WASTEWATER TREATMENT PLANT AND COLLECTION SYSTEM IMPROVEMENTS BASIS OF DESIGN AND ENGINEERING ANALYSIS REVIEW

CITY OF GRAND LEDGE, MICHIGAN

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SECTION 1.0 — INTRODUCTION

1.1 BACKGROUND

The City of Grand Ledge Wastewater Treatment Plant (WWTP) treats wastewater from the City's collection system using a conventional activated sludge process. The existing facilities are not able to provide effective capacity and treatment for existing wet weather as well as anticipated future flows. The equipment and facilities are approaching the end of their service life and high wet weather flows cause partially treated retention basin discharges and the collection system occasionally experiences sanitary sewer overflows (SSOs).

The City is required to address the requirements of the Administrative Consent Order (ACO) ACO-SW07-002, issued April 21, 2009 to address the SSOs. The pending NPDES discharge permit also requires the City to meet Advanced Wastewater Treatment (AWT) which typically includes tertiary filtration or ultrafiltration.

1.2 PROJECT SCOPE

The scope of this evaluation is to:

1. Evaluate alternatives to determine the most feasible and cost-effective improvements to the treatment system and provide conveyance and storage that will:
    a. Achieve a peak hydraulic flow of 8.0 MGD to improve its ability to handle large flows while minimizing the potential for SSOs.
    b. Provide the ability to treat the organic loading and desired sustained treatment capacity of 3.0 MGD design flow to provide for immediate system growth.
2. Develop a conceptual design and site layout for the proposed WWTP Treatment and Biosolids and Conveyance. This layout will include a plan to provide the footprint to address the above objectives and the ability to phase in the improvements in a future capacity expansion to 4.0 MGD.
3. Develop a Cost Opinion for the selected alternative as well as other alternatives required for the SRF Project Plan Amendment (Report under separate cover).
4. Evaluate the Project Delivery Methods including Design-Bid-Build and Design-Build options.

1.3 SUMMARY

This evaluation has determined that the Aerobic Granular Sludge (AGS) process followed by Tertiary Filtration will provide the proposed treatment goals to meet the City's required design and hydraulic capacity objectives. Other improvements will also be necessary to accomplish the overall objectives while optimally re-utilizing as much of the existing infrastructure as possible to reduce the capital cost including additional screening equipment, new grit removal, influent flow monitoring, influent pumping, UV disinfection, and reaeration. Biosolids (sludge) handling improvements necessitated by the process changes include sludge thickening, converting one of the existing aeration tanks into an aerobic digester and replacement of a portion of the sludge transfer and decant lines to/from the existing sludge storage tanks west of Fitzgerald Park.

The conveyance storage and treatment rate improvements will provide the City with the ability to handle peak wet weather flows generated during a 25-year, 24-hour precipitation events and improve its ability to minimize the potential for SSOs during other events. Over time, the City should also pursue policies as discussed herein to implement long-term improvements to the collection system that will reduce the amount of infiltration and inflow.

SECTION 2.0 — BASIS OF DESIGN

The following Basis of Design (BOD) for the proposed improvements to the City of Grand Ledge Wastewater Treatment Plant (WWTP) to accommodate the total current and future wastewater generated within the service area. The following tables give design flow, design wastewater characteristics, and the surface water discharge permit limitations in accordance with the National Pollutant Discharge Elimination System (NPDES) Permit MI0020800.

2.1 NEED FOR PROJECT

The City's WWTP maintains compliance with its NPDES discharge permit but there have been several unpermitted discharges from sanitary sewer overflows (SSOs) and retention basin discharges caused by excessive wet weather flows. A summary of the recent SSOs and retention basin discharges is provided in Appendix A.

The existing WWTP hydraulic and treatment capacity is not sufficient to handle the projected regional development in the area. The estimated growth, as measured in residential equivalent units (REUs) will increase the wastewater loading. Because this predicted growth is based on several significant development projects with estimated demands, a phased expansion to the anticipated 20-year planning period is recommended such that the treatment capacity can be readily increased for a future phase (30-year planning period) when additional capacity is required. Table 2.1 presents the projected residential equivalent units (REUs) that will be served by this project (Phase I) as well as the future Phase II for the anticipated full buildout from regional development.

Table 2.1. Total Project REUs Served by Project

	Existing Service*	20-year Planning Proposed Project (Phase I)	30-year Planning Future Project Expansion (Phase II)
Growth from Regional Development			
South/East	*	1,600	*2,400*
West	*	1,300	*2,000*
North	*	400	*700*
Industrial Growth	*	500	*800*
Subtotal	*	***3,800***	***5,900***
Existing REUs	3,300	3,300	*3,300*
Total to be Served	**3,300**	**7,100**	***9,200***

*Approximate # of Existing Users

Table 2.2 provides the projected wastewater flows due to growth from the additional REUs.

Table 2.2. Estimated Additional Flows

Flow Source	20-year Planning Proposed Project (Phase I)	30-year Planning Future Project Expansion (Phase II)
Additional Residential & Commercial Average	0.7	0.7
Additional Industrial Average	0.6	0.6
WTP Average Backwash Waste Flows	0.28	0.0
Total Additional Flows	**1.58**	**1.3**
Existing Average Flow	**1.07**	
Total Average Flow (after Phase I)	**2.65**	
Total Average Flow (after Phase II)	**3.95**	

Notes:

1. Assumes 275 gallons per day per REU.

2.2 DESIGN FLOWS

Table 2.3 summarizes the design flows for the City. The existing flow to the plant currently averages approximately 1.07 MGD with an estimated peak 25-year 24-hour flow of approximately 10.27 MGD under existing conditions.

The proposed WWTP improvements are based on an annual average design flow of 3.0 million gallons per day (MGD) for the entire plant to meet the current anticipated growth. The proposed peak hydraulic capacity is 8.0 MGD and flows greater than the peak hydraulic capacity would be stored in the retention basin which would then overflow to the existing intermediate pumps and be pumped into the existing primary tanks, which would then overflow into the existing aeration basins and clarifiers which would all be converted for wet weather storage and returned to the headworks after the event passes. In an extreme event (greater than a 25-year, 24-hour storm), if the storage capacity were to be exceeded, a relief overflow would be provided to the tertiary filters and thus any overflow would be filtered and disinfected prior to discharge to the Grand River.

Table 2.3. Design Flow Rates

Description	Existing WWTP Design		20-year Planning Proposed Project (Phase I)	30-year Planning Future Project Expansion (Phase II)
	Average	Design		
Influent or Sustained Treatment Rate	1.07	1.50	**3.0**	4.0
Peak Hydraulic Capacity (MGD)	3.0	3.0	**8.0**	TBD
REUs	3,300	4,025	**7,100**	9,200

Section 5 provides a more detailed evaluation of the predicted 25-year 24-hour hydrographs and the required wet weather storage for the project conditions.

2.3 DESIGN WASTEWATER CHARACTERISTICS

Table 2.4 summarizes the influent wastewater characteristics used in preparing the proposed WWTP improvements. Concentrations are based on existing data from the facility averaged over recent years and include the recycle flows. The table demonstrates that the existing average organic loading (as measured by BOD5) is 83% of the existing design capacity.

Typically, capacity expansion is required when average loading or flows exceed 80% of the design capacity. The recommended basis of design should provide the required peak hydraulic capacity and increase the sustained treatment capacity such that it provides the ability for the City to handle the additional growth of the system. The required wastewater treatment and biosolids handling would be completed in a phased approach with Phase II occurring when the system approaches approximately 80% of Phase I capacity.

Table 2.4. Wastewater Influent Characteristics and Proposed Basis of Design

	Unit	Existing Conditions	Existing Design Capacity	20-year Planning Proposed Project (Phase I)	30-year Planning Future Project Expansion (Phase II)
Sustained Treatment	MGD	1.07	1.50	3.00	*4.00*
Peak Hydraulic Capacity	MGD	3.00	3.00	8.00	*8.00**
BOD5	mg/L	261	225	198	*198*
BOD5	lbs/day	2,332	2,816	4,957	*6,609*
TSS	mg/L	251	251	225	*225*
TSS	lbs/day	2,243	3,144	5,633	*7,511*
Ammonia-N	mg/L	20	30	30	*30*
Ammonia-N	lbs/day	175	376	751	*1,001*
Total-P	mg/L	5	6	6	*6*
Total-P	lbs/day	48.1	75	150	*200*

*It is anticipated the Collection System Improvements to provide I&I reduction efforts will occur between Phase I and II Wastewater Improvements that will help to reduce future peak flows below the current average to peak ratios. In general, Ten States Standards also reduce this ratio as service area population increases.

2.4 NPDES PERMIT EFFLUENT LIMITATIONS

The treated effluent will continue to be discharged at the existing 24-inch outfall into the Grand River. The City's Draft NPDES permit with the revised effluent limits is included in Appendix B of this report for reference.

SECTION 3.0 — WASTEWATER TREATMENT

3.1 INFLUENT AND RETENTION

The WWTP currently receives and treats sanitary wastewater from the City of Grand Ledge as well as portions of Oneida Township in Eaton County and Eagle Township in Clinton County. In the future, more flow is anticipated from Eagle Township and Oneida Township.

3.1.1 Influent Flows

There is an existing 9-inch Parshall Flume flow meter on the raw wastewater flow. This flume will need to be replaced with a 12-inch flume to provide accurate measurement for flows above 5.7 MGD. However, if project funds fall short due to higher bid prices, then this flume replacement could be deferred with minimal functionality impact since flows above 5.7 MGD are rarely experienced and their accurate measurement here will not impair the ability of the plant to function.

3.2 PRELIMINARY TREATMENT

3.2.1 Screening Equipment

A ¼-inch automatically raked fixed bar screen was installed as part of the 2009 improvements project. The screen is in good working condition. This screen will have a new variable frequency drive motor installed to rake it faster so that it can provide raking at a sufficient rate to prevent blinding at a flow rate of up to 8.0 MGD. This screen will primarily be utilized as a backup/ overflow screen since the proposed Granular Activated Sludge process requires screening through a perforated plate screen.

A 24-inch bypass channel and channel grinder are currently provided for overflow and bypassing the automatic screening. This grinder will be removed, the channel geometry will be modified and a new perforated plate screen with washer-compactor will be provided. The new perforated plate screen and washer-compactor will have an 8.0 MGD throughput capacity. This channel will function as the primary channel and overflows will go to the existing bar screen via stop plates that have a shorter height than the channel walls.

3.2.2 Grit Removal

The existing aerated grit chamber is ineffective at grit removal and the WWTP has indicated that minimal grit has been removed over recent years. This grit is likely accumulating in the downstream aeration basins.

A new vortex grit chamber and grit pumping and classifier equipment will be installed and rated for a maximum peak flow capacity of 12 MGD. Connections to the existing 24-inch wide channel downstream of the screening equipment will be made using two 24-inch slide gates for the inlet and outlet of the vortex grit chamber. A 24-inch bypass stop plate will be provided in the existing 24-inch wide channel to bypass the grit tank for maintenance purposes if the tank needs to be taken out-of-service.

The design parameters of the proposed grit removal equipment are:

Tank Diameter	12 feet
Design Peak flow capacity:	12 MGD
Grit design removal at peak flow:	Remove 95% of grit greater than 50 mesh in size. Remove 85% of grit greater than 70 mesh in size. Remove 65% of grit greater than 100 mesh in size.

3.2.3 Influent Pumping

New submersible pumps for pumping raw influent to the treatment processes. Two smaller pumps will be used for normal dry weather conditions and the larger pumps will be used for wet weather conditions. The firm capacity of two small pumps and one large pump (One large pump out of service) would be 8.0 MGD.

***Pump Data*:**

Number of Pumps:	4	
Type:	Submersible	
Capacity:	Dry Weather Pumps:	Two @ 1,400 gpm (2 MGD) @ 45' TDH (30 hp)
	Wet Weather Pumps:	Two @ 2,800 gpm (4 MGD) @ 65' TDH (70 hp)
Drive Type:	Variable Frequency	

3.3 SECONDARY TREATMENT SYSTEM

A new secondary treatment system is proposed for the plant. It will consist of three reactor tanks and one spare reactor tank for flow equalization, which can be converted to process treatment in the future, a new piping gallery and building to house the aeration blowers and controls. Additional components include low pressure air piping, influent and effluent water piping, waste sludge removal piping, and water level control release as required by the AGS process.

3.3.1 Aerobic Granular Sludge (AGS)

An Aerobic granular sludge (AGS) process will be utilized for high-rate biological treatment. This process promotes the development of a granular sludge, with a much higher settling rate than conventional activated sludge, thereby reducing the area and time required to clarify the wastewater after treatment. This reduces the footprint of the site. The benefits to this process include the ability to establish a high mixed liquor suspended solids (MLSS) concentration to treat a higher loading within a smaller tank volume. The AGS process is a sequencing batch reactor (SBR) process in which influent wastewater is treated using a batch process. Over the course of a treatment cycle, each reactor undergoes a sequence of filling, aeration (or react), anoxic, settling, and decant (or draw). The benefits of this process allow for all the treatment to occur in one tank and the use of a higher sidewater depth than with typical activated sludge processes plus some ability to obtain biological nutrient removal by optimizing aeration and anoxic cycles.

Table 3.1. AGS Capacity

Wastewater Improvements Phase	Total BOD_5 Design Load (lbs/day)	Dimensions of Basins	Number of Reactors	Volume of Each Reactor (gallons)	Total Volume of Reactors (gallons)	BOD_5 loading (lbs BOD /day/1000 ft^3)
Phase I (3.0 MGD)	4,960	46' x 80'	3	580,000	1,740,000	21.5
Phase II (4.0 MGD)	6,610	46' x 80'	4	580,000	2,240,000	21.5

Notes:

1. The Ten States Standards loading for Extended Aeration such as SBRs is 15 lb BOD/d/1000 ft^3. However, up to 30 lbs BOD/d/1000 ft^3 is the manufacturer's recommended design loading and is typical for similar high-rate processes such as AGS.

3.3.2 Process Flow Equalization

Flows in excess of 8.0 MGD will be routed into one of the 530,000 gallon tanks which will serve as an equalization basin and would eventually serve as a future fourth aerobic granular sludge (AGS) reactor (see previous Section). The equalization will be controlled using a control valve and flow meter to divert this excess flow to the equalization tank. This tank will include mixing and a drain sump to remove settled solids. This additional volume will also be available for storage of excess flow rates caused by wet weather.

3.3.3 Waste Sludge

Waste sludge is directed by a series of controllable valves by gravity to one of two sludge buffer tanks. These valves will allow proper wasting and control of activated granular sludge without the need for pumping. These valves will be controlled at the Control Panel and these process controls also promote the development of sludge granulation by selectively wasting from the zone of poor settleability within the reactor.

Table 3.2. Waste Sludge

WAS	Existing Average Day	Phase I Design Capacity (3.0 MGD)	Phase II Design Capacity (4.0 MGD)
Waste Sludge (lb/day)	1,300	4,298	5,730
Waste Sludge at 0.5% (gpm)	21.7	71.8	95.7

3.4 TERTIARY TREATMENT

To meet NPDES requirements for advanced wastewater treatment as well as the TSS and phosphorus permit limits, a new tertiary treatment system will be constructed. Total phosphorus remaining after secondary treatment system will be removed from the TSS by a cloth media disk filter (CMDF) system. The filters are equipped with their own backwash system. The system will be designed to meet a maximum design flow of 12 MGD. Each tertiary filter will be rated for a flow rate of 4.0 MGD with a firm capacity to treat 8 MGD (one filter offline). The following data applies: The backwash flow from the filters (maximum daily rate of 0.15 MGD) will be routed back to the influent channel upstream of the raw wastewater pumps.

