ENGINEER'S REPORT

NYSDEC WASTEWATER TREATMENT PERMIT APPLICATION

CLOVEWOOD WASTEWATER TREATMENT PLANT
BLAGGS COVE
VILLAGE OF SOUTH BLOOMING GROVE
ORANGE COUNTY, NEW YORK

PREPARED FOR:

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1.0 INTRODUCTION

WSP USA Inc. (WSP) has prepared this Engineer's Report on behalf of Clovewood Transportation Corporation (CPC) in support of the State Pollutant Discharge Elimination System (SPDES) Application Form Private, Commercial & Institutional (P/C/I) Discharge of Treated Sanitary Sewage for the proposed Clovewood residential development.

This Engineer's Report presents the proposed Clovewood on-site wastewater treatment plant (WWTP) to be located in Blagg's Clove (TM Section 208, Block 1, Lots 2 & 3) within the Village of South Blooming Grove, Orange County, New York. This location is between the cross streets of Route 208 to the south and Round Hill Road to the north. The site was formerly occupied by the Lake Anne Golf Course until the 1990's and the Lake Anne Country Club cottage residences. These previous uses have been abandoned for at least 30 years.

2.0 DESCRIPTION OF WASTEWATER SOURCES

The Clovewood WWTP is being designed for an average daily flow of 256,760 gallons per day (gpd) with secondary biological treatment. This flow is consistent with the direction of the 2014 New York State Department of Environmental Conservation (NYSDEC) Design Standards for Intermediate Sized Wastewater Treatment Systems. The plant is being designed to meet the NYSDEC intermittent stream discharge standards, described in this report.

3.0 TREATMENT OBJECTIVES

The treated wastewater will be discharged to an un-named class C tributary to Satterly Creek located within the development site. This section presents the development of the treated effluent quality requirements.

3.1 Treated Effluent Permit Limits

In accordance with NYSDEC Division of Water Technical and Operational Guidance (TOGS) 1.3.5, a Waste Assimilation and Capacity (WAC) Analysis was completed for two potential sites for the proposed discharge from the new WWTP. NYSDEC has identified the intermittent stream effluent limits summarized in Table 1. These are considered preliminary effluent limits and will be finalized during detailed design and after the NYSDEC receives the State Pollution Discharge Elimination System (SPDES) application and all other required NYSDEC applications associated with the site have been submitted and deemed complete per Uniform Procedures Act (UPA) and State Environmental Quality Review (SEQR) has been satisfied.

TABLE 1: NYSDEC Intermittent Stream Effluent Limits

Parameter	Units	NYSDEC Intermittent Stream Effluent Limits
BOD_5, daily max.	mg/l	5
TSS, daily max	mg/l	10
Settleable Solids, daily max.	mg/l	0.1
pH	S.U.	6.5-8.5
Dissolved Oxygen (DO)	mg/l	min. 7.0
Ammonia, summer	mg/l as NH_3-N	1.5
Ammonia, winter	mg/l as NH3-N	2.2
Total Phosphorus (TP)	mg/l as P	0.5
Fecal coliforms 30-d geo. mean	CFU/100 ml	200
Fecal coliforms 7-d geo. mean	CFU/100 ml	400

mg/l: milligrams per liter

4.0 EXISTING TREATMENT FACILITIES

No existing treatment facilities exist on the site since this is a new residential development on a substantially undeveloped plot of land.

5.0 DEVELOPMENT OF TREATMENT FACILITY DESIGN PARAMETERS

Design was based on the standards and guidelines presented below:

- NYSDEC Design Standards for Intermediate Sized Wastewater Treatment systems, March 2014 (ISWTS).
- Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (GLUMBR) Recommended Standards for Wastewater Facilities (Ten State Standards), 2014 Edition.
- New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works –Technical Report-16 (TR-16), 2011.
- Wastewater Engineering, Metcalf & Eddy, 2004.

5.1 Design Flow

The Clovewood development project is a proposed 600 single-family residential lot subdivision with a total of 2,056 bedrooms. The average daily wastewater flow is based on an average water demand for the Clovewood project of 110 gallons per day per bedroom (gpd/bedroom). The average water demand for the proposed 600, three and four-bedroom residential units with a water usage of 110 gpd/bedroom is 226,160 gpd or 157.1 gallons per minute (gpm). There is also a Community Center/Bath House that accounts for an additional 9,600 gpd (1,200 persons at 8 gpd/person). Additional sources of waste flows originate from the Water Treatment Plants (WTP). These flows include backwash water from greensand

filters and from an iron/manganese removal system. Flow projections used to determine loading are presented in Table 2 below. The turbidity and suspended solids pretreatment processes for wells C-21 and C-23 will have a continuous wastewater loading of up to 15,000 gpd assuming the wells are in operation 24 hours per day. Average daily greensand filter backwash volume is calculated based on a seven-day (one-week) period assuming a typical backwash cycle of twice per week (6,000 gpd). The wastewater treatment facility will be designed to handle the wastewater at maximum build-out scenario, which will be at the selected average daily wastewater flow of 256,760 gpd based on the above-mentioned standard per-unit hydraulic loading rates. Peaking factors were estimated based on published curves used for estimating peak hourly flow rates from domestic sources.

TABLE 2: Design Hydraulic Loading

Water Usage	Units	Hydraulic loading rate per unit, gpd	No. of bedrooms / persons	Average daily flow, gpd
Single-family residence	Per bedroom	110	2,056	226,160
Community Center/Bath House	Per person	8	1,200	9,600
C-21 & C-23 Pretreatment Reject	--	--	--	15,000
Greensand Filter Backwash	--	--	--	6,000
TOTAL				**256,760**

It should be noted that the wastewater flow associated with the backwash cycles will vary depending on the operating cycles of the wells and will have an elevated total suspended solids (TSS) concentration; therefore, the hydraulic capacity used for wastewater treatment tankage and pretreatment uses the greatest possible backwash flow, 21,000 gpd, under the scenario that all greensand filter backwash on the same day.

5.2 Influent Wastewater Characteristics

Influent wastewater characterization is based on an average of the concentration ranges and the average daily flow (ADF) of 256,760 gpd from the domestic and water treatment sources. The influent wastewater characterization was based on mass loadings at 110 gpd per bedroom and typical average strength residential wastewater with the additional solids loading associated with the water treatment processes. A minimum design temperature of 10 degrees Celsius was selected based on the average winter wastewater temperature in the area of the Clovewood development. Table 3 presents a summary of the concentration ranges for each parameter.

TABLE 3: Influent Wastewater Characteristics

Parameter	Min. (mg/l)	Max. (mg/l)	Av. (mg/l)	Effluent limit (mg/l)	ADF loading rate, lbs./day at 256,760 gpd
Total Solids[1]	778	1369	1073		2,432
Total Volatile Solids	436	583	510		1,092
Total Suspended Solids[1]	241	513	378	10	857
Total Volatile Suspended Solids	171	412	292		625
5-day Biochemical Oxygen Demand	241	445	344	5	737
Chemical Oxygen Demand	778	1027	902		1,932
Total Nitrogen	40	117	79		169
Ammonia	6	20	13	1.5	27.8
Nitrates and Nitrates	<1	<1	<1	<1	<1
Total Phosphorus	9	19	14	0.5	30
Fats, Oils and Grease	109	163	136		291
Volatile Organic Compounds	0.2	0.5	0.3		0.64
Surfactants	14	28	21		45
Total Coliforms (MPN/100 mL)	1.00E+08	1.00E+10	5.05E+09	200	--
Fecal Coliforms (MPN/100 mL)	1.00E+06	1.00E+10	5.05E+07		--

1) Total solids and total suspended solids loading rate includes the maximum greensand filter backwash of 21,000 gpd for a total flow of 271,560 gpd.

6.0 ALTERNATIVES INVESTIGATION

This section provides a summary of the alternatives evaluation comparing MBR and SBR biological treatment for Clovewood WWTP. The alternatives were compared relative to both costs and non-costs criteria, as well as key advantages and disadvantages. The MBR costs were developed in 2023 by WSP. SBR costs were prepared by others and subsequently reviewed and updated to reflect 2023 costs.

6.1 Alternative 1: Membrane Bioreactor (MBR) Process

A membrane biological reactor (MBR) combines a conventional activated sludge reactor followed by a membrane filtration stage replacing a conventional secondary clarifier. The basis-of-design equipment is a suspended-growth bioreactor. It is a two-stage arrangement having an anoxic stage to remove nitrogen from nitrates to nitrogen gas, followed by an aerobic stage to remove organic matter and oxidize ammonia to nitrate. This process differs from conventional activated sludge in that a very high concentration of mixed-liquor suspended solids (MLSS) is maintained allowing the MBR process to operate at very low loadings and high solids retention times (SRTs). The membrane filtration following the bioreactor provides the treatment mechanism that result in a smaller footprint than conventional activated sludge systems.

This alternative has the following advantages and disadvantages:

Advantages:

- Excellent effluent quality compared to other activated sludge technologies.

- Provides high level of treatment in the bioreactor along with suspended solids retention by the membrane to result in a highly refined effluent with very low levels of biochemical oxygen demand (BOD) and total suspended solids (TSS);
- Occupies smallest footprint compared to conventional activated sludge technologies;
- Ease of operation, system can accommodate varying flows and loads;
- Low solids generation;
- Provides phosphorus removal to meet SPDES limits without additional filtration system;
- Stable process; and
- Expandability and ability to be constructed in phases based on development buildout.

Disadvantages:

- High O&M requirements for membrane cleaning and replacement;
- Additional chemicals required for CIP process; and
- Complexity of Instrumentation and Controls (I&C) compared to SBR technology.

6.2 Alternative 2: Sequencing Batch Reactor (SBR) Process

The Sequencing Batch Reactor (SBR) is an activated sludge process where various treatment steps occur in a single vessel. The steps- primary clarification, aeration, secondary clarification- are separated by time rather than space. It is otherwise identical to other activated sludge processes. The different process steps are created in an SBR by controlling process equipment such as aerators, mixers, pumps, and decanters during specific timed cycles. This is accomplished by the use of timed electronic controls. The timing and sequencing of events in an SBR cycle depend on the influent wastewater characteristics and treatment objectives. The batch kinetics with adjustable process event times allows greater flexibility compared to conventional activated sludge systems.

As noted, all treatment steps take place in a single vessel. There are somewhat fewer outboard mechanical components to operate and maintain. Because the settling is done in a batch process, ideal settling conditions are achieved, and the tanks are not subject to short-circuiting and density currents common in conventional, continuous flow secondary sedimentation/ clarification processes.

The SBR system operates in a plug flow condition, which achieves rapid biodegradation of the organic load resulting in shorter reaction time. If necessary, the operator can vary the residence time of the various cycles to accommodate varying hydraulic and organic loads without equipment or basin modifications.

This alternative has the following advantages and disadvantages:

Advantages:

- Simple process, easy to automate and requires less operator attention compared to MBR;
- Provides large operational flexibility; and
- Can accommodate varying flows.

Disadvantages:

- Large tank volumes required compared to MBR alternative;
- Equalization tank is required for the effluent; and
- Requires addition of tertiary filter to meet phosphorus limits.

6.3 Alternatives Evaluation Criteria

The evaluation criteria for the alternatives included:

- Ability to consistently meet SPDES permit limits;
- Sustainability / Utility requirements;
- Expandability for future flows;
- WWTP Footprint requirements;
- Chemical requirements;
- Quantity of sludge and residuals generated and ease of sludge handling;
- Automation and process control;
- Maintenance requirements;
- Ease of operation;
- Constructability; and
- Performance guarantee.

6.4 Comparison of Costs

Table 4 presents a comparison of the capital and O&M costs for the two alternatives. The total cost is also shown for comparison. The total costs are within approximately 15% of one another.

TABLE 4: Cost Comparison Summary

Alternative	Description	Capital Cost	Annual O&M Cost
1	MBR	$13,205,000[1/]	$640,000[1]
2	SBR with cloth media filter	$13,268,228[2/]	$667,583[2]

1 Construction cost estimate, 2023
2 2015 cost escalated to 2023 based on inflation data published the Federal Reserve Bank of Minneapolis.

6.5 Alternatives Selection

- Alternative 1 MBR had a capital cost of $42.60/gallon and O&M cost of $2.06/gallon.
- Alternative 2 SBR had a capital cost of $42.80/gallon and O&M cost of $2.15/gallon.

- Alternative 1 and 2 capital costs have an approximately $0.20 difference. The cost comparison was based on 2015 data previously submitted with a previous report prepared by others, escalated to mid-2023 costs as noted.
- It was recommended to proceed with the design for the MBR system as it provides the highest quality effluent consistently meeting the current SPDES discharge limits proposed by NYSDEC for intermittent streams.

7 DESIGN OF TREATMENT SYSTEM

This section provides a summary of the WWTP conceptual design based on the MBR process as selected in Section 6.

7.1 Treatment System Overview

This section provides a summary of the WWTP conceptual design employing the membrane biological reactor (MBR) process. The proposed WWTP utilizes a MBR for BOD and TSS removal and nitrification. Influent passes through a two-stage screening system prior to entering the MBR system. The MBR process is a two-stage suspended growth anaerobic/aerobic biological treatment system featuring biological reactors (bioreactors), followed by separation and retention of the MLSS in the bioreactor by using membrane filtration. MBR permeate will be re-aerated and treated by UV disinfection before discharging to a Class C tributary to Satterly Stream on the development site.

The major processes and equipment are as follows:

- One bar screen and grit removal system with Parshall flume influent metering.
- Two (2) Fine Screens (2 mm (millimeter) perforated plate openings) for MBR protection.
- Two (2) Bioreactor/Aeration Tanks with fine bubble diffused aeration and blowers.
- Two (2) Membrane Cassette Tanks (includes membrane modules in series, feed and recycle pumps, and scour blowers).
- Membrane Cleaning System – Clean-in-Place (CIP) tank, circulation pumps, chemical storage tanks, and feed pumps to the CIP tank.
- pH correction and nutrient chemical feed systems.
- Aerated sludge holding tank, with course bubble diffusers and blower.
- Sludge dewatering press with polymer feed system.
- In-channel ultraviolet (UV) disinfection.
- Post Aeration Tank and Blower.
- Effluent pump station.

A steel building will be provided to house the 2 mm fine screens, anoxic, aerated, and membrane concrete tankage, permeate pumps, UV disinfection reactors, MLSS recycle pumps, aeration blowers, scour blowers, membrane system compressor and dryer, and membrane cleaning systems. A non-classified

location within the building will contain the motor control center (MCC) and laboratory area/office. A separate sludge processing building with odor control will be provided for the sludge handling equipment.

Appendix I includes a process flow diagram and site plans for the Clovewood WWTP. As shown in the FEMA Flood Insurance Rate Map in Appendix II, the proposed WWTP is located well above the 500-year flood plain and enjoys minimum risk of process interruption or overflow during flooding. The WWTP has a minimum 150-foot setback distance from any inhabited structure as recommended in NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems, March 2014 for the referenced treatment equipment.

7.2 Process Sizing and Descriptions

7.2.1 Influent Headworks

The raw wastewater will flow from the sewer collection system to the head of the WWTP by gravity. The influent headworks facilities will provide pretreatment to remove solids in the influent to protect downstream pumps, valves, pipes, and other appurtenances from damage and clogging.

The headworks system will provide one stage of influent coarse screening/grit removal followed by fine (2 mm) automatic screens with screenings washing and dewatering. Two units of combined headworks system will be installed; each sized to accommodate the design peak hourly flows with the inclusion of any WWTP drainage or return flows. An emergency bypass to the manually cleaned bar screen will be provided.

The influent headworks will consist of the following components:

- Manually cleaned bar screen/ grit chamber;
- Parshall flume influent metering;
- 2 mm automatic fine screens with screenings washing and dewatering system;
- Utility water connection and hose station for washdown; and
- Dumpster area for washed/ dewatered solids storage and ultimate removal.

Screenings will be discharged to dumpsters located adjacent to the machines. An access platform for inspection and maintenance of the screens will be provided. The design criteria for the headworks are presented in Tables 1 and 2. Equipment cut sheets are included in Appendix III.

TABLE 5: Bar Screen Data

No. of Screens	1 Operating with Emergency Bypass Channel
Vendor Basis of Design	ParkUSA BSQ-24 screen
Hydraulic Capacity	1.4 MGD (peak hour)
Screen Type	Manual bar screen

Screen Size	1-inch
Screenings Handling	Manual rake with removable screenings basket

7.2.2 Fine Screens

The headworks effluent will flow through a set of fine screens providing additional protection to the MBR downstream of the headworks. Two (2) fine screens (2 mm perforated plate openings) will be provided; each unit has the ability to independently operate and treat the design peak hourly flow.

The design criteria for the fine screens are presented in Table 2. An equipment cut sheet is included in Appendix III.

TABLE 6: Fine Screen Data

No. of Fine Screens	1 Operating, 1 Installed Standby
Vendor Basis of Design:	Huber ROTAMAT RPPS Perforated Plate Screen
Hydraulic Capacity:	1.4 MGD (peak hour)
Screen Type:	Rotary Drum
Screen Size:	2 mm perforated
Controls:	Vendor supplied control panel
Screenings Handling:	Integral washing / compaction with screenings bagging
Water supply required:	25 gpm @ 80 psi per screen

7.2.3 Membrane Bioreactor Tanks

After screening and grit removal, the wastewater will flow to the membrane biological reactor (MBR) biological treatment system. Influent from the drum screen flows into a wet well where the flow is pumped to the MBR system. Two conventional rail-mount submersible pumps will be provided of the same size (594 gpm each) and have capacities such that with one unit out of service the remaining unit will handle the design average flow, and two pumps can handle the peak hourly flow.

TABLE 7: Influent pumps and wet well

HRT @ Average Daily Flow	15 min.
Tank Volume	6,000 gallons
Tank Working Volume	802 CF
Tank Depth (below invert)	6.0 FT
Tank Width & Length	12 FT

From the wet well, the wastewater will be split between the two anoxic stage/aerated stage tanks for BOD removal and nitrification. Treated water from the aeration tanks will enter the MBR cassettes tanks for ultrafiltration.

