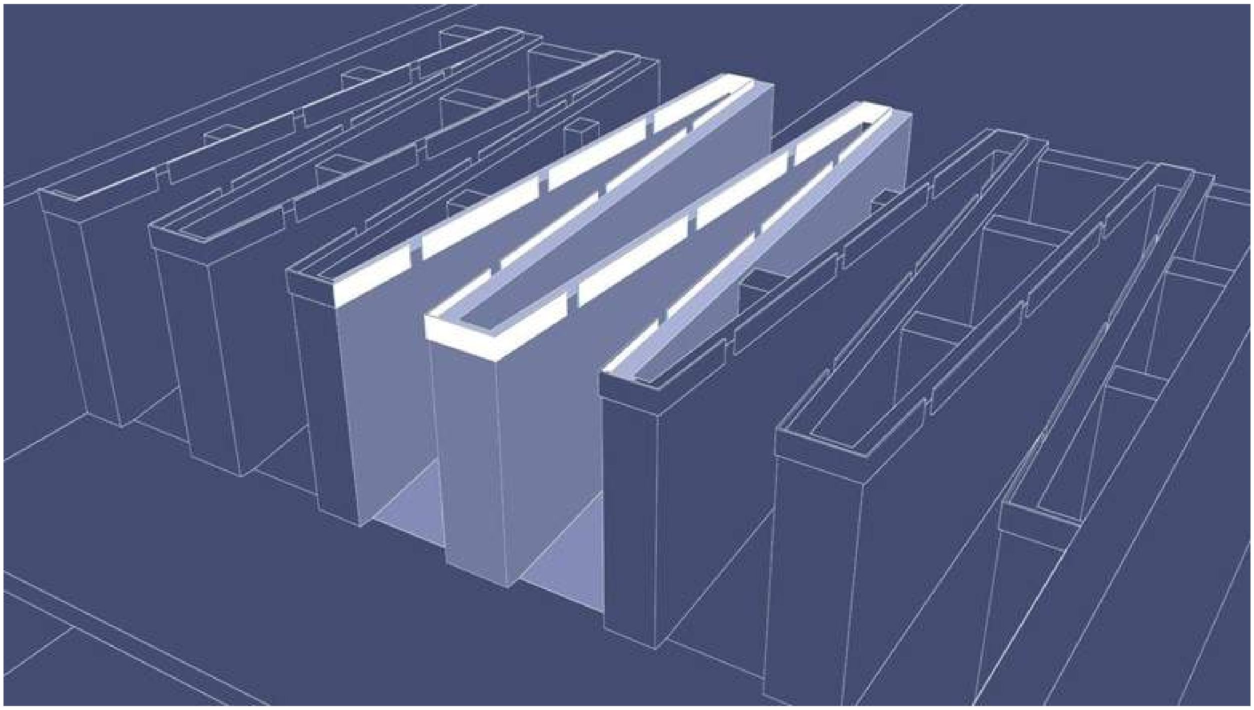
### Alternative 2A – Weir Modification for Fully Passive Control

Alternative 2A - Weir Modification for Fully Passive Control considers fully passive control by converting the existing submerged weir into a free discharge weir. This is mandatory to simplify level control. The free discharge assigns a unique depth over the weir to each flow, as long as the weir is not submerged, thus eliminating the need to manually control the water level in the effluent launders. For this alternative, the weir crest is left at its present elevation of 110.63 feet, and the ability to maintain a launder water level lower than 110.63 feet elevation (i.e., a constant free discharge) is assumed. This crest elevation can be raised or lowered if indicated by process requirements. If so, this will only affect the absolute water levels in the Aeration Decks. The relative weir elevation between local high-water level (HWL) and low-water level (LWL), and inter-Bay water level relationships will not be affected. The longer weir is an accommodation to improve flow measurement accuracy, it is not necessary to control the level.

The analysis showed that increasing the weir length by 40 feet from 300 feet to 340 feet did not have a significant effect in reducing the HWL gap. A more invasive and complex variation added two more launders for a total of 450 feet of weir length (see Figure 5-7). Note that the contractions are shown illustratively as open gaps in the plates. For clarity, the blocking structures are not shown. The number and locations of the gaps are also illustrative. The effect of the 450-foot weir for flows of 375 MGD to

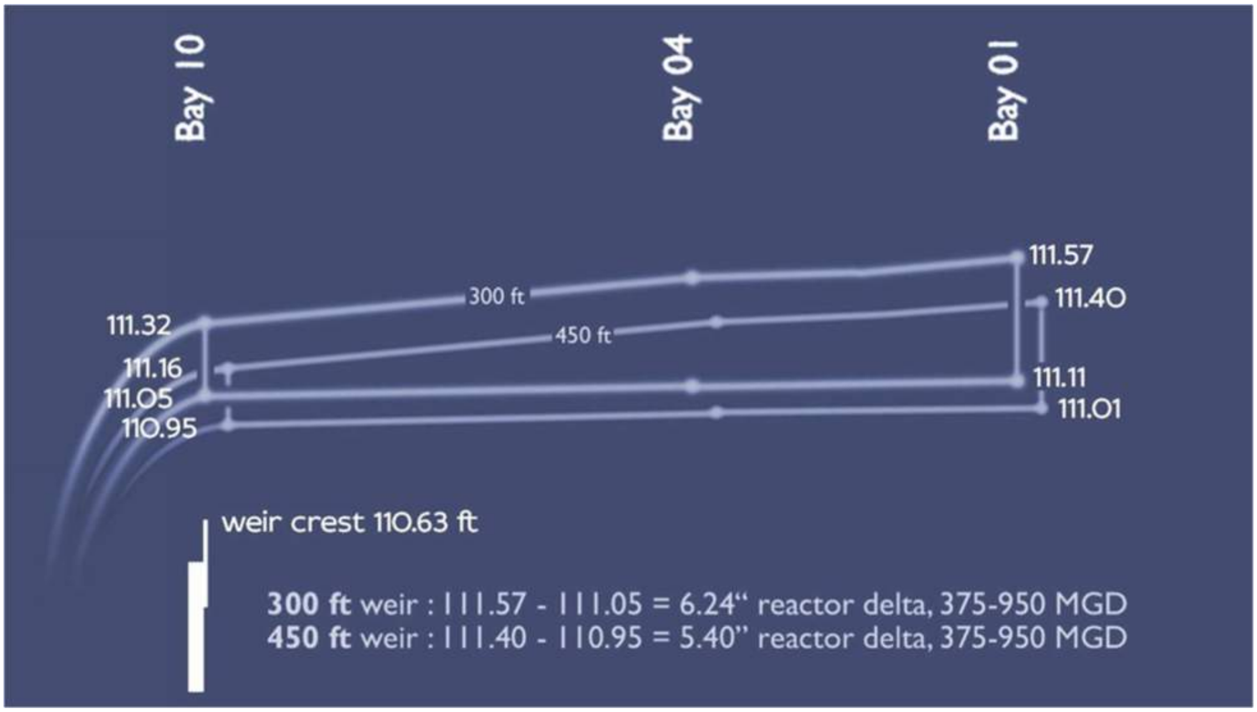
950 MGD is shown in Figure 5-8. While it produces a 13% reduction in water level change, the resulting 5.4-inch gap between Bay 01 and Bay 10 may still be too large and may leave little room to accommodate the higher or lower flows.

**Figure 5-7: 450 ft Fixed Weir – Addition of Two New Launders**



The expense and complexity of this alternative makes it infeasible. It must be stressed that this alternative was only explored conceptually and the constructability of the two launders was not examined in detail. The alternative was conceptualized to illustrate that the most extreme fully passive system that could fit inside Bay 10. From a performance perspective it may be only just sufficient, if at all. Thus, Alternative 2A Weir Modification for Fully Passive Control is not considered viable and not pursued further. A full engineer's opinion of probable costs was not prepared. This was not considered a "Principal Alternative".

**Figure 5-8: Hydraulic Profiles – 375 MGD to 950 MGD Over 300 ft and 450 ft of Fixed Weir**




### Alternative 2B – Weir Modification for Passive and Simple Active Hybrid Control

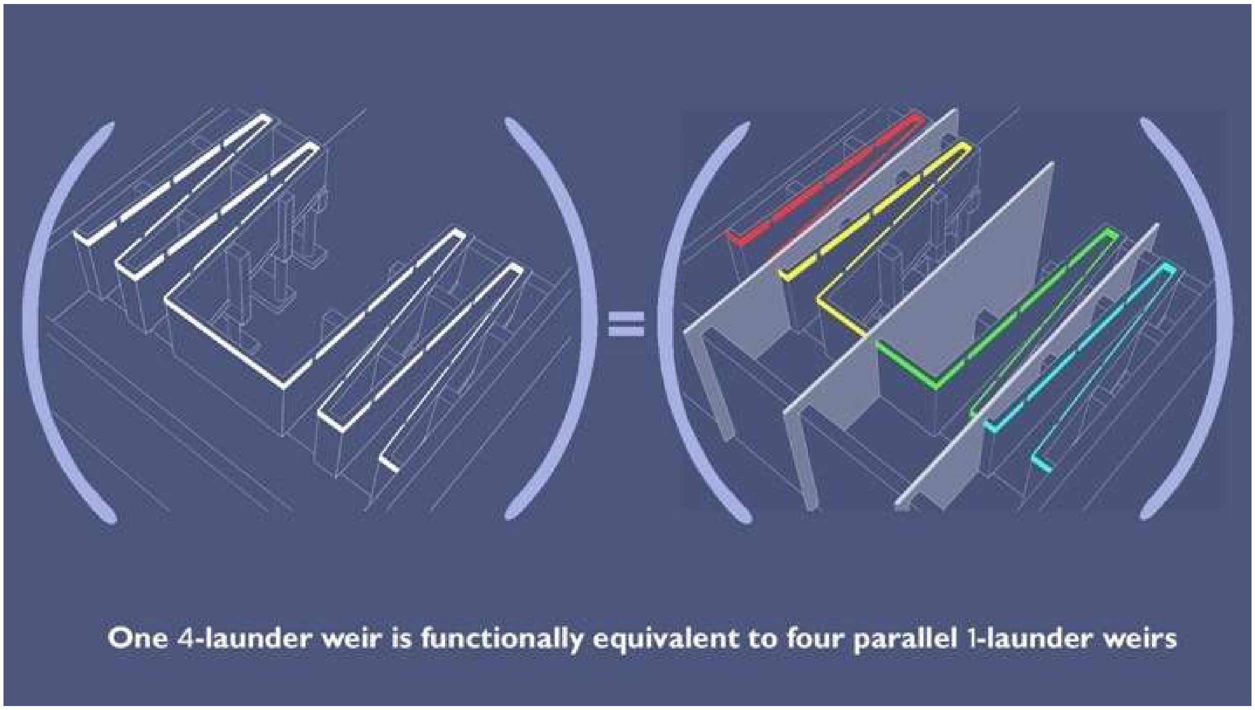
Alternative 2B investigated the supplemental flow method that would increase the hydraulic loading on the present fixed- length weir. Evidence shows that the 375 MGD of un-augmented flow over the 300-foot weir is not working, which implies that a weir loading of 0.58 MGD/ft is inadequate, while a 375 MGD of flow augmented by the 165 MGD recycle flow (a total of 540 MGD) with a weir loading of 0.77 MGD/ft is adequate. At the maximum design flow of 950 MGD, the weir loading is 1.22 MGD/ft, which is stipulated to be adequate, and essentially unchangeable if the weir length is not increased.

This modification includes four (4) 75-foot launders that This provides four (4) discrete weir length combinations:

- With one launder open, 75 feet (three gates closed)
- With two launders open, 150 feet (two gates closed)
- With three launders open, 225 feet (one gate closed)
- With four launders open, 300 feet (no gates closed)

Subsequent analysis showed that the single launder 75-foot weir is probably too short and the LWL-HWL gap can be sufficiently reduced with only three discrete lengths: 150 feet, 225 feet, and 300 feet. This requires only two gates (see Figure 5-9). However, up to four gates could be installed to provide maximum redundancy and flexibility.

**Figure 5-9: The Existing Weir with Potential for Conversion to Variable Lengths**

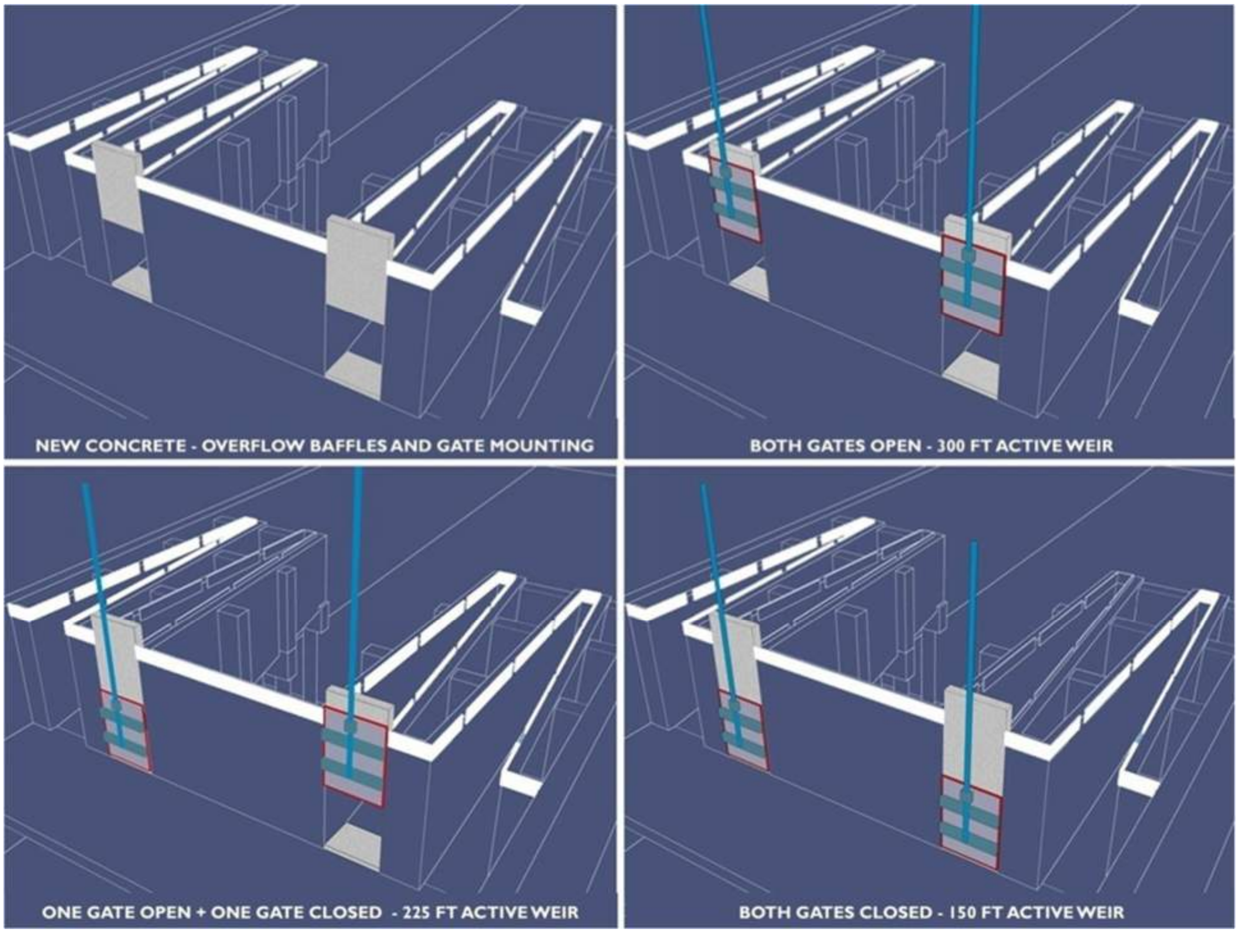



If the top of a closed gate is above the upstream water level in Bay 10, and the 75 feet of weir in the associated launder is out of service, the launder will fill, and its weir will submerge. However, no flow will leave the Bay via this weir, and it will not influence the water level. This can be ensured by installing a very tall gate (>15 feet) with its top well above the weir elevation when closed, but this may not be cost-effective and may limit the gate opening range. Thus, Alternative 2B Weir Modification for Passive and Simple Active Hybrid Control is not considered viable and not considered further. A full engineer's opinion of probable costs was not prepared. This was not considered a "Principal Alternative".

### Alternative 2C – Weir Modification Three-Stage Weir

Alternative 2C is a variation on Alternative 2B where instead of installing a very tall gate (>15 feet), a shorter gate (6 to 8 feet) is installed, and a concrete baffle is built. This modification is shown in Figure 5-10 and is referred to as the three-stage weir.

### Figure 5-10: Three-Stage Weir

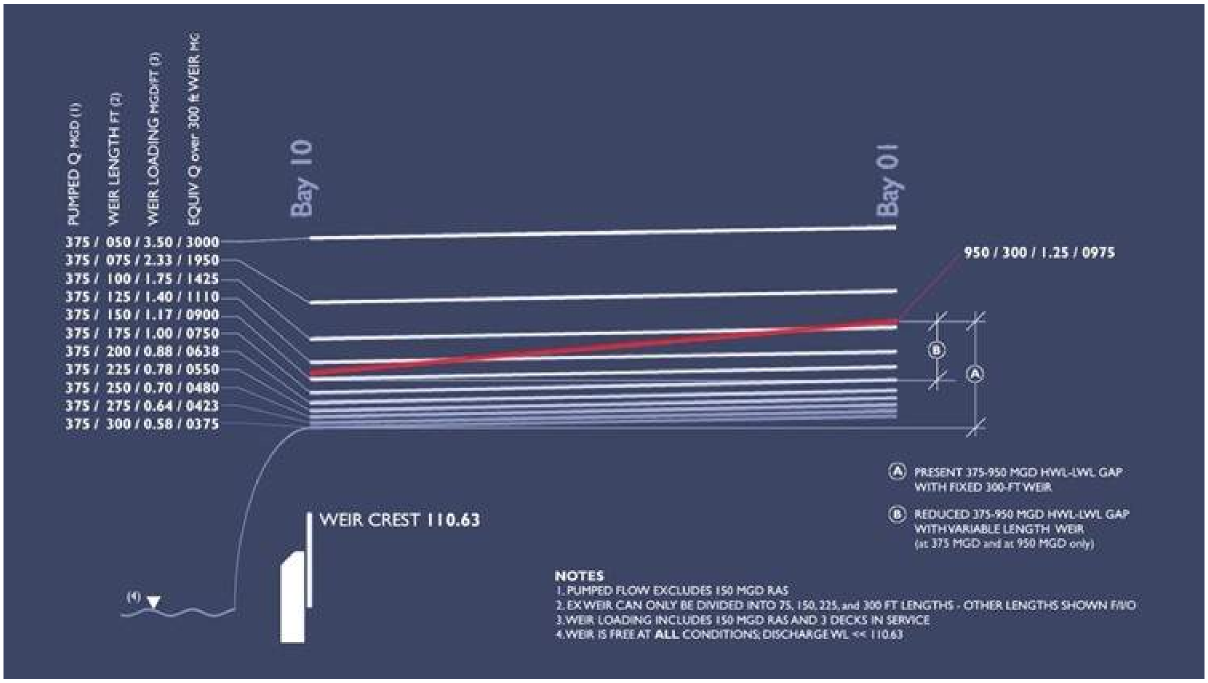



For a fixed flow, a shorter weir sees greater weir load, and the effluent flows deeper over the weir. Every identical incremental reduction in length has a greater effect than the preceding one. For example, at the flow of 375 MGD:

- The depth over a 275-foot-long weir is 0.06 ft deeper than the depth over a 300-foot weir;
- The depth over a 175-foot-long weir is 0.12 ft deeper than the depth over a 200-foot weir;
- The depth over a 75-foot-long weir is 0.58 ft deeper than the depth over a 100-foot weir.

For each identical incremental reduction, the level difference increases exponentially as shown on Figure 5-11.

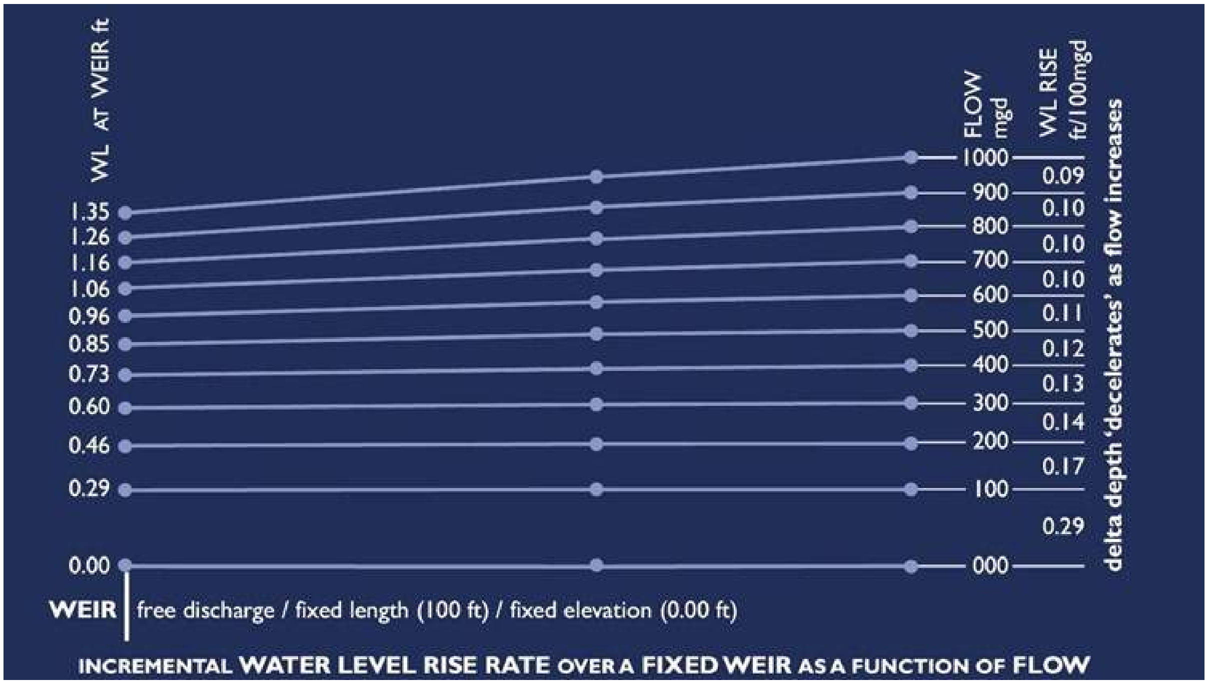
**Figure 5-11: Fixed-Flow Depth Acceleration as Variable-Length Weir Shortens**




As flows increase over a fixed-length weir, the increase in depth decreases exponentially for every increment (see Figure 5-12). For example:

- 100-foot weir between 0 and 200 MGD goes from 0 feet deep to 0.46 feet deep, i.e., an increase in depth of 0.46 feet per 200 MGD;
- Between 200 and 400 MGD, the rate drops to 0.27 feet per 200 MGD;
- Between 400 and 600 MGD, the rate drops to 0.23 feet/200 MGD; and
- Between 601 and 800 MGD, the rate drops to 0.20 feet/200 MGD.

**Figure 5-12: Flow Depth Deceleration with Increasing Flows Over a Fixed-Length Weir**




A shorter weir at a lower flow imposes a greater effect on the low-flow, LWL end of the flow spectrum. The high-flow, HWL over a long weir will increase as well, but not as significantly. A system that can use a short weir at low flow and a long weir at high flow will see LWL rise at a faster rate than the HWL. Thus, while both ends of the water level range will increase, the LWL increases faster than the HWL, and the LWL-HWL gap is narrowed, which is the desired goal.

This can be achieved by appropriately transitioning between the three weir lengths. These transitions should be made at high enough flows that the LWL effect is maximized, but not flows so high that the higher-load LWL exceeds the maximum flow HWL to the point that the LWL-HWL gap is made worse.

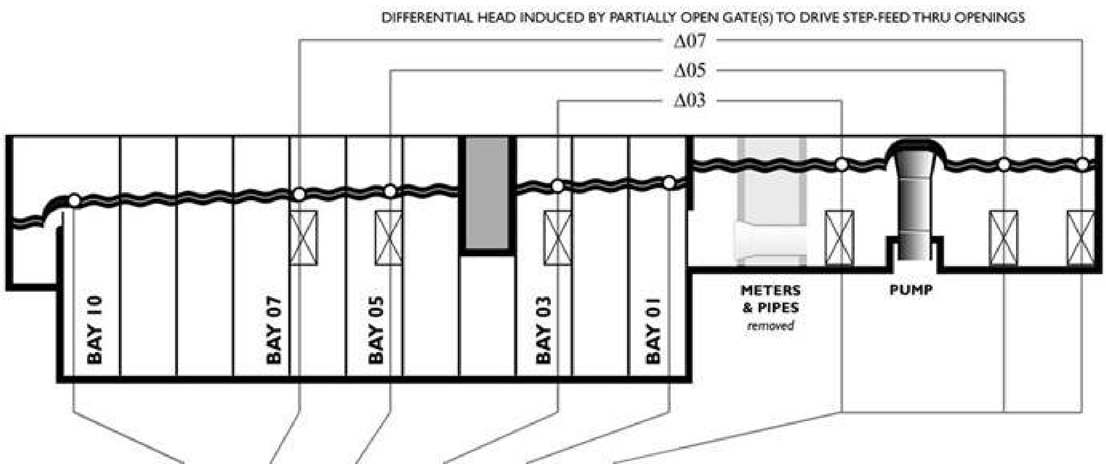
This was the most viable alternative and is considered the only "Principal" alternative for level control included in the economic analysis.

### 5.4.3 Alternative 3 – Step-Feed

Alternative 3 investigates the conversion from the current single point feed (Bay 01 only) to a flexible multi-point feed (Bays 01, 03, 05, and 07). Step-feed has a role in reducing high water level in the upstream zones of the reactor. It was part of the original plant, specifically in Deck 1, which at the time was a conventional aeration (not HPO) process. After Deck 1 was refitted as an HPO reactor, step-feed was discontinued. The gates to Bays 03, 05, and 07 (via the outlet of Bay 06) were removed and the openings sealed. Deck 2 was always an HPO reactor and never equipped with step-feed openings.

It is not specifically stated why the change occurred, but it can be assumed that the step-feed openings were ‘high’ (i.e., they were overflows). While they had motorized gates, there was probably an element of passive overflow in the scheme and the gates may have been left normally partially open. As overflows, they would have opened into the headspace of the adjacent reactor. This is not a concern with conventional aeration. However, with HPO the headspace of the reactor must be sealed to contain the pressurized expensive pure oxygen, and not allow it to escape through an overflow opening into the pump channel and subsequently into the atmosphere. Thus, the step-feed system in place may have been judged incompatible with HPO and therefore discontinued and the openings permanently sealed. This assumption is further reinforced by what appears to be a conversion of the Bay 01 inlets from an open surface channel to permanently submerged by the construction of a concrete cover lower than the expected low water level downstream of the opening. The step-feed method eliminates the metering pipes and magnetic flowmeters, removing the largest contributor to the hydraulic losses in the system. Figure 5-13 shows the channel hydraulic grade line (HGL) without these pipes; the elimination of this bottleneck renders it is essentially level.

**Figure 5-13: Channel-Deck Hydraulic Profile – Underflow Step – Feed Gates**




| | | | | | | | Δ07 | Δ05 | Δ03 |
|---|---|---|---|---|---|---|---|---|---|
| **375** | 11.33 | 11.35 | 11.36 | 11.37 | 11.38 | 11.89 | 0.54 | 0.53 | 0.52 |
| **900** | 11.31 | 11.41 | 11.44 | 11.48 | 11.54 | 12.50* | 1.09 | 1.06 | 1.02 |
| **975** | 11.34 | 11.46 | 11.49 | 11.53 | 11.58 | 12.50 | 1.04 | 1.01 | 0.97 |
| **1050** | 11.37 | 11.51 | 11.54 | 11.58 | 11.63 | 12.50 | 0.99 | 0.96 | 0.92 |
| **1095** | 11.39 | 11.54 | 11.57 | 11.61 | 11.66 | 12.50 | 0.96 | 0.93 | 0.89 |
| **1140** | 11.41 | 11.57 | 11.60 | 11.64 | 11.69 | 12.50 | 0.93 | 0.90 | 0.86 |
| **1200** | 11.43 | 11.61 | 11.64 | 11.68 | 11.74 | 12.50 | 0.89 | 0.86 | 0.82 |

Water levels relative to datum 100.00 ft
Bay 10 weir L = 150 ft at 375; L = 300 ft at 900 - 1200
375 minimum flow shown F/I/O; step-feed OFF
All step feed openings permanently submerged 0-100% open

gates open to position to induce
0.80 to 1.1 ft dH thru opening
when step feed is ON

**STEP-FEED HYDRAULIC PROFILE**
SELECT FLOWS BETWEEN 900 MGD and 1200 MGD (NTS)

For the step-feed system, underflow gates would be installed rather than overflow gates. Overflow gates were investigated, but overflow weirs would need to be relatively large as the 20-foot sealed openings indicate and analysis showed that the 20-foot-wide overflows would remain unsubmerged at the proposed step-feed flows, but there would be an air gap above the weir’s surface allowing expensive-to-generate oxygen to escape. The underflow gates have an advantage in that it begins to pass flow with the full force of the maximum driving head as soon as it cracks open. It is important for the emergency bypasses of ‘flash high flows’; however, as the flow is limited by the pumps, an instantaneous and unexpected flow spike is unlikely. The underflow gates also naturally isolate the HPO reactor headspace from the outside world, preventing loss of oxygen.

To measure the step-feed with underflow gates, at least three new open-channel flow meters are needed. The flow to Bay 01 is measured by an existing magnetic flow meter mounted in a 78-in diameter pipe. This system could be retained, but the owner has expressed a preference to replace these. If this is the case, the pipes should be removed, and the entire channel converted to a "wet" open-channel flow regime. An advantage of this is that these pipes are the largest contributor to the headloss in the entire system, and their removal will simplify flow splitting by producing a relatively equal water level at all four step-feed gates

Step feed is required to utilize biological phosphorus removal was the most viable alternative and is considered the only “Principal” alternative included in the economic analysis.

### 5.4.4 Alternative 4 – Intermediate Lift Pump Replacement

Alternative 4 investigates the replacement of the existing ILPs. ILP-1 and ILP-2 pump motors are in fair condition and have not exceeded an expected 30-year life. However, risk associated with their continued use would have to be mitigated and the risk associated with premature failure can’t be eliminated. Replacement of the pumps minimizes the risk of failure.

If the ISPs remain in use, a major service inspection requiring pump motor removal and inspection at a motor repair shop should be performed. Motor repair tasks such as bearing replacement, lube oil and seal replacement, and cooling water seals replacement would be expected. Megger testing of motor windings should be used to determine the existing condition of motor winding insulation to determine if existing motor windings would be suitable for the remaining 16 years of an expected 30-year life. A winding replacement, if recommended, would be a significant repair cost. The pump motors are long-lead items to procure. If a pre-mature unplanned failure would occur, would require extended down-time and reduced operating capacity during peak-demand wet weather events where both pumps are required to operate simultaneously.

Alternative 4 Intermediate Lift Pump Replacement would add new ILP-1 and ILP-2 pumps, new appurtenances, and new 4.16KV, 3 phase, 3000 HP pump motors to replace the existing ILPs, existing appurtenances, and the existing 4.16KV, 3 phase, 2500 HP pump motors. The existing ILP-1 and ILP-2 pump motors are 14 years old and significantly increased in size when they replaced the former, removed 4.16KV, 3 phase 2000 HP motors in 2007. The former ILP-1 and ILP-2 pumps and pump motors were installed in 1970 and were original to the Aeration Decks No. 1 and No. 2 construction and were 37 years old.

### 5.4.5 Monetary Evaluation and Alternative Evaluation

The evaluation of Aeration Deck Project's alternatives was dominated by non-cost factors based upon modeling results. The present worth and lifecycle cost calculations included in Appendix H were only performed for the combination of alternatives that best met the project needs. They are based upon the basis of design engineer's OPCC. Award of this design-build project is scheduled for Q1 2023.

## 5.5 Selected Alternative for the Aeration Decks Project

### 5.5.1 Project Description

The selected combination of alternatives includes Alternative 1C – Hybrid Mixers/Aerators, with Alternative 2C – Weir Modification Three-Stage Weir, Alternative 3 – Step Feed, and Alternative 4 – Intermediate Lift Pump Replacement. Other improvements included as part of this project include interior and exterior LED lighting, a new Green Snow Melt System, and solar panels for supplemental power generation.

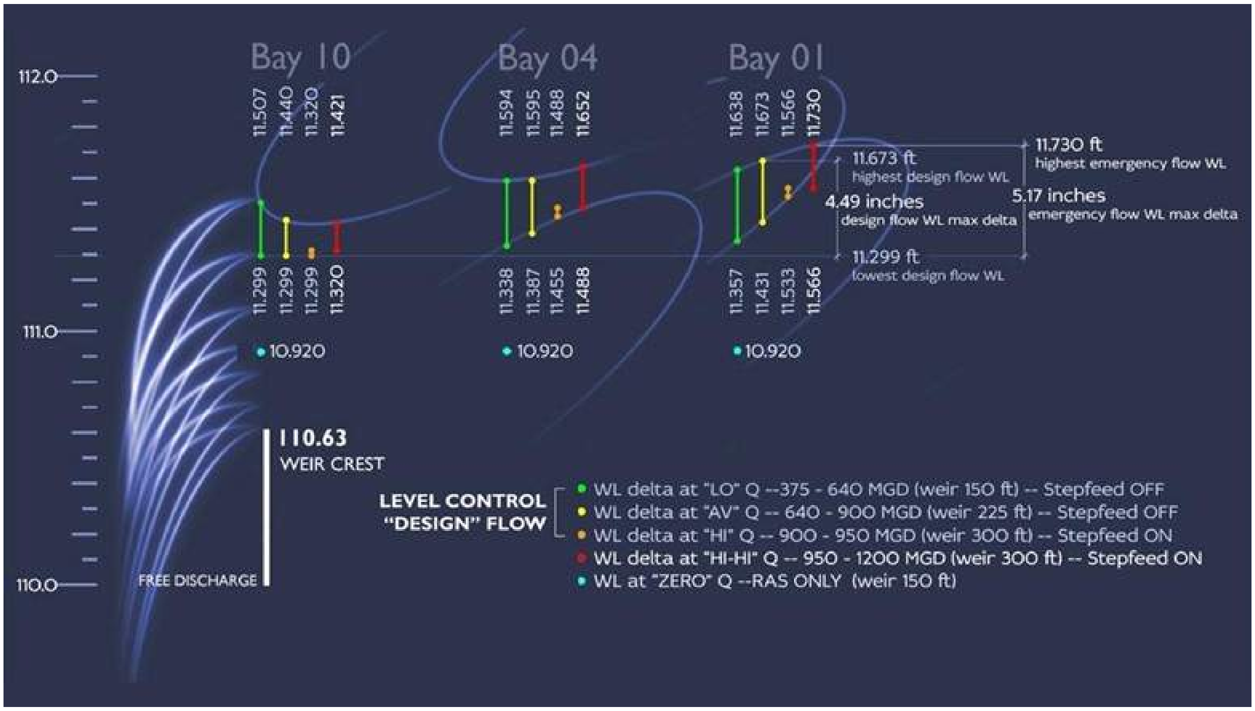
The surface aerators in Bays 01, 02, and 03 of Aeration Decks 1 and 2 to make these zones anaerobic and the aerators in Bays 04 through 10 will be replaced. The new mixer/aeration equipment design details are:

- Mixers in Bays 01, 02, and 03
  - Horsepower and Electrical Requirements: 20 hp mixers with constant speed motors
  - Quantity: Aeration Deck 1 - 6, Deck 2 - 6
- Surface Aerators in Bays 04 through 10
  - Horsepower and Electrical Requirements: See Table 7-9. The aerators shall be on VFDs
  - Quantity: Aeration Deck 1 - 14, Aeration Deck 2 – 14

The mixers and surface aerators will be installed in the existing column supports. The process model does support step-feed which is achieved with the installation of automated modulating slide gates at Bay 01, 03, 05, and 07 at Aeration Decks 1 and 2.

Measurement and control of the water surface elevation in the Aeration Decks 1-2 will be accomplished with three-stage weir. The weirs in Bay 10 will undergo structural changes to install a short gate that is 6 to 8 ft tall and will include a baffle at the weir. See Figure 7-10 for the conceptual design of the three-stage weir. The hydraulic profiles for Aeration Decks 1 and 2 are shown in Figure 5-14 for this three-stage weir.

**Figure 5-14: Deck 1/Deck 2 Hydraulic Profiles, 375 to 1200 MGD, 3-Stage Weir, Transitions at 640/900 MGD**




Step-Feed was selected to reduce high water levels in upstream zones of the reactor. An underflow gate system will be installed in both Aeration Decks at Bay 03, Bay 05, and Bay 06. The size of the underflow gates will be 10 feet by 8 feet. This step-feed system has been assessed to be able to accommodate pumps significantly larger than the current intermediate lift pumps, and even larger than any three pumps that could conceivably be installed. Pump sizing will not be constrained by this step-feed system and instead be constrained by process needs, and the pump technical limits and structural space availability. The pump discharge will be reconfigured to accommodate the step-feed system. Figure 5-15 displays the current process flow through the secondary treatment system while Figure 5-16 display the process flow with the new step feed system.

**Figure 5-15: Existing Liquid Train Process Flow**

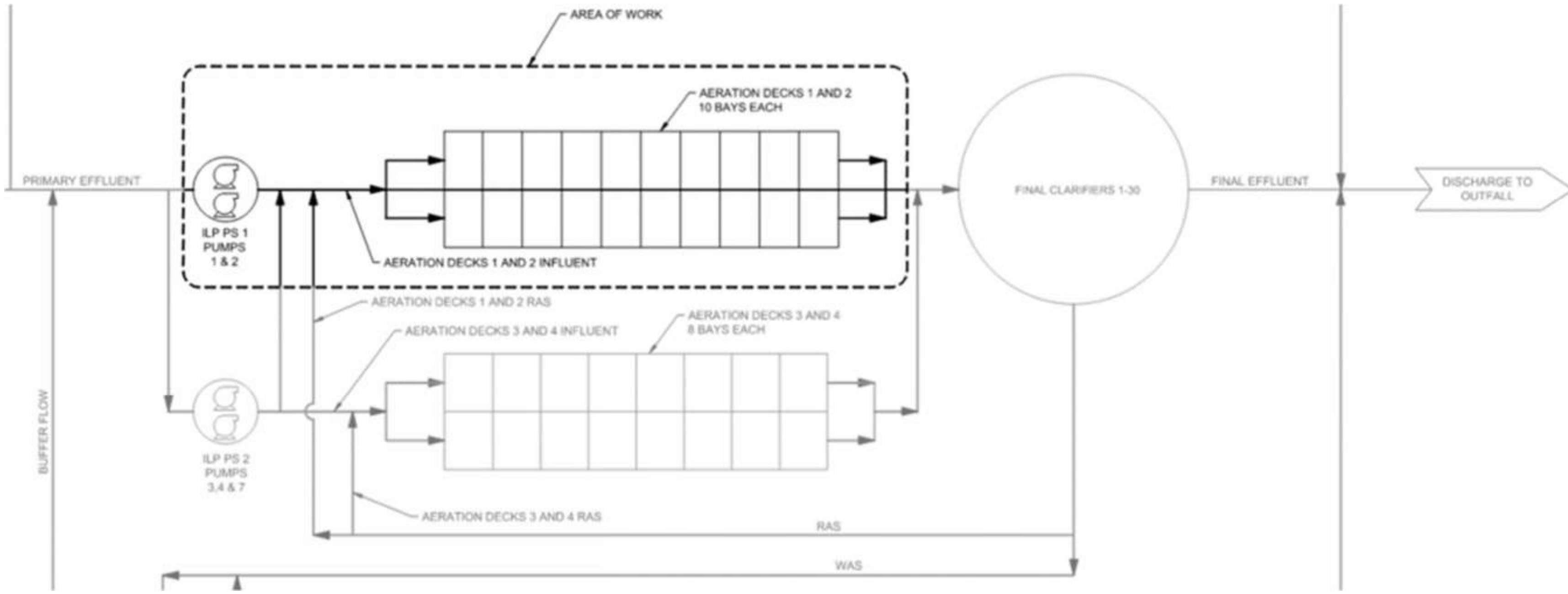
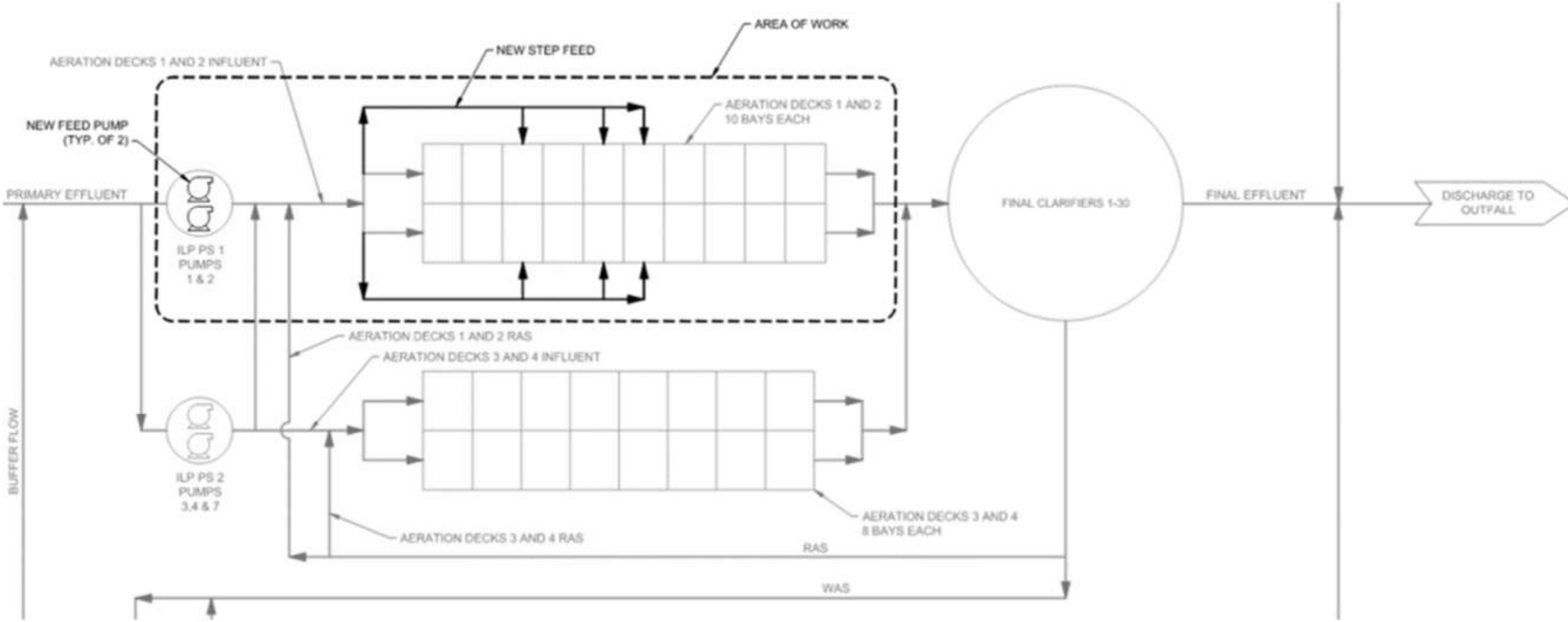
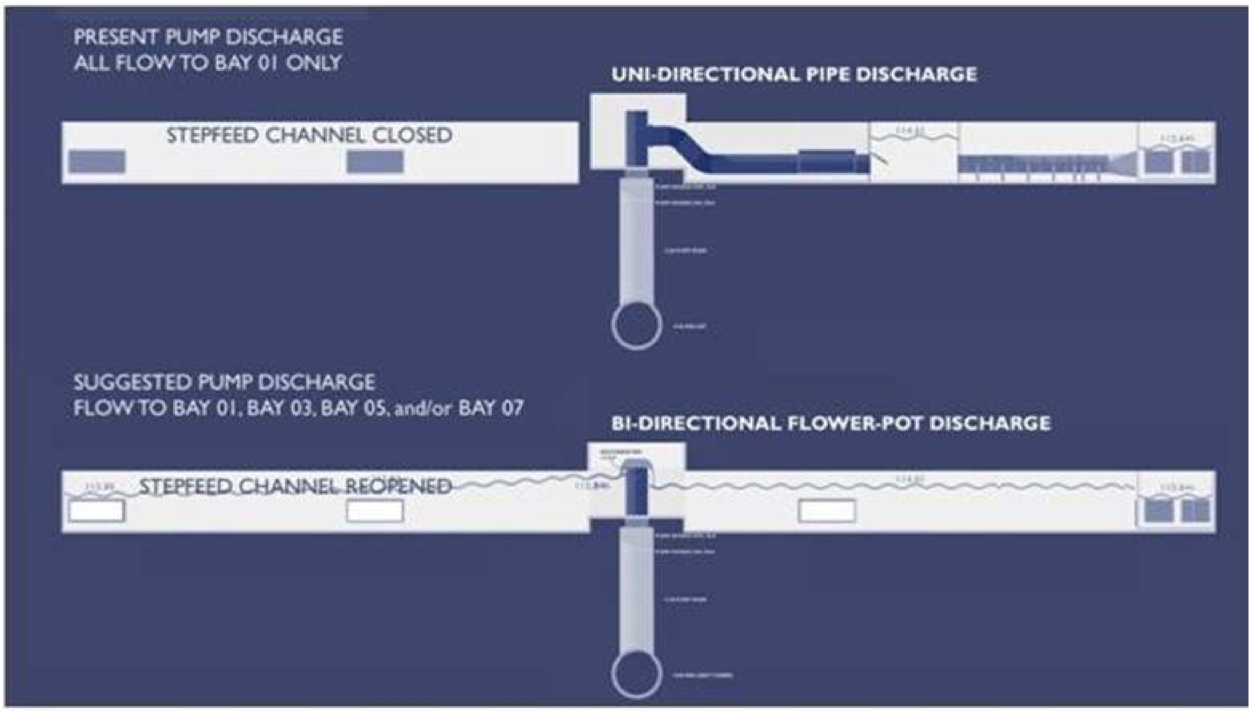


**Figure 5-16: Liquid Train Process Flow Diagram Step Feed Modification**



The easiest way to get step-feed is to restore the pump discharges to their original "flowerpot" overflows. This opens the pump discharge service in both segments of the central feed channel. This is shown in Figure 5-17. It is recommended an open-close gate be installed at the upstream end of the step-feed channel near the flower-pot discharge to isolate it so that it does not fill with water during extended intervals of flow below 900 MGD.

Figure 5-17: Pump Discharge – Present (top) and Planned Step-Feed Modification (bottom)




Post-modification to step feed, Deck 1 and Deck 2 will share a common 18-foot-wide normal feed channel (with four (4) outlets to Deck 1 Bay 01, Deck 2 Bay 01, Deck 1 Bay 03, and Deck 2 Bay 03) and a common 18 ft wide step feed channel (with four (4) outlets to Deck 1 Bay 05, Deck 2 Bay 07, Deck 1 Bay 05, and Deck 2 Bay 07). This removes the ability to dedicate ILP 1 to Deck 1 Bay 01 only and ILP 2 to Deck 2 Bay 01 only.

To restore this separation, the entire normal channel (including the pump discharge chamber) needs to be divided longitudinally with a full-height wall into two 9 ft wide parallel channels. The step feed channel also needs to be similarly divided to dedicate ILP 1 to Deck 1 and ILP 2 to Deck during step feed to Bays 05 and 07.

Excluding the six (6) new step feed gates and openings installed in the existing channel outside walls, the dividing wall will be provided with a minimum of two (2) gate-isolatable openings (minimum one (1) in the normal channel, and minimum one (1) in the step feed channel) to allow crossflow between the parallel channels to provide:

- A degree of equalization when both pumps and both decks are in service, these gates can be opened otherwise, keeping them closed (equivalent to no openings at all) maintains the one- pump, one-deck separation. (There is one such opening and gate in a short, divided chamber in the existing unmodified normal channel which could be retained and re-used, but it is not in the best location with respect for the flow measuring and to minimize flow stagnation and dead ends in unused parts of the channel under certain flow patterns).
- The ability to divert ILP 1 discharge to Deck 2 or ILP 2 discharge to Deck 1 (cannot do both at the same time) in case such diversion is required by certain combinations of Pump or Deck being out of service.

Excluding the six (6) new step feed gates and openings installed in the existing channel outside walls, and the minimum two (2) gate-isolatable openings described above, a minimum four (4) gates are recommended to isolate parts of the two (2) parallel 9-foot channels to prevent or minimize stagnation when step feed to Bay 05 and Bay 07 is OFF, and/or when PE feed to Bay 01 is OFF.

- To isolate and prevent stagnation in the step feed channel when step feed to Bay 05 and Bay 07 is OFF, each of the two parallel step feed channels should be fitted with an open-close isolation gate at their inlets, as close as possible to the pump discharge chamber.
- To prevent stagnation in the normal channels downstream of the inlets to Bay 03 when not discharging PE to Bay 01, each of the two parallel normal feed channels should be fitted with an open-close isolation gate at their inlets, downstream of and as close as possible to the Bay 03 inlet gates.

Replacement of the intermediated lift pumps will reduce risk and increase reliability. Based on the increased capacity from the modification to downstream aeration decks, ILPs 1 and 2 will be replaced with a similar type of vertical axial flow pumps. New pumps will be provided with a rated capacity of 400 MGD each. The basis of design for the replacement pumps is shown below.

- Pump Rating: 400 MGD at 28 feet total dynamic head (TDH), 3000 HP, 235 revolutions per minute (RPM).
- Increase the size of the suction bell as large as possible to keep the bell velocity with the range recommended by Hydraulic Institute (5.5 - 7 ft/sec), 6.5 to 7 ft/sec is recommended for this application.
- Pump outer column to be sized by pump manufacturer to accommodate the installation of the new pump assembly. Intake bell elevation to be determined by design-builder.
- Provide intake vortex suppressor based on a physical hydraulic model study by the design-builder. The model study must determine the design of the suppressor and the headloss that needs to be included in the pump total head calculation.
- Replace existing discharge pipe with a “Flower-Pot” type discharge. This is required to accommodate the hydraulics for the proposed Step-feed operation. This type of discharge would just be a spillover design into the discharge channel. Design-builder to provide the design of the

Flower-Pot discharge diameter, edge configuration. It is estimated that the new discharge configuration will add 2.5 to 3.5 feet to the present discharge elevation.

- The lip of the new pump discharge shall be 1 foot above maximum water surface level. Discharge flow should not hit the ceiling or be influenced by the channel wall.
- Remove existing motor. Replace existing motor and supports with a low-speed synchronous motor matching with the new pump. The new motors shall be 4160 Volt, 3 Phase, 3000 HP, 235 RPM motors with brushless excitation for use with new variable frequency drives or as determined by the design-builder.

To accommodate the process changes the structural modifications that will occur as part of the Aeration Decks 1 and 2 Improvements project are as follows:

- Reconstruction of the ILP to accommodate the new pump load and configuration.
- Reconstruction of the channels and slabs between Bays 3, 4, 5, and 6 to accommodate the new gates required for step-feed.
- Addition of a flow divider channel between Bays 1 to 3 and 4 to 7.
- Reconstruction of the existing junction chamber walls for new gates.
- Remove all precast concrete parking bumpers and replace them with hinged bollards.
- Add three-sided kiosks over all exterior instrumentation panels and instrumentation panels.
- At the base of the ramp over the effluent chambers, add a grated trench to facilitate the SCB-30 temporary bypass line.
- In Bays 2 and 6 of Decks 1 and 2 add a new 6-foot x 6-foot manway hatch.
- Remove the ILP pipe gallery and flow meter pipe to facilitate the new ILP pump flow and divider wall.
- In Bay 10 of Decks 1 & 2 install hanging walls and new slab penetrations at the outlet of the finger weirs to facilitate the installation of new gates.
- Install new covered walkway that supported elevated conduit bank.
- Add new stairs adjacent to each ramp.
- Install new floor drains at low spots in Deck 1.
- Provide membrane sealer to the underside of the entire structure.

Due to the poor structural condition of the Aeration Decks 1 and 2, structural rehabilitation will also occur. There are areas of deterioration that require repair and/or rehabilitation to prolong the life of the structure. The following work will be performed as part of Aeration Decks 1 and 2 Improvements project:

- Remove and replace the traffic coating on Deck 2.
- Remove and replace all the joints between the precast elements in Deck 2.
- Remove and replace all the joints on Deck 1.

- Remove and replace all the hatches and cover plates on both Decks 1 and 2 (and the channels between them).
- Remove and replace all the access stairs
- Remove all the stairs that go up and over banks of the conduit.
- Seal the cast-in-place concrete top slab of Deck 1 and the channel area to its north (any area that does not receive a traffic coating).
- Manual sounding (or thermal scanning or other means as may be appropriate) to locate and map all areas of deterioration on the top side of Decks 1 & 2 (and channels between them), Meter Vault, ramp over the RAS, and ramp over the effluent chambers. Remove all areas of delamination and spalling and patch the concrete.
- Apply crystalline waterproofing to the walls, the roof, and the floor of the meter vault, former ILP junction chamber and the former ILP pipe gallery.
- Replacement of all the floor drain grates, or floor drains if needed, in the top slabs and extension of the drainpipe.
- Remove scaling concrete around the mixer hatches and the mixer support columns, sound the concrete to map deterioration and patch.
- Replace or refurbish the mixer support cover plates.
- Replace the grating over the over low drop boxes attached to Bays 03 and 04 of both Decks 1 and 2.
- Repair two tube steel posts supporting the conduit adjacent to Electrical Building EB6A.
- Repair the failing pipe support at the northwest corner of Deck 2 Bay 3.
- Replace the man door on the west side and both access doors on the east side of the ILP.
- Coat the interior of the ILP access area (electric vault) with crystalline waterproofing and replace any expansion joints.
- The ramp vent on the east side of the deck shall be assessed and be removed and relocated if deemed necessary.

### 5.5.2 Project Schedule

The schedule for the Aeration Decks Project will be submitted by the selected Design-Build contractor. However, the GLWA plans to award the contract in the second quarter of 2023. Construction is expected to begin in August 2024 and finish in the first quarter of 2027.

### 5.5.3 Cost Estimate

The basis of design engineer prepared an OPCC for the Aeration Decks 1-2 project that was utilized in a Present Worth (Lifecycle Cost) Calculation. Both the detailed cost estimate and the cost analysis are included in Appendix H.

### 5.5.4 Green Project Reserve

As part of the exterior improvements, a new Green Snow Melt System is planned to be added as well as the installation of Solar Panels. LED lights will also be installed in place of the existing lights and as newly proposed lighting for the project. As determined by the MI-EGLE "2012 Clean Water State Revolving Fund 10% Green Project Reserve: Guidance for Determining Project Eligibility" document these features qualify the Aeration Decks 1-2 project for the Energy Efficiency portion of the Green Project Reserve.

#### Installing High Efficiency LED Lighting in Place of Standard Lighting Options

The interior and exterior lighting fixtures will be replaced with LED lighting fixtures to reduce ongoing energy usage. LED lighting fixtures are more energy efficient and have a longer operating life as compared to the existing fluorescent lighting fixtures. The longer operating life will also reduce ongoing maintenance and servicing costs for these lighting fixtures.

*Cost to Implement*

The cost to implement the use of LED high efficiency lights has been estimated at $129,029.83. This is the total cost for all existing light replacements, interior and exterior, all proposed lights for the Aeration Decks 1-2 project, and all proposed safety lighting.

*Eligibility*

There are three major types or light bulb: Fluorescent, Incandescent (traditional), and LED. The average lifespan of an LED bulb is 25,000 hours compared to 8,000 and 750 hours for fluorescent and traditional bulbs, respectively. The estimate kilowatt hour usage for an LED light is approximately 40% less than that of a fluorescent light and 82% less than a traditional light. Using the lesser difference in energy consumption of the LED compared to the fluorescent light, this energy savings is still above 20%. With this evaluation, the installation of LED lights as part of the Aeration Decks 1-2 project is Categorically Eligible for Green Project Reserve.

#### Installing a Green Snow Melt System and Solar Panels

As part of the exterior improvements, a new green snow melt system is planned to be added as well as the installation of solar panels. These proposed project items will give the WRRF the ability to reduce its energy usage. The green snow melt system will provide a way for the WRRF to handle winter conditions with a lower energy usage. The installation of solar panels will give the WRRF a secondary electricity option. This has multiple uses, either powering process needs or general building needs.

*Cost to Implement*

The cost to implement the Green Snow Melt System and the Solar Panels has been estimated at $660,105.58.

*Eligibility*

This portion of the project is Categorically Eligible for the Green Project Reserve being a renewable energy source.

**Installing VFDs on Proposed Mixers and Aerators to Reduce Energy Usage**

The current operation at the GLWA WRRF Aeration Decks 1-2 use soft starts on the existing aerators and mixers. The proposed project alternatives have evaluated the use of VFDs on the new mixers and aerators to conserve energy. With this evaluation, the use of VFDs on proposed equipment has been determined to reduce energy use by a significant amount and will be proposed for the selected alternative.

*Cost to Implement*

The cost to implement the use of VFDs on the proposed aerators and mixers is estimated to total $663,909.60.

*Eligibility*

The largest power draw exerted by a pump takes place upon start up. It has been shown that a VFD typically provides an energy savings close to 25% compared to normal operation. It is also anticipated that the VFDs will reduce the energy consumption of the aerators and mixers significantly over their expected useful lifespan. With a reduction in energy consumption of over 20%, this portion of the project is Categorically Eligible for the Green Project Reserve.

### 5.5.5 Implementability of Selected Alternative

GLWA has the appropriate Management, Engineering, and Maintenance and Operational staff to implement this proposed project and has implemented many projects with similar budget amounts in its history. They also have the ability to obtain technical support as needed for design and planning of the project. If this project is funded from MI-EGLE with low interest loan funding, GLWA is ready to implement, construct, operate, and maintain the proposed project.

The project will be completed as a design-build contract. GLWA is prepared to meet all schedule milestones set forth in the proposed schedule in Section 5.5.2.

### 5.5.6 User Costs

User Impact Costs are included in the Present Worth (Lifecycle Cost) Calculation included in Appendix H.

### 5.5.7 Useful life Evaluation

The evaluation of the selected alternative took into consideration the expected useful life of the proposed project components. Typical useful life spans for each project aspect were given based on either known lifespans, such as process equipment where a lifespan can be provided by a manufacturer, or standard item lifespans that have been accepted, such as the useful life of a structure. The structural components constructed in this project are expected to have a useful life of 50 years. The site civil work and the proposed process equipment both have an estimated useful life of 20 years. The electrical, instrumentation, and controls have a useful life of 15 years. Estimated useful life is used in the Present Worth (Lifecyle Cost) Calculations presented in Appendix H.

### 5.5.8 Analysis of Impacts

#### Direct Impacts

The construction of the Aeration Decks Project is not expected to have an adverse impact on archaeological, cultural, or historical areas. The construction for this project will occur within the WRRF boundaries and in areas that have been previously disturbed. This project is not anticipated to detrimentally affect water quality, air quality, wetlands, endangered species, wild and scenic rivers, or unique agricultural lands in the area.

The total user costs have been evaluated on an individual project basis and can be found in Appendix H. These evaluations returned a total user cost impact that is not unreasonably high and so it is not considered an adverse direct impact from the implementation of this project.

#### Indirect Impacts

The improvements made as part of the Aeration Decks Project are not expected to have an impact on the growth and development capacity in the surrounding residential, commercial, or industrial areas. The project is also not anticipated to have an impact on cultural, human, social, or economic resources in the surrounding area.

#### Cumulative Impacts

The Aeration Decks Project is anticipated to improve the overall efficiency and treatment capacity of the secondary treatment process. The improvements are expected to increase biological phosphorus removal in the treatment process, resulting in a cleaner environment.

### 5.5.9 Mitigation of the Selected Alternative

Where adverse impacts cannot be avoided, mitigation methods will be implemented. Mitigating measures for the projects such as soil erosion control, if required, will be utilized as necessary and in accordance with applicable laws. Details will be further specified in the construction contract documents used for the project.

#### Short-Term Mitigation

The Aeration Decks Project is expected to have unavoidable short-term impacts due to construction activities such as dust, noise, and traffic. Efforts to minimize dust such as giving unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment or periodically watering these areas will be implemented. Work will be scheduled and conducted in a manner to minimize the level of noise escaping the site, especially at nights and on weekends. These measures will be detailed in the contract project specifications.

### Long-Term Mitigation

The Aeration Decks Project is not expected to have adverse long-term impacts. Therefore, no long-term mitigation is expected for this project.

### Indirect Impact Mitigation

For this project, it is not anticipated that mitigative measures for indirect impacts will be necessary. The improvements on the Aeration Decks as part of this project are located within the boundaries of the WRRF so they do not promote growth in areas that are not serviced by GLWA.

# 6.0 PRIORITY 1C - PUMP STATION 2 BAR RACKS REPLACEMENT AND GRIT COLLECTION SYSTEM IMPROVEMENTS (PS-2 PROJECT)

## 6.1 Delineation of PS-2 Project Area

The PS-2 Project will improve reliability and increase removal efficiencies of screening and grit at the GLWA WRRF downstream of PS-2. The bar screens in the screen building are being replaced and the screen building is being extended to the north to accommodate two additional bar screens. The vortex grit separators are being retrofitted into the footprint of the grit chambers. The new grit processing facility will be located to the north of the girt chambers in the area of the existing monorail maintenance building and generators. Figure 6-1 depicts the existing layout of PS-2 and Figure 6-2 depicts the limits of the construction, including site/civil work.

Figure 6-1: Existing PS-2 Layout

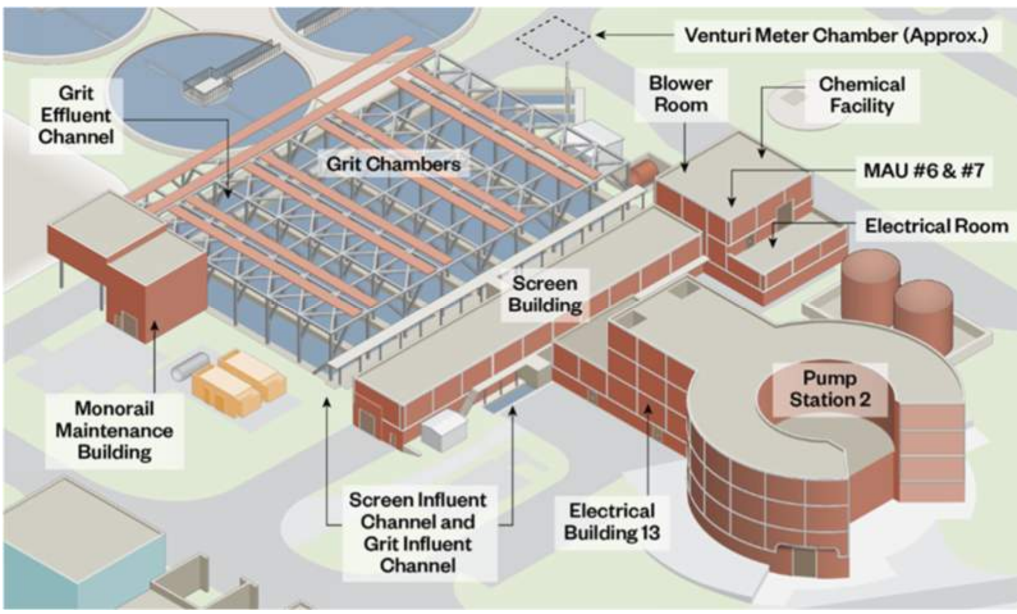


**Figure 6-2: PS-2 Project Limits of Construction**


## 6.2 Summary of PS-2 Project Need

The existing PS-2 Rack and Grit Facilities remove sanitary trash and grit from up to 900 MGD of raw sewage that is treated at the WRRF. The screening and grit systems are not meeting expected removal standards, operate inefficiently, and are prone to failure.

Effective grit and screening removal can dramatically impact the performance and reliability of downstream treatment equipment. The cost of ineffective grit and screenings removal is difficult to quantify, but has been shown to manifest in excessive accumulation of grit in downstream channels and process tanks with severe consequences that include making gates difficult or impossible to operate; reducing conveyance capacities; inducing excessive wear and shortened life of primary sludge pumps and solids processing equipment; clogging the vertical turbine solids handling) inlet strainers on return activated sludge pumps; and reduced quality of the biosolids product which negatively impacts GLWA's long-term goal of adequate anaerobic digestion.

The following goals for the PS-2 Project have been set to address the potential consequences and increasing downtime of the aged equipment:

- Improve the systems to provide for significantly higher screenings and grit removal efficiencies
- Make changes that improve the long-term system reliability
- Simplify O&M

New grit processing equipment will separate the grit from the wastewater and deposit the grit in trailers or dumpsters for transport to the landfill, while returning the wastewater to the treatment process.

Upgrades will improve the WRRF's reliability by maintaining treatment processes with greater ease and reducing operating costs.

## 6.3 Technical Considerations for the PS-2 Project Alternatives

The EGLE SRF Project Plan Preparation Guidance requires alternative evaluations include the following considerations, if applicable:

- Infiltration and Inflow (I/I) Removal
- Structural Integrity
- Sludge & Residuals
- Industrial Pre-Treatment
- Growth Capacity
- Areas Currently Without Sewers
- Reliability
- Alternative Sites and Routings
- Combined Sewer Overflows
- Contamination at the Project Site
- Green Project Reserve

The above considerations are not applicable to the PS-2 Project except for Structural Integrity, Growth Capacity, and Reliability.

### 6.3.1 Structural Integrity

The PS-2 Project scope includes the structural improvements necessary to extend the useful life of remaining structural components another 20 years or more.

### 6.3.2 Growth Capacity

The maximum capacity of the proposed PS-2 solids handling system exceeds those of the upstream PS-2 pumps and the downstream primary and secondary treatment systems (when combined with PS-1 capacity). If the upstream and downstream systems' capacities are increased and service demand increases, the maximum capacity of the PS-2 solids handling system should be revisited. The improvements will increase the reliability of the plant for performance during dry and wet weather events.