Table 3.3. Tertiary Filtration

Parameter	Design	Influent	Effluent
Max Design Flow (MGD)	8.0	-	-
Flow per Filter (MGD)	4.0		
Number of Filter Units	3 (2 duty and 1 standby)	-	-
Solids Loading Rate (lbs TSS/day/ft2)	0.58	-	-
Average TSS (mg/L)	-	10-20	5
Average Phosphorus (mg/L)	-	1	0.5

3.5 DISINFECTION, REAERATION, & EFFLUENT METERING

Disinfection will be accomplished by ultraviolet (UV) disinfection. Following tertiary filtration, tertiary effluent will be routed by gravity piping to a new UV disinfection system. The system will consist of an open channel UV system that will be constructed in one of the channels within the existing reaeration tank. The UV system is packaged with two power distribution centers and one system control center. One of the UV equipment modules can be removed from the channel while the other modules within the channel remain in service. The UV system will be sized to match the capacity of the secondary treatment system. The following data applies:

UV system design flow capacity:	4 MGD
UV system peak flow capacity:	8 MGD
UV Design Transmittance:	65% minimum
Number of Channels:	2 (1 bank per channel)
Number of Modules per Bank:	9 (8 duty and 1 standby)
Number of Lamps per Module:	9
Total Number of UV Lamps:	72 per bank (144 total)

The UV system control panel will transmit status and alarms to the plant control systems.

3.5.1 Reaeration

Reaeration to meet the NDPES limit for dissolved oxygen will be provided by using the existing chlorine contact chamber that will be equipped with fine bubble aeration diffusers fed by a small blower. Two blower packages will be provided for redundancy and housed within the existing blower building.

3.5.2 Effluent Flow Meter

Effluent flow will be measured by a new magnetic flow meter after the tertiary filters.

3.6 CHEMICAL FEED

Biological phosphorus removal is possible within the AGS process by optimizing the duration of aerobic / anoxic/ anaerobic cycles. Other AGS plants have been able to remove phosphorus down to less than 0.5 mg/l without chemical addition to a great degree. However, to consistently meet the total phosphorus NPDES permit limitations, it may be necessary to add aluminum sulfate (alum) to the AGS influent for chemical precipitation of phosphorus. This evaluation assumes conventional aluminum sulfate (48% solution) would be used as a replacement to ferric chloride with an estimated active concentration of alum (Al_2O_3) of 8.3%. A new pump system to replace the existing system will be installed for this purpose. It is assumed that the aluminum to phosphorus ratio is 2:1.

The chemical feed pumps, exposed piping, discharge piping, new buried chemical feed pipe would be installed to the reactor basins with an optional feed to the reactor effluent prior to filtration. Two chemical feed pumps will be provided and sized to provide sufficient turndown for design and minimum flows. Table 3.4 provides the design assumptions.

Table 3.4. Chemical Feed

Description	Unit	Minimum	Design
Design Flow	MGD	1.05	4.00
Influent P	mg/L	6	6
Total P	lb/day	53	200
Al:P ratio		2	2
Al	g/mol	27	27
P	g/mol	31	31
Required Al	lb/day	92	349
% as Al_2O_3		8.3%	8.3%
% as Al^{3+}		4.4%	4.4%
Density of Alum (48%)	lb/gal	11.2	11.2
Alum (48%) Feed	gpd	186	710.4
Alum (48%) Feed	gph	7.8	29.6
Required 30-day storage	gallons	5,595	21,313

A minimum alum storage will be provided by the two (2) existing fiberglass tanks sized to store the required 30 days of alum at the design flow.

3.7 ANALYSIS OF WASTEWATER TREATMENT LOCATION ALTERNATIVES

Two location alternatives were identified for the location of the treatment basins and future treatment or equalization tanks. The two location alternatives are:

- Alternative 3.1 – Construct AGS Reactors South of WWTP
  - Construction of the AGS Reactors in the south slope of the WWTP.
  - Includes removal of slope and trees to the south of the WWTP between the south maintenance road and the south WWTP fence line. May require some rock (sandstone) removal at the lowest portion of the excavation (3 to 5 feet total).
  - Keeps the tank footprint within one common fence line better for operations.
- Alternative 3.2 – Construct AGS Reactors at Bottom of the Hill west of Drive
  - Construction of the AGS reactors in the lower open area at the bottom of the hill, minimal excavation but would require mitigation of the wetlands.
  - Requires significantly more yard piping and new electrical.
  - Fitzgerald Park road would split the WWTP site in half thus making it more difficult for operators to maintain a secure site with easy access to the process tanks.

Alternative 3.1 requires a higher cost of excavation but less yard piping than Alternative 3.1. Alternative 3.2 requires additional operating and maintenance costs than Alternative 3.1 to account for the additional electricity required for pumping the influent and waste sludge as well as the additional time to operate a split site. Table 3.5 provides a comparison of the difference in capital cost and net present worth of the two alternatives.

Table 3.5. Evaluation of Location Alternatives

Alternative	Capital Cost
Alternative 3.1 - AGS Reactors South of WWTP	
Yard Piping	$995,000
AGS with Slope Removal	$19,795,000
Total Alternative 3.1 Capital Cost	*$20,790,000*
Total Alternative 3.1 20-yr NPW	***$20,790,000***
Alternative 3.2 – AGS Reactors at Bottom of Hill west of Drive	
Yard Piping at Bottom of Hill	$1,751,000
AGS without Slope Removal	$19,375,000
Wetlands Bank Purchase	$3,500
Total Alternative 3.2 Capital Cost	$21,129,500
Additional 20-yr O&M for Alternative 3.2	$189,000
Total Alternative 3.2 20-yr NPW	**$21,318,500**

The above table demonstrates Alternative 3.1 is slightly more favorable economically. This alternative also has a smaller impact to the City's property adjacent to the WWTP. If space for new process tanks is needed in the future, the current bottom of hill west of the drive location may be necessary for that purpose.

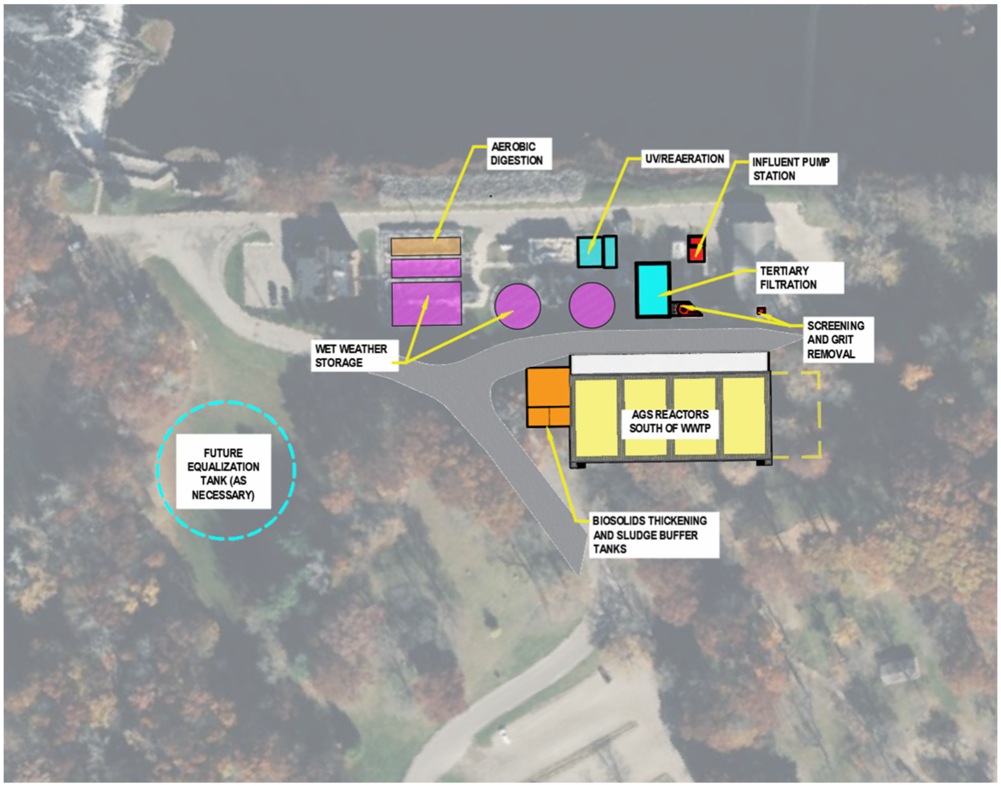


Figure 3-1. AGS Located South of WWTP

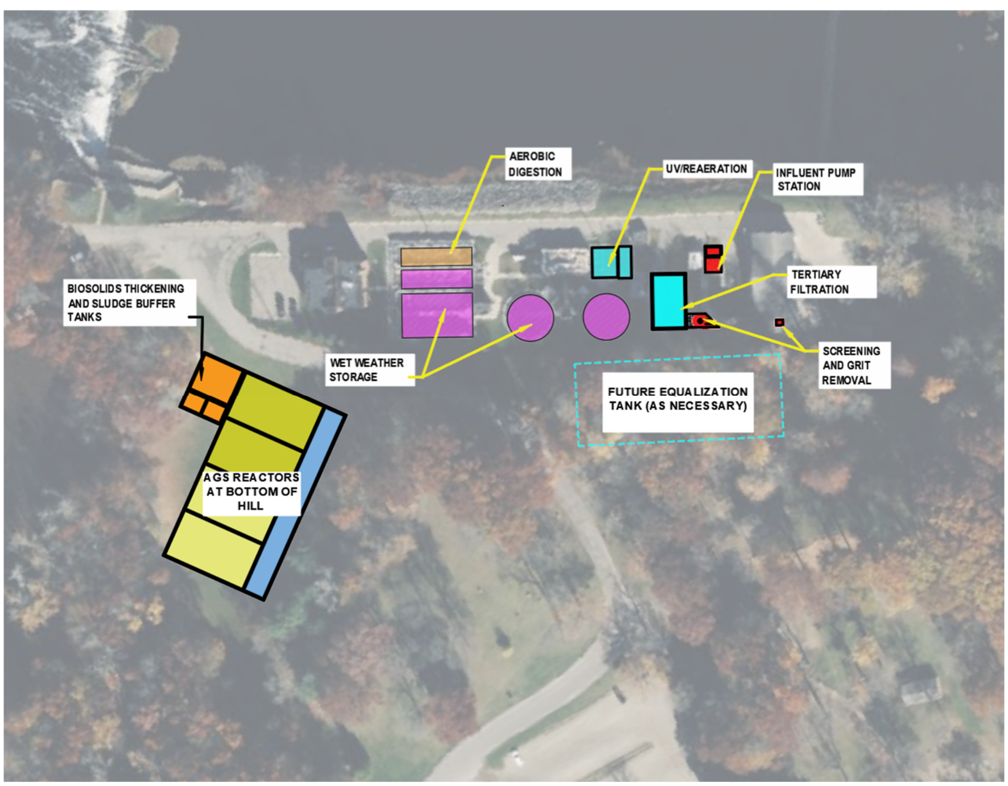


Figure 3-2. Alternative 3.2 AGS Reactors Located at Bottom of Hill west of Drive

SECTION 4.0 — BIOSOLIDS HANDLING

4.1 EXISTING BIOSOLIDS HANDLING

4.1.1 Biosolids Disposal

The City's biosolids are currently disposed of by land application to agricultural fields during the spring and fall months as Class B biosolids. Their program has always had a surplus of available farmers participating and this so not likely to change in the near future. Michigan Part 503 Class B biosolids requires that pathogens be reduced to levels that do not pose a threat to public health and the environment when applied according to specified conditions. At a minimum, all land applied biosolids must meet Class B pathogen reduction standards. This requires either a reduction in volatile solids (>38%) or using lime stabilization by raising the pH above 12 and holding for a set duration.

4.1.2 Biosolids Stabilization

The WWTP currently uses lime stabilization for the biosolids stabilization prior to land application for the existing 1.5 MGD design flow rate. Currently the plant uses a manual bag feeder to mix dry 50-lb bags of hydrated lime into a lime slurry in the lime feeder room and then inject the slurry into the waste sludge force main as it is pumped to the sludge storage tank west of Fitzgerald Park. This process is very messy, unsafe, and labor intensive and should be replaced with a different process or upgraded if lime stabilization is continued to be utilized. The use of bag feeders is a labor-intensive process and presents a safety risk due to the inherent risks of using hydrate lime. A lime silo that utilizes a pneumatic unloading and transport system from the trucks could be installed. This system would then utilize vibrators and gravity feeders to a batch slurry tank with pumps to pump the prepared slurry to blend with the pumped sludge being transferred to the storage tank. Relocating this system from the Administration Building is desirable since the handling and slurry preparation is such a dirty process.

Alternately, the sludge could be aerobically digested utilizing one of the existing process aeration tanks although this may slightly affect the marketability of the biosolids product to the farmers. Since the tanks already exist and the amount of piping and diffusers necessary to convert one of the tanks to aerobic digestion is minimal, it is recommended that this option be pursued.

If the project budget is exceeded, one of these two options (new lime silo and handling system or aerobic digestion) could be considered for a deductible alternate to keep the project budget within the available funding.

4.1.3 Biosolids Storage

The WWTP stores biosolids in three partially buried concrete biosolids (sludge) tanks with sufficient volume to store up to 180 days of biosolids (as required by EGLE). A summary of the existing biosolids tanks is provided in Table 4.1.

Table 4.1. Existing Biosolids Storage Tanks

Tank	Construction Year	Type	Dimensions	Approximate Volume (gallons)
1989 Storage Tank 1	1989	Concrete	42 feet x 65 feet x 12 feet deep	245,000
1989 Storage Tank 2	1989	Concrete	42 feet x 65 feet x 12 feet deep	245,000
2005 Storage Tank 3	2005	Concrete	49 feet x 67 feet x 12.5 feet deep	310,000
Total Storage Volume				**800,000**
Required Volume at Existing Flow (180-day)[1]				**711,000**
Required Volume at 1.5 MGD Design Flow (180-day)[1]				**955,000**
Required Volume at 1.5 MGD Design Flow (180-day)[2]				**756,000**

Notes:

1. 5% solids at specified noted flow rate after decanting, assumes solids include lime 0.35 lb lime per lb VSS.
2. 5% solids at specified noted flow rate after decanting without lime addition.

The above table demonstrates the City has sufficient sludge storage volume for current flows but is approaching the required volume for the design flows. Due to limited project funding availability, it is recommended that sludge storage be constructed when it is needed in a future phase. It is also recognized that if sludge thickening can be increased to 8% and lime is not added that the required storage volume will be reduced significantly therefore making the existing storage volume sufficient for several more years.

4.2 BIOSOLIDS HANDLING ALTERNATIVES

Several alternatives were evaluated to increase the biosolids handling capacity and reduce the storage requirements. The design goals for the biosolids are:

- Improve the biosolids treatment process operations and maintenance and improve safety.
- Provide additional biosolids handling capacity and reduce the storage requirement for the increased loading from the increased capacity.
- Implement the expansion in a phased approach to minimize the associated construction costs.

For all alternatives, it is assumed that the biosolids will continue to be land applied as Class B Biosolids.

The proposed expansion will be designed to accommodate a 3.0 MGD wastewater treatment capacity (Phase I Biosolids Improvements) and includes the following alternatives:

- Alternative 4.1 – Conversion of Existing Aeration Tank to Aerobic Digestion
- Alternative 4.2 –New Hydrated Lime Equipment

For both alternatives, the stabilized biosolids (sludge) would be thickened and pumped to the existing sludge storage tanks.