Two trains of MBR cassette tanks are sized to allow:

- One of the two trains capable of treating average daily flow;

- One of the two trains capable of treating the maximum monthly flow for a one-week period (maximum monthly flow assumed with a peaking factor of 1.25 to the average daily flow);
- Both trains capable of treating the maximum daily flow for one day; and
- Both trains capable of treating peak hourly flow for duration of one hour.

Permeate from the MBR system is pulled through the membranes via permeate pumps and directed to the post aeration tank. Recycle pumps return the sludge from the membrane cassette tanks to the aeration tanks, where it is mixed with the incoming influent screened wastewater. Excess sludge will be wasted from the system to the sludge storage tank using the recycle pumps. The biological treatment system will have the volumes noted in Table 4 below. The working depth of all tanks is 15 feet, not including freeboard. These tank sizes are consistent with those presented in the Veolia proposal included in Appendix III (please note this vendor proposal is to be updated by the manufacturer to reflect an ADF of 256,760 gpd).

TABLE 8: MBR Tank Volumes

Tank	No. of Tanks	Volume per Tank (gallon)	Total Volume (gallon)
Anoxic Tank	2 duty, 1 future use	11,109	22,219
Aeration Tank	2 duty, 1 future use	138,249	276,498
Membrane Tank	2 duty, 1 future use	13,150	26,300

Aeration Tanks:

Under normal operation, the MLSS concentration in the aeration tanks is 8,000 mg/l +/-. The aeration tanks are equipped with fine bubble aerators, piping, and control valves to deliver the required range of air rates. Each grid will be fed by a drop leg having a motor operated butterfly valve for open/close service.

Aeration air is provided by positive displacement (PD) blowers with controls (2 duty, 1 standby). The blowers will be located within the WWTP building and provided with piping to the respective aeration tanks.

The tanks will have a dissolved oxygen (DO) probes and transmitters for measuring and reporting DO (ranging from 0 to 14 mg/l). A pH probe and transmitter (ranging from 0 to 14 standard units) will also be placed in each aeration tank. A level element with indicating transmitter (ranging from 0 to 15 feet) and a high-high alarm float switch will also be provided in each tank. The data from these instruments will be displayed on the electronic control system display.

All tanks may be drained using nut-operated mud valves accessible from the tank access walkways. Components of the aeration system are provided in Table 5 below. Detailed design criteria and control for these components will be provided by the membrane system supplier as the next design phase is developed.

TABLE 9: Aeration System Data

Number of Aeration Tank	2 duty, 1 future use
Tank Dimension	62’ long x 20’ wide x 15’ deep, each
Type	Fixed Floor PVC Flexible Membrane, Fine Bubble Diffusers, Tapered Arrangement, Nominal 9-in. Diameter.
Aeration control	One Motor Operated Butterfly Valve for drop leg, Open/Close service
Design Air Flow Range per Tank	365 scfm @ 8.8 psig
Number of Blowers	3 (2 operating, 1 standby)
Location	WWTP Building
Type	Rotary Lobe Positive Displacement
Sound Enclosure	Manufacturer’s standard sound attenuation enclosure included
Silencers	Inline
Motor	30 hp each

pH Adjustment System:

A pH control system will dose sodium hydroxide into the aeration tank in order to maintain a desired pH for optimal biological performance. The MBR system is estimated to require approximately 60 gallons/day of 50% caustic solution. The WWTP Building will include two caustic totes with secondary containment to provide 11-day storage. The chemical system will be designed to meet the requirements of 6 NYCRR Parts 595-599 for storage and handling of hazardous substances.

TABLE 10: pH Adjustment Data

Caustic	Sodium Hydroxide
Feed Rate	60 gal/day (design estimate)
Tote Capacity	Two (2) 330 -gallon for 11-day storage

Coagulant Addition System:

The coagulant (alum) dosing system will be provided to feed aluminum sulfate to assist in precipitating phosphorus in the mixed liquor. The precipitate will be filtered in the membrane cassette tanks, preventing the precipitated phosphorus and aluminum from entering the effluent stream. Basic details are presented in Table 11.

TABLE 11: Coagulant Addition Data

Coagulant	Alum (Aluminum Sulfate)
Feed Rate	350 lbs./day of dry chemical
Tank Capacity	840 gallons for 14 day storage

Membrane Cassette Tanks:

Each membrane cassette tank will have a volume of 13,150 gallons. Flow control is via motor operated sluice gates. The tank inlets will be provided with energy dissipating baffles. Each cassette tank will accommodate two membrane cassettes, a level element with indicating transmitter (ranging from 0 to overflow height), a high-high and low-low level float switch, and a motor operated outlet sluice gate. In case draining is required for cassette removal, each tank will be equipped with a motor-operated mud valve accessible from the tank access walkways. Basic details are presented in Table 12. For removal and maintenance of the membranes, either an overhead or jib crane will be included.

TABLE 12: Membrane Cassette Design

Vendor Basis of Design	Veolia
Number of Membrane Tank	2 duty, one future use
Tank Dimensions	15’ long x 9’ wide x 15’ working depth each
Number of Cassettes	4 (2 per Membrane Tank)
Number of Modules	184 (92 per Membrane Tank)
Type	Hollow Fiber, ZeeWeed 500d
Frame Type	Self-Contained
Materials:	Type 316 Stainless Steel

Scour Blowers:

The Scour Blowers will be located in the WWTP building. Both are identified as duty blowers and will be located adjacent to the membrane tanks. Since there is a spare aeration blower provided, this may be used as the spare scour blower. Basic details for the scour blowers are presented in Table 13.

TABLE 13: Scour Blower Information

Number of Blowers	2 (2 Operating, common spare with aeration blower)
Location	WWTP Building
Type	Rotary Lobe Positive Displacement
Capacity	442 scfm @ 6.5 psig
Motor	20 hp
Sound Enclosure	Manufacturer’s standard sound attenuation enclosure included
Silencer	Inlet

Permeate Pumps & Tank:

The permeate pump system is part of the Veolia-supplied equipment package. It consists of a skid mounted system having two pumps, one each per membrane assembly. A spare shelf unit will be provided. These pumps convey biologically treated effluent through the membrane cassettes and discharge permeate to the post-aeration tank. The membranes separate the sludge portion of the wastewater from the liquid (treated) portion. The permeate pumps will operate across the entire flow range using variable frequency drives (VFDs) and are capable of providing flow at 1.15 times the peak hour rate. Permeate pump speed is controlled to match the influent flow, and automatically adjusts flow to maintain the set operating level in the membrane cassette tanks.

Mixed Liquor Recycle Pumps:

Mixed liquor will be recycled by the Mixed Liquor Recycle (MLR) Pumps from the Membrane Cassette Tanks to the Aeration Tank. Two operating MLR pumps will be provided by the membrane supplier, with one shelf spare. Flow will be recycled through two return lines, each connecting to the Aeration Tank. Sludge wasting will be accomplished by periodically diverting the mixed liquor from the recycle return line, via manual control. Basic details are presented in Table 14. Detailed design criteria and control for the pump will be provided by the membrane system supplier in the next design phase.

TABLE 14: MLR Pump Design

Number of Pumps	3 (2 duty with 1 spare provided)
Design Capacity	922 gpm @ 10 ft TDH
Horsepower	10 HP

Membrane System Compressor and Dryer System

Two duty and one standby compressors with air filter/dryers will be provided as part of the Veolia scope of supply. These compressors supply compressed air to operate the membrane system pneumatically-operated valves, the sludge dewatering unit, and any other membrane system pneumatically-operated equipment. These units will be located in the WWTP Building. Details of this system is included in the Veolia scope of supply.

Membrane Cleaning System

A membrane cleaning system will be provided as part of the Veolia scope of supply. Membrane cleaning will be manually initiated. Two separate systems, one each for citric acid and one for sodium hypochlorite are provided. The sodium hypochlorite (bleach) removes organic matter from the membrane to prevent fouling. The citric acid removes inorganic scale such as mineral deposits and salts from the membrane. The chemical day tanks will be in the WWTP Building, and will be 55-gallon drums with containment pallets. Additional chemical storage is available in a dedicated space in the sludge process building to provide a 14-day supply.

The chemical systems will be designed to meet the requirements of 6 NYCRR Parts 595-599 for storage and handling of hazardous substances. An eyewash and emergency shower will be provided in the WWTP building. To treat membrane-cleaning waste, it will be neutralized with mixed liquor, drained, and

pumped back to the head of the plant. During a cleaning cycle, the permeate pumps will provide back-pulse pressure to the membrane cassette tanks.

7.2.4 Post Aeration

The MBR permeate, which is clear water at this point, will be conveyed to a 29,200-gallon post-aeration tank using the permeate pumps. This tank will provide a 30-minute hydraulic retention time at peak daily flow conditions. The design air supply is 20 standard cubic feet per minute (scfm) per 1,000-gallon capacity. This volume is per the NYSDEC Design Standards for Intermediate Sized Wastewater Treatment Systems, March 2014. A diffused aeration system will provide 585 scfm air to increase the dissolved oxygen concentration in the wastewater to 7 mg/l or greater prior to the stream discharge.

The post-aeration tank will have fine bubble aerators to deliver the required range of air rates. Compressed air supply is via a positive displacement (PD) blower system comprised of one duty and one standby blower. The blowers will be located in the WWTP Building with piping to the tank. To measure the dissolved oxygen (DO) concentration, the tank will have a DO probe and transmitter for measuring and reporting DO (ranging from 0 to 14 mg/L). Additionally, a level indicating transmitter and a high-high float switch will be provided in the tank. To prevent short-circuiting, the tank will have a baffle or weir at the discharge outlet. Design criteria for post aeration system are shown in Table 15.

TABLE 15: Post-Aeration System Information

Number of Aeration Tank	1
Hydraulic Retention Time	30 min at peak hourly flow rate
Tank Volume	29,200 gallons
Tank Dimension	20 x 20 x 10 (LxWxH), ft
Type:	Fixed Floor PVC Flexible Membrane, Fine Bubble Diffusers, Tapered Arrangement, Nominal 9-in. Diameter.
Design Air Flow:	585 scfm
Control:	One Motor Operated Butterfly Valve for drop leg, Open/Close service
Number of Blowers:	2 (1 operating, 1 standby)
Location:	Process Control Building
Type:	Rotary Lobe Positive Displacement

7.2.5 Ultraviolet Disinfection

The effluent from the post-aeration tank will flow to the ultraviolet (UV) disinfection system prior to flowing to the effluent pump station. Two pumps will be provided of the same size (594 gpm each). Each pump has sufficient capacity to allow a single pump to convey the WTDF with one pump out of service and two pumps are sized the peak hourly flow.

The UV disinfection system consists of a single 17’ long x 24.5” wide x 72” depth channel, with two UV modules. The two lamp modules are mounted in series for reliable disinfection. The duty/standby configuration that ensures disinfection will not be interrupted during cleaning or lamp replacement. An array for 40 lamps are provided in each module, designed to provide a minimum dose at peak hourly flow no less than 30,000 Mw-s/cm^2. The lamps are 165-watt low pressure, high intensity type having a 13,000-hour warranty and electronic ballasts.

The UV system will have a clean-in-place system to eliminate fouling of the outer quartz lamp tubes. The automatic wiping system is automatically cycled once daily. Wipers require replacement once every two years.

The design criteria for the UV Disinfection System is presented in Table 16 and are based on 10 States Standards. The UV equipment cut sheet is included in Appendix III.

TABLE 16: UV Disinfection System Information

Peak Design Flow:	37,125 GPH
Performance:	< 200 CFU/100 mL (30 days geo mean) < 400 CFU/100 mL (7 days geo mean)
Number of Units:	2 (1 duty, 1 installed standby), in series
Number of Lamps	80 (40 per module)
Minimum UV Dose:	30,000 μW-s/cm^2
Ultraviolet Transmittance:	65% UVT (minimum)
Vendor Basis of Design:	Ozonia, Aquaray® 40 HO Vertical Lamp System

7.2.6 Aerated Sludge Holding Tank

A 65,263-gallon Aerated Sludge Holding Tank (23' Diameter x 15' depth) will contain the waste activated sludge (WAS) from the MBR process tanks. The tank is sized to provide greater than 3 days of hydraulic retention time at maximum month's sludge production rate. The design air supply is 40 scfm per 1000 cubic feet (cf) of sludge, as specified in Wastewater Engineering, Metcalf & Eddy, 2004. Fixed air diffusers will provide 250 scfm air to keep the sludge fresh prior to discharge to processing. Compressed air will be provided by positive displacement blower systems in a one duty/ one standby configuration. The blowers will be located in the WWTP Building and provided with piping to the tank. The design criteria for the sludge tank is presented in Table 17.

TABLE 17: Aerated Sludge Holding Tank Information

Number of Aeration Tank	1
Hydraulic Retention Time	3 days or greater at maximum month sludge production rate
Tank Volume	65,263 gallons
Tank Depth	15 ft
Tank Diameter	23 ft
Type	Fixed Floor PVC Flexible Membrane, Fine Bubble Diffusers, Tapered Arrangement, Nominal 9-in. Diameter.
Design Air Flow	250 scfm
Control	One Motor Operated Butterfly Valve for drop leg, Open/Close service
Number of Blowers	2 (1 operating, 1 standby)
Location	Process Control Building
Type	Rotary Lobe Positive Displacement

7.2.7 Belt Filter Press

Sludge from the sludge storage tank will be convey to the sludge press by duplex, flooded suction sludge pumps. Each pump is rated 50 gpm at 30' total dynamic head (TDH) and will be located near the tank. The Belt Filter Press will be located in the adjoining Sludge Process Building. Dewatering of sludge in a belt filter press is two cycles process consisting of a drain and a squeeze cycle. The belt filter press consists of two converging belts mounted on rollers. The lower belt is made of fine wire mesh and is porous.

As the sludge is moved along the belt, the entrained water is drained to a receiving pan. The sludge then passes through the press zone where converging belts and rollers compress and dewater the sludge. A belt tensioning and alignment system automatically adjusts to variations in sludge feed for consistent output. The belt with is 600 cm. The dewatered sludge cake is discharged through an inclined discharge ramp. The filter cake will fall into a sludge roll-off container located under the press. A wash water pump and spray nozzles automatically clean the belts.

The Sludge Process Building includes two 125-gallon day tanks of polymer. A liquid polymer make-down station will provide polymer feed to the suction side of the belt filter press feed pumps. The feed system allows for the proper polymer concentration by varying water flow and neat polymer flow. The polymer make-down station is a commercially available system including chemical feed pump, check valve, rotameter, pressure gauges.

A flowmeter will be provided on the filtrate discharge piping. When the filtrate discharge decreases to a set rate, an alarm will indicate the completion of the filter cycle. Alternatively, the press could be operated by a timer, based either on operator experience or on a target pressure. Filtrate will be pumped to the head of the MBR by one stainless steel, centrifugal pump. The design criteria for the sludge press are presented in Table 18. An equipment cut sheet is included in Appendix III.

TABLE 18: Sludge Filter Press Information

Number of Filter Press	1
Type	Belt Filter Press
Capacity	50 gpm, 30 psi (max pressure differential)
Size	0.6-meter effective belt width
Power Requirements	1.5 HP Belt Drive Unit, 1 HP Hydraulic Unit
Wash water	18 gpm at minimum 85 psi
Material	Skid mounted on galvanized carbon steel skid
Polymer Consumption	Approx. 10 lbs active polymer/dry ton of sludge
Polymer Storage	Two (2) 125-gallon tanks for one day storage each
Vendor Basis of Design	Ashbrook Klampress KP05

7.2.8 Effluent Disposal

Effluent from the UV channel will flow by gravity to the effluent pump station. This station will operate under conventional float level control. The WWTP effluent will be discharged via a force main and outfall to the un-named Class C tributary to Satterly Stream (Water Index No. H-89-17-4) located on the development site, as described in Section 3.1. The outfall will be an exposed, free-flow outfall on the side of the tributary.

7.2.9 Odor Control

An odor control system will be provided for the WWTP building and Sludge Process Building. A granulated activated carbon (GAC) based system has been selected for this function. The system will consist of fiberglass reinforced plastic (FRP) carbon vessels, grease filter/mist eliminator, demister, volume damper, collection ductwork, and propeller type makeup air fans. The odor control system will exhaust treated foul air from the Sludge Handling Building and the vents of the dewatering unit, as required.

7.2.10 WWTP Building

The WWTP Building will be of all steel construction and 100’ x 150’ in size, accommodating the following equipment:

- Fine screens;
- Influent pump station;
- Process tanks;
- Mixed Liquor Recycle Pumps;
- Aeration Blowers;
- Scour Blowers;
- Post Aeration Tank and Blowers;
- Sludge Holding Tank Blowers Membrane System;
- Air compressor and dryer system;
- Membrane Cleaning System;
- Sludge storage tank and sludge pumps;
- UV disinfection equipment
- Electrical equipment including the MCC and control system;
- Laboratory area;
- Office; and
- Rest Room.

7.2.11 Sludge Handling Building

The Sludge Handling Building will be provided for the sludge handling equipment (belt filter press and polymer feed system) and equipped with a GAC odor control system similar to the WWTP building. The sludge processing building will have a dedicated chemical storage area designed to meet the requirements of 6 NYCRR Parts 595-599 for storage and handling of hazardous substances.

7.3 Hydraulic Analysis

A schematic of the proposed treatment system hydraulic profile is attached as Appendix I – Conceptual Design Plans.

Raw sewage will flow by gravity to the WWTP through a collection system serving the development. The influent headworks convey flows through a bar screen, Parshall flume, fine screens, and then enters a wet well by gravity. Pumps will be installed to pump the wet well to the MBR system. Permeate of the MBR system will be pumped to the post-aeration tank. Post-aeration effluent will be pumped to the UV disinfection units and the UV effluent will be discharged by the effluent pump station and force main to an un-named Class C tributary to Satterly Creek located near the WWTP site.

Pipe systems will be designed to accommodate manufacturer's recommended velocities for the specific pipe material, generally below 5 ft/s for plastic pipe such as PVC. Gravity pipes will be designed per 10 States Standards to provide a minimum velocity of 2 ft/s when flowing full.