### 6.3.3 Reliability

The PS-2 Project increases the efficiencies of screenings and grit removal at the GLWA WRRF. The project also improves system redundancy for grit removal and processing by introducing the proposed grit processing facility and upsizing grit classifiers.

Effective grit and screening removal can dramatically impact the performance and reliability of downstream unit processes and assures the value of investment in the equipment. The cost of ineffective grit and screenings removal is difficult to quantify but has been shown to manifest in excessive accumulation of grit in downstream channels and process tanks with several consequences: making gates difficult or impossible to operate; reducing conveyance capacities; excessive wear and shortened life of primary sludge pumps and solids processing equipment; clogging of the vertical turbine solids handling (VTSH) inlet strainers on RAS pumps; reduced quality of the biosolids product.

## 6.4 Analysis of Alternatives of the PS-2 Project

The alternatives considered in this Plan were evaluated on a technical and cost basis, where applicable. Alternatives for PS-2 were assessed for each major process element – Screening (Alternatives 1A through 1E), grit removal (Alternatives 2A through 2C) and then grit handling (Alternatives 3A through 3C). The following sections present the analysis for each grouping.

### 6.4.1 PS-2 Screening Alternatives

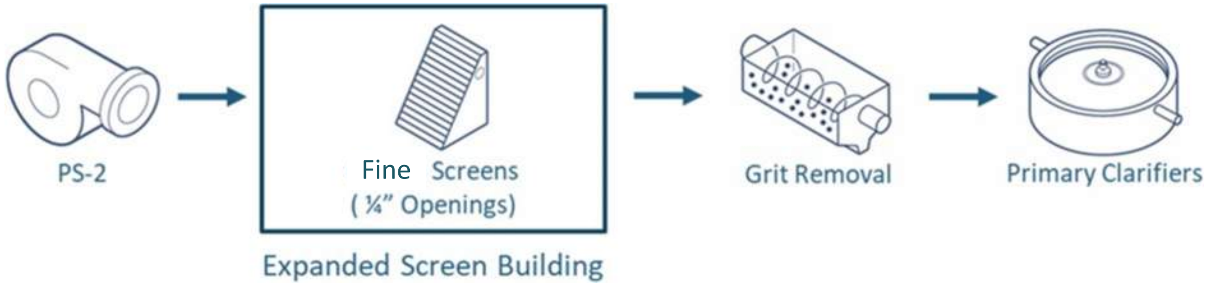
Five (5) screening alternatives were considered:

- Ten Fine Screens (1/4 inch) in Existing Channels with Two Additional Channels/ Screens
- New Coarse Screens (3/4 inch) in Existing Channels (1/4 inch) in the Grit Chambers Inlet
- New Coarse Screens (3/4 inch) in Discharge Channels and New Fine Screens (1/4 inch) in Existing Screen Channels
- New Coarse Screens (3/4 inch) in Existing Screen Channels and New Fine Screens (1/4 inch) in Grit Chamber Inlet
- New Coarse Screens (3/4 inch) in Existing Screen Channels and New Fine Screens (1/4 inch) in Grit Chamber Outlet

#### Alternative 1A – Ten Fine Screens (1/4 inch) in Existing Channels with Two Additional Channels/ Screens

Screening Alternative 1A consists of essentially replacing-the existing coarse screens (3/4 inch) with finer screens (1/4 inch) in the existing screen channels. Two additional screens will be added to address the upstream hydraulics, raising the total number of screens to ten (10). The screen slot velocity at peak flow (115 MGD each) is 5.5 feet per second which is within manufacturer's recommended range. The new screen channels would be constructed on the north end of the Screening Building in the current screenings dumpster area. These modifications would require the expansion of the Screening Building to house dumpsters. Figure 6-3 provides a process flow diagram for replacement of the existing screens in the Screening Building with a greater quantity of smaller opening screens. Due to the height of climber screens potentially conflicting with the existing bridge crane, multi-rake bar screens are the technology used in this evaluation.

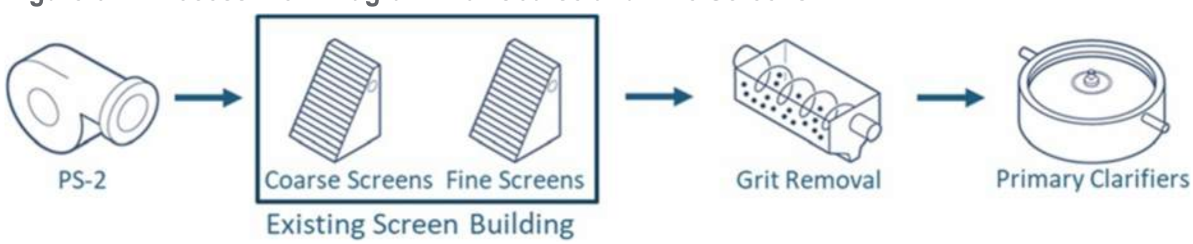
Figure 6-3: Process Flow Diagram with Fine Screens




### Alternative 1B – New Coarse Screens (3/4 inch) and Fine Screens (1/4 inch) in the Existing Screening Building

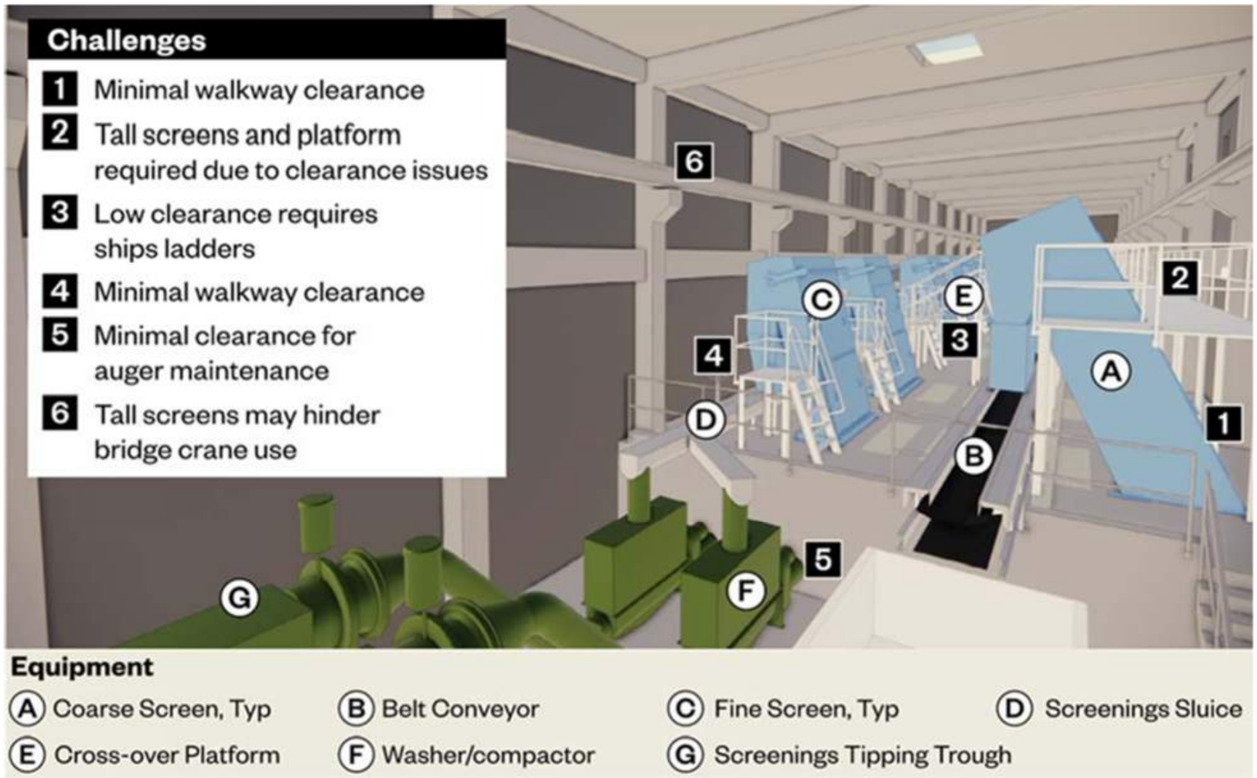
Screening Alternative 1B consists of placing two stages of screening, both coarse and fine, within the existing Screening Building. This alternative would minimize construction costs by working within the existing footprint and would also achieve the minimum 80% Screenings Capture Ratio (SCR) goal. However, there are significant challenges with maintaining sufficient clearance for personnel egress and to perform equipment maintenance. Figure 6-4 shown below provides a process flow diagram for replacement of the existing screens in the Screening Building with both coarse and fine screens.

Figure 6-4: Process Flow Diagram with Coarse and Fine Screens




Coarse and fine screening in the existing screen building was eliminated due to access and egress limitations, as shown in Figure 6-5. No cost estimate was prepared for this alternative.

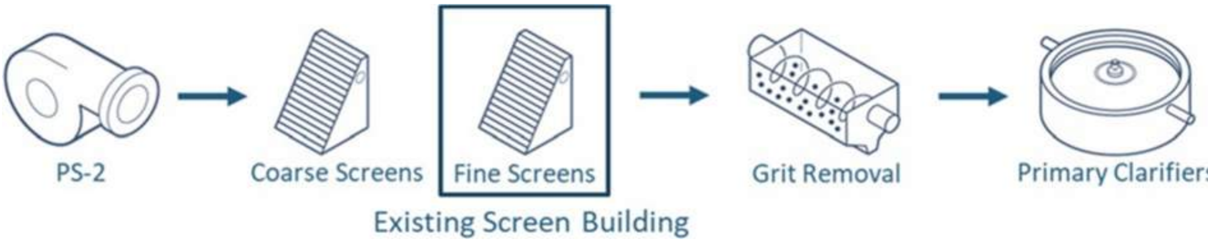
Figure 6-5: Coarse and Fine Screens Do Not Fit in the Screening Building




### Alternative 1C – New Coarse Screens (3/4 inch) in Discharge Channels and New Fine Screens (1/4 inch) in Existing Screen Channels

Screening Alternative 1C consists of placing coarse screens in the existing PS-2 split discharge channels and replacing the existing screens in the existing Screening Building with fine screens. This alternative would result in four (4) coarse screens upstream of eight (8) fine screens in the existing screen channels. The coarse screens would be enclosed in a new building to maintain operation year-round. Figure 6-6 shown below provides a process flow diagram for addition of coarse screens within the split discharge channels and replacement of the existing screens in the Screening Building with fine screens.

Figure 6-6: Process Flow Diagram with Coarse Screens in the Discharge Channels and Fine Screens in the Existing Screen Building



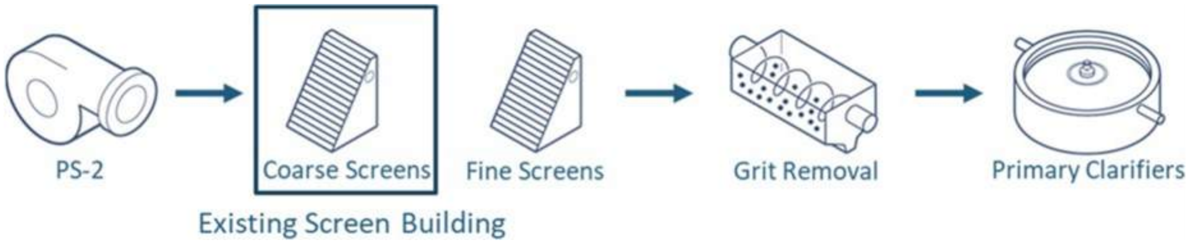
The model image provided in Figure 6-7 shows that it would be physically possible to locate coarse screens in the PS-2 discharge channels and fine screens in the existing screen channels. However, this alternative was ultimately eliminated due to the hydraulic capacity limitations associated with having only four coarse screens. No cost estimate was prepared for this alternative.

**Figure 6-7: Model View of Possible Screen Locations**

### Alternative 1D – New Coarse Screens (3/4 inch) in Existing Screen Channels and New Fine Screens (1/4 inch) in Grit Chamber Inlet

Screening Alternative 1D consists of replacing the coarse screens within the existing screen channels (Alternative 1A) and adding fine screens within the inlet of the existing grit chambers. In addition to the fine screens, a common channel would be constructed between the fine screens and grit chambers. These modifications impact the available space to retrofit an alternate grit technology and results in less volume available for alternatives involving maintaining aerated grit removal. Significant structural modifications would be necessary to install fine screens, including foundation improvements (e.g., micro-piles) and construction of a new building to enclose the fine screens. Figure 6-8 shown below provides a process flow diagram for replacement of the existing screens in the Screening Building and placement of fine screens at the inlet of the existing grit chambers.

**Figure 6-8: Process Flow Diagram with Coarse Screens in the Existing Screen Building and Fine Screens at the Grit Chamber Inlet**




### Alternative 1E – New Coarse Screens (3/4 inch) in Existing Screen Channels and New Fine Screens (1/4 inch) in Grit Chamber Outlet

Screening Alternative 1E is like Alternative 1D in that coarse screens would be replaced within the existing screen channels (Alternative 1A), but the fine screens would be added at the downstream end of the existing grit chambers. A common channel would be constructed between the fine screens and grit chambers resulting in less volume available for aerated grit and lower grit removal efficiencies. Significant structural modifications would be necessary to install fine screens; these would include foundation improvements (e.g., micro-piles) and construction of a new building to enclose the fine screens. Figure 6-9 shown below provides a process flow diagram for replacement of the existing screens in the Screening Building and placement of fine screens at the downstream end of the existing grit chambers.

**Figure 6-9: Process Flow Diagram with Coarse Screens in the Existing Screen Building and Fine Screens after Grit Removal**


## 6.4.2 PS-2 Grit Removal Alternatives

Three (3) types of grit removal alternatives were considered:

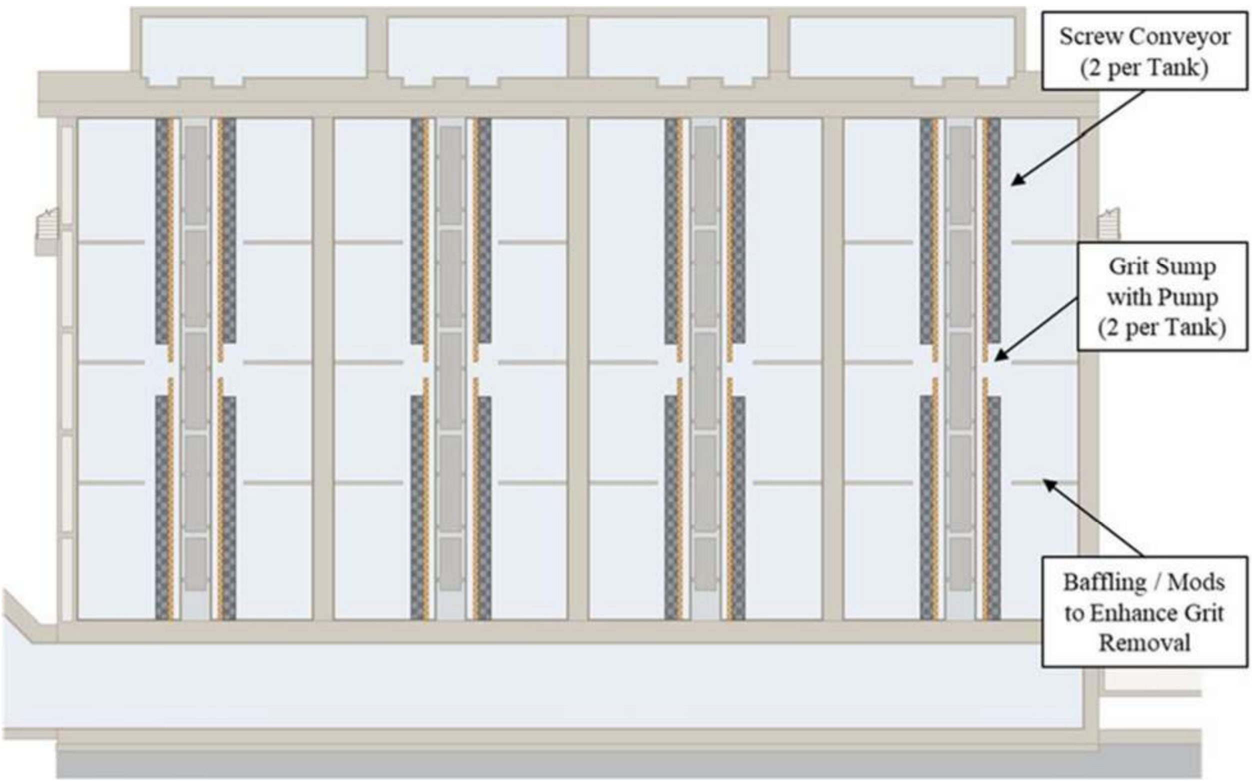
- Rehabilitate aerated grit chambers
- Retrofit grit chambers with stacked tray grit removal technology
- Retrofit grit chambers with stirred vortex grit removal technology

### Alternative 2A – Rehabilitate Aerated Grit Chambers

Grit Removal Alternative 2A consists of rehabilitating the existing aerated grit chambers and replacing the existing clamshell bucket system with a new grit removal method. The grit removal technologies under consideration were screw conveyors, chain and flight collectors, and submersible grit pumps.

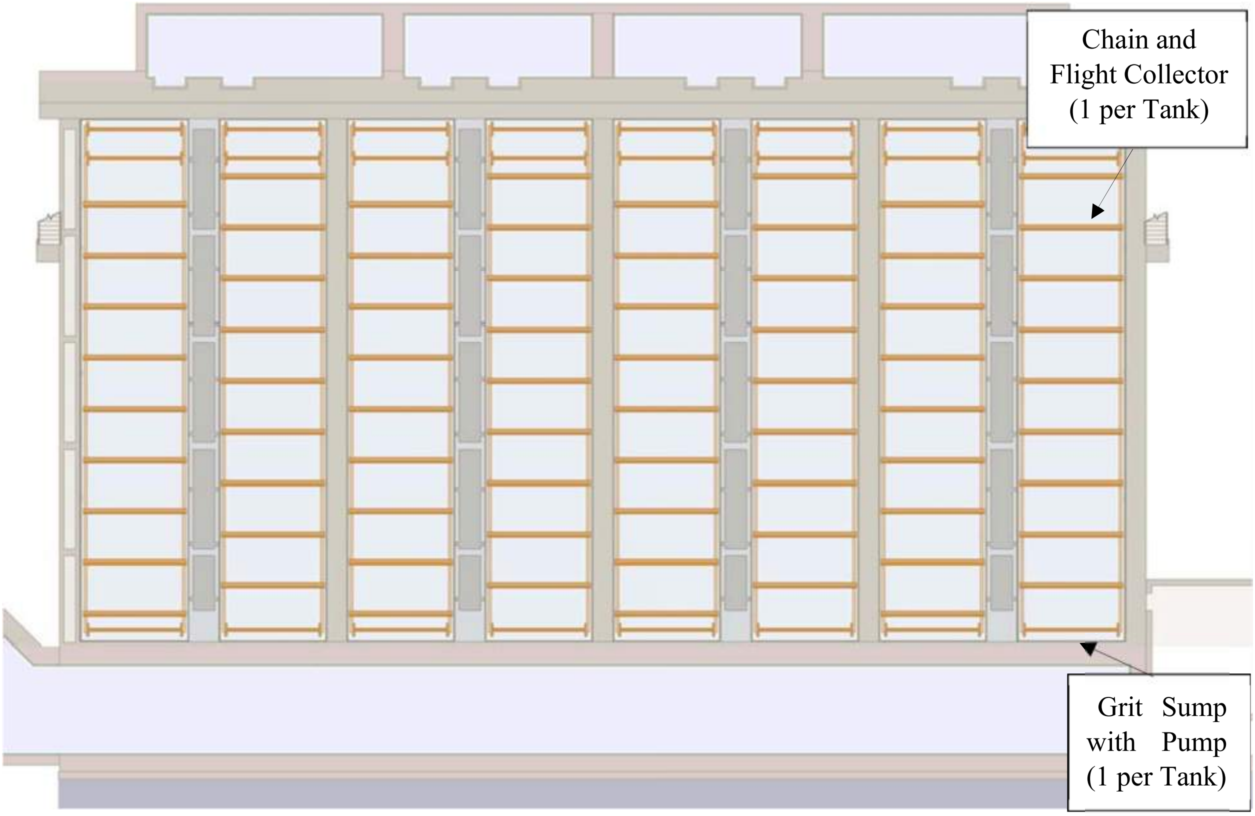
Screw conveyors would transfer the settled grit to a central sump where submersible pumps would remove grit from the rehabilitated aerated grit chambers and discharge to the grit processing facility. Each chamber would be retrofitted with two (2) conveyors that move grit toward a centralized sump with two (2) grit pumps (one (1) duty, one (1) stand-by). A layout for this alternative is shown in Figure 6-10.

**Figure 6-10: Layout of the Rehabilitation of the Aerated Grit Chambers with Screw Conveyors**




For chain and flight connectors each chamber would be retrofitted with one (1) chain and flight collector that moves grit toward a sump at the end of the chamber. Submersible pumps within the sump would remove grit from the rehabilitated aerated grit chambers and discharge to the grit processing facility. A layout for this alternative is shown in Figure 6-11.

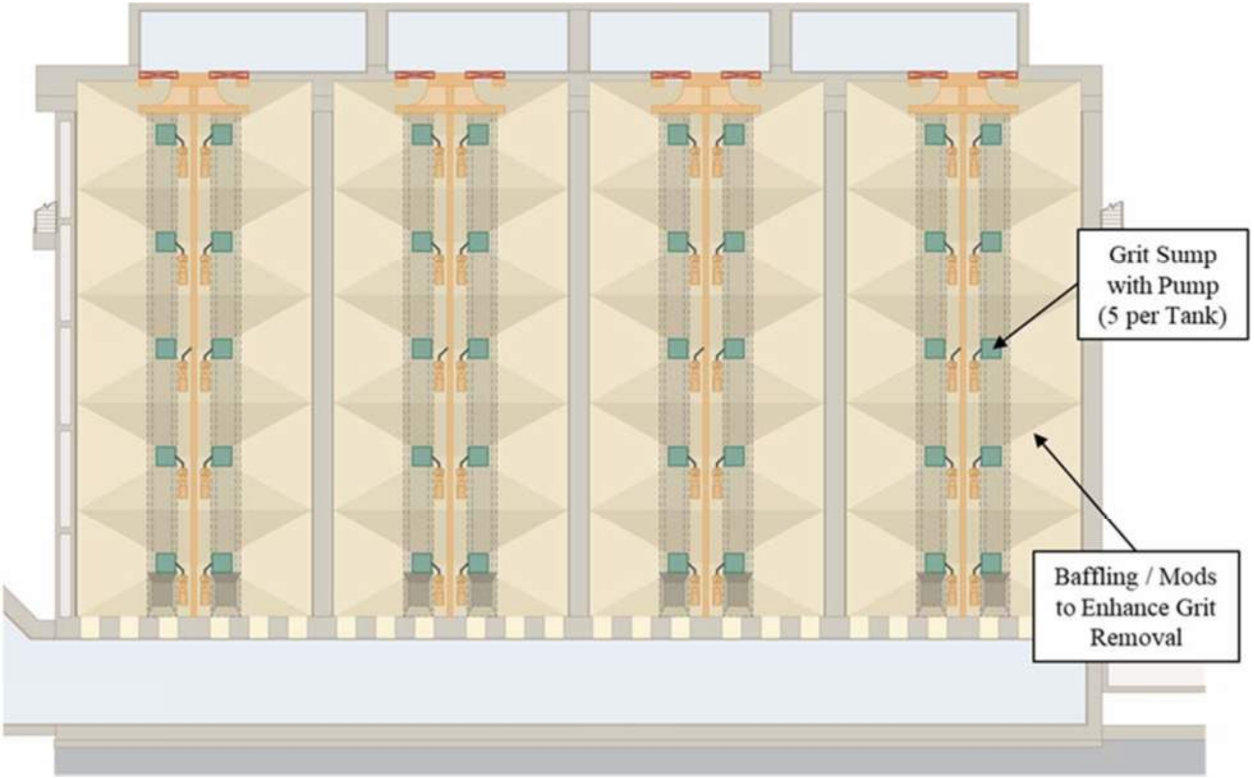
**Figure 6-11: Layout of the Rehabilitation of the Aerated Grit Chambers with Chain and Flight Connectors**




Rehabilitation of existing grit chambers with chain and flight mechanisms was eliminated due to O&M concerns with this technology. No cost estimate was developed for this alternative.

For submersible grit pumps each chamber would be retrofitted to have sloped bottoms funneling grit into five (5) sumps evenly spaced along the length of the chamber. The sumps would each contain a submersible grit pump that operates in an alternating sequence. A layout for this alternative is shown in **Figure 6-12.**

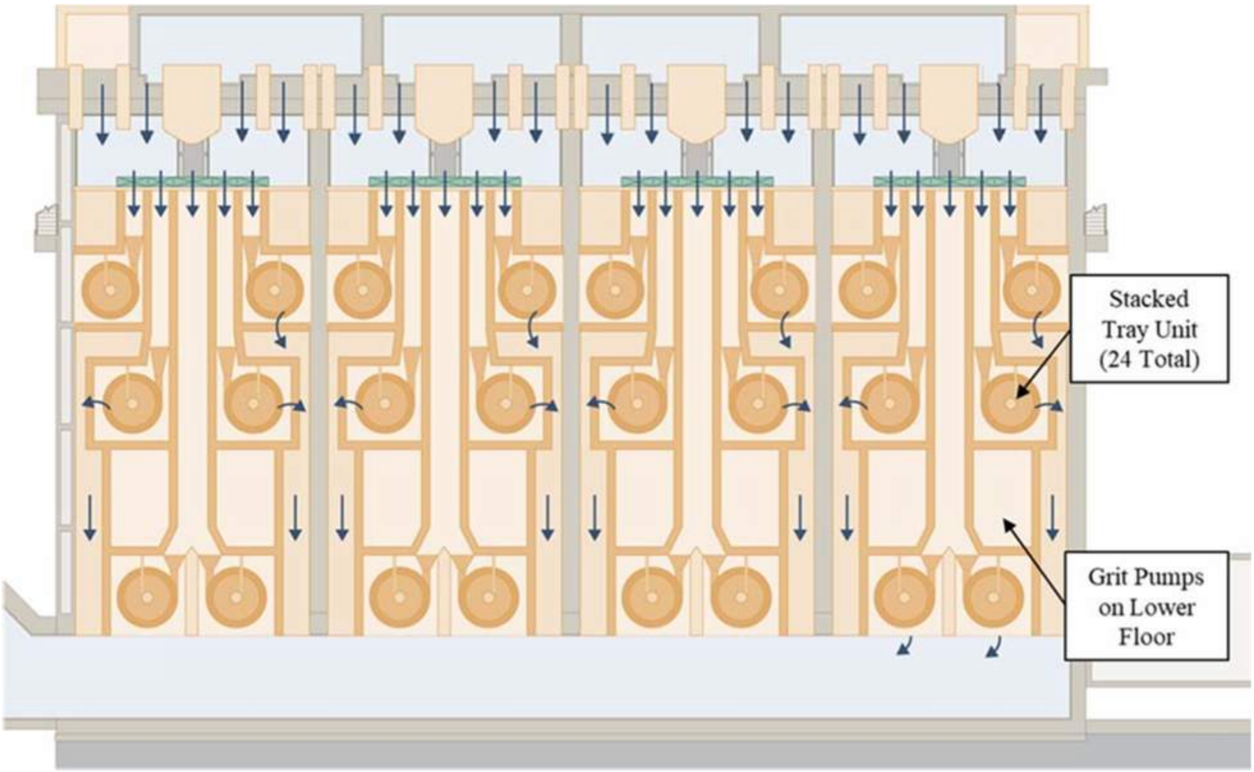
**Figure 6-12: Layout of the Rehabilitation of the Aerated Grit Chambers with Submersible Pumps**




### Alternative 2B – Retrofit Grit Chambers with Stacked Tray Grit Removal Technology

Grit Removal Alternative 2B consists of retrofitting the existing aerated grit chambers with stacked tray grit removal units. A common influent channel would be constructed to ensure even distribution of flow to each unit. Structural modifications to the chambers would be needed to form the required inlet and outlet channels for stacked trays, as well as provide access to the grit pumps below (one (1) per unit). It is estimated that each existing grit chamber could accommodate three (3) stacked tray units, for a total of 24 at a peak flow of 38.3 MGD per unit. A layout for this alternative is shown in Figure 6-13.

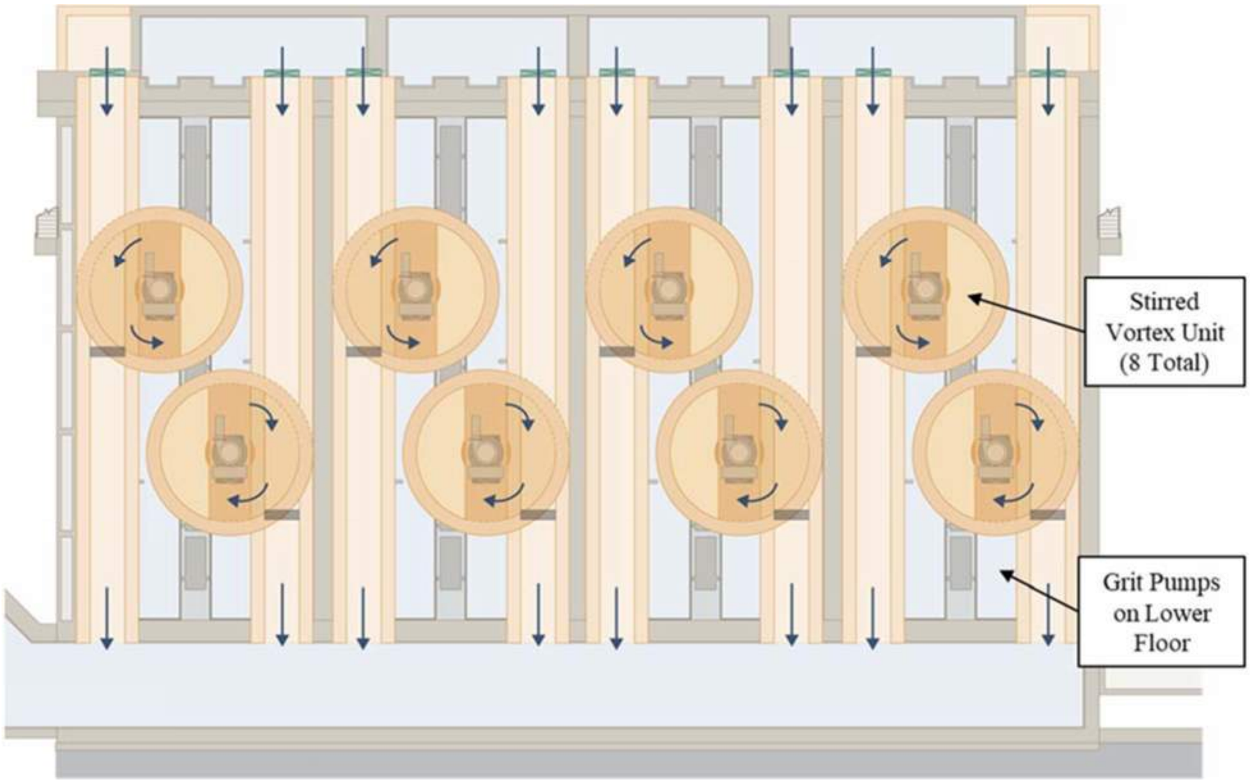
**Figure 6-13: Layout of the Retrofit of the Grit Chambers with Stacked Tray Grit Removal Technology**




### Alternative 2C – Retrofit Grit Chambers with Stirred Vortex Grit Removal Technology

Grit Removal Alternative 2C consists of retrofitting the existing aerated grit chambers with stirred vortex grit removal units. Structural modifications to the chambers would be needed to form the required inlet and outlet channels for stirred vortex, as well as provide access to the grit pumps below (one (1) duty and one (1) stand-by per unit). Each pair of chambers could accommodate two (2) stirred vortex units, for a total of eight (8) at a peak flow of 115 MGD per unit. A layout for this alternative is shown in Figure 6-14.

**Figure 6-14: Retrofit Grit Chambers with Stirred Vortex Grit Removal Technology**




### 6.4.3 PS-2 Grit Processing Alternatives

**Grit Processing Facility (GPF) Description**

Based on the selected alternative for grit removal, three (3) types of new grit processing equipment were considered:

- Grit cyclone and classifier
- Vortex grit washer and grit dewatering
- Fluidized bed grit washer and grit dewatering

Based on the lower construction cost, lower operation and maintenance cost, and other non-cost criteria scoring, GLWA selected use of cyclone-classifiers for grit processing. Other technical factors impacting the recommendation include the maximum slurry concentration, continuous versus batch operation, and hydraulic limitations of each technology.

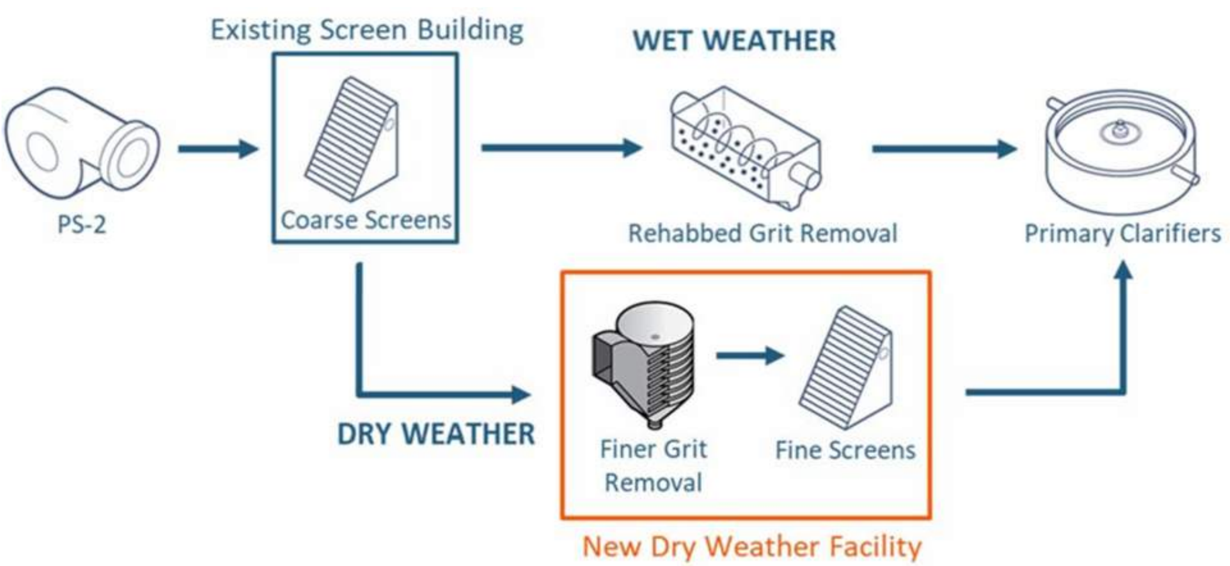
The grit processing facility alternatives are directly related to the alternatives for grit removal as seen in Table 6-1. The grit removal alternatives have various grit slurry pumping arrangements, which must be received and treated by the grit processing facility. For this reason, the grit processing alternatives are based on the number of grit slurry pumps in each grit removal alternative and the costs have been combined in Appendix H.

| Table 6-1: Grit Processing Facilities | | |
|---|---|---|
| Grit Removal Alternative | Qty of Grit Processing Units | Approximate Footprint |
| Rehab Existing Grit Chambers (Screw Conveyors) | 8 (one per grit slurry pump) | 101' x 51' |
| Rehab Existing Grit Chambers (Submersible Grit Pumps) | 16 (two per grit chamber) | 102' x 86' |
| Stacked Tray | 12 (one for each pair of stacked tray units) | 127' x 57' |
| Stirred Vortex | 8 (one per stirred vortex unit) | 101' x 51' |
| Dry Weather Facility | 16 (one for each pair of DWF stacked tray units, one per wet weather grit slurry pump) | 102' x 86' |

### 6.4.4 Separate Dry Weather Facility Alternative

A dry weather facility (DWF) alternative combined Screen Alternative 1E and Grit Alternative 2A into a separate facility intended to achieve a higher level of performance during typical flows while maintaining the capacity to treat peak flows during wet weather events. The coarse screens in the Screening Building would be replaced and the aerated grit chambers would be rehabilitated. Enhanced grit removal equipment and fine screens would be installed within the DWF. Figure 6-15 provides a process flow diagram for the new DWF.

Figure 6-15: Process Flow Diagram with a New Dry Weather Facility

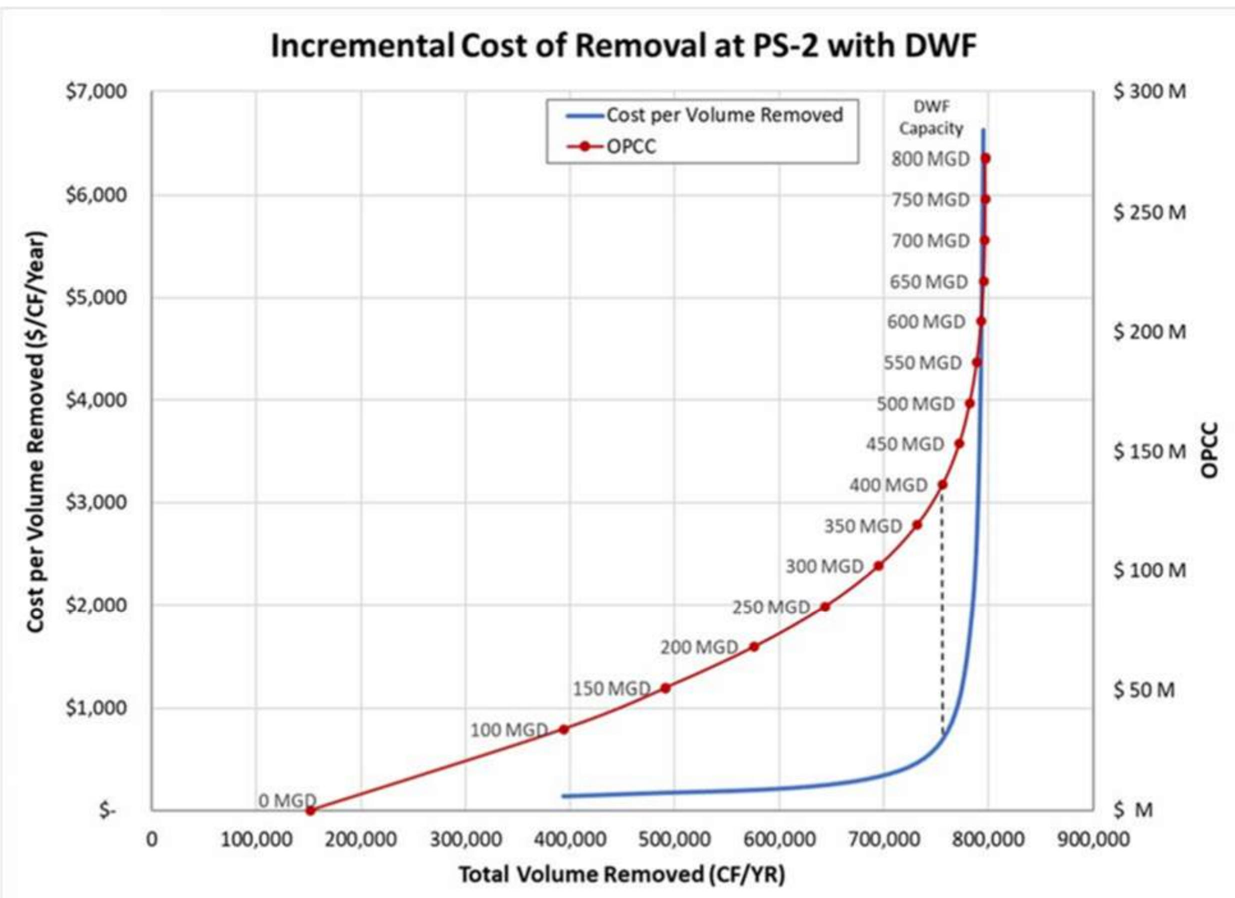


### DWF Sizing Approach

The DWF would not be sized to handle the full capacity of PS-2, but rather an amount corresponding to typical dry weather flows with enough additional capacity to limit the number of times when the wet weather train would need to be brought into service. Wet weather flows that exceed the DWF capacity would undergo coarse screening before being diverted to the existing, rehabilitated aerated grit tanks. Determination of the dry weather capacity for the new facility was based on a detailed review of historical flow data and influent loads.

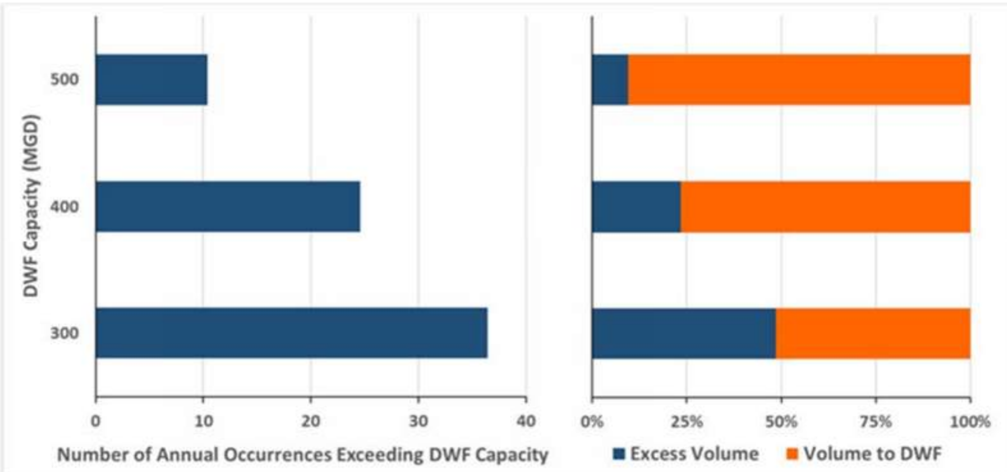
Screenings and grit removal were modeled at PS-2 with DWF capacities ranging from 100 to 800 MGD. For each scenario, screenings and grit removal were calculated incrementally at different influent flow rates to capture how flow would be distributed between the DWF and existing assets. These values were then multiplied by the frequency of each influent flow condition to provide the estimated total removal. Figure 6-16 uses this estimated total removal as the basis for comparing the opinion of probable construction cost and incremental cost per volume of removal.

**Figure 6-16: Incremental Cost of Removal at PS-2 with DWF**



The dashed line indicates the point where incremental cost begins to increase exponentially. This corresponds to a 400 MGD capacity DWF as the largest recommended size. This capacity threshold was additionally supported by the wet weather event evaluation shown in Figure 6-17.

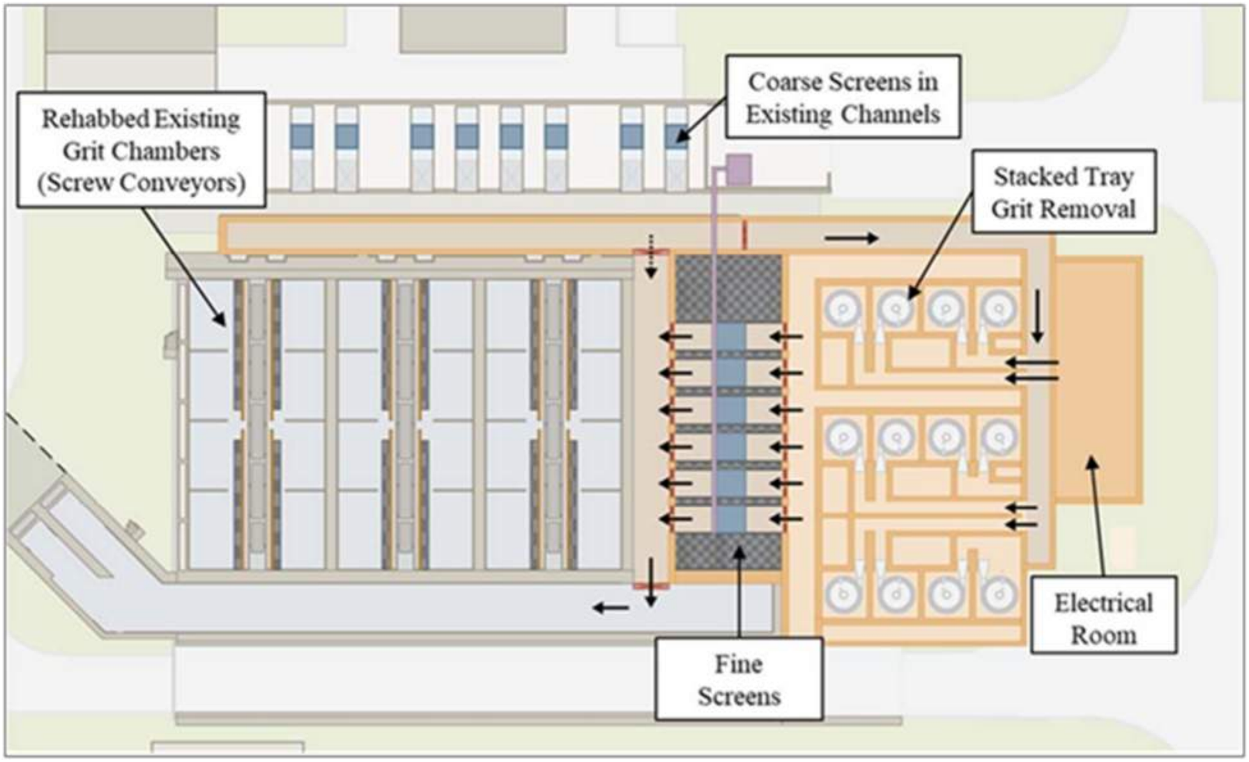
**Figure 6-17: Wet Weather Event Evaluation of the DWF**




The DWF capacity exceedance frequency (left) is the average number of times in a year that flow would need to be diverted to the wet weather facility (existing aerated grit). As DWF capacity increases, the proportion of total influent volume (right) that cannot be processed by the DWF facility (excess flow) decreases, reducing the need for additional wet weather equipment. The optimal DWF capacity should minimize the exceedance occurrences while still diverting enough excess flow to make maintenance of the wet weather facility worthwhile.

These operational considerations support the cost analysis in selecting 400 MGD as the DWF capacity used for further evaluation. A layout for this alternative is shown in Figure 6-18.

**Figure 6-18: Layout of the Proposed Dry Weather Facility**




Effluent from the coarse screens in the existing Screenings Building would be diverted to the DWF, where it would flow through 12 stacked tray units and six (6) fine screens before rejoining the existing grit chamber effluent channel. In wet weather scenarios, when the total influent flow to PS-2 exceeds the DWF capacity, the excess flow would be processed by the existing aerated grit chambers. The layout also allows for bypass around the DWF, through the fine screens effluent channel.

The DWF had the highest capital cost and high O&M costs. When also considering the large footprint required by the DWF, this alternative as eliminated from further consideration.

### 6.4.5 Monetary Evaluation and Alternative Evaluation

Cost and non-cost factors were included in the selection of the alternative that best satisfied the needs of the project. The monetary evaluation comparing the present worth of the alternatives and the business case evaluation was included in Appendix D and Appendix E of the “PS-2 Alterative Evaluation” (2021). These appendices are included in Appendix H along with present worth and user impact calculation for the selected alternative based upon the 30% Design OPCC. Note that the 2021 values have not been adjusted for inflation.

Many of the project needs were satisfied with improvements that did not require alternative evaluation. For example, updates to the structure, architectural components, electrical components, HVAC, plumbing, and I&C, etc. will improve operations, reduce maintenance effort, and extend the useful life of PS-2 solids handling system.

## 6.5 Selected Alternative for the PS-2 Project

### 6.5.1 Project Description

GLWA determined that the best combination of alternatives to meet the project needs was, Screening Alternative 1A - Ten Fine Screens (1/4 inch) in Existing Channels with Two Additional Channels/Screens, Grit Removal Alternative 2C – Retrofit Grit Chambers with Stirred Vortex Grit Removal Technology, and a grit processing facility utilizing redundant cyclones for each grit classifier.

Various screen types and opening sizes were considered to replace the existing equipment. Due to space constraints in the Screen Building, a single stage of multi-rake bar screens was selected as the optimal arrangement. The opening size of the new screens will be 1/4 inch to increase the overall screenings capture. At this lower opening size, two additional screens are required to accommodate upstream hydraulics, raising the total number of screens to ten (10). The design criteria for screens are listed in Table 6-2.

**Table 6-2: Screens Design Criteria**

| Parameter | Value |
|---|---|
| Technology | Multi-Rake Bar Screen |
| PS-2 Flow Capacity | 920 MGD (peak), 828 MGD (firm) |
| No. of Units Required | 10 screens |
| Peak Flow per Unit | 92 mgd |
| Freeboard in Channels & Tanks | 18” minimum at peak flow |
| Freeboard Upstream of PS-2 Surge Weirs | 3” minimum at peak flow |
| Screen Channel Dimensions | 8 ft W x 13 ft D |
| Downstream Water Level | 10.5 ft |
| Downstream Level Control Technique | Slide Gate Throttling |
| Bar Opening Size | 1/4" |
| Screenings Capture Ratio (SCR) | 35% (estimated) |
| Solids Removal Requirement (Total) | 120 cf/hr |

Chain and sprocket screens are recommended for this application due to the positive engagement of rake teeth at all times, which allows for more reliable screenings capture. This may require in-channel maintenance during the life of the screens, but the sealed bearing assemblies are warranted for 5-10 years. Chain and sprocket screens can also be competitively bid from multiple manufacturers that have experience in a significant number of installations at facilities with peak flow rates greater than 60 MGD per screen.

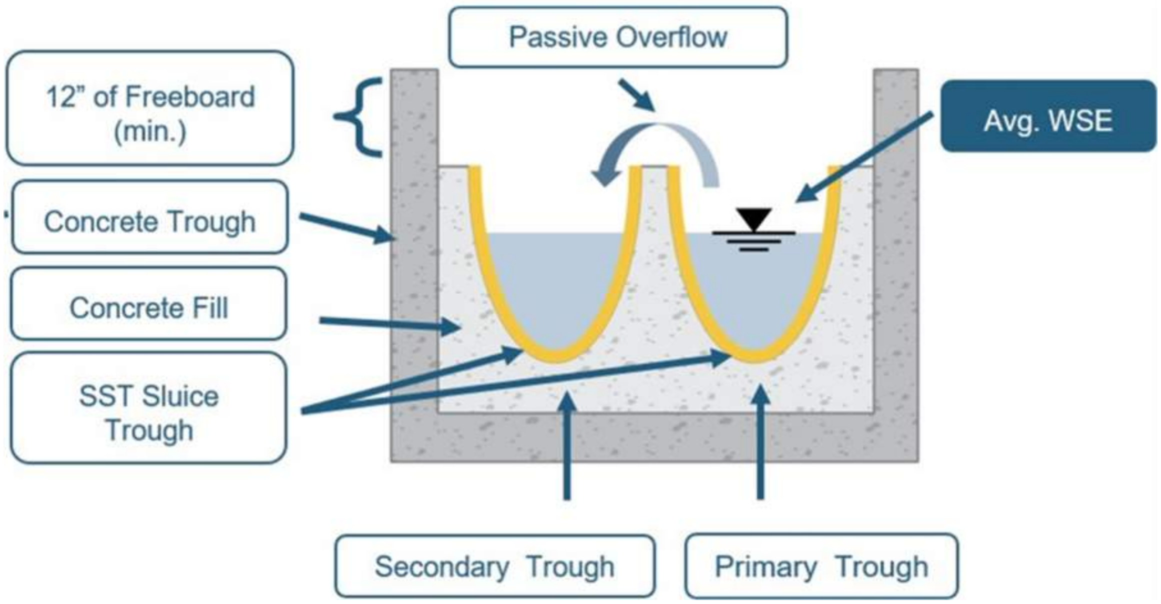
Screenings handling will consist of a dual-channel sluice trough for conveyance of screened material to two (2) horizontal rotary drum screens coupled with washer/compactors for processing prior to discharging to dumpsters for landfill disposal. A backup chain and multi-rake screen will also provide emergency screenings of sluiced material in the event of a failure of the rotary drum screens. The design criteria for screenings handling equipment are listed in Table 6-3. Heated wash water from the adjacent Chemical Facility will be made available at several pressure sprayers located along the west wall of the Screen Building to assist with cleaning the bar screens and sluices, when necessary.

**Table 6-3: Screenings Handling System Design Criteria**

| Parameter | Value |
|---|---|
| Average Screenings Removal | 7,400 tons/year |
| Peak Screenings Removal Rate | 300 cubic feet/hour (instantaneous)[1] |
| Maximum Hauling Frequency | 1 dumpster per 12 hours |
| Conveyance Technology | Dual Channel Sluice Trough |
| Solids Capacity | 300 cubic feet/hour |
| Hydraulic Capacity | 1000 gpm |
| Screen Technology | Horizontal Rotary Drum Screen |
| Unit Solids Capacity | 300 cubic feet/hour |
| Unit Hydraulic Capacity | 1000 gpm |
| Washer/Compactor Volume Reduction | 60% |
| No. of Units Required (Screen + W/C) | 1 duty, 1 standby |

Screenings are discharged from the top of the screens into the nearest channel of the dual-channel sluice trough. The sluice trough uses SFE water to convey screenings down its sloped length to the screenings handling area. SFE is injected at the head of the sluice and supplemental entry points at each screen. The sluice design, shown in Figure 6-19, has a passive overflow that provides redundancy in case of a blockage in the primary trough. At the end of the sluice, flow is distributed into two horizontal rotary drum screens, shown in Figure 6-20.

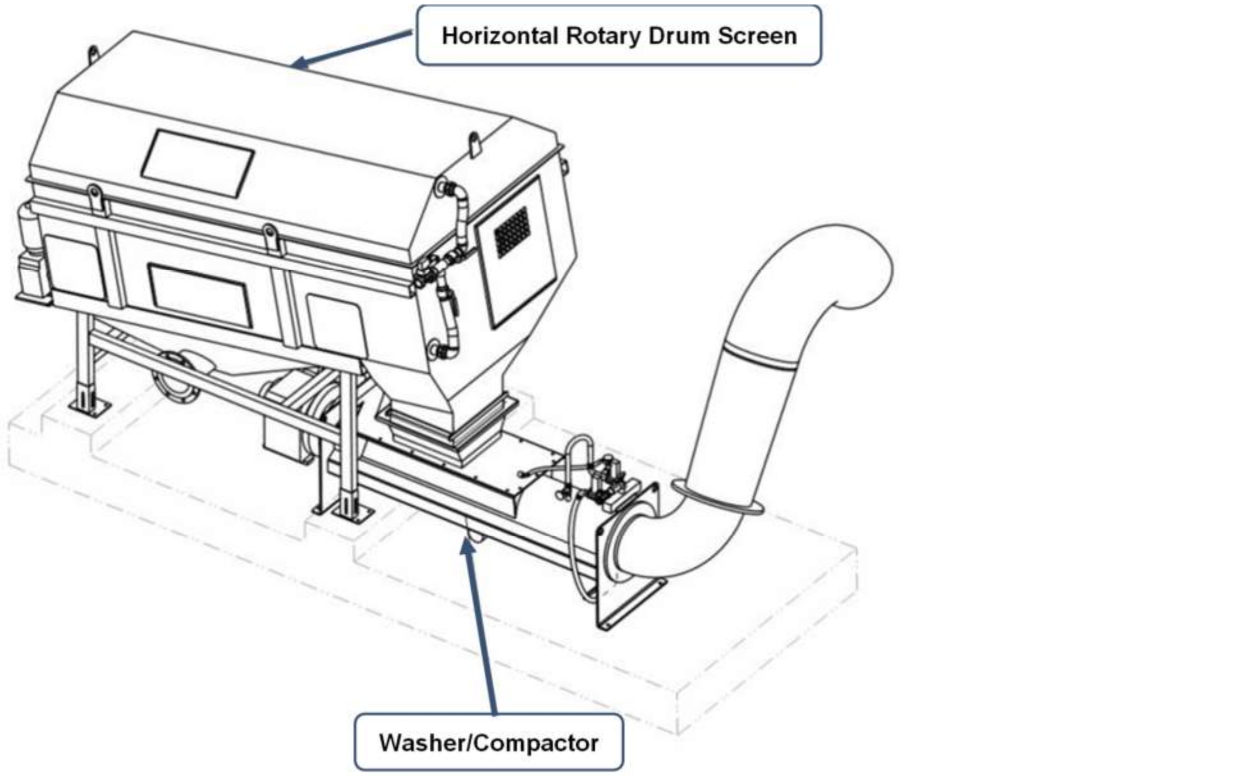
**Figure 6-19: Dual channel Sluice Trough Detail (Cross Section View)**




Horizontal rotary drum screens can handle the large quantities of wash water and the higher quantities of solids that will be conveyed from the sluice trough. After being separated from the sluice water by the drum screens, screenings are then discarded to the dumpsters via attached washer/compactors. Compaction was deemed necessary to reduce the frequency of dumpster changeout and costs associated with hauling water that remains in the screenings.

Dumpster-veyors were considered for assistance with solids distribution. However, other methods of solids distribution techniques with flush-mounted rails can allow more freedom of movement within the screenings handling area and potentially save cost. Additional concerns related to the Dumpster-veyor involve the rails that would extend outside the Screen Building and the challenges of snow and ice management during the winter months. Therefore, Dumpster-veyors are not included in the design and winches will be used instead. During detailed design dumpster distribution and management techniques will be further evaluated including the use of “tipping troughs”, articulating compactor chutes, and winches for auto moving of the dumpster boxes.

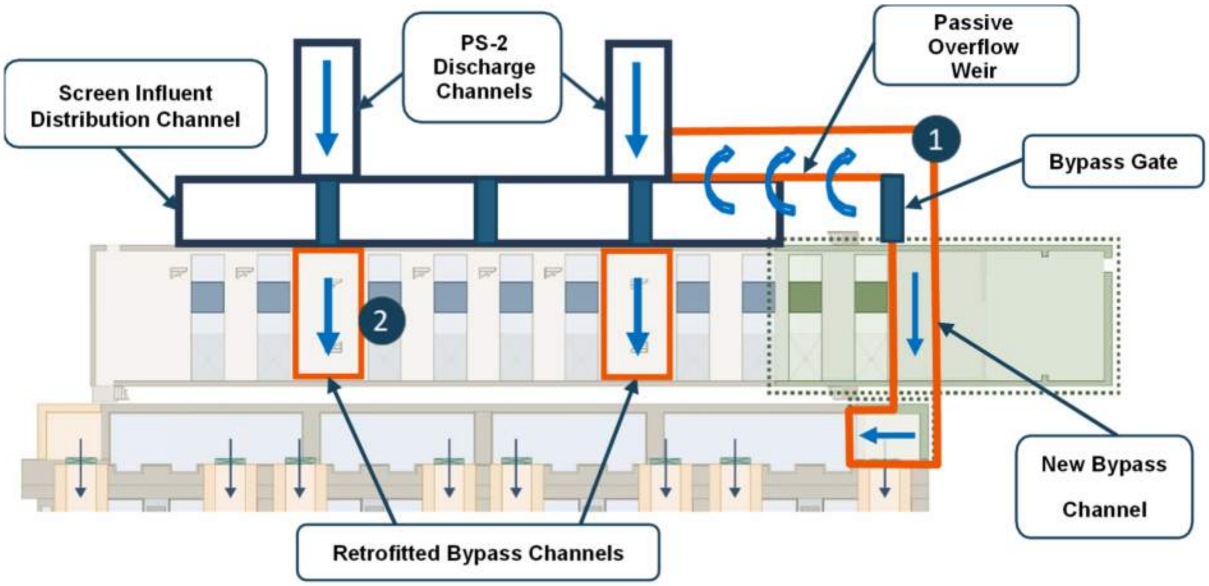
Figure 6-20: Horizontal Rotary Drum Screen (Courtesy of Huber)




A heated pressure washing system will be provided for washing down the fats, oil, and grease from the bar screens. The unit will be in the Chemical facility and the heated water will be piped into the Screen Building and there will be multiple spray hose locations for ease of use.

Two options were considered to provide hydraulic bypass around the screens and additional reliability to avoid overflows during extreme wet weather blinding events or catastrophic failure of a portion of the screens. Option 1, a new dedicated bypass channel on the north end of the building, was ruled out due to space limitations and existing utility conflicts. Option 2, involving use of existing void spaces between the screen channels was determined to be most feasible. These options are shown schematically in Figure 6-21.

Figure 6-21: Bypass Channel Configuration



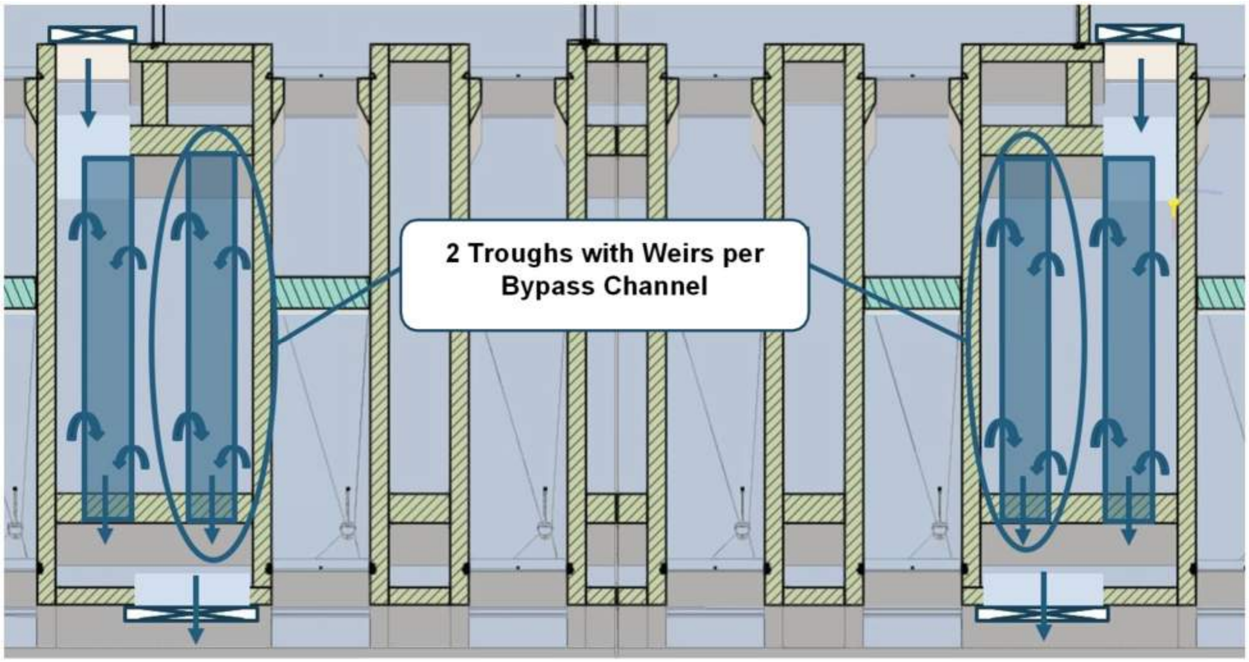

In addition to the screen bypass channels, other pathways will be available to convey flow during extreme events. The surge weir at PS-2 recycles to the wet well, providing additional response time. Flow can also continue to pass through partially blinded screens. Since these other pathways are available, the screen bypass channels will not need to convey the full design capacity of PS-2. The design criteria presented in Table 6-4 are based on hydraulic modeling and discussions with GLWA operations and maintenance staff.

Table 6-4: Screen Bypass channel Design Criteria

| Parameter | Value |
|---|---|
| Quantity Required | 2 bypass channels |
| Total Flow Capacity | 500 MGD total in both channels* |
| Upstream Isolation | Electrically actuated slide gates |
| Downstream Isolation | Electrically actuated slide gates |
| Hydraulic Control | Passive bypass: weirs and troughs |
| Weir Elevation | 107.75 |
| Depth of Flow Over Weir | 1.1 ft (at 500 MGD) |
| Bypass Channel Depth | 13 ft |

The bypass channels will be retrofitted with bypass troughs and weirs similar to those shown in Figure 6-22. Sufficient weir length and trough capacity is provided to convey 500 MGD without overflows in upstream channels.

**Figure 6-22: Passive Bypass Channels with Troughs and Weirs**



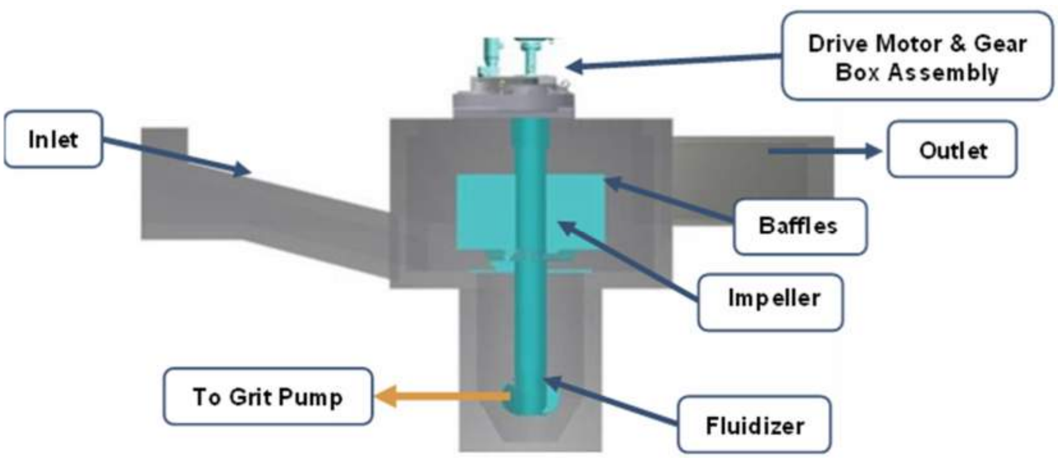

The operational intent of this configuration is that GLWA could open the upstream and downstream isolating slide gates prior to a wet weather event as part of protocol. If the bypass channels are needed, the flows will automatically overflow the weirs and be conveyed downstream via the troughs. After the event is over, the gates will be closed, and the channels will be drained. Some washdown and manual cleaning may also be necessary if debris has collected in the channel. Drainage of these channels, either following a wet weather event or to handle nuisance water behind the isolation gates, is anticipated to be accomplished using dewatering pumps. For gate operation and channel isolation, several other alternatives were considered and discussed later in this section.