When average wastewater flows increase above 3.0 MGD, the biosolids handling will need to be improved to handle the 4.0 MGD wastewater design flows (Phase II Biosolids Improvements). This may include a second Rotary Drum Thickener (RDT), additional biosolids storage and consideration of the following Biosolids Treatment alternatives:

- New additional Aerobic Digestion treatment tanks (possible conversion of the second existing aeration tank).

- Additional Hydrated Lime Feed Equipment.

4.2.1 Sludge Thickening with Rotary Drum Thickening (RDT)

To reduce the required biosolids storage volume, a mechanical thickener will be constructed to increase the solids concentration of the waste sludge sent to sludge storage. For this project, a rotary drum thickener (RDT) will be installed. An RDT uses a polymer to flocculate the sludge into a larger particle that can be separated from the water using a screen. The flocculated sludge is agitated and fed to a slowly rotating drum filter. In wastewater applications, solids concentrations up to 8% can typically be achieved (compared to the current 5% solids by manual decanting of the sludge storage tanks). The following design applies at the design operation of 3.0 MGD rate:

Table 4.2. Rotary Drum Thickener Design

Description	Item
Operation	5 days per week[1] 6 hours per day 30 hours per week
Solids Loading (dry)	30,000 lb per week
Required Solids Loading (dry)	1000 lb per hour
Flow Rate (at 1.5% solids)	400 gpm

[1]During initial years, the hours of operation would be much lower since average flows are much less.

For this evaluation, it is assumed that one 1000 lb per hour RDT would be installed in Phase I and a second RDT would be installed in Phase II when the design flow exceeds 3.0 MGD or longer periods of operation could be utilized.

4.2.2 Biosolids Stabilization Alternatives

4.2.2.1. Aerobic Digestion

Digestion of biosolids is the process of decomposing the biosolids removed from the primary and secondary treatment process using biological processes. The benefits to digestion include the reduction of the total solids as measured by the volatile solids (i.e., organic solids) and pathogen reduction to meet Class B biosolids requirements. Biosolids are digested in either aerobic or anaerobic processes. Aerobic digestion occurs in the presence of oxygen to convert the volatile solids into carbon dioxide and biomass. Aeration is provided to provide oxygen and solids mixing. The benefits of aerobic digestion include lower capital cost, lower odor potential (than anaerobic processes) and simple operation. The drawbacks when compared to anaerobic digestion are higher energy usage and lack of beneficial reuse of the methane generated during anaerobic digestion for sludge heating and power generation. Anaerobic digestion requires a significantly higher capital cost.

Table 4.3. Aerobic Digestion

Description	Item
Design Organic Loading	70 lb Volatile Solids per 1000 cuft[1]
Require Volume	44,350 cuft 322,620 gallons
Volume of Converted Aeration Basins	167,500 gallons (each) 335,000 gallons total)
Air Required (scfm)	1300 scfm (for mixing)
Blower power Required	65-hp

Notes:

1. The organic loading 50 lbs VSS per 1000 cuft is the maximum recommended per Ten States Standards, higher organic loadings are commonly used.

The recommended design standards for aerobic digestion include mixing requirements to prevent solids buildup that can inhibit sludge disposal and treatment. Because air is used for mixing most commonly, the required air flow rate for mixing energy is limiting factor rather than the air flow for oxygen transfer (typically much lower). For this analysis it is assumed two new blowers would provide the air flow for mixing. However, other technologies such as mechanical mixing or compressed gas mixing can lower the aeration requirements which could be explored during a final design. The air can typically be cycled off and on to reduce energy requirements and provide additional decanting of liquid to create a thicker product.

4.2.2.2. Lime Stabilization with Hydrated Lime

To replace the existing process of lime bag feeding process, it is assumed that a new hydrated lime silo would be installed. The silo would include hydrated lime feed pumps to mix the lime with water and generate a lime slurry.

4.2.3 Analysis of Biosolids Stabilization Alternatives

Table 4.4 provides a comparison of the estimated capital and net present worth of the 20-year operations and maintenance (O&M) costs for the two biosolids treatment alternatives considered.

Table 4.4. Phase I Biosolids Stabilization Alternative Analysis

Alternative	Alternative 4.1	Alternative 4.2
	Aerobic Digestion	New Hydrated Lime Equipment
Estimated Capital Cost	$899,000	$3,509,000
20 Year O&M Costs	$474,000	$955,000
Total Alternative 20-Year NPW	**$1,373,000**	**$4,464,000**

The results demonstrate the more cost-effective alternative is converting one of the two existing aeration basins to aerobic digesters and eliminating the associated costs of feeding lime to stabilize the biosolids. Depending on the solids loading, the second aeration basin could be converted in the future and used in the meanwhile for additional wet weather storage volume.

SECTION 5.0 — COLLECTION SYSTEM AND WET WEATHER FLOWS

5.1 SYSTEM DESCRIPTION

The Grand Ledge Collection System consists of six different subareas. The Whitney Street Pump Station Subarea consists of the area along the east side of the City South of the Grand River mostly within the City limits but also including a portion of Oneida Township north of Willow Highway (Oneida Woods Trail and River Bend Trail). This area is conveyed across the river to the north side of the river at the end of Oneida Woods Trail and there is a pump station adjacent to Whitney Street behind the Grand Ledge Recycling Center. The Whitney Street Pump Station lifts the flow and then it is conveyed into the North Side Subarea, which is then carried across the River on the Bridge Street (M-100) Bridge and then into the West River Pump Station (WRPS) which is about one block west of Bridge Street on West River Street. At WRPS, the flow from the north side plus the Whitney Street Pump Station Subarea is lifted into the River Interceptor Sewer.

The central area on the south side of the river north of West Saginaw Highway is tributary by gravity to the River Interceptor Sewer. This River Interceptor Subarea is one of the largest subareas in the City's collection system. Sanitary Sewer Overflows (SSOs) have occurred from this sub area from the River Interceptor Sewer at Russell Street and near the WRPS. Near the WRPS, there is an overflow manhole which overflows into the WRPS wetwell and when the pumps cannot keep up, an SSO to the River occurs from the wetwell.

Approximately 1,200 feet downstream of the WRPS, the Spring Street Sub area discharges into the River Interceptor Sewer in line with Spring Street where it intersects the sewer at the river. Historically, SSOs had occurred from the River Interceptor Sewer near the location where the Spring Street Sewer connects. However, as part of the 2009 improvements, this overflow location was eliminated and is no longer utilized.

The next contribution to the River Interceptor Sewer occurs approximately 300 feet upstream of the Wastewater Treatment Plant (WWTP) and includes the area north of the river along West Main Street. The sewers from this sub area cross under the river as an inverted siphon with two pipes (one for normal flows and a second one -if needed).

The River Interceptor Sewer terminates into a Diversion Chamber at the front end of the WWTP, where the flow can either be sent to the WWTP for treatment or diverted to a retention basin during high flows.

The last subarea is the area along the Sandstone Creek Valley and extends along the entire Southwest area of the City and includes areas south and west of Saginaw Highway. This sub area is tributary to the West Jefferson Pump Station (WJPS) and the WJPS discharges into a force main which empties into a gravity sewer at the south end of Fitzgerald Park which then travels along the length of the park and empties into the upstream end of the Flow Diversion Chamber at the WWTP independent of the River Interceptor Sewer.

A map of the Grand Ledge Collection System showing the subareas described above is shown in Figure 5-1 below and a schematic of the existing system is shown in Figure 5-2.

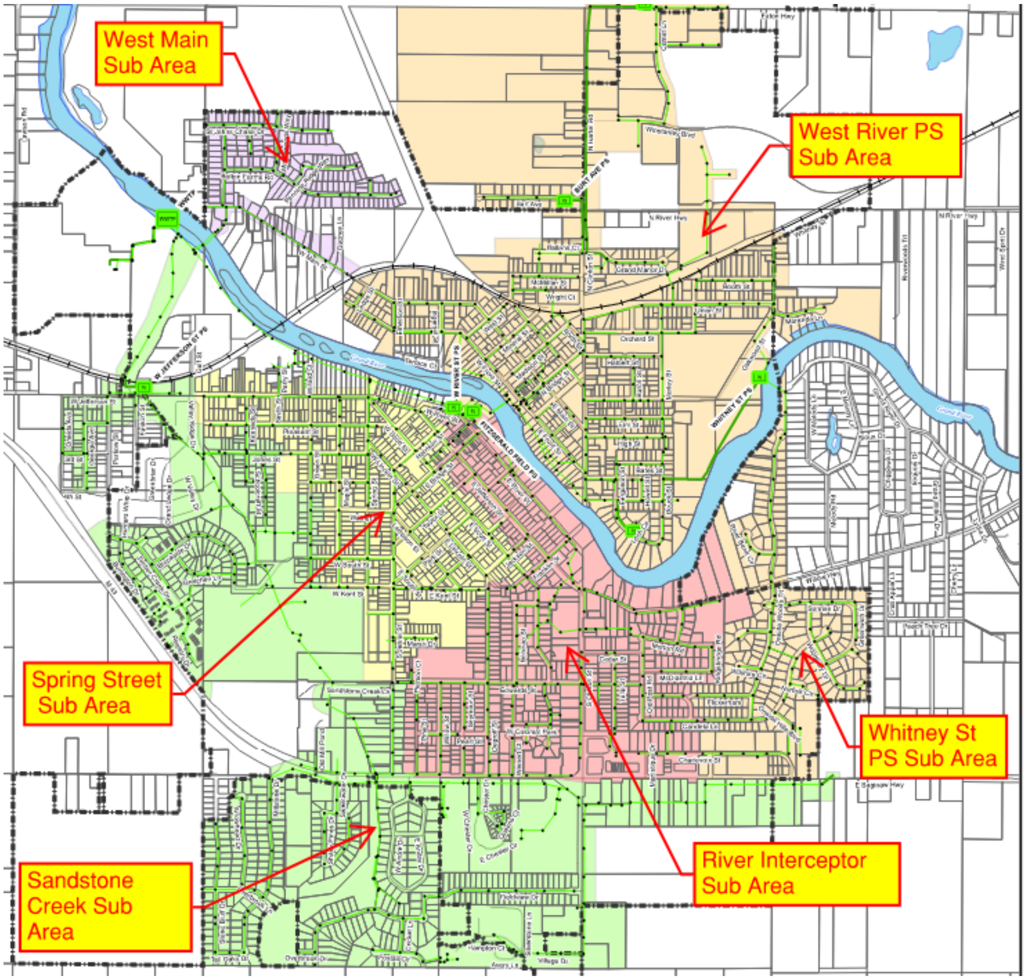


Figure 5-1. Grand Ledge Collection System Sub Areas

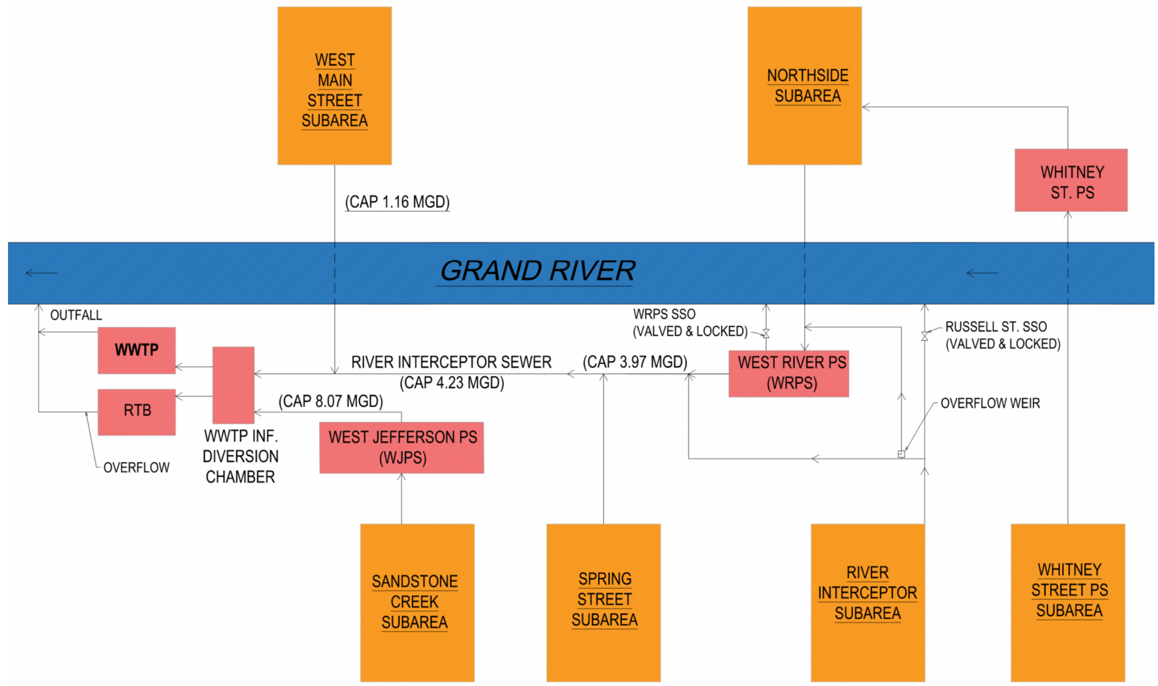


Figure 5-2. Existing Grand Ledge Collection System Schematic

5.2 CAPACITY ANALYSIS

The generally accepted standard for wastewater collection systems in Michigan is to be capable of conveying and treating the wastewater that is generated during a 25-year, 24-hour rainfall event (approximately 4.16 inches for Grand Ledge). Although the Grand Ledge Sanitary Sewer System is separated, during significant rainfall events, the flows in the system increase to the point where SSOs and retention basin discharges occur. As mentioned earlier, SSOs in the collection system occur at Russell Street and the WRPS from the River Interceptor Sewer. Historically, SSOs also occurred at the location where the Spring Street Sewer intercepts the River Interceptor Sewer. In 2009, a project was completed which included a 300,000-gallon wet weather retention basin and a diversion structure at the head end of the WWTP. This allowed for excess flows to be diverted into the retention basin. An outlet weir and disinfection facilities were also included. Discharges from the retention basin are classified as partially treated discharges since they are sampled and disinfected. With the completion of the 2009 project, there are no longer discharges from the Spring Street overflow and it has since been decommissioned. However, SSOs still occur at WRPS and occasionally at Russell Street. The majority of the wet weather discharges now occur from the retention basin at the WWTP.

To evaluate the capability of the system, SSO records dating back to June of 2000 were evaluated. During the period from June 2000 to January 2024, a total of 73 discharges were reported from 43 distinct rainfall or snowmelt events. Of these 43 events, 14 resulted in a significant amount of overflow volume at either the WWTP, WRPS or Russell Street. In almost all these cases, increased conveyance capacity in the River Interceptor or treatment capacity would have eliminated the potential for SSOs in the system or partially treated overflows from the retention basin. Of the 14 significant events analyzed, the events of October 14-15, 2017, and February 20-22, 2018 are worthy of note and are described below.

5.2.1 Event of October 14-15, 2017

Rainfall fell over 2 calendar days and was measured at the WWTP at 3.28 inches and so the event was evaluated using this total plus the hourly distribution from the Lansing Airport rain gauge (since local hourly rainfall data was not available), plus flow metering data for the same period.

The bulk of the rain fell from about 700 on 10/14 until about 700 on 10/15 over a period of about 24+ hours according to the Lansing Airport gage.

The influent flows peaked beyond normal levels for about 7 hours at WRPS but only had an excess volume of about 25,000 gallons there. There were no SSOs at WRPS or partially treated discharges at the WWTP.