7.4 Residuals Handling

Waste streams generated in the new treatment system will include:

- Wash-water from 2 mm fine screens
- Wasted Activated Sludge (WAS) from the MBR

The waste streams will be directed to the aerated sludge solids holding tank and will be directed to solids handling facilities to dewater and thicken. Residual solids will be hauled away off site.

7.5 Control Strategy

The new treatment facilities will be designed to operate automatically using a manufacturer-supplied programmable logic controller (PLC) based control system. The system will have the capability to generate local and remote alarms in the event of equipment failures. The control system will be provided with an internet connection to allow for remote diagnosis of operational problems by the manufacturer. The control system will have an auto-dialer to alert the operator of various alarm conditions.

7.6 Chemical Addition, Storage and Containment

The sodium hydroxide, citric acid and sodium hypochlorite systems will be designed to meet the requirements of 6 NYCRR Parts 595-599 for storage and handling of hazardous substances. The coagulant (alum) and sludge thickening polymer will be stored in manufacturer-supplied containers on a containment pallet that provides 110% containment. Refer to Section 7.2.11 for a description of the dedicated bulk chemical storage area.

7.7 Electrical Requirements and Emergency Power

Utility electrical power will be supplied to the WWTP via the looped medium-voltage underground distribution system serving the general site. A pad-mount transformer on the north side of the WWTP building reduces the 13.8 kV utility voltage to the 277/480 volt service required by the process equipment.

The secondary conductors will be routed to the WWTP building switchgear via underground conduit. Emergency power is required for the proposed treatment facilities. The standby generator will be located in proximity to the utility transformer. An automatic transfer switch (ATS) will be located in the MCC. As there is no natural gas service planned for the development, a diesel generator package with integrated fuel tank with secondary confinement will be provided. At this stage of design the transformer and generator required rating is 150 kVA.

7.8 Operator and Laboratory Requirements

The chief operator of the WWTP is required to hold a NYSDEC "A" certification. It is anticipated that contract operators will be employed. The operator will be responsible for monitoring all aspects of plant performance, supervising chemical delivery, performing routine preventative maintenance, repairing equipment, and reviewing operational data to ensure compliance with the SPDES permit. The operator must be aware of the special health and safety requirements associated with the chemicals used in the treatment process.

A laboratory sink and counter will be provided in the control room. However, we anticipate that all sample analysis will be performed by a certified analytical laboratory. Samples will be collected by the operator following the required protocols.

7.9 Cost Estimate

Equipment suppliers were contacted to develop preliminary sizing, list of major equipment and equipment costs in December 2022 to June 2023 based on the design basis established above. Equipment quotes and catalog information from the suppliers contacted are provided in Appendix III.

The capital cost for the WWTP in year 2024 dollars is estimated as $13,205,474. The annual O&M costs in year 2024 dollars is estimated at $639,948 per year. The estimated capital costs were developed as follows:

- WSP obtained equipment quotes for each of the major treatment processes.
- Installation was estimated at 20% of equipment costs, based on historic data and industry standards for typical plants of similar size and complexity.
- Non-component costs including: electrical, piping, instrumentation and controls (I&C), coatings, and civil site work were estimated based on factors or percentages of equipment costs. These factors account for standard installation commodities, accessories, steel supports and standard testing support.
- Building costs were estimated based on similar projects in the area based on WSPs recent experience.
- Indirect costs were estimated based on the percentages and allowances shown.
- Prime contractor mobilization/demobilization allowance to include a site trailer, site support equipment, power drop and temporary utility connections.
- Contract overhead includes the following:
    - Part time – Project management support, project controls, procurement, quality and safety support.

- Full time – Site construction manager (CM), site administration, and travel allowance.

- The cost escalation estimate assumed 24-month construction schedule starting in 2024. At the time of this report, the construction industry has experienced three years of dramatic price escalation. Because of the compounding effect, material prices are at least 25% to 28% higher than they would have been by equivalence in the year 2020. Due to this effect and the uncertainty of future escalation rates, a contingency of 30% was included for the remaining equipment items and non- component costs.

8 FINAL EFFLUENT CHARACTERISTICS

8.1 Mass Balance Summary

Based on information provided from vendors, the estimated removal rates and residuals production through the proposed WWTP were calculated and effluent quality was estimated. Appendix IV presents a mass balance for the proposed wastewater treatment processes based on the average design flow.

9 OPERATIONS AND MAINTENANCE MANUAL AND WET WEATHER OPERATING PLAN

An Operations and Maintenance (O&M) Manual will be developed and submitted to NYSDEC during the detailed design phase. The proposed Clovewood WWTP is not expected to suffer any significant inflow and infiltration (I&) condition from stormwater runoff or groundwater infiltration. Accordingly, a Wet Weather Operating Plan (WWOP) is not required.

10.0 SCHEDULE OF CONSTRUCTION

Construction of the new wastewater treatment plant will occur along with the construction of the Clovewood Development. The construction period estimate is 2 years following the permitting approval.

11.0 FINAL INSPECTION

A firm acting as the Owner's representative will be conducting an inspection and certifying to NYSDEC that the Clovewood WWTP has been fully completed in accordance with the approved engineering report, plans and specifications, SPDES permit, and letter of approval.

12.0 CLOSURE REQUIREMENTS

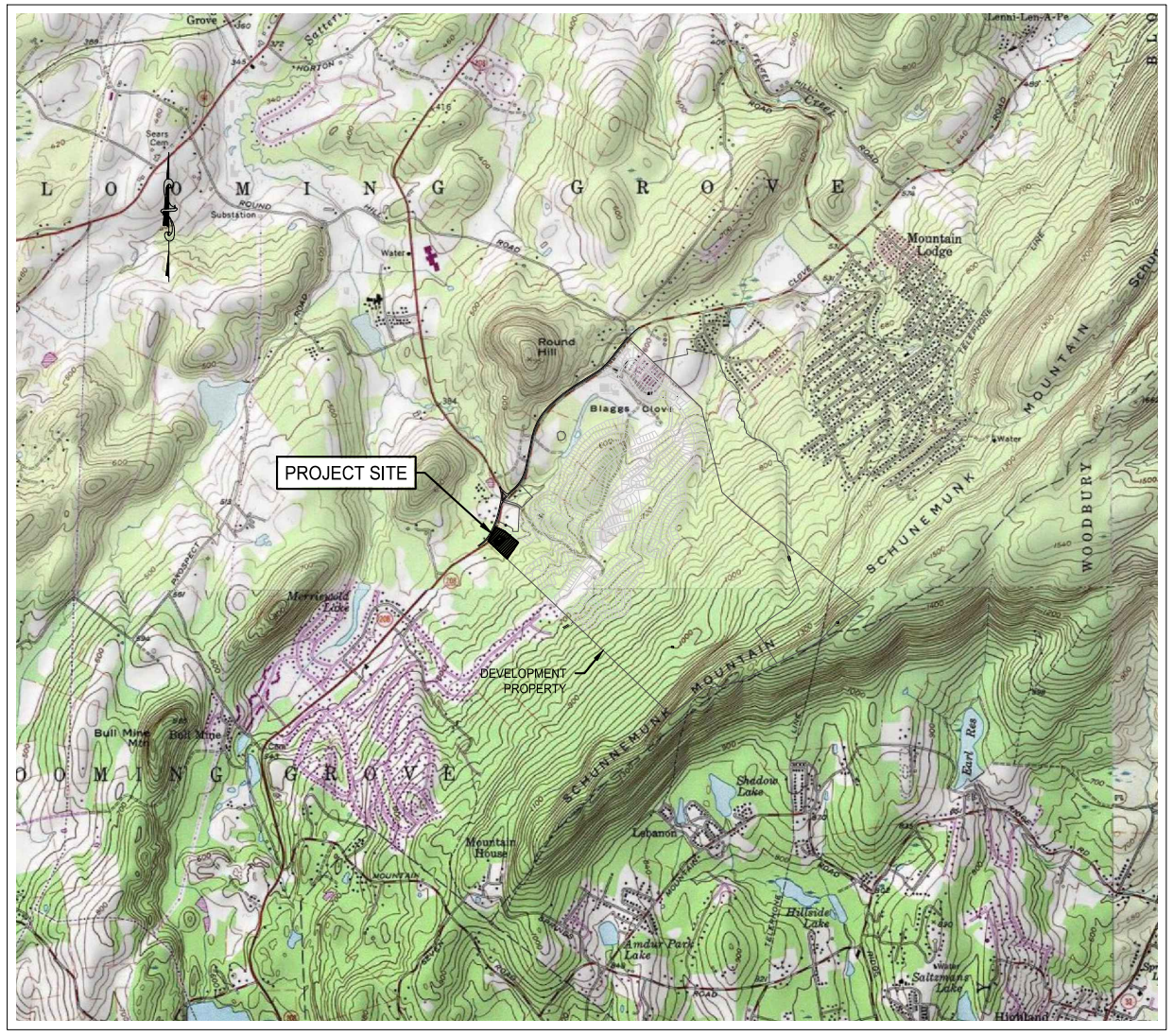
This section is not applicable as there is no disposal system closure involved in this new construction project.

APPENDIX I

VILLAGE OF SOUTH BLOOMING GROVE
BLAGGS CLOVE, ORANGE COUNTY, NEW YORK

CLOVEWOOD
WASTEWATER TREATMENT PLANT

CONCEPTUAL DESIGN



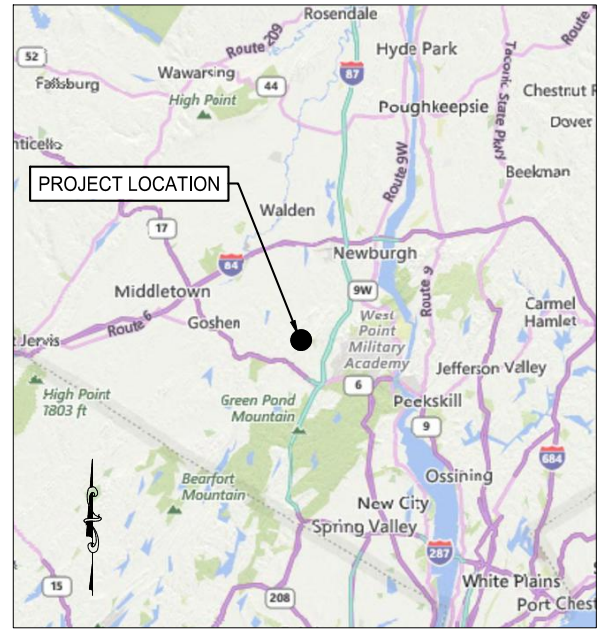
PROJECT SITE LOCATION MAP

Scale: 1"=2,000'

1"=2000' 2000 1000 0 2000 4000
Scale Feet

07/21/2023

PRELIMINARY



VICINITY MAP

Scale: 1"=50,000'

DRAWING INDEX

SHEETS COUNT	SHEET ID	SHEET TITLE
1	G01	COVER SHEET - G01
2	C01	WWTP SITE UTILITIES PLAN AND GRADING
3	C02	HYDRAULIC PROFILE
4	C03	WATER TREATMENT AND SLUDGE BUILDING PLANS
5	C04	PROCESS FLOW DIAGRAM-1 (PRE- TREATMENT)
6	C05	PROCESS FLOW DIAGRAM-2 (BIOLOGICAL TREATMENT)
7	C06	PROCESS FLOW DIAGRAM-3 (BIOLOGICAL TREATMENT)
8	C07	PROCESS FLOW DIAGRAM-4 (POST TREATMENT)
9	C08	PROCESS FLOW DIAGRAM-5 (SLUDGE FLOW)
10	C09	PROCESS & INSTRUMENTATION DIAGRAM-1 (PRE-TREATMENT)
11	C10	PROCESS & INSTRUMENTATION DIAGRAM-2 (BIOLOGICAL TREATMENT)
12	C11	PROCESS & INSTRUMENTATION DIAGRAM-3 (BIOLOGICAL TREATMENT)
13	C12	PROCESS & INSTRUMENTATION DIAGRAM-4 (POST TREATMENT)
14	C13	PROCESS & INSTRUMENTATION DIAGRAM-5 (SLUDGE FLOW)

PROJECT NUMBER
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PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

SHEET TITLE:
COVER SHEET

PROJ. NAME:
CLOVEWOOD
WASTEWATER TREATMENT PLANT

wsp

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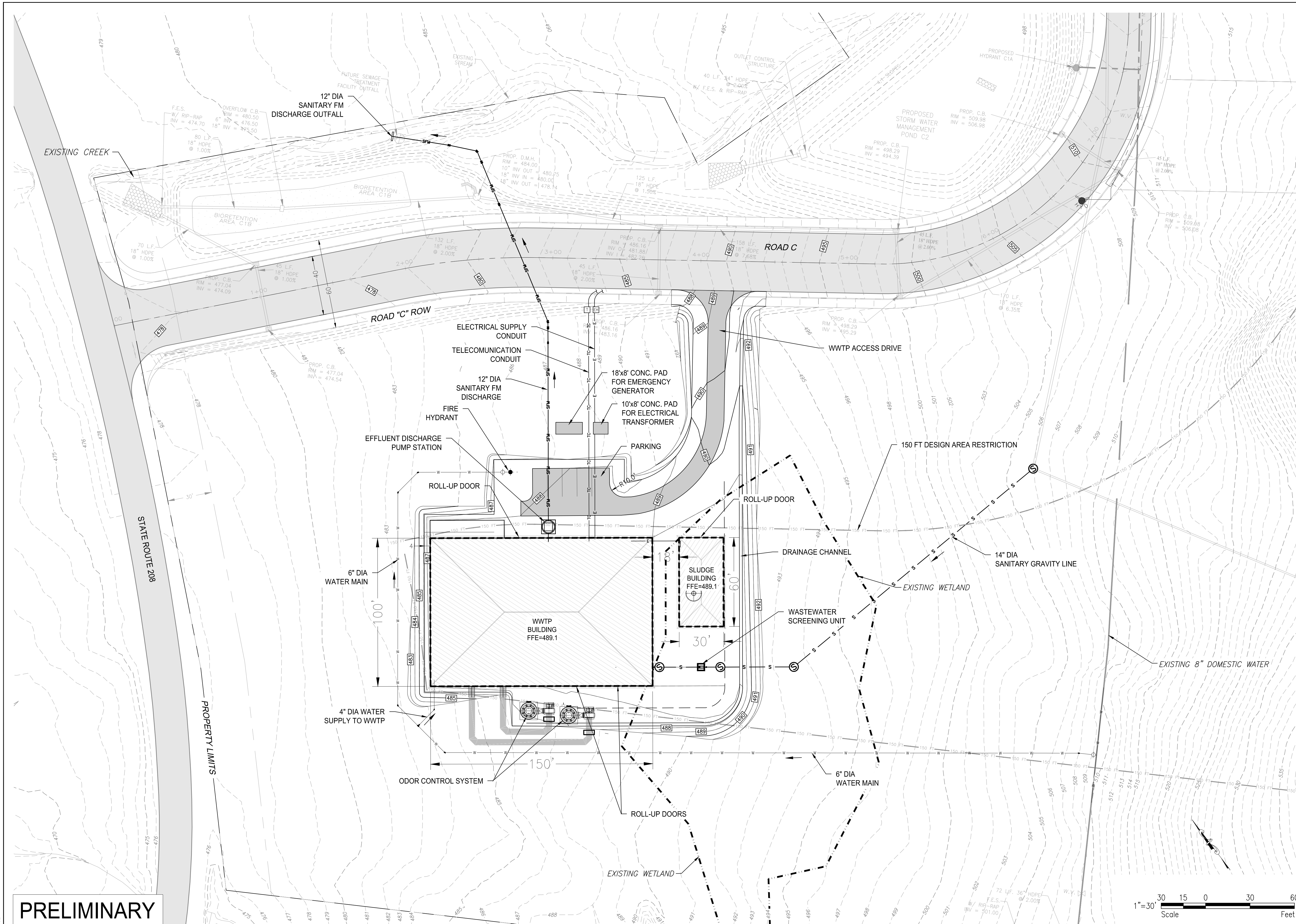

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PROJECT MANAGER
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DRAWING DATE
7/21/23

SHEET TITLE:
WWTP SITE UTILITIES PLAN AND GRADING

PROJ. NAME:
CLOVEWOOD
WASTEWATER TREATMENT PLANT

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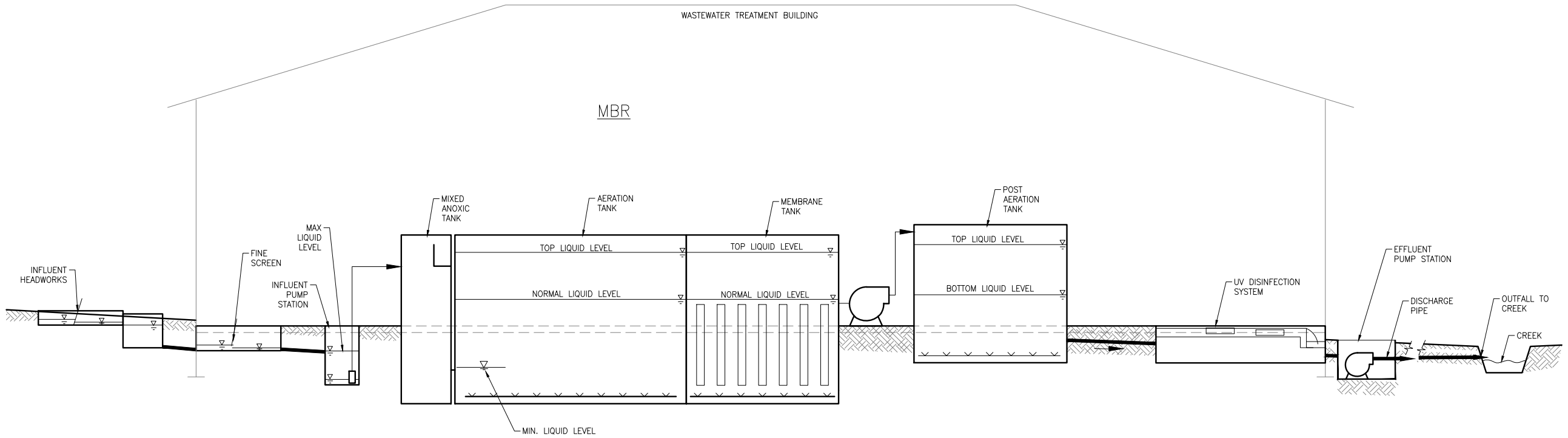