Three grit removal technologies were evaluated in detail during the alternative analysis: aerated grit, stacked tray, and stirred vortex. Aerated grit removal was eliminated from consideration due to lower grit removal performance than the other technologies. Stacked tray grit removal was eliminated because it required 24 units compared to 8 units for comparable performance compared to the stirred vortex alternative. Additionally, operation of the stirred vortex technology will be more similar to the existing grit removal process than the stacked tray alternative, since there will be the same number of units with comparable capacity. In summary, the stirred vortex alternative was determined to have an optimal combination of simpler O&M with improved grit removal performance. Table 6-5 below summarizes the design criteria for grit collection.

| Table 6-5: Grit Collector Design Criteria | |
|---|---|
| Parameter | Value |
| Technology | Stirred Vortex |
| No. of Units | 8 units |
| Peak Flow per unit | 115 MGD |
| Headloss @ Peak Flow | 4 inches |
| Grit Removal Design Cut Point | 95% removal of particles greater than or equal to 105 micron |
| Impeller Drive Mechanism Power | 2 HP |
| Material of Construction | Concrete / 316 Stainless Steel |
| Grit Slurry Removal Technique | Flooded suction grit pump |

Along with the key components highlighted in Figure 6-23 below, each grit collector will have downstream control of the water surface elevation using a weir. A new effluent weir elevation of 104.0 feet maintains the correct velocities through the grit collectors to maximize grit removal performance while not negatively impacting the upstream hydraulics. Sampling ports will be provided on both the influent and effluent end of each grit collector for grit sampling and characterization in the future.

Figure 6-23: Mechanically Stirred Vortex Grit Tank (Courtesy of Smith & Loveless)




The grit collection pump gallery located below the grit collectors will house the grit pumps necessary for pumping the grit slurry to the Grit Processing Facility. The design criteria for the grit pumps are provided in Table 6-6. Access to these grit pumps will be provided via staircases, one per pair of grit collectors.

| Table 6-6: Grit Pump Design Criteria | |
|---|---|
| Parameter | Value |
| Technology | Recessed Impeller |
| No. of Pumps Required | 16 units<br>(duty + standby for each grit collector) |
| Tip Speed | Below 5,300 fpm (typically below 4,000 fpm) |
| Percent Solids | 0.5 to 1.5% |
| Impeller and Casing Materials of Construction | Ni-hard (ASTM A532 Class 1) is a nickel/chromium (Ni-Cr) cast iron |
| Brinell Hardness Number (BHN) | 650 to 700 |
| Pump Duty Point | 550 GPM @ 89 ft TDH |
| Power Rating | 40 HP |
| Motor Rating | 460 Volt, 3-Phase, 60 HZ, TEFC |

The horizontal recessed impeller type, shown below in Figure 6-24, is the recommended grit pump due to its reliability in grit slurry applications and robustness to withstand the abrasive nature of grit. While a dry pit submersible pump was considered, the limited number of installs in this application ultimately led to the recessed impeller pump being selected.

Figure 6-24: Recessed Impeller Pump (Courtesy of Fairbanks Nijhuis)


Since the abrasive nature of grit becomes concentrated in the slurry pumped to the grit processing units, the durability of the piping and valves selected is critical. Table 6-7 summarizes design criteria to ensure a reliable piping system to the Grit Processing Facility.

**Table 6-7: Grit Slurry Piping System Design Criteria**

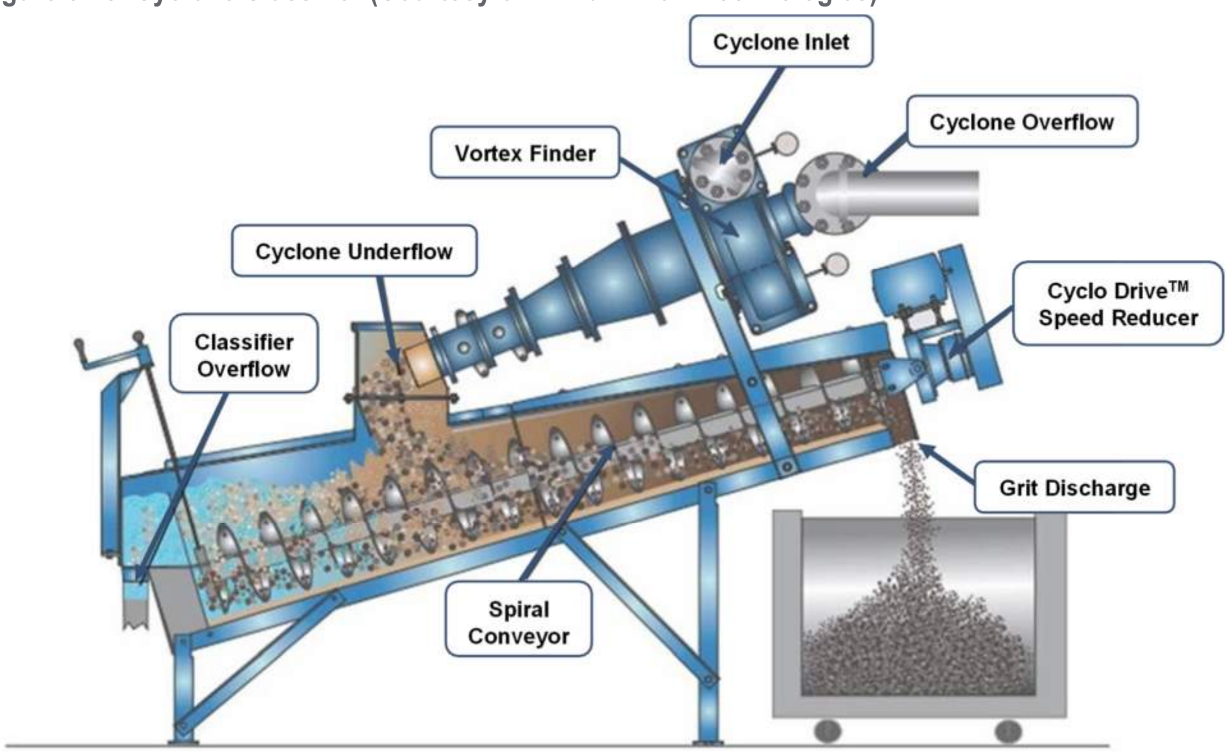
| Parameter | Value | |
|---|---|---|
| Pipe Size | 6-inch |  |
| Flow Velocity | 5 to 7 fps | |
| Pipe Materials of Construction | Glass-line ductile iron pipe with flanged joints | |
| Pipe Fittings | 45-degree Elbows (max)<br>Lateral Fittings |   |
| Flushing Connections | Incorporate into horizontal grit pump suction lines and along pipeline in areas prone to clogging | Flushing Connection |
| Valves | Full Port Eccentric Plug Valves |  |

The grit collectors will produce a grit slurry which consists of untreated wastewater with a grit concentration of 0.5% to 1.5% grit. The grit processing equipment will separate the grit from the wastewater and deposit the grit in trailers or dumpsters for transport to the landfill, while returning the wastewater to the treatment process. The design criteria for the grit processing equipment are shown in **Table 6-8.**

| Table 6-8: Grit Processing Equipment Design Criteria | |
|---|---|
| Parameter | Design Criteria |
| Max Flow Rate Per Unit | 550 gpm |
| Cyclone Inlet pressure drop | 7.5 psi |
| Cyclone Underflow rate | 55 gpm |
| Grit Slurry Concentration | 0.5% to 1.5% |
| Capture Rate | 95% of >105 micron |
| Grit Handling Capacity | 50 CF/HR |

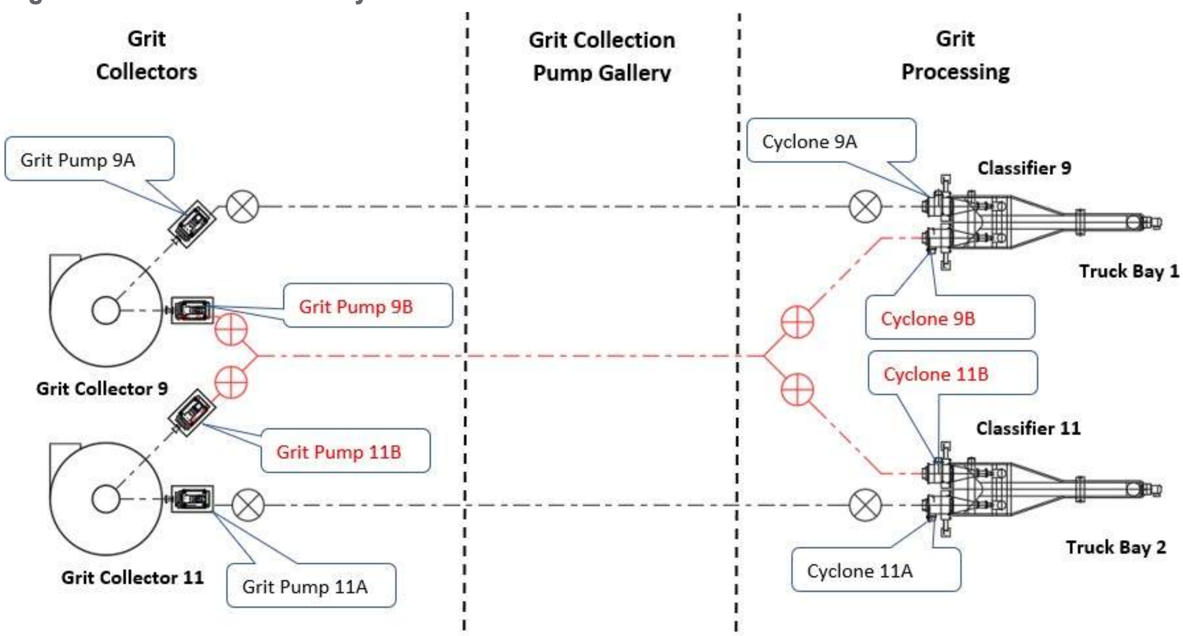
The recommended equipment operates by creating a vortex in the cyclone which separates the heavier grit particles from the lighter organics and wastewater. The cyclone concentrates the grit slurry by approximately 90%. Excess wastewater is returned to the treatment process and the concentrated slurry drops into the classifier hopper. The hopper provides an area for the grit to settle, while allowing lighter organics to overflow to the equipment drain. Wastewater containing organics is returned to the treatment process, while a slowly rotating screw conveyor lifts the grit out of the water, allowing it to drain and then drop into a dumpster or dump trailer to be hauled to the landfill. Figure 6-25 shows a typical cyclone-classifier configuration.

Figure 6-25: Cyclone Classifier (Courtesy of Trillium Flow Technologies)



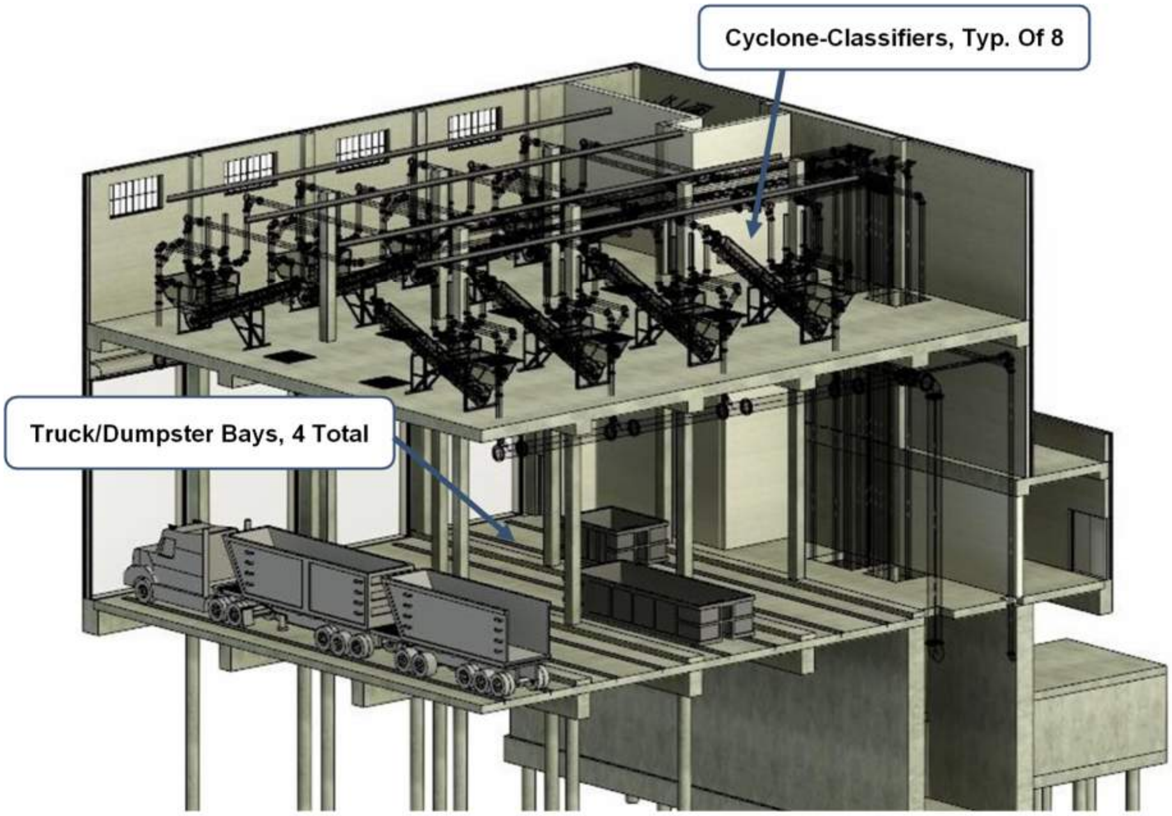
The Grit Processing Facility (GPF) will contain eight (8) sets of cyclone-classifier units. Each unit will consist of two (2) cyclones with one (1) classifier. Utilizing two (2) cyclones per classifier along with the capability to cross-connect grit collectors to different cyclones will provide redundancy in the event a cyclone is out of service due to plugging and/or maintenance. Upsizing the classifier to allow for the simultaneous operation of two (2) cyclones provides redundancy in the event that a classifier is out of service for maintenance or repair. Figure 6-26 shows a schematic of the cross-connections for a pair of cyclone-classifiers. Each pair of classifiers will discharge to a different truck bay, which will allow for continued operation if the container in a truck bay is full but cannot be switched out. There will be a total of four (4) pairs of cyclone-classifiers (two (2) units per bay).

**Figure 6-26: Grit Collector Cyclone Classifier Cross Connection Schematic**




The cyclone-classifiers will be located on the upper floor to allow trucks or dumpsters to be driven under the classifiers for loading. There will be four (4) truck/dumpster bays with two (2) classifiers per bay. Each bay will be large enough to accommodate either the dual trailer "gravel trains" currently used for hauling grit from PS-2, two (2) dump trucks, or two (2) 20-CY roll-off dumpsters. The system will provide GLWA with a high level of flexibility in container usage. The high ceilings in the truck bay shall provide enough clearance to allow loading and unloading of the roll-off dumpsters inside the building. Diverter chutes will be used to assist with load leveling. Additional features to assist with flexibility and load leveling were considered. The use of cross-connections between units was rejected due to the potential for plugging issues. Load leveling conveyors were rejected because the increase in maintenance of the conveyors outweighed their benefits. See Figure 6-27 for the building layout.

Figure 6-27: Grit Processing Facility Layout (Interior View)




### 6.5.2 Project Schedule

The Project Schedule for Pump Station 2 Improvements is shown below as Table 6-9. The project will be under construction during the same time as other possibly conflicting projects at the WRRF. This effort will require close coordination of Construction activities between projects by all parties.

| Table 6-9: PS-2 Project Milestone Schedule | |
|---|---|
| Milestone | Milestone Date |
| Notice to Proceed | May 1, 2023 |
| Grit Processing Facility Completion | June 24, 2025 |
| Substantial Completion | August 11, 2027 |
| Final Completion | February 7, 2028 |

### 6.5.3 Cost Estimate

An OPCC was developed for the 30% design of the PS-2 Rack and Grit Improvements project. The improvements will be further refined during the detailed design phase with input from GLWA staff. Refinements during design may result in changes to sizing, details, etc. which may result in changes to the estimated construction costs.

The OPCC is in 2022 dollars and represent average bidding conditions. The OPCC includes a contingency of 30% to compensate for detailed improvements not yet included. Based on the level of project definition, the OPCC is Class 3 as defined by the Association for the AACE and as such, have an expected accuracy range of +30% to -20% of the OPCC. A summary of the estimated construction costs for the improvements are shown in Table 6-10

**Table 6-10: Opinion of Probable Construction Costs**

| Project Element | OPCC |
|---|---|
| Pump Station 2 | $374,000 |
| Screen Building | $26,198,000 |
| Grit Removal | $25,606,000 |
| Grit Processing Facility | $20,025,000 |
| Chemical Facility | $2,540,000 |
| Pipe Tunnel | $893,000 |
| Pavement Modifications | $2,771,000 |
| Total Cost | $78,407,000 |

*Note: 1. OPCC accuracy range is +30% to -20%, in accordance with AACE Class 3 estimate.*

### 6.5.4 Implementability of Selected Alternative

GLWA has the appropriate Management, Engineering, and Maintenance and Operational staff to implement this proposed project and has implemented many projects with similar budget amounts in its history. They also have the ability to obtain technical support as needed for design and planning of the project. If this project is funded from MI-EGLE with low interest loan funding, GLWA is ready to implement, construct, operate, and maintain the proposed project.

### 6.5.5 User Costs

User Impact Costs are included in the Present Worth (Lifecycle Cost) Calculation included in Appendix H.

### 6.5.6 Useful Life Evaluation

The evaluation of the selected alternative took into consideration the expected useful life of the proposed project components. Typical useful life spans for each project aspect were given based on either known lifespan, such as process equipment where a lifespan can be provided by a manufacturer, or standard item lifespans that have been accepted, such as the useful life of a structure. The structural components constructed in this project are expected to have a useful life of 50 years. The site civil work and the proposed process equipment both have an estimated useful life of 20 years. The electrical, instrumentation, and controls have a useful life of 15 years. Estimated useful life is used in the Present Worth (Lifecyle Cost) Calculations presented in Appendix H.

### 6.5.7 Analysis of Impacts

#### Direct Impacts

The construction of the proposed PS-2 Bar Racks Replacement and Grit Collection System Improvements Project is not expected to have an adverse impact on archaeological, cultural, or historical areas. The construction for this project will occur within the WRRF boundaries and in areas that have been previously disturbed. This project is not anticipated to detrimentally affect water quality, air quality, wetlands, endangered species, wild and scenic rivers, or unique agricultural lands in the area.

The total user costs have been evaluated on an individual project basis and can be found in the Present Worth (Lifecycle Cost) Calculations presented in Appendix H. These evaluations returned a total user cost impact that is not unreasonably high and so it is not considered an adverse direct impact from the implementation of this project.

#### Indirect Impacts

The improvements made as part of the PS-2 Bar Racks Replacement and Grit Collection System Improvements Project are not expected to have an impact on the growth and development capacity in the surrounding residential, commercial, or industrial areas. The project is also not anticipated to have an impact on cultural, human, social, or economic resources in the surrounding area.

#### Cumulative Impacts

The PS-2 Bar Racks Replacement and Grit Collection System Improvements Project is anticipated to improve reliability and increase removal efficiencies of screening and grit at the GLWA WRRF leading to significantly higher screenings and grit removal efficiencies, long-term system reliability and simplified operations and maintenance.

### 6.5.8 Mitigation of the Selected Alternative

Where adverse impacts cannot be avoided, mitigation methods will be implemented. Mitigating measures for the projects such as soil erosion control, if required, will be utilized as necessary and in accordance with applicable laws. Details will be further specified in the construction contract documents used for the project.

#### Short-Term Mitigation

The PS-2 Bar Racks Replacement and Grit Collection System Improvements Project is expected to have unavoidable short-term impacts due to construction activities such as dust, noise, and traffic. Efforts to minimize dust such as giving unpaved areas and access drives used in the construction area a dust-preventive treatment or periodically watering these areas will be implemented. Work will be scheduled and conducted in a manner to minimize the level of noise escaping the site, especially at nights and on weekends. These measures will be detailed in the contract project specifications.

### Long-Term Mitigation

The PS-2 Bar Racks Replacement and Grit Collection System Improvements Project is not expected to have adverse long-term impacts. Therefore, no long-term mitigation is expected for this project.

### Indirect Impact Mitigation

For the PS-2 Bar Racks Replacement and Grit Collection System Improvements Project, it is not anticipated that mitigative measures for indirect impacts will be necessary. The construction of the PS-2 Bar Racks Replacement and Grit Collection System Improvements Project is located within the boundaries of the WRRF and does not promote growth in the surrounding areas that are not serviced by GLWA.

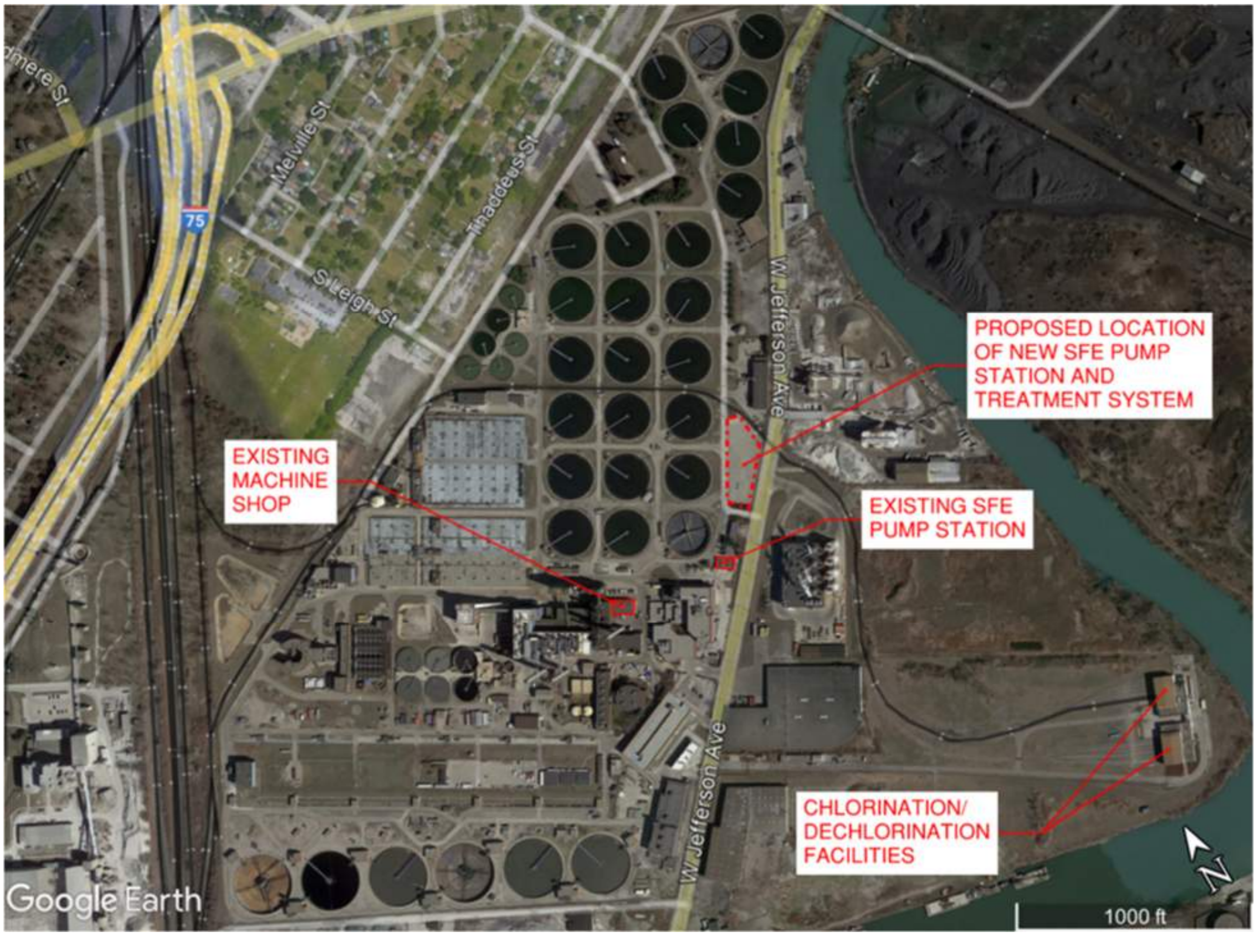
# 7.0 PRIORITY 1D - REHABILITATION OF THE SCREENED FINAL EFFLUENT PUMP STATION PROGRESSIVE DESIGN BUILD GUARANTEE PROJECT (SFE PROJECT)

## 7.1 Delineation of SFE Project Area

The existing SFE pump station provides SFE for various operations throughout the plant. The original capacity of the eight (8) pumps in the station, 124 MGD, far exceeds current average demand of 23 MGD. The system is often over-pressured which has caused maintenance issues and wastes energy. Rehabilitation or reconfiguration of the pump station is necessary to meet GLWA's operating needs.

The pump station rehabilitation and reconfiguration will use land currently within the GLWA WRRF adjacent to the existing SFE pump station. A new SFE pump station and treatment system will be designed to fit within the proposed area. This project will include other buildings besides the existing SFE pump station which are the existing machine shop and the existing chlorination/dechlorination facilities. The proposed location of the new SFE pump station and the location of the existing facilities is shown in Figure 7-1.

**Figure 7-1: Aerial View of WRRF with Locations Impacted by SFE Pump Station Project**




## 7.2 Summary of SFE Project Need

Currently, the WRRF relies on nearly 6 MGD of potable water from the City's water system to supply their low, medium, and high-pressure secondary water systems which supply process water throughout the plant and to the chlorination/dechlorination facilities on the east side of Jefferson Avenue. There is no redundant water supply for the secondary water systems. If a water main supply line were to go down, several of the process at the WRRF and the chlorination/dechlorination facilities would be interrupted, causing the WRRF to be out of compliance with their NPDES permit. EGLE has expressed concerns regard the availability of redundant secondary water system supply and is anticipating a solution from GLWA. For this reason, the "No Action" alternative is not being considered as an acceptable alternative in this Project Plan.

GLWA currently operates an SFE pump station at the WRRF to provide SFE water for treatment processes with a higher tolerance to water quality issues. This pump station was originally constructed when the demand for SFE water was significantly higher than what is currently required at the plant. There are eight existing pumps in the pump station with a total capacity of 124 MGD. With the current operational demands, only two (2) to three (3) pumps are utilized at a time. This allows the plant to meet the average daily demand of 23 MGD taken from a review of the past five years of operating data. The result of running these oversized pumps is over-pressurizing of the system and wasting energy.

With the existing set up of the SFE pump station it is not possible to meet GLWA's operating needs with only optimizing the performance of the existing facilities. Coupled with the City water system performance, the existing SFE pump station and the City water main are not suited to give GLWA the optimum performance for the WRRF treatment process. Therefore, the "Optimum Performance of Existing Facilities" alternative is not being considered as an acceptable alternative in this project plan.

## 7.3 Technical Considerations for the SFE Project Alternatives

The EGLE SRF Project Plan Preparation Guidance requires alternative evaluations include the following considerations, if applicable:

- Infiltration and Inflow (I/I) Removal
- Structural Integrity
- Sludge and Residuals
- Industrial Pre-Treatment
- Growth Capacity
- Areas Currently Without Sewers
- Reliability
- Alternative Sites and Routings
- Combined Sewer Overflows
- Contamination at the Project Site
- Green Project Reserve

The above considerations are not applicable to the SFE Project except for Sludge and Residuals, Growth Capacity, Reliability, and Green Project Reserve. Green Project Reservice is addressed in Section 7.5.4.

### 7.3.1 Sludge and Residuals

**Ammonia Removal**

Chlorine gas is an acid, and injection of approximately 3,500 mg/L of chlorine gas into carrier water (which is normal practice to avoid chlorine off-gassing) reduces pH to approximately 2. The secondary effluent at the Detroit WRRF has an average of 12 mg/L ammonia-nitrogen (NH3-N). If chlorine gas were injected into this water, then reactions between chlorine and ammonia would occur at the very low pH levels. Possible final reaction products include nitrogen gas (N2), nitrous oxide (N2O), and trichloramine (NCl3).

At low pH values the amount of NCl3 in the gas phase can be as high as 30%. NCl3 is explosive in the liquid phase at 0.5 mg/L and in the gas phase at 0.5 percent by volume. NCl3 reacts violently to form N2 and Cl2, the reaction being triggered by catalytic surfaces, impact, supersonic shock waves, or self-heating due to decomposition reactions. Oxygen is not involved in this reaction. If 12 mg/L NH3-N react to form NCl3 (30 percent), and N2O and N2 (70 percent), then there would be 36 mg/L of NCl3 in the liquid phase and 30 percent by volume in the gas phase, in each case well above the explosive limit. If NH3-N is not removed from secondary effluent before its use as carrier water, then there would be a risk of explosion in the liquid or gas phase.

By decreasing ammonia concentration to less than 0.2 mg/L before mixing with Cl2 in the injectors, NCl3 concentration in the liquid phase can be limited to 0.5 mg/L, the reported explosive limit. However, any ammonia that is mixed with Cl2 in the injectors could result in NCl3 in the gas phase that exceeds the reported explosive limit (30 percent). Unfortunately, it is not possible to quantify this risk, nor does there appear to be a way to mitigate it.

#### Organic Nitrogen Removal

The presence of organic nitrogen (ammonia functional groups that are part of organic compounds) also presents a risk because high concentrations of chlorine will react with many such compounds, releasing the ammonia. That ammonia would then react with chlorine. To address this risk, the treatment goal would be to achieve less than 0.2 mg/L total Kjeldahl nitrogen (TKN), which is the sum or organic nitrogen and ammonia.

Pilot testing of breakpoint chlorination in Virginia indicated that breakpoint chlorination removed some of the organic nitrogen entering in the process. At Detroit WRRF, it is unlikely breakpoint chlorination alone would achieve 0.2 mg/L TKN. To approach that objective, breakpoint chlorination would be followed by dechlorination and granular activated carbon to adsorb organic compounds, including those that have ammonia functional groups. Dechlorination would be included to avoid oxidizing the activated carbon.

#### Oil and Grease Removal

Chlorine is a strong oxidant that reacts with many materials, including lubricants and elastomers. Although the oil and grease concentration in Detroit WRRF secondary effluent is low, it could react with chlorine. Consequences could include deterioration of chlorine solution piping or explosion. The likelihood of such consequences cannot be assessed without testing. Such testing would include a breakpoint chlorination process, which has the potential to oxidize (remove) some oil and grease.

### 7.3.2 Growth Capacity

The ability for the WRRF to account for growth has been considered in evaluation of the alternatives. The proposed Alternative 2: Construction of a New SFE Pump Station and Treatment System would be more appropriately sized for the WRRF process demands GLWA has seen over the past five years. This actual measured flow has ranged from 15 to 40 MGD with an average daily demand of 23 MGD. The proposed pump station will be sized to handle the average daily flow with additional capacity to give GLWA the room to expand its treatment process in the future. This will require a firm capacity of 60 MGD from the new pump station.

The proposed storage volume of Alternative 1: Elevated Water Storage Tank would be sized for the WRRF to expand its treatment process, giving the facility the ability to store water at an expanded 3-day requirement volume.

### 7.3.3 Reliability

With the current set up of the process water feed, GLWA does not have a designated source of redundancy to the WRRF. If a water main supply line were to go down for any reason, several of the processes at the WRRF would be interrupted losing the water they needed to keep treatment running. This outage would in turn cause the WRRF to be out of compliance with their discharge permit.

Providing a source of redundancy for the WRRF was a major consideration in the evaluation of the alternatives. Both the proposed Alternative 1: Elevated Water Storage Tank and the proposed Alternative 2: Construction of a New SFE Pump Station and Treatment System would give the WRRF an internal source of process feed water. The currently used City water would then be used as a backup water feed if the proposed water feed were to fail.

## 7.4 Analysis of Alternatives for the SFE Project

With the need to provide redundancy to the secondary water system firmly established, GLWA has evaluated two possible alternatives: an elevated water storage tank, and a new SFE Pump Station with enhanced water treatment to serve those processes requiring higher-quality process water. This Project Plan evaluates these alternatives on a technical and cost basis.

### 7.4.1 Alternative 1 – Elevated Water Storage Tank

An elevated water storage tank capable of holding three days of process water demand would meet the redundancy requirements for the WRRF. This would result in an 18-million-gallon (MG) storage tank approximately 260 feet in diameter and 60 feet in height. A storage tank of that size is extremely expensive to construct and its nearly impossible to locate on the WRRF site without encroaching on space designated for future expansion. Additionally, since the water in the tank would only be used in emergencies, maintaining the temperature and water quality in the tank would require either its own treatment system or periodically flushing the tank resulting in wasted water. For these reasons, this alternative was not considered viable and was not pursued further. A full engineer's opinion of probable costs was not prepared. This was not considered a "Principal Alternative".

### 7.4.2 Alternative 2 – Construct a new SFE Pump Station and Treatment System

Redundancy to the secondary water systems can be achieved with the construction of a new SFE Pump Station and Treatment System adjacent to the existing SFE pump station. This new pump station would be appropriately sized for the WRRF's projected demands. This actual measured flow has ranged from 15 to 40 MGD with an average daily demand of 23 MGD. The proposed pump station will be sized to handle the average daily flow with additional capacity to give GLWA the room to expand its treatment process in the future. This will require a firm capacity of 60 MGD from the new pump station.

The SFE water currently being used at the plant would need to be treated to meet the higher water quality requirements of some of the current operating systems. This would be accomplished with a new treatment facility adjacent to the proposed SFE Pump Station. The level of water treatment would be designed to meet the minimum operating requirements of the existing process systems.

As a part of this alternative, redundancy would be created at the WRRF with the City water system now being used as a backup water supply. This would be achieved by installing pressure relief, backflow protection, and isolation valves on the City's supply lines. If the treated SFE water system lost pressure for any reason, the pressure sustaining valves would open allowing City water to enter the system and supply water to keep the WRRF treatment systems online.

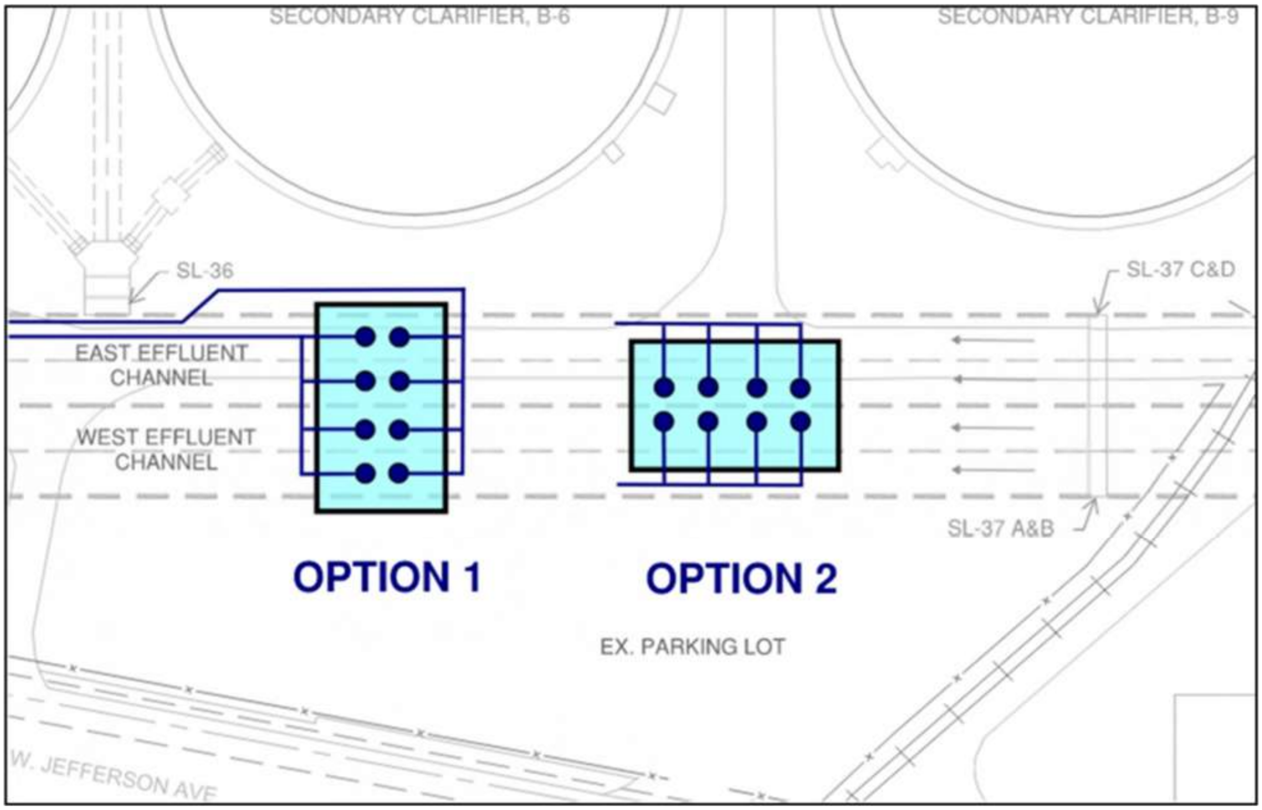
This alternative gives GLWA a means to reduce the amount of City water needed for daily operation as well as adding redundancy to the current operating process. Multiple sub-alternatives evaluated as part of this alternative are described in the following sections.  The GLWA is still in the process of evaluating and selecting preferred sub-alternative, but the not to exceed maximum price included in the progressive design-build contract allows this alternative to be considered in this Project Plan for SRF funding.

### Alternative 2A – SFE Pump Station Location

*Alternative 2A.1 – Over Existing Channels*

The current SFE pump station is located over the existing SFE channels. The proposed pump station can maintain this orientation, being constructed above the SFE channels in the new location. This would require less excavation and formwork than constructing the pump station adjacent to the channels. However, to protect the existing channels from the weight of the new pump station, piles would need to be installed on each side of the pump station with supports spanning the width of the channels. Options for an over-channel pump station are shown in Figure 7-2.

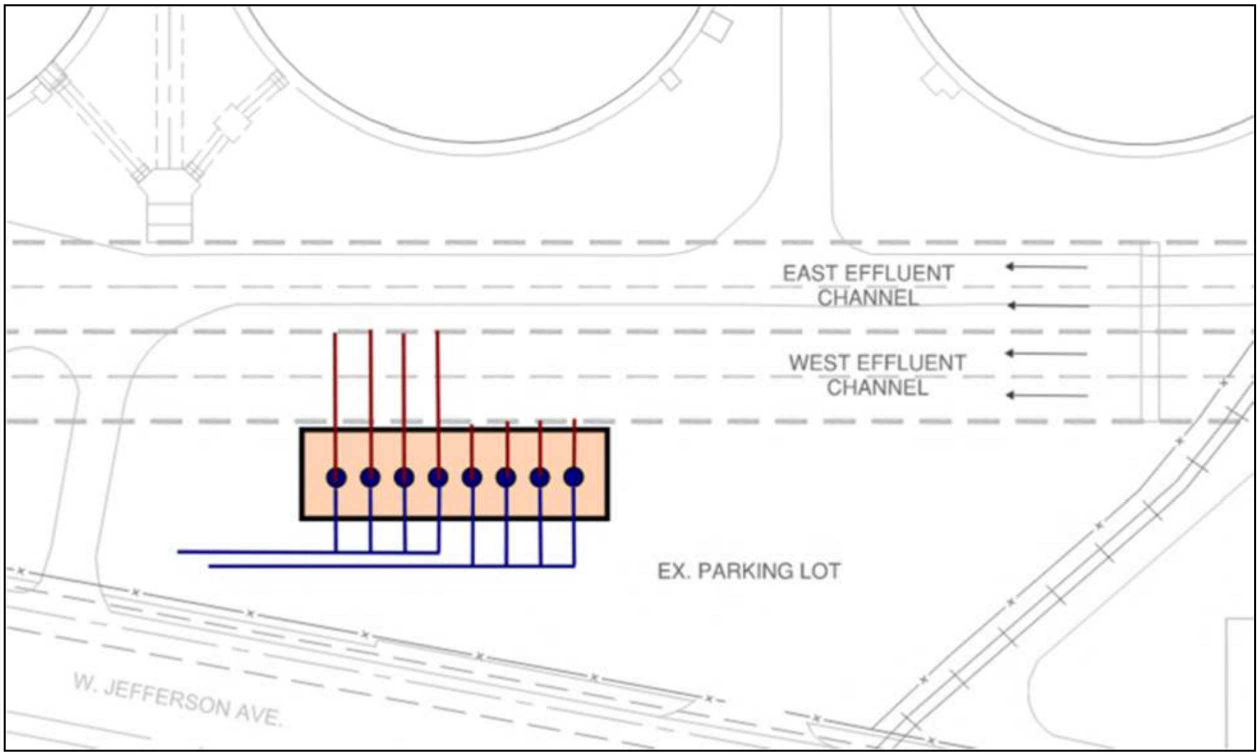
**Figure 7-2: SFE Pump Station Located Over Existing Channels**




*Alternative 2A.2 – Adjacent to Existing Channels*

Placing the new SFE pump station adjacent to the existing SFE channels would require excavation and construction of a new wet well or inlet piping connected to the existing channels to feed the proposed SFE pumps. Precautions would need to be taken during all excavation beside the existing channels to protect the channels that will remain in use during construction. This configuration also allows for the existing maintenance road to remain in service. The proposed layout for the SFE pump station location adjacent to the channels is shown in Figure 7-3.

**Figure 7-3: SFE Pump Station Located Adjacent to Existing Channels**




## Alternative 2B – SFE Pump Type

### *Alternative 2B.1 – Vertical Turbine Pumps*

The existing SFE pump station utilizes vertical pumps, and the proposed SFE pump station would have a similar arrangement. Vertical turbine pumps typically have better efficiency ratings than submersible pumps meaning they will use less power. The cost to install vertical turbine pumps is also lower than to install submersible pumps. This lower cost is also seen in the lower life cycle costs of vertical turbines.

Outside of these major factors, some secondary factors were evaluated for each pump alternative. Vertical turbines have a chance to overheat, but this can be mitigated by installing them in properly ventilated buildings. The existing SFE pump station utilizes vertical turbines, so the staff will have a familiarity with the proposed pumps. The new pump station building would need to be designed to carry the weight of the pumps on the operating floor. However, the pumps located on the operating floor gives an ease of maintenance.

### *Alternative 2B.2 – Submersible Pumps*

Submersible pumps typically have lower efficiency ratings than vertical turbine pumps meaning they will use more power. The cost to install submersible pumps is also higher than to install vertical turbine pumps as the pumps required would need to be in the 350-500 horsepower (HP) range which is larger than any existing submersible pump at the WRRF. Life cycle costs for submersible pumps are also higher than for vertical turbine pumps.

Outside of these major factors, some secondary factors were evaluated for each pump alternative. Submersible pumps have a chance for shaft seal leakage with a possibility to contaminate the motor and motor bearings. Leak sensors are installed on the pumps but would require the pumps to be pulled out of the existing channels for maintenance. The new pump station building would not need to be designed to carry the weight of the pumps on the operating floor as only the strainer would be located at this level. However, this increases the cost of maintenance when the pumps need to be pulled from the channels.

**Alternative 2C – SFE Pump Capacity and Drive Type**

*Alternative 2C.1 – Eight Equivalent Capacity Pumps*

This alternative evaluates the use of eight pumps with equivalent pumping capacities. The per pump capacity is proposed to be 8.6 MGD. This would give the new pump station a 60 MGD firm capacity and a total capacity of 69 MGD. This configuration can be equipped with VFDs on all eight pumps, or each pump can be left in constant speed operation.

*Alternative 2C.2 – Six Equivalent Capacity Pumps*

This alternative evaluates the use of six pumps with equivalent pumping capacities. The per pump capacity is proposed to be 12 MGD. This would give the new pump station a 60 MGD firm capacity and a total capacity of 72 MGD. This configuration can be equipped with VFDs on all six pumps, or each pump can be left in constant speed operation.

*Alternative 2C.3 – Four Large Capacity Pumps and Four Lower Capacity Pumps*

This alternative evaluates the use of eight pumps, four large capacity pumps and four lower capacity pumps. The per pump capacity is proposed to be 15 MGD for the larger pumps and 4 MGD for the lower capacity pumps. This would give the new pump station a 60 MGD firm capacity and a total capacity of 75 MGD. This configuration would operate on a constant speed basis and not utilize VFDs on any pump.

**Alternative 2D – SFE Treatment Ammonia Removal**

*Alternative 2D.1 – pH Adjustment*

In this alternative, ammonia would not be removed from SFE before using it as carrier water for chlorine. The strategy would be to maintain neutral pH (~7.0) in the carrier water by adding alkalinity prior to chlorine addition to neutralize its acidity. This approach is impractical. Approximately 2,500 mg/L as $CaCO_3$ would be needed. Chemical cost alone would be far more than the cost of avoided potable water.

*Alternative 2D.2 – Breakpoint Chlorination*

This alternative involves a step of adding only enough $Cl_2$ to react with the ammonia in the SFE, which would be released to the atmosphere as $N_2$ gas in a plug-flow contact tank. Operation at pH 7.5 to 8.0 has been reported to improve kinetics, improve process stability, and minimize $NCl_3$ formation.

Either gas chlorine or sodium hypochlorite could be used. Gas chlorine is an acid. If gas chlorine were used, approximately 140 mg/L as $CaCO_3$ of alkalinity would be required prior to $Cl_2$ addition to maintain a desirable pH range. Sodium hypochlorite is a weak base, and commercial sodium hypochlorite solutions contain sodium hydroxide as a stabilizer, contributing to alkalinity. For Detroit WRRF, Olin's (current hypochlorite supplier) data sheet indicates that for 12.5 percent by weight sodium hypochlorite, there is 0.4 percent by weight sodium hydroxide. For the anticipated low-alkalinity secondary effluent, it may be necessary to feed sulfuric acid or sodium hydroxide at different times along with sodium hypochlorite solution to keep pH in the desired range.

Regardless of the form of chlorine used, real-time monitoring of ammonia concentration in the SFE would be required to pace chlorine feed. Ammonia monitoring at the discharge of the contact tank would be required to ensure ammonia remains below target levels.

*Alternative 2D.3 – Biological Ammonia Removal (Nitrification)*

Biological ammonia removal would remove the ammonia to low levels prior to using it as carrier water. Biological treatment could be a membrane bioreactor (MBR) process, or a biologically active filtration (BAF) process followed by cloth disk filtration for solids removal. As in an activated sludge process, oxygen would be required for bacteria to oxidize NH3-N to nitrate-nitrogen (NO3-N). Approximately 140 mg/L as CaCO3 alkalinity would be required to maintain a neutral pH, a requirement for biological treatment. There would be no risk of NCl3 production. Due to anticipated capital and operating costs, complexity, and footprint, a nitrifying biological process is not recommended.

*Alternative 2D.4 – Ion Exchange*

It is difficult to use ion exchange to achieve sufficiently low NH3-N concentration. Furthermore, ion exchange is very expensive to implement and operate due to media regeneration or replacement. Ion exchange is not a recommended alternative.

*Alternative 2D.5 – Air Stripping*

Air stripping is achieved by adding a base, such as caustic, to raise pH to 10.5 to 11.5, which reduces ammonia solubility. Ammonia is then removed from the water using air in a packed tower. In some cases, "stripped" ammonia can be released to the atmosphere. In other cases, the gas stream must be treated. In cold weather, ammonia removal of 60 percent has been documented (USEPA Manual of Nitrogen Control, 1993), which would be insufficient for the proposed application. Air stripping is not recommended.

*Alternative 2D.6 – Reverse Osmosis*

One-pass reverse osmosis (RO) would remove 95 percent of the ammonia in secondary effluent, which is insufficient for the range of ammonia expected. Two-pass RO (two RO processes in series) could achieve 98+ percent ammonia removal, which would be sufficient. A single pass RO system would be expensive, and a two-pass RO system would be almost twice as expensive. RO is not recommended for ammonia removal, although it could provide organic nitrogen removal after a less expensive ammonia removal alternative.

*Alternative 2D.7 – Algae-Based Treatment*

Algae-based treatment requires light, carbon dioxide, ammonia, and bioavailable phosphorus to grow algae, which is then separated from the treated water. A proposal was received from a vendor for an algae-based nutrient removal facility. This facility would include the following major elements:

- Mix well, pumps, and strainers
- Greenhouse with glass piping and lighting for growing algae
- Low-pressure membranes for recovering algae
- Dewatering equipment to prepare recovered algae for drying
- Dryer to prepare algae for bagging (bagged algae is a saleable product)
- Mechanical and electrical support facilities

The estimated footprint is 36,000 square feet for 3.4-MGD capacity. Scaling up to the required 5.4-MGD capacity results in a footprint of 57,000 square feet. The parking area envisioned for all SFE-related treatment facilities is only 43,000 square feet, so an algae-based system cannot be accommodated in the area available.

In addition to the space limitation, several factors would need to be addressed to implement algae-based nutrient removal at Detroit WRRF. First, a method to capture carbon dioxide from the incinerator exhaust gas would be needed. Second, a phosphoric acid storage and feed system would be needed because Detroit WRRF secondary effluent contains insufficient phosphorus to remove all of its ammonia. Given the impracticality of implementing algae-based nutrient removal at Detroit WRRF, the supplier's cost figures were not evaluated.

### Alternative 2E – SFE Filtration

*Alternative 2E.1 – Cloth Disk Filters*

The evaluation basis for cloth disk filters was a proposal from a possible vendor. Cloth disk equipment can be placed in concrete or steel tanks, and steel was selected for this evaluation. In a cloth disk filter, wastewater enters the compartment containing the disks. It flows from the outside of the disks to the inside, entering a central tube, which empties into the effluent compartment.

A cloth disk filter backwashes a pair of disks while other disks in the same unit continue to produce filtrate. Firm capacity is based on one unit out of service while the other unit produces filtered water and backwashes its disks intermittently.

The filters receive pumped flow from the breakpoint chlorination process (or pumped SFE when breakpoint chlorination is unavailable). Alum addition at a static mixer and a single-stage flocculation process increases particle size, making particles more amenable to removal by the filters. Filtered water is stored in a tank and pumped to distribution. Sodium hypochlorite and sodium hydroxide are injected before water leaves the filter facility.

While the figure shows backwash pumps transferring flow from the filtrate tanks, the evaluation basis is for the filters to produce backwash supply “on the fly,” with filtrate pumped from the effluent compartment of the filters and the filtrate tank sized for 30 minutes of storage to buffer changes in demand.

*Alternative 2E.2 – Granular Media Pressure Filters*

The evaluation basis for pressure filters was a proposal from a vendor. Horizontal pressure filters were evaluated because they are available with multiple parallel cells in the same steel tank, whereas a vertical pressure filter has only one cell. Pressure filters use granular media (sand and/or anthracite) over a graded gravel layer. During filtration, water passes downward through the media, and particles are removed by several mechanisms. As particles accumulate on the media, the headloss increases, requiring a filter cell to be backwashed periodically. Horizontal pressure filters backwash one cell at a time. Firm capacity is based on one cell out of service and another cell in backwash. When a filter cell is backwashed, it stops production, and the backwash supply (filtered water) and air are injected beneath the media, expanding the media and dislodging particles. The backwash supply can be produced by other cells in service, or it can be stored and pumped. Backwash supply by other cells is the basis for this evaluation. Dirty backwash water is directed to drain. After backwash, the cell returns to production.

The filters receive pumped flow from the breakpoint chlorination process (or pumped SFE when breakpoint chlorination is unavailable). Filtered water is stored in a tank and pumped to distribution. Sodium hypochlorite and sodium hydroxide are injected before water leaves the filter facility.

The Water Environment Federation’s Design of Municipal Wastewater Treatment Plants states, “At a smaller plant with severe space limitations, pressure filters may be a better choice. However, pressure filters must be selected with caution because internal inspection, maintenance, and media replacement are complicated by size and space limitations and concurrent problems of lighting and ventilation. In practice, the use of pressure filters for municipal applications is not common; however, their use is encountered more frequently in industrial wastewater treatment applications.

*Alternative 2E.3 – Granular Media Gravity Filters*

The evaluation basis for granular media gravity filters is based on information based on manufaturers products that have been installed in similar situations. Gravity filters use granular media (sand and/or anthracite) over a graded gravel layer (or sometimes a porous plate). During filtration, water passes downward through the media, and particles are removed by several mechanisms. As particles accumulate on the media, the headloss increases, requiring a filter to be backwashed periodically.

When a filter cell is backwashed, it stops production, and the backwash supply (filtered water) and air are injected beneath the media, expanding the media and dislodging particles. In this evaluation, the backwash supply is pumped from the filtrate tank, so the other filters do not need to ramp up production for a backwash. Dirty backwash water is directed to drain. After backwash, the filter returns to production.

The filters receive pumped flow from the breakpoint chlorination process (or pumped SFE when breakpoint chlorination is unavailable). Filtered water is stored in a tank and pumped to distribution. Sodium hypochlorite and sodium hydroxide are injected before water leaves the filter facility.

### 7.4.3 Monetary Evaluation and Alternative Evaluation

Cost and non-cost factors were included in the selection of the alternative that best satisfied the needs of the project. The monetary evaluation comparing the present worth of the alternatives is included in Appendix H. Many of the project needs were satisfied with improvements that did not require present worth evaluation. For example, location and structure of the new pump station and treatment facility; advanced water treatment technology; architectural components; electrical components; HVAC; plumbing; and I&C associated with the new facility.

## 7.5 Selected Alternative for the SFE Project

### 7.5.1 Project Description

After evaluation of the possible alternatives, the selected alternative is Alternative 2 - Construct a new SFE Pump Station and Treatment System. This alternative will include the following combination of sub-alternatives: 2A.1 – SFE Pump Station Located Over Existing Channels, 2B.1 – Vertical Turbine SFE Pumps, 2C.1 Eight Equivalent Capacity SFE Pumps with VFDs, 2D.2 – Breakpoint Chlorination for Ammonia Removal, and 2E.3 – Granular Media Gravity Filtration of SFE.

The proposed pump station will be constructed above the SFE channels in the new location. This will require less excavation and formwork than constructing the pump station adjacent to the channels. To protect the existing channels from the weight of the new pump station, piles will be installed on each side of the pump station with supports spanning the width of the channels. The pump station will be rotated 90 degrees from the current orientation to provide room for an access road to pass the proposed layout.

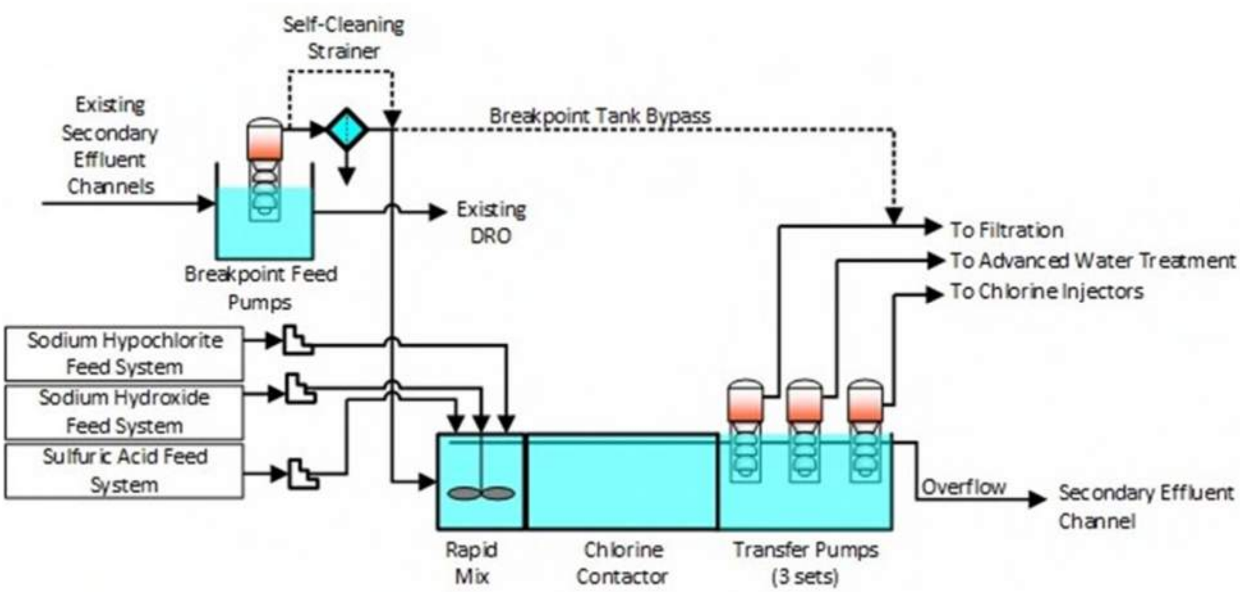
The existing SFE pump station utilizes vertical pumps, so it is proposed that the new SFE pump station will use the same type of pump and will have a similar arrangement. Using vertical turbine pumps will provide better efficiency ratings and require less power. The proposed pump station building will be designed to properly ventilate the proposed pumps. The existing SFE pump station utilizes vertical turbines, so the staff will have a familiarity with the proposed pumps. The new pump station building will be designed to carry the weight of the pumps on the operating floor. The proposed SFE pump station will use an eight-pump layout with equivalent pumping capacities. The per pump capacity is proposed to be 8.6 MGD. This will give the new pump station a 60 MGD firm capacity and a total capacity of 69 MGD. This configuration will be equipped with VFDs on all eight pumps.

The proposed SFE treatment will utilize breakpoint chlorination for ammonia removal. This alternative involves a step of adding only enough Cl2 to react with the ammonia in the SFE, which will be released to the atmosphere as N2 gas in a plug-flow contact tank. Operation will be monitored to provide a range of pH 7.5 to 8.0 to improve kinetics, improve process stability, and minimize NCl3 formation.

Either gas chlorine or sodium hypochlorite could be used. Gas chlorine is an acid. If gas chlorine were used, approximately 140 mg/L as $CaCO_3$ of alkalinity would be required prior to $Cl_2$ addition to maintain a desirable pH range. Sodium hypochlorite is a weak base, and commercial sodium hypochlorite solutions contain sodium hydroxide as a stabilizer, contributing to alkalinity. For Detroit WRRF, Olin's (current hypochlorite supplier) data sheet indicates that for 12.5 percent by weight sodium hypochlorite, there is 0.4 percent by weight sodium hydroxide. For the anticipated low-alkalinity secondary effluent, it may be necessary to feed sulfuric acid or sodium hydroxide at different times along with sodium hypochlorite solution to keep pH in the desired range.

Regardless of the form of chlorine used, real-time monitoring of ammonia concentration in the SFE will be required to pace chlorine feed. Ammonia monitoring at the discharge of the contact tank will be required to ensure ammonia remains below target levels. A process flow schematic of the proposed process is shown as Figure 7-4.

### Figure 7-4: Simplified Process Flow Schematic of Breakpoint Chlorination

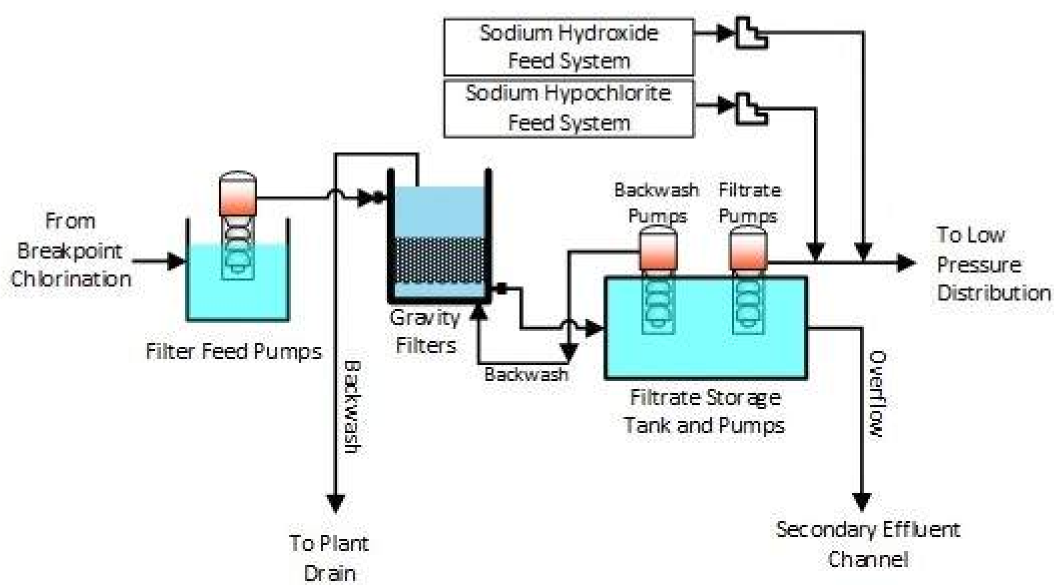



The proposed gravity filters will use granular media (sand and/or anthracite) over a graded gravel layer (or sometimes a porous plate). During filtration, water will pass downward through the media, and particles will be removed by several mechanisms. As particles accumulate on the media, the headloss will increase, requiring a filter to be backwashed periodically.

When a filter cell is backwashed, it will stop production, and the backwash supply (filtered water) and air will be injected beneath the media, expanding the media and dislodging particles. The backwash supply will be pumped from the filtrate tank, so the other filters will not need to ramp up production for a backwash. Dirty backwash water will then be directed to drain. After backwash, the filter will return to normal production.

The filters will receive pumped flow from the breakpoint chlorination process (or pumped SFE when breakpoint chlorination is unavailable). Filtered water will be stored in a tank and pumped to distribution. Sodium hypochlorite and sodium hydroxide will be injected before water leaves the filter facility. The gravity filter process schematic is shown as Figure 7-5.

**Figure 7-5: Simplified Process Flow Schematic of Gravity Filtration**




An advanced water treatment (AWT) train that includes microfiltration (MF) and RO is proposed. Effluent from the breakpoint chlorination process will be pumped to MF. MF filtrate will be pumped to RO. The RO process will be followed by decarbonation to remove excess carbon dioxide followed by chemical addition to achieve acceptable chemical stability for distribution around the plant. Figure 7-6 is a simplified process flow schematic of the AWT processes.

Elements of the MF system are as follows:

- Feed pumps (at breakpoint chlorination facility)
- Self-cleaning strainers (300 micron)

- Pretreatment chemicals (sodium hypochlorite and ammonium sulfate to create chloramine for biofouling control)
- Membrane modules and rack assembly
- Compressed air system
- Backwash system
- Chemical wash storage and transfer pump systems
- Clean-in-place system (sodium hypochlorite, sodium hydroxide, and citric acid)
- Filtrate tank (also serves as RO feed tank)

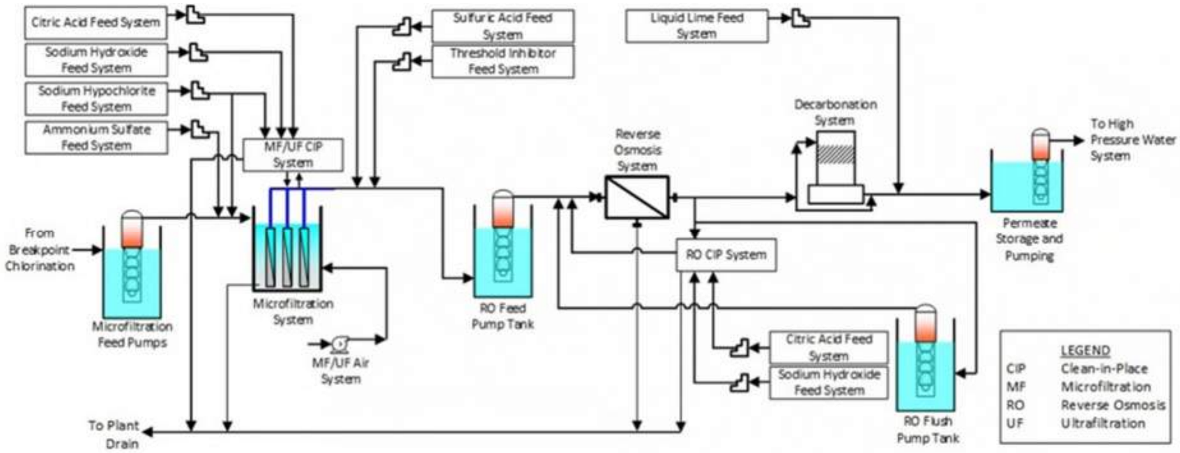
Elements of the RO system are as follows:
- High-pressure pumps
- Pretreatment chemicals (sulfuric acid and threshold inhibitor, both to control scaling)
- Membrane trains
- Clean-in-place system (sodium hydroxide and citric acid)
- Flushing system

The upstream breakpoint chlorination process will achieve consistently low bacteria and ammonia concentrations, and water leaving that process will have a low free chlorine residual. The target free chlorine residual will be 1 to 2 mg/L, but at times, the residual may be lower. Thin film composite RO membranes are incompatible with free chlorine; therefore, ammonium sulfate and sodium hypochlorite will be added upstream of MF to achieve a consistent, low chloramine residual for MF and RO biofouling control. Between the MF membranes and the filtrate tank, free chlorine residual and other parameters will be monitored. If free chlorine is detected, RO system feed will stop.

MF feed is anticipated to contain detectable oil and grease. This may preclude the use of some membrane materials. The effect of grease on membranes depends on membrane material, material of other membrane system components, grease concentration, and grease characteristics. During the breakpoint chlorination pilot study, treated water can be analyzed for polar and non-polar greases. Mineral oil, which is non-polar, is more detrimental to many membrane materials. Microfiltration can be tested at bench scale to determine concentrations of polar and non-polar greases in filtrate, which could affect selection of the RO elements.