The influent flows at the WWTP peaked beyond normal levels (2 MGD) for about 8.25 hours but only had an excess volume of almost 205,000 gallons (actual 204,931). There were no partially treated discharges at the WWTP and with increased treatment capacity there also would not be any partially treated discharges in the future. If a 25-year, 24-hour wet weather event (4.2 inches total) were to be experienced, under the same rainfall distribution conditions, it is estimated that that the excess volume at the WWTP would be 260,000 gallons under this scenario.

5.2.2 Event of February 20-22, 2018

A significant rainfall measuring 3.2 inches fell on Feb 20-21, 2018 but immediately prior to this rainfall there was snow on the ground which was measured at 1.23 inches (as water depth) the day prior. On February 20, the temperatures rose significantly with high temperatures of 50 degrees on 2/20/18 and 59 on 2/21/18. The rainfall plus the significant snowmelt (total depth of 4.43 inches) probably produced something very close to a 25-year, 24-hour rainfall/runoff event since the snowmelt can contribute significantly to foundation drain inflow since it can trap moisture near the basement foundations which ultimately end up in the foundation drains.

During this event, the flow pumped at WRPS (which was mainly the flow from the north side of the river plus some excess flow from the Grand River Interceptor Sewer that overflow into the pump station wetwell) averaged 1.75 MGD and peaked at 1.94 MGD. Also, the flow to treatment at the WWTP (not including that portion of the flow diverted to the wet weather retention basin) averaged 3.29 MGD and peaked at 5.43 MGD. During this event, there were discharges at Russell Street, WRPS and WWTP Retention Basin totaling 3.18, 3.27 and 3.89 MG or a total at these three locations of 10.34 MG.

The SSO at Russell Street was over 31 hours from 0630 on 2/20 until 1525 on 2/21. The average SSO rate at Russell Street was 1.53 MGD. The SSO at WRPS was over 32.75 hours from 0650 on 2/20 until 1535 on 2/21. The average SSO rate at WRPS was 1.57 MGD. The partially treated discharge at the WWTP was over 49.5 hours from 1245 on 2/20 until 1415 on 2/22. The average discharge rate at the WWTP was 0.53 MGD.

It is not possible with the data available to quantify the conveyance rate needed west of WRPS since some of the pumped flow was merely circulated back to the wetwell or overflowed at Russell Street since there was no check valve to prevent high levels in the River Interceptor Sewer from backing up further to the east. The current conveyance capacity of the river interceptor sewer immediately west of WRPS is 3.97 MGD. At flows above this, the sewer starts to overflow back to the wetwell via the overflow sewer just east of the pump station. At this flow rate it is likely that overflows will also start at WRPS or if the levels are high enough, at Russell Street. Also, it is likely that, during peak flows, a portion of the flow pumped at WRPS from the north side of the river was likely just circulated back into the River Interceptor Sewer during this event and thereby contributed to the overflow rates occurring at Russell Street and WRPS. By adding a check valve on the River Interceptor Sewer at WRPS plus additional pumps and by surcharging the sewer, it is estimated that a revised conveyance capacity of 5.4 MGD can be achieved west of WRPS.

Providing additional treatment and storage capacity at the WWTP will significantly reduce the potential for partially treated discharges at the WWTP. With the ability to treat hydraulic flows of up to 8 MGD during wet weather (about a 4 MGD increase over current levels), this event would not have generated any SSO's.

Since the average pumping rate was 1.75 MGD at WRPS, to avoid any discharge at this location during an event such as what was experienced in February of 2018, a conveyance capacity to the west of WRPS of 4.85 MGD (=1.75+1.53+1.57) from both the pumps and the sewers would have been required. By providing an overflow weir from the existing river interceptor sewer that flows to the pump wetwell in addition to a check valve on the river interceptor sewer and new, higher capacity pumps, the full capacity of the river interceptor sewer could be utilized with surcharge of the sewer at the upstream end. By providing new, higher capacity pumps, a capacity of approximately 5.4 MGD can be provided or an increase of about 1.43 MGD.

Increasing the conveyance capacity from the WRPS station to 5.4 MGD by adding an inline check valve to the sewer and adding three new 1900 gpm (2.7 MGD) capacity pumps to push into the downstream sewer plus providing additional treatment capacity will address the 25-year, 24-hour storm event. In the future, if additional capacity were desired, the higher capacity pumps could pump into an alternate force main that could discharge into the existing 24-inch gravity sewer downstream of the West Jefferson Pump Station (WJPS) (Sandstone Creek Subarea). This would result in a revised conveyance capacity of approximately 9.4 MGD, 5.4 MGD with pumps and 3.97 MGD through the river interceptor sewer. The revised system Schematic is shown below in Figure 5-3.

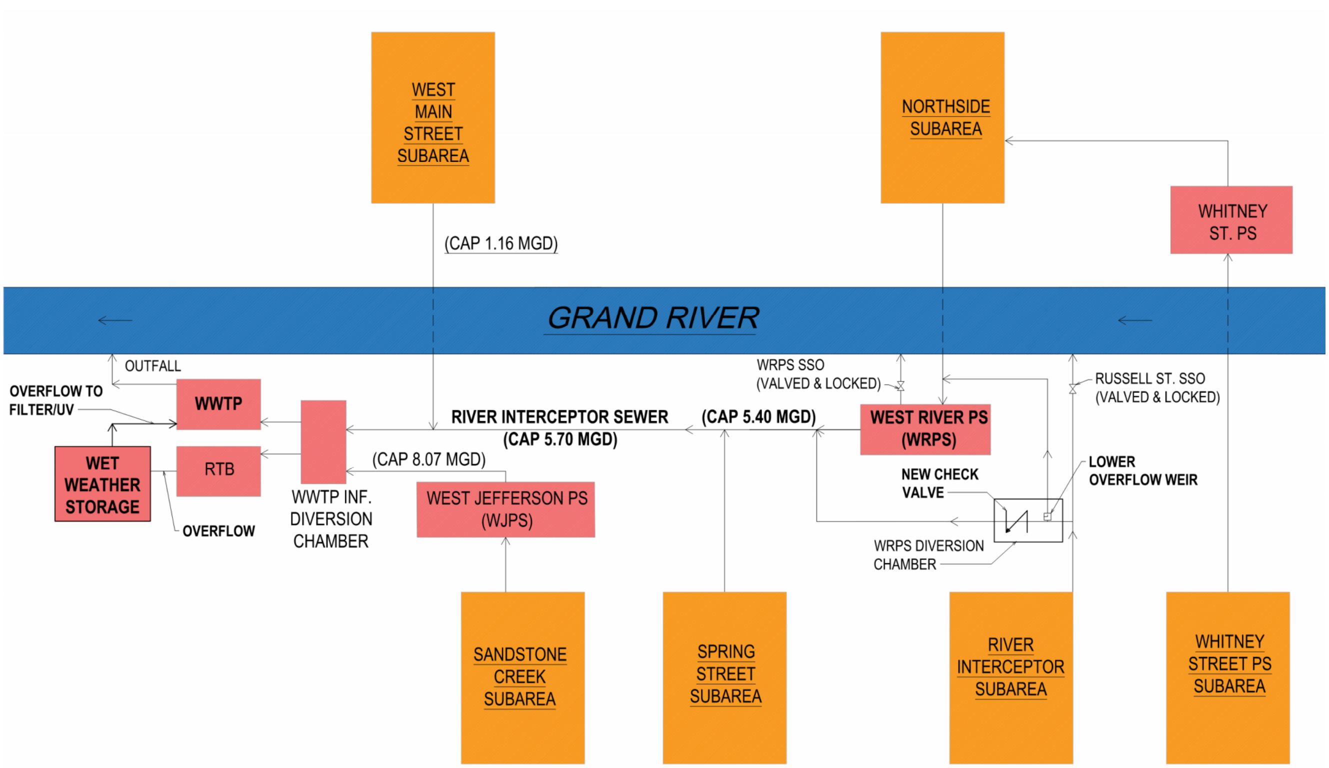


Figure 5-3. Revised Grand Ledge Collection System Schematic

5.2.3 WWTP RTK Unit Hydrograph

An RTK Unit Hydrograph was projected using flow monitoring data at the WWTP from 2017/18 from three significant storm events (June 16, 2017, October 14, 2017, and October 22, 2017). The 15-minute and hourly rainfall from the Lansing Capitol Airport rain gauge (KLAN) was used for the precipitation timing and the totals were from the WWTP Rain Gauge. The hydrograph was then used to estimate the flows to the WWTP during a 25-year, 24-hour rainfall event (approximately 4.16 inches for Grand Ledge). Figure 5-4 depicts the predicted total flows for this storm event on top of the existing wastewater flows and the future peak wastewater flows after the projected future growth from Phase I and Phase II. The estimated flows assume a peak daily base flow condition and no reduction of infiltration and inflow.

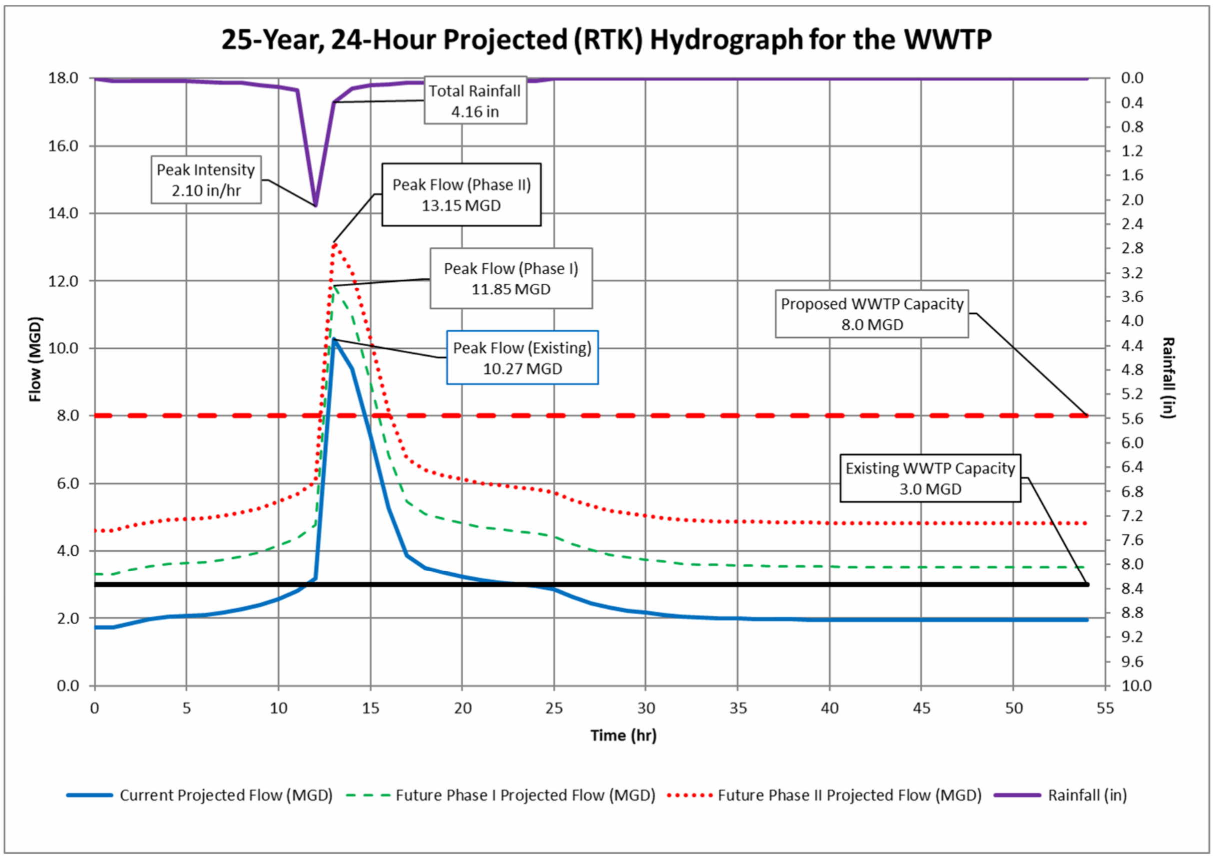


Figure 5-4. Preliminary WWTP RTK Unit Hydrograph

The estimated wet weather storage requirements for the existing WWTP were determined for both the existing peak hydraulic throughput capacity (3.0 MGD) and the proposed WWTP peak hydraulic throughput capacity (8.0 MGD). These volumes were determined by calculating the area above the peak hydraulic throughput capacity and the projected flow for each. Based on this analysis, the required storage volume for a 25-year, 24-hour event would be 0.33 MG after Phase I system growth and 0.49 MG after Phase II system growth. This analysis assumes no reduction due to system I&I removal. Approximately 0.96 MG will be available by using the existing 0.3 MG Retention Basin plus re-use of the existing primary tanks, one aeration basin and the existing final clarifiers. In addition, if half of the proposed AGS Equalization Basin were available (0.26 MG), a total of 1.22 MG would be available for storage versus the potential required volume of between 0.33-0.49 MG.

Table 5.1. Required Storage for 25-year, 24-hour Storm

	Units	At 3 MGD	At 8 MGD
Existing Projected Flow	MG	0.94	0.15
Projected Flow after Phase I System Growth	MG	2.96	0.33
Projected Flow after Phase II System Growth	MG	5.94	0.49

5.3 COLLECTION SYSTEM ALTERNATIVE EVALUATION AND RECOMMENDATION

This section outlines a second alternative for a phased approach to implementing the collection system improvements and provides an evaluation in comparison with the previously identified selected alternative.

5.3.1 Phased Collection System Improvements (Alternative 5.2)

The following collection system improvements are recommended to be implemented in a phased approach to reduce overall cost impact on the City and allow the City time to identify and remove sources of wet weather flow. The improvements recommended for this Phase I to be completed in Fiscal Year (FY) 2025 to provide the Grand Ledge Collection System with additional conveyance capacity to address the flows from a 25-year, 24-hour precipitation event.

<u>Phase I Improvements</u>

- Construct an Overflow Chamber with a weir and rubber inline check valve on the River Interceptor Sewer just upstream of WRPS.
- Although it has been indicated that the existing interceptor sewer has previously been lined and all the manholes have bolt-down lids, some additional ballast and possibly supplemental venting may be required for some of the most manhole lids immediately west of WRPS to resist blowoff during surcharge events.
- Provide three additional pumps at WRPS such that a firm capacity to pump 6.0 MGD into the river interceptor sewer can be provided along with sufficient standby power generation capable of operating two pumps during loss of utility power.
- Modify the existing retention basin at the WWTP to allow for a maximum influent rate of 8 MGD into the retention basin. With this influent rate plus having the ability to pump 6.2 MGD using the existing intermediate lift pumps into additional storage tanks (re-purposed existing primary and secondary treatment tanks), a total of 0.96 MG would be available for storage (0.47 MG more than what is required per Table 5.1 above).
- If a portion (assume 50%) of the Proposed AGS Equalization were available in advance of a wet weather event, the available storage could be increased by about 0.26 MG, after Phase I the total available storage volume would be 1.22 MG (or 0.73 MG above what is required per Table 5.1 above).
- If I&I reduction efforts are successful, the storage volumes could be reduced more in the future.
- Provide a maximum hydraulic influent rate of 8 MGD into the WWTP for treatment. See Section 3 (wastewater treatment section) of this report.
- In an extreme wet weather event, it is desirable for the wet weather storage tanks to be provided with a means to overflow and receive controlled, partial treatment rather than just releasing untreated flow to the river. It is recommended that a means to route overflows from the storage tanks to the CMDF filters

and then through the UV disinfection and reaeration prior to discharge to the river. Given that this flow will have received three stages of settling prior to the filters, and would overflow very infrequently, it is unlikely that the plant permit discharge levels would be exceeded during this type of event.