1 HYDRAULIC PROFILE

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PROJECT MANAGER
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DRAWING DATE
7/21/23

SHEET TITLE:
HYDRAULIC PROFILE

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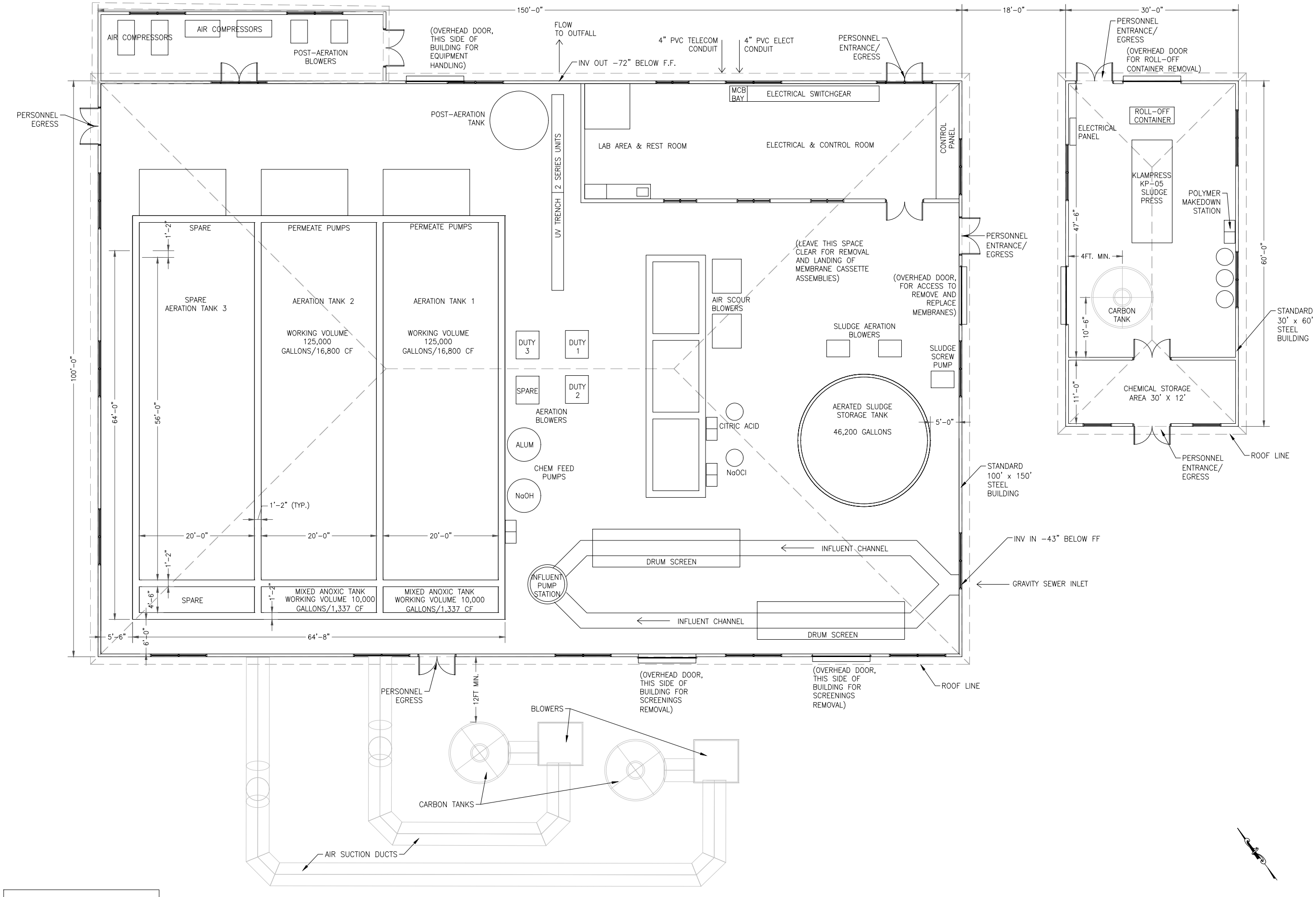

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PROJECT MANAGER	T. PAYNE
DRAWING DATE	7/21/23

WASTEWATER TREATMENT AND SLUDGE BUILDING PLAN

SHEET TITLE:

CLOVEWOOD WASTEWATER TREATMENT PLANT

PROJ. NAME:

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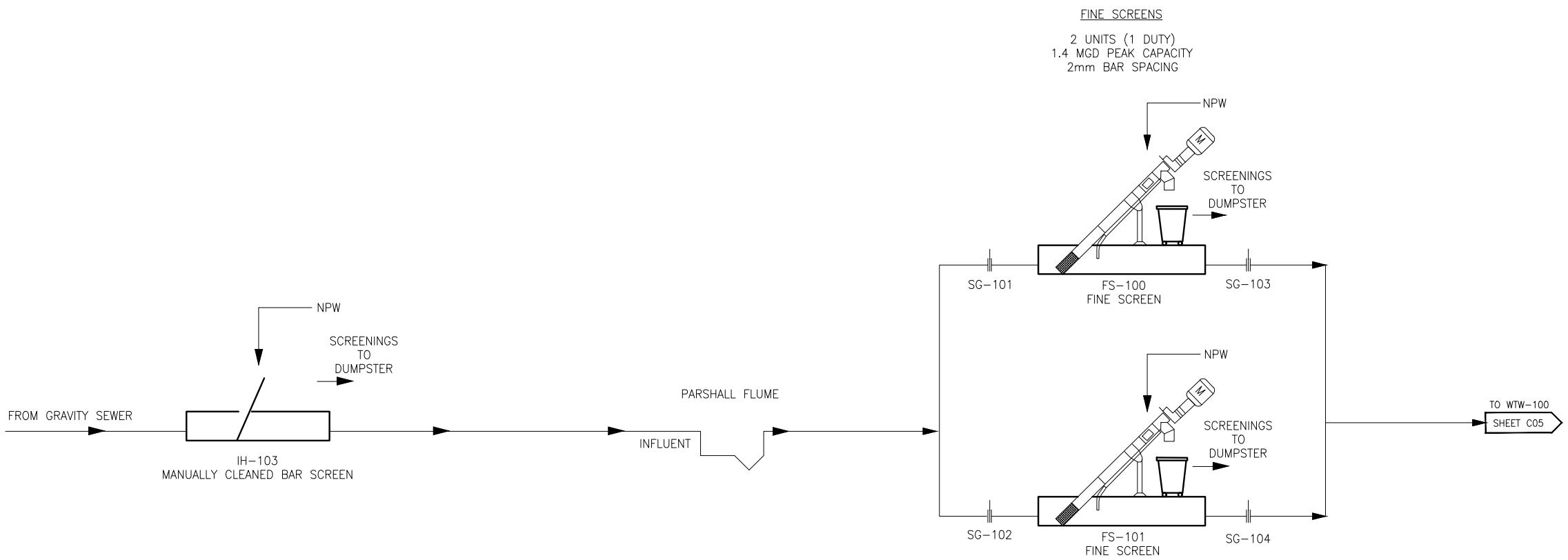

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PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

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WASTEWATER TREATMENT PLANT

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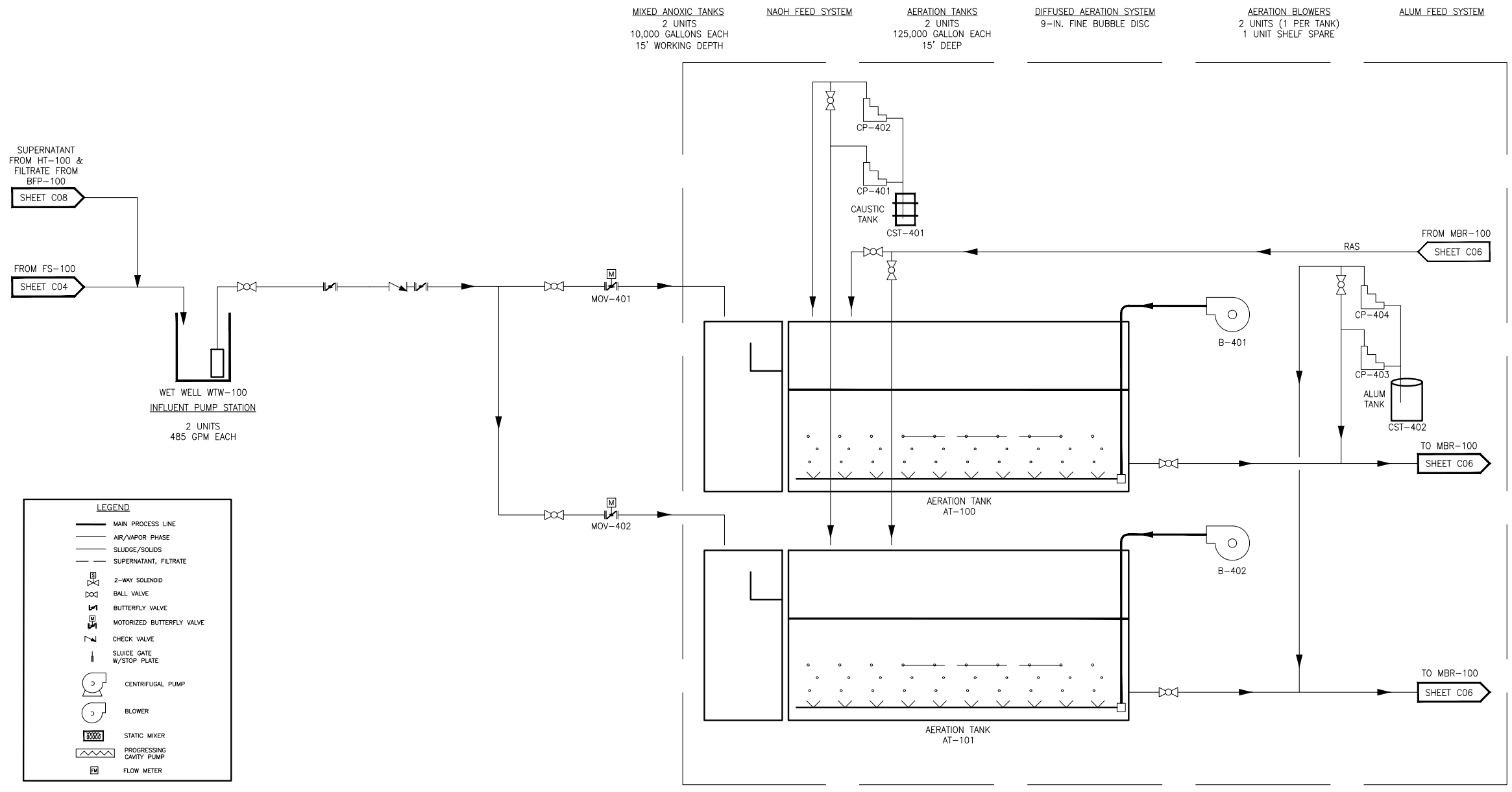

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PROJECT MANAGER	T. PAYNE
DRAWING DATE	7/21/23

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PROJ. NAME: CLOVEWOOD WASTEWATER TREATMENT PLANT

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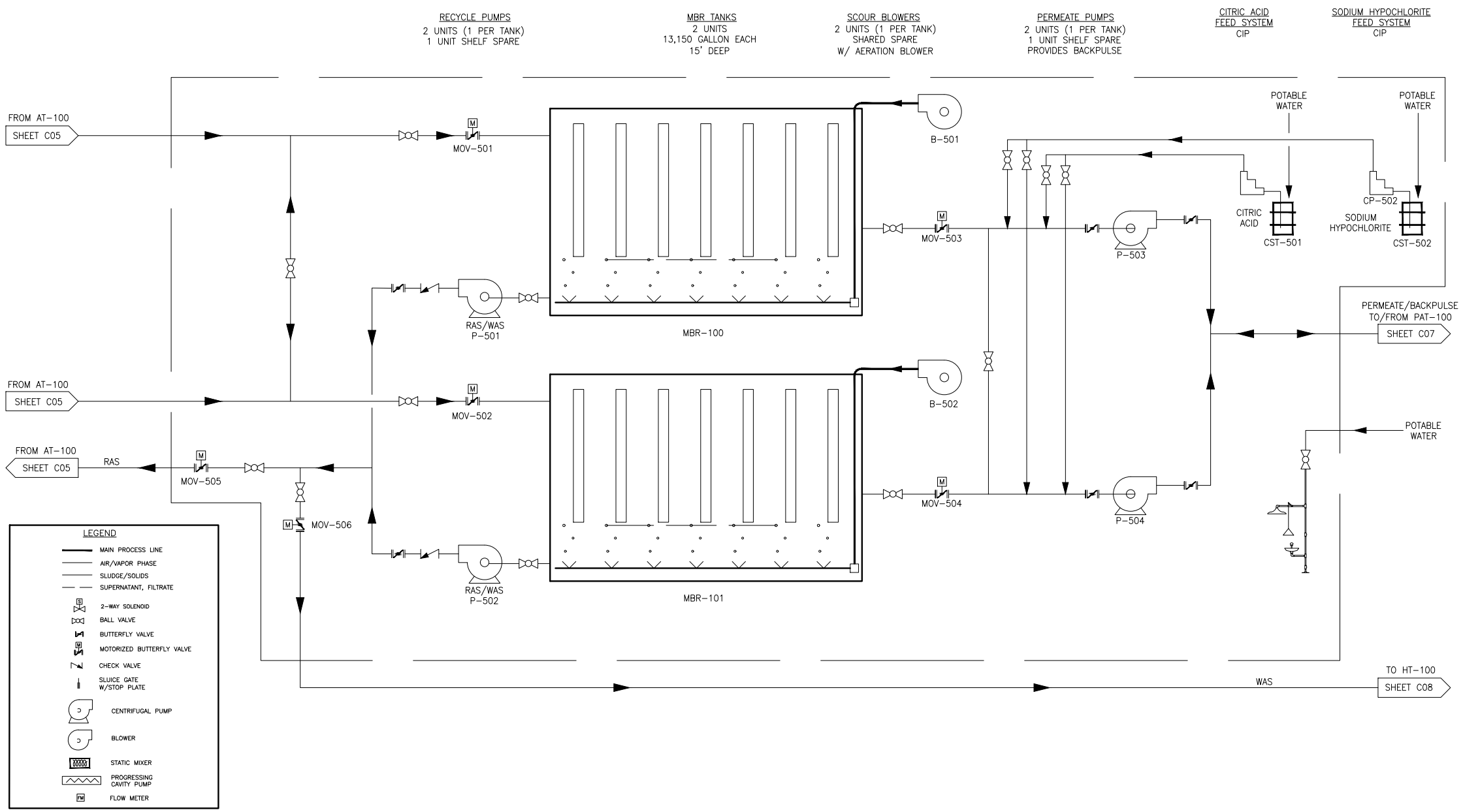

PROCESS FLOW DIAGRAM-3
(BIOLOGICAL TREATMENT)

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PROJECT MANAGER	T. PAYNE
DRAWING DATE	7/21/23

SHEET TITLE: PROCESS FLOW DIAGRAM-3 (BIOLOGICAL TREATMENT)

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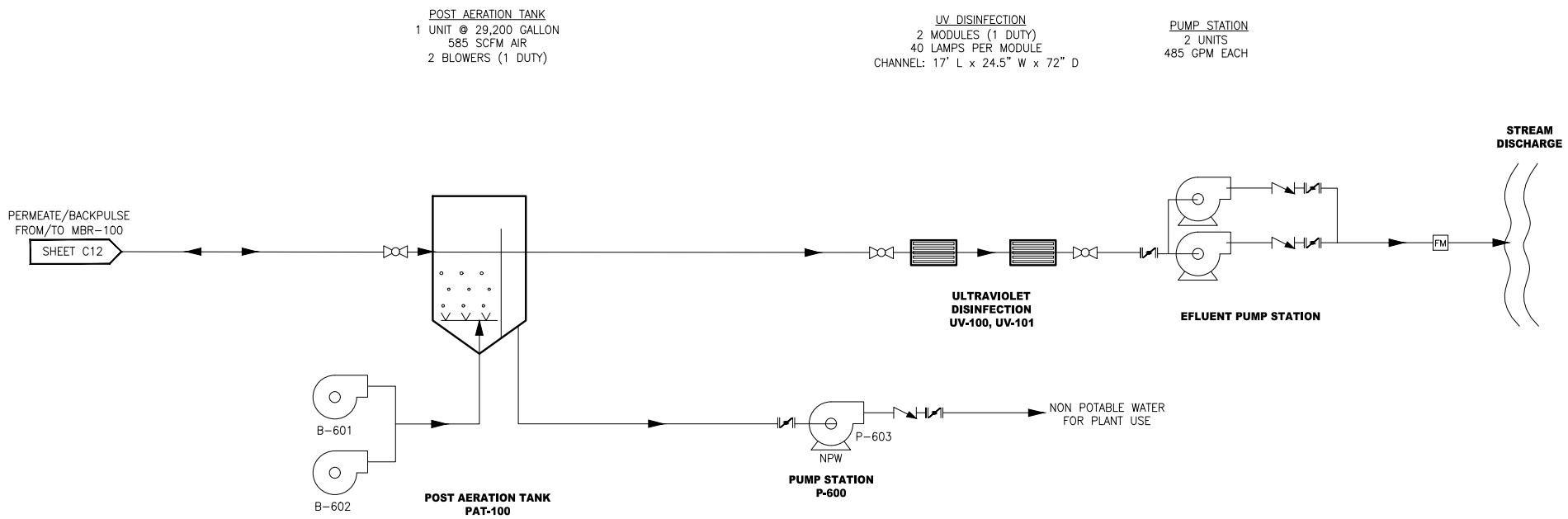

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- AIR/VAPOR PHASE
- SLUIDGE/SOLIDS
- SUPERNATANT, FILTRATE
- 2-WAY SOLENOID
- BALL VALVE
- BUTTERFLY VALVE
- MOTORIZED BUTTERFLY VALVE
- CHECK VALVE
- SLUICE GATE W/STOP PLATE
- CENTRIFUGAL PUMP
- BLOWER
- STATIC MIXER
- PROGRESSING CAVITY PUMP
- FM FLOW METER

1 PROCESS FLOW DIAGRAM–4 (POST TREATMENT)

N.T.S.