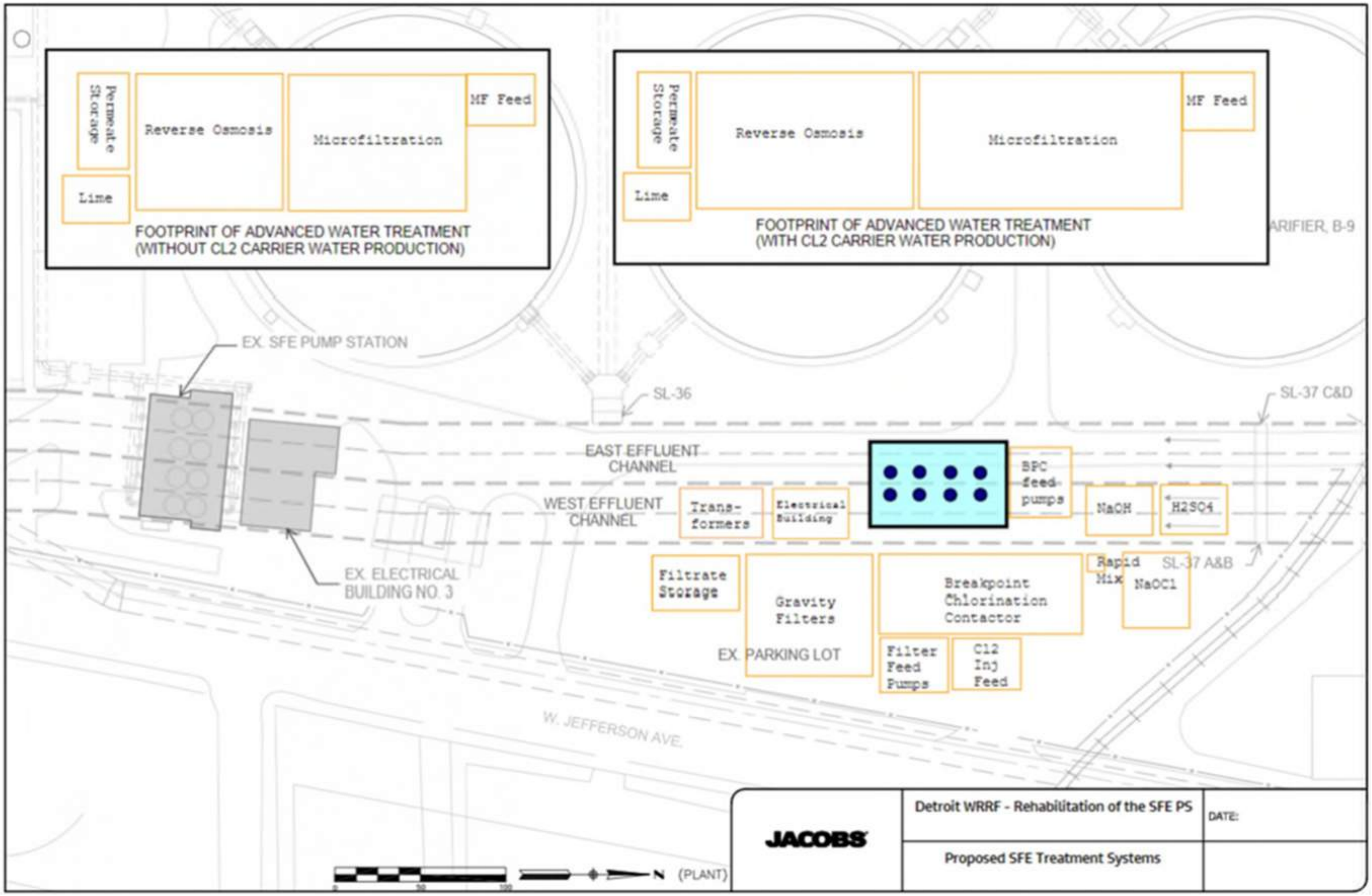
Post-RO stabilization cannot be finalized until individual ion concentrations are measured and design projections are run. For purposes of this project plan, it has been assumed that the RO system will be followed by a decarbonation process to remove carbon dioxide followed by hydrated lime addition to improve stability.

**Figure 7-6: Simplified Process Flow Schematic of Advanced Water Treatment**




After treatment of the SFE water, the water will be routed to connect to the plants existing pipe network for process water in the low, intermediate, and high-pressure secondary water process usages. Figure 7-7 contains the overall layout of the proposed pump station, treatment processes, chemical and holding tanks, ancillary buildings, and existing site features.

**Figure 7-7: Overall Layout of Proposed SFE Treatment Systems**



### 7.5.2 Project Schedule

The SFE project contract will be awarded in the first quarter of 2023 as a progressive design-build contract with a not to exceed maximum price. Once this contract is awarded, GLWA and the recipient of the contract will work on schedule that fits the need for the WRRF to meet its goal of redundancy in the operational processes. The timeline for EGLE funding will be a major driver for the milestones in this schedule. The project will be under construction during the same time as other possibly conflicting projects at the WRRF. This effort will require close coordination of Construction activities between projects by all parties.

Once the schedule for design and construction is complete, GLWA will provide the finalized schedule to EGLE for review.

### 7.5.3 Cost Estimate

A detailed cost estimate will be provided as it becomes available with the advancement of the selected alternative. The current estimated cost for the construction and design of the SFE Project is based on the not to exceed cost of $80,000,000.

### 7.5.4 Green Project Reserve

As determined by the MI-EGLE "2012 Clean Water State Revolving Fund 10% Green Project Reserve: Guidance for Determining Project Eligibility" document, the SFE Project qualifies for the Green Project Reserve in two categories: Water Efficiency and Energy Efficiency. The project will replace the WRRF's need to rely on City potable water for treatment processes with reuse water. The amount of potable water replaced with reuse water on an annual basis is estimated to be 2.2 billion gallons. This is based on the WRRF's daily water usage estimate of 6 MGD. Under this project, the existing SFE pumps will be replaced with pumps equipped with VFDs. This will reduce the energy needed to run the SFE pump station.

#### Replace Potable Water Use with Reuse Water

The current operation at the GLWA WRRF requires 6 MGD of potable water from the City system to function. This demand has been evaluated in the project alternatives and it has been proven that SFE can replace all of the required potable water use with proper treatment and filtration.

*Cost to Implement*

The cost to implement this change of feed water is currently being evaluated. When an estimated cost for the reuse portion of the project is finalized, the amount will be added to this project plan.

*Eligibility*

As a project that replaces potable water usage with SFE water usage, this project is Categorically Eligible for Green Project Reserve.

### Installing VFDs on SFE Pumps to Reduce Energy Usage

The current operation at the GLWA WRRF SFE pump station is a constant speed pump set up. To start the pumps, a large amount of energy is needed. The use of VFDs on the new pumps has been evaluated in the project alternatives. And after evaluation, it has been determined that the proposed pumps will utilize VFDs.

*Cost to Implement*

The cost to implement the use of VFDs on the proposed pumps is currently being evaluated. When an estimated cost for the installation of VFDs on the proposed pumps is finalized, the amount will be added to this project plan.

*Eligibility*

The largest power draw exerted by a pump takes place upon start up. It has been shown that a VFD typically provides an energy savings close to 25%. With a reduction in energy consumption of over 20%, this portion of the project is Categorically Eligible for the Green Project Reserve.

### 7.5.5 Implementability of Selected Alternative

GLWA has the appropriate Management, Engineering, and Maintenance and Operational staff to implement this proposed project and has implemented many projects with similar budget amounts in its history. They also can obtain technical support as needed for design and planning of the project. If this project is funded from MI-EGLE with low interest loan funding, GLWA is ready to implement, construct, operate, and maintain the proposed project.

The project will be completed as a design-build contract. GLWA is prepared to meet all schedule milestones set forth in the proposed schedule when it is complete.

### 7.5.6 User Costs

User Impact Costs are included in the Present Worth (Lifecycle Cost) Calculation included in **Appendix H.**

### 7.5.7 Useful Life Evaluation

The evaluation of the selected alternative took into consideration the expected useful life of the proposed project components. Typical useful life spans for each project aspect will be given based on either known lifespan, such as process equipment where a lifespan can be provided by a manufacturer, or standard item lifespans that have been accepted, such as the useful life of a structure. The structural components constructed in this project are expected to have a useful life of 50 years. The site civil work and the proposed process equipment both have an estimated useful life of 20 years. The electrical, instrumentation, and controls have a useful life of 15 years. The Present Worth (Lifecyle Cost) Calculations presented in **Appendix H** assumed an average lifespan of 20 years.

### 7.5.8 Analysis of Impacts

#### Direct Impacts

The construction of the proposed SFE Pump Station is not expected to have an adverse impact on archaeological, cultural, or historical areas. The construction for this project will occur within the WRRF boundaries and in areas that have been previously disturbed. This project is not anticipated to detrimentally affect water quality, air quality, wetlands, endangered species, wild and scenic rivers, or unique agricultural lands in the area.

The total user costs have been evaluated on an individual project basis and can be found in Appendix H. These evaluations returned a total user cost impact that is not unreasonably high and so it is not considered an adverse direct impact from the implementation of this project.

#### Indirect Impacts

The improvements made as part of the SFE Pump Station Project are not expected to have an impact on the growth and development capacity in the surrounding residential, commercial, or industrial areas. The project is also not anticipated to have an impact on cultural, human, social, or economic resources in the surrounding area.

#### Cumulative Impacts

The proposed SFE Pump Station is anticipated to improve GLWA's redundancy in their treatment processes. This has the possibility to give the WRRF the ability to treat wastewater during water main breaks/shutdowns and reduce the amount of time processes are out of service.

### 7.5.9 Mitigation of the Selected Alternative

Where adverse impacts cannot be avoided, mitigation methods will be implemented. Mitigating measures for the projects such as soil erosion control, if required, will be utilized as necessary and in accordance with applicable laws. Details will be further specified in the construction contract documents used for the project.

#### Short-Term Mitigation

The SFE Project is expected to have unavoidable short-term impacts due to construction activities such as dust, noise, and traffic. Efforts to minimize dust such as giving unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment or periodically watering these areas will be implemented. Work will be scheduled and conducted in a manner to minimize the level of noise escaping the site, especially at nights and on weekends. These measures will be detailed in the contract project specifications.

#### Long-Term Mitigation

The SFE Project is not expected to have adverse long-term impacts. Therefore, no long-term mitigation is expected for this project.

### Indirect Impact Mitigation

For the SFE project, it is not anticipated that mitigative measures for indirect impacts will be necessary. The construction of the SFE Pump Station is located within the boundaries of the WRRF and does not promote growth in the surrounding areas that are not serviced by GLWA.

# 8.0 PUBLIC PARTICIPATION

GLWA and the Project Design Teams have identified municipalities, agencies, and government entities that may regulate the work or require permits for the construction required for the four (4) projects in this Project Plan. Other stakeholders or interested parties, who may be affected by the proposed projects, have also been identified. Communications will be made continuously through the design and construction of these projects.

## 8.1 Public Hearing Advertisement

GLWA advertised a Public Hearing Meeting to be held on May 25th, 2022 (See **Appendix I**). This advertisement was published to alert parties interested in this Project Plan and request input prior to its adoption. In addition, a direct mail notification was sent to the potentially interested parties included on a mailing list provided by GLWA (See **Appendix I**). This direct mail notice included an invitation to comment.

The Project Plan will be advertised in the local newspaper and on the GLWA website. Copies of the Draft Project Plan are available for download and the public's review on the GLWA website.

## 8.2 Public Hearing Contents

The Public Hearing will be held to review the work associated with this Draft Project Plan and the "2023 WRRF Clean Water State Revolving Fund Projects Plan Summary" which can be found in **Appendix I.** The hearing will review information presented in the Draft Project Plan, including estimated user costs, and submitted comments and views of interested persons. The Public Hearing Presentation and transcript will be available in **Appendix I** after the Project Plan is finalized.

## 8.3 Public Comments Received and Answered

Representatives from GLWA and Consultant project teams will be present at the public hearing to address public comments.

As of the date of this Draft Project Plan, no public comments have been received.

Changes to the Project Plan based on the public participation process will be addressed in the Final Project Plan.

## 8.4 Resolution and Adoption of the Plan

GLWA will make a formal resolution regarding this Project Plan at a Board Meeting following the public hearing. An executed copy of the resolution will be included in the Final Project Plan in **Appendix J.** This resolution will Authorize GLWA to proceed with the filing of the Project Plan for the purpose of securing low interest loan assistance under the SRF Program.

# Appendix A.
# Supporting Resources for Cultural Evaluation

# Application for SHPO Section 106 Consultation

# APPLICATION FOR SHPO SECTION 106 CONSULTATION

**Submit one application for each project for which comment is requested. Consult the *Instructions for the Application for SHPO Section 106 Consultation Form* when completing this application.**

**Mail form, all attachments, and check list to: Michigan State Historic Preservation Office, 300 North Washington Square, Lansing, MI 48913**

## I. GENERAL INFORMATION

☒ New submittal
☐ More information relating to SHPO ER# SHPO Project #
☐ Submitted under a Programmatic Agreement (PA)
PA Name/Date: PA name/date, if applicable

a. **Project Name:** GLWA 2023 WRRF Clean Water SRF Project
b. **Project Municipality**: Detroit
c. **Project Address** (*if applicable*): 9300 W. Jefferson Avenue
d. **County:** Wayne

## II. FEDERAL AGENCY INVOLVEMENT AND RESPONSE CONTACT INFORMATION

a. **Federal Agency:** U.S Environmental Protection Agency
**Contact Name:** Andrew Lausted
**Contact Address:** U.S.EPA – Water Division – Region 5, 77 W. Jackson Blvd. **City:** Chicago **State:** IL **Zip:** 60604-3507
**Email:** lausted.andrew@epa.gov
**Specify the federal agency involvement in the project:** U.S. EPA provides capitalization to the Michigan Clean Water SRF program.

b. **If HUD is the Federal Agency: 24 CFR Part 50 ☐ or Part 58 ☐**
**Responsible Entity (RE):** Name of the entity that is acting as the Responsible Entity
**Contact Name:** RE Contact name
**Contact Address:** RE mailing address **City:** RE city **State:** RE State **Zip:** RE zip code
**RE Email:** RE contact's email **Phone:** RE contact's phone #

c. **State Agency Contact (*if applicable*):** Michigan Department of Environment, Great Lakes, and Energy
**Contact Name:** Name of state agency contact
**Contact Address:** Constitution Hall, 525 W. Allegan Street, P.O. Box 30457 **City:** Lansing **Zip:** 48909-7957
**Email:** State contact's email **Phone:** State contact's phone #

d. **Applicant (if different than federal agency):** Name of Applicant's agency/firm
**Contact Name:** Applicant contact's name
**Contact Address:** Applicant contact's mailing address **City:** Applicant's city **State:** Applicant contact's state **Zip:** Applicant contact's zip code
**Email:** Applicant contact's email **Phone:** Applicant contact's phone #

e. **Consulting Firm (if applicable):** Wade Trim
Contact Name: Arthur F. Mullen, AICP
Contact Address: 500 Griswold Street – Suite 2500 **City:** Detroit **State:** MI **Zip**: 49226-4481
**Email:** amullen@wadetrim.com Phone: 313.456.8510

## III. PROJECT INFORMATION

a. **Project Location and Area of Potential Effect (APE)**

i. **Maps.** Please indicate all maps that will be submitted as attachments to this form.
☒Street map, clearly displaying the direct and indirect APE boundaries
☐Site map
☒USGS topographic map   Name(s) of topo map(s): Dearborn and Detroit
☒Aerial map
☐Map of photographs
☐Other: Identify type(s) of map(s)

ii. **Site Photographs**

iii. **Describe the APE:**
The GLWA 2023 Water Resource Recovery Facility (WRRF) Clean Water SRF project is broken down into four separate sub-projects with five specific project areas, each with its own specific direct APEs:
1) Pump Station 1 – The APE of the PS-1 sub-project is within 100' feet of the edge of the site work.
2) Pump Station 2 – The APE of the PS-2 sub-project extends to 100' from the edge of the site work.
3) Aeration Decks – The APE of the Aeration Decks sub-project extends to 100' from the edge of the site work.
4) Screened Final Effluent (SFE) Project – The APE of the SFE sub-project extends to 100' from the edge of the site work. Due to the two locations of work, there will be two APEs for this sub-project.

As the project will be only impacting the efficiency of the WRRF's operations, there will be no indirect APE.

iv. **Describe the steps taken to define the boundaries of the APE:**
The various construction activities were evaluated to determine the potential for impact upon the structures within the WRRF and potential for impacts beyond the site. After careful consideration of the project's scopes of work at each of the sub-project areas, the project's surroundings were then analyzed to compare the proposed activities to the WRRF facilities and the area adjacent. The boundaries of the APE were then selected to include all of the areas where the construction activities will be occurring at each of the facilities and the areas adjacent to those construction activities. After the brief construction period, the project will have no auditory impacts to the WRRF site and the adjacent properties. The visual impacts of the project will be minimal and will not impact the eligibility of any of the WRRF structures or any adjacent properties. A small sympathetic addition is being added to PS-1 for electrical controls that will not impact architectural integrity of the building and a new SFE building built along W. Jefferson Avenue will not impact the appearance of the WRRF industrial complex or any adjacent properties.

b. **Project Work Description**
Describe all work to be undertaken as part of the project:
The Great Lakes Water Authority operates the Water Resource Recovery Facility (WRRF), the largest single sewer treatment facility in North America, and the 2023 Clean Water State Revolving Fund Project will upgrade several facilities at the WRRF to upgrade the existing processing equipment, provide systems redundancy, and increase facility efficiency. The overall WRRF 2023 Clean Water SRF project is divided into four sub-projects at five locations:

1) Pump Station 1 – The improvements to PS-1 include refurbishment of existing pumps, renovation of the existing windows, installation of a new doorwall and widening of the opening, and construction of a small sympathetic addition to the pump house.
2) Pump Station 2 – The PS-2 complex does not meet the 50-year-old eligibility threshold; however, some underground work is proposed on the site including new piping, new paving, new retaining wall, and a new structure on pilings as a part of the upgrades to PS-2's rack and grit facilities. This area has been heavily disturbed during the operation of the sewer treatment plant since the late 1930s including significant disturbance during the construction of the PS-2 facility in the early 1990s.
3) Aeration Decks – These improvements will be to the aeration decks that are an important process in the secondary treatment of the effluent including the elimination of phosphorus. These improvements will improve the operation and efficiency of the decks through automation. All work will be above-ground on existing equipment.
4) Screened Final Effluent – Improvements to the SFE system will be made including the construction of a new control structure in Project Area 4 A. Improvements will occur within the Pump Houses in Project Area 4 B, but there will be no changes to the SFE pump house on the Rouge River or any underground disturbances in this subproject area.

## IV. IDENTIFICATION OF HISTORIC PROPERTIES

a. **Scope of Effort Applied**

i. **List sources consulted for information on historic properties in the project area** (including but not limited to SHPO office and/or other locations of inventory data).

The National Register of Historic Places and the Michigan State Historic Sites listing for the City of Detroit were examined, and no listed historic properties were identified within the vicinity of the WRRF. The City of Detroit's Historic District Commission maps do not indicate any designated historic districts within the vicinity of the WRRF. A visual electronic architectural survey was conducted of the project area. The majority of the structures on the WRRF do not meet the 50-year-old criterion for eligibility to the National Register of Historic Places. The oldest building at the complex is the 1940 Pump Station 1 that is a focus of this review, and the incineration complex also dates from circa 1950, which is not located within the APE. NETROnline historical aerials were consulted, which date back to 1951. They indicated that only one non-descript industrial building outside of the WRRF, located at 9303 W. Jefferson Avenue, meets the age eligibility requirement. The building dates from circa 1960, but this building does not meet the criteria for listing on the National Register of Historic Places. See bibliography included on the PS-1 Architectural Properties Identification Form.

ii. Provide documentation of previously identified sites as attachments. Not applicable

iii. **Provide a map** showing the relationship between the previously identified properties and sites, your project footprint and project APE. Not applicable

iv. Have you reviewed existing site information at the SHPO: ☐Yes ☒ No

v. Have you reviewed information from non-SHPO sources: ☒Yes ☐ No

b. **Identification Results**

i. **Above-ground Properties**

A. Attach the appropriate Michigan SHPO Architectural Identification Form for each resource or site 50 years of age or older in the APE. Refer to the *Instructions for the Application for SHPO Section 106 Consultation Form* for guidance on this.
See the attached Pump Station 1 Architectural Properties Identification Form.

B. **Provide the name and qualifications of the person who made recommendations of eligibility for the above-ground identification forms.**
**Name** Arthur F. Mullen, AICP **Agency/Consulting Firm:** Wade Trim
Is the individual a 36CFR Part 61 Qualified Historian or Architectural Historian ☒ Yes ☐ No
Are their credentials currently on file with the SHPO? ☐ Yes ☐ No
*If NO* attach this individual's qualifications form and resume.

ii. **Archaeology** (complete this section if the project involves temporary or permanent ground disturbance) Submit the following information using attachments, as necessary.

*This section will be completed once Commonwealth Heritage Group completes its archaeological literature review. A request for information was submitted by Commonwealth Heritage Group to the Michigan State Historic Preservation Office on April 11, 2022 for the necessary files.*

A. **Attach Archaeological Sensitivity Map.**

B. **Summary of previously reported archaeological sites and surveys:**
Previously reported archaeological sites and surveys

C. **Town/Range/Section or Private Claim numbers:** PC 11, 45, 569, 589

D. **Width(s), length(s), and depth(s) of proposed ground disturbance(s):** Width, length, depth of proposed ground disturbance

E. **Will work potentially impact previously undisturbed soils?** ☒ Yes ☐ No
**_If YES,_ summarize new ground disturbance:**
The ground disturbance activities will include the running of new utilities, new paving, new structures on pilings at the PS-2 complex.
The SFE site 4 A will include some ground disturbance activities including the construction of a new building along W. Jefferson Avenue and running of utilities.

F. **Summarize past and present land use:**
Originally developed as French ribbon farms and area was developed as industrial uses at the turn of the $20^{th}$ Century. The City of Detroit opened the original sewer treatment plant in 1938 (Pump Station #1) and the plant has expanded over the fifty years onto formerly developed residential and industrial land.

G. **Potential to adversely affect significant archaeological resources**:
☐ Low ☐ Moderate ☐ High
**For moderate and high potential, is fieldwork recommended?** ☐ Yes ☐ No
**Briefly justify the recommendation:**
Justification for recommendation of fieldwork

H. **Has fieldwork already been conducted?** ☐ Yes ☒ No
***If YES:***
☐ Previously surveyed; refer to A. and B. above.
☐ Newly surveyed; attach report copies and provide full report reference here:
Full report reference

I. **Provide the name and qualifications of the person who provided the information for the Archaeology section:**
**Name:** Name of archaeologist **Agency/Firm:** Commonwealth Heritage Group
Is the person a 36CFR Part 61 Qualified Archaeologist? ☒ Yes ☐ No
Are their credentials currently on file with the SHPO? ☒ Yes ☐ No
*If NO,* attach this individual's qualifications form and resume.

***Archaeological site locations are legally protected.***
***This application may not be made public without first redacting sensitive archaeological information.***

## V. IDENTIFICATION OF CONSULTING PARTIES

a. **Provide a list of *all* consulting parties,** including Native American tribes, local governments, applicants for federal assistance/permits/licenses, parties with a demonstrated interest in the undertaking, and public comment:
Great Lakes Water Authority
Hazen and Sawyer
Wade Trim
Detroit Historic District Commission
Detroit Historic Designation Advisory Board
Michigan's 12 Federally designated Indian tribes

b. **Provide a summary of consultation with consultation parties:**
Letters notifying Michigan's 12 Indian tribes were sent in late February, but no responses have been received as of April 13, 2022.
Email notifications were sent to the Detroit Historic Designation Advisory Board and the Detroit Historic District Commission.

c. **Provide summaries of public comment and the method by which that comment was sought:**
A public hearing is scheduled for May 25, 2022 for input in the SRF plan. As of now, no public comments have been received.

## VI. DETERMINATION OF EFFECT

**Guidance for applying the Criteria of Adverse Effect can be found in *the Instructions for the Application for SHPO Section 106 Consultation Form*.**

a. **Basis for determination of effect**:

Besides the work on PS-1 Complex, it is determined that **no historic properties will be affected** for the remainder of the proposed construction activities. All of the activities will be taking place on facilities that do not meet the age criteria for listing on the National Register of Historic Places. Most of the entire site has been previously disturbed during construction activities at the site over the last 80 years, and there is limited likelihood that virgin soil will be disturbed. Use of an Inadvertent Discovery Plan is recommended for work activities during the PS-2 underground activities and while excavation activities are occurring related to the construction of the new SFE building in Project Area 4 A.

For the work on the PS-1 complex, it is determined that the construction activities will have **no adverse effect** on the pump house. One doorway/window opening is being widened on the northside of the Pump House to allow for the safe and easy removal and installation of pumps from/into the building that occur regularly during refurbishment or replacement. The current opening is barely sufficient enough to allow the removal of the pumps, and to accomplish these repairs/replacements, the entire window and door assembly has to be removed. The brickwork will be widened by approximately 18 inches in the one bay and existing bricks will be used so that the widening of the opening is not noticeable. A small new control structure will be added that is designed with complimentary brick materials, massing, and detailing; however, the new structure will be clearly evident that the addition is a new due to its diminutive size related to the existing structures. This construction activity will not impact the eligibility of the PS-1 complex for listing to the National Register of Historic Places.

b. **Determination of effect**

☒ **No historic properties will be affected** or

☒ **Historic properties will be affected** and the project will (check one):

☒ have **No Adverse Effect** on historic properties within the APE.

☐ have an **Adverse Effect** on one or more historic properties in the APE and the federal agency, or federally authorized representative, will consult with the SHPO and other parties to resolve the adverse effect under 800.6.

☐ **More Information Needed:** We are initiating early consultation. A determination of effect will be submitted to the SHPO at a later date, pending results of survey.

Federally Authorized Signature:______________________________________ Date:________________

Type or Print Name: ______________________________________________

Title: ____________________________________________________________

APPLICATION FOR SHPO SECTION 106 CONSULTATION

## ATTACHMENT CHECKLIST

**Identify any materials submitted as attachments to the form:**

☐ Additional federal, state, local government, applicant, consultant contacts

☒ Maps of project location

Number of maps attached: three

☐ Site Photographs

☐Map of photographs

☐ Plans and specifications

☐ Other information pertinent to the work description: Identify the type of materials attached

☐ Documentation of previously identified historic properties

☒ Architectural Properties Identification Forms

☐ Map showing the relationship between the previously identified properties, your project footprint, and project APE

☐ Above-ground qualified person's qualification form and resume

☐ Archaeological sensitivity map

☐ Survey report

☐ Archaeologist qualifications and resume

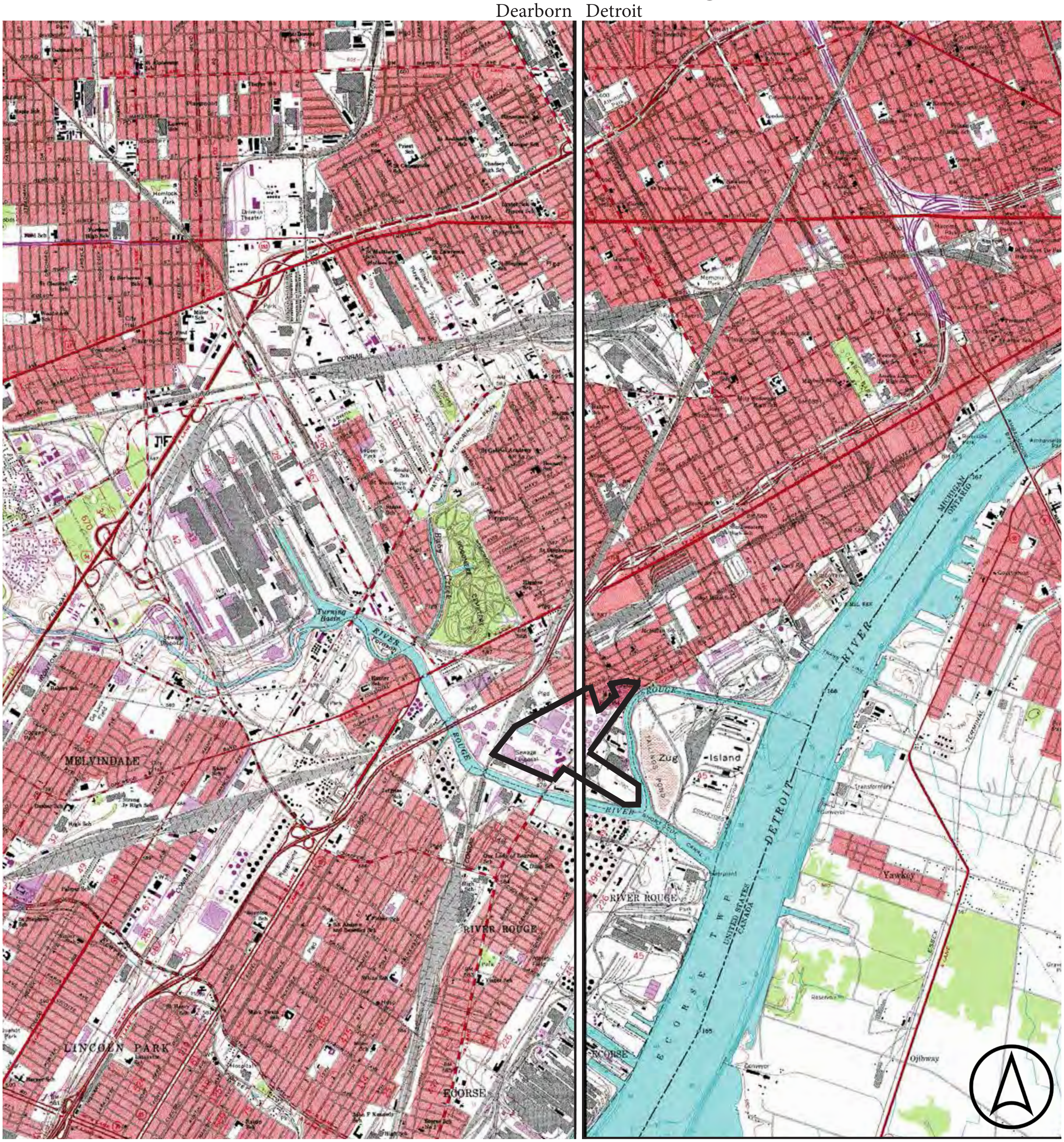
☐ Other: Identify other attached materials

# Great Lakes Water Authority
# 2023 Water Resource Recovery Facility
# Clean Water SRF Project
# Areas of Potential Effects Map


Source: Google Earth

**Project APE Areas**
#1 - Pump Station 1
#2 - Pump Station 2
#3 - Aeration Decks
#4 A - SFE - New Building
#4 B - SFE Pump House (existing)

# Great Lakes Water Authority
# 2023 Water Resource Recovery Facility
# Clean Water SRF Project
# Topographical Map
# Dearborn and Detroit Quadrangle Maps




Project Location

Source: U.S.G.S. Topographic Map
*not to scale*

# Great Lakes Water Authority
# 2023 Water Resource Recovery Facility
# Clean Water SRF Project
# Aerial Map


Source: Google Earth

# Michigan SHPO Architectural Properties Identification Form

Property Overview and Location    Pump Station 1 Complex

| | | | |
|---|---|---|---|
| Street Address | 9300 W. Jefferson Avenue | | |
| City/Township, State, Zip Code | Detroit, MI 48209 | | |
| County | Wayne | | |
| Assessor's Parcel # | 20000089 | | |
| Latitude/Longitude (to the 6th decimal point) | Lat:42.284242 | Long: -83.126734 | |

| | | | | | |
|---|---|---|---|---|---|
| Ownership | Private ☐ | Public-Local ☒ | Public-State ☐ | Public-Federal ☐ | Multiple ☐ |

**Property Type**

*(Insert primary photograph below.)*

| | |
|---|---|
| Building ☒ select sub-type below<br>Commercial ☐<br>Residential ☐<br>Industrial ☒<br>Other ☐ | Structure ☒<br>Object ☐ |


**Architectural Information**

| | | |
|---|---|---|
| Construction Date | 1935-1940 | |
| Architectural Style | Classical | |
| Building Form | Round and Rectilinear | |
| Roof Form | Flat | |
| Roof Materials | Composite | |
| Exterior Wall Materials | Brick | |
| Foundation Materials | Concrete | |
| Window Materials | Aluminum | |
| Window Type | Industrial Casements | |
| Outbuildings | Yes ☒ | No ☐ |
| Number/Type: | Six/Utilitarian | |

**Eligibility**

| | | | | |
|---|---|---|---|---|
| Individually Eligible | Criterion A ☒ | Criterion B ☐ | Criterion C ☒ | Criterion D ☐ |
| Criteria Considerations: | | a. ☐ b. ☐ c. ☐ d. ☐ e. ☐ f. ☐ g. ☐ | | |
| Component of a Historic District | Contributing to a district ☐ | Non-contributing to a district ☐ | Historic District Name | |
| Not Eligible ☐ | | | | |

| | |
|---|---|
| Area(s) of Significance | Architecture, Engineering |
| Period(s) of Significance | 1940 to present |

Integrity – Does the property possess integrity in all or some of the 7 aspects?

| | | | | | | |
|---|---|---|---|---|---|---|
| Location ☒ | Design ☒ | Materials ☒ | Workmanship ☒ | Setting ☒ | Feeling ☐ | Association ☒ |

| | | | | |
|---|---|---|---|---|
| General Integrity: | Intact ☐ | Altered ☐ | Moved ☐ | Date(s): |
| Historic Name | Detroit Wastewater Treatment Plant | | | |
| Current/Common Name | GLWA Water Resource Recovery Facility | | | |
| Historic/Original Owner | City of Detroit | | | |
| Historic Building Use | Sewer treatment plant | | | |
| Current Building Use | same | | | |
| Architect/Engineer/Designer | J.S. Stringham – Detroit City Engineer | | | |
| Builder/Contractor | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Survey Date | | Recorded By | | Agency Report # | |

| | | |
|---|---|---|
| For SHPO Use Only | SHPO Concurrence?: Y / N | Date: |

**Narrative Architectural Description**

*Provide a detailed description of the property, including all character-defining features and any accessory resources. This is required for all properties.*

The Pump House 1 complex at the WRRF is comprised of the circular measuring 56 feet in circumference measuring 50 feet tall, which is connected to the Rack and Grit Building by a narrow one story Control Room connector. The Rack and Grit Building measures 218 feet long by 55 feet wide by 37 feet tall. All three structures include a darker brick base, central vertical section with a corbelled brick cornice with extruded aluminum coping. Very restrained classical detailing is used throughout.

The Pump House 1 structure is divided into vertical bays approximately 20 feet wide with brick piers separating the individual bays. There is a decorative brick corbelled band that encircles the building. The building's original main entrance is located on the eastern façade with an entrance portico breaking up the circular nature of the pump house. The portico aligns with the Rack and Grit Building. The portico is divided into three bays with narrow vertical window bays on the east side of the entrance bay. Decorative brickwork surmounts the central doorway feature with horizontal and vertical elements and a single upright acorn decorate sconce is located on each side of the doorway. Each of the bays include a carved stone panel inserted into the façade centered over each of the window openings. There are decorative narrow limestone blocks matching the height of the bricks as accents at the top of the vertical brickwork before reaching the soldier coursework across each of the window openings.

Both the Control Room and the Rack and Grit Buildings continue the vertical bay arrangements with the Rack and Grit Building having 13 bays, but there are no inset stone panels above each of the bays however, and only a single piece of decorative stone is at the top of the vertical brick bands adjacent to windows as compared the windows in the Pump House 1. The ends of the Rack and Grit Building are solid brick bays with a single band of vertical windows, which matches the style of the side bays on the front portico to the Pump House 1.

**History of the Resource**

*Provide information on previous owners, land use(s), and construction and alteration dates in a narrative format. <u>This is required for all intensive level surveys, NRPQs, and nominations, and recommended for other identification efforts</u>.*

The Water Resources Recovery Facility, aka Detroit Wastewater Treatment Plant, was constructed 1935-1940 for $27 million with majority of the funding coming from the Public Works Administration. This project included the construction of Pump Station 1, the Incinerator Building, and other ancillary structures. The project was designed to collect sewage from the City of Detroit and seven adjacent communities and provide primary treatment through the use of bar screens, grit chambers, sedimentation tanks, and chlorination. L.G. Lenhardt was the Commissioner of Public Works at the time of construction.

The plant included an unusual enclosed sod covered sedimentation tank farm due to the close proximity of the complex to the Carbon Works and Delray neighborhoods.

The plant received a $33 million upgrade in 1957 that expanded and improved the facilities associated with PS-1. Changes to Federal regulations including amendments to the Federal Water Pollution Control Act of 1972 (aka the Clean Water Act), and further amendments to Clean Water Act of 1977 spurred significant expansion of the Detroit Wastewater Treatment Plant to include secondary treatment and numerous cylindrical tanks to the northeast of the PS-1 site, nearly doubling the size of the complex through residential removal of several blocks of homes.

In the 1990s, Pump Station 2 was constructed to increase the plant capacity.

**Statement of Significance/Recommendation of Eligibility**

*Provide a detailed explanation of the property's eligibility for the National Register. Include an evaluation under at least one of the four National Register Criteria and one Area of Significance. Include a discussion of the seven aspects of integrity, and make a recommendation about eligibility. <u>This is required for all properties</u>.*

The Pump Station 1 building meets Criterion A and Criterion C.

The effort to bring wastewater treatment to municipal areas was a major concern during the first half of the 20th Century when significant urban and industrial growth exceeded the capacity of the dilution model to address sewerage. From the early 1910s, Detroit as a region was trying to determine where and how to fund wastewater treatment for the rapidly growing metropolitan area. By the time the funding was addressed through State laws and funding from the Public Works Administration, the Delray site was the only location available. Detroit was constructed as the largest single sewerage plant in the country, a title that it retains today. The location and construction of Detroit's Wastewater Treatment Plant is indicative of a series of events that reflect the pattern of development of the Detroit Metropolitan area as the plant was expanded in the 1950s to allow for much of the region's suburban sprawl.

Regarding Criterion C, the neo-classical design of the pump and flume structures illustrates a peak in municipal architecture where no expense was spared on the brick detailing of utilitarian buildings. After World War II, the design trend would be constrained by the influences of growing Modernism architectural style and a growing cost consciousness that would limit the amount of spending on "non-necessary aesthetic" flourishes on industrial buildings.

The PS-1 complex is significant in the following areas: Architecture and Engineering. It is an exceptional example of the ornate Classicism utilized on a municipal service building and Pump Station 1 served as the pumping station to North America's largest single wastewater treatment plant.

The PS-1 complex retains a majority of its integrity including location, design, materials, workmanship, setting, and association. It's feeling as been altered with the construction of a three and half story tall parking deck directly to its south, and it affects the original alignment of PS-1 that is no longer easily visible from W. Jefferson Avenue.

The PS-1 complex is eligible for listing to the National Register of Historic Places.

**References**

*List references used to research and evaluate the individual property. For NRPQ's include copies of key documents.*

Hyde, Charles K., *The Lower Peninsula of Michigan: An Inventory of Historic Engineering and Industrial Sites*, National Park Service, Historic American Engineering Record, Office of Archaeology and Historic Preservation, 1976.

Johnson, Barry N., *Wastewater Treatment Comes to Detroit: Law, Politics, Technology, and Funding*, Wayne State University, Doctor of Philosophy dissertation, May 2011.

Daisy, Michael, *Detroit Water and Sewerage Department: The First 300 Years*, City of Detroit, 2001.

*Detroit Water and Sewerage Department: Wastewater Master Plan Executive Summary*, Camp Dresser & McKee, October 2003.

Sauer, Wm. C, *Detailed Official Atlas of Wayne County*, Wm. C. Sauer, Detroit, MI, 1893.

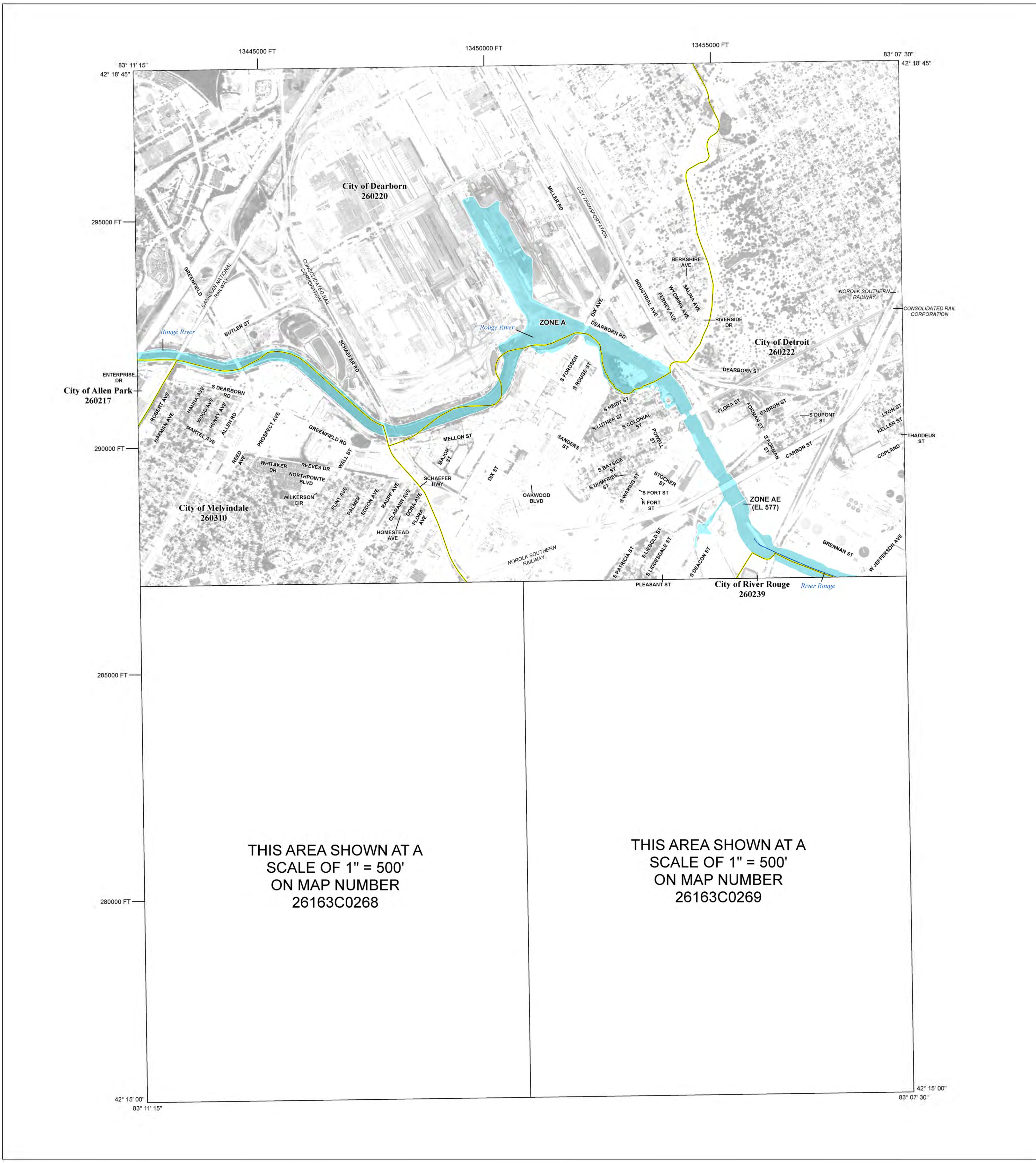
*Sewerage Treatment Plant – Pumping Station and Grit Chambers – P.W.A. Docket No. 9602-R* drawings, City of Detroit Department of Public Works, City Engineering Office, Bureau of Public Structures, 1936-37.

# Cultural Evaluation Report

TO BE ADDED IN FINAL PROJECT PLAN

# Appendix B.
# Supporting Resources for Environmental Evaluation

# FEMA FIRMette Map Panels




## FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

| | |
|---|---|
| SPECIAL FLOOD HAZARD AREAS | Without Base Flood Elevation (BFE) *Zone A, V, A99* |
| | With BFE or Depth *Zone AE, AO, AH, VE, AR* |
| | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* |
| | Future Conditions 1% Annual Chance Flood Hazard *Zone X* |
| | Area with Reduced Flood Risk due to Levee See Notes. *Zone X* |
| | Area with Flood Risk due to Levee *Zone D* |
| OTHER AREAS | NO SCREEN Areas of Minimal Flood Hazard *Zone X* |
| | Area of Undetermined Flood Hazard *Zone D* |
| GENERAL STRUCTURES | Channel, Culvert, or Storm Sewer |
| | Levee, Dike, or Floodwall |
| | E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation |
| | 8 Coastal Transect |
| | Coastal Transect Baseline |
| | Profile Baseline |
| | Hydrographic Feature |
| | 513 Base Flood Elevation Line (BFE) |
| OTHER FEATURES | Limit of Study |
| | Jurisdiction Boundary |

## NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

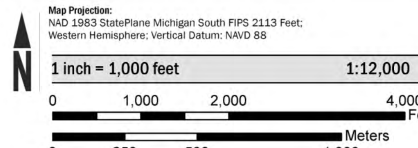
For community and countywide map dates refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

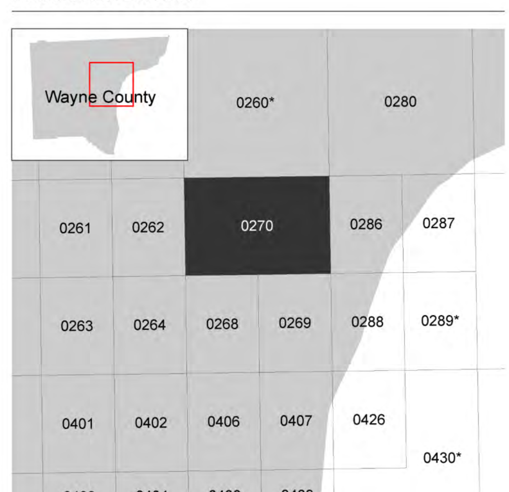
Base map information shown on this FIRM was provided in digital format by the United States Department of Agriculture Farm Service Agency (USDA-FSA). This information was derived from digital orthophotography at a 1-meter resolution from photography dated 2012.

## SCALE

Map Projection:
NAD 1983 StatePlane Michigan South FIPS 2113 Feet;
Western Hemisphere; Vertical Datum: NAVD 88




## PANEL LOCATOR




* PANEL NOT PRINTED

National Flood Insurance Program

FEMA

## NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

**WAYNE COUNTY, MICHIGAN**
(All Jurisdictions)

PANEL **270** OF **575**

FEMA

Panel Contains:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| ALLEN PARK, CITY OF | 260217 | 0270 | F |
| DEARBORN, CITY OF | 260220 | 0270 | F |
| DETROIT, CITY OF | 260222 | 0270 | F |
| MELVINDALE, CITY OF | 260310 | 0270 | F |
| RIVER ROUGE, CITY OF | 260239 | 0270 | F |

VERSION NUMBER
**2.4.3.5**

MAP NUMBER
**26163C0270F**

MAP REVISED
**OCTOBER 21, 2021**


## FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

**SPECIAL FLOOD HAZARD AREAS**
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

**OTHER AREAS**
- NO SCREEN Areas of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

**GENERAL STRUCTURES**
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**
- (E) 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- (8) Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

## NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

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Base map information shown on this FIRM was provided in digital format by the United States Department of Agriculture Farm Service Agency (USDA-FSA). This information was derived from digital orthophotography at a 1-meter resolution from photography dated 2012.

## SCALE

**Map Projection:**
NAD 1983 StatePlane Michigan South FIPS 2113 Feet; Western Hemisphere; Vertical Datum: NAVD 88

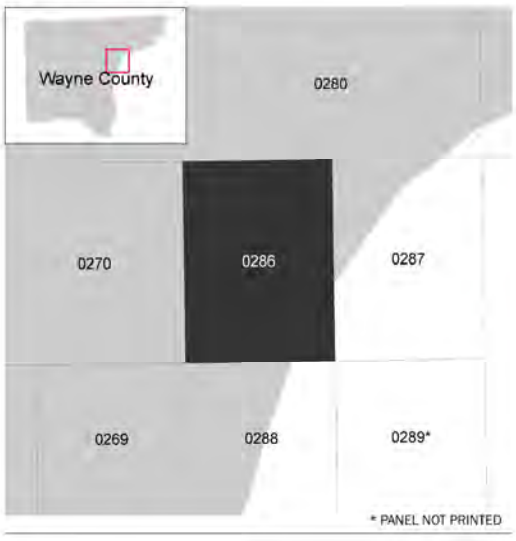
N

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 125 250 500 Meters

## PANEL LOCATOR




* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

**NATIONAL FLOOD INSURANCE PROGRAM**
FLOOD INSURANCE RATE MAP

**WAYNE COUNTY, MICHIGAN**
(All Jurisdictions)

PANEL 286 OF 575

FEMA

Panel Contains:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| DETROIT, CITY OF | 260222 | 0286 | F |
| RIVER ROUGE, CITY OF | 260239 | 0286 | F |

VERSION NUMBER
2.4.3.5

MAP NUMBER
26163C0286F

MAP REVISED
OCTOBER 21, 2021

MI-EGLE Wetland Inventory Map

# Wetlands Map Viewer

April 7, 2022

Wetland (Hydric) Soils

National Wetlands Inventory 2005

Potential Wetland Restoration

Highest Potential - Hydric and Presettlement Wetland Overlay

High Potential - Hydric Soils Only

Moderate Potential - Presettlement Wetlands Only

1:19,254

0 0.15 0.3 0.6 mi

0 0.25 0.5 1 km

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap

Disclamer: This map is not intended to be used to determine the specific

USGS National Surface Waters Map


USGS
National Water Dashboard
Add or remove map layers
Layers
Legend
Tools
Search for a place
Delray Community Center
Forman Playfield
US Steel Corp
DWSD Wastewater Treatment Plant
Zug Island
Levy Aggregates
Detroit Marine Terminal
River Rouge
Scale 9,028
300 m
1000 ft
Privacy Policy | Legal | Accessibility | Site Map | Contact USGS | USGS Provisional Statement
U.S. Department of the Interior | DOI Inspector General | White House | E-Gov | USA.gov | No FEAR Act Data | FOIA
Federal Data Sources Include
NIDIS
FAQ
Feedback

# MNFI Review Response

MICHIGAN STATE UNIVERSITY | Extension

Rebecca Bartlett, Engineer
Wade Trim
25251 Northline Road
Taylor, MI 48180

March 16, 2022

**Re: Rare Species Review #3079 – GLWA Clean Water Revolving Fund Project, Detroit, Wayne County, MI.**

Ms. Bartlett:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, …fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.

Several at-risk species have been documented within 1.5 miles of the proposed activity **and it is possible that negative impacts will occur.** This response reflects a desktop review of the database and MNFI cannot fully evaluate this project without visiting the area. MNFI offers several levels of Rare Species Reviews, including field surveys which I would be happy to discuss with you.

Sincerely,

*Michael A. Sanders*

Michael A. Sanders
Environmental Review Specialist/Zoologist
Michigan Natural Features Inventory

**MSU EXTENSION**

**Michigan Natural Features Inventory**

PO Box 13036
Lansing MI 48901

(517) 284-6200
Fax (517) 373-9566

mnfi.anr.msu.edu

**<u>Comments for Rare Species Review #3079:</u>**

It is important to note that it is the applicant's responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a <u>state</u> listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, DNR-Wildlife Division, 517-284-6210, or ReitzC@michigan.gov. If a federally listed species is involved and, you think a permit is needed, please contact Jessica Pruden, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8316, or Jessica_Pruden@fws.gov.

**NOTE:** special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts. Please consult MNFI's Rare Species Explorer for additional information on Michigan's rare plants and animals.

**Table 1: Occurrences of threatened and endangered species within 1.5 miles of RSR#3079**

| ELCAT | SNAME | SCOMNAME | USESA | SPROT | G_RANK | S_RANK | FIRSTOBS | LASTOBS |
|---|---|---|---|---|---|---|---|---|
| Animal | *Noturus stigmosus* | Northern madtom | | E | G3 | S1 | 1978 | 1978-05-16 |
| Animal | *Acipenser fulvescens* | Lake sturgeon | | T | G3G4 | S2 | 1978 | 1978 |
| Animal | *Falco peregrinus* | Peregrine falcon | | E | G4 | S3 | 1997 | 2019 |
| Animal | *Cyclonaias tuberculata* | Purple wartyback | | T | G5 | S2 | 2006-08 | 2019-07-29 |
| Animal | *Epioblasma torulosa rangiana* | Northern riffleshell | LE | E | G1 | S1 | 2006-08 | 2019-07-29 |
| Animal | *Obovaria olivaria* | Hickorynut | | E | G4 | S1 | 2006-08 | 2019-07-29 |
| Animal | *Toxolasma parvum* | Lilliput | | E | G5 | S1 | 1936-pre | 1936-pre |
| Animal | *Ligumia recta* | Black sandshell | | E | G4G5 | S1? | | |
| Animal | *Ligumia recta* | Black sandshell | | E | G4G5 | S1? | 2006-08 | 2019-07-29 |
| Animal | *Ligumia nasuta* | Eastern pondmussel | | E | G4 | S2 | 2019-07-29 | 2019-07-29 |
| Animal | *Obovaria subrotunda* | Round hickorynut | | E | G4 | S1 | 2019-07-29 | 2019-07-29 |
| Plant | *Zizania aquatica* | Wild rice | | T | G5 | S2S3 | 1915-09-15 | 1915-09-05 |

**<u>Comments for Table 1 :</u>**

**NOTE:** Several rare freshwater mussel species have been documented in the area. Freshwater mussels (*Unionida*) require a fish host to complete their life cycle. Eggs are fertilized and develop into larvae within the gills of the female mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult mussel. As zebra mussel (*Dreissena polymorpha*) infestation has led to the extirpation of many native mussel communities, boat hulls and trailers, fishing gear and scuba equipment should be thoroughly cleaned before moving between waterbodies, to prevent the spread of zebra mussel larvae and adults.

This section of the **Rouge River** in this area is a Group 2 mussel stream which means that state threatened, or state endangered mussels are expected to occur here and that certain surveys and possibly relocation procedures apply. I encourage you to review the ***Michigan Freshwater Mussel Survey Protocols and Relocation Procedures*** publication if in-stream work and/or land clearing activities occur that result in streambed disturbance and erosion and sedimentation into the river. A copy of the publication can be found at: https://mnfi.anr.msu.edu/resources/michigan-mussels

**Table 2: Occurrences of special concern species/natural features within 1.5 miles of RSR#3079**

| ELCAT | SNAME | SCOMNAME | USESA | SPROT | G_RANK | S_RANK | FIRSTOBS | LASTOBS |
|---|---|---|---|---|---|---|---|---|
| Animal | *Pleurobema sintoxia* | Round pigtoe | | SC | G4G5 | S3 | 2006-08 | 2006-08 |
| Animal | *Villosa iris* | Rainbow | | SC | G5 | S3 | 2006-08 | 2006-08 |
| Animal | *Cincinnatia cincinnatiensis* | Campeloma spire snail | | SC | G5 | S3 | | |
| Animal | *Nycticorax nycticorax* | Black-crowned night-heron | | SC | G5 | S3 | 2006-06-25 | 2006-06-25 |
| Animal | *Lasmigona costata* | Flutedshell | | SC | G5 | SNR | 2006-08 | 2006-08 |
| Animal | *Potamilus alatus* | Pink heelsplitter | | SC | G5 | SNR | 2006-08 | 2019-07-29 |
| Animal | *Ptychobranchus fasciolaris* | Kidney shell | | SC | G4G5 | S2 | 2006-08 | 2019-07-29 |
| Animal | *Truncilla truncata* | Deertoe | | SC | G5 | S2S3 | 2006-08 | 2006-08 |
| Animal | *Lasmigona costata* | Flutedshell | | SC | G5 | SNR | 2019-07-29 | 2019-07-29 |
| Animal | *Villosa iris* | Rainbow | | SC | G5 | S3 | 2019-07-25 | 2019-07-25 |
| Plant | *Cerastium velutinum* | Field Chickweed | | X | G5T4? | SX | 1867-05 | 1867-05 |
| Plant | *Corispermum pallasii* | Pallas' bugseed | | SC | G4? | SNR | 1930-09-30 | 1930-09-30 |

**Comments for Table 2 :**

**NOTE:** Several rare freshwater mussel speices have been documented in the area. Freshwater mussels (*Unionida*) require a fish host to complete their life cycle. Eggs are fertilized and develop into larvae within the gills of the female mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult mussel. As zebra mussel (*Dreissena polymorpha*) infestation has led to the extirpation of many native mussel communities, boat hulls and trailers, fishing gear and scuba equipment should be thoroughly cleaned before moving between waterbodies, to prevent the spread of zebra mussel larvae and adults.

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# Codes to accompany Occurrence Tables:

**State Protection Status Code Definitions (SPROT)**
E: Endangered
T: Threatened
SC: Special concern

**Federal Protection Status Code Definitions (USESA)**
LE = listed endangered
LT = listed threatened
LELT = partly listed endangered and partly listed threatened
PDL = proposed delist
E(S/A) = endangered based on similarities/appearance
PS = partial status (federally listed in only part of its range)
C = species being considered for federal status

**Global Heritage Status Rank Definitions (GRANK)**
The priority assigned by NatureServe's national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.
G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
Q: Taxonomy uncertain

**State Heritage Status Rank Definitions (SRANK)**
The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.
S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.
S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.
S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).
S4 = apparently secure in state, with many occurrences.
S5 = demonstrably secure in state and essentially ineradicable under present conditions.
SX = apparently extirpated from state.

**Section 7 Comments for Rare Species Review #3079**
**Wade Trim**
**GLWA Clean Water Revolving Fund Project Plan for FY22**
**City of Detroit**
**Wayne County, MI**
**March 16, 2022**

**<u>For projects involving Federal funding or a federal agency authorization</u>**

The following information is provided to assist you with Section 7 compliance of the Federal Endangered Species Act (ESA). The ESA directs all Federal agencies “to work to conserve endangered and threatened species. Section 7 of the ESA, called "Interagency Cooperation, is the means by which Federal agencies ensure their actions, including those they authorize or fund, do not jeopardize the existence of any listed species.”

The proposed project falls within the range of nine (9) federally listed/proposed/candidate species that have been identified by the U.S. Fish and Wildlife Service (USFWS) to occur in Wayne County, Michigan:

**<u>Federally Endangered</u>**

**Indiana bat** – there appears to be suitable habitat within 1.5 miles of the project site. Indiana bats (*Myotis sodalis*) are found only in the eastern United States and are typically confined to the southern three tiers of counties in Michigan. Indiana bats that summer in Michigan winter in caves in Indiana and Kentucky. This species forms colonies and forages in riparian and mature floodplain habitats. Nursery roost sites are usually located under loose bark or in hollows of trees near riparian habitat. Indiana bats typically avoid houses or other artificial structures and typically roost underneath loose bark of dead elm, maple and ash trees. Other dead trees used include oak, hickory and cottonwood.

Foraging typically occurs over slow-moving, wooded streams and rivers as well as in the canopy of mature trees. Movements may also extend into the outer edge of the floodplain and to nearby solitary trees. A summer colony's foraging area usually encompasses a stretch of stream over a half-mile in length. Upland areas isolated from floodplains and non-wooded streams are generally avoided.

*Conservation and Management*: the suggested seasonal tree cutting range for Indiana bat is between October 1 and March 31 (i.e., no cutting April 1-September 30). This applies throughout the Indiana bat range in Michigan.

**Northern riffleshell** – there are documented occurrences within 1.5 miles of the project site. The northern riffleshell *(Epioblasma torulosa-angiana)* mussel inhabits medium to large rivers in gravel riffles, where the water is highly oxygenated. This species was formerly widespread in the Midwest, but it has declined in range by more than 95% and now exists in only eight to ten isolated populations, most of which are small and peripheral.

*Conservation and Management*: members of the genus *Epioblasma* seem to be particularly sensitive to impacts from impoundment, which include population fragmentation and streamflow alteration. Other threats include habitat destruction (e.g. channelization, dredging, bulkheading), exotic species introductions, siltation, pollution, and modified streamflows due to wetland loss, dam operation, and intensive landscape modification. The other two subspecies of *E. torulosa*, *E. torulosa torulosa* and *E. torulosa gubernaculum*, appear to have already gone extinct due to modification and degradation of river systems.

**Piping plover** – there does not appear to be suitable habitat within 1.5 miles of the project site. In the Great Lakes region, the federal and state endangered piping plover *(Charadrius melodus)* prefers to nest and forage on sparse or non-vegetated sand-pebble beaches with less than 5% vegetative cover. Nests are simple depressions in the sand are generally placed in level areas between the water's edge and the first dune. Associated bodies of water and interdunal wetlands enhance these areas by increasing food availability. Optimal foraging areas are especially crucial along Lake Superior, where shoreline and benthic invertebrate communities are known to be naturally sparse. While feeding, open shoreline is preferred to vegetated beach areas. Piping plovers begin arriving in mid- to late-April. The nesting season is under way by mid-May and lasts until mid-August.

*Conservation and Management* - this species is declining throughout the Midwest due to habitat destruction and disturbance. The nests are simple depressions in the sand and are difficult to see. People walking on the beach may inadvertently destroy nests. Dogs on the beach can be especially dangerous for chicks and adults. Piping plovers are protected under the Federal Endangered Species Act and are very sensitive to human disturbance. Please avoid activity along the shoreline in this compartment between May and September.

**Rayed bean mussel** – there appears to be suitable habitat within 1.5 miles of the project site. The federally and state endangered rayed bean mussel *(Villosa fabalis)* is found in fine mud substrates and riffles among roots of aquatic vegetation. Limits of the breeding season are not known but gravid specimens have been found in May.

*Conservation and Management*: like other mussels, threats to the rayed bean include: natural flow alterations, siltation, channel disturbance, point and non-point source pollution, and exotic species. Maintenance or establishment of vegetated riparian buffers can help protect mussel habitats from many of their threats. Control of zebra mussels is critical to preserving native mussels. And as with all mussels, protection of their hosts habitat is also crucial.

**Federally Threatened**

**Northern long-eared bat** - although no known hibernacula or roost trees have been documented within 1.5 miles of the project site, this activity occurs within the designated WNS zone (i.e., within 150 miles of positive counties/districts impacted by WNS. In addition, suitable habitat does exist within 1.5 miles of the project. The USFWS has prepared a dichotomous key to help determine if this action may cause prohibited take of this bat. Please consult the USFWS Endangered Species Page for more information.

Northern long-eared bat (*M. septentrionalis*) numbers in the northeast US have declined up to 99 percent. Loss or degradation of summer habitat, wind turbines, disturbance to hibernacula, predation, and pesticides have contributed to declines in Northern long-eared bat populations. However, no other threat has been as severe to the decline as White-nose Syndrome (WNS). WNS is a fungus that thrives in the cold, damp conditions in caves and mines where bats hibernate. The disease is believed to disrupt the hibernation cycle by causing bats to repeatedly awake thereby depleting vital energy reserves. This species was federally listed in May 2015 primarily due to the threat from WNS.

Also called northern bat or northern myotis, this bat is distinguished from other *Myotis* species by its long ears. In Michigan, northern long-eared bats hibernate in abandoned mines and caves in the Upper Peninsula; they also commonly hibernate in the Tippy Dam spillway in Manistee County. This species is a regional migrant with migratory distance largely determined by locations of suitable hibernacula sites.

Northern long-eared bats typically roost and forage in forested areas. During the summer, these bats roost singly or in colonies underneath bark, in cavities or in crevices of both living and dead trees. These bats seem to select roost trees based on suitability to retain bark or provide cavities or crevices. Common roost trees in southern Lower Michigan included species of ash, elm, and maple. Foraging occurs primarily in areas along woodland edges, woodland clearings, and over small woodland ponds. Moths, beetles, and small flies are common food items. Like all temperate bats this species typically produces only 1-2 young per year.

*Conservation and Management*: when there are no known roost trees or hibernacula in the project area, we encourage you to conduct tree-cutting activities and prescribed burns in forested areas during October 1 through March 31. When that is not possible, we suggest all tree removal occur prior to June 1 or after July 31, as that will help to protect young bats that may be in forested areas but are not yet able to fly.

**Eastern prairie fringed orchid** – there does not appear to be suitable habitat within 1.5 miles of the project site. The eastern prairie fringed orchid (*Platanthera leucophaea*) occurs in a wide variety of habitats, from mesic prairie to wetlands such as sedge meadows, marsh edges, even bogs. It requires full sun for optimum growth and flowering and a grassy habitat with little or no woody encroachment. The white blossoms produce a heavy fragrance at dusk that attracts many moths, including the primary pollinators of *P. leucophaea*, hawkmoths (Lepidoptera: Sphingidae). Hawkmoths are likely co-adapted pollinators, since their tongues are long enough to reach the nectar that lies deep in the spur of the flower. Capsules mature in September, releasing hundreds of thousands of airborne seeds. Plants may not flower every year but frequently produce only a single leaf above ground, possibly even becoming dormant when conditions are unsuitable, such as the onset of drought.

*Conservation and Management*: this species requires the maintenance of natural hydrological cycles and open habitat. Activities such as shrub removal are likely to benefit the species, but other management such as prescribed fire is not well understood. Caution and proper monitoring should be employed if using prescribed fire in occupied habitat. Spring fires should be conducted prior to emergence (mid-April). Poaching is also a threat.

**Rufa red knot** – there appears to be suitable habitat within 1.5 miles of the project site. The rufa red knot (*Calidris canutus rufa*) is one of the longest-distance migrants in the animal kingdom, flying some 18,000 miles annually between its breeding grounds in the Canadian Arctic to the wintering grounds at the southern-most tip of South America. Primarily occurring along the Atlantic and Gulf coasts, small groups of this shorebird regularly use the interior of the United States such as the Great Lakes during the annual migration. The Great Lakes shorelines provide vital stopover habitat for resting and refueling during their long annual journey.

The largest concentration of rufa red knots is found in May in Delaware Bay, where the birds stop to gorge on the eggs of spawning horseshoe crabs; a spectacle attracting thousands of birdwatchers to the area. In just a few days, the birds nearly double their weight to prepare for the final leg of their long journey to the Arctic. This species may be especially vulnerable to climate change which affects coastal habitats due to rising sea levels.

*Conservation and Management*: applies to actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.