- The cost of these improvements is approximately $3.7M which can be compared to the previous project which included construction of a new force main along Jefferson Street and sewer through Fitzgerald Park along with a 3.5 MG storage tank at a cost of $18.2M.

Phase II Improvements (future)

The above improvements will allow for the system to provide treatment for a 25-year, 24-hour precipitation event under existing conditions.

Since the system is known to have issues with infiltration and inflow, it is also recommended that the City pursue the removal of inflow from foundation drains and any other sources that are connected to the sanitary sewer system since these inflows will likely continue to cause problems in the future and could cause localized high flows and thus sanitary sewer overflows (SSO's). Foundation drain removals can be accomplished through a rate-incentivized program that provides a lower rate for homes that can document that their foundation drains have been removed or are known not to be connected to the system and provides a higher rate for homeowners that are known to have connected foundation drains or refuse to have them removed. In addition, as building permits for modifications are issued, a requirement to do a foundation investigation should be included. The specific details of this program would need to be investigated. If excess funds are available at the completion of this program, specific areas with known connected drains could initially be pursued for removal.

Based on previous investigations there are approximately 39 houses with existing foundation drains and sump pumps connected to sanitary sewers that could relatively easily be removed and rerouted to storm sewers. During wet weather, these homes could contribute between 2-6 gpm to the sanitary sewer system or approximately 0.11-0.33 MGD and in some cases even higher. Their contribution can vary greatly depending on the proximity of roof drains to the roof line and whether the groundwater in the area is relatively high. Specific investigations could be performed to assess whether the cost of removal is warranted but assuming that this quantity could probably be removed at a cost of between $3000 and $6000 per home depending on the length of sump pump conveyance line required. This would result in a cost of approximately $117,000 to 234,000 or between 354,000 to $709,000 per MGD removed. The cost per MGD removed might seem high but if more drains in a particular area could be removed, the cost per MGD removed would likely go down.

The City has previously completed several investigations of I&I including dye tracing and smoke testing. Completing a sanitary sewer evaluation of the most problematic subareas subject to I&I and a review of previous efforts will help the City identify where separation and sewer rehabilitation will be beneficial. Sewer rehabilitation not only remove I&I it also prolongs the life of the sanitary sewers and manholes that have reached the end of its service life and can be more cost effective than full replacement.

Phase III Improvements (if necessary)

The above improvements are the most cost-effective method to control wet weather flows and remove I&I. As the flows to the system increase due to future growth, it may be necessary to expand the capacity by further increasing the wastewater conveyance capacity depending on which direction the future flows are coming from. The need to improve the wastewater conveyance capacity of the river interceptor may also depend on the effectiveness of I&I removal efforts in the older areas of the City and improving conveyance in conjunction with supplementing the capacity of older sewers and/or providing additional storage to treat the peak wet weather flows may be necessary. Constructing additional conveyance could possibly be structured to also address any deficiencies in capacity that may still exist at that time.

5.3.2 Analysis of Collection System Alternatives

The table below compares the estimated capital cost of the above described Alternative 5.2 with the previously selected collection system alternative (Alternative 5.1) that was included in the previous project plan and bid in 2023. This previous project included the WRPS capacity expansion, 24-inch force main from WRPS to the WWTP, and a 3.5 million gallon (MG) equalization tank.

Table 5.2. Flow Equalization and Collection System Alternatives Evaluation

<u>Alternative 5.1 – (Previously Selected Project – Recently bid but not constructed) WRPS Improvements, Force Main, and 3.5 MG Storage</u>	
WRPS Improvements and Force Main	$2,941,000
3.5 MG Equalization Tank	$15,300,000
Total Alternative 5.1	***$18,241,000***
<u>Alternative 5.2 - Phased Improvements</u>	
Phase I - Collection System Improvements and Wet Weather Storage	
0.58 MG Equalization Tank (future fourth AGS Reactor)[1]	$1,360,000
Collection System Improvements[1]	$1,360,000
West River Pump Station[1]	$540,000
Conversion of WWTP Tanks for Wet Weather Storage[1]	$410,000
Phase I Subtotal (FY 2025)	*$3,670,000*
Phase II - Collection System I&I Removal	
Sump Pump Removal and Footing Drain Disconnection Program (varies significantly)	$3,000,000
Sanitary Sewer Evaluation Study	$200,000
Sewer Rehabilitation and Sewer Separation (varies significantly)	$1,500,000
Phase II Subtotal (future)	*$4,700,000*
Phase III - Wet Weather Equalization Tank	
1.5 MG Equalization Tank (if necessary)	$7,500,000
WRPS Force Main (if necessary)	$2,000,000
Phase III Subtotal (if necessary)	*$9,500,000*
Total Alternative 5.2	***$17,870,000***
Phase I Alternative 5.2 Subtotal (FY 2025)	***$3,540,000***

Notes:

1. Includes 20% cost estimating contingency and 16% general conditions.

The above table demonstrates that Alternative 5.2 is more favorable approach to addressing the collection system improvements. Phase I will provide the ability to provide treatment for a 25-year, 24-hour precipitation event. Phase II would be implemented as a future project to allow the City time to determine the required I&I removal and identify the areas targeted for I&I removal, sewer separation, and sewer rehabilitation. With these improvements, the City will be able to convey the wet weather flows and future flows from the proposed future growth. If these improvements are insufficient, the additional capacity and flow equalization may be required as described in Phase III. The costs of these Phase III improvements are significantly higher and underlines the importance of pursuing I&I removal and sewer rehabilitation.

SECTION 6.0 — RECOMMENDED IMPROVEMENTS AND APPROACH

The proposed project will implement the recommended Phase I Wastewater Improvements, Phase I Biosolids Handling Improvements, and Phase I Collection System Improvements to address the requirements of the ACO and provide the peak hydraulic flow capacity and storage to meet the required 25-year, 24-hours flows. The improvements provide the City the ability to handle the immediate growth of the system.

Phase II Collection System Improvements would be completed following the Phase I Collection System Improvements as these provide long-term and require ongoing corrective actions following determination and evaluation of the system to identify the required improvements.

As the City's number of users grows, the Phase II Biosolids Handling Improvements would need to be implemented to provide the required capacity for higher solids loading. This would occur when the average daily flows exceed 3.0 MGD. The future wastewater improvements would likely be implemented when the annual average daily flows exceed 2.5 MGD (or 80% of the design capacity) and this would be completed by equipping the equalization basin (AGS Reactor #4).

The success of Phase II Collection System Improvements in reducing wet weather flows should be evaluated as part of the project monitoring. If the peak flows are reduced such that the expanding capacity and wet weather storage is sufficient to handle the system growth, the Phase III Collection System improvements (a new equalization tank at the bottom of the hill) and conveyance improvements may not be necessary.

SECTION 7.0 — COST ESTIMATE AND SCHEDULE

7.1 PROJECT COST ESTIMATE

This cost estimate provides the City a budget for determining the capital cost of the recommended project improvements. The summary table of the cost estimate is provided in Table 6.1 below and assumes a 20% estimating contingency and 16% General Conditions and Mobilization. Detailed cost estimates are provided in Appendix D. Design and construction engineering fees are roughly estimated at approximately 6% of the overall project cost and may be adjusted depending on the project delivery method (see discussion below).

Because overall costs and impacts on user costs are a major concern with City, the project could be constructed such that portions of the project could be incorporated as a future project phase to stay within the target construction budget.

Table 7.1. Phase I Project Cost Estimate Summary

HRC

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 — Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** — DATE: **6/27/2024**

LOCATION: **Grand Ledge** — PROJECT NO. **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL — ESTIMATOR: **DIU**

WORK: **WWTP Improvements - Cost Summary** — CHECKED BY: **DJB**

CURRENT ENR: **13532**

NUMBER	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Site Work/Demolition/Existing Tank Conversion to WW Storage	1	LS	$909,000	$909,000
2	WWTP Electrical, Emergency Power, and SCADA	1	LS	$2,375,000	$2,375,000
3	Yard Piping	1	LS	$995,000	$995,000
4	Headworks Perforated Plate Screen	1	LS	$1,195,000	$1,195,000
5	Grit Removal and Influent PS	1	LS	$1,836,000	$1,836,000
6	Aerobic Granular Sludge and Equalization	1	LS	$19,695,000	$19,695,000
7	Tertiary Filters	1	LS	$2,545,000	$2,545,000
8	Ultraviolet Disinfection and Reaeration	1	LS	$1,545,000	$1,545,000
9	Aerobic Digestion (Converted Aeration Basins)	1	LS	$899,000	$899,000
10	Sludge Thickening	1	LS	$2,133,000	$2,133,000
11	Collection System Improvements	1	LS	$1,000,000	$1,000,000
12	West River Pump Station	1	LS	$489,000	$489,000
13	General Conditions, Mobilization, Bonds, and Insurance	16	%		$5,699,000
14				***Construction Subtotal***	**$41,400,000**
15	Estimating Contingency	20	%		$8,100,000
16		***Total Estimated Construction Cost***			***$49,500,000***
17	Design/Construction Engineering	6	%		$2,800,000
18	Administrative, Legal, Finance				$75,000
	TOTAL PROJECT COST				***$52,400,000***

7.2 PROJECT DELIVERY AND SCHEDULE

7.2.1 Conventional Design Bid Build (DBB)

Conventional Design Bid Build is the most common construction delivery method in which the owner and engineer develops 100% plans for bidding and then enters a contract with the lowest responsive bidder. The benefits to this method typically include the ability to solicit competitive bids to reduce costs as well as identification of the most appropriate contractor that is prepared to implement the project in the required schedule.

7.2.2 Fixed Price Design Build (FDB)

Fixed Price Build Design Build is a project delivery method in which the owner procures a design-build team for a fixed price based that is based on a preliminary set of construction documents (typically 30%). In this method, the design-build team develops a detailed set of construction documents in a short timeframe (typically while prices are being confirmed and orders for long lead time equipment are being executed) and reduce portions of the design costs since less detailed plans are required since the Owner, the Constructing Contractor and Designer are working together as a team. The benefits include the ability for the Owner to be involved with the major decisions as they affect the construction costs. The drawbacks may include slightly higher costs associated with risks in determining the fixed price while various uncertainties remain. However, the potential of increased costs versus Design-Bid-Build are usually offset by savings in schedule due to the ability to pre-order long lead time equipment and materials. Under this option, the Owner will retain the services of an oversight representative to oversee the Project to assure the Owner's interests are being addressed during project execution.

7.2.3 Project Schedule

Table 7.2 compares the preliminary CWSRF financing schedule for a conventional design bid build and design build project approach.

Table 7.2. Preliminary CWSRF Project Schedule

Financing Schedule	CWSRF FY2025 Q2	CWSRF FY2025 Q1.5
Action	Conventional Design Bid Build (DBB)	Fixed-Price Design Build (FDB)
Select Design or Design-Build Team	May 2024	May 2024
Solicit Fixed Price Design Build Price	NA	June 2024
Develop 30% Construction Drawings	July 2024	July 2024
Develop 60% Construction Drawings	September 2024	August 2024
Submit Plans for Part 41 Permit Review	November 2024	September 2024
Part 41 Construction Permit	December 2025	October 2024
Pre-Order Long Lead Time Equipment and Materials	NA	October 2024
Bid Advertisement	December 2025	
Bid Opening	January 2025	
Submit Part III Application	January 2025	December 2024
Commence Construction	June 2025	January 2025
Complete Construction	March 2027	July 2026

Appendix A — List of SSOs and Retention Basin Discharges

List of SSO and Retention Basin Discharges

Event Date(s)	Rainfall (in)	Estimated Volume Discharged (MG)			WWTP Flow (MGD)		WRPS Flow (MGD)		Duration (days)
		WWTP	WRPS	Russell	Avg	Max	Avg	Max	
5/23/2004	No data	4.04							0.17
1/13/2005*	No data	3.38	4.00	3.24	2.5				0.96
6/6/2008	No data	0.68							0.79
12/28/2008	No data	2.45							1.00
5/26/2011	2.06	0.87							0.33
5/29/2011	1.55	1.94							0.58
2/20-22/2018	3.20	3.89	3.27	3.18	3.29	5.43	1.75	1.94	2.08
3/14-28/2019	1.15	7.27			1.00	1.90	0.45	0.537	14.71
6/20/2019	2.60	2.74	1.13		2.7	3.72	1.86	1.86	1.63
1/10-11/2020	2.67	5.19			1.95	3.25	1.64	1.64	3.38
5/17-18/2020	2.93	5.66	2.26	1.14	2.63	3.3	2.04	2.04	2.46
2/17/2022	1.05	0.96			2.3	3.19	0.78	0.78	0.29
4/4-7/2023	2.84	7.6	1.27	0.48	2.2	3.75	1.25	1.62	1.52
1/26/2024									2.96
3/14/2016	1.01	0			4.65	6.2			
10/14-15/2017	3.28	0	0	0	1.40	4.58	0.58	1.74	
*Footnotes	1. Overflow at WRPS estimated from data on work charts. Overflow indicated for Russell is Spring Street Avg WWTP flow is an estimate 2. WWTP Discharge is from Retention Basin								

Appendix B — NPDES Permit (excerpt from draft permit as of 3/28/23)

New permit

PART I

Section A. Limitations and Monitoring Requirements

1. Final Effluent Limitations, Monitoring Point 001A – Prior to Completion of Facility Upgrade

During the period beginning on the effective date of this permit and lasting until the completion of the facility upgrade to 3.9 MGD capacity, the permittee is authorized to discharge treated municipal wastewater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to the Grand River at Latitude 42.762387, Longitude -84.761341. Such discharge shall be limited and monitored by the permittee 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
Carbonaceous Biochemical Oxygen Demand (CBOD5)	310	500	(report)	lbs/day	25	40	(report)	mg/l	5x Weekly	24-Hr Composite
Total Suspended Solids (TSS)	380	560	(report)	lbs/day	30	45	(report)	mg/l	5x Weekly	24-Hr Composite
Ammonia Nitrogen (as N)	---	---	---	---	---	---	(report)	mg/l	5x Weekly	24-Hr Composite
Total Phosphorus (as P)	12	---	(report)	lbs/day	1.0	---	(report)	mg/l	5x Weekly	24-Hr Composite
Chloride	---	---	---	---	---	---	(report)	mg/l	Monthly	24-Hr Composite
Sulfate	---	---	---	---	---	---	(report)	mg/l	Monthly	24-Hr Composite
Fecal Coliform Bacteria	---	---	---	---	200	400	(report)	cts/ 100 ml	Daily	Grab
Total Residual Chlorine	---	---	---	---	---	---	38	ug/l	Daily	Grab
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	0.000025	---	---	lbs/day	2.0	---	---	ng/l	Quarterly	Calculation
					Minimum % Monthly		**Minimum % Daily**			
CBOD5 Minimum % Removal	---	---	---	---	85	---	(report)	%	Monthly	Calculation
TSS Minimum % Removal	---	---	---	---	85	---	(report)	%	Monthly	Calculation

PART I

Section A. Limitations and Monitoring Requirements

Parameter					Minimum Daily		Maximum Daily	Units	Monitoring Frequency	Sample Type
pH	---	---	---	---	6.5	---	9.0	S.U.	Daily	Grab
Dissolved Oxygen	---	---	---	---	4.0	---	---	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: 1.5 MGD.