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PROJECT NUMBER
31404120.003

PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

SHEET TITLE:
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(POST TREATMENT)

PROJ. NAME:
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WASTEWATER TREATMENT PLANT

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Sheet ID
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AERATED SLUDGE HOLDING TANK
1 UNIT @ 46,200 GALLON
23'-0"ø x 15'-0" D

DIFFUSED AERATION SYSTEM
2 UNITS (1 DUTY)
250 SCFM AIR, EACH

SLUDGE PUMPS
2 UNITS
50 GPM, 30 FT TDH

ROTARY DRUM THICKENER
1 UNIT
60 GPM, 300 LBS/HR
@ 1% SOLIDS

POLYMER FEED SYSTEM

BELT FILTER PRESS
125 GPM
1-0 METER BELT WIDTH

LEGEND
- MAIN PROCESS LINE
- AIR/VAPOR PHASE
- SLUDGE/SOLIDS
- SUPERNATANT, FILTRATE
- 2-WAY SOLENOID
- BALL VALVE
- BUTTERFLY VALVE
- MOTORIZED BUTTERFLY VALVE
- CHECK VALVE
- SLUICE GATE W/STOP PLATE
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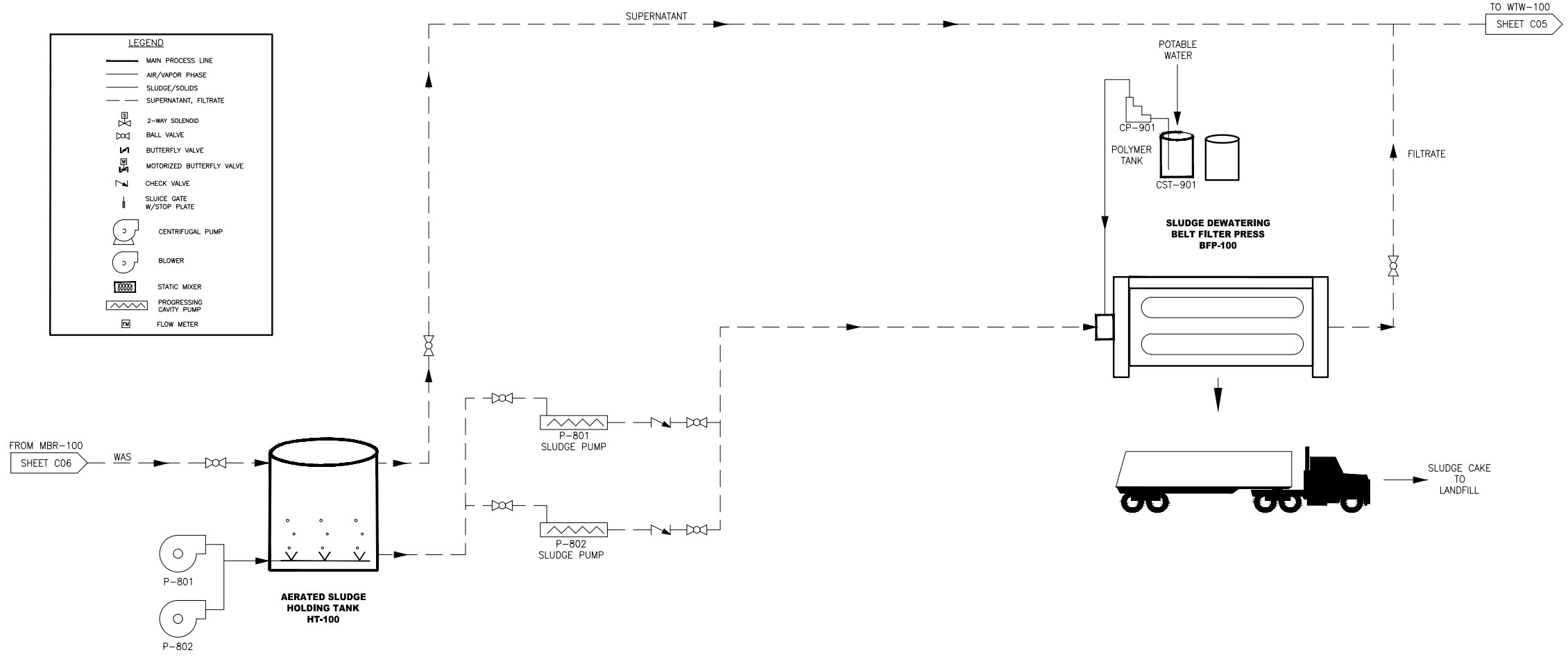
- STATIC MIXER
- PROGRESSING CAVITY PUMP
- FM FLOW METER



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31404120.003

PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

SHEET TITLE:
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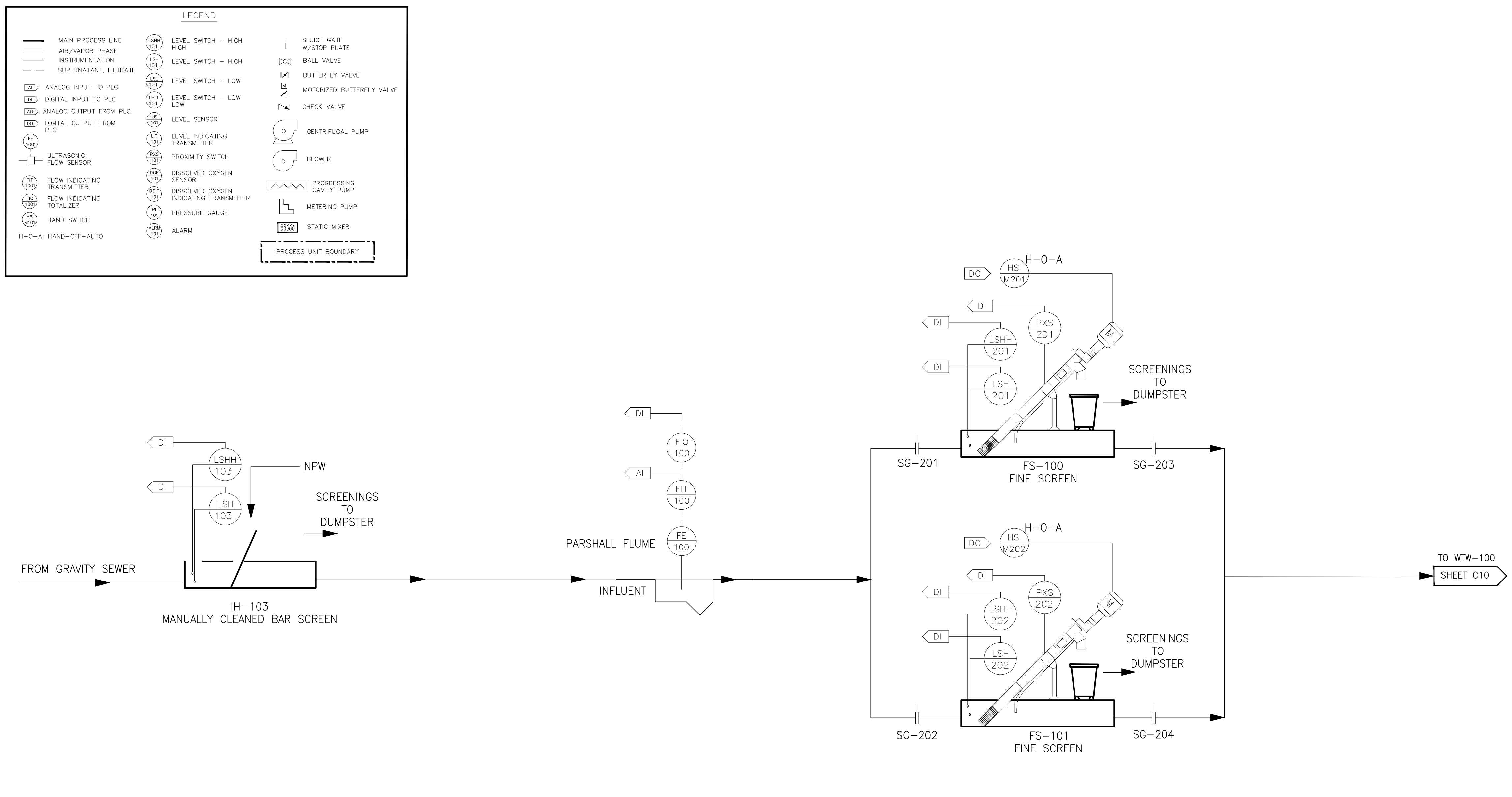

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PRELIMINARY

PROJECT NUMBER
31404120.003

PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

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WASTEWATER TREATMENT PLANT

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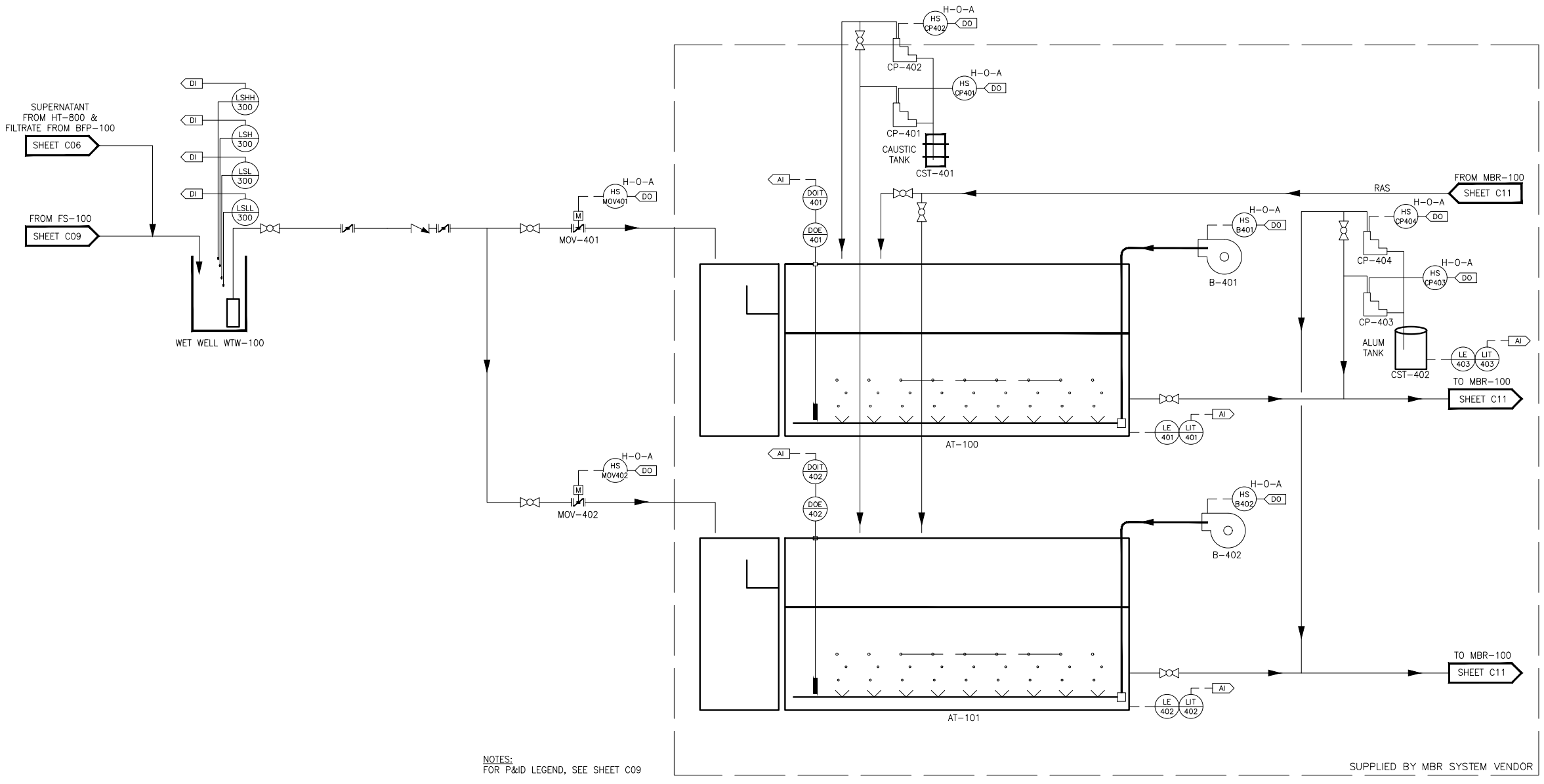

NOTES:
FOR P&ID LEGEND, SEE SHEET C09

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(BIOLOGICAL TREATMENT)

1 N.T.S.

PRELIMINARY

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PROJECT MANAGER	T. PAYNE
DRAWING DATE	7/21/23

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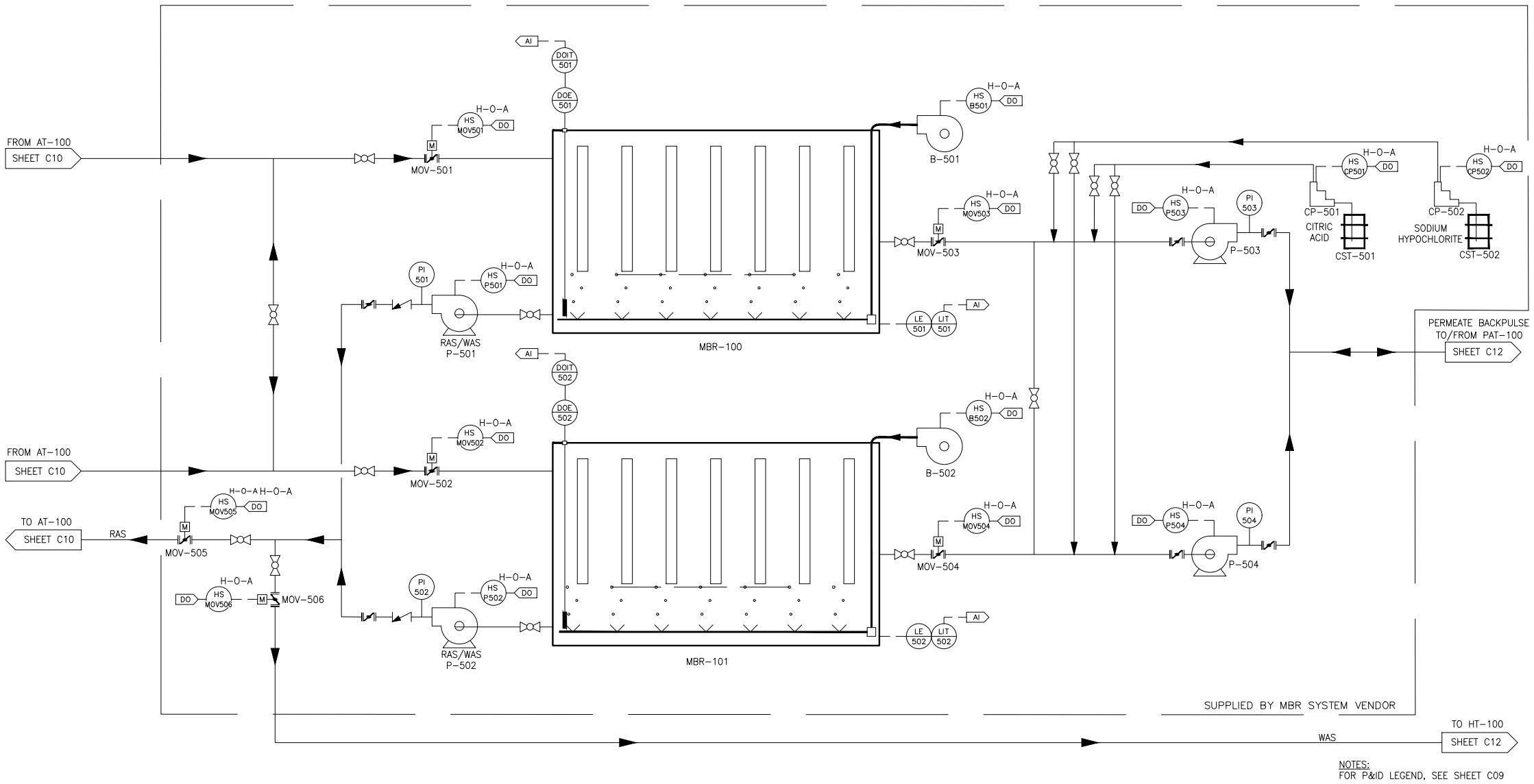

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PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

SHEET TITLE: PROCESS & INSTRUMENTATION DIAGRAM-3 (BIOLOGICAL TREATMENT)