**Eastern massasauga rattlesnake (EMR)** – the project falls outside of EMR habitat as designated by the US Fish and Wildlife Service. The eastern massasauga rattlesnake *(Sistrurus catenatus)* is Michigan's only venomous snake and is found in a variety of wetland habitats including bogs, fens, shrub swamps, wet meadows, marshes, moist grasslands, wet prairies, and floodplain forests. Eastern massasaugas occur throughout the

Lower Peninsula but are not found in the Upper Peninsula. Populations in southern Michigan are typically associated with open wetlands, particularly prairie fens, while those in northern Michigan are better known from lowland coniferous forests, such as cedar swamps. These snakes normally overwinter in crayfish or small mammal burrows often close to the groundwater level and emerge in spring as water levels rise. During late spring, these snakes move into adjacent uplands they spend the warmer months foraging in shrubby fields and grasslands in search of mice and voles, their favorite food.

Often described as "shy and sluggish", these snakes avoid human confrontation and are not prone to strike, preferring to leave the area when they are threatened. However, like any wild animal, they will protect themselves from anything they see as a potential predator. Their short fangs can easily puncture skin and they do possess potent venom. Like many snakes, the first human reaction may be to kill the snake, but it is important to remember that all snakes play vital roles in the ecosystem. Some may eat harmful insects. Others like the massasauga consider rodents a delicacy and help control their population. Snakes are also a part of a larger food web and can provide food to eagles, herons, and several mammals.

*Conservation and Management:* maintaining or restoring open habitat conditions is critical for this species. Fragmentation of suitable wetland-upland habitat complexes by roads or other barriers should be avoided or minimized. Land management practices such as timber harvesting, mowing, disking, or prescribed burning should be conducted in such a manner so as to minimize the potential for adverse impacts to massasaugas (e.g., conducting management activities during the snakes' inactive season (November through early March) or on days when snakes are less likely to be active on the surface during the active season). Protecting suitable hibernation sites also is critical. Hydrological alterations such as drawdowns should be conducted prior to or after hibernation to reduce the potential for causing winter mortality due to desiccation or freezing. Sudden and/or permanent increases or decreases in water levels during the active season also can cause adverse impacts.

**<u>Candidate Species</u>**

**Monarch Butterfly** (*Danaus plexipuss*) on December 15, 2020, the U.S. Fish and Wildlife Service announced that listing the monarch as endangered or threatened under the Endangered Species Act is warranted but precluded by higher priority listing actions. The decision is the result of an extensive status review of the monarch that compiled and assessed the monarch's current and future status. The monarch is now a candidate under the Endangered Species Act; we will review its status annually until a listing decision is made.

*Management and Conservation*: neither section 7 of the Endangered Species Act nor the implementing regulations for section 7 contain requirements for federal agencies with respect to candidate species. Habitat loss and fragmentation has occurred throughout the monarch's range. Pesticide use can destroy the milkweed monarchs need to survive. A changing climate has intensified weather events which may impact monarch populations.

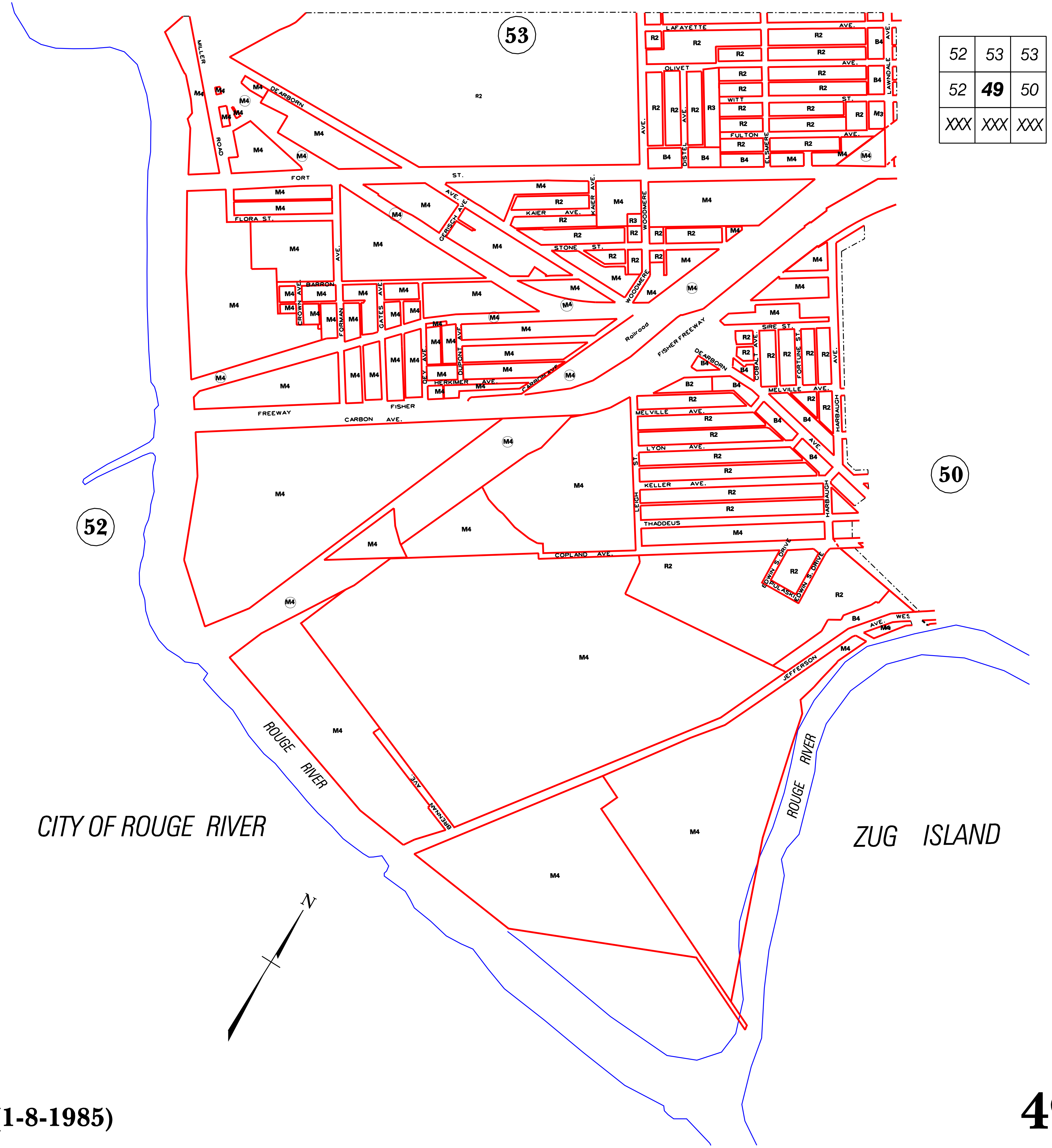
USFWS Section 7 Consultation Technical Assistance can be found at:

https://www.fws.gov/midwest/endangered/section7/s7process/index.html

The website offers step-by-step instructions to guide you through the Section 7 consultation process with prepared templates for documenting "no effect." as well as requesting concurrence on "may affect, but not likely to adversely affect" determinations.

# Appendix C.
# Zoning Map

City of Detroit Zoning Map Panel


52 53 53
52 49 50
XXX XXX XXX
53
50
52
CITY OF ROUGE RIVER
ZUG ISLAND
ROUGE RIVER
ROUGE RIVER
N
FORT ST.
FISHER FREEWAY
CARBON AVE.
COPLAND AVE.
JEFFERSON
DEARBORN
LAFAYETTE AVE.
OLIVET
FULTON AVE.
MELVILLE AVE.
LYON AVE.
KELLER AVE.
THADDEUS
HARBAUGH
LEIGH ST.
WOODMERE
Railroad

# 49 (1-8-1985)

49

# Appendix D.
# Fiscal Sustainability and Cost Estimation Certifications

# Signed Project Useful Life and Cost Analysis Certification Form

# Project Useful Life and Cost Analysis Certification Form

Project Information

Applicant Name:
______________________________________________________________________

SRF Project to be Funded:_______________________________________________

______________________________________________________________________

______________________________________________________________________

Per Section 602(b)(13) of the Federal Water Pollution Control Act (FWPCA), all Clean Water State Revolving Fund (CWSRF) assistance recipients must certify that they have conducted the studies and evaluations described in 602(b)(13)(A) and (B), collectively known as a cost and effectiveness analysis.

☐ 1) The applicant has studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is sought under the CWSRF; and

☐ 2) The applicant has selected, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of:
- o constructing the project or activity;
- o operating and maintaining the project or activity over the life of the project; and
- o replacing the project or activity.

☐ 3) The applicant has completed a Project Useful Life analysis for the project or activity. **Attach appropriate documentation**

I certify that requirements (1), (2), and (3) as checked above have been met.

______________________________________________________________________
Name of Professional Engineer *(Please Print or Type)*

______________________________________________________________________
Signature of Professional Engineer Date

______________________________________________________________________
Name and Title of Authorized Representative *(Please Print or Type)*

______________________________________________________________________
Signature of Authorized Representative Date

# Signed Fiscal Sustainability Plan Certification Form

# Fiscal Sustainability Plan Certification Form

Describe SRF Project to be Funded: OR SRF Project Number ______________

______________________________________________________________________

______________________________________________________________________

Check one box below:

☐ FSP does not apply because:

- ☐ The project is for a new treatment works system.
- ☐ The project involves an upgrade that does not involve repair/replacement or expansion of a treatment works system.
- ☐ The project is for nonpoint source work.
- ☐ Other (explain)

☐ FSP is complete for the SRF-funded project and is available for review by contacting:

______________________________________________________________________
(Name) (Phone)

______________________________________________________________________

______________________________________________________________________

I certify that ________________________________ has developed and implemented a plan that meets
(Applicant's Name)
the requirements of Section 603(d)(1)(E)(i) of the Water Resources Reform and Development Act of 2014. The FSP includes an inventory of critical assets, an evaluation of the condition and performance of inventoried assets, a plan for maintaining, repairing, and as necessary, replacing the treatment works, and a plan for funding such activities. The applicant also certifies that the water and energy conservation efforts have been evaluated and will be implemented.

______________________________________________________________________
Name and Title of Authorized Representative *(Please Print or Type)*

______________________________________________________________________
Signature of Authorized Representative Date

*2/2015*

# Appendix E.
# Regulatory Compliance Documents

# GLWA NPDES Discharge Permit

# PERMIT NO. MI0022802

# *STATE OF MICHIGAN*
# *DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY*

## AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, 33 U.S.C., Section 1251 *et seq*., as amended; Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); Part 41, Sewerage Systems, of the NREPA; and Michigan Executive Order 2011-1,

**City of Detroit Water and Sewerage Department**
735 Randolph
Detroit, MI 48226

and

**Great Lakes Water Authority**
735 Randolph
Detroit, MI 48226

are authorized to discharge from the **Great Lakes Water Authority Water Resource Recovery Facility** located at

9300 W. Jefferson
Detroit, MI 48209

designated as **GLWA WRRF**

to the receiving water named the Detroit River and the Rouge River, and from combined sewer overflow facilities to the receiving waters named the Detroit River, the Rouge River, and Conner Creek in accordance with effluent limitations, monitoring requirements, and other conditions set forth in this permit.

This permit is based on a complete application submitted on March 29, 2017 and amended through May 25, 2017.

**This permit takes effect on July 18, 2019**. The provisions of this permit are severable. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked in whole or in part during its term in accordance with applicable laws and rules. On its effective date, this permit shall supersede National Pollutant Discharge Elimination System (NPDES) Permit No. MI0022802 (expiring October 1, 2017).

This permit and the authorization to discharge shall expire at midnight on **October 1, 2022**. In order to receive authorization to discharge beyond the date of expiration, the permittees shall submit an application that contains such information, forms, and fees as are required by the Michigan Department of Environment, Great Lakes, and Energy (Department) by **April 4, 2022**.

**Issued:** June 28, 2019. This permit was modified (minor) on July 18, 2019.

Original signed by Christine Alexander
Christine Alexander, Manager
Permits Section
Water Resources Division

# PERMIT FEE REQUIREMENTS

In accordance with Section 324.3120 of the NREPA, the permittees shall make payment of an annual permit fee to the Department for each October 1 the permit is in effect regardless of occurrence of discharge. The permittees shall submit the fee in response to the Department’s annual notice. The fee shall be postmarked by January 15 for notices mailed by December 1. The fee is due no later than 45 days after receiving the notice for notices mailed after December 1.

**Annual Permit Fee Classification:** Municipal Major, 500 MGD or greater (IP)

In accordance with Section 324.3132 of the NREPA, the permittees shall make payment of an annual biosolids land application fee to the Department if the permittees land applies biosolids. In response to the Department's annual notice, the permittees shall submit the fee, which shall be postmarked no later than January 31 of each year.

# CONTACT INFORMATION

Unless specified otherwise, all contact with the Department required by this permit shall be made to the Southeast Michigan District Office of the Water Resources Division. The Southeast Michigan District Office is located at 27700 Donald Court, Warren, MI, 48092-2793, Telephone: 586-753-3700, Fax: 586-751-4690.

# CONTESTED CASE INFORMATION

Any person who is aggrieved by this permit may file a sworn petition with the Michigan Administrative Hearing System within the Michigan Department of Licensing and Regulatory Affairs, c/o the Michigan Department of Environment, Great Lakes, and Energy, setting forth the conditions of the permit which are being challenged and specifying the grounds for the challenge. The Department of Licensing and Regulatory Affairs may reject any petition filed more than 60 days after issuance as being untimely.

**PART I**

## Section A. Limitations and Monitoring Requirements

### 1. Effluent Limitations, Monitoring Point 049F

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittees are authorized to discharge treated municipal wastewater from Monitoring Point 049F through Outfall 049 (DRO). Outfall 049 (DRO) discharges to the Detroit River. Such discharge shall be limited and monitored by the permittees as specified below.

Until the initiation of operation of the Rouge River Outfall (RRO) Disinfection Project, this discharge shall consist of secondary treated municipal wastewater and additional primary treated municipal wastewater up to the hydraulic capacity of Outfall 049 (DRO). After initiation of operation of the RRO Disinfection Project, this discharge shall consist of secondary treated municipal wastewater typically, but primary treated municipal wastewater and additional secondary treated municipal wastewater up to the hydraulic capacity of Outfall 049 (DRO) during wet weather events. During such wet weather events, the permittees are approved to discharge primary treated municipal wastewater from 049A thorough Outfall 049 (DRO).

Whenever Outfall 049 (DRO) is out of service for repairs, the permittees may discharge through Outfall 050 (RRO). All effluent authorized for discharge from Outfall 049F, and the monitoring, limitations and other requirements specified below shall apply to the discharge through Outfall 050 (RRO) unless otherwise specified. At least 10 days in advance of scheduled maintenance and within 24-hours after initiation of diversion due to emergency conditions, the permittees shall notify the Department of the reason for the diversion and the expected duration of the diversion.

| | Maximum Limits for Quantity or Loading | | | | Maximum Limits for Quality or Concentration | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monitoring Frequency** | **Sample Type** |
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Fecal Coliform Bacteria | --- | --- | --- | --- | 200 | 400 | (report) | cts/100 ml | Daily | Grab |
| Total Residual Chlorine | --- | --- | --- | --- | --- | --- | 0.11 | mg/l | Daily | Grab |
| Oil & Grease | --- | --- | --- | --- | --- | 15 | (report) | mg/l | Daily | Grab |
| Polychlorinated Biphenyls (PCBs) | | | | | | | | | | |
| PCB Aroclor 1016 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1221 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1232 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1242 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1248 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1254 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1260 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| | | | | | **Maximum PCB Aroclor** | | | | | |
| PCB Aroclor (see I.A.1.g.) | | --- | --- | --- | <0.1 | --- | --- | µg/l | Monthly | See I.A.1.g. |
| Acute Toxicity | --- | --- | --- | --- | --- | --- | (report) | $TU_A$ | Quarterly | 24-Hr Composite |
| Carbonaceous Biochemical Oxygen Demand (CBOD5) | --- | --- | (report) | lbs/day | --- | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Ammonia Nitrogen (as N) | | --- | (report) | lbs/day | (report) | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Available Cyanide | --- | --- | (report) | lbs/day | --- | --- | (report) | µg/l | Monthly | Grab |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Perfluorooctane sulfonate (PFOS) | (report) | --- | (report) | lbs/day | (report) | --- | (report) | ng/l | Quarterly | Grab |
| Perfluorooctanoic acid (PFOA) | (report) | --- | (report) | lbs/day | (report) | --- | (report) | µg/l | Quarterly | Grab |
| Total Copper | --- | --- | (report) | lbs/day | --- | --- | (report) | µg/l | Quarterly | 24-Hr Composite |
| | | | | | **Minimum Daily** | | **Maximum Daily** | | | |
| pH | --- | --- | --- | --- | 6.0 | --- | 9.0 | S.U. | Daily | Grab |
| Dissolved Oxygen | --- | --- | --- | --- | (report) | --- | --- | mg/l | Daily | Grab |

The following design flow was used in determining the above limitations, but is not to be considered a limitation or actual capacity: a combined 930 MGD of secondary treated effluent.

a. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Sampling Locations
The sampling locations for the pollutants indicated in Part I.A.1. of this permit shall be representative of the effluent and consistent with the locations approved by the Department. The Department may approve alternate sampling locations that are demonstrated by the permittees to be representative of the effluent.

c. Quarterly Monitoring
Quarterly samples shall be taken during the months of January, April, July, and October. If the facility does not discharge during these months, the permittees shall sample the next discharge occurring during the period in question. If the facility does not discharge during the period in question, a sample is not required for that period. For any month in which a sample is not taken, the permittees shall enter "*G" on the Discharge Monitoring Report (DMR).

d. Total Residual Chlorine (TRC)
Compliance with the TRC limit shall be determined on the basis of one or more grab samples. If more than one (1) sample per day is taken, the additional samples shall be collected in near equal intervals over approximately eight (8) hours. The samples shall be analyzed immediately upon collection and the average reported as the daily concentration. Samples shall be analyzed in accordance with Part II.B.2. of this permit.

e. Monitoring Frequency Reduction for Perfluorooctane Sulfonate (PFOS) and/or Perfluorooctanoic Acid (PFOA)
After the submittal of 24 months of data, the permittee may request, in writing, Department approval of a reduction in monitoring frequency for PFOS and/or PFOA. This request shall contain an explanation as to why the reduced monitoring is appropriate. Upon receipt of written approval and consistent with such approval, the permittee may reduce the monitoring frequency indicated in Part I.A.1. of this permit. The monitoring frequency for PFOS and/or PFOA, shall not be reduced to less than annually. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittee.

f. Analytical Methods and Quantification Levels for Available Cyanide and Total Copper
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Available Cyanide shall be in accordance with EPA Method OIA-1677. The quantification level for Available Cyanide and Total Copper shall be 2.0 µg/l and 1.0 µg/l respectively unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination. Upon approval from the

Department, the permittees may use alternate analytical methods (for parameters with methods specified in Title 40 of the Code of Federal Regulations (CFR), Part 136, the alternate methods are restricted to those listed in 40 CFR, Part 136).

g. Limits Below the Quantification Level – Total Polychlorinated Biphenyls (PCBs)
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total PCBs shall be in accordance with EPA Method 608.3. Upon approval from the Department, the permittees may use alternate analytical methods (for parameters with methods specified in 40 CFR, Part 136, the alternate methods are restricted to those listed in 40 CFR, Part 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The water quality-based effluent limitation for Total PCBs is $2.6\times10^{-5}$ µg/l ($2.0\times10^{-4}$ lbs/day) maximum monthly average. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **The discharge of any individual aroclor at or above the quantification level of 0.1 ug/l is a specific violation of this permit**. If concentrations of all aroclors representing a monitoring period are less than their quantification levels, the permittees will be considered to be in compliance with the permit for the monitoring period that the analyses represent, provided that the permittees are also in full compliance with the Pollutant Minimization Program for Total PCBs set forth in Part I.A.10 of this permit. For the purpose of reporting on the Daily tab of the DMR, individual aroclor results less than the quantification level shall be reported as "<0.1." For the purpose of reporting on the Summary tab of the DMR, the value reported under PCB Aroclor shall be the highest aroclor concentration observed during the monitoring period. This permit condition does not authorize the discharge of PCBs at levels that are injurious to the designated uses of the waters of the state or that constitute a threat to the public health or welfare.

h. Acute Toxicity Requirements
Test species shall include *Ceriodaphnia dubia*. Testing and reporting procedures shall follow procedures contained in EPA-821-R-02-012, "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms" (Fifth Edition). When the effluent ammonia nitrogen (as N) concentration is greater than 5 mg/l, the pH of the toxicity test shall be maintained at the pH of the effluent at the time of sample collection. The acute toxic unit ($TU_A$) value for **each species tested** shall be reported on the DMR. For **each species not tested**, the permittees shall enter **"*W"** on the DMR. Completed toxicity test reports for each test conducted shall be retained by the permittees in accordance with the requirements of Part II.B.5. of this permit and shall be available for review by the Department upon request. Toxicity test data acceptability is contingent upon the validation of the test method by the testing laboratory. Such validation shall be submitted to the Department upon request.

The Department will review the toxicity data submitted by the permittees to determine if the acute toxicity requirements of R 323.1219 are being satisfied.

1) If the data indicate persistent exceedance of the acute toxicity requirements of R 323.1219, upon written notification by the Department, the following conditions apply. Within 90 days of the above notification, the permittees shall implement a Toxicity Reduction Evaluation (TRE). The objective of the TRE shall be to reduce the toxicity of the final effluent from Monitoring Point 049F to <3.0 $TU_A$ within three (3) years of notification. The following documents are available as guidance to reduce toxicity to acceptable levels: Phase I, EPA/600/6-91/003; Phase II, EPA/600/R-92/080; Phase III, EPA/600/R-92/081; and Publicly Owned Treatment Works, EPA/833B-99/002. The tests shall be conducted and reported as specified above. Upon approval from the Department, the acute toxicity tests may be performed using the more sensitive species identified in the acute toxicity database. If a more sensitive species cannot be identified, the acute toxicity tests shall be performed with both species. Annual progress reports shall be submitted to the Department within 30 days of the completion of the last test of each annual cycle.

2) This permit may be modified in accordance with applicable laws and rules to include additional whole effluent toxicity control requirements as necessary.

## 2. Effluent Limitations, Monitoring Point 049A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittees are approved to discharge treated municipal wastewater and treated storm water runoff from Monitoring Point 049A through Outfall 049 (DRO). Outfall 049 (DRO) discharges to the Detroit River. Such discharge shall be limited and monitored by the GLWA as specified below.

Monitoring Point 049A is a primary treated effluent conduit. There shall be no discharge from Monitoring Point 049A directly to the Detroit River through Outfall 049 (DRO) unless the discharge from Monitoring Point 049B exceeds a peak hourly flow of 930 MGD (which includes recycle) or in accordance with an approved GLWA Wet Weather Operational Plan (see Part I.A.11.). Discharges from Monitoring Point 049A shall be limited and monitored by the permittees as specified below.

| | Maximum Limits for Quantity or Loading | | | Maximum Limits for Quality or Concentration | | | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **Daily** | **Units** | **Monthly** | **Daily** | **Units** | **Monitoring Frequency** | **Sample Type** |
| Flow | (report) | (report) | MGD | --- | --- | --- | Daily | Report Total Daily Flow |
| Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) | --- | --- | --- | 40 | (report) | mg/l | Daily | 24-Hr Composite |
| Total Suspended Solids | --- | --- | --- | 70 | (report) | mg/l | Daily | 24-Hr Composite |
| Total Phosphorus (as P) | --- | --- | --- | 1.5 | (report) | mg/l | Daily | 24-Hr Composite |
| Ammonia Nitrogen (as N) | --- | --- | --- | (report) | (report) | mg/l | Daily | 24-Hr Composite |
| Total Mercury | | | | | | | | |
| – Corrected | (report) | (report) | lbs/day | (report) | (report) | ng/l | 2x Monthly | Calculation |
| – Uncorrected | --- | --- | --- | --- | (report) | ng/l | 2x Monthly | Grab |
| – Field Duplicate | --- | --- | --- | --- | (report) | ng/l | 2x Monthly | Grab |
| – Field Blank | --- | --- | --- | --- | (report) | ng/l | 2x Monthly | Preparation |
| – Laboratory Method Blank | --- | --- | --- | --- | (report) | ng/l | 2x Monthly | Preparation |

| | **12-Month Rolling Average** | | | | **12-Month Rolling Average** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Mercury | 0.19 | --- | --- | lbs/day | 25 | --- | --- | ng/l | Monthly | Calculation |

a. Sampling Locations
The sampling locations for the pollutants in Part 1.A.2. of this permit shall be representative of the effluent and consistent with the locations approved by the Department. Samples for CBOD5, Total Suspended Solids, Ammonia Nitrogen, Total Mercury, and Total Phosphorus shall be taken prior to mixing with other waste streams. The Department may approve alternate sampling locations that are demonstrated by the permittees to be representative of the effluent

b. Sampling of Short-Term Wet Weather Events
If the first calendar day of the discharge event through Monitoring Point 049A includes less than three hours of flow but continues into the next calendar day, the sampling can be included as a part of the subsequent event the following day.

c. Final Effluent Limitation for Total Mercury
The final limit for total mercury is the Discharge Specific Level Currently Achievable (LCA) based on a multiple discharger variance from the WQBEL of 1.3 ng/l, pursuant to Rule 1103(9) of the Water Quality Standards. Compliance with the LCA shall be determined as a 12-month rolling average, the calculation of which may be done using blank-corrected sample results. The 12-month rolling average shall be determined by adding the present monthly average result to the preceding 11 monthly average results then dividing the sum by 12. For facilities with quarterly monitoring requirements for total mercury, quarterly monitoring shall be equivalent to three (3) months of monitoring in calculating the

12-month rolling average. Facilities that monitor more frequently than monthly for total mercury must determine the monthly average result, which is the sum of the results of all data obtained in a given month divided by the total number of samples taken, in order to calculate the 12-month rolling average. If the 12-month rolling average for any month is less than or equal to the LCA, the GLWA will be considered to be in compliance for total mercury for that month, provided the GLWA is also in full compliance with the Pollutant Minimization Program for Total Mercury, set forth in Part I.A.10. of this permit.

The permittee may choose to demonstrate that an alternate site-specific LCA is appropriate and request a permit modification. Such request and supporting documentation shall be submitted in writing to the Department. Supporting documentation shall include a minimum of 12 samples taken over 12-month period in accordance with EPA Method 1631. Upon approval, this permit may be modified in accordance with applicable laws and rules to incorporate the alternate site-specific LCA as the effluent limitation for Total Mercury.

After a minimum of 12 monthly data points have been collected, the permittees may request a reduction in the monitoring frequency for total mercury. This request shall contain an explanation as to why the reduced monitoring is appropriate and shall be submitted to the Department. Upon receipt of written approval and consistent with such approval, the permittees may reduce the monitoring frequency for total mercury indicated in Part I.A.2. of this permit. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittees.

d. Total Mercury Testing and Additional Reporting Requirements
The analytical protocol for total mercury shall be in accordance with EPA Method 1631, Revision E, "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry." The quantification level for total mercury shall be 0.5 ng/l, unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The use of clean technique sampling procedures is required unless the permittees can demonstrate to the Department that an alternate sampling procedure is representative of the discharge. Guidance for clean technique sampling is contained in EPA Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (Sampling Guidance), EPA-821-R96-001, July 1996. Information and data documenting the permittee’s sampling and analytical protocols and data acceptability shall be submitted to the Department upon request.

In order to demonstrate compliance with EPA Method 1631E and EPA Method 1669, the permittees shall report, on the daily sheet, the analytical results of all field blanks and field duplicates collected in conjunction with each sampling event, as well as laboratory method blanks when used for blank correction. The permittees shall collect at least one (1) field blank and at least one (1) field duplicate per sampling event. If more than ten (10) samples are collected during a sampling event, the permittees shall collect at least one (1) additional field blank AND field duplicate for every ten (10) samples collected. Only field blanks or laboratory method blanks may be used to calculate a concentration lower than the actual sample analytical results (i.e., a blank correction). Only one (1) blank (field OR laboratory method) may be used for blank correction of a given sample result, and only if the blank meets the quality control acceptance criteria. If blank correction is not performed on a given sample analytical result, the permittees shall report under "Total Mercury – Corrected" the same value reported under "Total Mercury – Uncorrected." The field duplicate is for quality control purposes only; its analytical result shall not be averaged with the sample result.

## 3. Effluent Limitations, Monitoring Point 049B

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittees are authorized to discharge treated municipal wastewater from Monitoring Point 049B through Outfall 049 (DRO), or through Outfall 050 (RRO) when there is reduced hydraulic capacity through DRO or during wet weather, once the RRO Disinfection Project is completed. Outfall 049 (DRO) discharges to the Detroit River. Outfall 050 (RRO) discharges to the Rouge River. In addition, the permittees are authorized to discharge treated municipal wastewater from Monitoring Point 049B through Outfall 050 to the Rouge River as provided in Part I.A.4.

Outfall 049B is the combined secondary treated effluent conduit for all dry weather flows and all wet weather flows up to and including a peak hourly flow of 930 MGD (which includes recycle).

Discharges from Monitoring Point 049B shall be limited and monitored by the permittees as specified below.

| | **Maximum Limits for Quantity or Loading** | | | | **Maximum Limits for Quality or Concentration** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monitoring Frequency** | **Sample Type** |
| Flow (This flow measurement is all secondary flow minus recycle and buffer flows) | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Recycled Flow (Screened Final Effluent) | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily SFE Flow |
| Buffer Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) | 194,000 | 310,000 | (report) | lbs/day | 25 | 40 | (report) | mg/l | Daily | 24-Hr Composite |
| Total Suspended Solids | 233,000 | 349,000 | (report) | lbs/day | 30 | 45 | (report) | mg/l | Daily | 24-Hr Composite |
| Ammonia Nitrogen (as N) | | --- | --- | --- | (report) | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Total Mercury | | | | | | | | | | |
| – Corrected | (report) | --- | (report) | lbs/day | (report) | --- | (report) | ng/l | Quarterly | Calculation |
| – Uncorrected | --- | --- | --- | --- | --- | --- | (report) | ng/l | Quarterly | Grab |
| – Field Duplicate | --- | --- | --- | --- | --- | --- | (report) | ng/l | Quarterly | Grab |
| – Field Blank | --- | --- | --- | --- | --- | --- | (report) | ng/l | Quarterly | Preparation |
| – Laboratory Method Blank | --- | --- | --- | --- | --- | --- | (report) | ng/l | Quarterly | Preparation |
| | **12 Month Rolling Average** | | | | **12 Month Rolling Average** | | | | | |
| Total Mercury | 0.023 | --- | --- | lbs/day | 3.0 | --- | --- | ng/l | Monthly | Calculation |
| | | | | | **Minimum Daily** | | **Maximum Daily** | | | |
| pH | --- | --- | --- | --- | 6.0 | | 9.0 | S.U. | Daily | Grab |
| Total Phosphorus (as P) | 5400 | --- | (report) | lbs/day | 0.7 | --- | (report) | mg/l | Daily | 24-Hr Composite |
| | **Six Month Average (April - Sept.)** | | | | **Six Month Average (April - Sept.)** | | | | | |
| Total Phosphorus | 4600 | --- | --- | lbs/day | 0.6 | --- | --- | mg/l | (see I.A.3.c) | Calculation |

| | | | | **Minimum** **Monthly** | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $CBOD_5$ Minimum % Removal | --- | --- | --- | 85 | --- | (report) | % | Monthly | Calculation |
| Total Suspended Solids Minimum % Removal | | | --- | 85 | --- | (report) | % | Monthly | Calculation |

a. Sampling Locations
Samples for $CBOD_5$, Total Suspended Solids, Ammonia Nitrogen, Total Phosphorus, Total Mercury and pH shall be taken prior to mixing with other waste streams. Samples for pH shall be collected only during periods of discharge from Monitoring Point 049A through Outfall 049 (DRO).

b. Percent Removal Requirements
These requirements shall be calculated based on the monthly (30-day) effluent CBOD5 and TSS concentrations and the monthly influent concentrations for approximately the same period.

c. Total Phosphorus Six Month Average Limit (April - September)
The six month average shall be determined by adding the six monthly average results from April through September and dividing the sum by six. For the purpose of reporting on the Discharge Monitoring Reports, the permittees shall calculate and report the six month average on the October Discharge Monitoring Report.

d. Quarterly Monitoring
Quarterly samples shall be taken during the months of January, April, July, and October. If the facility does not discharge during these months, the permittee shall sample the next discharge occurring during the period in question. If the facility does not discharge during the period in question, a sample is not required for that period. For any month in which a sample is not taken, the permittee shall enter "*G" on the Discharge Monitoring Report (DMR). (For purposes of reporting on the Daily tab of the DMR, the permittee shall enter “*G” on the first day of the month only).

e. Final Effluent Limitation for Total Mercury
The final limit for total mercury is the Discharge Specific Level Currently Achievable (LCA) based on a multiple discharger variance from the WQBEL of 1.3 ng/l, pursuant to Rule 1103(9) of the Water Quality Standards. Compliance with the LCA shall be determined as a 12-month rolling average, the calculation of which may be done using blank-corrected sample results. The 12-month rolling average shall be determined by adding the present monthly average result to the preceding 11 monthly average results then dividing the sum by 12. For facilities with quarterly monitoring requirements for total mercury, quarterly monitoring shall be equivalent to three (3) months of monitoring in calculating the 12-month rolling average. Facilities that monitor more frequently than monthly for total mercury must determine the monthly average result, which is the sum of the results of all data obtained in a given month divided by the total number of samples taken, in order to calculate the 12-month rolling average. If the 12-month rolling average for any month is less than or equal to the LCA, the permittees will be considered to be in compliance for total mercury for that month, provided the permittees are also in full compliance with the Pollutant Minimization Program for Total Mercury, set forth in Part I.A.10. of this permit.

The permittee may choose to demonstrate that an alternate site-specific LCA is appropriate and request a permit modification. Such request and supporting documentation shall be submitted in writing to the Department. Supporting documentation shall include a minimum of 12 samples taken over 12-month period in accordance with EPA Method 1631. Upon approval, this permit may be modified in accordance with applicable laws and rules to incorporate the alternate site-specific LCA as the effluent limitation for Total Mercury.

After a minimum of 12 monthly data points have been collected, the permittees may request a reduction in the monitoring frequency for total mercury. This request shall contain an explanation as to why the reduced monitoring is appropriate and shall be submitted to the Department. Upon receipt of written approval and consistent with such approval, the permittees may reduce the monitoring frequency for total mercury indicated in Part I.A.3. of this permit. The Department may revoke the approval for reduced monitoring at any time upon notification to the permittees.

f. Total Mercury Testing and Additional Reporting Requirements
The analytical protocol for total mercury shall be in accordance with EPA Method 1631, Revision E, "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry." The quantification level for total mercury shall be 0.5 ng/l, unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The use of clean technique sampling procedures is required unless the permittees can demonstrate to the Department that an alternate sampling procedure is representative of the discharge. Guidance for clean technique sampling is contained in EPA Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels (Sampling Guidance), EPA-821-R96-001, July 1996. Information and data documenting the permittee's sampling and analytical protocols and data acceptability shall be submitted to the Department upon request.

In order to demonstrate compliance with EPA Method 1631E and EPA Method 1669, the permittees shall report, on the daily sheet, the analytical results of all field blanks and field duplicates collected in conjunction with each sampling event, as well as laboratory method blanks when used for blank correction. The permittees shall collect at least one (1) field blank and at least one (1) field duplicate per sampling event. If more than ten (10) samples are collected during a sampling event, the permittees shall collect at least one (1) additional field blank AND field duplicate for every ten (10) samples collected. Only field blanks or laboratory method blanks may be used to calculate a concentration lower than the actual sample analytical results (i.e., a blank correction). Only one (1) blank (field OR laboratory method) may be used for blank correction of a given sample result, and only if the blank meets the quality control acceptance criteria. If blank correction is not performed on a given sample analytical result, the permittees shall report under "Total Mercury – Corrected" the same value reported under "Total Mercury – Uncorrected." The field duplicate is for quality control purposes only; its analytical result shall not be averaged with the sample result.

## 4. Interim Effluent Limitations, Monitoring Point 050A

During the period beginning on the effective date of this permit and lasting until initiation of operation of the RRO Disinfection Project, the permittees are approved to discharge treated municipal wastewater and treated storm water runoff from Monitoring Point 050A through Outfall 050 (RRO). Normally, the discharge may consist of only primary treated effluent when the discharge is necessary due to hydraulic constraints resulting from wet weather events. There shall be no discharge from Monitoring Point 050A unless the discharge from Monitoring Point 049B exceeds a peak hourly flow of 930 MGD (which includes recycle) or in accordance with an approved GLWA WRRF Wet Weather Operational Plan (see Part I.A.11.). Discharge from Outfall 050 (RRO) is not allowed unless hydraulically or structurally necessary. Outfall 050 (RRO) discharges to the Rouge River.

Other options for discharge from Outfall 050 include, 1) when Outfall 049 (DRO) is out-of-service, the discharge may consist of secondary or secondary and primary treated wastewater, 2) when Outfall 049 (DRO) has reduced hydraulic capacity the discharge may consist of secondary or secondary and primary treated wastewater, and 3) when there is department approved limited secondary capacity when Outfall 049 cannot be used due to construction, the discharge may consist of secondary or secondary and primary treated wastewater. Discharges from Monitoring Point 050A shall be limited and monitored by the permittees as specified below.

| | Maximum Limits for Quantity or Loading | | | | Maximum Limits for Quality or Concentration | | | | Monitoring | Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Daily** | **Units** | **Frequency** | **Type** |
| Available Cyanide | | --- | --- | --- | --- | --- | 89 | µg/l | Daily | Grab |
| Fecal Coliform Bacteria | --- | --- | --- | --- | (report) | (report) | --- | cts/100 ml | Daily | Grab |

Limitations and monitoring requirements in effect when Outfall 049 is out-of-service and prior to initiation of operation of the RRO Disinfection Project:

All limitations and monitoring specified in Part I.A.1. apply except for the Available Cyanide monitoring requirement, Total Residual Chlorine requirement, and the Fecal Coliform Bacteria limitations, which are replaced with the limitations and monitoring requirements specified below with the Total Residual Chlorine monitoring and limitation removed:

a. Sampling of Short-Term Wet Weather Events
If the first calendar day of the discharge event through Monitoring Point 050A includes less than three hours of flow but continues into the next calendar day, the sampling can be included as a part of the subsequent event the following day.

## 4. Interim Effluent Limitations, Monitoring Point 050A (continued)

| | Maximum Limits for Quantity or Loading | | | | Maximum Limits for Quality or Concentration | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monitoring Frequency** | **Sample Type** |
| Limitations and monitoring requirements in effect during other periods of discharge from Monitoring Point 050A and prior to Initiation of operation of the RRO Disinfection Project: | | | | | | | | | | |
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) | --- | --- | --- | --- | 40 | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Total Suspended Solids | --- | --- | --- | --- | 70 | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Total Phosphorus (as P) | --- | --- | --- | --- | 1.5 | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Available Cyanide | --- | --- | --- | --- | --- | --- | 89 | µg/l | Daily | Grab |
| Fecal Coliform Bacteria | --- | --- | --- | --- | (report) | --- | (report) | cts/100 ml | Daily | Grab |
| Ammonia Nitrogen (as N) | | --- | --- | --- | (report) | --- | (report) | mg/l | Daily | 24-Hr Composite |
| Total Copper | --- | --- | --- | --- | --- | --- | (report) | µg/l | Daily | 24-Hr Composite |
| Polychlorinated Biphenyls (PCBs) | | | | | | | | | | |
| PCB Aroclor 1016 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1221 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1232 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1242 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1248 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1254 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1260 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| | | | | | **Maximum PCB Aroclor** | | | | | |
| PCB Aroclor (see I.A.4.e.) | | --- | --- | --- | (report) | --- | --- | µg/l | Monthly | See I.A.4.e. |
| | | | | | **Minimum Daily** | | **Maximum Daily** | | | |
| pH | --- | --- | --- | --- | 6.0 | | 9.0 | S.U. | Daily | Grab |
| Dissolved Oxygen | --- | --- | --- | --- | (report) | | --- | mg/l | Daily | Grab |

a. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Sampling Locations
The sampling locations for the pollutants in Part 1.A.4. of this permit shall be representative of the effluent and consistent with the locations approved by the Department. The Department may approve alternate sampling locations that are demonstrated by the GLWA to be representative of the effluent.

c. Sampling of Short-Term Wet Weather Events
If the first calendar day of the discharge event through Monitoring Point 050A includes less than three hours of flow but continues into the next calendar day, the sampling can be included as a part of the subsequent event the following day.

d. Analytical Methods and Quantification Levels for Available Cyanide and Total Copper
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Available Cyanide shall be in accordance with EPA Method OIA-1677. The quantification levels for Available Cyanide and Total Copper shall be 2.0 µg/l and 1.0 µg/l respectively unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination. Upon approval of the Department, the permittees may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

e. Limits Below the Quantification Level – Total Polychlorinated Biphenyls (PCBs) The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total PCBs shall be in accordance with EPA Method 608.3. Upon approval from the Department, the permittees may use alternate analytical methods (for parameters with methods specified in 40 CFR, Part 136, the alternate methods are restricted to those listed in 40 CFR, Part 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

For the purpose of reporting on the Daily tab of the DMR, individual aroclor results less than the quantification level shall be reported as "<0.1." For the purpose of reporting on the Summary tab of the DMR, the value reported under PCB Aroclor shall be the highest individual aroclor concentration observed during the monitoring period. This permit condition does not authorize the discharge of PCBs at levels that are injurious to the designated uses of the waters of the state or that constitute a threat to the public health or welfare.

## 5. Final Effluent Limitations, Monitoring Point 050A

Upon initiation of operation of the RRO Disinfection Project, the permittees are approved to discharge secondary treated municipal wastewater and primary treated municipal wastewater when hydraulically necessary from Monitoring Point 050A through Outfall 050 (RRO). Outfall 050 (RRO) discharges to the Rouge River. Discharge from Outfall 050 (RRO) is approved when the hydraulic capacity of Outfall 049 (DRO) is not sufficient to meet the approved GLWA wet weather operational plan (see Part I.A.11.). Such discharge shall be limited and monitored by the permittees as specified below.

| | Maximum Limits for Quantity or Loading | | | | Maximum Limits for Quality or Concentration | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monitoring Frequency** | **Sample Type** |
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Available Cyanide | --- | --- | --- | --- | --- | --- | 44 | µg/l | Daily | Grab |
| Total Copper | --- | --- | --- | --- | --- | --- | (report) | µg/l | Monthly | 24-Hr Composite |
| Fecal Coliform Bacteria | --- | --- | --- | --- | 200 | 400 | (report) | cts/100 ml | Daily | Grab |
| Total Residual Chlorine | --- | --- | --- | --- | --- | --- | 38 | µg/l | Daily | Grab |
| Oil & Grease | --- | --- | --- | --- | --- | 15 | (report) | mg/l | Daily | Grab |
| Total Polychlorinated Biphenyls (PCBs) | | | | | | | | | | |
| PCB Aroclor 1016 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1221 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1232 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1242 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1248 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1254 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| PCB Aroclor 1260 | --- | --- | --- | --- | --- | --- | (report) | µg/l | Weekly | 24-Hr Composite |
| | | | | | **Maximum PCB Aroclor** | | | | | |
| PCB Aroclor (See I.A,5.f.) | | --- | --- | --- | <0.1 | --- | --- | µg/l | Monthly | See I.A.5.f. |
| | | | | | **Minimum Daily** | | **Maximum Daily** | | | |
| pH | --- | --- | --- | --- | 6.0 | --- | 9.0 | S.U. | Daily | |
| Dissolved Oxygen | --- | --- | --- | --- | 3.0 | --- | --- | mg/l | Daily | Grab |

a. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

b. Sampling Locations
The sampling locations for the pollutants in Part I.A.5. of this permit shall be representative of the effluent and consistent with the locations approved by the Department. The Department may approve alternate sampling locations that are demonstrated by the permittees to be representative of the effluent.

c. Sampling of Short-Term Wet Weather Events
If the first calendar day of the discharge event includes less than three hours of flow but continues into the next calendar day, the sampling can be included as part of the subsequent event the following day.

d. Total Residual Chlorine (TRC)
Compliance with the TRC limit shall be determined on the basis of one or more grab samples. If more than one (1) sample per day is taken, the additional samples shall be collected in near equal intervals over approximately eight (8) hours. The samples shall be analyzed immediately upon collection and the average reported as the daily concentration. Samples shall be analyzed in accordance with Part II.B.2. of this permit.

e. Analytical Methods and Quantification Levels for Available Cyanide and Total Copper
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Available Cyanide shall be in accordance with EPA Method OIA-1677. The quantification levels for Available Cyanide and Total Copper shall be 2.0 µg/l and 1.0 µg/l, respectively, unless a higher level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination. Upon approval of the Department, the permittees may use alternate analytical methods (for parameters with methods specified in 40 CFR 136, the alternate methods are restricted to those listed in 40 CFR 136).

f. Limits Below the Quantification Level – Total Polychlorinated Biphenyls (PCBs)
The sampling procedures, preservation and handling, and analytical protocol for compliance monitoring for Total PCBs shall be in accordance with EPA Method 608.3. Upon approval from the Department, the permittees may use alternate analytical methods (for parameters with methods specified in 40 CFR, Part 136, the alternate methods are restricted to those listed in 40 CFR, Part 136). The quantification level shall be 0.1 ug/l unless a higher level is appropriate because of sample matrix interference. Justification for a higher quantification level shall be submitted to the Department within 30 days of such determination.

The water quality-based effluent limitation for Total PCBs is $2.6 \times 10^{-5}$ µg/l ($2.0 \times 10^{-4}$ lbs/day) maximum monthly average. This is less than the quantification level. Control requirements are therefore established consistent with R 323.1213. **The discharge of any individual aroclor at or above the quantification level of 0.1 ug/l is a specific violation of this permit**. If concentrations of all aroclors representing a monitoring period are less than their quantification levels, the permittees will be considered to be in compliance with the permit for the monitoring period that the analyses represent, provided that the permittees are also in full compliance with the Pollutant Minimization Program for Total PCBs set forth in Part I.A.10 of this permit. For the purpose of reporting on the Daily tab of the DMR, individual aroclor results less than the quantification level shall be reported as "<0.1." For the purpose of reporting on the Summary tab of the DMR, the value reported under PCB Aroclor shall be the highest aroclor concentration observed during the monitoring period. This permit condition does not authorize the discharge of PCBs at levels that are injurious to the designated uses of the waters of the state or that constitute a threat to the public health or welfare.

g. Schedule of Implementation
The permittees shall implement the following for Outfall 050 (RRO) Disinfection Program:

1) On or before February 1, 2010 (submitted), the permittees shall submit for review and approval a basis of design report for the previously proposed Outfall 084 (RRO2).

2) On or before March 1, 2011 (submitted), the permittees shall submit for review and approval complete plans and specifications for Segment 1 of the previously proposed Outfall 084 (RRO2) project. Segment 1 consists of improvements undertaken at the WRRF consistent with the approved Basis of Design report.

3) On or before July 1, 2012 (submitted), the permittees shall commence construction of Segment 1, consistent with the approved plans and specifications.

4) On or before July 1, 2013 (submitted), the permittees shall submit a construction progress report for Segment 1 of the previously proposed Outfall 084 (RRO2).

5) On or before March 1, 2015, (completed) the permittees shall complete construction of Segment 1 of the previously proposed Outfall 084 (RRO2) project.

6) On or before June 1, 2016, (submitted) the permittees shall submit for review and approval a complete basis of design report, and complete plans and specifications, for the Outfall 050 (RRO) Disinfection Project (if design, bid, build). Alternatively, if DWSD chooses to pursue design-build for the Outfall 050 (RRO) Disinfection Project, DWSD shall submit on or before June 1, 2016, (submitted) a detailed engineering report for the overall project, a permitting plan (that includes a description of the construction segments), a timetable for Part 41 permit application submittal, and sufficient project schematics for the overall project.

7) On or before November 1, 2016, (completed) the permittees shall submit complete plans and specifications for at a minimum the first segment to be construction under a design-build contract.

8) On or before April 1, 2017, (commenced) the permittees shall commence construction of the RRO Disinfection Project, consistent with the approved plans and specifications.

9) On or before April 1, 2018, (submitted) the permittees shall submit a construction progress report for RRO Disinfection Project.

10) On or before April 1, 2019, (completed) the permittees shall complete construction of RRO Disinfection Project and place into full operation the facilities to achieve final effluent limits specified in Part I.A.5.

## 6. Combined Sewer Overflow Retention Treatment Basin Discharge Authorization, Monitoring Points 101A, 102A, 103A, 104A, 108A and 109A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittees are authorized to discharge treated combined sewage from the Hubbell/Southfield Combined Sewer Overflow (CSO) Retention Treatment Basin (RTB), Monitoring Point 101A, through Outfall 101; from the Puritan/Fenkell CSO RTB, Monitoring Point 102A, through Outfall 102; from the Seven Mile CSO RTB, Monitoring Point 103A, through Outfall 103; from the Belle Isle RTB, Monitoring Point 108A, through Outfall 108; from the Oakwood RTB, Monitoring Point 109A, through Outfall 109; and from the Conner Creek CSO RTB Monitoring Point 104A, through Outfall 104 when the basins are full and wastewater flows exceed downstream interceptor capacity. Outfall 101, Outfall 102, Outfall 103, and Outfall 109 discharge to the Rouge River. Outfall 108 discharges to the Detroit River. Outfall 104 discharges to Conner Creek. Such discharges shall be limited and monitored by the permittees as specified below:

| | Maximum Limits for Quantity or Loading | | | | Maximum Limits for Quality or Concentration | | | | Monitoring | Sample |
|---|---|---|---|---|---|---|---|---|---|---|
| **Influent Characteristics** | **Monthly** | **7-Day** | **Daily** | **Units** | **Monthly** | **7-Day** | **Event** | **Units** | **Frequency** | **Type** |
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| **Effluent Characteristics** | | | | | | | | | | |
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Event | Composite |
| Total Suspended Solids | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Event | Composite |
| Ammonia Nitrogen (as N) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Event | Composite |
| Total Phosphorus (as P) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Event | Composite |
| Fecal Coliform Bacteria | | | | | | | | | | |
| May 1 – October 31 | --- | --- | --- | --- | --- | --- | 400 | cts/100 ml | See I.A.6.a. | Grab |
| November 1 – April 30 | --- | --- | --- | --- | --- | --- | 1000 | cts/100 ml | See I.A.6.a. | Grab |
| | | | | | **Event Average** | | **Event Maximum** | | | |
| Total Residual Chlorine | | | | | | | | | | |
| Any Event | --- | --- | --- | --- | (report) | --- | (report) | mg/l | See I.A.6.a. | Grab |

(See additional controls specified in Part I.A.8.)

| Effluent Characteristics | Maximum Limits for Quantity or Loading Monthly | 7-Day | Daily | Units | Maximum Limits for Quality or Concentration Monthly | 7-Day | Event | Units | Monitoring Frequency | Sample Type |
|---|---|---|---|---|---|---|---|---|---|---|
| Oil & Grease (Monitoring Point 109A only) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Daily During Discharge | Grab |
| | | | | | Event Minimum | | Event Maximum | | | |
| pH | --- | --- | --- | --- | (report) | --- | (report) | S.U. | Daily During Discharge | Grab |
| Dissolved Oxygen | --- | --- | --- | --- | (report) | --- | --- | mg/l | Daily During Discharge | Grab |

a. Retention Basin Monitoring and Reporting
The permittee shall conduct retention basin monitoring and report consistent with the requirements of Part II.C.2. of this permit. The permittee shall supply the results of each sample analyzed during each discharge period.

An Event starts when combined sewage is discharged into a facility, and ends when effluent flow (if any) ceases and does not resume within 24 hours.

**Influent flow** shall be reported for all wet weather events where combined sewage is discharged into the facility. Influent flow reporting shall also indicate the component of the total influent flow that is dewatered to the interceptor from the facility during an event and shall be reported in the comment section of the monthly Discharge Monitoring Reports (DMR). Alternate procedures may be approved by the Department.

**Effluent flow** shall be reported for all events that cause discharge from the facility to the receiving waters.

**Effluent sampling for $CBOD_5$, TSS, Ammonia Nitrogen (as N), and Total Phosphorus (as P)** shall be by effluent flow-weighted composite sampling over the entire event. Alternate procedures for determining an event composite may be approved by the Department if existing equipment cannot reliably determine a flow-weighted composite. For purposes of reporting for a discharge event that occurs on multiple calendar days, the composite pollutant concentrations for the event shall be reported on the day the discharge event ended. Individual events shall be determined by a lack of effluent discharge for 24 hours.

For **effluent pH,** report the maximum value of any individual sample taken during the month in the “Maximum” column under “Quality or Concentration” on the monthly DMRs and the minimum value of any individual sample taken during the month in the “Minimum” column under “Quality or Concentration” on the monthly DMRs. The individual values taken during the month shall be reported on the daily DMRs.

For **effluent dissolved oxygen**, report the lowest concentration of any individual sample in the “Minimum” column under the “Quantity or Concentration” on the monthly DMRs. The individual values taken during the month shall be reported on the daily DMRs.

For **effluent Fecal Coliform Bacteria and Total Residual Chlorine,** grab samples shall be collected every two (2) hours for the first six (6) hours of the discharge and every four (4) hours thereafter for the duration of the discharge; the first sample shall be collected as soon as practical after the discharge begins. For fecal coliform, the "event maximum" shall be reported on the daily DMRs as the geometric mean of all samples taken during an event, provided that three (3) or more samples are collected. For TRC, report the average of all samples in an event as the "Event Average" and the maximum individual sample in an event as the "Event Maximum" on the daily DMRs. The goal of the effluent sampling program is to collect at least three samples during each discharge event, and samples shall be collected at shorter intervals at the onset of the event, if the permittee estimates that the event duration may be less than six hours. For purposes of reporting for a discharge event that occurs on multiple calendar days, the pollutant concentrations for the event shall be reported on the day the discharge event ended. The highest event averages for Fecal Coliform and TRC shall also be reported in the "Maximum" columns under "Quality and Concentration" on the monthly DMRs.

b. Retention Treatment Basin Dewatering
The retention treatment basin shall be promptly dewatered as in accordance with the Department Approved Consolidated Annual Report following the need to divert flow to the basin and shall be maintained in readiness for use. The discharge of sludge or residual accumulations from the basin to the surface waters is prohibited. These sludges shall be promptly removed and disposed in accordance with procedures approved by the Department.

For this permit while the Regional Operational Plan is being revised, if up to 930 MGD (including recycle) is being processed with secondary treatment at the WRRF and no primary flow is being discharged, then tributary combined or sanitary storage basins in the GLWA system may be dewatered. Such dewatering will not be considered a violation of this permit, even if contrary to the Wet Weather Event definition (see Part II.A.). Once a revised Regional Operation Plan is developed, it shall be implemented once reviewed and approved by the Department.

c. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

d. Operation and Maintenance Plan
The permittee shall assure that discharges only occur in response to rainfall (or snowmelt) events and cease soon thereafter. Any rehabilitation and maintenance needs shall be addressed to ensure adequate sewer capacity and functionality. This may be accomplished through continued implementation of the approved Operation and Maintenance Plan.

## 7. Combined Sewer Overflow Screening and Disinfection Facilities Discharge Authorization, Monitoring Points 105A, 106A and 107A

During the period beginning on the effective date of this permit and lasting until the expiration date of this permit, the permittees are authorized to discharge treated combined sewage from the Leib Combined Sewer Overflow (CSO) Screening and Disinfection Facility Monitoring Point 105A through Outfall 105, from the St. Aubin CSO Screening and Disinfection Facility Monitoring Point 106A through Outfall 106, and from the Baby Creek CSO Screening and Disinfection Facility Monitoring Point 107A through Outfall 107 when the wastewater flows exceed downstream interceptor capacities. Outfall 105 and Outfall 106 discharge to the Detroit River. Outfall 107 discharges to the Rouge River. Such discharges shall be limited and monitored by the permittees as specified below:

| Effluent Characteristics | Maximum Limits for Quantity or Loading: Monthly | 7-Day | Daily | Units | Maximum Limits for Quality or Concentration: Monthly | 7-Day | Daily | Units | Monitoring Frequency | Sample Type |
|---|---|---|---|---|---|---|---|---|---|---|
| Flow | (report) | --- | (report) | MGD | --- | --- | --- | --- | Daily | Report Total Daily Flow |
| Carbonaceous Biochemical Oxygen Demand (CBOD5) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Quarterly | Grab |
| Total Suspended Solids | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Quarterly | Grab |
| Ammonia Nitrogen (as N) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Quarterly | Grab |
| Total Phosphorus (as P) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Quarterly | Grab |
| Oil & Grease (Baby Creek CSO Screening & Disinfection Facility, only) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | Daily During Discharge | Grab |
| | | | | | | | **Event Maximum** | | | |
| Fecal Coliform Bacteria | | | | | | | | | | |
| May 1 – October 31 | --- | --- | --- | --- | --- | --- | 400 | cts/100 ml | See I.A.7.a. | Grab |
| November 1 – April 30 | --- | --- | --- | --- | --- | --- | 1000 | cts/100 ml | See I.A.7.a. | Grab |
| | | | | | **Event Average** | | **Event Maximum** | | | |
| Total Residual Chlorine Any Event (see additional controls specified in Part 1.A.8.) | --- | --- | --- | --- | (report) | --- | (report) | mg/l | See I.A.7.a. | Grab |
| | | | | | **Event Minimum** | | **Event Maximum** | | | |
| pH | --- | --- | --- | --- | (report) | --- | (report) | S.U. | Daily During Discharge | Grab |
| Dissolved Oxygen | --- | --- | --- | --- | (report) | --- | --- | mg/l | Daily During Discharge | Grab |

a. Screening and Disinfection Facilities Monitoring and Reporting
The permittees shall monitor screening and disinfection facilities performance and report the monitoring consistent with the requirements of Part II.C.2. of this permit. The permittees shall supply the results of each sample taken during each discharge period.

**Effluent flow** shall be reported for all events that cause discharge from the facility to the receiving waters.

For **effluent pH**, report the maximum value of any individual sample taken during the month in the “Maximum” column under “Quality or Concentration” on the monthly DMRs and the minimum value of any individual sample taken during the month in the “Minimum” column under “Quality or Concentration” on the monthly DMRs. The individual values taken during the month shall be reported on the daily DMRs.

For **effluent dissolved oxygen**, report the lowest concentration of any individual sample in the “Minimum” column under the “Quantity or Concentration” on the monthly DMRs. The individual values taken during the month shall be reported on the daily DMRs.

For **effluent Fecal Coliform Bacteria and Total Residual Chlorine**, grab samples shall be collected every two (2) hours for the first six (6) hours of the discharge and every four (4) hours thereafter for the duration of the discharge; the first sample shall be collected as soon as practical after the discharge begins. For fecal coliform, the “event maximum” shall be reported on the daily DMRs as the geometric mean of all samples taken during an event, provided that three (3) or more samples are collected. For TRC, report the average of all samples in an event as the “Event Average” and the maximum individual sample in an event as the “Event Maximum” on the daily DMRs. The goal of the effluent sampling program is to collect at least three samples during each discharge event, and samples shall be collected at shorter intervals at the onset of the event, if the permittees estimate that the event duration may be less than six hours. For purposes of reporting for a discharge event that occurs on multiple calendar days, the pollutant concentrations for the event shall be reported on the day the discharge event ended. The highest event averages for Fecal Coliform and TRC shall also be reported in the “Maximum” columns under “Quality and Concentration” on the monthly DMRs.

b. Narrative Standard
The receiving water shall contain no turbidity, color, oil films, floating solids, foams, settleable solids, or deposits as a result of this discharge in unnatural quantities which are or may become injurious to any designated use.

c. Sampling Locations
The sampling locations for the pollutants indicated in Part I.A.7 of this permit shall be representative of the effluent and consistent with the locations approved by the Department.

d. Operation and Maintenance Plan
The permittees shall assure that discharges only occur in response to rainfall (or snowmelt) events and cease soon thereafter. Any rehabilitation and maintenance needs shall be addressed to ensure adequate sewer capacity and functionality. This may be accomplished through continued implementation of the approved Operation and Maintenance Plan.

e. Treatment Facility Dewatering
The treatment facility shall be promptly dewatered (if applicable) in accordance with the Department Approved Consolidated Annual Report possible following the need to divert flow to the facility and shall be maintained in readiness for use. The discharge of sludge or residual accumulations from the facility to the surface waters is prohibited.

For this permit while the Regional Operational Plan is being revised, if up to 930 MGD (including recycle) is being processed with secondary treatment at the WRRF and no primary flow is being discharged, then tributary combined or sanitary storage basins in the GLWA system may be dewatered. Such dewatering will not be considered a violation of this permit, even if contrary to the Wet Weather Event definition (see Part II.A). Once a revised Regional Operation Plan is developed, it shall be implemented once reviewed and approved by the Department.

f. Quarterly Monitoring
Quarterly samples shall be taken during the months of January, April, July, and October. If the facility does not discharge during these months, the permittee shall sample the next discharge occurring during the period in question. If the facility does not discharge during the period in question, a sample is not required for that period. For any month in which a sample is not taken, the permittee shall enter "*G" on the Discharge Monitoring Report (DMR). (For purposes of reporting on the Daily tab of the DMR, the permittee shall enter “*G” on the first day of the month only).

# 8. Total Residual Chlorine Minimization Program

The goal of the Total Residual Chlorine (TRC) Minimization Program is operate the CSO RTBs and the CSO screening and disinfection facilities in a manner that will provide consistent, effective disinfection while minimizing the discharge of TRC, recognizing the overall goal is compliance with the TRC Final Acute Value of 0.038 mg/l at any point in the receiving stream, unless it is determined by the Department by a permit action that a higher level is acceptable.

In addition, the Operational Goals for this facility are 1.5 mg/l TRC as an event average value and 2.0 mg/l (November – April) or 3.0 mg/l (May – October) TRC as an event instantaneous maximum value.

a. TRC Minimization Assessment (Assessment) (submitted)
The permittees shall prepare and conduct a program to assess the capability of each of the 5 CSO RTBs and screening and disinfection facilities as agreed to (a subset of those listed in Part I.A.6. and Part I.A.7.), to minimize the discharge of TRC. Each Assessment shall be conducted according to a schedule acceptable to the Department. Compliance with the Fecal Coliform Bacteria effluent limits set forth in Part I.A.6. and Part I.A.7. of this permit shall be maintained during each Assessment. Each Assessment shall include an evaluation of various operational practices under a variety of wet weather events to identify measures which can be taken to reduce TRC discharge concentrations. Upon notification by the Department, the permittees shall begin conducting each Assessment over an 18-month period and shall submit a report summarizing the results to the Department within 60 days of completion. An extension of an Assessment period beyond 18 months may be requested by the permittees for approval by the Department in the event that a sufficient number of CSO discharge events have not occurred to allow for an adequate assessment of operational procedures.

Each Assessment report shall include the expected achievable TRC discharge concentrations, recommendations as to specific protocols to be used to manage sodium hypochlorite (NaOCl) dosage rates under various conditions to achieve the Operational Goals, and recommended facility modifications to enhance the ability to control TRC levels while maintaining compliance with the Fecal Coliform Bacteria limits. Specific procedures for adjustment of NaOCl feed rates to minimize the discharge of TRC shall be submitted as part of the Operational Plan (and revised as appropriate in annual updates), as required by Part I.A.15.e. of this permit. The TRC minimization procedures, developed as part of each Assessment, shall be implemented upon approval by the Department.

b. Operational Goals
Upon completion of each Assessment, the permittees shall operate the facility with a goal of 1.5 mg/l TRC as an event average value and a goal of 2.0 mg/l (November – April) or 3.0 mg/l (May – October) TRC as an event instantaneous maximum value. If upon completion of an Assessment, the permittees determine the facility can achieve lower TRC goals than those specified above, then the permittees shall operate the facility to achieve the lower TRC levels. If either TRC goal is exceeded for a CSO discharge event, the permittees shall submit a written report to the Department within seven (7) days explaining the cause of the exceedance and describing the corrective measures that will be undertaken to prevent a future recurrence.

c. In-Stream TRC Effluent Plume Evaluation (submitted)
The permittees shall conduct an evaluation of the in-stream TRC effluent plume attributable to each of the agreed-to 5 CSO RTBs screening and disinfection facility discharges. The evaluation shall identify the location and size of the TRC effluent plume during and after CSO discharge events and identify the maximum TRC concentrations in-stream at various downstream locations. Upon notification by the Department to begin conducting each Assessment (Part I.A.8.a.), the permittees shall have 60 days to submit a TRC effluent plume work plan describing the proposed evaluation including sampling locations and a proposed implementation schedule such that the In-Stream TRC Effluent Plume Evaluation shall occur after completion of each Assessment and when the operational goals begin. The permittees shall implement the In-Stream TRC Effluent Plume Evaluation following the schedule upon Department approval of the TRC effluent plume work plan. The permittees shall submit a report documenting the results of the TRC Effluent Plume Evaluation within 90 days after completion of the field work.

d. Permit Re-Opener Clause
Upon completion of each TRC Minimization Assessment and each In-Stream TRC Effluent Plume Evaluation, the Department may reevaluate the need for TRC effluent limitations. This permit may be

modified in accordance with applicable laws and rules to incorporate such revisions as may be necessary to comply with Water Quality Standards at the time of discharge.

e. Best Management Practices/Operator Coordination Work Group (Work Group)
The permittees shall attend and participate in at least quarterly Work Group meetings with representatives from other CSO facilities in Southeast Michigan to exchange information and share experiences relating to the operation and maintenance of CSO control facilities. Such Work Group meetings shall be used to develop Best Management Practices (BMPs) relating to CSO RTB operation, with an initial focus on actions to minimize the TRC discharge levels. At a minimum, the Work Group shall include representatives of the following CSO facilities: Birmingham CSO RTB, Bloomfield Village CSO RTB, Dearborn CSO, GLWA WRRF CSO Facilities, Inkster-Dearborn Heights CSO, Oakland County-Acacia Park (Acacia Park CSO Drainage District, Village of Beverly Hills, City of Birmingham), Redford Township CSO, River Rouge CSO, Wayne County – Dearborn Heights CSO, Wayne County – Inkster CSO, Wayne County – Inkster – Dearborn Heights CSO, and Wayne County – Redford – Livonia CSO. The Work Group shall submit an annual report summarizing the meetings and BMPs developed to the Department by March 1$^{st}$ of each year.