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
Samples for CBOD5, TSS, Ammonia Nitrogen, Total Phosphorus, Chloride, and Sulfate shall be taken prior to disinfection. Samples for Fecal Coliform Bacteria, Total Residual Chlorine, Total Mercury, pH, and Dissolved Oxygen shall be taken after disinfection. The Department may approve alternate sampling locations that are demonstrated by the permittee 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 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).

d. Total Residual Chlorine (TRC)
Compliance with the TRC limit shall be determined on the basis of one (1) 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 at least 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. Percent Removal Requirements
Monthly percent removal shall be calculated based on the monthly average effluent CBOD5 and TSS concentrations and the monthly average influent concentrations for approximately the same period. Daily percent removal shall be calculated based on the daily effluent CBOD5 and TSS concentrations and the daily influent concentrations for the same day. Reporting of Daily percent removal is only required on days on which an influent sample is obtained. The calculation shall be made as follows for each parameter: Percent removal = (influent concentration - effluent concentration) / influent concentration x 100.

PART I

Section A. Limitations and Monitoring Requirements

2. Final Effluent Limitations, Monitoring Point 001A – After Completion of Facility Upgrade

The permittee shall notify the Department 60 days prior to the completion of upgrades at the facility to bring the wastewater treatment plant to 3.9 MGD capacity. During the period beginning on the completion of the facility upgrade to 3.9 MGD capacity, and lasting until the expiration date of this permit, the permittee is authorized to discharge treated municipal wastewater from Monitoring Point 001A through Outfall 001. Outfall 001 discharges to the Grand River at Latitude 42.762387, Longitude -84.761341. Such discharge shall be limited and monitored by the permittee 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
Carbonaceous Biochemical Oxygen Demand (CBOD5)										
May – October	130	320	(report)	lbs/day	4	---	10	mg/l	5x Weekly	24-Hr Composite
November – April	810	1,300	(report)	lbs/day	25	40	(report)	mg/l	5x Weekly	24-Hr Composite
Total Suspended Solids (TSS)										
May – October	650	980	(report)	lbs/day	20	30	(report)	mg/l	5x Weekly	24-Hr Composite
November – April	980	1,500	(report)	lbs/day	30	45	(report)	mg/l	5x Weekly	24-Hr Composite
Ammonia Nitrogen (as N)										
May – October	16	65	(report)	lbs/day	0.5	---	2.0	mg/l	5x Weekly	24-Hr Composite
November	260	---	(report)	lbs/day	8.0	---	(report)	mg/l	5x Weekly	24-Hr Composite
December – March	320	---	(report)	lbs/day	10	---	(report)	mg/l	5x Weekly	24-Hr Composite
April	390	---	(report)	lbs/day	12	---	(report)	mg/l	5x Weekly	24-Hr Composite
Total Phosphorus (as P)	12	---	(report)	lbs/day	1.0	---	(report)	mg/l	5x Weekly	24-Hr Composite
Chloride	---	---	---	---	---	---	(report)	mg/l	Monthly	24-Hr Composite
Sulfate	---	---	---	---	---	---	(report)	mg/l	Monthly	24-Hr Composite
Acute Toxicity – *C. dubia*	---	---	---	---	---	---	(report)	TU_A	Quarterly	24-Hr Composite
							Individual Chronic Value			
Chronic Toxicity – *C. dubia*	---	---	---	---	5.1	---	(report)	TU_C	Quarterly	24-Hr Composite

Section A. Limitations and Monitoring Requirements

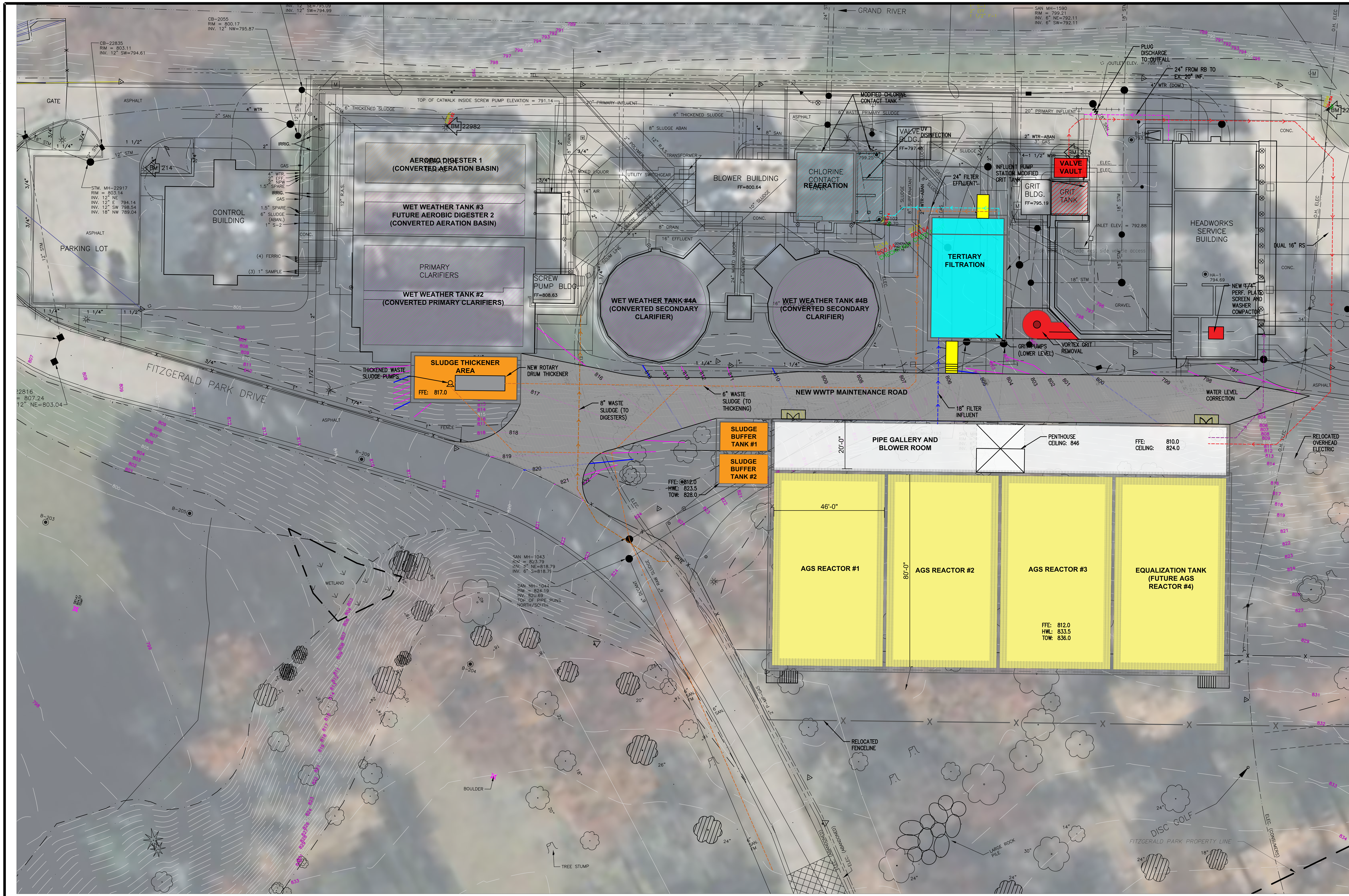
Parameter	Maximum Limits for Quantity or Loading				Maximum Limits for Quality or Concentration				Monitoring Frequency	Sample Type
	Monthly	7-Day	Daily	Units	Monthly	7-Day	Daily	Units		
Fecal Coliform Bacteria	---	---	---	---	200	400	(report)	cts/ 100 ml	Daily	Grab
Total Mercury										
Corrected	(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	0.000065	---	---	lbs/day	2.0	---	---	ng/l	Quarterly	Calculation
					Minimum % Monthly		**Minimum % Daily**			
CBOD5 Minimum % Removal										
November – April	---	---	---	---	85	---	(report)	%	Monthly	Calculation
SS Minimum % Removal										
November – April	---	---	---	---	85	---	(report)	%	Monthly	Calculation
					Minimum Daily		**Maximum Daily**			
pH	---	---	---	---	6.5	---	9.0	S.U.	Daily	Grab
Dissolved Oxygen	---	---	---	---	3.0	---	---	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: 3.9 MGD.

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
Samples for CBOD5, TSS, Ammonia Nitrogen, Total Phosphorus, Chloride, Sulfate, Acute Toxicity, and Chronic Toxicity shall be taken prior to disinfection. Samples for Fecal Coliform Bacteria, Total Mercury, pH, and Dissolved Oxygen shall be taken after disinfection. The Department may approve alternate sampling locations that are demonstrated by the permittee to be representative of the effluent.

Appendix C — Preliminary Drawings



KEY/LEGEND

- PRELIMINARY TREATMENT (SCREENING, GRIT, INFLUENT PUMPING)
- AEROBIC GRANULAR SLUDGE (AGS) SECONDARY TREATMENT
- TERTIARY TREATMENT AND DISINFECTION
- BIOSOLIDS HANDLING AND TREATMENT
- WET WEATHER STORAGE
- HATCHING INDICATES EXISTING TANK CONVERSION

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
2101 AURELIUS RD SUITE 2
HOLT, MI 48842
PHONE: (517) 694-7760
WEB SITE: www.hrcengr.com

DATE	ADDITIONS AND/OR REVISIONS

DESIGNED
DRAWN
CHECKED
APPROVED

DRAFT NOT FOR CONSTRUCTION

CITY OF
GRAND LEDGE WASTEWATER TREATMENT PLANT

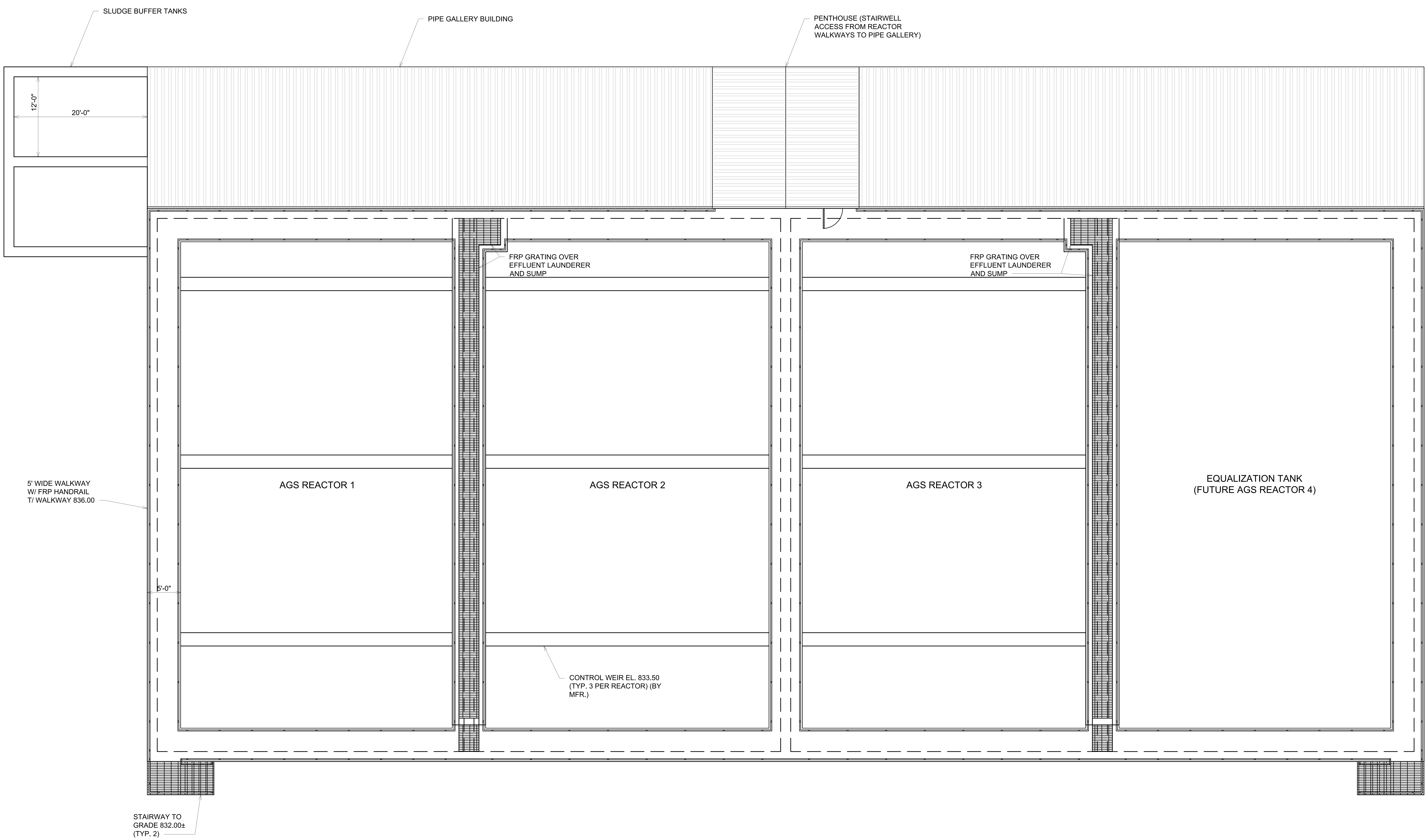
PRELIMINARY SITE LAYOUT

HRC JOB NO.	SCALE
20221119	AS SHOWN
DATE: June 2024	SHEET NO. FIG 01

ORIGINAL PLOT SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)

6/12/2024 12:19 PM
V:\202211\20221119\P\Sheets\Figure_X_Site_Plan.dwg
Cole, Joshua

6/12/2024 11:08 AM



AGS REACTORS PLAN VIEW

0 1 2 4 8 16

1/8" = 1'- 0"

N

V:\202211\20221119\P\Sheets\Figure_X_AGS_Tanks.dwg

Cole, Joshua

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915
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HOLT, MI 48842
PHONE: (517) 694-7760
WEB SITE: www.hrcengr.com

DATE	ADDITIONS AND/OR REVISIONS

DESIGNED

DRAWN

CHECKED

APPROVED

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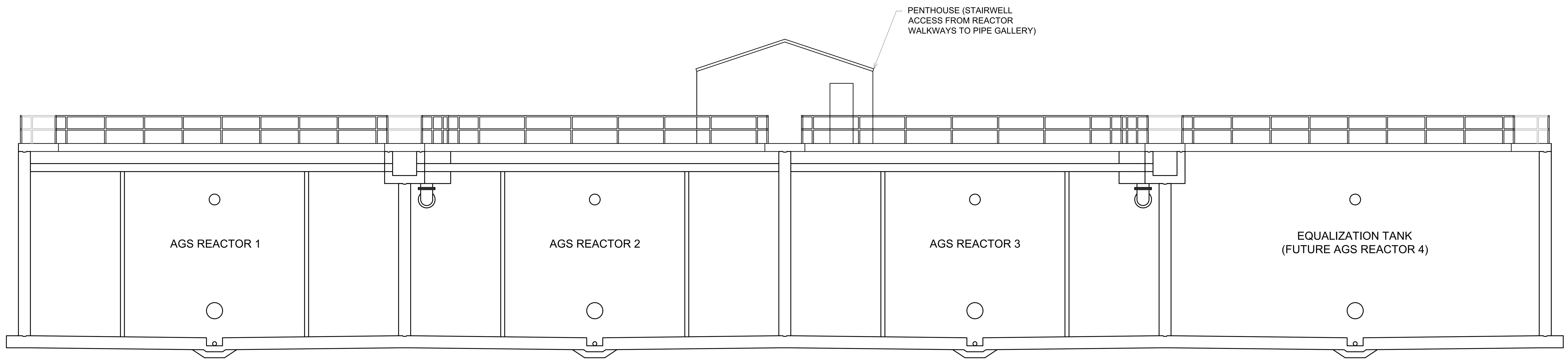
CITY OF