PROJ. NAME: CLOVEWOOD WASTEWATER TREATMENT PLANT

wsp

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C11

LEGEND

- MAIN PROCESS LINE
- AIR/VAPOR PHASE
- SLUDGE/SOLIDS
- SUPERNATANT, FILTRATE
- 2-WAY SOLENOID
- BALL VALVE
- BUTTERFLY VALVE
- MOTORIZED BUTTERFLY VALVE
- CHECK VALVE
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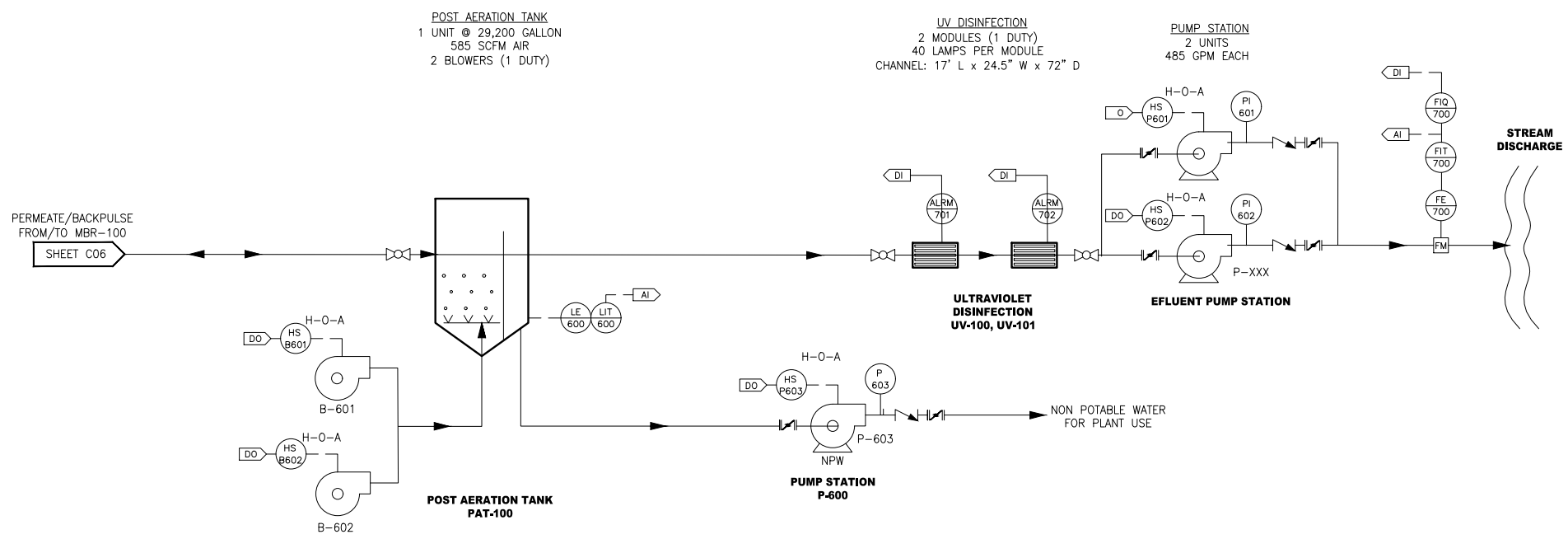
- CENTRIFUGAL PUMP
- BLOWER
- STATIC MIXER
- PROGRESSING CAVITY PUMP
- FM FLOW METER



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PRELIMINARY

PROJECT NUMBER
31404120.003

PROJECT MANAGER
T. PAYNE

DRAWING DATE
7/21/23

SHEET TITLE: PROCESS & INSTRUMENTATION DIAGRAM-4 (POST TREATMENT)

PROJ. NAME: CLOVEWOOD WASTEWATER TREATMENT PLANT

wsp

Sheet Count
13 of 14

Sheet ID
C12

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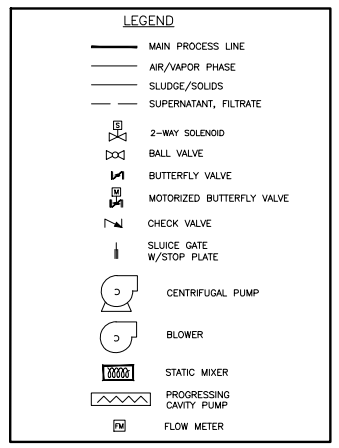

NOTES:
FOR P&ID LEGEND, SEE SHEET S02

PRELIMINARY

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PROJECT NUMBER	31404120.003
PROJECT MANAGER	T. PAYNE
DRAWING DATE	7/21/23

SHEET TITLE: PROCESS & INSTRUMENTATION DIAGRAM-5 (SLUDGE FLOW)

PROJ. NAME: CLOVEWOOD WASTEWATER TREATMENT PLANT

Sheet Count 14 of 14

Sheet ID C13

APPENDIX II

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography provided by the New York Sate Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 30-centimeter and 60-centimeter resolution natural color orthoimagery from photography dated April-May 2004.

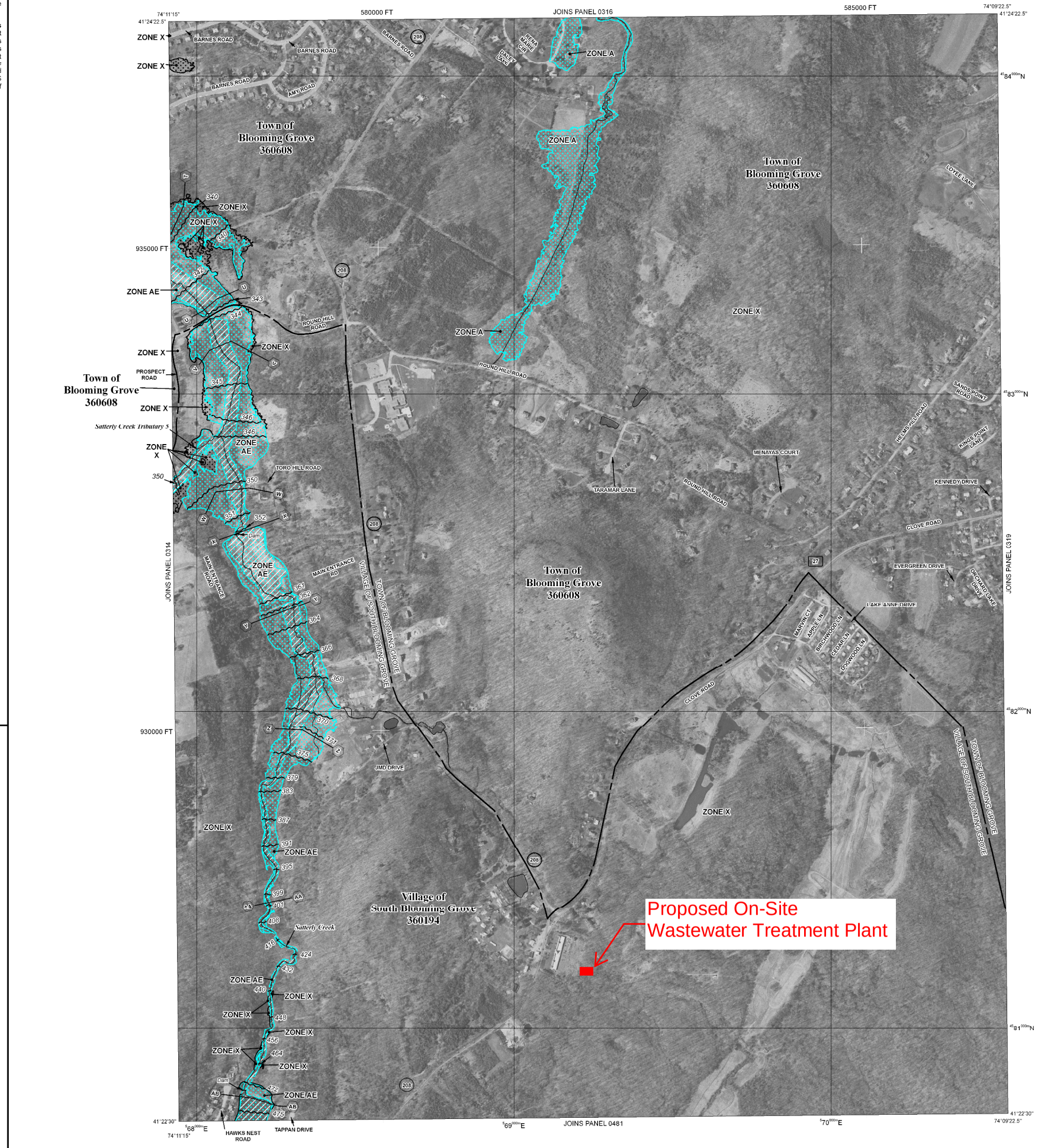
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% annual chance floodplain boundary
	0.2% annual chance floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
3 — 3	Limited detail cross section line
23 — 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4376000mN	1000-meter Universal Transverse Mercator grid values, zone 18N
600000 FT	5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
● M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 3, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0318E

FIRM

FLOOD INSURANCE RATE MAP

for ORANGE COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
BLOOMING GROVE, TOWN OF	360608
SOUTH BLOOMING GROVE, VILLAGE OF	360194

PANEL 318 OF 630
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
36071C0318E

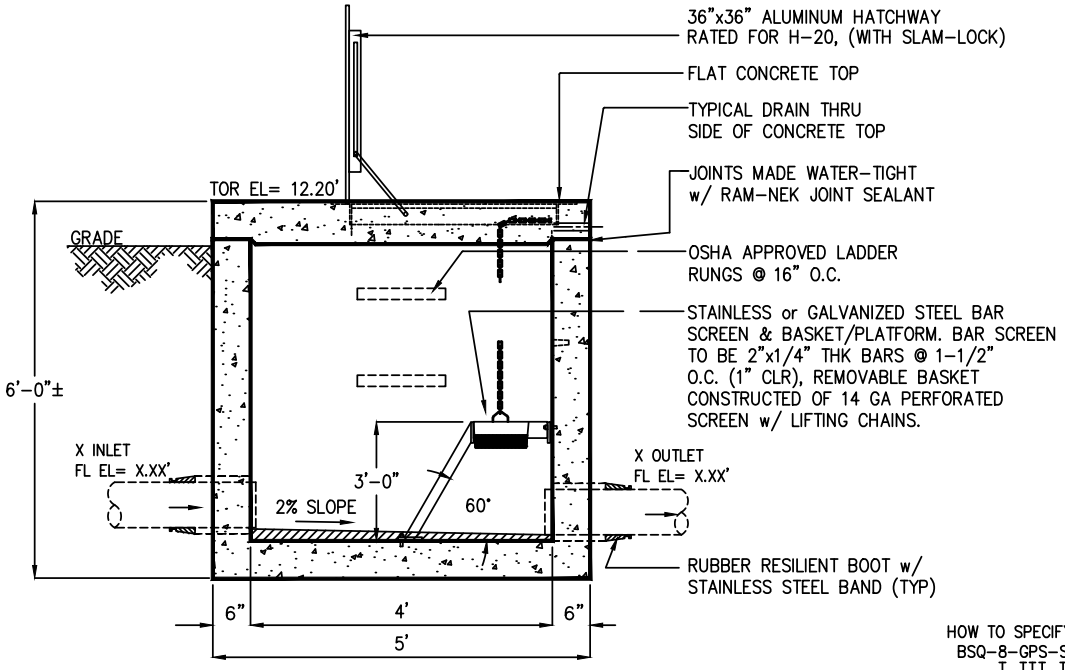
EFFECTIVE DATE
AUGUST 3, 2009

Federal Emergency Management Agency

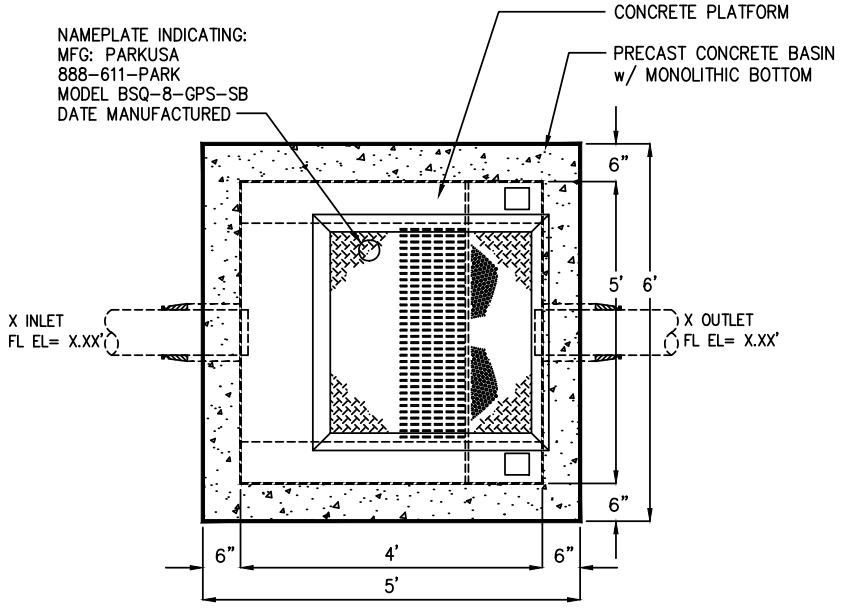
APPENDIX III

THE FOLLOWING CHART IS BASED ON SIZING OF THE BAR SCREEN BSQ USING A METHODOLOGY OF EQUIVALENT AREAS; THE CROSS SECTIONAL AREA OF THE PIPE ≤ THE OPEN AREA OF THE GRATE W/ THE MAXIMUM ANTICIPATED BLINDING. THIS CHART IS TO BE USED AS A REFERENCE ONLY AND IS SUBJECT TO CHANGE BASED ON RECOMMENDATION BY THE ENGINEER OF RECORD. THE OPEN AREA OF THE SLOPED GRATE IN THE TREATED FLOW AREA IS ASSUMED TO BE 92 % OF THE TOTAL AREA OF THE GRATE WITH A MAXIMUM HEAD LOSS OF 0.01 FT.

MODEL	MAX PIPE SIZE (ø IN INCHES)	AREA OF THE PIPE (FT^2)	NOMINAL FLOWRATE (CFS using V = 4 fps)	HEIGHT OF PLATFORM ABOVE BASE (FT)	ANGLE OF THE GRATE (DEGREES)	LENGTH OF GRATE (FT)	INTERIOR WIDTH (FT)	AREA OF GRATE (FT^2)	OPEN AREA OF GRATE (FT^2)	OPEN AREA w/ 67% BLINDING (FT^2)	BYPASS AREA (FT^2)	SIZE OF OUTSIDE OF VAULT (WxLxH)
BSQ-24	24	3.1	12.4	3	60	3.5	4	14	9.7	3.2	1	5' x 6' x 7'
BSQ-30	30	4.9	19.6	3	60	3.5	5	17.5	12.9	4.3	1	6' x 6' x 9'
BSQ-36	36	7.1	28.4	3	60	3.5	5	17.5	12.9	4.3	1	6' x 6' x 9'



ELEVATION



PLAN VIEW

HOW TO SPECIFY BY MODEL NUMBER:
BSQ-8-GPS-SB

- LINER OPTIONS
  - S-NO EXTERIOR LINER
  - B-BUTUMASTIC EXTERIOR LINER
  - E-EPOXY EXTERIOR LINER
  - S-NO INTERIOR LINER
  - E-EPOXY INTERIOR LINER
  - F-FIBERGLASS INTERIOR LINER
- HATCHWAY OPTIONS
  - S-STD HATCHWAY
  - W-WATERPROOF HATCHWAY
  - P-PEDISTRIAN DUTY HATCHWAY
  - H-TRAFFIC DUTY HATCHWAY
- BAR SCREEN ASSEMBLY OPTIONS
  - G-GALVANIIZED STEEL SCREEN ASSEMBLY
  - S-STAINLESS STEEL SCREEN ASSEMBLY
- PIPE SIZE
  - 24, 30, 36 ETC.

SPECIFICATIONS

CONCRETE: Class I/II concrete with of design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first stage of wall with sectional riser to required depth.

REINFORCEMENT: Grade 60 reinforced. Steel rebar conforming to ASTM A615 on required centers or equal.

HATCHWAY: Hatchway is of aluminum skid-resistant floor plate, extruded aluminum frame w/ continuous concrete anchor and door seat, stainless steel hinges and tamperproof bolting.

REV	DATE	BY	DESCRIPTION
A	.	.	ORIGINAL SUBMITTAL

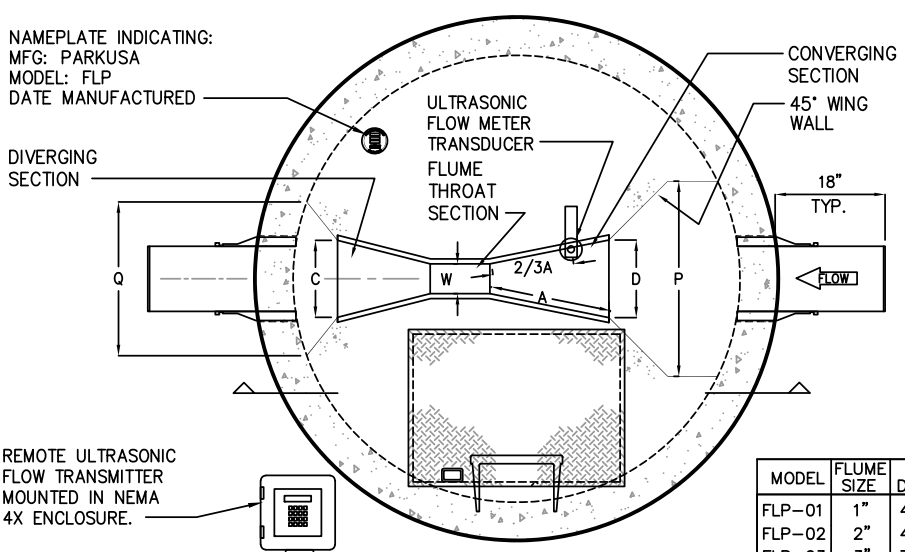
PROJECT: .
CUSTOMER: .
ENGINEER: .
ORDER #: . PROJ #: .
DATE: . LOCATION: .

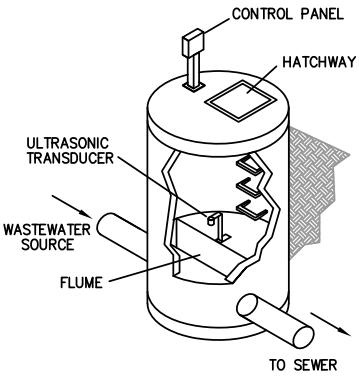
PARK USA
A Northwest Pipe Company

BAR SCREEN ASSEMBLY
MODEL BSQ SIZE 8 GALLONS

PM	PC	DRN	ENG	DWG. NO.	REV.
.	.	.	.	BSQ-8-GPS-SB-STD-NEW	A
DATE .					