## 9. Additional Monitoring Requirements

As a condition of this permit, the permittees shall monitor the discharge from monitoring points 049F and 050A for the constituents identified below. This monitoring is an application requirement of 40 CFR 122.21(j), effective December 2, 1999. Testing shall be conducted in October 2019, May 2020, March 2021, and August 2021. Grab samples shall be collected for total phenols, and the Volatile Organic Compounds identified below. For all other parameters, 24-hour composite samples shall be collected.

Test species for whole effluent toxicity monitoring shall include fathead minnow **and** *Ceriodaphnia dubia*. If the permittees have received Department approval to conduct chronic toxicity testing using the more sensitive species identified in the toxicity database, the first three (3) tests required above may be performed using the more sensitive species. The last (4$^{th}$) test shall be conducted using both species. Testing and reporting procedures shall follow procedures contained in EPA-821-R-02-013, “Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms” (Fourth Edition). When the effluent ammonia nitrogen (as N) concentration is greater than 3 mg/l, the pH of the toxicity test shall be maintained at a pH of 8 Standard Units. Acute and chronic toxicity data shall be included in the reporting for the toxicity test results. Toxicity test data acceptability is contingent upon the validation of the test method by the testing laboratory. Such validation shall be submitted to the Department upon request.

For selected parameters required under this section, the maximum acceptable quantification levels and analytical methods shall be as specified under Quantification Levels and Analytical Methods for Selected Parameters, below, unless a higher quantification level is appropriate because of sample matrix interference. Justification for higher quantification levels shall be submitted to the Department within 30 days of such determination.

The results of such additional monitoring shall be submitted with the application for reissuance (see the cover page of this permit for the application due date). The permittees shall notify the Department within 14 days of completing the monitoring for each month specified above in accordance with Part II.C.5. Additional reporting requirements are specified in Part II.C.11. The permittees shall report to the Department any whole effluent toxicity test results greater than 1.0 $TU_A$ or 1.0 $TU_C$ within five (5) days of becoming aware of the result. If, upon review of the analysis, it is determined that additional requirements are needed to protect the receiving waters in accordance with applicable water quality standards, the permit may then be modified by the Department in accordance with applicable laws and rules.

Whole Effluent Toxicity
chronic toxicity

Hardness
calcium carbonate

Metals (Total Recoverable), Cyanide and Total Phenols

| | | | |
|---|---|---|---|
| antimony | arsenic | barium | |
| beryllium | boron | cadmium | chromium |
| copper | lead | nickel | |
| selenium | silver | thallium | zinc |
| total phenolic compounds | | | |

Volatile Organic Compounds

| | | | |
|---|---|---|---|
| acrolein | acrylonitrile | benzene | bromoform |
| carbon tetrachloride | chlorobenzene | chlorodibromomethane | chloroethane |
| 2-chloroethylvinyl ether | chloroform | dichlorobromomethane | 1,1-dichloroethane |
| 1,2-dichloroethane | trans-1,2-dichloroethylene | 1,1-dichloroethylene | 1,2-dichloropropane |
| 1,3-dichloropropylene | ethylbenzene | methyl bromide | methyl chloride |
| methylene chloride | 1,1,2,2,-tetrachloroethane | tetrachloroethylene | toluene |
| 1,1,1-trichloroethane | 1,1,2-trichloroethane | trichloroethylene | vinyl chloride |

Acid-Extractable Compounds

| | | | |
|---|---|---|---|
| 4-chloro-3-methylphenol | 2-chlorophenol | 2,4-dichlorophenol | 2,4-dimethylphenol |
| 4,6-dinitro-o-cresol | 2,4-dinitrophenol | 2-nitrophenol | 4-nitrophenol |
| Pentachlorophenol | phenol | 2,4,6-trichlorophenol | |

Base/Neutral Compounds

| | | | |
|---|---|---|---|
| acenaphthene | acenaphthylene | anthracene | benzidine |
| benzo(a)anthracene | benzo(a)pyrene | 3,4-benzofluoranthene | benzo(ghi)perylene |
| benzo(k)fluoranthene | bis(2-chloroethoxy)methane | bis(2-chloroethyl)ether | bis(2-chloroisopropyl)ether |
| bis(2-ethylhexyl)phthalate | 4-bromophenyl phenyl ether | butyl benzyl phthalate | 2-chloronaphthalene |
| 4-chlorophenyl phenyl ether | chrysene | di-n-butyl phthalate | di-n-octyl phthalate |
| dibenzo(a,h)anthracene | 1,2-dichlorobenzene | 1,3-dichlorobenzene | 1,4-dichlorobenzene |
| 3,3'-dichlorobenzidine | diethyl phthalate | dimethyl phthalate | 2,4-dinitrotoluene |
| 2,6-dinitrotoluene | 1,2-diphenylhydrazine | fluoranthene | fluorene |
| Hexachlorobenzene | hexachlorobutadiene | hexachlorocyclo-pentadiene | hexachloroethane |
| indeno(1,2,3-cd)pyrene | isophorone | naphthalene | nitrobenzene |
| n-nitrosodi-n-propylamine | n-nitrosodimethylamine | n-nitrosodiphenylamine | phenanthrene |
| pyrene | 1,2,4-trichlorobenzene | | |

Quantification Levels and Analytical Methods for Selected Parameters

| Parameter | Quantification Level | | Analytical Method |
|---|---|---|---|
| 1,2-Diphenylhydrazine (as Azobenzene) | 3.0 | ug/l | |
| 2,4,6-Trichlorophenol | 5.0 | ug/l | |
| 2,4-Dinitrophenol | 19 | ug/l | |
| 3,3’-Dichlorobenzidine | 1.5 | ug/l | EPA Method 605 |
| 4-chloro-3-methylphenol | 7.0 | ug/l | |
| 4,4’-DDD | 0.05 | ug/l | EPA Method 608 |
| 4,4’-DDE | 0.01 | ug/l | EPA Method 608 |
| 4,4’-DDT | 0.01 | ug/l | EPA Method 608 |
| Acrylonitrile | 1.0 | ug/l | |
| Aldrin | 0.01 | ug/l | EPA Method 608 |
| Alpha-Hexachlorocyclohexane | 0.01 | ug/l | EPA Method 608 |
| Antimony, Total | 1 | ug/l | |
| Arsenic, Total | 1 | ug/l | |
| Barium, Total | 5 | ug/l | |
| Benzidine | 0.1 | ug/l | EPA Method 605 |
| Beryllium, Total | 1 | ug/l | |
| Beta-Hexachlorocyclohexane | 0.01 | ug/l | EPA Method 608 |

| Parameter | Quantification Level | | Analytical Method |
|---|---|---|---|
| Bis (2-Chloroethyl) Ether | 1.0 | ug/l | |
| Boron, Total | 20 | ug/l | |
| Cadmium, Total | 0.2 | ug/l | |
| Chlordane | 0.01 | ug/l | EPA Method 608 |
| Chromium, Hexavalent | 5 | ug/l | |
| Chromium, Total | 10 | ug/l | |
| Copper, Total | 1 | ug/l | |
| Cyanide, Available | 2 | ug/l | EPA Method OIA 1677 |
| Cyanide, Total | 5 | ug/l | |
| Delta-Hexachlorocyclohexane | 0.01 | ug/l | EPA Method 608 |
| Dieldrin | 0.01 | ug/l | EPA Method 608 |
| Di-N-Butyl Phthalate | 9.0 | ug/l | |
| Endosulfan I | 0.01 | ug/l | EPA Method 608 |
| Endosulfan II | 0.01 | ug/l | EPA Method 608 |
| Endosulfan Sulfate | 0.01 | ug/l | EPA Method 608 |
| Endrin | 0.01 | ug/l | EPA Method 608 |
| Endrin Aldehyde | 0.01 | ug/l | EPA Method 608 |
| Fluoranthene | 1.0 | ug/l | |
| Heptachlor | 0.01 | ug/l | EPA Method 608 |
| Heptachlor Epoxide | 0.01 | ug/l | EPA Method 608 |
| Hexachlorobenzene | 0.01 | ug/l | EPA Method 612 |
| Hexachlorobutadiene | 0.01 | ug/l | EPA Method 612 |
| Hexachlorocyclopentadiene | 0.01 | ug/l | EPA Method 612 |
| Hexachloroethane | 5.0 | ug/l | |
| Lead, Total | 1 | ug/l | |
| Lindane | 0.01 | ug/l | EPA Method 608 |
| Lithium, Total | 10 | ug/l | |
| Mercury, Total | 0.5 | **ng/l** | EPA Method 1631E |
| Nickel, Total | 5 | ug/l | |
| PCB-1016 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1221 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1232 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1242 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1248 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1254 | 0.1 | ug/l | EPA Method 608.3 |
| PCB-1260 | 0.1 | ug/l | EPA Method 608.3 |
| Pentachlorophenol | 1.8 | ug/l | |
| Perfluorooctane sulfonate (PFOS) | 2.0 | ng/l | ASTM D7979 or an isotope dilution method (sometimes referred to as Method 537 modified) |
| Perfluorooctanoic acid (PFOA) | 2.0 | ng/l | ASTM D7979 or an isotope dilution method (sometimes referred to as Method 537 modified) |
| Phenanthrene | 1.0 | ug/l | |
| Selenium, Total | 1.0 | ug/l | |

| Parameter | Quantification Level | Analytical Method |
|---|---|---|
| Silver, Total | 0.5 ug/l | |
| Strontium, Total | 1000 ug/l | |
| Sulfide, Dissolved | 20 ug/l | |
| Thallium, Total | 1 ug/l | |
| Toxaphene | 0.1 ug/l | EPA Method 608 |
| Vinyl Chloride | 0.25 ug/l | |
| Zinc, Total | 10 ug/l | |

## 10. Pollutant Minimization Program for Total Mercury and PCBs

The goal of the Pollutant Minimization Program is to maintain the effluent concentration of total mercury at or below 1.3 ng/l and the final effluent limitations for Total Polychlorinated Biphenyls (PCBs). The permittees shall continue to implement the Pollutant Minimization Program approved on November 9, 1995, and updated in October, 1996, and modifications thereto, to proceed toward the goal. The Pollutant Minimization Program includes the following:

a. an annual review and semi-annual monitoring of potential sources of mercury and PCBs entering the wastewater collection system, including wet weather sources such as runoff/contributions from contaminated sites in the collection area;

b. a program for quarterly monitoring of influent and periodic monitoring of sludge for mercury and PCBs; and

c. implementation of reasonable cost-effective control measures when sources of mercury and/or PCBs are discovered. Factors to be considered include significance of sources, economic considerations, and technical and treatability considerations.

On or before October 1st of each year, the permittees shall submit a status report for the previous calendar year to the Department that includes 1) the monitoring results for the previous year, 2) an updated list of potential mercury and/or PCB sources, and 3) a summary of all actions taken to reduce or eliminate identified sources of mercury and/or PCBs.

Any information generated as a result of the Pollutant Minimization Program set forth in this permit may be used to support a request to modify the approved program or to demonstrate that the Pollutant Minimization Program requirement has been completed satisfactorily.

A request for modification of the approved program and supporting documentation shall be submitted in writing to the Department for review and approval. The Department may approve modifications to the approved program (approval of a program modification does not require a permit modification), including a reduction in the frequency of the requirements under items a. and b.

This permit may be modified in accordance with applicable laws and rules to include additional mercury and/or PCB conditions and/or limitations as necessary.

## 11. Water Resource Recovery Facility Wet Weather Operational Plan

The approved Water Resource Recovery Facility Wet Weather Operational Plan provides the protocol for operations during the interim period before full completion of the Long-term CSO Control Plan. This plan details the necessary requirements to maximize wet weather treatment at the WRRF, while complying with effluent limits and all other conditions of this permit, and minimizing untreated combined sewage discharges in the tributary collection system.

The GLWA WRRF Wet Weather Operational Plan shall be coordinated with the Collection System and CSO Treatment Facilities Operational Plan that is required in accordance with Part I.A.15.d. of this permit. Annually, on or before April 1st, the permittees shall submit an update of the Water Resource Recovery Facility Wet Weather Operational Plan in conjunction with the Collection System and CSO Treatment Facilities Operational Plan update as part of the Consolidated Annual Report to the Department for review and approval.

## 12. Facilities Improvement Program

The permittees shall continue to meet the sludge dewatering, conveyance, and final disposal requirements; submit and implement the solids disposal plans; correct the alum sludge issue; submit the WRRF shutdown schedules; and develop and implement the asset management program as detailed below.

a. WRRF Solids Processing Requirements and Corrections

1) Capacity for sludge dewatering, conveyance, and final disposal; Required maximum solids inventory loads.

The permittees shall ensure that sludge dewatering equipment, sludge conveyance equipment, and final sludge disposal capability is available at the GLWA WRRF as follows:

a) The permittees shall ensure that the WRRF sludge dewatering equipment, sludge conveyance equipment, and final sludge disposal capability are maintained for use; and in good operational working order to meet the following requirements:

(1) Average capacity of 500 dry tons per day (dtpd), calculated as a calendar monthly average;

(2) Peak capacity of 850 dtpd, calculated as a 10-day average;

(3) The peak 10-day average shall be available during any wet weather event when the WRRF is operated in the “Storm Period” of the currently approved WRRF Wet Weather Operational Plan as required by Part I.A.11.

The permittees shall also:

(4) Notify the Department within one business day if solids are recycled from the gravity thickeners to the head of the WRRF for more than 72 hours and provide an explanation for the recycled solids. <u>Recycled solids are defined as a TSS overflow concentration of 1000 mg/l or greater from Complex A thickeners;</u>

(5) Maintain a monthly average solids inventory of less than 750 dtpd, when there are less than 5 days of discharge from Outfall 049A during the month, and maintain a calendar quarterly average solids inventory not to exceed 1000 dtpd. Solids inventory is defined as the total solids in gravity thickener complexes A and B, determined daily in dtpd;

(6) This Section will be reviewed during the next NPDES reissuance based on WRRF performance; and

(7) The permittees are allowed to submit to the Department for review and approval a request to modify the numerical levels specified in Part I.A.12.a. of this permit. This modification request shall include supporting rationale for the revised numerical levels.

2) Long-Term Solids Disposal Plan

a) The permittees submitted to the Department for review and approval a Long-Term Solids Disposal Plan (LTSDP). This Solids Disposal Plan is designed to ensure the availability of sufficient sludge dewatering equipment and sludge disposal capability to meet the capacity requirements specified in Parts I.A.12.a.1).a).(1)&(2) of this permit. The permittees shall implement the LTSDP in accordance with the following schedule:

(1) On or before December 31, 2018, (submitted) the permittees shall submit for approval, a disposal plan for 250 dtpd. This requirement is based on the LTSDP approved on September 24, 2013. Upon notification from the Department, the permittees shall implement the approved disposal plan;

(2) On or before December 31, 2025, the permittees shall complete implementation of the approved plan referenced in item (1) above;

b) The GLWA are advised that implementation of individual elements of the LTSDP may require Part 41 wastewater construction permits or may require other Department approvals.

3) Alum Sludge Correction
The permittees shall continue to implement the approved plan to correct the solids dewatering concerns at the WRRF due to alum sludge discharges from GLWA water treatment plants (WTPs) into the collection system.

Annually, on or before September 1st the permittees shall submit a report to the Department describing if the implemented plan continued to meet the conditions specified above for the preceding fiscal year (July 1 – June 30).

Part 41 construction permits at the WRRF and/or Act 399 construction permits at the specific WTPs may be needed depending on the components of the approved plan.

b. WRRF Quarterly Shutdown Schedules
On or before December 1, March 1, June 1, and September 1, the permittees shall submit quarterly WRRF Shutdown Schedules, until notified in writing by the Department. Consistent with the quarterly dates indicated above, these schedules shall be submitted to the Department in a mutually agreeable format one month prior to the start of each calendar quarter for review and approval. Each quarterly schedule shall detail the primary treatment capacity, secondary treatment capacity, and sludge processing capacity that is planned to be available during the upcoming quarter, considering coordinated shutdowns necessary to complete all rehabilitation and other projects. The shutdown schedules shall be proposed to minimize environmental impact and maximize available treatment during construction of all projects, consistent with the requirements of the rules associated with Act 451, Part 41, being 299.2943 and 299.2955(1) and (3).

c. Operation, Maintenance & Replacement/Asset Management
The permittees shall at all times properly operate and maintain all facilities (i.e., sewer system, treatment works, as defined in Part 41 of Act 451, 1994 as amended, and control systems) that are installed or used by the permittees to operate the treatment works and sewer system and achieve and maintain compliance with the conditions of this permit. The requirements of an asset management program contain goals of effective performance, adequate funding, and adequate operator staffing and training. Asset management is a planning process focused on gaining optimum value for each asset and providing the financial resources to rehabilitate and replace them when necessary; Asset management is centered on a framework of five (5) core elements: the current state of the assets, the required sustainable level of service, the assets critical to sustained performance, the best-value life-cycle costs, and the best long-term funding strategy.

1) The permittees shall continue to implement the approved Asset Management Program that addresses the following items:

- A comprehensive fixed asset inventory that is maintained, managed, and updated within a computerized maintenance management system (CMMS),

- A comprehensive inventory of the collection system fixed assets and collection system map,
- A Preventive Maintenance Program that may include predictive and reliability centered maintenance,
- A Needs Assessment updated every five years as part of the Project Plan (due on or before October 1, 2021), including condition assessment and evaluation of service level,
- An assessment of asset criticality and risk management,
- A capital planning process,
- A Scheduled Replacement Program (SRP) for assets,
- Monitoring and periodic performance evaluation through Key Performance Indicators (KPIs),
- Management oversight of system performance.

The permittees' Asset Management Program submitted on January 1, 2014, was approved on January 14, 2014, and substantially revised on September 29, 2017.

2) An Annual Report covering implementation of the Asset Management Program during the prior Fiscal Year (July 1 – June 30) shall be prepared by the permittees and submitted to the Department on or before October 1st. The Annual Report shall include:

a) A description and evaluation of the sufficiency of the staffing levels maintained during the year,

b) A description and evaluation of the sufficiency and adequacy of inspections and maintenance activities conducted and corrective actions taken during the previous year,

c) Expenditures for collection system maintenance activities, treatment works maintenance activities, corrective actions, and capital investment during the previous year, compared with budged/projected expenditures, including an evaluation of the sufficiency of expenditures,

d) A summary of asset/areas identified for inspection/action (including capital improvement) in the upcoming year based on the five (5) core elements and the criticality and risk analysis,

e) A maintenance budget and capital improvement budget for the upcoming year, based on implementation of an effective asset management program that meets the five (5) core elements,

f) An updated estimate of the revenue necessary to complete anticipated OM&R activities, the associated rate schedule impact, and an assessment of the adequacy of the revenue to perform necessary OM&R work, and

g) A description of the progress made towards completion of the outstanding tasks as described in the previous year's Asset Management Annual Report and an updated schedule for completion of any outstanding tasks.

d. Staffing Plan

A Staffing Plan, as required by ACO-00131, has been approved by the Department. The GLWA shall provide an adequate staffing level, in accordance with the approved Staffing Plan, to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. During the term of ACO-00131, a change in the minimum staffing level may be requested by the GLWA by submittal of a revised Staffing Plan, including training requirements, and may be revised only by mutual agreement in writing between the GLWA and the Department. Should ACO-00131 be terminated, then the staffing plan shall be updated as required by the Operations and Maintenance Manual (Part II.C.14 of this permit), and an up to date copy of the manual shall be kept at the WRRF. The Department may review the manual in whole or in part (i.e. staffing) at their discretion and require modifications to it if portions are determined to be inadequate.

e. Key Performance Indicator Monthly Report
The permittee shall update the Key Performance Indicator (KPI) report monthly. If Administrative Consent Order No. ACO-000131, as amended, is terminated, the KPI report shall be submitted by the last day of the month following the termination of the ACO.

f. Public Participation
The permittees will participate in Department initiated public outreach meetings during the term of this permit as resources allow and provided there is adequate notification by the Department.

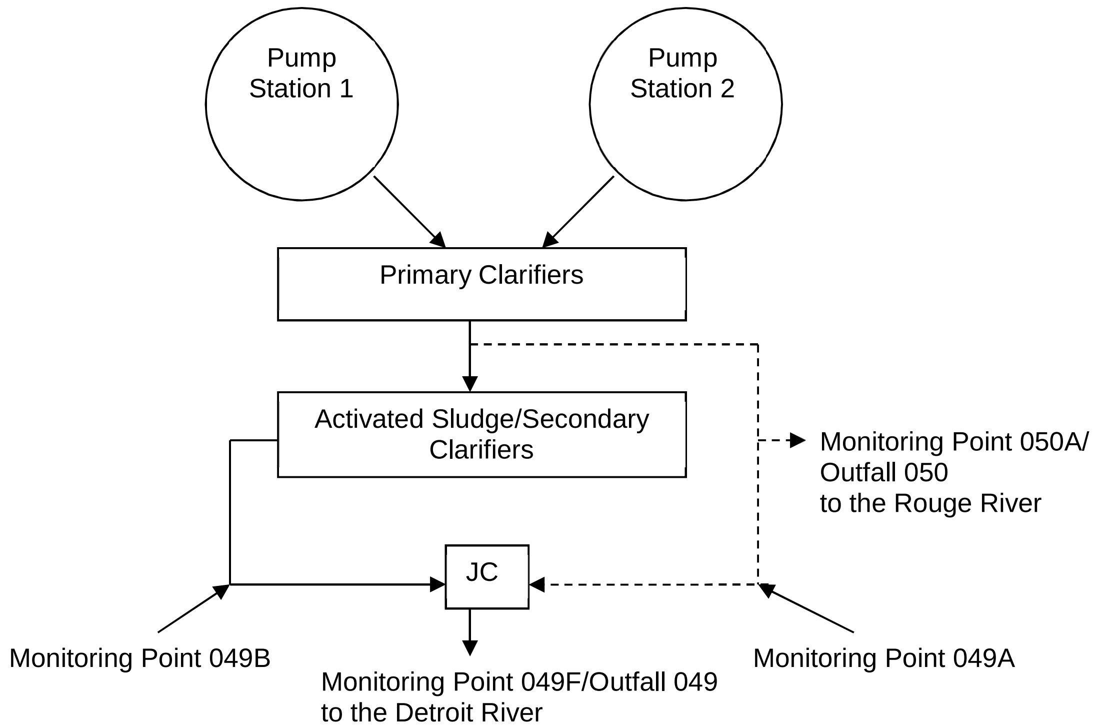
## 13. Reopener for Primary and Secondary Treatment Capacity

The permittees are required to maintain a wet weather primary treatment capacity of 1700 MGD (raw) and wet weather secondary treatment capacity of 930 MGD (which includes recycle). When the elevation of the influent wet well is greater than 85 feet and the facility is not pumping at 1700 MGD (raw), the discharge from untreated combined sewage overflow (CSO) upstream of the facility are not authorized, unless caused by localized storm conditions.

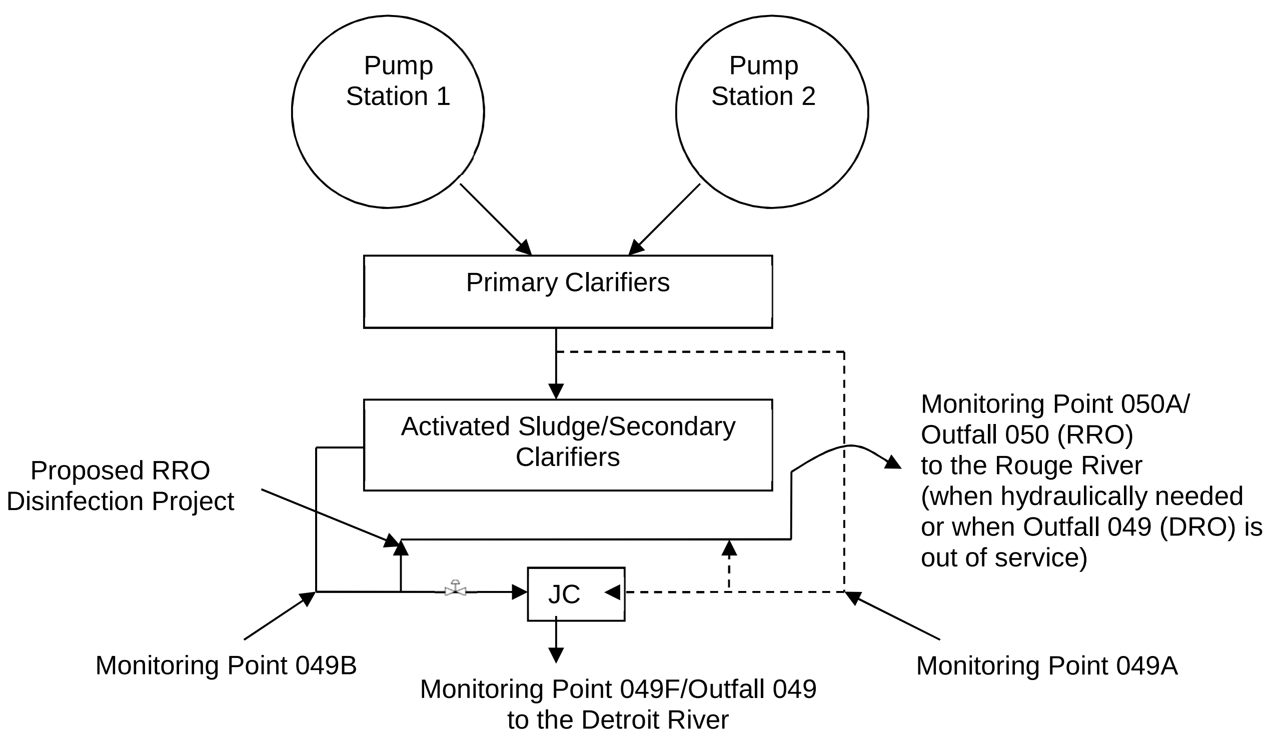
These required wet weather treatment capacities may be revised if new/altered wet weather conditions (such as initiation of operation of upstream CSO facilities, etc.) indicate that either less or more flow can be effectively processed. The criteria used to determine whether the required wet weather primary treatment capacities should be revised must include additional plant evaluation under the updated conditions, using testing procedures approved by the Department.

For reference, outfall/monitoring point designations are shown on the following diagrams:

Prior to Initiation of Operation of RRO Disinfection Project




After Initiation of Operation of RRO Disinfection Project



# 14. Outfalls Prohibited from Discharge to Combined Sewer System

The following Outfalls are prohibited from discharge except as provided for in Part II.C.9.:

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 004 | Fairview (DWF) Pump Station (P28 through P31) Parkview & Detroit River - **Emergency only** | 42°21'20" 082°58'01" | Discharge to Detroit River (Stop-logged) |
| 014 | Dubois (B12) Dubois & Detroit River | 42°20'01" 083°01'19" | Detroit River |
| 051 | Carbon (B46) Carbon & Rouge River | 42°17'07" 083°08'17" | Rouge River |
| 054 | Fort St. (DWSD Northwest) Interceptor) (B50) South Fort St. & Rouge River (West Shore) | 42°17'25" 083°08'35" | Rouge River |
| 056 | Fort St. (Oakwood District) (B49) South Fort St. & Rouge River (West Shore) | 42°17'27" 083°08'33" | Rouge River |
| 080 | Fox Creek Backwater Gates (B01) East Jefferson & Fox Creek. | 42°22'28" 082°56'27" | Fox Creek to Detroit River |

The permittees shall provide for ongoing monitoring (Flow, Duration) for these outfalls should they discharge. This monitoring shall be used to comply with the requirements of Section 324.3112(a) of The Michigan Act (See Part I.A.16.).

## 15. Discharges from Combined Sewer System

a. Limited Discharge Authorization

The permittees are required to utilize, to the maximum extent practicable, available sewerage system transportation capabilities for the delivery of combined sewage to treatment facilities. For an interim period during which the amended Long-Term CSO Control Plan is to be implemented, the permittees are authorized to discharge during wet weather events (see Part II.A.) combined sewage from the outfalls and locations listed below in accordance with the following conditions:

1) a flow rate equivalent to the peak dry weather flow rate has been conveyed to the secondary treatment facilities for treatment without bypass,

2) the total sewerage system storage and transportation capacity for conveyance of wet weather flows to the treatment facilities for treatment has been utilized within the hydraulic design constraints of the system,

3) all primary treatment plant capacity and secondary treatment plant capacity has been utilized in accordance with the approved WRRF Wet Weather Operation Plan (Part 1.A.11.), unless a storm event is localized to the extent that the hydraulic capacity of a portion of the collection system (considering storage) is exceeded prior to reaching plant capacities, and

4) the permittees are in full compliance with all requirements as set forth in Part I.A.16. Combined Sewer Overflow discharges to the Rouge River, the Detroit River, and the Old Channel of the Rouge River are authorized until prohibited, eliminated, or adequately treated to meet water quality standards at times of discharge in accordance with the requirements below, and as specified in Part 1.A.15.f. and g.

5) the outfalls that immediately follow this paragraph are included in the Limited Discharge Authorization. There are some untreated CSO outfalls that appear to discharge only during extreme events. Extreme is defined as; (a) no more than one untreated discharge in ten years from a CSO outfall during the April 1 through October 31 growth period, (b) modeled to not discharge at the 25 year – 24 hour event (during growth period, with normal soil moisture, rainfall distributed to a SCS Type II distribution), or (c) monitored to occur only at rainfalls greater than 4 inches in a 24 hour period. The Department does not intend to require construction of treatment facilities at the following outfalls should they continue to only discharge at the extreme event. This addresses CSO outfalls consistently with SSO outfalls according to the 2002 SSO Policy and 2003 Clarification Statement. The list of untreated CSO outfalls that only discharge at the extreme event is flexible and may be adjusted with the adaptive management CSO correction program.

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 029 | Rosa Parks (B27)<br>Rosa Parks & Detroit River | 42°19'13"<br>083°03'56" | Detroit River |
| 030 | Vermont (B28)<br>Vermont (extended) & Detroit River | 42°19'06"<br>083°04'09" | Detroit River |
| 037 | McKinstry (B35)<br>McKinstry & Detroit River | 42°18'19"<br>083°05'13" | Detroit River |
| 042 | Campbell (B40)<br>Campbell & Detroit River | 42°18'01"<br>083°05'30" | Detroit River |
| 048 | Pulaski (B59A &B)<br>Pulaski & Rouge River | 42°17'21"<br>083°07'11" | Old Channel<br>Rouge River |

6) the outfalls that immediately follow this paragraph are also included in the Limited Discharge Authorization. There are some untreated CSOs that appear to discharge at a minimal frequency and volume. Minimal discharge is defined as actual monitoring of a volume less than 0.3 MG of discharge over a five year period. The Department does not intend to require construction of treatment facilities at the following outfalls should they continue to only discharge at this minimal frequency and volume. The list of untreated CSO outfalls that only discharge at a minimal frequency and volume is flexible and may be adjusted with the adaptive management CSO correction program.

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 024 | Griswold (B22)<br>Griswold & Detroit River | 42°19'35"<br>083°02'28" | Detroit River |
| 032 | Twenty-First St. (B30)<br>Twenty-First St. & Detroit River | 42°18'53"<br>083°04'31" | Detroit River |
| 034 | West Grand Blvd. (B32)<br>West Grand Blvd. & Detroit River | 42°18'41"<br>083°04'50" | Detroit River |
| 035 | Swain (B33)<br>Swain & Detroit River | 42°18'35"<br>083°04'56" | Detroit River |
| 036 | Scotten (B34)<br>Scotten & Detroit River | 42°18'31"<br>083°05'02" | Detroit River |
| 041 | Junction (B39)<br>Junction & Detroit River | 42°18'07"<br>083°05'25" | Detroit River |
| 043 | Dragoon (Livernois Relief)<br>(B41) Dragoon (extended)<br>& Detroit River | 42°17'49"<br>083°05'41" | Detroit River |
| 047 | Dearborn St. (B45)<br>Dearborn St. & Rouge River | 42°17'26"<br>083°06'59" | Old Channel<br>Rouge River |
| 073 | Riverdale (B79)<br>Florence & Rouge River | 42°24'36"<br>083°16'13" | Rouge River |

7) the outfalls that immediately follow this paragraph are also included in the Limited Discharge Authorization. These are untreated CSOs that represent the remaining non-core outfalls that will be required to be addressed under the adaptive management CSO correction program. They include the high-priority non-core CSOs. Note that the list of untreated CSO outfalls is flexible and may be adjusted with the adaptive management CSO correction program.

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 005 | McClellan (B03)<br>McClellan (extended) &<br>Detroit River | 42°21'20"<br>082°58'02" | Detroit River |
| 006 | Fischer (B04)<br>Fischer & Detroit River | 42°21'16"<br>082°59'15" | Detroit River |
| 007 | Iroquois (B05)<br>Iroquois & Detroit River | 42°21'14"<br>082°59'21" | Detroit River |
| 008 | Helen (B06)<br>Helen & Detroit River | 42°20'40"<br>083°00'06" | Detroit River |
| 009 | Mt. Elliott (B07)<br>Mt. Elliott & Detroit River | 42°20'24"<br>083°00'28" | Detroit River |
| 011 | Adair (B09)<br>Adair & Detroit River | 42°20'16"<br>083°00'41" | Detroit River |
| 012 | Joseph Campau (B10)<br>Joseph Campau & Detroit River | 42°10'08"<br>083°01'02" | Detroit River |
| 016 | Orleans Relief (B15)<br>Orleans (Eastside of) &<br>Detroit River | 42°19'54"<br>083°01'36" | Detroit River |
| 017 | Orleans (B14)<br>Orleans (Westside of) &<br>Detroit River | 42°19'53"<br>083°01'37" | Detroit River |
| 018 | Riopelle (B16)<br>Riopelle & Detroit River | 42°19'52"<br>083°01'42" | Detroit River |
| 019 | Rivard (B17)<br>Rivard & Detroit River | 42°19'48"<br>083°01'55" | Detroit River |
| 020 | Hastings (B18)<br>Schweizer Place & Detroit River | 42°19'46"<br>083°02'03" | Detroit River |
| 021 | Randolph (B19)<br>Randolph & Detroit River | 42°19'29"<br>083°02'26" | Detroit River |
| 022 | Bates (B20)<br>Bates & Detroit River | 42°19'38"<br>083°02'32" | Detroit River |
| 023 | Woodward (B21)<br>Woodward & Detroit River | 42°19'37"<br>083°02'35" | Detroit River |
| 025 | First-Hamilton (B23)<br>First (extended) & Detroit River | 42°19'30"<br>083°02'57" | Detroit River |
| 026 | Third St. (B24)<br>Third St. & Detroit River | 42°19'28"<br>083°03'07" | Detroit River |

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 027 | Cabacier (B25)<br>Brooklyn (extended) &<br>Detroit River | 42°19'24"<br>083°03'26" | Detroit River |
| 028 | Eleventh St. (B26)<br>Eleventh St. & Detroit River | 42°19'17"<br>083°03'46" | Detroit River |
| 031 | Eighteenth St. (B29)<br>Eighteenth St. & Detroit River | 42°18'57"<br>083°04'31" | Detroit River |
| 033 | Twenty-Fourth St. (B31)<br>Twenty-Fourth St. & Detroit River | 42°18'47"<br>083°04'42" | Detroit River |
| 038 | Summit-Clark (B36)<br>Summit & Detroit River | 42°18'14"<br>083°05'18" | Detroit River |
| 039 | Ferdinand (B37)<br>Ferdinand & Detroit River | 42°18'13"<br>083°05'19" | Detroit River |
| 040 | Morrell (B38)<br>Morrell & Detroit River | 42°18'10"<br>083°05'22" | Detroit River |
| 044 | Schroeder (B42)<br>Schroeder & West Jefferson | 42°17'32"<br>083°06'00" | Detroit River |
| 046 | Cary (B44)<br>Cary & Rouge River | 42°17'29"<br>083°06'47" | Old Channel<br>Rouge River |
| 059 | Warren (B54)<br>West Warren & Rouge River | 42°20'34"<br>083°14'57" | Rouge River |
| 060 | Tireman (B56, 57 & 58)<br>Tireman & Rouge River | 42°20'59"<br>083°14'51" | Rouge River |
| 061 | West Chicago (B60, 61 & 62)<br>West Chicago & Rouge River<br>(East Shore) | 42°21'46"<br>083°14'56" | Rouge River |
| 062 | West Chicago (B63)<br>West Chicago & Rouge River<br>(West Shore) | 42°21'52"<br>083°15'18" | Rouge River |
| 063 | Plymouth (B64)<br>Plymouth & Rouge River | 42°22'18"<br>083°15'21" | Rouge River |
| 064 | Glendale Relief (B65)<br>Rouge Park Golf Course | 42°22'33"<br>083°14'52" | Rouge River |
| 065 | Lahser (Dolson) (B67 & 68)<br>Lahser & Rouge River | 42°22'52"<br>083°15'23" | Rouge River |
| 066 | Schoolcraft (B70)<br>Jeffries Freeway, I-96 & Rouge River | 42°23'07"<br>083°16'02" | Rouge River |

| OUTFALL | LOCATION | LAT/LONG | RECEIVING STREAM |
|---|---|---|---|
| 067 | West Parkway (B69)<br>Jeffries Freeway, I-96 & Rouge River | 42°23'07"<br>083°16'02" | Rouge River |
| 068 | Brammel (B71)<br>Ray & Rouge River | 42°23'30"<br>083°15'56" | Rouge River |
| 069 | Lyndon (B72)<br>Lyndon & Rouge River | 42°23'35"<br>083°15'57" | Rouge River |
| 072 | Puritan (B77)<br>Puritan & Rouge River (East Shore) | 42°24'28"<br>083°16'14" | Rouge River |
| 074 | McNichols (B80 & 81)<br>West McNichols & Rouge River | 42°24'52"<br>083°15'59" | Rouge River |
| 075 | Glenhurst (B82)<br>Glenhurst & Rouge River | 42°25'32"<br>083°16'19" | Rouge River |
| 077 | Seven Mile (B85)<br>West Seven Mile & Rouge River<br>(East Shore) | 42°25'44"<br>083°16'09" | Rouge River |
| 079 | Pembroke (B87)<br>Frisbee & East Shore Rouge River | 42°26'02"<br>083°16'24" | Rouge River |

Nothing in this section of the permit shall be construed to limit the State of Michigan's ability to pursue remedies under the Michigan Act.

b. Qualified Operations and Maintenance Manager for CSO Discharges
The permittees shall place the wastewater collection system under the supervision of a qualified Operations and Maintenance Manager who shall serve as the contact person for the Department regarding combined sewer discharges. The permittees may replace the manager at any time and shall notify the Department within ten days after the replacement.

c. Disconnection of Eaves Troughs and Roof Downspouts
The permittees shall eliminate direct connections of eaves troughs and roof downspouts to the sewer system throughout the service area tributary to the Upper Rouge CSO outfalls (Outfalls 059-069, 072-075, 077, and 079). This requirement shall be completed for residential property and commercial and industrial properties or as approved by the Department consistent with the permittees' implementation of the Green Storm Water Infrastructure program. In addition, the permittees shall eliminate direct connections of eave troughs and roof downspouts in the service areas tributary to the CSO RTBs, to the CSO Screening & Disinfection Facilities, and to the remaining untreated CSOs based upon the plan detailed in the revised Long-term Control Program. This requirement does not apply if the permittees demonstrates that the disconnection of eaves troughs and roof downspouts is not a cost-effective means of reducing the frequency or duration of combined sewer overflows or of maintaining compliance with this permit. Such a demonstration and supporting documentation shall be submitted to the Department for approval.

d. Collection System and CSO Treatment Facilities Operational Plan
The permittees shall continue implementation of the approved Collection System and CSO Treatment Facilities Operational Plan (Operational Plan). The implementation of the Operational Plan shall be coordinated with the WRRF Wet Weather Operational Plan that is required for development and implementation in accordance with Part I.A.11. of this permit.

On or before <u>April 1 (annually)</u>, the permittees shall submit a revised Operational Plan for Department review and approval, which incorporates all changes made to the plan during the last calendar year (items 1-12 below), and supplies the annual discharge documentation (item 13 below). Any changes to the Operational Plan that affect the rate, volume, or characteristics of the discharge, or the system storage and transportation for conveyance of wet weather flows, shall be submitted to the Department and approved prior to implementation. The operational plan shall define the hydraulic design constraints of the system during both dry and wet weather operation.

The plan shall include:
1) the procedures utilized at the permittees' CSO RTBs and Screening & Disinfection Facilities for adjustment of NaOCl disinfectant feed rates to minimize the discharge of total residual chlorine,

2) the procedures and schedule for sampling/monitoring the stored NaOCl disinfectant at the permittees' CSO RTBs and Screening & Disinfection Facilities to determine the concentration of available chlorine and assure that the stored NaOCl is of sufficient strength to provide effective disinfection,

3) the procedures for sampling/monitoring the available chlorine concentration of each load of NaOCl delivered to the permittees' CSO RTBs and Screening & Disinfection Facilities,

4) if applicable, the procedures utilized at the permittees' CSO RTBs and Screening & Disinfection Facilities for adjustment of dehalogenating reagent feed rates to minimize the discharge of excess reagent,

5) the procedures to ensure that the collection and treatment systems are operated to maximize treatment,

6) the procedures to ensure that all dry weather flows are conveyed to the treatment facilities for treatment without bypass,

7) the hydraulic profile and hydraulic operational elevations for system pump stations, regulators, diversion devices, gates, level sensors, interceptors, etc., to ensure the conveyance of all dry weather flows to the treatment facilities for treatment without bypass,

8) the procedures to ensure that the sewerage system hydraulic and storage capacity is identified and fully utilized during wet weather events with eventual treatment of stored flows,

9) the procedures to ensure that the greatest quantity of wet weather flow is conveyed to the treatment facilities for treatment to minimize untreated wastewater discharges within the region tributary to the GLWA WRRF,

10) the hydraulic profile and hydraulic operational elevations for system pump stations, regulators, diversion devices, gates, level sensors, interceptors, etc., to ensure that the greatest quantity of wet weather flow is conveyed to the treatment facilities for treatment to minimize combined sewage discharges,

11) the procedures for ongoing inspection of the sewer system within the permittees' jurisdiction for excessive inflow and infiltration and, where necessary, reduction of the excessive infiltration and inflow sources, and the elimination of unauthorized sewer system connections, and

12) identification of the location of the rain gauges.

13) The permittees shall submit annual reports that supply the documentation of rainfall and the frequency, duration, and volume of all discharge events during the previous 12-month period (from January 1st through December 31st of the previous year).

The permittees shall continue to pursue the coordination of operational plans (Regional Operational Plan) with tributary communities with the intent of maximizing flow conveyance to the GLWA system and minimizing regional CSOs. Once the Regional Operational Plan is approved by the Department, it shall be implemented.

e. New Wastewater Flows
Increased levels of discharge of sanitary sewage from the combined sewer overflow outfalls listed in Part I.A.15.a. of this permit, the CSO RTBs (see Part I.A.6. of this permit), and the CSO Screening and Disinfection Facilities (see Part I.A.7. of this permit) are prohibited unless:

1) the increased discharges are the result of new sanitary wastewater flows which, on the basis of sound professional judgment, are within design peak dry weather transportation capacity, or

2) the permittees have officially adopted and are timely implementing a definite program, satisfactory to the Department, leading to the construction and operation of necessary collection, transportation, or treatment devices.

f. CSO Control Projects

1) Pertinent CSO Program History

The permittees are continuing to implement CSO Control Programs for the various CSO outfalls that discharge to the Rouge River and the Detroit River. Depending upon the particular CSO Control Program and outfall, the permittees are required to provide for the prohibition, elimination, or adequate treatment of combined sewage discharges containing raw sewage, to comply with the Water Quality Standards at times of discharge.

For the CSO outfalls discharging to the Rouge River, the development and implementation of the CSO Control Programs for the various outfalls was initially established based upon the goals of the Rouge River Remedial Action Plan (RAP), which called for a phased approach to solving the water quality problems of the river. Phase I of the Rouge River RAP extended to 1993 and included 1) monitoring and optimization of the existing combined sewer system, 2) detailed local planning for CSO controls and 3) resolution of financing and institutional problems. Phase II of the Rouge River RAP extended to 2005 (2012 for a few limited outfalls) and called for facility construction based on the goal of protection of public health through the elimination of raw sewage discharges and the control of toxic pollutants. Phase III of the Rouge River RAP follows completion of Phase II facilities and includes further improvements, if necessary, to comply with water quality standards at the time of discharge. Due to the demonstrated financial capability of the permittees for City of Detroit residents in 2009, 2012 and 2017, the CSO Control Program for the CSOs discharging to the Rouge River has been revised as reflected below.

For the CSO outfalls discharging to the Detroit River and the Old Channel of the Rouge River, Department approval of the CSO Control Programs is determined on a case-by-case basis with considerations for environmental impacts, public health impacts, technical feasibility, and economic affordability. As was the case for the Rouge River program, the demonstrated financial capability of the permittees for City of Detroit residents in 2009, 2012 and 2017 also affected the CSO Control Program for the Detroit River and the Old Channel of the Rouge River, and has been revised as reflected below.

In addition, the CSO Control Program now includes significant Green Storm water Infrastructure (GSI) requirements that are an important component of the approved Long-Term CSO Control Program.

Previous Long-Term CSO Control Program Documents include:

- Original Long-Term CSO Control Plan (1996)
- Long-Term CSO Control Plan Update (2002)
- Amendment Rouge (2008)
- Amendment Detroit (2008)
- Evaluation of CSO Control Alternative (for the Upper Rouge Outfalls) (December 15, 2009)

- Supplemental Report on Alternative CSO Controls for the Upper Rouge Outfalls) (April 30, 2010)

The implementation and completion of the CSO Control Program indicated in Part I.A.15.f. and g. are a necessary and essential requirement of this permit.

2) CSO Correction Program Moving Forward

The permittees shall control remaining combined sewer discharges, that are not classified as either extreme or minimal (see Part 1.A.15.a.5) & 6)), to eliminate the discharges or provide adequate treatment of the combined sewage discharges to comply with Water Quality Standards at times of discharge. Upon completion of the RRO disinfection project at the GLWA WRRF and commencing final use of Outfall 050A, the permittees will have completed core elements of their CSO control program and will have achieved a very high level of CSO control. It has been determined that this core level of control has routinely achieved adequate treatment of 95% of the annual combined sewer volume to the collection system. While additional CSO control measures are needed to fully comply with Michigan's Water Quality Standards, as the permittees moves into the final phases of the CSO control program it is appropriate to plan and schedule the remaining control measures, taking into account what has been put in place to date and lessons learned, the unique technical and financial situation of the city of Detroit, and the nature of the remaining CSO challenges.

Based on the foregoing, the permittees shall proceed with remaining CSO corrections using an adaptive management approach. This means that as new information is gained from: (1) evaluation of existing CSO projects and new treatment technologies, (2) evaluation of real-time collection system controls, (3) more accurate and complete data on CSO discharge frequency and volume, (4) benefits of less flow to the collection system from green storm water infrastructure (GSI), (5) benefits of less flow to the collection system due to the City's drainage charge program and new storm water ordinance, (6) benefits of less flow to the collection system as the City continues its sewer rehabilitation program, and (7) any other pertinent information, future CSO controls can be adapted to best provide cost-effective elimination of discharges, adequate treatment of discharges, or classification of discharges as minimal or extreme. Note that for purposes of designing CSO correction projects, minimal discharge is defined as less than 0.3 MG of discharge over a five year period, and extreme is defined as; (a) no more than one untreated discharge in ten years from a CSO outfall during the April 1 through October 31 growth period, (b) modeled to not discharge at the 25 year – 24 hour event (during growth period, with normal soil moisture, rainfall distributed to a SCS Type II distribution), or (c) monitored to occur only at rainfalls greater than 4 inches in a 24 hour period. The performance standard can be based on actual monitoring data normalized for a typical and representative 10-year period of rainfall record or predictively determined based on a calibrated and verified continuous model using a typical and representative 10-year period of rainfall record or other method as determined acceptable by the Department.

The permittees shall propose the non-core CSO correction projects to be designed, constructed, and operated to provide CSO elimination or adequate treatment during the subsequent five-year permit cycle, with each permit reapplication beginning in April 2022. High priority non-core outfalls should generally be addressed first, and outfalls thought of as high priority can change at any time due to implementation of the adaptive management approach. City of Detroit residents within the DWSD service area are "high burden" status based on sewer fees paid as a percentage of median annual household income. Planning of CSO control measures may reflect the permittees' financial capacity for City of Detroit residents determined in the Financial Capability Evaluation that is submitted with each permit reapplication. Based on current and projected CSO capital revenue requirements, and the current average cost per Detroit household for wastewater treatment and CSO control as a percentage of Detroit median household income, the Department does not expect the permittees to propose non-core CSO correction projects with this permit. The permittees shall next propose non-core CSO correction projects for review and approval with the permit reapplication required by April 4, 2022 (and then on April 4, 2027, and April 4, 2032). However, this first tier of non-core projects during 2023 through 2027 is expected to be relatively low cost. Discussion between the permittees and the Department have determined that low cost projects can include connection of CSO discharges to existing CSO treatment facilities, limited storage projects based on the performance standard with no disinfection, outfall gates and in-system storage projects, increased regulator flow capacity, separation projects that use smaller sanitary pipes in existing larger combined sewers to carry sanitary sewage to

GLWA interceptors while the existing combined sewer becomes a storm sewer, and others. At each application submittal in 2022, 2027, and 2032, the project proposal shall include an updated Financial Capability Evaluation that may also include other financial factors as appropriate. Reissued permits will then be drafted and issued with schedules for approved CSO correction projects that provide continuing progress toward meeting water quality standards. The permittees shall prepare an evaluation of Financial Capability, consistent with state and federal guidance, and shall submit the evaluation with the applications for reissuance of this permit (see the cover page of this permit for the next application due date). The Financial Capability Report shall be in the form of previous reports utilizing the EPA Financial Capability Guidance Document (USEPA 832-B-97-004; February, 1997), and updated with information as may be available in order to assess the permittees' ability to undertake future capital improvement projects related to the Long-Term CSO Control Program. This permit may be modified in accordance with applicable law and rules to incorporate revisions to conform to pertinent laws or rules, or as necessary to address prevailing situations.

Based on information currently available, the following are lists by water body that are high priority CSOs that require control. These outfalls can be revised at any time by the permittees or the Department, reflecting adaptive management considerations. While either the permittees or Department can propose changes at any time, an agreement between the two parties is required and shall be made in writing. The goal will be to complete projects fully addressing all high priority outfalls before October 1, 2037.

Rouge River non-core CSOs (these can be changed by mutual agreement between the permittees and the Department)

| High Priority Outfalls |
|---|
| 059, 061, 064, 065, 074 |

Detroit River non-core CSOs (these can be changed by mutual agreement between the permittees and the Department)

| High Priority Outfalls |
|---|
| 005, 007, 009, 012, 022, 025, 031, 038 |

3) Adaptive Management Program for this Permit

The adaptive management approach for this permit, before beginning relatively low cost CSO correction projects from 2023-2027, looks at the (1) evaluation of existing CSO projects and new treatment technologies, (2) evaluation of real-time collection system controls, (3) more accurate and complete data on CSO discharge frequency and volume, (4) benefits of less flow to the collection system from green storm water infrastructure (GSI), (5) benefits of less flow to the collection system due to the City's drainage charge program and new storm water ordinance, (6) benefits of less flow to the collection system as the City continues its sewer rehabilitation program, and (7) any other pertinent information. The permittees shall use the above measures, as appropriate, to further reduce untreated CSO discharges on an ongoing basis from the collection system before starting CSO projects from 2023 - 2037.

On or before <u>April 1st (annually starting in 2020)</u>, the permittees shall prepare a joint Progress Report that summarizes; 1) significant real time controls that occurred during the preceding calendar year, 2) GSI implementation work during the preceding year that has been undertaken and completed, including a work plan for GSI implementation projects for the next year, documentation of the annual expenditure for the preceding year, and documentation of a cumulative total-spent-to-date on the GSI program, 3) benefits from the new storm water ordinance and green credit program, and 4) benefits from the City sewer rehabilitation program. The report shall summarize the total benefits from all programs by including; a) an updated estimate of the annual volume of wet weather flow that has been removed from the combined sewer system, b) the resulting frequency, volume and duration of CSO discharges (based on actual monitoring), and c) the predicted change modeled continuously and at design events to frequency, volume and duration of CSO discharges based on the calibrated hydraulic model developed in the Master Plan effort. The report shall reference the CSO discharge report submitted under Part I.A.15.d.(13) of this permit and include the pertinent data as a reference. As part of this reporting process, it shall be documented that an average of $3 million dollars per fiscal year was spent for 2018 and 2019, and $2 million dollars per year for 2020, 2021, and 2022 for the GSI program (these expenditures are an enforceable requirement of this permit).

A more complete description of the adaptive management approach includes:

a) Real-time Control

The GLWA is in the process of determining if real-time control can be used to help further minimize or even eliminate some untreated CSO discharges. One real-time control discussion currently taking place is the Interim Wet Weather Operations Plan (IWOP). The operational changes agreed to between the permittees and the Department in the IWOP will be reported in the Operational Plan Annual Update (Part 1.A.15 d.). The IWOP is evaluating if critical system regulators, gates, pumps, etc., can be adjusted to allow for more treated CSO, and less untreated CSO from the remaining CSO outfalls. Approved adjustments will be at least acceptable until completion of all non-core CSO correction projects and shall be included in Operational Plan Annual Updates. The evaluation shall include all necessary supporting documentation, including hydraulic model runs if appropriate.

b) Green Storm Water Infrastructure (GSI)

For the west side of the City, there is a GSI program in the tributary area to Rouge River Outfalls 059-069, 072-075, 077, and 079. DWSD has developed and is implementing a Department approved GSI Plan for this area consistent with the "Evaluation of CSO Control Alternatives" report dated December 15, 2009. The GSI Plan describes a process for locating, designing, constructing, operating, and evaluating GSI in these sewersheds. GSI implementation shall be planned to capture, reduce, or otherwise control wet weather flows that would otherwise flow into the sewer system and contribute to CSOs, at the permittees' direction. The Plan includes the following elements:

(1) Provisions for disconnection of residential downspouts and disconnection of commercial and industrial downspouts where feasible (see Part I.A.15.c.).

(2) Provisions for demolition and removal of vacant structures and replacement with pervious land cover. Where demolition is planned and implemented at sites that will be re-purposed for GSI, the demolition specifications shall ensure that basements and other impervious surfaces at the sites are removed, that the site is raked to remove large rocks and construction debris, and that engineered soils consisting of an appropriate mix of topsoil, compost, and sand is applied following the demolition to support plant growth and promote infiltration.

(3) Provisions for installation of bioswales along roadways and parking lots to intercept runoff and reduce storm water inputs to the combined sewer system from impervious surfaces.

(4) Provisions for installation of GSI and/or BMPs at commercial and residential properties to capture and retard storm water runoff.

(5) Provisions for tree planting for uptake and evapotranspiration along roadways and open spaces.

(6) Provisions for other GSI implementation projects as determined to be appropriate.

(8) Processes for public outreach and public participation in selecting sites and implementing GSI practices.

(9) Procedures/methods for tracking GSI implementation and measuring effects.

(10) Provisions for ensuring appropriate maintenance of sites where GSI has been implemented, including roles and schedules for maintenance.

(11) Provisions for ensuring storm water management (runoff reduction) benefits associated with GSI implementation continue over time, even as redevelopment may occur in the sewersheds.

The permittees shall continue to implement GSI in these sewersheds. The investment in GSI in these sewersheds shall be an average of 3 million dollars per fiscal year for the ten-year period ending 2019 (for a total of $30 million), and an average of 2 million dollars per year for the following 10 years (for a total of $20 million). GSI implementation will be in accordance with the GSI Plan.

For the near-east side of the City, there has been another GSI program in the tributary area to Detroit River Outfalls 005 - 009, 011, and 012. Because of the potential for some larger-scale green projects due to a relatively large amount of vacant land in the area, it may be possible to eliminate or reduce the size of some previously envisioned CSO treatment facilities for this area using the combination of GSI implementation along with possible sewer separation, and other engineering solutions. With GSI implementation now spreading across the city, it is acceptable for the city to use one-third (1/3) of the total GSI expenditures on projects upstream of untreated CSOs other than Rouge River Outfalls 059-069, 072-075, 077, and 079.

c) Storm Water Control

1) On or before April 1, 2018, (submitted) the permittees shall submit to the Department for review and approval a storm water control requirement for areas of new development and/or redevelopment. This storm water control requirement is primarily a focus within the Rouge Sewer District and Central Sewer District, as it is these two Districts that have untreated CSOs. Therefore, the permittees shall propose a level of storm water control for new development and redevelopment in these two sewer districts, and for the circumstances stated above, that is designed to help further reduce the volume and frequency of untreated CSO discharges, and a procedure and schedule for implementing this control requirement.

2) Storm water runoff from new development and redevelopment that will be conveyed through storm sewers to DWSD's combined sewers will require control to help further reduce volume and frequency of untreated CSO discharges. These are projects that will require construction plan review by the permittees, and a Part 41 construction permit issued by the Department. Please note that in most cases, new combined sewers will no longer be permitted under Part 41 (except for combined sewer relocation projects). Note that this is not a requirement for storm sewers subject to Permit No. MIS040000 issued to the City of Detroit, as the storm sewers under MIS040000 discharge directly to surface waters and are not owned by the DWSD.

d) City Sewer Rehabilitation

DWSD is currently working on a more robust annual program to remove infiltration/inflow (I/I) from its combined collection system. It is the Department's understanding that this program has a budget of about $20 million per year.

g. Combined Sewer Overflow Control Program Schedule

1) West-side Model; Rouge River Outfalls 059-069, Outfalls 072-075, Outfall 077, and Outfall 079. For untreated combined sewer overflows from Outfalls 059-069, Outfalls 072-075, Outfall 077, and Outfall 079, the permittees shall determine the accurate frequency and volume of untreated CSO discharges and amend the "Supplemental Report on Alternative CSO Controls for the Upper Rouge River," dated April 30, 2010 according to the following schedule:

a) The work plan has been approved by the Department that (1) sets forth the monitoring of the 17 CSOs that will be accomplished to accurately determine the frequency and volume of these untreated CSO discharges, (2) uses this monitoring along with the current Ovation monitoring as appropriate in a calibrated and verified model to accurately detail the volume and frequency of the 17 CSOs during a representative and typical 10-year period of rainfall record, and (3) to determine the peak hour flow at the 10 yr – 1 hr event of each of the 17 CSOs. The permittees shall continue to implement the approved work plan.

b) On or before April 15, 2019, (submitted) the permittees shall submit a report to the Department for review and approval that summarizes the determination and provides the volume and frequency of these 17 CSOs over a representative and typical 10-year period of rainfall record and provides the peak hour flow at the 10 yr – 1 hr event for each of these 17 CSOs;

c) On or before November 15, 2022, the permittees shall submit an amendment for Department review and approval to the "Supplemental Report on Alternative CSO Controls for the Upper Rouge River" (dated April 30, 2010) that describes any changes to the recommended long-term CSO control projects for the 17 CSOs. This plan may propose an alternative to the use of 10 minutes of detention at the 10 year – 1 hour event, at the permittees' discretion;

2) Near eastside; Detroit River Outfalls 005-009, 011, and 012. The permittees shall develop a revised CSO Control Plan for this tributary area in accordance with the following schedule:

On or before November 15, 2022, the permittees shall submit to the Department for review and approval an update to their Long-term CSO Control program (Detroit update 2008) for providing elimination or adequate treatment of CSO Outfalls 005-009, Outfall 011, and Outfall 012 to meet water quality standards at times of discharge. This plan shall consider the GI recommendations and potential for storm water reduction from the completed 205(j) report for this area. This plan may propose an alternative control requirement for the Long-term CSO control program.

3) The permittees may choose to offer an entire updated Long-term CSO Control program for all Detroit River CSOs. This updated plan can include a totally revised Detroit update (2008) for all remaining CSOs. Note that CSOs can be prohibited, eliminated, or adequately treated to meet water quality standards at times of discharge. If the permittees decide to pursue this approach, then the revised plan is due on or before November 15, 2022, for Department review and approval.

Following implementation of any phase of any of the approved Control Programs contained in Part I.A.15.f. and g. of this permit, the Control Program(s) may be reevaluated by the permittees or the Department. Future permits may include requirements to conduct water quality evaluations designed to verify that the overall CSO control program is providing adequate treatment to meet water quality standards. This permit may be modified in accordance with applicable laws and rules, to incorporate revisions necessary to conform to pertinent rules or laws, or as necessary to address prevailing situations, such as technical or financial constraints.

h. Notification and Testing Requirements
The federal rule promulgated by the United States Environmental Protection Agency in 40 CFR Part 122 establishing the public notification requirements for CSO discharges to the Great Lakes basin took effect February 7, 2018.

On or before August 7, 2018, (submitted) the permittees shall submit to the Department for approval, a public notification plan in accordance with 40 CFR 122.38(c). Additionally, on or before April 4, 2022, with the application for reissuance, the permittees shall submit to the Department for approval, an updated public notification plan.

Beginning November 7, 2018, all permittees authorized to discharge untreated or treated CSO to the Great Lakes Basin must provide public notification of CSO discharges in accordance with 40 CFR 122.38(a) and the approved public notification plan. The requirements include but are not limited to the following: notification of the local public health department, other potentially affected public entities and the public; and signage, where feasible at discharge points and other potentially impacted public access areas. In addition, in accordance with Section 324.3112a of the NREPA, the permittees shall provide notification to a newspaper of general circulation in the county in which the discharge occurred or is occurring. To the extent that a conflict may arise between Part I.A.15.h. and Part I.A.16., the Department approved Public Notification Plan shall govern.

## 16. Untreated or Partially Treated Sewage Discharge Reporting and Testing Requirements

In accordance with Section 324.3112a of the NREPA, if untreated or partially treated sewage is directly or indirectly discharged from a sewer system onto land or into the waters of the state, the entity responsible for the sewer system shall immediately, but not more than 24 hours after the discharge begins, notify, by telephone, the Department, local health departments, a daily newspaper of general circulation in the county in which the permittees are located, and a daily newspaper of general circulation in the county or counties in which the municipalities whose waters may be affected by the discharge are located that the discharge is occurring.

The permittees shall also annually contact municipalities, including the superintendent of a public drinking water supply with potentially affected intakes, whose waters may be affected by the permittees' discharge of untreated or partially treated sewage, and, if those municipalities wish to be notified in the same manner as specified above, the permittees shall provide such notification. Such notification shall also include a daily newspaper in the county of the affected municipality.

At the conclusion of the discharge, written notification shall be submitted in accordance with and on the "Report of Discharge Form" available via the internet at: http://www.deq.state.mi.us/csosso/ , or, alternatively for combined sewer overflow discharges, in accordance with notification procedures approved by the Department.

In addition, in accordance with Section 324.3112a of the NREPA, each time a discharge of untreated or partially treated sewage occurs, the permittees shall test the affected waters for Escherichia coli to assess the risk to the public health as a result of the discharge and shall provide the test results to the affected local county health departments and to the Department. The testing shall be done at locations specified by each affected local county health department but shall not exceed ten (10) tests for each separate discharge event. The affected local county health department may waive this testing requirement, if it determines that such testing is not needed to assess the risk to the public health as a result of the discharge event. The results of this testing shall be submitted with the written notification required above, or, if the results are not yet available, submitted as soon as they become available. This testing is not required, if the testing has been waived by the local health department, or if the discharge(s) did not affect surface waters.

Permittees accepting sanitary or municipal sewage from other sewage collection systems are encouraged to notify the owners of those systems of the above reporting and testing requirements.

## 17. Pollutant Minimization and Source Evaluation Program for Perfluorooctane Sulfonate (PFOS) and/or Perfluorooctanoic Acid (PFOA)

The goal of the Pollutant Minimization and Source Evaluation Program is to identify and address sources of perfluorooctane sulfonate (PFOS) and/or perfluorooctanoic acid (PFOA) and to reduce and maintain the effluent concentrations of PFOS and/or PFOA at or below the water quality standards (WQS) and/or the Water Quality-Based Effluent limit (WQBEL). The WQS is 11 **ng/L** for PFOS and the WQBEL for PFOA is 8.04 **ug/l**.

On or before October 1, 2019, the permittee shall submit an approvable Pollutant Minimization and Source Evaluation Program for PFOS and/or PFOA to proceed toward the goal. The Pollutant Minimization and Source Evaluation Program shall continue work under the IPP Interim Initiative and shall include the following at a minimum:

a. Identification of and strategies to identify any additional potential and probable PFOS and/or PFOA sources

b. Monitoring plan for the permitted facility's influent and effluent and effluent from potential sources

c. Implemented measures thus far to eliminate, reduce, and/or control sources, and an assessment of the degree of success and the strategies used to measure success

d. Proposed measures and implementation schedules for elimination, control, and/or reduction of the identified sources (prioritizing highest loadings and concentrations), and the strategies that will be used to measure success

The Pollutant Minimization and Source Evaluation Program shall be implemented upon approval by the Department.

On or before May 1 of each year following Pollutant Minimization and Source Evaluation Program implementation, the permittee shall submit to the Department a status report for the previous calendar year. Upon written notification by the Department, the permittee may be required to submit more frequent status reports. Status reports at a minimum shall include:

a. Complete listing of PFOS and/or PFOA sources

b. Summary of influent and effluent monitoring data

c. Summary of monitoring data from known or potential sources

d. History and compliance status for sources

e. Implemented measures to eliminate, reduce, or control sources, (prioritizing highest loadings and concentrations), and an assessment of the degree of success and the strategies used to measure success

f. Proposed measures and schedules for elimination, control, or reduction of any newly identified PFOS and/or PFOA sources (prioritizing highest loadings and concentrations), and the strategies that will be used to measure success

g. Barriers to implementation and revisions to the implementation schedule

h. Laboratory reports, if not previously supplied

Any information generated as a result of the Pollutant Minimization and Source Evaluation Program set forth in this permit may be used to support a request to modify the Pollutant Minimization and Source Evaluation Program or to demonstrate that the requirement has been completed satisfactorily.
A request for modification of the approved Pollutant Minimization and Source Evaluation Program shall be submitted in writing to the Department along with supporting documentation for review and approval. The Department may approve modifications to the approved Pollutant Minimization and Source Evaluation Program, including a reduction in the frequency of the influent and known or potential source monitoring requirements. Approval of a Pollutant Minimization and Source Evaluation Program modification does not require a permit modification.

This permit may be modified in accordance with applicable laws and rules to include additional PFOS and/or PFOA conditions and/or limitations as necessary.