GRAND LEDGE WASTEWATER TREATMENT PLANT

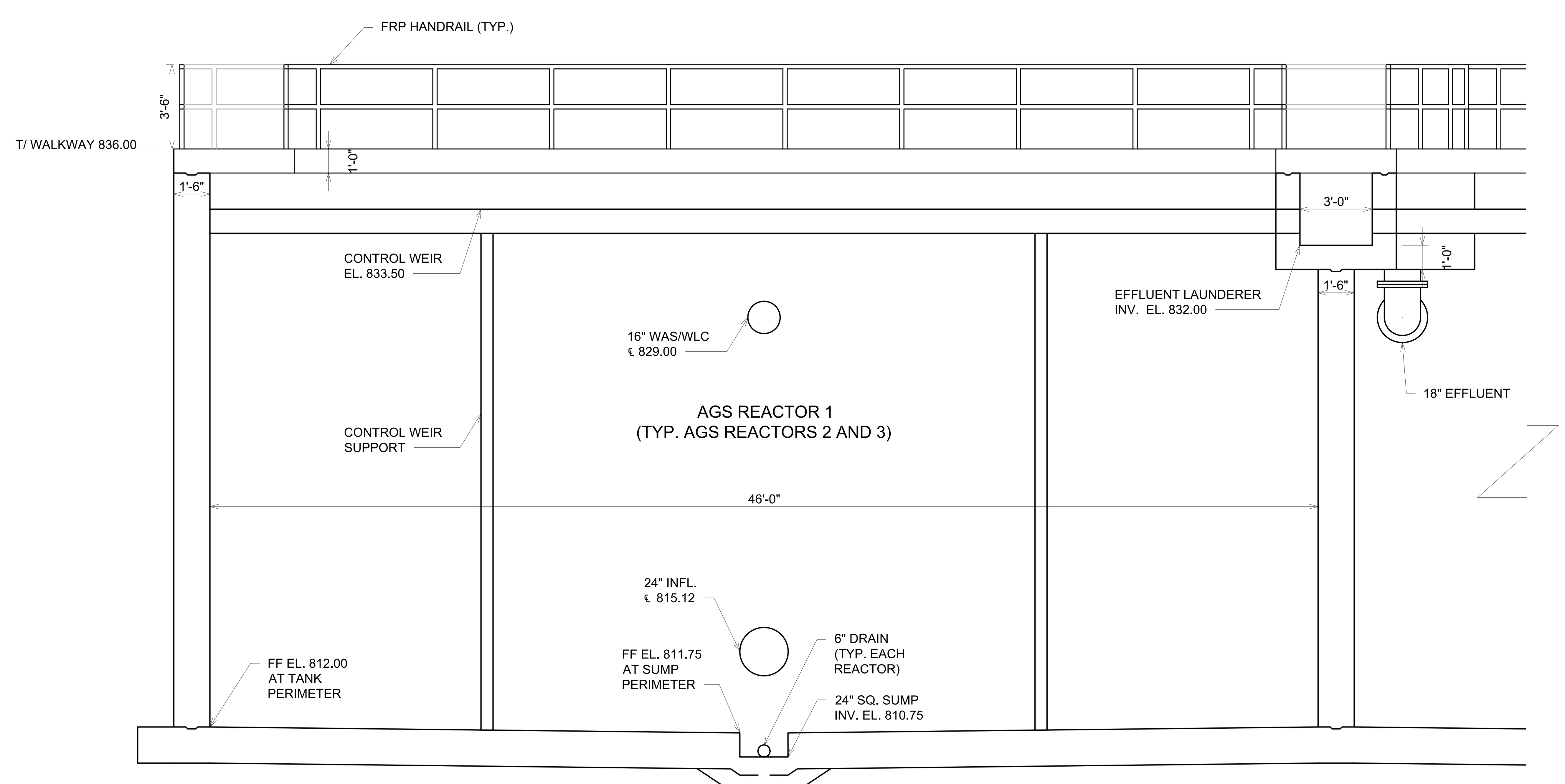
HRC JOB NO.	SCALE
20221119	AS SHOWN
DATE June 2024	SHEET NO. FIG 02

ORIGINAL PLOT SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)



AGS REACTORS SECTION VIEW

0 1 2 4 8 16
1/8" = 1'- 0"



AGS REACTOR 1 SECTION VIEW

0 1 2 4 8
1/4" = 1'- 0"

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

2101 AURELIUS RD SUITE 2
HOLT, MI 48842
PHONE: (517) 694-7760
WEB SITE: www.hrcengr.com

DATE	ADDITIONS AND/OR REVISIONS

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CHECKED
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CITY OF
GRAND LEDGE WASTEWATER TREATMENT PLANT

HRC JOB NO. 20221119	SCALE
DATE June 2024	SHEET NO. FIG 03

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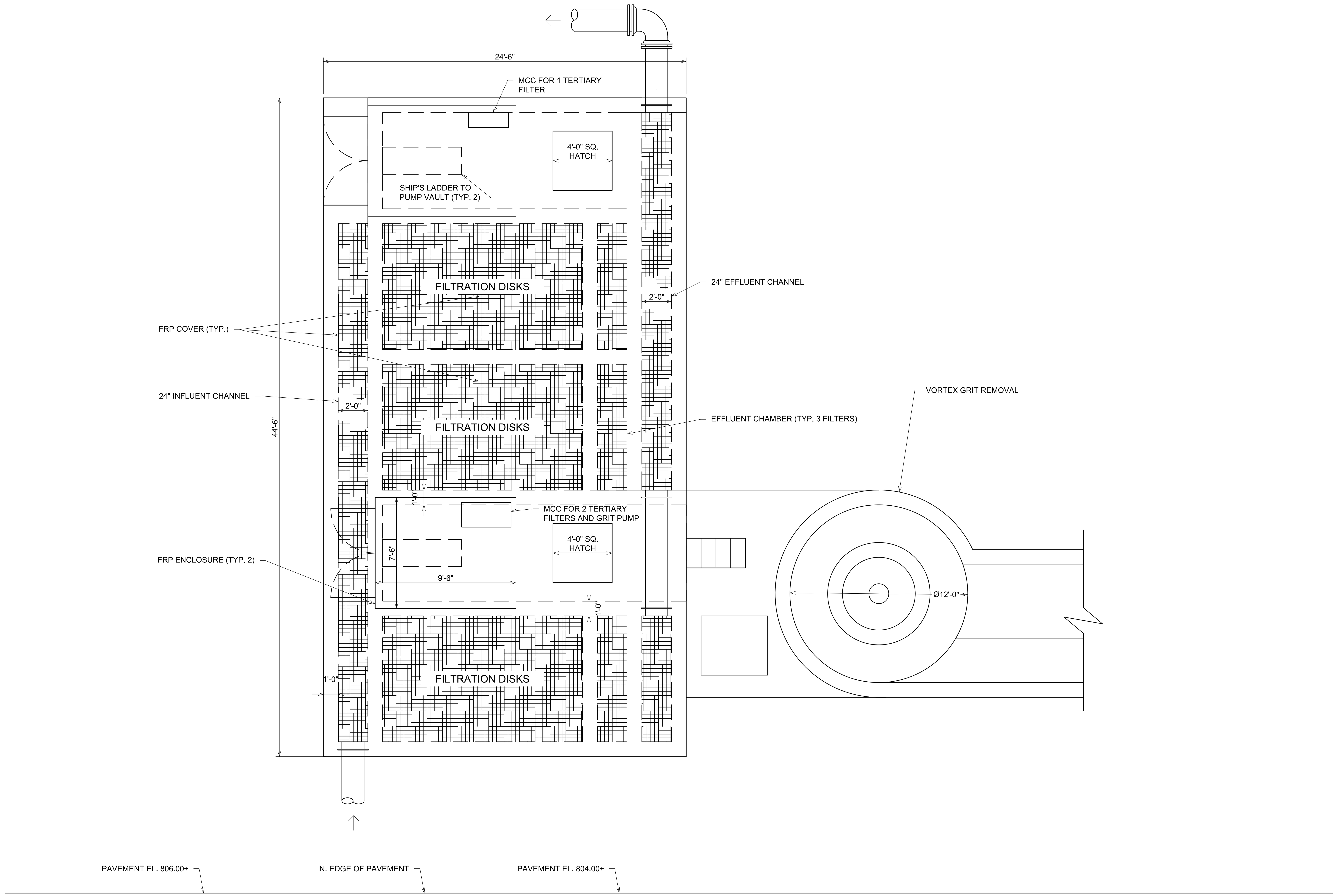
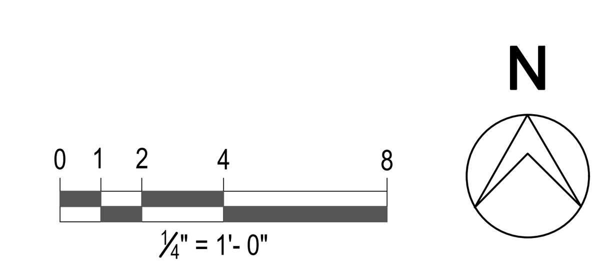
Cole, Joshua





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DATE	ADDITIONS AND/OR REVISIONS

DESIGNED

DRAWN

CHECKED

APPROVED

DRAFT NOT FOR CONSTRUCTION

CITY OF

GRAND LEDGE WASTEWATER TREATMENT PLANT

HRC JOB NO. 20221119	SCALE AS SHOWN
DATE June 2024	SHEET NO. FIG 04

ORIGINAL PLOT SIZE: ANSI FULL BLEED D (34.00 X 22.00 INCHES)

Appendix D — Detailed Cost Estimates

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** DATE: **6/12/2024**

LOCATION: **Grand Ledge** PROJECT NO. **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL ESTIMATOR: **DIU**

WORK: **WWTP Improvements - Cost Summary** CHECKED BY: **DJB**

CURRENT ENR: **13532**

NUMBER	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Site Work/Demolition/Existing Tank Conversion to WW Storage	1	LS	$909,000	$909,000
2	WWTP Electrical, Emergency Power, and SCADA	1	LS	$2,375,000	$2,375,000
3	Yard Piping	1	LS	$995,000	$995,000
4	Headworks Perforated Plate Screen	1	LS	$1,195,000	$1,195,000
5	Grit Removal and Influent PS	1	LS	$1,836,000	$1,836,000
6	Aerobic Granular Sludge and Equalization	1	LS	$19,695,000	$19,695,000
7	Tertiary Filters	1	LS	$2,545,000	$2,545,000
8	Ultraviolet Disinfection and Reaeration	1	LS	$1,545,000	$1,545,000
9	Aerobic Digestion (Converted Aeration Basins)	1	LS	$899,000	$899,000
10	Sludge Thickening	1	LS	$2,133,000	$2,133,000
11	Collection System Improvements	1	LS	$1,000,000	$1,000,000
12	West River Pump Station	1	LS	$489,000	$489,000
13	General Conditions, Mobilization, Bonds, and Insurance	16	%		$5,699,000
14				***Construction Subtotal***	**$41,400,000**
15	Estimating Contingency	20	%		$8,100,000
16				***Total Estimated Construction Cost***	***$49,500,000***
17	Design/Construction Engineering	6	%		$2,800,000
18	Administrative, Legal, Finance				$75,000
	TOTAL PROJECT COST				***$52,400,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJE	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCAT	**WWTP**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK	**Site Work/Demolition/Existing Tank Conversion to WW Storage**	CHECKED BY:	**DJB**
		CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1					
2	*Demolition/Existing Tank Conversion to Wet Weather Storage*				
3	Replace Handrailing	720	LF	$100	$72,000
4	New 24" from RTB to Existing 20"	100	LF	$510	$51,000
5	New 18" from RTB Effluent Box to 24"	100	LF	$400	$40,000
6	Core 24" openings in Existing RTB	5	EA	$1,500	$7,500
7	Piping connection from Th Sl to Aerobic Digester	1	LS	$10,000	$10,000
8	Piping connection from Aerobic Digester to Storage	1	LS	$10,000	$10,000
9	12-in Piping connection from RAS Pumps to Filter Influent Piping	200	LF	$500	$100,000
10	Modification for connection from Th Sl to Aerobic Digester	1	LS	$10,000	$10,000
11				*Subtotal*	*$300,500*
12	*Site Prep*				
13	Sidewalk, Non-Reinforced Concrete	400	SF	$8	$3,200
14	Road Improvements	667	SY	$250	$166,667
15	Site Stairs with Handrail	20	VLF	$3,000	$60,000
16	Tree Removal	40	EA	$3,000	$120,000
17	Ex Road Relocation	200	LF	$400	$80,000
18	New HMA Pavement	1,000	TON	$135	$135,000
19				*Subtotal*	*$564,867*
20	*Fencing*				
21	Chainlink Fence (Southwest Corner)	300	LF	$45	$13,500
22	Electrical Service Line pole relocation (for South slope AGS Alt only	1	LS	$30,000	$30,000
23				*Subtotal*	*$43,500*
	Total Cost				***$909,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**Yard Piping**	CHECKED BY:	**DJB**
	Alternative 3.1	CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Dual 16" RS FM (Influent PS to AGS)	570	LF	$330	$188,100
2	16" Buried RS Plug Valves (jncl in vault)	2	EA	$35,000	$70,000
3	18" Buried FE Piping	60	LF	$400	$24,000
4	6" TS (Sludge Buffer to Sludge Storage)	200	LF	$220	$44,000
5	6" Buried TS Valves	4	EA	$15,000	$60,000
6	6" Buried DigS	200	LF	$220	$44,000
7	6" Buried DigS Valves	4	EA	$15,000	$60,000
8	4" Buried DIP PW	300	LF	$200	$60,000
9	2" Buried CS Natural Gas	300	LF	$150	$45,000
10	1" Buried CPVC ALUM (Chemical Feed to AGS)	250	LF	$80	$20,000
11	4" Grit Pump to Washer	50	LF	$200	$10,000
12	4" Backwash Return	50	LF	$200	$10,000
13	8" Supernatant Return	300	LF	$200	$60,000
14	6" TS to Sludge Tank	300	LF	$200	$60,000
15	24" RB Ovfl	100	LF	$400	$40,000
16	6" TS (Conn to Aerobic Digester)	20	LF	$200	$4,000
17	24" Ovfl from WW RBs to FI	100	LF	$500	$50,000
18	24" Vault, Check Valve and Control Valve	1	EA	$30,000	$30,000
19	Storm Manholes and Drains	4	EA	$12,500	$50,000
20	15" Storm	300	LF	$85	$25,500
21	18" WLC Ovfl to WW1	200	LF	$200	$40,000
	TOTAL COST				***$995,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**Yard Piping**	CHECKED BY:	**DJB**
	Alternative 3.2	CURRENT EN	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Dual 16" RS FM (Influent PS to AGS)	1,600	LF	$330	$528,000
2	16" Buried RS Plug Valves (jncl in vault)	2	EA	$35,000	$70,000
3	18" Buried FE Piping	600	LF	$400	$240,000
4	6" TS (Sludge Buffer to Sludge Storage)	400	LF	$220	$88,000
5	6" Buried TS Valves	4	EA	$15,000	$60,000
6	6" Buried DigS	400	LF	$220	$88,000
7	6" Buried DigS Valves	4	EA	$15,000	$60,000
8	4" Buried DIP PW	300	LF	$200	$60,000
9	2" Buried CS Natural Gas	300	LF	$150	$45,000
10	1" Buried CPVC ALUM (Chemical Feed to AGS)	400	LF	$80	$32,000
11	4" Grit Pump to Washer	50	LF	$200	$10,000
12	4" Backwash Return	50	LF	$200	$10,000
13	8" Supernatant Return	300	LF	$200	$60,000
14	6" TS to Sludge Tank	300	LF	$200	$60,000
15	24" RB Ovfl	100	LF	$400	$40,000
16	6" TS (Conn to Aerobic Digester	20	LF	$200	$4,000
17	24" Ovfl from WW RBs to FI	100	LF	$500	$50,000
18	24" Vault, Check Valve and Control Valve	1	EA	$30,000	$30,000
19	Storm Manholes	4	EA	$12,500	$50,000
20	15" Storm	300	LF	$85	$25,500
21	18" Rapid Drain / Ovfl to RTB	700	LF	$200	$140,000
	TOTAL COST				***$1,751,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** DATE: **6/12/2024**