BSQ-8-NEW PLOTTED ON 7/7/2022 11:15 AM BY Jones, Matthew, Y:\Parkdwgs\BS - BAR SCREENS\STANDARD DRAWINGS\BSQ-8-NEW
CREATED ON 7/1/2022 BY -----
LAST MODIFIED ON 7/7/2022 11:03 AM BY MATTJONES



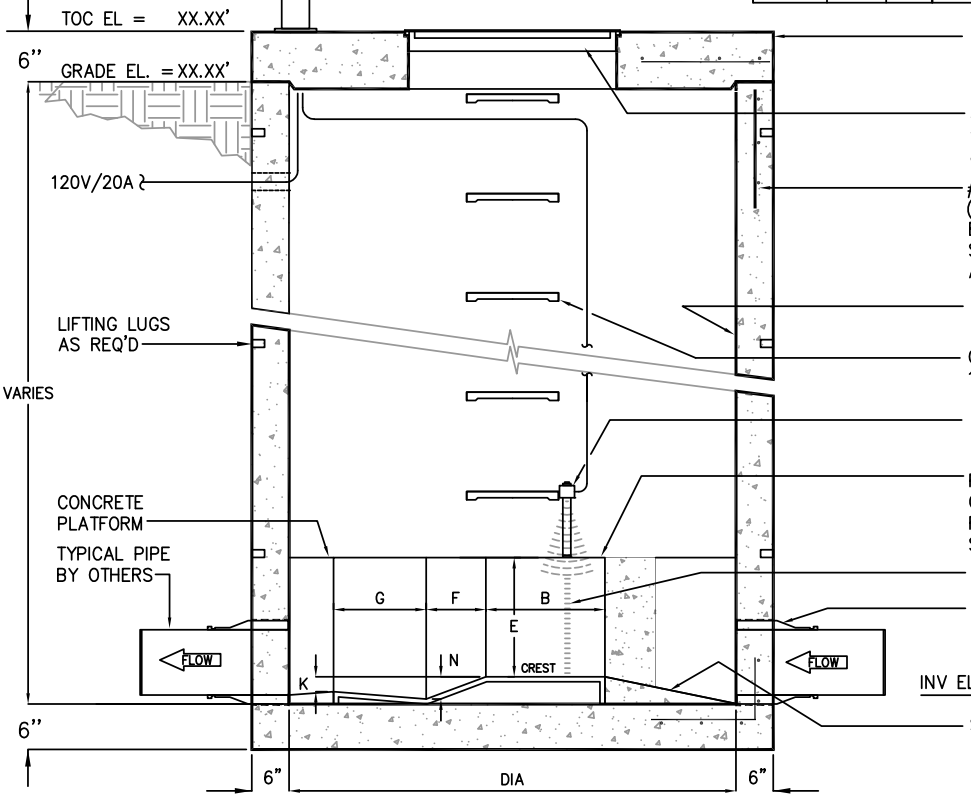


REMOTE ULTRASONIC FLOW TRANSMITTER MOUNTED IN NEMA 4X ENCLOSURE.

ALUM MOUNTING PEDESTAL

TOP VIEW

MODEL	FLUME SIZE	DIA	MAXIMUM FLOW RATE GPM	MGD	PARSHALL FLUME DIMENSIONS (in) W	A	B	C	D	E	F	G	K	N	P	Q
FLP-01	1"	48"	82	0.117	1	14-¼	14	3-p	6-¼	9	3	8	¾	1-⅛	20	12
FLP-02	2"	48"	163	0.235	2	16-5⁄16	16	5-5⁄16	8-7⁄16	9	4-½	10	⅞	1-1⁄16	28	18
FLP-03	3"	72"	835	1.200	3	18-⅜	18	7	10-3⁄16	24	6	12	1	2-¼	30	18
FLP-06	6"	84"	1755	2.530	6	24-7⁄16	24	15-½	15-5⁄8	24	12	24	3	4-½	36	24
FLP-09	9"	96"	3981	5.730	9	34-5⁄8	34	15	22-5⁄8"	30	12	18	3	4-½	42	24



ELEVATION

Specifications

CONCRETE : Class I/II concrete with design strength of 4500 PSI at 28 days. Unit is of monolithic construction at floor and first 7 feet of riser. Flat concrete top is 6" thick.

REINFORCEMENT: Grade 60 reinforced with steel rebar conforming to ASTM A615 on required centers or equal.

HATCHWAY: 1/4" aluminum skid resistant diamond plate, with 1/4" extruded aluminum frame. Hatch to be furnished with 316 SS snap lock & hinges.

Engineering Data

Field excavation and preparation shall be completed prior to delivery of assembly. Use dimensional data as shown.

PROJECT:	
CUSTOMER:	
ENGINEER:	
ORDER #:	
PROJ #:	
DATE:	

888.611.PARK
www.park-usa.com
PARK USA
DESIGN FOR WATER

WASTEWATER MONITORING MANHOLE
MODEL FLP – PARSHALL FLUME

PM	DRN	DWG. NO.	REV.
.	CH	FLP-1	A
DATE 01/14			

FLP-1

Budget Proposal for the
Clovewood Wastewater Treatment Plant
Village of South Blooming Grove, Orange County, New York

ZeeWeed Membrane Bioreactor

Submitted To:
Walter Mahoney – Senior Engineer, WSP

Date: January 18th, 2023

Proposal Number: 153453 – Rev 3

Submitted By:
Graham Best– Regional Sales Manager
Office: (905) 465-3030
Mobile: (905) 330-0881
graham.best@veolia.com

Local Representation By:
Tech Sales NE, Inc.
Sherwood Logan & Associates, Inc.

Table Of Contents

1 Benefits of Veolia System Design

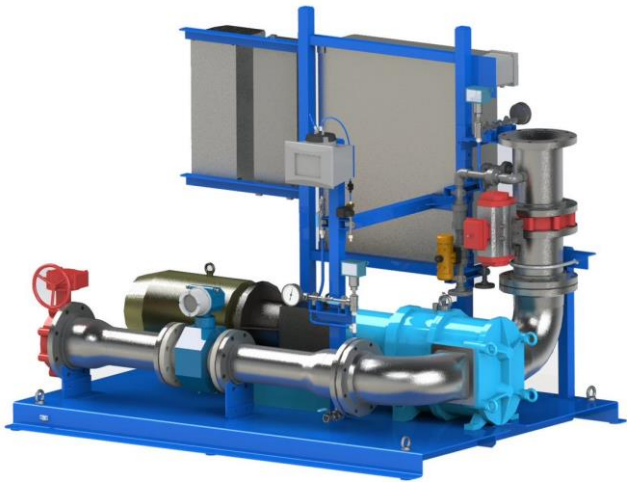
At Veolia, our goal is to create long term partnerships with our customers, which is why we design our systems with you in mind. Our approach to the proposed ZeeWeed membrane bioreactor system utilizes a Z-MOD L process pump skid – a pre-engineered process pump equipment skid which will help to simplify the ZeeWeed membrane filtration system design and installation.

1.1 Pre-Engineered Z-MOD L Process Pump Skid

The Z-MOD L is a “plug and go” skid that incorporates most of dedicated membrane train equipment onto a single prefabricated equipment skid for simple onsite installation.

The Z-MOD L skid is designed to handle all membrane train flow conditions and includes a bi-directional process pump that performs both permeation and backpulse duty. A train-dedicated remote I/O panel is installed on the Z-MOD L skid, with all skidded equipment and instrumentation pre-wired and tested within the panel. The Z-MOD L system is designed with three key attributes in mind:

1. Lowest lifecycle cost MBR
2. Simple operations
3. Robust design



1.2 Low Lifecycle Cost MBR

LEAPmbr

Aeration is one of the most important operating parameters for successful long term MBR operations and is a significant component of operating cost. The MBR system utilizes a very simple aeration strategy which minimizes the amount of instrumentation and controls required to achieve energy efficient membrane aeration. No complex control loops or complicated airflow measurement devices are required for LEAPmbr aeration technology to achieve energy efficiency. LEAPmbr’s combined initiatives will impact your plant design by:

- Improving your productivity by 15%,
- Decreasing your membrane system footprint by 20%,
- Removing equipment needed to provide aeration to your membranes by 50%,
- Saving you over 30% in membrane aeration power costs

Membrane Life, Cleaning, and Replacement

The ZeeWeed 500 series membrane technology offers the following benefits to ensure an owner’s peace of mind for the life of their MBR facility.

- A membrane with a proven membrane life and high resistance to upset conditions
- A system designed with multiple cleaning options to ensure the highest chance of achieving maximum membrane life
- Veolia as a single point of responsibility provides an integrated supply chain between the system and membrane warranty provider and the membrane manufacturer

1.3 Simple Operations

Membrane Cleaning Systems

Veolia has developed design principles based on best engineering practices that ensure permeability is maintained over the life of the membranes. A fully automated suite of membrane maintenance procedures will ensure long-term, successful operation.

- In-situ chemical cleaning performed directly in the membrane process tanks
- Ability to increase/decrease the frequency of cleans to fit the operating conditions
- The ability to backpulse, when needed, to greatly improve your operator's ability to recover from non-design conditions

The above cleaning systems can be automated, resulting in operators having available a full suite of comprehensive cleaning systems which are simple to use and initiate.

1.4 Robust Design Basis

Positive Displacement Permeate Pumps

Z-MOD L systems use positive displacement pumps to draw effluent through the membranes.

- The positive displacement design of these pumps allows for variations within the hydraulic profile that will not adversely affect the pump performance
- The pumps come complete with an ability to backpulse the membranes should sludge conditions deteriorate
- A wide range of pump turndown provides the operator to wide window of flow adjustment for a variety of situations.

This pump selection provides a high level of security and flexibility for operation.

Permeate for Cleaning Solution

Z-MOD L systems ensure a volume of clean permeate is always stored ready for use for cleaning solutions.

- Z-MOD L systems include a backpulse tank which provides the operations staff with a readily available source of water for cleaning whenever it is required. This ensures no reliance or costs from a potable water system to supply cleaning solution to the site for the membrane cleaning process.

Mixed Liquor Operating Range

Veolia MBR systems rely solely on the pore size of the membrane for filtration of the mixed liquor. This allows the MBR to operate at a wide range of mixed liquor concentrations. This reduces the need for mixed liquor concentrations to be within the intended operating range during start-up processes or low flow scenarios.

Electrical Design

Z-MOD L systems are designed based on the following electrical architecture:

- Central PLC and common equipment I/O panel
- Remote I/O panel, VFD, and disconnect mounted on the permeate pump skid

This design basis allows the system to readily accommodate additional trains and allows operators to isolate or troubleshoot individual trains without the loss of the central PLC.

2 Basis of Design

The proposed ZeeWeed membrane bioreactor system for Clovewood WWTP is offered based on using the design parameters summarized in the following sections.

2.1 Influent Flow Data

Flow Conditions	Value	Units
Average day flow (ADF)	285,000	mgd
Maximum month flow (MMF) [2]	356,250	mgd
Maximum day flow (MDF) [2]	427,500	mgd
Peak hour flow (PHF)	681.95	gpm
maximum flow with one train offline for maintenance or cleaning (for less than 24 hours) [2]	427,500	mgd

Note 1: Any flow conditions that exceed the above-noted flow limits must be equalized prior to treatment in the ZeeWeed membrane bioreactor system.

Note 2: Flows have been assumed based on standard peaking factors.

Note 3: Flow definitions are as follows:

- ADF – the average flow rate occurring over a 24-hour period based on annual flow rate data.
- MMF – the average flow rate occurring over a 24-hour period during the 30-day period with the highest flow based on annual flow rate data.
- MDF – the maximum flow rate averaged over a 24-hour period occurring within annual flow rate data.
- PHF – the maximum flow rate sustained over a 1-hour period based on annual flow rate data.

2.2 Influent Quality

The design solution proposed is based on the wastewater characteristics detailed below. The concentrations listed below are specific to the flow used for the biological design.

Influent Design Parameters	Value	Unit
Design Influent Temperature	10	ºC
BOD_5	344	mg/L
TSS	378	mg/L
TVSS	292	%
NH_3-N	13	mg/L
TP	14	mg/L

Note 1: Parameter value assumed.

Note 2: Veolia is assuming that influent alkalinity is insufficient to ensure proper performance of the biological system. Veolia has included a NaOH dosing system for pH control in the scope of supply.

2.3 Effluent Quality

The following performance parameters are expected upon equipment startup and once the biological system has stabilized.

Effluent Design Parameters	Value	Unit
BOD_5	≤ 5	mg/L
TSS	≤ 10	mg/L
NH_3-N	≤ 1.5	mg/L
TP[1]	≤ 0.5	mg/L

Note 1: With coagulant addition.

2.4 Influent Variability

Influent wastewater flows or loads in excess of the design criteria defined above must be equalized prior to entering the membrane tanks. In the event that the influent exceeds the specifications used in engineering this proposal, or the source of influent changes, the ability of the treatment system to produce the designed treated water quality and/or quantity may be impaired. Buyer may choose to continue to operate the system but assumes the risk of damage to the system and/or additional costs due to increased membrane cleaning frequency, potential for biological upset and/or increased consumables usage.

2.5 Biological System Design

The biological system for this project consists of pre-anoxic and aerobic zones. The corresponding volumes for each zone are listed in the table below.

Biological Design Parameters	Value	Unit
Flow basis for biological design	0.356	mgd
Total pre-anoxic tank working volume	20,000	gal
Total aerobic working volume (excluding membranes)	250,000	gal
Total bioreactor working volume (excluding membranes)	270,000	gal
Total design HRT	18	hours
Aerobic design SRT	13.3	days
Waste sludge removal (based on ADF and 10 g/L)	0.02	mgd
Design MLSS concentration in bioreactor	≤ 8,000	mg/L
AOR	1,082	lb O_2/day
Design liquid depth in bioreactor	15	ft

Note 1: Tank volumes are preliminary only and may change once final detail design commences.

Note 2: The biological system is designed for installation within concrete tanks supplied by buyer.

2.6 Membrane System Design

The ZeeWeed membrane system design is summarized in the table below.

Membrane Design Parameters	Value
Number of membrane trains	2
Number of Z-MOD L630 skids	2
Number of cassette spaces per train	4
Number of cassettes installed per train	4
Type of cassette	ZW500D, 430 ft^2,16M
Module design per train	2x (16/16) + 2x (12/16)
Total number of modules installed per train	56
Total number of modules installed per plant	112
Total number of cassettes installed per plant	8
Spare space	12.5%
Membrane tank internal dimensions (W x L x H)	8’ x 12.47’ x 13’

Note 1: Tank dimensions/volumes are preliminary only and may change once final detail design commences.

Note 2: The ultrafiltration system is designed for installation within concrete tanks supplied by buyer.

3 Equipment Description

The following is a description of the equipment included in Veolia's scope of supply. Pre-assembled components include the process pump skids, membrane cassette assemblies, and membrane cleaning chemical pump panels. Critical items that will be shipped loose for installation by buyer include the master control panel, backpulse tank, blowers, RAS pumps and other associated equipment. Please refer to Section 3.1 below for a complete list of Veolia supplied equipment.

Master PLC Panel

An Allen-Bradley Compact Logix Programmable Logic Controller (PLC) and Panel View Plus 6 1250 Human Machine Interface (HMI), installed in the UL Type 4 main control panel, monitors, and manages all critical process operations.

The master PLC panel communicates using Ethernet TCP/IP and includes I/O for common equipment items such as membrane blowers, air compressors, RAS pumps and other items (if included in Veolia Scope).

Z-MOD L Process Pump Skid

One reversible process pump per train is used to draw water through the membranes. The process pump, associated valves, and pump suction and discharge spools are mounted on a factory assembled, epoxy-coated carbon steel skid.

Each Z-MOD L630 process pump skid is designed with a remote I/O panel UL Type 4, which distributes control wiring to the pump, skid mounted VFD UL Type 4 and instrumentation including a magnetic flowmeter required to operate the pump system, all located on the process pump skid.

A turbidity meter has been included onto the Z-MOD L process pump skid for train-dedicated permeate turbidity monitoring.

Air Ejector System

One air ejector system per train is used to prime the dedicated process pump. The air ejector system is installed at the highest point between the membranes installed and process pump, to ensure that all air is removed in the process pump suction line.

Membrane Scour Aeration System

One duty membrane blower per train will be supplied with one common standby blower to be shared by all trains.

Blowers will typically come complete with required isolation valves, check valves, pressure relief valve, pressure indicators and flow indicators.

Sludge Wasting System

Sludge wasting is accomplished by periodically diverting mixed liquor from the recirculation return line, via manual control. The frequency of wasting is a function of influent characteristics, reactor design and operator preference. In certain operating circumstances, bioreactors can be designed to accommodate client preferences with regards to wasting frequencies; however, the preferred fashion of wasting would be a continuous 24-hour bleeding at fixed flow rate.

Process Aeration System

The process aeration blowers provide air for the biological tank and ensure that sufficient oxygen is available to maintain the biological processes in the tank. For best efficiency and

reduction of the aeration energy, Veolia has used one duty blower per train with a common standby blower.

Fine Bubble Diffusers

A fine bubble diffused aeration system delivers air from the process aeration blowers to the aerobic zone of the process tank.

Process Mixers

Process mixers are used to mix the pre-anoxic chambers to prevent solids from settling.

Mixed Liquor Recirculation Equipment

Recirculation (RAS) pumps are used to transfer mixed liquor from the the membrane tanks to the bioreactor at a rate of 4 × ADF.

Recirculation pumps will be supplied with check valves, isolation valves magmeter and pressure indicator.

Sodium Hypochlorite Dosing System

The sodium hypochlorite dosing system is used for membrane cleaning to remove organic foulants from the membrane surface.

Citric Acid Dosing System

The citric acid dosing system is used for membrane cleaning to remove inorganic foulants from the membrane surface.

pH Adjustment System

The pH control system doses an alkaline solution (typically sodium hydroxide) into the process tank in order to maintain a desired pH for optimal biological performance.

Coagulant Addition System

The coagulant dosing system is used to feed a metal salt to assist in precipitating (converting to a particulate form) influent phosphorus. This precipitate is then filtered by the ultrafiltration membranes and removed with waste activated sludge, preventing phosphorus from entering the effluent stream.