## 18. Collection System Contingency Plan

An emergency condition at the WRRF might occur that requires reduced (or even no) influent flows to the WRRF. Under Rule 299.2959 of Part 41, the permittee is required to minimize discharge of excessive pollutants. On or before July 1, 2020, the permittee shall submit to the Department for review and approval, a report that documents how the collection system and WRRF would be operated if an emergency condition required reduced influent flow (or no flow) to the WRRF to minimize discharge of excessive pollutants per Rule 299.2959 of Part 41 of PA 451. This could involve in-system storage of flows, use of Retention Treatment Basins for storage and potentially treated discharge, rerouting of flow, use of portions of the WRRF as appropriate, etc. The report shall evaluate operation of the collection system and WRRF, considering at least two hypothetical conditions with no influent flow to the WRRF; a duration of six (6) hours of no influent flow, and a duration of 24 hours of no influent flow.

## 19. Facility Contact

The "Facility Contact" was specified in the application. The permittees may replace the facility contact at any time, and shall notify the Department in writing within 10 days after replacement (including the name, address and telephone number of the new facility contact).

a. The facility contact shall be (or a duly authorized representative of this person):
- for a corporation, a principal executive officer of at least the level of vice president; or a designated representative if the representative is responsible for the overall operation of the facility from which the discharge originates, as described in the permit application or other NPDES form,
- for a partnership, a general partner,
- for a sole proprietorship, the proprietor, or
- for a municipal, state, or other public facility, either a principal executive officer, the mayor, village president, city or village manager or other duly authorized employee.

b. A person is a duly authorized representative only if:
- the authorization is made in writing to the Department by a person described in paragraph a. of this section; and
- the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the facility (a duly authorized representative may thus be either a named individual or any individual occupying a named position).

Nothing in this section obviates the permittees from properly submitting reports and forms as required by law.

## 20. Monthly Operating Reports

Part 41 of Act 451 of 1994 as amended, specifically Section 324.4106 and associated R 299.2953, requires that the permittees file with the Department, on forms prescribed by the Department, operating reports showing the effectiveness of the treatment facility operation and the quantity and quality of liquid wastes discharged into waters of the state.

Within thirty (30) days of the effective date of this permit, the permittees shall submit to the Department a revised treatment facility monitoring program to address monitoring requirement changes reflected in this permit, or submit justification explaining why monitoring requirement changes reflected in this permit do not necessitate revisions to the treatment facility monitoring program. The permittees shall implement the revised treatment facility monitoring program upon approval from the Department. Applicable forms and guidance are available on the Department's web site at http://www.michigan.gov/deq/0,1607,7-135-3313_44117---,00.html. The permittees may use alternate forms if they are consistent with the approved treatment facility monitoring program. Unless the Department provides written notification to the permittees that monthly submittal of operating reports is required, operating reports that result from implementation of the approved treatment facility monitoring program shall be maintained on site for a minimum of three (3) years and shall be made available to the Department for review upon request.

## 21. Discharge Monitoring Report – Quality Assurance Study Program

The permittees shall participate in the Discharge Monitoring Report – Quality Assurance (DMR-QA) Study Program. The purpose of the DMR-QA Study Program is to annually evaluate the proficiency of all in-house and/or contract laboratory(ies) that perform, on behalf of the facility authorized to discharge under this permit, the analytical testing required under this permit. In accordance with Section 308 of the Clean Water Act (33 U.S.C. § 1318); and R 323.2138 and R 323.2154 of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, participation in the DMR-QA Study Program is required for all major facilities, and for minor facilities selected for participation by the Department.

Annually and in accordance with DMR-QA Study Program requirements and submittal due dates, the permittees shall submit to the Michigan DMR-QA Study Program state coordinator all documentation required by the DMR-QA Study. DMR-QA Study Program participation is required only for the analytes required under this permit and only when those analytes are also identified in the DMR-QA Study.

If the permitted facility's status as a major facility should change, participation in the DMR-QA Study Program may be reevaluated. Questions concerning participation in the DMR-QA Study Program should be directed to the Michigan DMR-QA Study Program state coordinator.

All forms and instructions required for participation in the DMR-QA Study Program, including submittal due dates and state coordinator contact information, can be found at
http://www.epa.gov/compliance/discharge-monitoring-report-quality-assurance-study-program.

## Section B. Storm Water Pollution Prevention

This section is not required.

**PART I**

## Section C. Industrial Waste Pretreatment Program

### 1. Federal Industrial Pretreatment Program

a. The permittees shall implement the Federal Industrial Pretreatment Program approved on June 26, 1997, and any subsequent modifications approved up to the issuance of this permit. Approval of substantial program modifications after the issuance of this permit shall be incorporated into this permit by minor modification in accordance with 40 CFR 122.63.

b. The permittees shall comply with R 323.2301 through R 323.2317 of the Michigan Administrative Code (Part 23 Rules), the General Pretreatment Regulations for Existing and New Sources of Pollution (40 CFR Part 403), and the approved Federal Industrial Pretreatment Program.

c. The permittees shall have the legal authority and necessary interjurisdictional agreements that provide the basis for the implementation and enforcement of the approved Federal Industrial Pretreatment Program throughout the service area. The legal authority and necessary interjurisdictional agreements shall include, at a minimum, the authority to carry out the activities specified in R 323.2306(a).

d. The permittees shall develop procedures which describe, in sufficient detail, program commitments which enable implementation of the approved Federal Industrial Pretreatment Program, 40 CFR Part 403, and the Part 23 Rules in accordance with R 323.2306(c).

e. The permittees shall establish an interjurisdictional agreement (or comparable document) with all tributary governmental jurisdictions. Each interjurisdictional agreement shall contain, at a minimum, the following:

1) identification of the agency responsible for the implementation and enforcement of the approved Federal Industrial Pretreatment Program within the tributary governmental jurisdiction's boundaries; and

2) the provision of the legal authority which provides the basis for the implementation and enforcement of the approved Federal Industrial Pretreatment Program within the tributary governmental jurisdiction's boundaries.

f. The permittees shall prohibit discharges that:

1) cause, in whole or in part, the permittees, failure to comply with any condition of this permit or the NREPA;

2) restrict, in whole or in part, the permittee’s management of biosolids;

3) cause, in whole or in part, operational problems at the treatment facility or in its collection system;

4) violate any of the general or specific prohibitions identified in R 323.2303(1) and (2);

5) violate categorical standards identified in R 323.2311; and

6) violate local limits established in accordance with R 323.2303(4).

g. The permittees shall maintain a list of its nondomestic users that meet the criteria of a significant industrial user as identified in R 323.2302(cc).

h. The permittees shall develop an enforcement response plan which describes, in sufficient detail, program commitments which will enable the enforcement of the approved Federal Industrial Pretreatment Program, 40 CFR Part 403, and the Part 23 Rules in accordance with R 323.2306(g).

i. The Department may require modifications to the approved Federal Industrial Pretreatment Program which are necessary to ensure compliance with 40 CFR Part 403 and the Part 23 Rules in accordance with R 323.2309.

j. The permittees shall not implement changes or modifications to the approved Federal Industrial Pretreatment Program without notification to the Department. Any substantial modification shall be subject to Department public noticing and approval in accordance with R 323.2309.

k. The permittees shall maintain an adequate revenue structure and staffing level for effective implementation of the approved Federal Industrial Pretreatment Program.

l. The permittees shall develop and maintain, for a minimum of three (3) years, all records and information necessary to determine nondomestic user compliance with 40 CFR Part 403, Part 23 Rules and the approved Federal Industrial Pretreatment Program. This period of retention shall be extended during the course of any unresolved enforcement action or litigation regarding a nondomestic user or when requested by the Department or the United States Environmental Protection Agency. All of the aforementioned records and information shall be made available upon request for inspection and copying by the Department and the United States Environmental Protection Agency.

m. The permittees shall evaluate the approved Federal Industrial Pretreatment Program for compliance with the 40 CFR Part 403, Part 23 Rules and the prohibitions stated in item f. (above). Based upon this evaluation, the permittees shall propose to the Department all necessary changes or modifications to the approved Federal Industrial Pretreatment Program no later than the next Industrial Pretreatment Program Annual Report due date (see item o. below).

n. The permittees shall develop and enforce local limits to implement the prohibitions listed in item f above. Local limits shall be based upon data representative of actual conditions demonstrated in a maximum allowable headworks loading analysis. An evaluation of whether the existing local limits need to be revised shall be submitted to the Department by June 1, 2021. The submittal shall provide a technical evaluation of the basis upon which this determination was made which includes information regarding the maximum allowable headworks loading, collection system protection criteria, and worker health and safety, based upon data collected since the last local limits review.

The following pollutants shall be evaluated:

1) Arsenic, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, and Zinc;

2) Pollutants that are subject to limits or monitoring in this permit;

3) Pollutants that have an existing local limit; and,

4) Other pollutants of concern which would reasonably be expected to be discharged or transported by truck or rail or otherwise introduced into the POTW.

o. On or before April 1 of each year, the permittees shall submit to the Department, as required by R 323.2310(8), an Industrial Pretreatment Program Annual Report on the status of program implementation and enforcement activities. The reporting period shall begin on January 1 and end on December 31. At a minimum, the Industrial Pretreatment Program Annual Report shall include:

1) the Pretreatment Program Report data identified in Appendix A to 40 CFR part 127 – NPDES Electronic Reporting;

2) a summary of changes to the approved IPP that have not been previously reported to the Department;

3) a summary of results of all the sampling and analyses performed of the WRRF’s influent, effluent, and biosolids conducted in accordance with approved methods during the reporting period. The summary shall include the monthly average, daily maximum, quantification level, and number of samples analyzed for each pollutant. At a minimum, the results of analyses for all locally limited parameters for at least one monitoring event that tests influent, effluent and biosolids during the reporting period shall be submitted with each report, unless otherwise required by the Department. Sample collection shall be at intervals sufficient to provide pollutant removal rates, unless the pollutant is not measurable; and;

4) any other relevant information requested by the Department.

p, The permittee is required under this permit and R 323.2303(4) of the Michigan Administrative Code to review and update their local limits when:

1) New pollutants are introduced.

2) New pollutants that were previously unevaluated are identified

3) New water quality or biosolids standards are established or additional information becomes available about the nature of pollutants, such as removal rates and accumulation in biosolids.
Substantial increases of pollutants are proposed as required in the notification of new or increased uses in accordance with the provisions of 40 CFR 122.42.

## 2. Schedule for Notification to Contributing Jurisdictions

On or before May 1st and November 1st of each year, the permittees shall submit to the Department a report demonstrating the efforts and progress toward achieving the requirement of having all contributing jurisdictions adopt a legal authority that is equivalent to or more restrictive than the permittees', including the revised local limits to be incorporated by the permittees as result of the requirements of Part I.C.2. of this permit. This legal authority includes the provisions of Ordinance 08-05 (Detroit City Code Chapter 56, Article III. Division 3) and subsequent revisions to the local limits. These progress reports shall be submitted every six months until the requirement is achieved. The biannual progress reports shall contain:

a. a listing of all contributing jurisdictions,

b. the status of each contributing jurisdiction’s adoption of adequate legal authority, and

c. for contributing jurisdictions who have not yet adopted adequate legal authority, a description of the steps/actions the permittees have taken to assure progress toward the contributing jurisdiction’s adoption of adequate legal authority.

The permittees shall, to the best of its ability, work with those contributing jurisdictions who did not adopt adequate legal authority by January 1, 2008, to obtain such legal authority.

**PART I**

# Section D. Residuals Management Program

## 1. Residuals Management Program for Land Application of Biosolids

The permittees are authorized to land-apply bulk biosolids or prepare bulk biosolids for land application in accordance with the permittees' approved Residuals Management Program (RMP) approved on April 22, 2008, and approved modifications thereto, in accordance with the requirements established in R 323.2401 through R 323.2418 of the Michigan Administrative Code (Part 24 Rules). The approved RMP, and any approved modifications thereto, are enforceable requirements of this permit. Incineration, landfilling and other residual disposal activities shall be conducted in accordance with Part II.D.7. of this permit. The Part 24 Rules can be obtained via the internet (http://www.michigan.gov/deq/ and on the left side of the screen click on Water, Biosolids & Industrial Pretreatment, Biosolids then click on Biosolids Laws and Rules Information which is under the Laws & Rules banner in the center of the screen).

a. Annual Report
On or before <u>October 30 of each year</u>, the permittees shall submit an annual report to the Department for the previous fiscal year of October 1 through September 30. The report shall be submitted electronically via the Department's MiWaters system at https://miwaters.deq.state.mi.us. At a minimum, the report shall contain:

1) a certification that current residuals management practices are in accordance with the approved RMP, or a proposal for modification to the approved RMP; and

2) a completed Biosolids Annual Report Form, available at https://miwaters.deq.state.mi.us.

b. Modifications to the Approved RMP
Prior to implementation of modifications to the RMP, the permittees shall submit proposed modifications to the Department for approval. The approved modification shall become effective upon the date of approval. Upon written notification, the Department may impose additional requirements and/or limitations to the approved RMP as necessary to protect public health and the environment from any adverse effect of a pollutant in the biosolids.

c. Record Keeping
Records required by the Part 24 Rules shall be kept for a minimum of five years. However, the records documenting cumulative loading for sites subject to cumulative pollutant loading rates shall be kept as long as the site receives biosolids.

d. Contact Information
RMP related submittals to the Department shall be to the Southeast Michigan District Supervisor of the Water Resources Division. The Southeast Michigan District Office is located at 27700 Donald Court, Warren Michigan, 48092-2793, Telephone: 586-753-3750, Fax: 586-753-3751.

## PART II

Part II may include terms and /or conditions not applicable to discharges covered under this permit.

# Section A. Definitions

**Acute toxic unit ($TU_A$)** means 100/$LC_{50}$ where the $LC_{50}$ is determined from a whole effluent toxicity (WET) test which produces a result that is statistically or graphically estimated to be lethal to 50% of the test organisms.

**Annual monitoring frequency** refers to a calendar year beginning on January 1 and ending on December 31. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

**Authorized public agency** means a state, local, or county agency that is designated pursuant to the provisions of section 9110 of Part 91 of the NREPA to implement soil erosion and sedimentation control requirements with regard to construction activities undertaken by that agency.

**Best management practices (BMPs)** means structural devices or nonstructural practices that are designed to prevent pollutants from entering into storm water, to direct the flow of storm water, or to treat polluted storm water.

**Bioaccumulative chemical of concern (BCC)** means a chemical which, upon entering the surface waters, by itself or as its toxic transformation product, accumulates in aquatic organisms by a human health bioaccumulation factor of more than 1000 after considering metabolism and other physiochemical properties that might enhance or inhibit bioaccumulation. The human health bioaccumulation factor shall be derived according to R 323.1057(5). Chemicals with half-lives of less than 8 weeks in the water column, sediment, and biota are not BCCs. The minimum bioaccumulation concentration factor (BAF) information needed to define an organic chemical as a BCC is either a field-measured BAF or a BAF derived using the biota-sediment accumulation factor (BSAF) methodology. The minimum BAF information needed to define an inorganic chemical as a BCC, including an organometal, is either a field-measured BAF or a laboratory-measured bioconcentration factor (BCF). The BCCs to which these rules apply are identified in Table 5 of R 323.1057 of the Water Quality Standards.

**Biosolids** are the solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. This includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

**Bulk biosolids** means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

**Certificate of Coverage (COC)** is a document, issued by the Department, which authorizes a discharge under a general permit.

**Chronic toxic unit ($TU_C$)** means 100/MATC or 100/$IC_{25}$, where the maximum acceptable toxicant concentration (MATC) and $IC_{25}$ are expressed as a percent effluent in the test medium.

**Class B biosolids** refers to material that has met the Class B pathogen reduction requirements or equivalent treatment by a Process to Significantly Reduce Pathogens (PSRP) in accordance with the Part 24 Rules. Processes include aerobic digestion, composting, anaerobic digestion, lime stabilization and air drying.

**Combined sewer system** is a sewer system in which storm water runoff is combined with sanitary wastes.

**Daily concentration** is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the quantification limit, regard that value as zero when calculating the daily concentration. The daily concentration will be used to determine compliance with any maximum and minimum daily concentration limitations (except for pH and dissolved oxygen). When required by the permit, report the maximum calculated daily concentration for the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the Discharge Monitoring Reports (DMRs).

For pH, report the maximum value of any *individual* sample taken during the month in the "MAXIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs and the minimum value of any *individual* sample taken during the month in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs. For dissolved oxygen, report the minimum concentration of any *individual* sample in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

**Daily loading** is the total discharge by weight of a parameter discharged during any calendar day. This value is calculated by multiplying the daily concentration by the total daily flow and by the appropriate conversion factor. The daily loading will be used to determine compliance with any maximum daily loading limitations. When required by the permit, report the maximum calculated daily loading for the month in the "MAXIMUM" column under "QUANTITY OR LOADING" on the DMRs.

**Daily monitoring frequency** refers to a 24-hour day. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

**Department** means the Michigan Department of Environment, Great Lakes, and Energy.

**Detection level** means the lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated level of probability.

**Discharge** means the addition of any waste, waste effluent, wastewater, pollutant, or any combination thereof to any surface water of the state.

**$EC_{50}$** means a statistically or graphically estimated concentration that is expected to cause 1 or more specified effects in 50% of a group of organisms under specified conditions.

**Fecal coliform bacteria monthly**
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a discharge event. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR. If the period in which the discharge event occurred was partially in each of two months, the calculated monthly value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria monthly is the geometric mean of all daily concentrations determined during a reporting month. Days on which no daily concentration is determined shall not be used to determine the calculated monthly value. The calculated monthly value will be used to determine compliance with the maximum monthly fecal coliform bacteria limitations. When required by the permit, report the calculated monthly value in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

**Fecal coliform bacteria 7-day**
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days of discharge during a discharge event. If the number of daily concentrations determined during the discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean value for the month in the “MAXIMUM” column under “QUALITY OR CONCENTRATION” on the DMRs. If the 7-day period was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – Fecal coliform bacteria 7-day is the geometric mean of the daily concentrations determined during any 7 consecutive days in a reporting month. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. Days on which no daily concentration is determined shall not be used to determine the value. The calculated 7-day value will be used to determine compliance with the maximum 7-day fecal coliform bacteria limitations. When required by the permit, report the maximum calculated 7-day geometric mean for the month in the “MAXIMUM” column under “QUALITY OR CONCENTRATION” on the DMRs. The first calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

**Flow-proportioned sample** is a composite sample with the sample volume proportional to the effluent flow.

**General permit** means a National Pollutant Discharge Elimination System permit issued authorizing a category of similar discharges.

**Geometric mean** is the average of the logarithmic values of a base 10 data set, converted back to a base 10 number.

**Grab sample** is a single sample taken at neither a set time nor flow.

**$IC_{25}$** means the toxicant concentration that would cause a 25% reduction in a nonquantal biological measurement for the test population.

**Illicit connection** means a physical connection to a municipal separate storm sewer system that primarily conveys non-storm water discharges other than uncontaminated groundwater into the storm sewer; or a physical connection not authorized or permitted by the local authority, where a local authority requires authorization or a permit for physical connections.

**Illicit discharge** means any discharge to, or seepage into, a municipal separate storm sewer system that is not composed entirely of storm water or uncontaminated groundwater. Illicit discharges include non-storm water discharges through pipes or other physical connections; dumping of motor vehicle fluids, household hazardous wastes, domestic animal wastes, or litter; collection and intentional dumping of grass clippings or leaf litter; or unauthorized discharges of sewage, industrial waste, restaurant wastes, or any other non-storm water waste directly into a separate storm sewer.

**Individual permit** means a site-specific NPDES permit.

**Inlet** means a catch basin, roof drain, conduit, drain tile, retention pond riser pipe, sump pump, or other point where storm water or wastewater enters into a closed conveyance system prior to discharge off site or into waters of the state.

**Interference** is a discharge which, alone or in conjunction with a discharge or discharges from other sources, both: 1) inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal; and 2) therefore, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or, of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent state or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including Title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including state regulations contained in any state sludge management plan prepared pursuant to Subtitle D of the SWDA), the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act. [This definition does not apply to sample matrix interference].

**Land application** means spraying or spreading biosolids or a biosolids derivative onto the land surface, injecting below the land surface, or incorporating into the soil so that the biosolids or biosolids derivative can either condition the soil or fertilize crops or vegetation grown in the soil.

**$LC_{50}$** means a statistically or graphically estimated concentration that is expected to be lethal to 50% of a group of organisms under specified conditions.

**Maximum acceptable toxicant concentration (MATC)** means the concentration obtained by calculating the geometric mean of the lower and upper chronic limits from a chronic test. A lower chronic limit is the highest tested concentration that did not cause the occurrence of a specific adverse effect. An upper chronic limit is the lowest tested concentration which did cause the occurrence of a specific adverse effect and above which all tested concentrations caused such an occurrence.

**Maximum extent practicable** means implementation of best management practices by a public body to comply with an approved storm water management program as required by a national permit for a municipal separate storm sewer system, in a manner that is environmentally beneficial, technically feasible, and within the public body's legal authority.

**MGD** means million gallons per day.

**Monthly concentration** is the sum of the daily concentrations determined during a reporting period divided by the number of daily concentrations determined. The calculated monthly concentration will be used to determine compliance with any maximum monthly concentration limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly concentration in the "AVERAGE" column under "QUALITY OR CONCENTRATION" on the DMR.

For minimum percent removal requirements, the monthly influent concentration and the monthly effluent concentration shall be determined. The calculated monthly percent removal, which is equal to 100 times the quantity [1 minus the quantity (monthly effluent concentration divided by the monthly influent concentration)], shall be reported in the "MINIMUM" column under "QUALITY OR CONCENTRATION" on the DMRs.

**Monthly loading** is the sum of the daily loadings of a parameter divided by the number of daily loadings determined during a reporting period. The calculated monthly loading will be used to determine compliance with any maximum monthly loading limitations. Days with no discharge shall not be used to determine the value. When required by the permit, report the calculated monthly loading in the "AVERAGE" column under "QUANTITY OR LOADING" on the DMR.

**Monthly monitoring frequency** refers to a calendar month. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

**Municipal separate storm sewer** means a conveyance or system of conveyances designed or used for collecting or conveying storm water which is not a combined sewer and which is not part of a publicly-owned treatment works as defined in the Code of Federal Regulations at 40 CFR 122.2.

**Municipal separate storm sewer system (MS4)** means all separate storm sewers that are owned or operated by the United States, a state, city, village, township, county, district, association, or other public body created by or pursuant to state law, having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under state law, such as a sewer district, flood control district, or drainage district, or similar entity, or a designated or approved management agency under Section 208 of the Federal Act that discharges to the waters of the state. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

**National Pretreatment Standards** are the regulations promulgated by or to be promulgated by the Federal Environmental Protection Agency pursuant to Section 307(b) and (c) of the Federal Act. The standards establish nationwide limits for specific industrial categories for discharge to a POTW.

**No observed adverse effect level (NOAEL)** means the highest tested dose or concentration of a substance which results in no observed adverse effect in exposed test organisms where higher doses or concentrations result in an adverse effect.

**Noncontact cooling water** is water used for cooling which does not come into direct contact with any raw material, intermediate product, by-product, waste product or finished product.

**Nondomestic user** is any discharger to a POTW that discharges wastes other than or in addition to water-carried wastes from toilet, kitchen, laundry, bathing or other facilities used for household purposes.

**Outfall** is the location at which a point source discharge enters the surface waters of the state.

**Part 91 agency** means an agency that is designated by a county board of commissioners pursuant to the provisions of section 9105 of Part 91 of the NREPA; an agency that is designated by a city, village, or township in accordance with the provisions of section 9106 of Part 91 of the NREPA; or the Department for soil erosion and sedimentation activities under Part 615, Part 631, or Part 632 pursuant to the provisions of section 9115 of Part 91 of the NREPA.

**Part 91 permit** means a soil erosion and sedimentation control permit issued by a Part 91 agency pursuant to the provisions of Part 91 of the NREPA.

**Partially treated sewage** is any sewage, sewage and storm water, or sewage and wastewater, from domestic or industrial sources that is treated to a level less than that required by the permittees' National Pollutant Discharge Elimination System permit, or that is not treated to national secondary treatment standards for wastewater, including discharges to surface waters from retention treatment facilities.

**Point of discharge** is the location of a point source discharge where storm water is discharged directly into a separate storm sewer system.

**Point source discharge** means a discharge from any discernible, confined, discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, or rolling stock. Changing the surface of land or establishing grading patterns on land will result in a point source discharge where the runoff from the site is ultimately discharged to waters of the state.

**Polluting material** means any material, in solid or liquid form, identified as a polluting material under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

**POTW** is a publicly owned treatment work.

**Pretreatment** is reducing the amount of pollutants, eliminating pollutants, or altering the nature of pollutant properties to a less harmful state prior to discharge into a public sewer. The reduction or alteration can be by physical, chemical, or biological processes, process changes, or by other means. Dilution is not considered pretreatment unless expressly authorized by an applicable National Pretreatment Standard for a particular industrial category.

**Public** (as used in the MS4 individual permit) means all persons who potentially could affect the authorized storm water discharges, including, but not limited to, residents, visitors to the area, public employees, businesses, industries, and construction contractors and developers.

**Public body** means the United States; the state of Michigan; a city, village, township, county, school district, public college or university, or single-purpose governmental agency; or any other body which is created by federal or state statute or law.

**Qualified Personnel** means an individual who meets qualifications acceptable to the Department and who is authorized by an Industrial Storm Water Certified Operator to collect the storm water sample.

**Qualifying storm event** means a storm event causing greater than 0.1 inch of rainfall and occurring at least 72 hours after the previous measurable storm event that also caused greater than 0.1 inch of rainfall. Upon request, the Department may approve an alternate definition meeting the condition of a qualifying storm event.

**Quantification level** means the measurement of the concentration of a contaminant obtained by using a specified laboratory procedure calculated at a specified concentration above the detection level. It is considered the lowest concentration at which a particular contaminant can be quantitatively measured using a specified laboratory procedure for monitoring of the contaminant.

**Quarterly monitoring frequency** refers to a three month period, defined as January through March, April through June, July through September, and October through December. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

**Regional Administrator** is the Region 5 Administrator, U.S. EPA, located at R-19J, 77 W. Jackson Blvd., Chicago, Illinois 60604.

**Regulated area** means the permittee's urbanized area, where urbanized area is defined as a place and its adjacent densely-populated territory that together have a minimum population of 50,000 people as defined by the United States Bureau of the Census and as determined by the latest available decennial census.

**Secondary containment structure** means a unit, other than the primary container, in which significant materials are packaged or held, which is required by State or Federal law to prevent the escape of significant materials by gravity into sewers, drains, or otherwise directly or indirectly into any sewer system or to the surface or ground waters of this state.

**Separate storm sewer system** means a system of drainage, including, but not limited to, roads, catch basins, curbs, gutters, parking lots, ditches, conduits, pumping devices, or man-made channels, which is not a combined sewer where storm water mixes with sanitary wastes, and is not part of a POTW.

**Significant industrial user** is a nondomestic user that: 1) is subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N; or 2) discharges an average of 25,000 gallons per day or more of process wastewater to a POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process waste stream which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the permittees as defined in 40 CFR 403.12(a) on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's treatment plant operation or violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

**Significant materials** Significant Materials means any material which could degrade or impair water quality, including but not limited to: raw materials; fuels; solvents, detergents, and plastic pellets; finished materials such as metallic products; hazardous substances designated under Section 101(14) of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (see 40 CFR 372.65); any chemical the facility is required to report pursuant to Section 313 of Emergency Planning and Community Right-to-Know Act (EPCRA); polluting materials as identified under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code); Hazardous Wastes as defined in Part 111 of the NREPA; fertilizers; pesticides; and waste products such as ashes, slag, and sludge that have the potential to be released with storm water discharges.

**Significant spills and significant leaks** means any release of a polluting material reportable under the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code).

**Special-use area** means secondary containment structures required by state or federal law; lands on Michigan's List of Sites of Environmental Contamination pursuant to Part 201, Environmental Remediation, of the NREPA; and/or areas with other activities that may contribute pollutants to the storm water for which the Department determines monitoring is needed.

**Stoichiometric** means the quantity of a reagent calculated to be necessary and sufficient for a given chemical reaction.

**Storm water** means storm water runoff, snow melt runoff, surface runoff and drainage, and non-storm water included under the conditions of this permit.

**Storm water discharge point** is the location where the point source discharge of storm water is directed to surface waters of the state or to a separate storm sewer. It includes the location of all point source discharges where storm water exits the facility, including *outfalls* which discharge directly to surface waters of the state, and *points of discharge* which discharge directly into separate storm sewer systems.

**SWPPP** means the Storm Water Pollution Prevention Plan prepared in accordance with this permit.

**Tier I value** means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier I toxicity database.

**Tier II value** means a value for aquatic life, human health or wildlife calculated under R 323.1057 of the Water Quality Standards using a tier II toxicity database.

**Total maximum daily loads (TMDLs)** are required by the Federal Act for waterbodies that do not meet water quality standards. TMDLs represent the maximum daily load of a pollutant that a waterbody can assimilate and meet water quality standards, and an allocation of that load among point sources, nonpoint sources, and a margin of safety.

**Toxicity reduction evaluation (TRE)** means a site-specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in effluent toxicity.

**Water Quality Standards** means the Part 4 Water Quality Standards promulgated pursuant to Part 31 of the NREPA, being R 323.1041 through R 323.1117 of the Michigan Administrative Code.

**Weekly monitoring frequency** refers to a calendar week which begins on Sunday and ends on Saturday. When required by this permit, an analytical result, reading, value or observation shall be reported for that period if a discharge occurs during that period.

**Wet Weather Flow** is the wastewater flow (domestic, industrial, commercial and institutional) including infiltration and inflow that occurs as the result of a precipitation or snowmelt event.

**Wet Weather Event**, for the interim period, is defined as those days on which an average 0.10 inches or more of precipitation was recorded by six strategically located rainfall gauges (as defined in Part I.9.c.(10) of the Operational Plan) in the WRRF's service area, plus two days immediately following days of 0.10 inch to 1.00 inch days of precipitation or three days following days of 1.00 inch or more precipitation. Rainfall days are further limited to those days in which the air temperature exceeds 32° F (0° C) for at least an eight hour period. The permittee may demonstrate that certain events such as snowmelt, and other unforeseen events will be considered rainfall days.

The above definition of wet weather event is not adequate on a long term basis, or for the purposes of planning, designing, or implementing the combined sewer overflow improvements required in this permit. For purposes of planning and designing future CSO improvements, the permittee shall consider the effect of dewatering tributary storage basins on overall system recovery, both at the WRRF and CSO overflow points in the collection system.

For this permit while the Regional Operational Plan is being revised, if up to 930 MGD (including recycle) is being processed with secondary treatment at the WRRF and no primary flow is being discharged, then tributary combined or sanitary storage basins in the GLWA system may be dewatered. Such dewatering will not be considered a violation of this permit, even if contrary to the above Wet Weather Event definition. Once a revised Regional Operation Plan is developed, it shall be implemented once reviewed and approved by the Department.

Upon approval of the Department, an alternate "wet weather event" definition may be used.

**WWSL** is a wastewater stabilization lagoon.

**WWSL discharge event** is a discrete occurrence during which effluent is discharged to the surface water up to 10 days of a consecutive 14 day period.

**3-portion composite sample** is a sample consisting of three equal-volume grab samples collected at equal intervals over an 8-hour period.

**7-day concentration**
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily concentrations determined. If the number of daily concentrations determined during the WWSL discharge event is less than 7 days, the number of actual daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations. When required by the permit, report the maximum calculated 7-day concentration for the WWSL discharge event in the “MAXIMUM” column under “QUALITY OR CONCENTRATION” on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred.

FOR ALL OTHER DISCHARGES – The 7-day concentration is the sum of the daily concentrations determined during any 7 consecutive days in a reporting month divided by the number of daily concentrations determined. If the number of daily concentrations determined is less than 7, the actual number of daily concentrations determined shall be used for the calculation. The calculated 7-day concentration will be used to determine compliance with any maximum 7-day concentration limitations in the reporting month. When required by the permit, report the maximum calculated 7-day concentration for the month in the “MAXIMUM” column under “QUALITY OR CONCENTRATION” on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

**7-day loading**
FOR WWSLs THAT COLLECT AND STORE WASTEWATER AND ARE AUTHORIZED TO DISCHARGE ONLY IN THE SPRING AND/OR FALL ON AN INTERMITTENT BASIS – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days of discharge during a WWSL discharge event divided by the number of daily loadings determined. If the number of daily loadings determined during the WWSL discharge event is less than 7 days, the number of actual daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations. When required by the permit, report the maximum calculated 7-day loading for the WWSL discharge event in the “MAXIMUM” column under “QUANTITY OR LOADING” on the DMR. If the WWSL discharge event was partially in each of two months, the value shall be reported on the DMR of the month in which the last day of discharge occurred

FOR ALL OTHER DISCHARGES – The 7-day loading is the sum of the daily loadings determined during any 7 consecutive days in a reporting month divided by the number of daily loadings determined. If the number of daily loadings determined is less than 7, the actual number of daily loadings determined shall be used for the calculation. The calculated 7-day loading will be used to determine compliance with any maximum 7-day loading limitations in the reporting month. When required by the permit, report the maximum calculated 7-day loading for the month in the “MAXIMUM” column under “QUANTITY OR LOADING” on the DMR. The first 7-day calculation shall be made on day 7 of the reporting month, and the last calculation shall be made on the last day of the reporting month.

**24-hour composite sample** is a flow-proportioned composite sample consisting of hourly or more frequent portions that are taken over a 24-hour period. In accordance with the Department Approved Wet Weather Operational Plan (See Part I.A.11.), alternate requirements for 24-hour composite sampling may be utilized to satisfy the monitoring requirements of this permit.

**PART II**

# Section B. Monitoring Procedures

## 1. Representative Samples

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge.

## 2. Test Procedures

Test procedures for the analysis of pollutants shall conform to regulations promulgated pursuant to Section 304(h) of the Federal Act (40 CFR Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants), unless specified otherwise in this permit. **Test procedures used shall be sufficiently sensitive to determine compliance with applicable effluent limitations**. Requests to use test procedures not promulgated under 40 CFR Part 136 for pollutant monitoring required by this permit shall be made in accordance with the Alternate Test Procedures regulations specified in 40 CFR 136.4. These requests shall be submitted to the Section Manager of the Permits Section, Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy, P.O. Box 30458, Lansing, Michigan, 48909-7958. The permittees may use such procedures upon approval.

The permittees shall periodically calibrate and perform maintenance procedures on all analytical instrumentation at intervals to ensure accuracy of measurements. The calibration and maintenance shall be performed as part of the permittees' laboratory Quality Control/Quality Assurance program.

## 3. Instrumentation

The permittees shall periodically calibrate and perform maintenance procedures on all monitoring instrumentation at intervals to ensure accuracy of measurements.

## 4. Recording Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittees shall record the following information: 1) the exact place, date, and time of measurement or sampling; 2) the person(s) who performed the measurement or sample collection; 3) the dates the analyses were performed; 4) the person(s) who performed the analyses; 5) the analytical techniques or methods used; 6) the date of and person responsible for equipment calibration; and 7) the results of all required analyses.

## 5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation and recordings from continuous monitoring instrumentation shall be retained for a minimum of three (3) years, or longer if requested by the Regional Administrator or the Department.

**PART II**

# Section C. Reporting Requirements

## 1. Start-up Notification

If the permittees will not discharge during the first 60 days following the effective date of this permit, the permittees shall notify the Department within 14 days following the effective date of this permit, and then 60 days prior to the commencement of the discharge.

## 2. Submittal Requirements for Self-Monitoring Data

Part 31 of the NREPA (specifically Section 324.3110(7)); and R 323.2155(2) of Part 21, Wastewater Discharge Permits, promulgated under Part 31 of the NREPA, allow the Department to specify the forms to be utilized for reporting the required self-monitoring data. Unless instructed on the effluent limitations page to conduct "Retained Self-Monitoring," the permittees shall submit self-monitoring data via the Department's MiWaters system.

The permittees shall utilize the information provided on the MiWaters website, located at https://miwaters.deq.state.mi.us, to access and submit the electronic forms. Both monthly summary and daily data shall be submitted to the Department no later than the 20th day of the month following each month of the authorized discharge period(s). The permittees may be allowed to submit the electronic forms after this date if the Department has granted an extension to the submittal date.

## 3. Retained Self-Monitoring Requirements

If instructed on the effluent limits page (or otherwise authorized by the Department in accordance with the provisions of this permit) to conduct retained self-monitoring, the permittees shall maintain a year-to-date log of retained self-monitoring results and, upon request, provide such log for inspection to the staff of the Department. Retained self-monitoring results are public information and shall be promptly provided to the public upon request.

The permittees shall certify, in writing, to the Department, on or before January 10th (April 1st for animal feeding operation facilities) of each year, that: 1) all retained self-monitoring requirements have been complied with and a year-to-date log has been maintained; and 2) the application on which this permit is based still accurately describes the discharge. With this annual certification, the permittees shall submit a summary of the previous year's monitoring data. The summary shall include maximum values for samples to be reported as daily maximums and/or monthly maximums and minimum values for any daily minimum samples.

Retained self-monitoring may be denied to permittees by notification in writing from the Department. In such cases, the permittees shall submit self-monitoring data in accordance with Part II.C.2., above. Such a denial may be rescinded by the Department upon written notification to the permittees. Reissuance or modification of this permit or reissuance or modification of an individual permittees' authorization to discharge shall not affect previous approval or denial for retained self-monitoring unless the Department provides notification in writing to the permittees.

## 4. Additional Monitoring by Permittees

If the permittees monitor any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be included in the calculation and reporting of the values required in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

Monitoring required pursuant to Part 41 of the NREPA or Rule 35 of the Mobile Home Park Commission Act (Act 96 of the Public Acts of 1987) for assurance of proper facility operation shall be submitted as required by the Department.

## 5. Compliance Dates Notification

Within 14 days of every compliance date specified in this permit, the permittees shall submit a *written* notification to the Department indicating whether or not the particular requirement was accomplished. If the requirement was not accomplished, the notification shall include an explanation of the failure to accomplish the requirement, actions taken or planned by the permittees to correct the situation, and an estimate of when the requirement will be accomplished. If a written report is required to be submitted by a specified date and the permittees accomplish this, a separate written notification is not required.

## 6. Noncompliance Notification

Compliance with all applicable requirements set forth in the Federal Act, Parts 31 and 41 of the NREPA, and related regulations and rules is required. All instances of noncompliance shall be reported as follows:

a. 24-Hour Reporting
Any noncompliance which may endanger health or the environment (including maximum and/or minimum daily concentration discharge limitation exceedances) shall be reported, verbally, within 24 hours from the time the permittees becomes aware of the noncompliance. A written submission shall also be provided within five (5) days.

b. Other Reporting
The permittees shall report, in writing, all other instances of noncompliance not described in a. above at the time monitoring reports are submitted; or, in the case of retained self-monitoring, within five (5) days from the time the permittees become aware of the noncompliance.

Written reporting shall include: 1) a description of the discharge and cause of noncompliance; and 2) the period of noncompliance, including exact dates and times, or, if not yet corrected, the anticipated time the noncompliance is expected to continue, and the steps taken to reduce, eliminate and prevent recurrence of the noncomplying discharge.

## 7. Spill Notification

The permittees shall immediately report any release of any polluting material which occurs to the surface waters or groundwaters of the state, unless the permittees have determined that the release is not in excess of the threshold reporting quantities specified in the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code), by calling the Department at the number indicated on the second page of this permit (or, if this is a general permit, on the COC); or, if the notice is provided after regular working hours, call the Department’s 24-hour Pollution Emergency Alerting System telephone number, 1-800-292-4706 (calls from **out-of-state** dial 1-517-373-7660).

Within ten (10) days of the release, the permittees shall submit to the Department a full written explanation as to the cause of the release, the discovery of the release, response (clean-up and/or recovery) measures taken, and preventive measures taken or a schedule for completion of measures to be taken to prevent reoccurrence of similar releases.

## 8. Upset Noncompliance Notification

If a process "upset" (defined as an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittees) has occurred, the permittees who wishes to establish the affirmative defense of upset, shall notify the Department by telephone within 24 hours of becoming aware of such conditions; and within five (5) days, provide in writing, the following information:

a. that an upset occurred and that the permittees can identify the specific cause(s) of the upset;

b. that the permitted wastewater treatment facility was, at the time, being properly operated and maintained (note that an upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation); and

c. that the permittees has specified and taken action on all responsible steps to minimize or correct any adverse impact in the environment resulting from noncompliance with this permit.

No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

In any enforcement proceedings, the permittees, seeking to establish the occurrence of an upset, has the burden of proof.

## 9. Bypass Prohibition and Notification

a. Bypass Prohibition
Bypass is prohibited, and the Department may take an enforcement action, unless:

1) bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2) there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass; and

3) the permittees submitted notices as required under 9.b. or 9.c. below.

b. Notice of Anticipated Bypass
If the permittees know in advance of the need for a bypass, it shall submit prior notice to the Department, if possible at least ten (10) days before the date of the bypass, and provide information about the anticipated bypass as required by the Department. The Department may approve an anticipated bypass, after considering its adverse effects, if it will meet the three (3) conditions listed in 9.a. above.

c. Notice of Unanticipated Bypass
The permittees shall submit notice to the Department of an unanticipated bypass by calling the Department at the number indicated on the second page of this permit (if the notice is provided after regular working hours, use the following number: 1-800-292-4706) as soon as possible, but no later than 24 hours from the time the permittees becomes aware of the circumstances.

d. Written Report of Bypass
A written submission shall be provided within five (5) working days of commencing any bypass to the Department, and at additional times as directed by the Department. The written submission shall contain a description of the bypass and its cause; the period of bypass, including exact dates and times, and if the bypass has not been corrected, the anticipated time it is expected to continue; steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass; and other information as required by the Department.

e. Bypass Not Exceeding Limitations
The permittees may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to ensure efficient operation. These bypasses are not subject to the provisions of 9.a., 9.b., 9.c., and 9.d., above. This provision does not relieve the permittees of any notification responsibilities under Part II.C.11. of this permit.

f. Definitions

1) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.

2) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

## 10. Bioaccumulative Chemicals of Concern (BCC)

Consistent with the requirements of R 323.1098 and R 323.1215 of the Michigan Administrative Code, the permittees are prohibited from undertaking any action that would result in a lowering of water quality from an increased loading of a BCC unless an increased use request and antidegradation demonstration have been submitted and approved by the Department.

## 11. Notification of Changes in Discharge

The permittees shall notify the Department, in writing, as soon as possible but no later than 10 days of knowing, or having reason to believe, that any activity or change has occurred or will occur which would result in the discharge of: 1) detectable levels of chemicals on the current Michigan Critical Materials Register, priority pollutants or hazardous substances set forth in 40 CFR 122.21, Appendix D, or the Pollutants of Initial Focus in the Great Lakes Water Quality Initiative specified in 40 CFR 132.6, Table 6, which were not acknowledged in the application or listed in the application at less than detectable levels; 2) detectable levels of any other chemical not listed in the application or listed at less than detection, for which the application specifically requested information; or 3) any chemical at levels greater than five times the average level reported in the complete application (see the first page of this permit, for the date(s) the complete application was submitted). Any other monitoring results obtained as a requirement of this permit shall be reported in accordance with the compliance schedules.

## 12. Changes in Facility Operations

Any anticipated action or activity, including but not limited to facility expansion, production increases, or process modification, which will result in new or increased loadings of pollutants to the receiving waters must be reported to the Department by a) submission of an increased use request (application) and all information required under R 323.1098 (Antidegradation) of the Water Quality Standards or b) by notice if the following conditions are met: 1) the action or activity will not result in a change in the types of wastewater discharged or result in a greater quantity of wastewater than currently authorized by this permit; 2) the action or activity will not result in violations of the effluent limitations specified in this permit; 3) the action or activity is not prohibited by the requirements of Part II.C.10.; and 4) the action or activity will not require notification pursuant to Part II.C.11. Following such notice, the permit or, if applicable, the facility's COC may be modified according to applicable laws and rules to specify and limit any pollutant not previously limited.

## 13. Transfer of Ownership or Control

In the event of any change in control or ownership of facilities from which the authorized discharge emanates, the permittees shall submit to the Department 30 days prior to the actual transfer of ownership or control a written agreement between the current permittees and the new permittees containing: 1) the legal name and address of the new owner; 2) a specific date for the effective transfer of permit responsibility, coverage and liability; and 3) a certification of the continuity of or any changes in operations, wastewater discharge, or wastewater treatment.

If the new permittees are proposing changes in operations, wastewater discharge, or wastewater treatment, the Department may propose modification of this permit in accordance with applicable laws and rules.

## 14. Operations and Maintenance Manual

For wastewater treatment facilities that serve the public (and are thus subject to Part 41 of the NREPA), Section 4104 of Part 41 and associated Rule 2957 of the Michigan Administrative Code allow the Department to require an Operations and Maintenance (O&M) Manual from the facility. An up-to-date copy of the O&M Manual shall be kept at the facility and shall be provided to the Department upon request. The Department may review the O&M Manual in whole or in part at its discretion and require modifications to it if portions are determined to be inadequate.

At a minimum, the O&M Manual shall include the following information: permit standards; descriptions and operation information for all equipment; staffing information; laboratory requirements; record keeping requirements; a maintenance plan for equipment; an emergency operating plan; safety program information; and copies of all pertinent forms, as-built plans, and manufacturer's manuals.

Certification of the existence and accuracy of the O&M Manual shall be submitted to the Department at least sixty days prior to start-up of a new wastewater treatment facility. Recertification shall be submitted sixty days prior to start-up of any substantial improvements or modifications made to an existing wastewater treatment facility.

## 15. Signatory Requirements

All applications, reports, or information submitted to the Department in accordance with the conditions of this permit and that require a signature shall be signed and certified as described in the Federal Act and the NREPA.

The Federal Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

The NREPA (Section 3115(2)) provides that a person who at the time of the violation knew or should have known that he or she discharged a substance contrary to this part, or contrary to a permit, COC, or order issued or rule promulgated under this part, or who intentionally makes a false statement, representation, or certification in an application for or form pertaining to a permit or COC or in a notice or report required by the terms and conditions of an issued permit or COC, or who intentionally renders inaccurate a monitoring device or record required to be maintained by the Department, is guilty of a felony and shall be fined not less than $2,500.00 or more than $25,000.00 for each violation. The court may impose an additional fine of not more than $25,000.00 for each day during which the unlawful discharge occurred. If the conviction is for a violation committed after a first conviction of the person under this subsection, the court shall impose a fine of not less than $25,000.00 per day and not more than $50,000.00 per day of violation. Upon conviction, in addition to a fine, the court in its discretion may sentence the defendant to imprisonment for not more than 2 years or impose probation upon a person for a violation of this part. With the exception of the issuance of criminal complaints, issuance of warrants, and the holding of an arraignment, the circuit court for the county in which the violation occurred has exclusive jurisdiction. However, the person shall not be subject to the penalties of this subsection if the discharge of the effluent is in conformance with and obedient to a rule, order, permit, or COC of the Department. In addition to a fine, the attorney general may file a civil suit in a court of competent jurisdiction to recover the full value of the injuries done to the natural resources of the state and the costs of surveillance and enforcement by the state resulting from the violation.

## 16. Electronic Reporting

Upon notice by the Department that electronic reporting tools are available for specific reports or notifications, the permittees shall submit electronically all such reports or notifications as required by this permit, on forms provided by the Department.

**PART II**

## Section D. Management Responsibilities

### 1. Duty to Comply

All discharges authorized herein shall be consistent with the terms and conditions of this permit. The discharge of any pollutant identified in this permit, more frequently than, or at a level in excess of, that authorized, shall constitute a violation of the permit.

It is the duty of the permittees to comply with all the terms and conditions of this permit. Any noncompliance with the Effluent Limitations, Special Conditions, or terms of this permit constitutes a violation of the NREPA and/or the Federal Act and constitutes grounds for enforcement action; for permit or Certificate of Coverage (COC) termination, revocation and reissuance, or modification; or denial of an application for permit or COC renewal.

It shall not be a defense for permittees in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

### 2. Operator Certification

The permittees shall have the waste treatment facilities under direct supervision of an operator certified at the appropriate level for the facility certification by the Department, as required by Sections 3110 and 4104 of the NREPA. Permittees authorized to discharge storm water shall have the storm water treatment and/or control measures under direct supervision of a storm water operator certified by the Department, as required by Section 3110 of the NREPA.

### 3. Facilities Operation

The permittees shall, at all times, properly operate and maintain all treatment or control facilities or systems installed or used by the permittees to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance includes adequate laboratory controls and appropriate quality assurance procedures.

### 4. Power Failures

In order to maintain compliance with the effluent limitations of this permit and prevent unauthorized discharges, the permittees shall either:

a. provide an alternative power source sufficient to operate facilities utilized by the permittees to maintain compliance with the effluent limitations and conditions of this permit; or

b. upon the reduction, loss, or failure of one or more of the primary sources of power to facilities utilized by the permittees to maintain compliance with the effluent limitations and conditions of this permit, the permittees shall halt, reduce or otherwise control production and/or all discharge in order to maintain compliance with the effluent limitations and conditions of this permit.

### 5. Adverse Impact

The permittees shall take all reasonable steps to minimize or prevent any adverse impact to the surface waters or groundwaters of the state resulting from noncompliance with any effluent limitation specified in this permit including, but not limited to, such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge in noncompliance.

## 6. Containment Facilities

The permittees shall provide facilities for containment of any accidental losses of polluting materials in accordance with the requirements of the Part 5 Rules (R 324.2001 through R 324.2009 of the Michigan Administrative Code). For a Publicly Owned Treatment Work (POTW), these facilities shall be approved under Part 41 of the NREPA.

## 7. Waste Treatment Residues

Residuals (i.e. solids, sludges, biosolids, filter backwash, scrubber water, ash, grit, or other pollutants or wastes) removed from or resulting from treatment or control of wastewaters, including those that are generated during treatment or left over after treatment or control has ceased, shall be disposed of in an environmentally compatible manner and according to applicable laws and rules. These laws may include, but are not limited to, the NREPA, Part 31 for protection of water resources, Part 55 for air pollution control, Part 111 for hazardous waste management, Part 115 for solid waste management, Part 121 for liquid industrial wastes, Part 301 for protection of inland lakes and streams, and Part 303 for wetlands protection. Such disposal shall not result in any unlawful pollution of the air, surface waters or groundwaters of the state.

## 8. Right of Entry

The permittees shall allow the Department, any agent appointed by the Department, or the Regional Administrator, upon the presentation of credentials and, for animal feeding operation facilities, following appropriate biosecurity protocols:

a. to enter upon the permittee’s premises where an effluent source is located or any place in which records are required to be kept under the terms and conditions of this permit; and

b. at reasonable times to have access to and copy any records required to be kept under the terms and conditions of this permit; to inspect process facilities, treatment works, monitoring methods and equipment regulated or required under this permit; and to sample any discharge of pollutants.

## 9. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Act and Rule 2128 (R 323.2128 of the Michigan Administrative Code), all reports prepared in accordance with the terms of this permit, shall be available for public inspection at the offices of the Department and the Regional Administrator. As required by the Federal Act, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Act and Sections 3112, 3115, 4106 and 4110 of the NREPA.

## 10. Duty to Provide Information

The permittees shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or the facility’s COC, or to determine compliance with this permit. The permittees shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Where the permittees become aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.

**PART II**

## Section E. Activities Not Authorized by This Permit

### 1. Discharge to the Groundwaters

This permit does not authorize any discharge to the groundwaters. Such discharge may be authorized by a groundwater discharge permit issued pursuant to the NREPA.

### 2. POTW Construction

This permit does not authorize or approve the construction or modification of any physical structures or facilities at a POTW. Approval for the construction or modification of any physical structures or facilities at a POTW shall be by permit issued under Part 41 of the NREPA.

### 3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypass" (Part II.C.9. pursuant to 40 CFR 122.41(m)), nothing in this permit shall be construed to relieve the permittees from civil or criminal penalties for noncompliance, whether or not such noncompliance is due to factors beyond the permittee’s control, such as accidents, equipment breakdowns, or labor disputes.

### 4. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittees from any responsibilities, liabilities, or penalties to which the permittees may be subject under Section 311 of the Federal Act except as are exempted by federal regulations.

### 5. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittees from any responsibilities, liabilities, or penalties established pursuant to any applicable state law or regulation under authority preserved by Section 510 of the Federal Act.

### 6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize violation of any federal, state or local laws or regulations, nor does it obviate the necessity of obtaining such permits, including any other Department of Environment, Great Lakes, and Energy permits, or approvals from other units of government as may be required by law.

# Appendix F.
# GLWA Project Projections

# GLWA Schedule of Project Needs 2020 through 2060

**Table 7-21. Schedule of Active and Future Planned CIP Projects WRRF Liquid Treatment Train**

| | CIP No. | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 | 2056 | 2057 | 2058 | 2059 | 2060 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PRELIMINARY TREATMENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab of Ferric Chloride System | 211008 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future Rehab of Ferric Chloride System (as necessary) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PS1 Improvements | 211006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future PS1 Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PS 2 Improvements - Phase II | 211005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PS2 Screen and Grit Improvements | 211007 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future PS2 Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future PS2 Screen and Grit Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PS1 Screen and Grit Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future PS1 Screen and Grit Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New Connection - Oakwood Interceptor to PS2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **PRIMARY TREATMENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab of Rectangular Clarifiers 1-12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab of Circular Clarifier Scum Removal | 211009 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| New High Rate Clarification (HRC) System | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab Circular Clarifiers 17 and 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab Circular Clarifiers 13-16 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **SECONDARY TREATMENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab RAS pumps | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab of Secondary Clarifiers | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 1 and 2: EBPR w/ Oxygen and Hydraulic Optimization | 212008 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 3 and 4: EBPR w/ Oxygen and Hydraulic Optimization | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 1 & 2: Step Feed and ILP Mods | 212008 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 3 & 4: Step Feed and ILP Mods | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 1 & 2: Aerator Replacement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Aeration Decks 3 & 4: Aerator Replacement | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future Aeration Decks 1 & 2 Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future Aeration Decks 3 & 4 Improvements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **DISINFECTION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Future rehab of Hypochlorite System (as necessary) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Convert to Sodium Hypo for all flow (if feasible) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Assess Alternative Disinfectant | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **ANCILLARY FACILITIES** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Underground Duct Bank Repair | 216001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plant-Wide Fire Alarm | 216002 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Potable Water, SFE, Natural Gas, Compressed Air (F) | 216003 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab SFE PS and secondary water system (F) | 216006 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rehab Maint Bldg (F) | 216005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

# Appendix G. Correspondences

# Michigan Natural Features Inventory Correspondence

# Davidek, Tyler

| | |
|---|---|
| **From:** | Sanders, Michael <sander75@msu.edu> |
| **Sent:** | Wednesday, March 16, 2022 1:32 PM |
| **To:** | Bartlett, Rebecca |
| **Cc:** | Delia, David; Ware, Alexander; Davidek, Tyler |
| **Subject:** | RE: Rare Species Review - GLWA CWRF |
| **Attachments:** | RSR #3079_ Response Letter.pdf; RSR_3079_Section 7 Comments_Wayne County.pdf |

**This message originated from outside of Wade Trim**

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**Rare Species Review #3079 in Wayne County, MI**

Hello:

Please find our response letter for Rare Species Review #3079 in Wayne County, MI. Also included are comments for projects involving federal funding or a federal agency authorization, plus the optional project map as requested.

Please let me know if you have questions or comments.

Thank you,

Mike Sanders

Michael Sanders
Rare Species Review Specialist/Zoologist
Michigan Natural Features Inventory
Michigan State University Extension
PO Box 13036
Lansing, MI 48901
Cell: 517-980-5632



---

**From:** Bartlett, Rebecca <rbartlett@wadetrim.com>
**Sent:** Friday, February 18, 2022 5:09 PM
**To:** mnfi@msu.edu
**Cc:** Delia, David <ddelia@wadetrim.com>; Ware, Alexander <aware@wadetrim.com>; Davidek, Tyler <tdavidek@wadetrim.com>
**Subject:** Rare Species Review - GLWA CWRF

**CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov**

Hello,

GLWA is preparing a Clean Water Revolving Fund Project Plan to apply for State Revolving Fund funding of four project located at the GLWA Wastewater Resource Recovery Facility, 9300 W Jefferson Ave, Detroit, MI 48209. These projects are in the same area so we would request a single Rare Species Review. The projects are: 1) Rehabilitation of Pump Station 1 (PS-1) Improvements, 2) Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, 3) Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and 4) Aeration Decks 1-2 Modification.

I have attached a pdf map of the project boundary as well as a brief summary of each project.

If you have any questions, please contact me by email at rbartlett@wadetrim.com or by phone at (248)–880-6557

Thank you,
Rebecca

WADE TRIM

**Rebecca Bartlett,** Engineer
25251 Northline Road, Taylor, MI 48180
734.947.9700 office
248.880.6557 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Sanders, Michael <sander75@msu.edu> |
| **Sent:** | Tuesday, March 1, 2022 3:22 PM |
| **To:** | Bartlett, Rebecca |
| **Cc:** | Delia, David; Ware, Alexander; Davidek, Tyler |
| **Subject:** | RE: Rare Species Review - GLWA CWRF |
| **Attachments:** | RSR#3079_Invoice.pdf; RSR #3079_InfoAgre.pdf |

**This message originated from outside of Wade Trim**

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**Rare Species Review #3079**

Hello,

Thank you for allowing MNFI to review this activity for possible impacts to Michigan's rare natural features. Attached are the project invoice plus the Information Use Agreement that explains how our data can be used.

We will begin processing the review once payment is received and the signed Information Agreement is returned.

Please let me know if you have questions or comments.

V/r,

Mike Sanders

Michael Sanders
Rare Species Review Specialist/Zoologist
Michigan Natural Features Inventory
Michigan State University Extension
PO Box 13036
Lansing, MI 48901

---

**From:** Bartlett, Rebecca <rbartlett@wadetrim.com>
**Sent:** Friday, February 18, 2022 5:09 PM
**To:** mnfi@msu.edu
**Cc:** Delia, David <ddelia@wadetrim.com>; Ware, Alexander <aware@wadetrim.com>; Davidek, Tyler <tdavidek@wadetrim.com>
**Subject:** Rare Species Review - GLWA CWRF

**CAUTION: This is an External email. Please send suspicious emails to abuse@michigan.gov**

Hello,

GLWA is preparing a Clean Water Revolving Fund Project Plan to apply for State Revolving Fund funding of four project located at the GLWA Wastewater Resource Recovery Facility, 9300 W Jefferson Ave, Detroit, MI 48209. These projects are in the same area so we would request a single Rare Species Review. The projects are: 1) Rehabilitation of Pump Station 1 (PS-1) Improvements, 2) Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System

Improvements, 3) Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and 4) Aeration Decks 1-2 Modification.

I have attached a pdf map of the project boundary as well as a brief summary of each project.

If you have any questions, please contact me by email at rbartlett@wadetrim.com or by phone at (248)–880-6557

Thank you,
Rebecca

WADE TRIM

**Rebecca Bartlett,** Engineer
25251 Northline Road, Taylor, MI 48180
734.947.9700 office
248.880.6557 cell

# Tribal Historic Preservation Office Correspondence

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Little Traverse Bay Band of Odawa
7500 Odawa Circle
Harbor Springs, MI 49740

Attention: Mr. Wes Andrews

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Andrews:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

This notice and opportunity to comment is being sent to you to fulfill the consultation requirement of Section 106 of the National Historic Preservation Act review process. Should you have any comments on potential impacts to known areas of religious, historic, and/or cultural significance in the area of the proposed project, please provide them before the Public Hearing Meeting on May 25th, 2022. Any comments or concerns received will be included in the Final Project Plan.

The following are brief descriptions of the proposed projects:

The proposed work for the Rehabilitation of PS-1 Improvements consists of significant structural, mechanical, process, and electrical upgrades that will maintain the long-term reliability of this critical pumping facility at the headworks of the Water Resource Reclamation Facility (WRRF).

The proposed work for PS-2 Bar Rack Replacements and Grit Collection System Improvements consists of finer bar screens with enhanced capture, the possible addition of additional bar screens, improved screenings removal, improved grit removal, and a new grit processing facility to improve the reliability of the rack and grit systems.

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Please see the attached maps for the specific location of the projects.

The complete draft project plan will be available to the public on April 22nd, 2022, on the **GLWA Website:** https://www.glwater.org/. If you require a bound printed copy, please contact me and we can arrange for a physical copy to be mailed.

If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Match-e-be-nash-shee-wish Gun Lake Band of Potawatomi Indians
2872 Mission Drive
Shelbyville, MI 49344

Attention: Ms. Heather Bush

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Ms. Bush:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

WADE TRIM

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Bay Mills Indian Community
12140 W. Lakeshore Drive
Brimley, MI 49715

Attention: Ms. Paula Carrick, THPO

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Ms. Carrick:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Saginaw Chippewa Indian Tribe of MI
6650 E. Broadway
Mt. Pleasant, MI 48858

Attention: Mr. William Johnson
Interim THPO

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Johnson:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Johnson-Ltr.docx
Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Keweenaw Bay Indian Community
16429 Bear Town Road
Baraga, MI 49908

Attention: Mr. Gary Loonsfoot, THPO

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Loonsfoot:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Loonsfoot-Ltr.docx
Attachments

WADE TRIM

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Keweenaw Bay Indian Community
P.O. Box 249
Watersmeet, MI 49969

Attention: Giiwegiizhigookway Martin

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Giiwegiizhigookway Martin:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Martin -Ltr.docx
Attachments

WADE TRIM

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Sault Ste. Marie Tribe of Chippewa
523 Ashmun
Sault Ste. Marie, MI 49783

Attention: Ms. Colleen Medicine

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Ms. Medicine:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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The proposed work for PS-2 Bar Rack Replacements and Grit Collection System Improvements consists of finer bar screens with enhanced capture, the possible addition of additional bar screens, improved screenings removal, improved grit removal, and a new grit processing facility to improve the reliability of the rack and grit systems.

The proposed work for the Rehabilitation of the SFE Pump Station consists of replacing the existing SFE pump station with a new SFE pump station that will add additional water treatment to significantly reduce the amount of city water required to operate the WRRF and to allow the facility to operate during any water supply interruptions.

The proposed work for the Aeration Decks 1-2 Modification Project consists of modifications to allow for step-feed, biological Phosphorous removal, and improved hydraulic control to accommodate swings in demand from wet weather conditions reducing recovery times and probability of in-plant violations.

Please see the attached maps for the specific location of the projects.

The complete draft project plan will be available to the public on April 22nd, 2022, on the **GLWA Website:** https://www.glwater.org/. If you require a bound printed copy, please contact me and we can arrange for a physical copy to be mailed.

If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Medicine -Ltr.docx
Attachements

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Hannahville Potawatomi Indian Community
N-14911 Hannahville B-1 Road
Wilson, MI 49896

Attention: Mr. Earl Meshigaud

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Meshigaud:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

This notice and opportunity to comment is being sent to you to fulfill the consultation requirement of Section 106 of the National Historic Preservation Act review process. Should you have any comments on potential impacts to known areas of religious, historic, and/or cultural significance in the area of the proposed project, please provide them before the Public Hearing Meeting on May 25th, 2022. Any comments or concerns received will be included in the Final Project Plan.

The following are brief descriptions of the proposed projects:

The proposed work for the Rehabilitation of PS-1 Improvements consists of significant structural, mechanical, process, and electrical upgrades that will maintain the long-term reliability of this critical pumping facility at the headworks of the Water Resource Reclamation Facility (WRRF).

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The proposed work for the Rehabilitation of the SFE Pump Station consists of replacing the existing SFE pump station with a new SFE pump station that will add additional water treatment to significantly reduce the amount of city water required to operate the WRRF and to allow the facility to operate during any water supply interruptions.

The proposed work for the Aeration Decks 1-2 Modification Project consists of modifications to allow for step-feed, biological Phosphorous removal, and improved hydraulic control to accommodate swings in demand from wet weather conditions reducing recovery times and probability of in-plant violations.

Please see the attached maps for the specific location of the projects.

The complete draft project plan will be available to the public on April 22nd, 2022, on the **GLWA Website:** https://www.glwater.org/. If you require a bound printed copy, please contact me and we can arrange for a physical copy to be mailed.

If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading 2023 WRRF Clean Water State Revolving Fund (CWSRF).

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Little River Band of Ottawa Indians
2608 Government Center Drive
Manistee, MI 49660

Attention: Mr. Jay Sam
Director

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Sam:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Pokagon Band of Potawatomi
58620 Sink Road
Dowagiac, MI 49047

Attention: Mr. Marcus Winchester, THPO

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mr. Winchester:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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Please see the attached maps for the specific location of the projects.

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If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF).*

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Winchester-Ltr.docx
Attachments

WADE TRIM

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Grand Traverse Band of Ottawa and Chippewa Indians
2605 NW Bayshore Drive
Peshawbetown, MI 49682

Attention: Ms. Cindy Winslow

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Ms. Winslow:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF).*

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
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Attachments

Wade Trim Associates, Inc.
25251 Northline Road • Taylor, MI 48180
734.947.9700 • www.wadetrim.com

February 18, 2022

Nottawaseppi Band of Huron Potawatomi
1485 Mno-Bmadzewen Way
Fulton, MI 49052

Attention: Mon-ee Zapata
Cultural Specialist

Re: Notice and Opportunity to Comment
GLWA WRRF 2022 State Revolving Fund Projects' Application
Great Lakes Water Authority

Dear Mon-ee Zapata:

Wade Trim Associates, working on behalf of Great Lakes Water Authority (GLWA), is preparing a Clean Water Revolving Fund (CWRF) Project Plan with the intent to apply for State Revolving Fund (SRF) funding of the following four projects located at the GLWA Wastewater Resource Recovery Facility (WRRF), 9300 W Jefferson Ave, Detroit, MI 48209: Rehabilitation of Pump Station 1 (PS-1) Improvements, Pump Station 2 (PS-2) Bar Rack Replacements and Grit Collection System Improvements, Rehabilitation of the Screened Final Effluent (SFE) Pump Station, and Aeration Decks 1-2 Modification. This application is intended to secure low interest loan funding through the Michigan Department of Environment, Great Lakes, and Energy (MI-EGLE) CWRF, with distribution starting in fiscal year 2023.