LOCATION: **Grand Ledge** PROJECT NO. **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL ESTIMATOR: **DIU**

WORK: **WWTP Electrical, Emergency Power, and SCADA** CHECKED BY: **DJB**

CURRENT ENR: **13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	SCADA Updates/Fiberoptic	1	LS	$450,000	$450,000
2	Rerouted Ductbank	1	LS	$250,000	$250,000
3	Buried Electrical	1	LS	$200,000	$200,000
4	New Electrical Feed/Main Switchgear	1	LS	$700,000	$700,000
5	Motor Control Centers	1	LS	$475,000	$475,000
6	Standby Power Generator	1	LS	$200,000	$200,000
7	Rerouted Overhead (New Pole and Line Relocation	1	LS	$100,000	$100,000
	Total Cost				***$2,375,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	**6/12/2024**
LOCATION:	**Grand Ledge**	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	**DIU**
WORK:	**Headworks Perforated Plate Screen**	**DJB**
		13532

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Sawcuts	32	LF	$700	$22,400
2	Vaxcavation	11	CY	$800	$8,533
3	Grinder Demo	1	LS	$12,000	$12,000
4	Concrete Removal	9	CY	$1,500	$13,333
5	New Floors	5	CY	$1,200	$6,400
6	New Walls	5.33	CY	$1,500	$8,000
7	Screening Equipment	1	EA	$500,000	$500,000
8	Screening Equipment Installation	1	LS	$400,000	$400,000
9	New Dumpster	1	EA	$8,000	$8,000
10					
11					
12	Misc Metal	1	%	$10,000	$10,000
13	Misc Mechanical	5	%	$49,000	$49,000
14	Misc Painting	1	%	$10,000	$10,000
15	Electrical	15	%	$147,000	$147,000
	TOTAL COST				***$1,195,000***

HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** DATE: **6/12/2024**
LOCATION: **Grand Ledge** PROJECT NO. **20221119**
BASIS FOR ESTIMATE: [ ] CONCEPTUAL [ ] PRELIMINARY [X] FINAL ESTIMATOR: **DIU**
WORK: **Grit Removal and Influent PS** CHECKED BY: **DJB**
CURRENT ENR: **13532**

ITEM NO.	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Vortex Grit Removal System				
2	Excavation - Removed	296	CY	$45	$13,333
3	Excavation - Backfill	237	CY	$35	$8,296
4	Handrail Grit Tank	50	LF	$100	$5,000
5	Grit Removal Equipment and Grit Classifier w/installation	1	LS	$337,500	$337,500
6	Stop Plates	3	EA	$5,000	$15,000
7	Vault Floor	11	CY	$1,200	$12,800
8	Vault Walls	6	CY	$1,900	$10,606
9	Grit Tank Floor	7	CY	$1,200	$8,932
10	Grit Tank and Channel Walls	22	CY	$1,900	$41,479
11	Grit Tank Channel Floors	5	CY	$1,200	$6,222
12	Grit Tank/ Grating	100	SF	$120	$12,000
13	DIP Fittings	16	EA	$1,500	$24,000
14	Grit Pump	1	EA	$30,000	$30,000
15	4" Grit Discharge Piping	75	LF	$200	$15,000
16	Influent Flow Meter, New 12" Flume to Replace 9" Flume	1	LS	$35,000	$35,000
17	Influent Pump Station and Grit Tank Conversion				
18	DIP Pipe Fitting	20	EA	$3,000	$60,000
19	DIP Piping (buried & exposed)	200	LF	$300	$60,000
20	24" FRP Dropbox (30"x30"x30")	1	LS	$10,000	$10,000
21	8" Check Valves	2	EA	$7,500	$15,000
22	8" Plug Valves	2	EA	$8,000	$16,000
23	16" Check Valves	2	EA	$23,000	$46,000
24	16" Plug Valves	2	EA	$25,000	$50,000
25	Valve Vault Floor	30	CY	$1,200	$35,467
26	Valve Vault Walls	28	CY	$1,900	$52,412
27	Access Hatch	1	LS	$15,000	$15,000
28	Pump Package w/ VFDs and CP (house in Ex Control Bldg.)	1	EA	$562,500	$562,500
29	Re-route 18" storm around Grit Tank	20	LF	$200	$4,000
30	Misc Metal	1	%	$16,000	$16,000
31	Misc Mechanical	5	%	$76,000	$76,000
32	Misc Painting	1	%	$16,000	$16,000
33	Electrical	15	%	$226,000	$226,000
	TOTAL PROJECT COST				**$1,836,000**

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** DATE: **6/12/2024**

LOCATION: **Grand Ledge** PROJECT NO. **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL ESTIMATOR: **DIU**

WORK: **Aerobic Granular Sludge and Equalization** CHECKED BY: **DJB**

Alternative 3.1 CURRENT ENR: **13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	AGS Tanks and Equalization				
2	Excavation/Slope Removal	25,044	CYD	$30	$751,333
3	Concrete - base slab - based on inside dimensions without	1,090	CYD	$1,000	$1,090,370
4	Concrete - walls/platform where are weir troughs and top w	1,024	CYD	$1,700	$1,740,800
5	Sludge Buffer Tanks				
6	Excavation/Slope Removal	2,000	CYD	$30	$60,000
7	Concrete - base slab - based on inside dimensions withou	56	CYD	$1,000	$56,296
8	Concrete - walls/platform - where are weir troughs and top	122	CYD	$1,700	$207,022
9	Pipe Gallery and Blower Building				
10	New Building Superstructure (Split-Face Block)	3680	SF	$700	$2,576,000
11	Footings for Walls	66	CY	$1,000	$66,370
12	Main Floor	204	CY	$1,200	$245,333
13	Retaining Walls 4-8 feet slope retained	300	LF	$890	$267,000
14	Aeration/Control Equipment				
15	Aeration Equipment - Mixers for EQ Tank?	1	LS	$5,700,000	$5,700,000
16	Aeration Equipment Installation	40	%	$5,700,000	$2,280,000
17	Valves	15	EA	$12,000	$180,000
18	Gates	6	EA	$50,000	$300,000
19	Grating/Walkway/Handrail	1	LS	$75,000	$75,000
20	Stairs	40	VLF	$2,000	$80,000
21	Gallery Piping	1	LS	$500,000	$500,000
23	Earthwork/grading	1	LS	$50,000	$50,000
24	Misc Metal	1	%	$162,000	$162,000
25	Misc Mechanical	5	%	$16,226,000	$811,300
26	Misc Painting	1	%	$16,226,000	$162,260
27	Electrical	15	%	$16,226,000	$2,433,900
	TOTAL COST				***$19,695,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**Aerobic Granular Sludge and Equalization**	CHECKED BY:	**DJB**
	Alternative 3.2	CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	AGS Tanks and Equalization				
2	Excavation/Slope Removal	5,000	CYD	$30	$150,000
3	Concrete - base slab	1,090	CYD	$1,100	$1,199,407
4	Concrete - walls/platform	1,024	CYD	$1,700	$1,740,800
5	Sludge Buffer Tanks				
6	Excavation/Slope Removal	0	CYD	$30	$0
7	Concrete - base slab	56	CYD	$1,000	$56,296
8	Concrete - walls/platform	122	CYD	$1,700	$207,022
9	Blower/Control Building				
10	New Building Superstructure (Split-Face Block)	3680	SF	$700	$2,576,000
11	Footings for Walls	66	CY	$1,200	$79,644
12	Main Floor	204	CY	$1,200	$245,333
13					
14	Aeration/Control Equipment				
15	Aeration Equipment	1	LS	$5,700,000	$5,700,000
16	Aeration Equipment Installation	40	%	$5,700,000	$2,280,000
17	Valves	15	EA	$12,000	$180,000
18	Gates	6	EA	$50,000	$300,000
19	Grating/Walkway/Handrail	1	LS	$75,000	$75,000
20	Stairs	80	VLF	$2,000	$160,000
21	Gallery Piping	1	LS	$500,000	$500,000
23	Earthwork/grading	1	LS	$50,000	$50,000
24	Misc Metal	1	%	$155,000	$155,000
25	Misc Mechanical	5	%	$15,500,000	$775,000
26	Misc Painting	1	%	$15,500,000	$155,000
27	Electrical	18	%	$15,500,000	$2,790,000
	TOTAL COST				***$19,375,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**Tertiary Filters**	CHECKED BY:	**DJB**
		CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Filtration Equipment (Three 6.0 MGD Filters)	1	LS	$1,100,000	$1,100,000
2	Equipment Installation	40	%	$1,100,000	$440,000
3	Concrete channel/slab	200	CYD	$1,200	$240,000
4	Grating	1	LS	$55,000	$55,000
5	Piping	1	LS	$75,000	$75,000
6	Fiberglass Covers	500	SF	$100	$50,000
7	Stairs	20	VLF	$2,000	$40,000
8	Fiberglass Access Chambers	2	EA	$35,000	$70,000
9	Handrail	175	LF	$100	$17,500
10	Misc Metal	1	%	$21,000	$21,000
11	Misc Mechanical	5	%	$104,000	$104,000
12	Misc Painting	1	%	$21,000	$21,000
13	Electrical	15	%	$311,000	$311,000
	TOTAL COST				***$2,545,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**Ultraviolet Disinfection and Reaeration**	CHECKED BY:	**DJB**
		CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	UV Disinfection				
2	UV Equipment w/ Install	1	LS	$743,750	$743,750
3	UV Channel	59	CYD	$1,200	$71,111
4	Grating	1	LS	$55,000	$55,000
5	Piping modifications	1	LS	$25,000	$25,000
6	Demolition	1	LS	$25,000	$25,000
7	Fill in/modify remaining tank	1	LS	$100,000	$100,000
8	Effluent Weirs/Troughs	1	LS	$35,000	$35,000
9	Reaeration				
10	FRP Covers and Diffusers	1	LS	$50,000	$50,000
11	4" Aeration Piping	200	LF	$250	$50,000
12	6" Aeration Piping	50	LF	$300	$15,000
13	Effluent Meter	1	LS	$20,000	$20,000
14	Reaeration Blowers	1	LS	$75,000	$75,000
15					
16	Misc Metal	1	%	$13,000	$13,000
17	Misc Mechanical	5	%	$64,000	$64,000
18	Misc Painting	1	%	$13,000	$13,000
19	Electrical	15	%	$190,000	$190,000
	TOTAL COST				***$1,545,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** **6/12/2024**

LOCATION: **Grand Ledge** **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL **DIU**

WORK: **Aerobic Digestion (Converted Aeration Basins)** **DJB**

13532

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Sludge pumps with valves/install	1	LS	$130,000	$130,000
2	Aeration/mixing equipment in existing tank with install	1	LS	$375,000	$375,000
3	Exist Aerations Basin modifications/rehab	1	LS	$155,000	$155,000
4	Demolition	1	LS	$75,000	$75,000
5					
6	Misc Metal	1	%	$8,000	$8,000
7	Misc Mechanical	5	%	$37,000	$37,000
8	Misc Painting	1	%	$8,000	$8,000
9	Electrical	15	%	$111,000	$111,000
	TOTAL COST				***$899,000***

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ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** **6/12/2024**

LOCATION: **Grand Ledge** **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL **DIU**

WORK: **Hydrated Lime Feed System** **DJB**

13532

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New Hydrated Lime Feed Silo and Pumps w/ installation	1	LS	$2,500,000	$2,500,000
2	Mixing Equipment	1	LS	$150,000	$150,000
4	Pipings Modification	1	LS	$150,000	$150,000
6	Demolition	1	LS	$75,000	$75,000
7					
8	Misc Metal	1	%	$29,000	$29,000
9	Misc Mechanical	5	%	$144,000	$144,000
10	Misc Painting	1	%	$29,000	$29,000
11	Electrical	15	%	$432,000	$432,000
	TOTAL COST				***$3,509,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT: **Grand Ledge WWTP and Collection System Improvements** **6/12/2024**

LOCATION: **Grand Ledge** **20221119**

BASIS FOR ESTIMATE: [X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL **DIU**

WORK: **Sludge Thickening** **DJB**

13532

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	New Building Superstructure (Metal Building)	1600	SF	$500	$800,000
2	Footings for Walls	49	CY	$1,200	$59,022
3	Main Floor	96	CY	$1,200	$114,667
4	Excavation - Removed	956	CY	$45	$43,000
5	Floc Tank Footings	7	CY	$1,200	$8,889
6	Sludge thickener with install/platform	1	LS	$375,000	$375,000
7	Sludge pumps (two) with install	1	LS	$100,000	$100,000
8	Polymer system with install	1	LS	$75,000	$75,000
9	Excavation/Demo For Building Footing	1778	CY	$50	$88,889
10	Sludge piping modifications in blower building	1	LS	$100,000	$100,000
11	Misc Metal	1	%	$17,000	$17,000
12	Misc Mechanical	5	%	$84,000	$84,000
13	Misc Painting	1	%	$17,000	$17,000
14	Electrical	15	%	$250,000	$250,000
	TOTAL COST				***$2,133,000***

ENGINEER'S OPINION OF PROBABLE PROJECT COST

2101 Aurelius Rd. Ste. 2A; Holt, MI 48842 Telephone: 517-694-7760

PROJECT:	**Grand Ledge WWTP and Collection System Improvements**	DATE:	**6/12/2024**
LOCATION:	**Grand Ledge**	PROJECT NO.	**20221119**
BASIS FOR ESTIMATE:	[X] CONCEPTUAL [ ] PRELIMINARY [ ] FINAL	ESTIMATOR:	**DIU**
WORK:	**West River Pump Station**	CHECKED BY:	**DJB**
		CURRENT ENR:	**13532**

	DESCRIPTION	QUANT.	UNIT	UNIT AMOUNT	TOTAL AMOUNT
1	Diversion Manhole				$0
2	Excavation and Backfill	39	CY	$50	$1,956
3	Base Slab	5	CY	$1,200	$5,867
4	Precast Structure	1	LS	$25,000	$25,000
5	Check Valve	1	EA	$6,400	$6,400
6	Restoration	1	LS	$15,000	$15,000
7	18" Sewer Removal and Replacement	10	LF	$220	$2,200
8	Dry Pit Pumps	3	EA	$60,000	$180,000
9	In Bldg. Piping	20	LF	$200	$4,000
10	Check Valves	3	EA	$6,000	$18,000
11	Plug Valves	3	EA	$8,000	$24,000
12	12" Meter	1	EA	$18,000	$18,000
13	Generator Upgrade	1	EA	$150,000	$150,000
14	FM Reeroute	1	LS	$20,000	$20,000
15	MH Ballasts	6	EA	$3,000	$18,000
	TOTAL COST				***$489,000***