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Please see the attached maps for the specific location of the projects.

The complete draft project plan will be available to the public on April 22nd, 2022, on the **GLWA Website:** https://www.glwater.org/. If you require a bound printed copy, please contact me and we can arrange for a physical copy to be mailed.

If you have any questions on this request or need further information to complete a review of the proposed projects, please contact me at 734.947.9700 or at tdavidek@wadetrim.com. Please direct any written communications to my office at 25251 Northline Road, PO Box 10, Taylor MI, 48180 with the subject heading *2023 WRRF Clean Water State Revolving Fund (CWSRF)*.

Very truly yours,

Wade Trim Associates, Inc.

Tyler Davidek, PE
Engineer

TD:lf
HZN 2005-01T
20220218_Zapata-Ltr.docx
Attachments

# Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:47 PM |
| **To:** | cindy.winslow@gtb.nsn.us |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Draft Project Plan - Request to Review |
| **Attachments:** | 20220218_Winslow-Ltr.pdf |

Hello Ms. Winslow,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise during your review, please contact me as soon as possible so that we can work out a plan for working around any specific requirements that there may be.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

**From:** Davidek, Tyler
**Sent:** Friday, February 18, 2022 6:02 PM
**To:** cmedicine@saulttribe.net
**Subject:** GLWA Project Plan - Request to Review
**Attachments:** 20220218_Medicine-Ltr.pdf

Hello Ms. Medicine,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

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If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 6:01 PM |
| **To:** | wjohnson@sagchip.org |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Johnson-Ltr.pdf |

Hello Mr. Johnson,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise during your review, please contact me as soon as possible so that we can work out a plan for working around any specific requirements that there may be.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

**From:** Davidek, Tyler
**Sent:** Friday, February 18, 2022 5:59 PM
**To:** marcus.winchester@pokogonband-nsn.gov
**Subject:** GLWA Project Plan - Request to Review
**Attachments:** 20220218_Winchester-Ltr.pdf

Hello Mr. Winchester,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

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If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

**Davidek, Tyler**

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:58 PM |
| **To:** | mzapata@nhbpi.com |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Zapata-Ltr.pdf |

Hello,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

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Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:56 PM |
| **To:** | heather.bush@glt-nsn.gov |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Bush-Ltr.pdf |

Hello Ms. Bush,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise during your review, please contact me as soon as possible so that we can work out a plan for working around any specific requirements that there may be.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:54 PM |
| **To:** | jsam@lrboi-nsn.gov |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Sam-Ltr.pdf |

Hello Mr. Sam,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

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Thank you,

Tyler

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:53 PM |
| **To:** | gmartin@lvdtribal.com |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Martin-Ltr.pdf |

Hello,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise during your review, please contact me as soon as possible so that we can work out a plan for working around any specific requirements that there may be.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

**From:** Davidek, Tyler
**Sent:** Friday, February 18, 2022 5:51 PM
**To:** gloonsfoot@kbic-nsn.gov
**Cc:** Delia, David; Ware, Alexander
**Subject:** GLWA Project Plan - Request to Review
**Attachments:** 20220218_Loonsfoot-Ltr.pdf

Hello Mr. Loonsfoot,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

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Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:50 PM |
| **To:** | earlmeshigaud@hannahville.org |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Project Plan - Request to Review |
| **Attachments:** | 20220218_Meshigaud-Ltr.pdf |

Hello Mr. Meshigaud,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise during your review, please contact me as soon as possible so that we can work out a plan for working around any specific requirements that there may be.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

## Davidek, Tyler

**From:** Davidek, Tyler
**Sent:** Friday, February 18, 2022 6:04 PM
**To:** wandrews@ltbbodawa-nsn.gov
**Subject:** GLWA Project Plan - Request to Review
**Attachments:** 20220218_Andrews-Ltr.pdf

Hello Mr. Andrews,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

We ask that all comments and/or concerns be returned to us on or before May 25th. This is the date of the public hearing for the Draft Project Plan, and we would like to get all comments and concerns addressed by this date. If there are any major concerns that arise while you review, please let me know as soon as possible so we can work around any requests.

If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

# Davidek, Tyler

| | |
|---|---|
| **From:** | Davidek, Tyler |
| **Sent:** | Friday, February 18, 2022 5:44 PM |
| **To:** | paulacarrick@baymills.org |
| **Cc:** | Delia, David; Ware, Alexander |
| **Subject:** | GLWA Project Plan Review Request |
| **Attachments:** | 20220218_Carrick-Ltr.pdf |

Hello Ms. Carrick,

I work for an engineering firm called Wade Trim and we are currently putting together a Clean Water Revolving Fund Project Plan on behalf of Great Lakes Water Authority. As part of this Project Plan, all THPOs that may have historic, cultural, and/or religious areas close to the project site are sent a request to review and return any comments and/or concerns.

I have attached a letter to this email that has also been sent to you by standard mail. The letter contains brief descriptions of the projects as well as a map of the locations of the projects. A full Draft Project Plan will be available to the public on April 22nd for your review.

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If you have any questions or need more information for your review, please feel free to contact me by email or phone.

Thank you,

Tyler

WADE TRIM

**Tyler Davidek, P.E.,** Professional Engineer
25251 Northline Road, Taylor, MI 48180
734.947.2667 office
810.360.9729 cell

# State Historic Preservation Office Correspondence

TO BE ADDED IN FINAL PROJECT PLAN

# Appendix H.
# Cost Estimates and Present Worth (Lifecycle Cost) Calculations

# Pump Station 1 Project Cost Estimate

# Memorandum

To: GLWA

From: Wade Trim Team

Date: February 28, 2022

Subject: CS-102 - Rehabilitation of Pump Station No. 1
Engineer's Opinion of Probable Construction Cost
100% Submittal

An Engineer's Opinion of Probable Construction Cost for the CS-102 Pump Station No. 1 Rehabilitation project was updated based on the latest design concept presented in the 100% Design Submittal. The estimate was developed at a Class 1 AACE estimate reliability with an expected accuracy of -10%/+15%. The construction costs include all the labor, materials, equipment, supervision, and general requirements needed to build the project.

To meet CIP goals, GLWA requested that Discharge Gate Valve (DGV) and Make-Up Air Unit (MAU) Equipment be procured separately in advance of the Main Contract. The equipment cost was removed from the estimate. **Table 1** summarizes the developed of the Opinion of Probable Construction Costs for the resulting Main Contract improvements. **Appendix A** includes the detailed development of costs by specification division.

| **Table 1 – Rehabilitation of Pump Station No. 1<br>100% Submittal Less Pre-Procurement Equipment Total Cost Summary** | |
|---|---|
| Description | Construction Costs |
| **Subtotal Direct Costs** | **$57,077,000** |
| **Overhead (10%)** | **$5,708,000** |
| Subtotal | $62,785,000 |
| **Profit (5%)** | **$3,139,000** |
| Subtotal | $65,924,000 |
| **Mob/Bonds/Insurance (5%)** | **$3,296,000** |
| **Design Contingency (1%)** | **$692,000** |
| **GLWA Provisionary Allowance (5%)** | **$3,500,000** |
| **Total Construction Cost** | **$73,412,000** |

Table 2 presents the estimated Equipment Costs and Table 3 presented the total anticipated Construction budget need for all the improvements.

| Table 2 – Rehabilitation of Pump Station No. 1<br>100% Submittal Cost Summary – Pre-Procurement of MAUs and DGVs | |
|---|---|
| Description | Construction Costs |
| **MAUs (7)** | $1,391,000 |
| **Discharge Gate Valves and Actuators (8)** | $3,871,000 |
| **Total Equipment Cost** | $5,262,000 |

| Table 3 – Rehabilitation of Pump Station No. 1<br>100% Submittal Total Cost Summary | |
|---|---|
| Description | Construction Costs |
| **Total Main Contract Construction Cost** | $73,412,000 |
| **Total Pre-Procurement Equipment Cost** | $5,262,000 |
| **Total Construction Budget** | $78,674,000 |

# APPENDIX A

# ENGINEER'S OPINION OF CONSTRUCTION COST

**PROJECT:** CS-102 Rehabilitation of PS-1 Improvements **DATE:** 2/28/22

**LOCATION:** Detroit, MI **PROJECT NO.:** GLW2018

**BASIS FOR ESTIMATE:** [ ] CONCEPTUAL [ ] PRELIMINARY [X] 100% [ ] FINAL

**WORK:** Wet Well , Pump, Motor, Gates, Valves and Structural Rehabilitation
Electrical and I&C Updates, HVAC /Plumbing Rehab, Architectural Upgrades, Civil/Site Work,
Flow Metering Installation, New Electrical Room, Venturi Vault Rehab

| ITEM NO. | DESCRIPTION | AMOUNT TOTAL |
|---|---|---|
| | | |
| | **Division 01 - General Requirements (Includes Allowances)** | **$10,346,000** |
| | **Division 02 - Existing Conditions** | **$2,907,000** |
| | **Division 03 - Concrete** | **$664,000** |
| | **Division 04 - Masonry** | **$511,000** |
| | **Division 05 - Metals** | **$1,098,000** |
| | **Division 06 - Wood, Plastics, & Composites** | **$25,000** |
| | **Division 07 - Thermal & Moisture Protection** | **$762,000** |
| | **Division 08 - Openings** | **$1,131,000** |
| | **Division 09 - Finishes** | **$955,000** |
| | **Division 10 - Specialties** | **$27,000** |
| | **Division 12 - Furnishings** | **$86,000** |
| | **Division 14 - Conveying Systems** | **$1,500,000** |
| | **Division 22 - Plumbing** | **$340,000** |
| | **Division 23 - HVAC** | **$973,000** |
| | **Division 26 - Electrical** | **$9,402,000** |
| | **Division 31 - Earthwork** | **$19,000** |
| | **Division 32 - Exterior Improvements** | **$227,000** |
| | **Division 33 - Utilities** | **$5,000** |
| | **Division 40 - Process Interconnections** | **$10,785,000** |
| | **Division 41 - Material Processing and Handling Equipment** | **$100,000** |
| | **Division 43 - Process Gas and Liquid Handling, Purification and Storage** | **$14,964,000** |
| | **Division 44 - Pollution and Waste Control Management** | **$250,000** |
| | **Subtotal** | **$57,077,000** |
| | | |
| | **Overhead (10%)** | **$5,708,000** |
| | Subtotal | $62,785,000 |
| | | |
| | **Profit (5%)** | **$3,139,000** |
| | Subtotal | $65,924,000 |
| | | |
| | **Mob/Bonds/Insurance (5%)** | **$3,296,000** |
| | Subtotal | $69,220,000 |
| | | |
| | **Design Contingency (1%)** | **$692,000** |
| | Subtotal | $69,912,000 |
| | | |
| | **Unforeseen Condition Allowance (5%)** | **$3,500,000** |
| | **Total Construction Cost** | **$73,412,000** |

*This Engineer's Opinion of Construction Costs is provided based on available information and the engineer's experience and qualifications and represents their best judgment as a design professional familiar with the construction industry. The engineer has no control over the costs of labor, materials, equipment, or over the contractor's methods of determining prices or over competitive bidding or market conditions. The engineer cannot and does not guarantee that proposals, bids or construction cost will not vary from this estimate.*

Pump Station 1 Project
Present Worth Calculations

**Present Worth (Lifecycle Cost) Calculations**
**Pump Station No. 1 Improvements Project**

**Conceptual Cost Estimate:** Used in SRF Plan Cost Estimation
Planning Period 20 years Number of Households: 1,136,500
Discount Rate (DR): 1.875% from MDEQ Website (https://www.michigan.gov/egle/0,9429,7-135-3307_3515_4143---,00.html)
Inflation Rate (i): 1.400% http://www.economagic.com/em-cgi/data.exe/fedbog/prime

| | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|
| Description | | Rehabilitate the Existing Pumps and Motors | | Replace with New Constant Speed Pumps and Motors | | Replace with New Variable Speed Pumps and Motors | |
| Construction Duration | | 3 years | | 3 years | | 3 years | |
| **Capital Costs Expected Useful Life (years)** | | **Capital Costs** | **Escalated** | **Capital Costs** | **Escalated** | **Capital Costs** | **Escalated** |
| | Years | | **Salvage Value** | | **Salvage Value** | | **Salvage Value** |
| Architectural | 20 | $ 4,387,202 | $ - | $ 4,387,202 | $ - | $ 4,387,202 | $ - |
| Site Civil | 20 | $ 322,834 | $ - | $ 322,834 | $ - | $ 322,834 | $ - |
| I&C Equipment | 10 | $ 13,982,197 | $ - | $ 13,982,197 | $ - | $ 13,982,197 | $ - |
| Mechanical & Electrical Equipment | 15 | $ 6,018,094 | | $ 6,018,094 | | $ 6,018,094 | |
| Process Equipment | 20 | $ 19,103,815 | $ - | $ 19,103,815 | $ - | $ 19,103,815 | $ - |
| Prepurchased Mechanical Equipment | 15 | $ 1,391,000 | | $ 1,391,000 | | $ 1,391,000 | |
| Prepurchased Process Equipment | 20 | $ 3,871,000 | $ - | $ 3,871,000 | $ - | $ 3,871,000 | $ - |
| Structural | 50 | $ 2,587,819 | $ 1,552,691 | $ 2,587,819 | $ 1,552,691 | $ 2,587,819 | $ 1,552,691 |
| Pumps & Motors | 20 | $ 27,010,039 | $ - | $ 48,899,610 | $ - | $ 53,738,235 | $ - |
| **Subtotal** | | **$ 78,674,000** | **$ 1,552,691** | **$ 100,563,571** | **$ 1,552,691** | **$ 105,402,196** | **$ 1,552,691** |
| Contingency | 5% | $ 3,933,700 | | $ 5,028,179 | | $ 5,270,110 | |
| Engineering | 17% | $ 13,000,000 | | $ 16,617,007 | | $ 17,416,536 | |
| Legal | 0% | $ - | | $ - | | $ - | |
| Admin | 0% | $ - | | $ - | | $ - | |
| **Total** | | **$ 95,607,700** | | **$ 122,208,757** | | **$ 128,088,842** | |
| **Annual Additional OM&R Costs** | **Year:** | **2022** | **Annual Change** | **2022** | **Annual Change** | **2022** | **Annual Change** |
| Salaries and Administrative | | $ - | | $ - | | $ - | |
| Energy (can be escalated) | | $ - | $ - | $ - | $ - | $ - | $ - |
| Chemicals | | $ - | | $ - | | $ - | |
| Repair and Maintenance | | $ - | | $ - | | $ - | |
| **Total O&M** | | $ - | | $ - | | $ - | |
| | | | **Escalated** | | **Escalated** | | **Escalated** |
| Replacement | 10 | $ 13,982,197 | $ 16,067,746 | $ 13,982,197 | $ 16,067,746 | $ 13,982,197 | $ 16,067,746 |
| Replacement | 15 | $ 7,409,094 | $ 9,127,134 | $ 7,409,094 | $ 9,127,134 | $ 7,409,094 | $ 9,127,134 |
| **PRESENT WORTH CALCULATIONS** | | | | | | | |
| Initial Cost | | $ 95,607,700 | | $ 122,208,757 | | $ 128,088,842 | |
| OM&R | | $ 20,251,263 | | $ 20,251,263 | | $ 20,251,263 | |
| Salvage Value (minus) | | $ (1,070,860) | | $ (1,070,860) | | $ (1,070,860) | |
| Interest During Construction | | $ 2,543,212 | | $ 3,250,813 | | $ 3,407,226 | |
| Total Present Worth | | **$ 117,331,315** | | **$ 144,639,973** | | **$ 150,676,471** | |
| **Equivalent Annual Cost** | | **$ 7,089,332** | | **$ 8,739,361** | | **$ 9,104,095** | |
| **User Impact Cost** | | **$ 6.24** | | **$ 7.69** | | **$ 8.01** | |

***Present Worth Factors***

| ***Case*** | ***Years*** | ***Factor*** |
|---|---|---|
| *Single Payment* | *10* | *0.8305* |
| *Single Payment* | *15* | *0.7568* |
| *Salvage Value* | *20* | *0.6897* |
| *OM&R* | *20* | *16.5504* |
| *Energy* | *20* | *147.0297* |
| *Capital Recovery Factor* | *20* | *0.0604* |

***Assumptions:***

The project is anticipated to reduce annual operations, maintenance and repair (OM&R) costs; $0 is assumed for Salaries and Administrative, Energy, Chemicals, and Repair and Maintenance because the project is anticipated to reduce costs from current expenditures and should not negatively affect User Impact Cost.

# Aeration Decks 1-2 Project Cost Estimate

AECOM
707 Grant Street
6th Floor
Pittsburgh, PA 15219

**Project: Aeration Basins 1 & 2 Improvements**
Location: Detroit, Michigan
Client: Great Lakes Water Authority
CIP #: 212008

11/16/2021

**30% Design**

**12.00 Estimate Summary**

| Division | Description | % of Costs | | Total |
|---|---|---|---|---|
| 1 | General Conditions | 0.00% | $ - | $ - |
| 2 | Existing Conditions | 0.71% | $ 182,774.72 | $ 182,775 |
| 3 | Concrete | 3.59% | $ 926,908.38 | $ 926,908 |
| 4 | Masonry | 0.00% | $ - | $ - |
| 5 | Metals | 7.13% | $ 1,839,859.02 | $ 1,839,859 |
| 6 | Wood, Lumber, and Composites | 0.00% | $ - | $ - |
| 7 | Thermal and Moisture Protection | 2.83% | $ 730,996.62 | $ 730,997 |
| 8 | Openings | 0.02% | $ 4,918.20 | $ 4,918 |
| 9 | Finishes | 0.00% | $ - | $ - |
| 10 | Specialties | 0.00% | $ - | $ - |
| 11 | Equipment | 0.00% | $ - | $ - |
| 12 | Furnishings | 0.00% | $ - | $ - |
| 13 | Special Construction | 0.00% | $ - | $ - |
| 14 | Conveying Systems | 0.00% | $ - | $ - |
| 21 | Fire Suppression | 0.00% | $ - | $ - |
| 22 | Plumbing | 0.00% | $ - | $ - |
| 23 | Heating, Ventilating, and Air Conditioning | 0.00% | $ - | $ - |
| 26 | Electrical, Instrumentation, and Controls | 22.79% | $ 5,878,918.58 | $ 5,878,919 |
| 27 | Communications | 0.00% | $ - | $ - |
| 28 | Electronic Safety and Security | 0.00% | $ - | $ - |
| 31 | Earthwork | 0.00% | $ - | $ - |
| 32 | Exterior Improvements | 2.56% | $ 660,105.58 | $ 660,106 |
| 33 | Utilities | 3.73% | $ 962,657.31 | $ 962,657 |
| 40 | Process Integration | 0.00% | $ - | $ - |
| 46 | Water and Wastewater Equipment | 56.63% | $ 14,604,668.68 | $ 14,604,669 |

| | | | | |
|---|---|---|---|---|
| **Subtotal** | | | **$ 25,791,807.07** | **$ 25,791,807** |
| General Conditions | | | 10.00% | *$ 2,579,181* |
| Sales Tax | | | 6.00% | *$ 1,263,229* |
| Security Allowance | | | 0.25% | *$ 64,480* |
| Phasing Requirements | | | 2.00% | *$ 515,836* |
| Subcontractor Markup | 30% | of work | 5.00% | *$ 386,877* |
| **Subtotal** | | | **$ 30,601,409.26** | **$ 30,601,409** |
| Escalation | Months to Mid-Point of Construction | 6.90% | 21.18% | *$ 6,482,344* |
| **Subtotal** | | | **$ 37,083,753.30** | **$ 37,083,753** |
| General Contractor Overhead | | | 10.00% | *$ 3,708,375* |
| General Contractor Profit | | | 10.00% | *$ 3,708,375* |
| **Subtotal** | | | **$ 44,500,503.97** | **$ 44,500,504** |
| Bonds and Insurance | | | 2.00% | *$ 890,010* |
| **Subtotal** | | | **$ 45,390,514.05** | **$ 45,390,514** |
| Construction Contingency | | | 20.00% | *$ 9,078,103* |
| Bidding Contingency | Not Required | | 0.00% | *$ -* |
| Design-Build Engineering | | | 10.00% | *$ 4,539,051* |
| **Total Construction Costs** | | | **$ 59,007,668.26** | **$ 59,007,668** |

# Aeration Decks 1-2 Project
# Present Worth Calculations

**Present Worth (Lifecycle Cost) Calculations**
**Aeration Decks 1-2 Modifications Project**

**Conceptual Cost Estimate:** Used in SRF Plan Cost Estimation
Planning Period 20 years Approx. No. Households: 1,136,500
Discount Rate (DR): 1.875% from MDEQ Website (https://www.michigan.gov/egle/0,9429,7-135-3307_3515_4143---,00.html)
Inflation Rate (i): 1.4% https://www.usinflationcalculator.com/inflation/current-inflation-rates/

| | | | Aeration Decks Project Selected Alternative | |
|---|---|---|---|---|
| | Description | | Hybrid Aeration/Mixing; 3-Stage Weir Modification; Step-Feed Replace Intermediate ILPs | |
| | Construction Duration | | 1.5 years | |
| **Capital Costs Expected Useful Life (years)** | | | **Capital Costs** | **Escalated Salvage Value** |
| | | Years | | |
| | Structures | 50 | $ 8,857,148 | $ 5,314,288.77 |
| | Process equipment | 20 | $ 31,074,299 | $ - |
| | Site Civil | 20 | $ 2,437,131 | $ - |
| | Electrical, Instrumentation, and Controls | 15 | $ 12,508,553 | $ - |
| | **Subtotal** | | **$ 54,877,131** | **$ 5,314,289** |
| | Contingency | 20% | $ 10,975,426 | |
| | Engineering | 15% | $ 8,231,570 | |
| | Legal | 0% | $ - | |
| | Admin | 0% | $ - | |
| | **Total** | | **$ 74,084,127** | |
| | | | * | |
| **Annual Additional OM&R Costs** | **Year:** | | **2022** | **Annual Change** |
| | Salaries and Administrative | | $ - | |
| | Energy (can be escalated) | | $ - | $ - |
| | Chemicals | | $ - | |
| | Repair and Maintenance | | $ - | |
| | **Total O&M** | | **$ -** | |
| | | Years | | **Escalated** |
| | Replacement | 5 | $ - | $ - |
| | Replacement | 10 | $ - | $ - |
| | Replacement | 15 | $ 12,508,553 | $ 15,409,069 |
| **PRESENT WORTH CALCULATIONS** | | | | |
| | Initial Cost | | $ 74,084,127 | |
| | OM&R | | $ 11,661,706 | |
| | Salvage Value (minus) | | $ (3,665,158) | |
| | Interest During Construction | | $ 1,013,179 | |
| | Total Present Worth | | **$ 83,093,854** | |
| | **Equivalent Annual Cost** | | **$ 5,020,654** | |
| | **User Impact Cost** | | **$ 4.42** | |

***Present Worth Factors***

| *Case* | *Years* | *Factor* |
|---|---|---|
| *Single Payment* | *10* | *0.8305* |
| *Single Payment* | *15* | *0.7568* |
| *Salvage Value* | *20* | *0.6897* |
| *OM&R* | *20* | *16.5504* |
| *Energy* | *20* | *147.0297* |
| *Capital Recovery Factor* | *20* | *0.0604* |

***Assumptions:***

The project is anticipated to reduce annual operations, maintenance and repair (OM&R) costs; $0 is assumed for Salaries and Administrative, Energy, Chemicals, and Repair and Maintenance because the project is anticipated to reduce costs from current expenditures and should not negatively affect User Impact Cost.

# Pump Station 2 Project Cost Estimate

**Great Lakes Water Authority**
**PS-2 Bar Rack Replacement And**
**Grit Collection System Improvements**
**Engineer's Opinion of Probable Construction Cost - Class 3**
**Basis of Design Report**

| Facility / Description | OPCC Value |
|---|---|
| Pump Station 2 | $ 374,000 |
| Screen Building | $ 26,075,000 |
| Grit Removal | $ 25,660,000 |
| Grit Processing Facility | $ 20,038,000 |
| Chemical Facility | $ 2,540,000 |
| Pipe Tunnel | $ 893,000 |
| Pavement Modifications | $ 2,771,000 |
| **TOTAL COST** | **$ 78,351,000** |

**Great Lakes Water Authority**
**PS-2 Bar Rack Replacement And**
**Grit Collection System Improvements**
**Engineer's Opinion of Probable Construction Cost - Class 3**
**Basis of Design Report**

Date: 1/12/2022

| Division | Description | Total | |
|---|---|---|---|
| 01 | General Conditions | $ | 5,732,610 |
| 02 | Existing Conditions | $ | 1,131,224 |
| 03 | Concrete | $ | 9,005,262 |
| 04 | Masonry | $ | 2,292,097 |
| 05 | Metals | $ | 966,102 |
| 06 | Woods, Plastics and Composites | $ | 50,000 |
| 07 | Thermal & Moisture Protection | $ | 221,557 |
| 08 | Openings | $ | 499,258 |
| 09 | Finishes | $ | 1,194,130 |
| 10 | Specialties | $ | 3,320 |
| 11 | Equipment | $ | - |
| 12 | Furnishings | $ | - |
| 13 | Special Construction | $ | 1,289,518 |
| 14 | Conveying Equipment | $ | - |
| 15 | Not Used | $ | - |
| 16 | Not Used | $ | - |
| 17 | Not Used | $ | - |
| 18 | Not Used | $ | - |
| 19 | Not Used | $ | - |
| 20 | Not Used | $ | - |
| 21 | Fire Suppression | $ | - |
| 22 | Plumbing Equipment | $ | - |
| 23 | Heating, Ventilating, and Air Conditioning (HVAC) | $ | 1,156,892 |
| 24 | Not Used | $ | - |
| 25 | Integrated Automation | $ | - |
| 26 | Electrical | $ | 3,648,713 |
| 27 | Communications | $ | - |
| 28 | Electronic Safety and Security | $ | - |
| 29 | Not Used | $ | - |
| 30 | Not Used | $ | - |
| 31 | Earthwork | $ | 283,221 |
| 32 | Exterior Improvements | $ | 1,296,546 |
| 33 | Utilities | $ | 199,015 |
| 34 | Transportation | $ | - |
| 35 | Waterway and Marine Construction | $ | - |
| 36 | Not Used | $ | - |
| 37 | Not Used | $ | - |
| 38 | Not Used | $ | - |
| 39 | Not Used | $ | - |
| 40 | Process Interconnections | $ | 5,875,594 |
| 41 | Material Processing and Handling Equipment | $ | 212,174 |
| 42 | Process Heating, Cooling and Drying Equipment | $ | - |

Great Lakes Water Authority
PS-2 Bar Rack Replacement And
Grit Collection System Improvements
Engineer's Opinion of Probable Construction Cost - Class 3
Basis of Design Report

Date: 1/12/2022

| Division | Description | | | | | Total | |
|---|---|---|---|---|---|---|---|
| 43 | *Process Gas and Liquid Handling, Purification and Storage Equipment* | | | | | $ | 472,894 |
| 44 | *Pollution and Waste Control Equipment* | | | | | $ | - |
| 45 | *Industry-Specific Manufacturing Equipment* | | | | | $ | - |
| 46 | *Water and Wastewater Equipment* | | | | | $ | 8,419,886 |
| 47 | *Not Used* | | | | | $ | - |
| 48 | *Electrical Power Generation* | | | | | $ | - |
| 49 | *Not Used* | | | | | $ | - |
| 50 | *Not Used* | | | | | $ | - |
| | **Subtotal:** | | | | | **$** | **43,950,013** |
| | *Value of Subcontracted Work* | | | $ | 13,160,986 | | |
| | *Subcontractor Overhead, Profit & Fee* | 25.0% | on | $ | 13,160,986 | $ | 3,290,246 |
| | **Subtotal:** | | | | | **$** | **47,240,260** |
| | *Prime Contractor Overhead* | 10.0% | on | $ | 30,789,028 | $ | 3,078,903 |
| | **Subtotal:** | | | | | **$** | **50,319,163** |
| | *Prime Contractor Profit* | 10.0% | on | $ | 33,867,931 | $ | 3,386,793 |
| | **Subtotal:** | | | | | **$** | **53,705,956** |
| | *GC Profit on Subcontracted Work* | 5.0% | on | $ | 16,451,232 | $ | 822,562 |
| | **Subtotal:** | | | | | **$** | **54,528,517** |
| | *Labor Escalation at 3.50% annually* | 7.1% | on | $ | 16,595,155 | $ | 1,181,990 |
| | *Material/Equip Escalation at 5.00% annually* | 10.3% | on | $ | 27,354,859 | $ | 2,803,873 |
| | **Subtotal:** | | | | | **$** | **58,514,380** |
| | *Bond and Insurance* | 3.0% | | | | $ | 1,755,431 |
| | **Subtotal:** | | | | | **$** | **60,269,812** |
| | *Design Contingency* | 30.0% | | | | $ | 18,080,943 |
| | **Subtotal:** | | | | | **$** | **78,350,755** |
| | *Contract Allowances* | | | | | | |
| | | | | | | $ | - |
| | | | | | | $ | - |
| | | | | | | $ | - |
| | **Total (rounded):** | | | | | **$** | **78,351,000** |

Note: Project Assumptions

| | |
|---|---|
| Construction NTP: | 1/2/2023 |
| Duration (field work): | 24 months |

**Expected Cost Range**

| -20% | 30% |
|---|---|
| **$62,681,000** | **$101,856,000** |

# Pump Station 2 Project
# Present Worth Calculations

## Present Worth (Lifecycle Cost) Calculations
## Pump Station No. 2 Bar Racks Replacement and Grit Collection System Improvements

**Conceptual Cost Estimate:** Used in SRF Plan Cost Estimation
Planning Period 20 years ox. No. Households: 1,136,500
Discount Rate (DR): 1.875% from MDEQ Website (https://www.michigan.gov/egle/0,9429,7-135-3307_3515_4143---,00.html)
Inflation Rate (i): 1.4% https://www.usinflationcalculator.com/inflation/current-inflation-rates/

**Yellow alternatives are combined into the Selected Alternative**

| | | PS-2 Selected Alternative | | Screening Alternatives: Alternative 1A | | Screening Alternatives: Alternative 1D | |
|---|---|---|---|---|---|---|---|
| Description | | 10 fine screens (1/4 inch); 8 stirred vortex; grit processing facility (8 units) | | Ten fine screens (1/4 inch) in existing channels with two additional channels/screens | | New coarse screens (3/4 inch) in existing screen channels and new fine screens (1/4 inch) in grit chamber inlet | |
| Construction Duration | | 4 years | | 4 years | | 4 years | |
| **Capital Costs Expected Useful Life (years)** | | Capital Costs | Escalated | Capital Costs | Escalated | Capital Costs | Escalated |
| | Years | | Salvage Value | | Salvage Value | | Salvage Value |
| Structures | 50 | $ 25,218,000 | $ 15,130,800 | $ 7,057,000 | $ 4,234,200 | $ 12,877,000 | $ 7,726,200 |
| Process Equipment; Civil/Site; Architectural | 20 | $ 38,419,000 | $ - | $ 15,696,000 | $ - | $ 29,793,000 | $ - |
| Electrical and Mechanical Equipment | 15 | $ 10,890,000 | $ - | $ 2,352,000 | $ - | $ 4,306,000 | $ - |
| I & C Equipment | 10 | $ 3,880,000 | $ - | $ 1,467,000 | $ - | $ 979,000 | $ - |
| **Subtotal** | | **$ 78,407,000** | **$ 15,130,800** | **$ 26,572,000** | **$ 4,234,200** | **$ 47,955,000** | **$ 7,726,200** |
| Contingency | 10% | $ 7,840,700 | | $ 2,657,200 | | $ 4,795,500 | |
| Engineering | 15% | $ 11,761,050 | | $ 3,985,800 | | $ 7,193,250 | |
| Legal | 0% | $ - | | $ - | | $ - | |
| Admin | 0% | $ - | | $ - | | $ - | |
| **Total** | | **$ 98,008,750** | | **$ 33,215,000** | | **$ 59,943,750** | |
| **Annual Additional OM&R Costs** | **Year:** | **2021** | **Annual Change** | **2021** | **Annual Change** | **2019** | **Annual Change** |
| Salaries and Administrative | | $ - | | $ - | | $ - | |
| Energy (can be escalated) | | $ 13,797 | $ 193 | $ 13,147 | $ 184 | $ 26,293 | $ 368 |
| Chemicals | | $ 4,008 | | $ - | | $ - | |
| Repair and Maintenance | | $ 10,494 | | $ 5,728 | | $ 11,455 | |
| **Total O&M** | | **$ 28,298** | | **$ 18,874** | | **$ 37,749** | |
| | | | **Escalated** | | **Escalated** | | **Escalated** |
| Replacement | 5 | $ - | $ - | $ - | $ - | $ - | $ - |
| Replacement | 10 | $ 3,880,000 | $ 4,458,731 | $ 1,467,000 | $ 1,685,814 | $ 979,000 | $ 1,125,025 |
| Replacement | 15 | $ 10,890,000 | $ 13,415,202 | $ 2,352,000 | $ 2,897,388 | $ 4,306,000 | $ 5,304,487 |
| **PRESENT WORTH CALCULATIONS** | | | | | | | |
| Initial Cost | | $ 98,008,750 | | $ 33,215,000 | | $ 59,943,750 | |
| OM&R | | $ 10,649,472 | | $ 2,532,204 | | $ 4,693,353 | |
| Salvage Value (minus) | | $ (10,435,409) | | $ (2,920,243) | | $ (5,328,605) | |
| Interest During Construction | | $ 96,193,601 | | $ 32,599,849 | | $ 58,833,575 | |
| **Total Present Worth** | | **$ 194,416,415** | | **$ 65,426,810** | | **$ 118,142,074** | |
| **Equivalent Annual Cost** | | **$ 11,746,927** | | **$ 3,953,185** | | **$ 7,138,319** | |
| **User Impact Cost** | | **$ 10.34** | | **$ 3.48** | | **$ 6.28** | |

| | | Screening Alternatives: Alternative 1E | | Grit Removal Alternatives: Alternative 2A | | Grit Removal Alternatives: Alternative 2B | |
|---|---|---|---|---|---|---|---|
| Description | | New coarse screens (3/4 inch) in existing screen channels and new fine screens (1/4 inch) in grit chamber outlet | | Rehabilitated aerated grit chambers | | Retrofit grit chambers with stacked tray grit removal technology | |
| Construction Duration | | 4 years | | 4 years | | 4 years | |
| **Capital Costs Expected Useful Life (years)** | | Capital Costs | Escalated | Capital Costs | Escalated | Capital Costs | Escalated |
| | Years | | Salvage Value | | Salvage Value | | Salvage Value |
| Structures | 50 | $ 13,336,000 | $ 8,001,600 | $ 9,296,000 | $ 5,577,600 | $ 16,233,000 | $ 9,739,800 |
| Process Equipment; Civil/Site; Architectural | 20 | $ 29,142,000 | $ - | $ 11,101,000 | $ - | $ 22,258,000 | $ - |
| Electrical and Mechanical Equipment | 15 | $ 4,306,000 | $ - | $ 4,957,000 | $ - | $ 3,077,000 | $ - |
| I & C Equipment | 10 | $ 979,000 | $ - | $ 979,000 | $ - | $ 978,000 | $ - |
| **Subtotal** | | **$ 47,763,000** | **$ 8,001,600** | **$ 26,333,000** | **$ 5,577,600** | **$ 42,546,000** | **$ 9,739,800** |
| Contingency | 10% | $ 4,776,300 | | $ 2,633,300 | | $ 4,254,600 | |
| Engineering | 15% | $ 7,164,450 | | $ 3,949,950 | | $ 6,381,900 | |
| Legal | 0% | $ - | | $ - | | $ - | |
| Admin | 0% | $ - | | $ - | | $ - | |
| **Total** | | **$ 59,703,750** | | **$ 32,916,250** | | **$ 53,182,500** | |
| **Annual Additional OM&R Costs** | **Year:** | **2019** | **Annual Change** | **2021** | **Annual Change** | **2019** | **Annual Change** |
| Salaries and Administrative | | $ - | | $ - | | $ - | |
| Energy (can be escalated) | | $ 26,293 | $ 368 | $ - | $ - | $ - | $ - |
| Chemicals | | $ - | | $ - | | $ - | |
| Repair and Maintenance | | $ 11,455 | | $ - | | $ - | |
| **Total O&M** | | **$ 37,749** | | **$ -** | | **$ -** | |
| | | | **Escalated** | | **Escalated** | | **Escalated** |
| Replacement | 5 | $ - | $ - | $ - | $ - | $ - | $ - |
| Replacement | 10 | $ 979,000 | $ 1,125,025 | $ 979,000 | $ 1,125,025 | $ 978,000 | $ 1,123,876 |
| Replacement | 15 | $ 4,306,000 | $ 5,304,487 | $ 4,957,000 | $ 6,106,442 | $ 3,077,000 | $ 3,790,503 |
| **PRESENT WORTH CALCULATIONS** | | | | | | | |
| Initial Cost | | $ 59,703,750 | | $ 32,916,250 | | $ 53,182,500 | |
| OM&R | | $ 4,693,353 | | $ 4,621,404 | | $ 2,868,683 | |
| Salvage Value (minus) | | $ (5,518,543) | | $ (3,846,759) | | $ (6,717,344) | |
| Interest During Construction | | $ 58,598,020 | | $ 32,306,632 | | $ 52,197,546 | |
| **Total Present Worth** | | **$ 117,476,581** | | **$ 65,997,527** | | **$ 101,531,384** | |
| **Equivalent Annual Cost** | | **$ 7,098,109** | | **$ 3,987,668** | | **$ 6,134,676** | |
| **User Impact Cost** | | **$ 6.25** | | **$ 3.51** | | **$ 5.40** | |

| | | Grit Removal Alternatives: Alternative 2D | | Grit Processing: Grit Processing Facility | |
|---|---|---|---|---|---|
| Description | | Retrofit grit chambers with stirred vortex grit removal technology | | 8 grit classifiers with duplex cyclones in a new grit processing facility | |
| Construction Duration | | 4 years | | 4 years | |
| **Capital Costs Expected Useful Life (years)** | | Capital Costs | Escalated | Capital Costs | Escalated |
| | Years | | Salvage Value | | Salvage Value |
| Structures | 50 | $ 12,364,000 | $ 7,418,400 | $ 5,797,000 | $ 3,478,200 |
| Process Equipment; Civil/Site; Architectural | 20 | $ 9,596,000 | $ - | $ 13,127,000 | $ - |
| Electrical and Mechanical Equipment | 15 | $ 4,394,000 | $ - | $ 4,144,000 | $ - |
| I & C Equipment | 10 | $ 1,792,000 | $ - | $ 621,000 | $ - |
| **Subtotal** | | **$ 28,146,000** | **$ 7,418,400** | **$ 23,689,000** | **$ 3,478,200** |
| Contingency | 10% | $ 2,814,600 | | $ 2,368,900 | |
| Engineering | 15% | $ 4,221,900 | | $ 3,553,350 | |
| Legal | 0% | $ - | | $ - | |
| Admin | 0% | $ - | | $ - | |
| **Total** | | **$ 35,182,500** | | **$ 29,611,250** | |
| **Annual Additional OM&R Costs** | **Year:** | **2019** | **Annual Change** | **2019** | **Annual Change** |
| Salaries and Administrative | | $ - | | $ - | |
| Energy (can be escalated) | | $ - | $ - | $ 650 | $ 9 |
| Chemicals | | $ - | | $ 4,008 | |
| Repair and Maintenance | | $ - | | $ 4,766 | |
| **Total O&M** | | **$ -** | | **$ 9,424** | |
| | | | **Escalated** | | **Escalated** |
| Replacement | 5 | $ - | $ - | $ - | $ - |
| Replacement | 10 | $ 1,792,000 | $ 2,059,290 | $ 621,000 | $ 713,627 |
| Replacement | 15 | $ 4,394,000 | $ 5,412,892 | $ 4,144,000 | $ 5,104,922 |
| **PRESENT WORTH CALCULATIONS** | | | | | |
| Initial Cost | | $ 35,182,500 | | $ 29,611,250 | |
| OM&R | | $ 4,096,520 | | $ 4,020,749 | |
| Salvage Value (minus) | | $ (5,116,321) | | $ (2,398,845) | |
| Interest During Construction | | $ 34,530,910 | | $ 29,062,842 | |
| **Total Present Worth** | | **$ 68,693,609** | | **$ 60,295,996** | |
| **Equivalent Annual Cost** | | **$ 4,150,569** | | **$ 3,643,173** | |
| **User Impact Cost** | | **$ 3.65** | | **$ 3.21** | |

***Present Worth Factors***

| *Case* | *Years* | *Factor* |
|---|---|---|
| *Single Payment* | *10* | *0.8305* |
| *Single Payment* | *15* | *0.7568* |
| *Salvage Value* | *20* | *0.6897* |
| *OM&R* | *20* | *16.5504* |
| *Energy* | *20* | *147.0297* |
| *Capital Recovery Factor* | *20* | *0.0604* |

***Assumptions:***

Capital costs are based upon the engineer's 30% design opinion of probabable construction costs (OPCC); OM&R Costs are based upon engineer's basis of design (OPCC) and have been adjusted from 2021 to 2022 using ENR Construction Cost Index (1.035); Salaries and Adminstrative costs are assumed to be $0 because the project is anticipated to reduce costs from current expenditures and should not negatively affect User Impact Cost.

# SFE Pump Station Project
# Present Worth Calculations

## Present Worth (Lifecycle Cost) Calculations
## Rehabilitation of the Screened Final Effluent Pump Station

**Conceptual Cost Estimate:** Used in SRF Plan Cost Estimation

Planning Period: 20 years — Approx. No. Households: 1,136,500

Discount Rate (DR): 1.875% from MDEQ Website (https://www.michigan.gov/egle/0,9429,7-135-3307_3515_4143---,00.html)

Inflation Rate (i): 1.4% https://www.usinflationcalculator.com/inflation/current-inflation-rates/

| | | Alternative 1 | | | Alternative 2 | |
|---|---|---|---|---|---|---|
| Description | | **Proposed Elevated Storage Tank** | | | **Proposed New SFE Pump Station** | |
| Construction Duration | | 2 years | | | 2 years | |
| **Capital Costs Expected Useful Life (years)** | | **Capital Costs** | **Escalated** | | **Capital Costs** | **Escalated** |
| | Years | | **Salvage Value** | | | **Salvage Value** |
| Structures | 50 | $ 20,920,200 | $ 12,552,120 | | $ 12,000,000 | $ 7,200,000 |
| Process equipment | 20 | $ 30,930,200 | $ - | | $ 24,000,000 | $ - |
| Site Civil | 20 | $ 11,911,000 | $ - | | $ 9,600,000 | $ - |
| Electrical, Instrumentation, and Controls | 15 | $ 9,909,000 | $ - | | $ 16,000,000 | $ - |
| | | | $ - | | | $ - |
| **Subtotal** | | **$ 73,670,400** | **$ 12,552,120** | | **$ 61,600,000** | **$ 7,200,000** |
| Contingency | 20% | $ 14,734,080 | | 20% | $ 12,320,000 | |
| Engineering | 15% | $ 11,050,560 | | 10% | $ 6,160,000 | |
| Legal | 0% | $ - | | 0% | $ - | |
| Admin | 0% | $ - | | 0% | $ - | |
| **Total** | | **$ 99,455,040** | | | **$ 80,080,000** | |
| **Annual Additional OM&R Costs** | **Year:** | **2022** | **Annual Change** | | **2022** | **Annual Change** |
| Salaries and Administrative | | $ 73,670 | | | $ 61,600 | |
| Energy (can be escalated) | | See Note 2 | | | See Note 3 | |
| Chemicals | | | | | | |
| Repair and Maintenance | | $ 198,910 | | | $ 160,160 | |
| **Total O&M** | | **$ 272,580** | | | **$ 221,760** | |
| | Years | | **Escalated** | | | **Escalated** |
| Replacement | 5 | $ - | $ - | | $ - | $ - |
| Replacement | 10 | $ - | $ - | | $ - | $ - |
| Replacement | 15 | $ 9,909,000 | $ 12,206,725 | | $ 16,000,000 | $ 19,710,122 |
| **PRESENT WORTH CALCULATIONS** | | | | | | |
| Initial Cost | | $ 99,455,040 | Energy and | | $ 80,080,000 | Energy and |
| OM&R | | $ 13,749,464 | Chemicals | | $ 18,586,994 | Chemicals |
| Salvage Value (minus) | | $ (8,656,945) | Excluded | | $ (4,965,695) | Excluded |
| Interest During Construction | | $ 1,796,771 | | | $ 1,446,739 | |
| **Total Present Worth** | | **$ 106,344,330** | | | **$ 95,148,038** | |
| **Equivalent Annual Cost** | | **$ 6,425,482** | | | **$ 5,748,985** | |
| **User Impact Cost** | | **$ 5.65** | | | **$ 5.06** | |

Note 2: The Design Builder is providing a "not to exceed" cost which guarantees electrical and water savings. However, at the time of this publication the electrical and water saving for the separate alternatives is not known. First year pump station electrical saving associated with Alternative 1 is estimated at $239,765. First year estimated water savings is $304,021. The total estimated Year 1 savings for Alternative 1 are $543,786 These values are based on current estimates and may change.

Note 3: The Design Builder is providing a "not to exceed" cost which guarantees electrical and water savings. However, at the time of this publication the electrical and water saving for the separate alternatives is not known. First year savings associated with the City Water Use Reduction at the Cholrination/Dechlorination Facility for Alternative 2 are estimated at $3,260,555. First year estimated water savings associated with the RRO Water Replacement are $304,021. First year estimated water savings associated with the Low Pressure System at the WRRF are $2,075,585. First year estimated water savings associated with the High and Intermediate Pressure Systems at the WRRF are $1,257,930. First year pump station electrical savings are estimated at $239,765. The total estimated Year 1 savings for Alternative 2 are $7,137,855. These values are based on current estimates and may change.

***Present Worth Factors***

| *Case* | *Years* | *Factor* |
|---|---|---|
| *Single Payment* | *10* | *0.8305* |
| *Single Payment* | *15* | *0.7568* |
| *Salvage Value* | *20* | *0.6897* |
| *OM&R* | *20* | *16.5504* |
| *Energy* | *20* | *147.0297* |
| *Capital Recovery Factor* | *20* | *0.0604* |

***Assumptions:***

Repair and Maintenance costs are assumed to be annual, equal, and recurring; Salaries and Administration is assumed to be 0.1% of the Total; Repair and Maintenance is assumed to be 0.2% of the Total

# Present Worth Cost Comparison of 2023 GLWA CWRF Projects

## Comparison of Costs

**Present Worth (Lifecycle Cost) Calculations**

| Project | Total Capital Costs * (based on most current Engineers' OPCC or values provided by GLWA) | Total Project Cost * (includes Contingency, Engineering, Legal, and Admin) | Present Worth * | Equivalent Annual Cost* | Annual User Impact Cost | Monthly Impact |
|---|---|---|---|---|---|---|
| PS-1 Project | $78,674,000 | $95,608,000 | $117,331,000 | $7,089,000 | $6.24 | $0.52 |
| Aeration Decks Project | $54,877,000 | $74,084,000 | $83,094,000 | $5,021,000 | $4.42 | $0.37 |
| PS-2 Project | $78,407,000 | $98,009,000 | $194,416,000 | $11,747,000 | $10.34 | $0.86 |
| SFE Project | $61,600,000 | $80,080,000 | $95,148,000 | $5,749,000 | $5.06 | $0.42 |
| **TOTAL** | **$273,558,000** | **$347,781,000** | **$489,990,000** | **$29,606,000** | **$26.05** | **$2.17** |

* Rounded to the nearest thousand dollars

## Appendix I.
## Public Participation

# GLWA CWRF 2023 Project Plan Summary

GLWA

Great Lakes Water Authority

# 2023 WRRF CLEAN WATER STATE REVOLVING FUND PROJECT PLAN SUMMARY

APRIL 15, 2022

WADE TRIM


## Proposed Improvements

The Great Lakes Water Authority (GLWA) operates the Water Resource Recovery Facility (WRRF) located in the southwest corner of Detroit. The WRRF serves Detroit and the surrounding areas accepting wastewater and storm water from combined sewers. The water received is sent through multiple treatment processes within the WRRF. This treatment ensures the discharge meets the requirements of the National Pollutant Discharge Elimination System (NPDES) Permit for the WRRF.

To keep the WRRF functioning at a high level of effectiveness, four projects are being proposed to upgrade the facility's equipment, structures, and processes. GLWA has identified and prioritized these projects as follows: Priority 1A - Pump Station No. 1 Improvements (PS-1 Project); Priority 1B - Aeration Decks 1-2 Modifications (Aeration Decks Project), Priority 1C - Pump Station No. 2 Bar Racks Replacement and Grit Collection System Improvements (PS-2 Project); and Priority 1D - Rehabilitation of the Screened Final Effluent (SFE) Pump Station (SFE Project).

## Summary of Project Needs

The needs, and goals of each project are presented below.

### PS-1 Project (Priority 1A)

PS-1 is over 80 years old and is the primary pump station that conveys up to 1,200 million gallons per day (MGD) of sewage. Improvements are needed to ensure reliable service of the pumping equipment and to extend the estimated useful life of the station for another 20 years. Failure of PS-1 could result in overflow of dry weather and combined sewage to the Detroit and Rouge Rivers and violations of the NPDES permit.

Major goals of the PS-1 Project include:

- Provide NDPES required firm capacity
- Rehabilitate the pumps to run within the manufacturers' recommended operating ranges
- Meet Hydraulic Institute recommendations for suction intake conditions
- Decrease electrical consumption
- Right size utilities and mechanical systems
- Provide for a minimum design life of 20 years for the process equipment and building
- Improve the pump station's ability to address grit entering the wet well
- Improve the pump station's ability to meter flow
- Reduce the number of steps needed to properly operate the pump station
- Improve ability of operations and maintenance (O&M) staff to access and disassemble the pumps

## Aeration Decks Project (Priority 1B)

The secondary treatment process is the capacity limiting process at the WRRF. Changes to the high-purity oxygen activated sludge system are needed to optimize the aeration system's performance and accommodate more stringent phosphorus limits that will be included in an upcoming NPDES Permit. These changes include better control flow (contact time) for dry and wet weather flows by controlling water tank levels and the opportunity to utilize biological phosphorus removal to meet the pending NPDES Permit limits.

The surface aerators are limited to a narrow range of water levels, i.e. about 5 inches. The Aeration Deck level control system cannot maintain the water elevation in that range, which is especially evident at low flows when up to 175 MGD (instantaneous) of clean water must be recycled to artificially maintain a higher minimum water level. The level control system relies on submerging the effluent weir and using downstream, manually-operated flow control valves to stabilize the level at the weir outlet. Restoring the system to free-discharge weirs will eliminate the need to manually manage the water level and give the weir complete, passive control of the bioreactor water levels. To limit the flow-induced water level variations in the secondary treatment process, the hydraulic loading rate range at the effluent weir must be narrowed.

Major goals for the Aeration Decks Project include:

- Increase the overall efficiency and wet weather treatment capacity of the secondary treatment process by providing step-feed and improving the performance efficiency of Intermediate Lift Pump (ILP) Station No. 1 by replacing ILPs 1 and 2.
- Provide better hydraulic control at Aeration Decks 1 and 2.
- Improve the system's energy efficiency by efficiently sizing the mixing and aeration equipment.
- Provide Biological Phosphorus (Bio P) removal to accommodate the more stringent NPDES standards.

Increasing the efficiency will improve the performance and reliability of the secondary treatment process. The increased capacity will also prepare the system for projected increased flows from service population growth.

### PS-2 Project (Priority 1C)

The existing PS-2 Rack and Grit facilities remove sanitary trash and grit from up to 828 MGD of raw sewage that is treated at the WRRF. The screening and grit systems are not meeting expected removal standards, operate inefficiently, and are prone to failure.

Effective grit and screening removal can dramatically impact the performance and reliability of downstream treatment equipment. The cost of ineffective grit and screenings removal is difficult to quantify, but has been shown to manifest in excessive accumulation of grit in downstream channels and process tanks with severe consequences that include making gates difficult or impossible to operate; reducing conveyance capacities; inducing excessive wear and shortened life of primary sludge pumps and solids processing equipment; clogging the vertical turbine solids handling) inlet strainers on return activated sludge pumps; and reduced quality of the biosolids product which negatively impacts GLWA's long-term goal of adequate anaerobic digestion.

The following goals for the PS-2 Project have been set to address the potential consequences and increasing downtime of the aged equipment:

- Improve the systems to provide for significantly higher screenings and grit removal efficiencies
- Make changes that improve the long-term system reliability
- Simplify O&M

Upgrades will improve the WRRF's reliability by maintaining treatment processes with greater ease and reducing operating costs.

### SFE Project (Priority 1D)

The SFE Pump Station at the WRRF provides water for treatment processes that do not require "potable quality" water. This pump station was originally constructed when the demand for SFE water was significantly higher than today. Eight existing pumps have a total capacity of 124 MGD while the current operational demand is only 23 MGD. Running these oversized pumps is over-pressurizing the system and wasting energy.

In addition, EGLE has expressed concerns regarding the availability of redundant water supplies to the WRRF process units. Processes that rely on water of higher quality, rather than SFE, use the secondary water system. Secondary water is sourced from the Detroit Water and Sewerage Department's (DWSD's) potable system into reservoirs and is repumped from the basement of the existing machine shop to the low, intermediate, and high-pressure systems throughout the plant. Currently, the WRRF does not have redundancy for the secondary water system, upon which many processes rely. The existing secondary water system uses almost 6 MGD of potable water.

If a water main supply line were to go down, several of the processes at the WRRF and the chlorination/dechlorination facilities on the east side of Jefferson Avenue would be interrupted, losing the water necessary to keep treatment running. This outage would cause the WRRF to be out of compliance with their NPDES Permit.

The following goals have been set for the SFE Project to address the risks associated with the existing process:

- Replace the aging SFE pump station with a new right-sized pump station
- Provide treatment to SFE water sufficient for use in the secondary water system
- Provide redundancy to the secondary water system.

Use of the existing SFE Pump Station cannot be optimized to meet the current operating demands. Coupled with the reliance on DWSD's potable water system, the SFE Pump Station and City water main are not suited to provide optimum performance for the WRRF treatment processes. Changes are needed to the SFE Pump Station to meet these needs.

## Potential Alternatives

Multiple alternatives were considered for each project to provide the best and most cost-effective project plan. Brief descriptions of the alternatives evaluated and their determined feasibility are provided in the following sections.

### Common Alternatives

Two initial alternatives were common to all projects: the "No Action" and "Regional" alternatives.

The "No Action" alternative was determined to be unacceptable for all projects based on the existing condition of the various treatment processes and was not evaluated further. This alternative would not address the identified needs for any project and put the ability to meet the NPDES Permit at risk, now and in the future.

The WRRF is the largest treatment plant in Michigan and is already considered a "Regional" treatment facility because it accepts flows from multiple communities in the surrounding areas. Thus, the "Regional" alternative was not relevant to these projects and was not evaluated further.

Specific additional technical alternatives considered and evaluated for each project are presented below.

### PS-1 Project Alternatives

Three pump system alternatives were considered for the PS-1 Project: rehabilitation of the existing pumps and motors; replacement with new constant speed driven pumps and motors; and replacement with new variable speed driven pumps and motors.

Rehabilitation of the existing pumps and motors was determined to be the most cost-effective solution to extend the remaining useful life of the pump station to 20 years. A condition assessment of the pumps revealed that the pump casings had adequate remaining life (i.e., the entire pump did not need to be replaced). The original pumps and facility were designed to have the pullout assemblies replaced periodically, and this can be done at a much lower cost than full pump replacement. The constant speed motors, already some of the most efficient available, could also be rebuilt at a lower cost than providing new motors.

An analysis of pumping demands determined that the existing pump capacity combinations provides the WRRF with the ability to manage flow properly, thereby avoiding the expense associated with variable speed controls and variable speed compatible motors.

Additional improvements included within the recommended alternative that benefit operations and maintenance of the facility include: relocation of equipment to a new electrical room addition; addition of air-locks and other improvements to achieve NFPA-820 “unclassified” space in the pump station’s dry spaces; structural and architectural improvements; replacement of gates, valves, and actuators; rehabilitation of the elevators; additional drains and sump pump replacements; replacement of instrumentation and controls that had exceeded their useful life; and addition of small cranes to facilitate the movement of maintenance materials.

### Aeration Decks Project Alternatives

The Aeration Decks Project evaluated three alternatives for aeration/mixing and three alternatives for controlling the water level in the secondary system. An alternative for biological phosphorus removal (step-feed), which is dependent upon the selected aeration/mixing and water level control solution, was also evaluated. Finally, an alternative to replace, rather than maintain, intermediate lift pumps (ILPs) 1 and 2 was assessed.

The alternative selected includes a combination of mixers and aerators referred to as the “hybrid alternative”; three-stage weir modification; step feed to achieve biological phosphorus removal; and ILP replacement.
The Aeration Decks will have mixers in Bays 1 through 3 to create anoxic zones, and surface aerators in Bays 4 through 10 to create aerated zones. New weirs will be installed to create a three-stage system in the aeration decks, thus providing a more suitable/stable hydraulic profile. New ILPs will increase the reliability and efficiency of the improved secondary process.

### PS-2 Project Alternatives

Alternatives prepared for the PS-2 Project addressed needed improvements to screening, grit removal, and grit processing.

Five screening alternatives were identified. All screening alternatives include replacement of the eight coarse screens with either coarse (¾-inch) or fine (¼-inch) screens. Also, a hydraulic analysis determined that more screens were required to meet the percent removal goals. Additional screening was considered at the screening building; downstream of the existing screen channels at the grit chamber inlet; and at the grit chamber outlet.

Due to space constraints in the existing screening building, a single stage of multi-rake bar screens was selected as the optimal arrangement. This alternative included replacement of the eight coarse screens with ¼-inch screens and the addition of two, ¼-inch fine screens, for a total of 10 screens. The additional screens require the extension of the screening building, influent channel, and effluent channel.

Other screening improvements include the addition of a new sluice channel to carry the screenings to dewatering drum conveyors; improvements to the dumpster roll-off configuration; the addition of gated, screenings bypass channels; mechanical improvements to plumbing and HVAC; and architectural improvements including lighting.

Three grit removal alternatives were identified, including rehabilitating the aerated grit chambers and replacing the clamshell bucket system with a new grit removal method; retrofitting the aerated grit chambers with stacked tray grit removal units; and retrofitting the aerated grit chambers with stirred vortex grit removal units.

Aerated grit removal was eliminated from consideration due to low grit removal performance. Stacked tray grit removal was eliminated because it required 24 units compared to only 8 stirred vortex units for comparable performance. Additionally, operation of the stirred vortex technology will be similar to the existing grit removal process. The stirred vortex alternative combines lower operations and maintenance cost with improved grit removal performance.

Due to the greater efficiency of the new grit removal process, a separate grit processing facility is needed. The grit processing facility equipment alternatives considered were conventional grit cyclones and classifiers; vortex grit washers and grit dewatering; and fluidized bed grit washers and grit dewatering.

Cyclone-classifiers were selected because they have lower construction and operation and maintenance costs than the vortex and fluidized bed grit processing options.

The final recommended combined alternative for the PS-2 Project includes 10 new fine screen units; 8 stirred vortex grit removal units; and a new grit processing facility with 8 pairs of conventional grit cyclones and eight classifiers.

### SFE Project Alternatives

The SFE Project considered 2 alternatives: a new elevated storage tank and a new SFE pump station and treatment facility. Evaluation of the tank showed that the space available for a facility sized to hold the required amount of water to supply all processes at the WRRF was not sufficient without encroaching on areas reserved for future expansion. In addition, the cost estimate for the storage tank was the highest of the alternatives. The need to treat the water within the tank or flush the system regularly to keep the water quality within acceptable limits also deterred the selection of this alternative.

Construction of a new SFE pump station and treatment facility was the alternative selected. While final selection of components in this progressive design-build project is still pending, this Project Plan assumes the new treatment and pumping facility will include reverse osmosis filtration, chlorination, and 8 centrifugal pumps with variable speed drives capable of discharging water at low, medium, and high pressures.

## Environmental Evaluation

Short-term impacts, such as equipment noise and dust, cannot be avoided during construction of these proposed projects. However, thoroughly designed and well-planned construction sequencing should minimize impacts. Equipment noise impacts to surrounding areas can be minimized by controlling hours of work. Dust and soil deposits will be controlled through frequent watering and pavement sweeping. Soil erosion control measures will also be implemented as needed to reduce unwanted soil runoff. Specific techniques will be specified in the construction contract documents for each project.

A state historic resource evaluation and an endangered species and habitat review are underway for all projects at the WRRF. There are no known cases of conflict with the projects. Each project will be closely monitored, and any conflict will halt the project until the correct course of action is determined, and steps are taken for proper mitigation.

## Estimated Project Costs

The total project costs for each project are summarized in the table below. These costs include estimated values for construction, project contingencies, and engineering.

**Proposed Projects' Priorities and Costs**

| Priority | Project | Estimated Total Project Cost |
|---|---|---|
| 1-A | PS-1 Project | $95,600,000 |
| 1-B | Aeration Decks Project | $74,100,000 |
| 1-C | PS-2 Project | $98,000,000 |
| 1-D | SFE Project | $80,100,000 |
| Total | | $347,800,000 |

## Estimated User Cost Impact

Calculating the total present worth of each project, assuming a funding term of 20 years and a loan interest rate of 1.875% based on the EGLE posted loan rate, yields an equivalent annual cost of $29,606,000. According to the GLWA Master Plan and available housing data from the Southeast Michigan Council of Governments, an estimated 1,136,500 households will be impacted by these projects.

The per household user cost is estimated to be $26.05 per year, or $ 2.17 per month.

## Proposed Implementation Schedule

The proposed schedule for the project plan and design and construction of the projects contained within it is presented in the table below.

**Proposed Schedule of Projects**

| Project | Estimated Construction Start Date | Estimated Construction End Date |
|---|---|---|
| PS-1 Improvements Project<br>(Design-Bid-Build) *Prepurchase of Equipment starts Q3 2022* | Q1 2023 | Q1 2028 |
| Aeration Decks 1-2 Modifications Project<br>(Design-Build Contract) *Design starts Q1 2023* | Q2 2025 | Q2 2031 |
| PS-2 Bar Racks Replacement and Grit Collection System Improvements Project<br>(Design-Bid-Build) | Q2 2023 | Q3 2029 |
| Rehabilitation of the Screened Final Effluent Pump Station Project<br>(Progressive Design-Build) | Q1 2023 | Q3 2026 |

# GLWA CWRF 2023 Project Plan Public Hearing Transcript

TO BE ADDED IN FINAL PROJECT PLAN

# GLWA CWRF 2023 Project Plan
# Public Hearing List of Questions

TO BE ADDED IN FINAL PROJECT PLAN

# GLWA CWRF 2023 Project Plan
# Direct Mailing List

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Eastpointe, MI  48021-1683

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47275 Sugarbush Rd.
Chesterfield, MI 48047-5136

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Sterling Heights, MI 48311-8009

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Mt. Clemens, MI 48043-2525

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Romeo, MI 48065-4405

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40700 Romeo Plank Rd.
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35095 Potter St.
Memphis, MI 48041-4654

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34935 Hidden Pine Dr.
Fraser, MI 48026-2091

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63775 Gratiot Ave.
Lenox, MI 48050-2517

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54111 Broughton Rd.
Macomb, MI 48042-1831

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27600 Jefferson Circle Dr.
Saint Clair Shores, MI 48094-2883

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Richmond, MI 48062-3624

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New Haven, MI 48048-2627

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Detroit, MI 48226

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74274 Burk St.
Armada, MI 48005-7704

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Utica, MI 48317-5279

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New Baltimore, MI 48047-2598

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Richmond, MI 48062-1383

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Roseville, MI 48066-2179

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23121 E. Main St.
Armada, MI 48005-4706

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38151 Lanse Creuse St.
Harrison, Township, MI 48045-3479

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Warren, MI 48093-5290

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26000 Evergreen Rd.
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Karl Richter Center
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1440 Rochester Rd., Ste. 2
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Troy, MI  48084-5285

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3338 Coolidge Hwy.
Berkley, MI 48072-1690

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1100 Atlantic St., Ste. 1
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21131 Garden Ln.
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49045 Pontiac Trail
Wixom, MI 48393-2567

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45 E. Long Lake Rd.
Bloomfield Hills, MI 48304-2369

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5200 Civic Center Dr.
Waterford, MI 48329-3715

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58000 Grand River Ave.
New Hudson, MI 48165-9816

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45175 W. 10 Mile Rd.
Novi, MI 48375-3024

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335 S. Warren St.
South Lyon, MI 48178-1317

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23925 Woodward Ave.
Pleasant Ridge, MI 48069-1199

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1820 Inverness St.
Sylvan Lake, MI 48320-1679

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26815 Scotia Rd.
Huntington Woods, MI 48070-1101

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1100 Atlantic St., Ste. 2
Milford, MI 48381-2001

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21 E. Church St.
Lake Orion, MI 48362-3212

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111 E. 9 Mile Rd., Fl. 2
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24255 W. 13 Mile Rd., Ste. 190
Bingham Farms, MI 48025-4345

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44020 Cottisford St.
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211 S. Williams St.
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47450 Woodward Ave.
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Lake Angelus, MI 48326-1262

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1000 Rochester Hills Dr.
Rochester Hills, MI 48309-3033

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7525 Highland Rd.
White Lake, MI 48383-2938

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4695 Grange Hall Rd.
Holly, MI 48442-8707

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23 E. Elmwood
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1355 Southfield Rd.
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Belleville, MI 48111-9679

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3869 W. Jefferson Ave.
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14100 Civic Park Dr.
Riverview, MI 48193-7600

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10600 W. Jefferson Ave., Ste. 1
River Rouge, MI 48218-1298

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21869 West Rd.
Woodhaven, MI 48183-3297

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201 S. Main St.
Plymouth, MI 48170-1637

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6 Main St.
Belleville, MI 48111-2736

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6045 Fenton, St.
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22950 Huron River Dr.
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## Appendix J.
## Board Resolution

# Executed Board Resolution

TO BE ADDED IN FINAL PROJECT PLAN