InSight Pro – Process Consulting Service

InSight Pro – process consulting service has been provided with your MBR system for the first year of operation. InSight Pro pairs you with a Veolia process expert who is specifically assigned to your plant and will monitor key parameters on a regular rhythm using InSight. The process expert will be in frequent contact with key members of your operations team to discuss and resolve performance, process, and operational issues. While supporting your team with day-to-day operations, the process expert will use InSight to focus on long term trends and provide you with recommendations that will help maximize membrane and equipment life and reduce costs.

3.1 Scope of Supply by Veolia

Quantity	Description
The MBR system will consist of the following equipment:	
ZeeWeed Membranes	
Lot.	Membrane tank cassette mounting assemblies
8	ZeeWeed 500D membrane cassettes
112	ZeeWeed 500D membrane modules
2 sets	Permeate collection & air distribution header piping
4	Membrane tank level switches (2 per train high/low)
4	Membrane tank level transmitters
Ejector & Associated Equipment	
2	Air ejector assembly w/ air supply assembly
Master Control Panel	
1	Master control panel w/ Allen Bradley CompactLogix PLC and PanelView Plus 6 1250 HMI and Flex I/O
Z-MOD L630 Process Pump Skid	
2	Process pump equipment skids – epoxy coated carbon steel base and 316L stainless steel piping
2+1	Positive displacement, reversible lobe process pumps (2 duty skid mounted + 1 shelf spare)
2	Actuated valves
2	Manual valves
2	Remote I/O panels – includes Allen Bradley Flex I/O
2	Process pump VFDs
2	Motor disconnects
2	Pressure transmitters
4	Pressure gauges and pressure switches (two per train)
2	Flow transmitters
Lot.	Chemical injection ports and valves for Citric Acid and Sodium Hypochlorite
2	Turbidimeters (one per train) – includes isolation valves, throttle valve and backplate
Backpulse System	
Included	Process pumps will also provide backpulse duty
1	Flow through backpulse water storage tank, with tank level control and associated valves
Membrane Air Scour Blowers	
2+1	Membrane air scour blowers (2 duty + 1 standby) – includes isolation valves, flow switches, pressure gauges and acoustical enclosures
Mixed Liquor Recirculation Equipment	
2+1	Mixed liquor recirculation pump (2 duty + 1 shelf spare), used to transfer mixed liquor from the membrane tanks to the bioreactor
Biological Equipment (for two biological trains)	
2	Fine bubble diffuser systems for process aeration, shipped loose
2+1	Process blowers (2 duty + 1 standby) – includes flow switches, isolation valves and acoustical enclosures (VFD's by Others).
2	Process mixers c/w mixer rails
2	Aerobic dissolved oxygen sensor

Quantity	Description
2	pH sensor
Chemical Dosing Systems	
1	Coagulant system – includes dosing pump (1 duty + 1 standby) and associated valving
1	pH system – includes dosing pump (1 duty + 1 standby), pH sensor and associated valving
Membrane Cleaning Systems	
1	Sodium hypochlorite chemical feed system - includes dosing pump (1 duty + 1 standby), and associated valving.
1	Citric acid chemical feed system - includes dosing pump (1 duty + 1 standby), associated valving
Miscellaneous	
1+1	Air compressor (1 duty + 1 standby) for pneumatic valve operation and refrigerated air drier
1	Modem for remote monitor system
General	
Included	P&IDs and equipment general arrangement and layout drawings for Veolia supplied equipment
Included	Operator training
Included	Operating & maintenance manuals
Included	Field service and start-up assistance - 24 days support over 2 site visits from Veolia field-service personnel for commissioning, plant start-up and operator training
Included	InSight Pro – Process consulting service – 1 year
Included	24/7 emergency phone support – 1 year
Included	Equipment mechanical warranty – 1 year or 18 months from shipment
Included	Membrane warranty - 10 year (2-year cliff and 8 year prorated)

Note 1: Additional man-hours will be billed separately from the proposed system capital cost at an additional rate per day plus living and traveling expenses. Detailed Veolia service rates are available upon request.

Note 2: All Veolia supplied equipment is designed for installation in an unclassified area.

Note 3: To receive complete 24/7 Emergency Telephone Technical Support Service and to allow for InSight Monitor Service, a suitable secure remote internet connection, by buyer, is required.

3.2 Buyer Scope of Supply

The following items are for supply by buyer and will include, but are not limited to:

- Overall plant design responsibility
- Review and approval of design and design parameters related to the biological process and/or membrane separation system
- Review and approval of Veolia supplied equipment drawings and specifications
- Detail drawings of all termination points where Veolia equipment or materials tie into equipment or materials supplied by buyer
- Design, supply, and installation of lifting devices including overhead traveling bridge crane and/or monorail able to lift (4,000 lbs) for membrane removal and lifting davits for submersible mixers.
- Civil works, provision of main plant tank structure, buildings, equipment foundation pads etc. including but not limited to:
    - Common channels, housekeeping pads, equipment access platforms, walkways, handrails, stairs, etc.

- Equalization tank – as required
- Bioreactor tank – complete with pre-anoxic and aerobic zones
- Membrane tanks c/w tank covers, grating, and their support over membrane tanks

- HVAC equipment design, specifications, and installation (where applicable)
- UPS, Power Conditioner, Emergency power supply and specification (where applicable)
- VFDs and MCC for all Veolia supplied equipment (not including those mounted on the Z-MOD L process skid)
- 2-mm pretreatment fine screens
- Equalization tank equipment – if required
- Membrane tank drain pumps and valves
- All chemical storage tanks, day tanks, and secondary containments
- Plant SCADA system
- Process & utilities piping, pipe supports, hangers, valves, etc. including but not limited to:
    - Piping, pipe supports and valves between Veolia-supplied equipment and other plant process equipment
    - Piping between any loose-supplied Veolia equipment
    - Process tank aeration system air piping, equalization tank system piping, etc.
    - Interconnecting piping between Veolia-supplied skids, loose shipped equipment and tanks (as applicable)
- Electrical wiring, conduit and other appurtenances required to provide power connections as required from the electrical power source to the Veolia control panel and from the control panel to any electrical equipment, pump motors and instruments external to the Veolia-supplied enclosure
- Supply and installation of suitable, secure remote internet connection for 24/7 emergency telephone technical support service and InSight remote monitoring & diagnostics service
- Design, supply and installation of equipment anchor bolts and fasteners for Veolia supplied equipment. All seismic structural analysis and anchor bolt sizing
- Receiving (confirmation versus packing list), unloading and safe storage of Veolia-supplied equipment at site until ready for installation
- Installation on site of all Veolia-supplied skids and loose-shipped equipment
- Alignment of rotating equipment
- Raw materials, chemicals, and utilities during equipment start-up and operation
- Disposal of initial start-up wastewater and associated chemicals
- Supply of seed sludge for biological process start-up purposes
- Laboratory services, operating and maintenance personnel during equipment checkout, start-up, and operation
- Touch up primer and finish paint surfaces on equipment as required at the completion of the project
- Weather protection as required for all Veolia supplied equipment. Skids and electrical panels are designed for indoor operation and will need shelter from the elements
- All permits

4 Commercial

4.1 Pricing

Pricing for the proposed equipment and services, as outlined in Section 3, is summarized in the table below. All pricing is based on the design operating conditions and influent characteristics that are detailed in Section 2 of the proposal. The pricing herein is for budgetary purposes only and does not constitute an offer of sale. No sales, consumer use or other similar taxes or duties are included in the pricing below.

Price: All Equipment & Service	
Proposed system price as per scope of supply proposed in Section 3.1	$ 1,350,000 USD

4.2 Equipment Shipment and Delivery

Equipment shipment is estimated at 35 to 52 weeks after order acceptance. The buyer and seller will arrange a kick-off meeting after contract acceptance to develop a firm shipment schedule.

Typical Drawing Submission and Equipment Shipment Schedule

Deliverables	**Duration (Weeks)**					
		14-16	**2-4**	**19-32**		**2**
Acceptance of PO						
Submission of drawings						
Drawings approval						
Equipment manufacturing						
Equipment shipment						
Plant operations manuals						

The delivery schedule is presented based on current workload backlogs and production capacity. This estimated delivery schedule assumes no more than 2 weeks for buyer review of submittal drawings. Any delays in buyer approvals or requested changes may result in additional charges and/or a delay to the schedule.

4.3 Freight

The following freight terms used are as defined by INCOTERMS 2020. All pricing is CIP from Guelph, ON, Canada to Clovewood Wastewater Treatment Plant, Village of South Blooming Grove, Orange County, New York.

4.4 Terms and Conditions of Sale

This proposal has been prepared and is submitted based on seller's standard terms and conditions of sale.

SUEZ Treatment Solutions Inc.
600 Willow Tree Road
Leonia, NJ 07605, USA
Tel: +1 201 676 2525

January 30, 2018

To: Gary M. Grey
HDR

Re: Aquaray® 40 HO Vertical Lamp Ultraviolet Disinfection Equipment
Orange County, NY

In accordance with your recent request, we are pleased to submit our preliminary proposal for the Aquaray® 40 HO Vertical Lamp ultraviolet disinfection system for the above referenced project. The Aquaray® 40 HO Vertical Lamp System has been proven through extensive use worldwide (over 400 Aquaray installations) to be a very effective and reliable UV disinfection system. The system's many features make operation and maintenance cost effective, easy, and safe. These features include:

- Third-Party validated (Hydroqual Inc.) UV system performance
- Title-22 reuse approved
- Fully automated operation. Only requires a 4-20 mA flow signal
- Easy maintenance without the need to remove equipment from channel for lamp and ballast replacement.
- Highest turndown of any UV system in the market. Automatic dose control is achieved turning on/off lamps in relation to a flow signal, ensuring that the plant is operated economically while still providing the required performance.
- Lowest lamp replacement cost of any UV system in the market ($25 per lamp)

If you have any questions or require any additional information, please don't hesitate to contact our Representative below or the writer.

Local Sales Representative
Robert Fenton
GP Jager Inc.
PO Box 50
Boonton, NJ 07005
Phone: 973-750-1180
Cell: 201-412-4370
Email: bfenton@jagerinc.com

SUEZ Regional Manager
Paul Ravelli
SUEZ Treatment Solutions Inc.
Tel: 856-761-2407
Email: paul.ravelli@suez-na.com

Sincerely,

For SUEZ Treatment Solutions Inc.

George Vrachimis
Applications Engineer
201-676-2227
George.Vrachimis@suez-na.com

AQUARAY® 40 HO (High Output) SYSTEM DESCRIPTION

The Aquaray® 40 "HO" system is latest generation and improvement of the previous Aquaray® VLS design which has been in use around the world since 1986. The Aquaray® 40 "HO" VLS System is based on the arrangement of the original Aquaray® 40 VLS "Type-B" design. The vertical lamp orientation and configuration has been proven, through general use and extensive pilot studies, to be a very effective form of disinfection. The system also has many features that make it easy and safe to operate and maintain.

The low pressure, low intensity lamps of the original Aquaray® 40 VLS have been replaced with new low pressure, high output lamps - requiring fewer lamps to treat the same capacity. Fewer lamps guarantee considerable savings on capital, operation, and maintenance costs.

UV DOSAGE ENHANCEMENT:

The ultraviolet dosage is the product of the ultraviolet intensity multiplied by the time (in seconds) that the water is in contact with that UV intensity. Based on completed bioassays, the Aquaray® HO VLS system can treat more than twice the flow compared to the standard low pressure low intensity lamps in an Aquaray® 40 configuration with the same UV dosage (uWatts-secs/cm^2) requirement. Flow deflection baffles have been added to enhance the disinfection performance capability of the Aquaray® HO VLS system.

HIGH OUTPUT LAMP ARRANGEMENT:

The ultraviolet lamps are mounted vertically so that all electrical connections are made out of the water and within the protection of a NEMA 4X stainless steel enclosure. Unlike other designs, all the lamps are easily accessed through the lid of this enclosure. Therefore, routine service such as lamp changes can be made without having to remove the lamp modules from the channel.

The lamps are also mounted in a uniform staggered array, three inch on center across the channel and five inch on center along the channel. This ensures a semi-tortuous path so that every particle of water will come into intimate contact with the most intense point of lamp output.

MODULE ARRANGEMENT:

The number and layout of the modules within the channel is determined based on the required UV dosage and a UV path for the water that eliminates any possibility of hydraulic short-circuiting.

See “DESIGN BRIEF” for details of module arrangement for this project.

CONTROL AND MONITORING:

Electronic lamp control is utilized to minimize power consumption. Electronic lamp control assemblies are conveniently mounted in the Aquaray® High Output Module’s NEMA-4X enclosure. This locates the assemblies close to the high output lamps, which minimizes the effect of outside interference such as radio waves, lightning, and voltage spikes.

With our Aquaray® High Output Module each individual lamp is monitored through the use of an on-board computer called a Data Controller Assembly (DCA). The DCA gathers and stores information relative to individual lamp hours and cycles. A non-volatile memory is included so that a possible relocation of the module will not result in a loss or misdirection of valuable lamp data.

The benefits of recording the individual lamp history may not be immediately apparent. UV lamps are guaranteed to provide a minimum operating life measured in terms of active operating hours, usually up to 13,000 hours. If a lamp fails electrically before the guarantee, our end-of-lamp life conditional warranty provides for a replacement at a cost pro-rated to the actual use achieved with the original lamp. For example, if a lamp fails at mid-life the replacement will be provided at half price.

A Power Distribution and Data Center (PDDC) included which houses the load center enclosure and GFCI Breakers for each high output module. The PDDC also includes the Allen CompactLogix PLC and Panelview 1000 Plus Operator Interface. Each Aquaray ® High Output module in the UV disinfection channel receives power from the load center locally mounted at the PDDC via a single power cable with waterproof plug-in connectors.

Each Aquaray® High Output module is fully independent and capable of automatic, fail safe operation in case of a control fault. This “default on” design ensures continuous disinfection even under emergency conditions.

FLOW PACING:

Flow Pacing is a system whereby lamp rows are switched on and off in relation to plant flow variations. The Aquaray® 40 HO System provides for very fine adjustments of the number of High Output lamps in service. Adjustments are made in direct proportion to the flow, with switching increments as low as 3%. To take full advantage of this feature we take a control signal, usually from the plant flow meter, and switch the lamps on or off as the flow changes.

The advantage of being able to switch the lamps by row is twofold:

- Energy Conservation
- Lamp Conservation

In our system each lamp requires 165 Watts. You realize immediate savings by activating only the minimum number of lamps required.

SYSTEM CLEANING:

Any UV system gradually accumulates a coating on the quartz sleeves housing the lamps. This routine fouling must be removed periodically. The Aquaray® 40 HO VLS System offers a fully automatic, in-channel cleaning system which reduces maintenance. The automatic wiping system is to be operated once daily and the wipers are to be replaced once every two years. This system is included in our proposal.

SERVICE:

Every piece of equipment within a wastewater plant requires service. The Aquaray® 40 HO VLS System has been developed to permit easy troubleshooting and quick replacement of components. The majority of maintenance activities can be carried out while the equipment is still located within the channel. The recommended spares included in this proposal will ensure that the system can be maintained efficiently and brought back to full operation in the shortest possible time.

DESIGN BRIEF

PLANT INFORMATION AND DESIGN BASIS:

Plant Location ..... Orange County, NY

Peak Flow ..... 38,445 GPH (922,680 GPD)
Maximum Daily Flow ..... 559,200 GPD
Design Average Daily Flow ..... 279,600 GPD

UVT…… ..... 65% minimum (Assumed)
TSS……<30 mg/L (Assumed average)
Permit, Fecal Coliform..... 200 CFU/100mL (30 day average)
..... 400 CFU/100mL (7 day average)

Minimum UV Dose ..... 30 mJ/cm^2

SUMMARY:

The system proposed will provide a minimum UV dosage of 30 mJ/cm^2, at the peak flow. The dosage calculation takes into account several factors including the end of lamp life, the quartz sleeve transmittance factor, and the peak capacity.

Based on the peak hourly flow of 38,445 GPH (922,680 GPD) and an assumed minimum UVT of 65%, we are proposing one (1) UV disinfection channel, with two (2) Aquaray® 40 HO modules mounted one (1) across by two (2) banks in series per channel (1 duty + 1 standby). The total number of Aquaray® 40 HO UV modules is two (2) at the peak flow of 38,445 GPH (922,680 GPD) with one bank out of service.

Each Aquaray® 40 HO module includes 40 Low Pressure High Output Lamps, arranged in five rows of eight lamps each.

PROPOSED AQUARAY® 40 HO VERTICAL LAMP SYSTEM DESIGN:

Peak Flow, MGD	0.923 MGD
% UV Transmission	65% minimum (Assumed)
Bioassay UV Dosage at Peak Flow, mJ/cm^2	***30 mJ/cm^2***
Number of Channels	1
Number of Modules Across (Modules per Bank)	1
Number of Modules in Series (Number of Banks)	2 (1 duty + 1 standby)
Channel Width, in.	24.5 inches
Channel Length, ft.	17 feet
Channel Depth, in.	72 inches
Water Levels	57.5 to 62 inches
Aquaray® Modules/Channel	2
Total Number of Modules	2
Number of Lamps/Module	40
Total Number of Lamps	80
Headloss across all the UV modules, in.	0.06 inches
Power Consumption per Lamp, W	165 watts
Power Consumption at Peak Hourly Flow (922,680 GPD), kW	6.60 kW
Power Consumption at Maximum Daily Flow (559,200 MGD), kW	5.28 kW
Power Consumption at Average Daily Flow (279,600 MGD), kW	3.96 kW
Total Installed Power, kW	13.2 kW

SPARE PART REPLACEMENT COST:

UV Lamps (13,000 hour warranty)	$25
Sleeves (5 year warranty)	$25
Ballasts (5 year warranty)	$200

SCOPE OF SUPPLY AND BUDGET PRICE

We propose to furnish the following equipment for the Aquaray® 40 HO Vertical Lamp ultraviolet disinfection system described in the previous sections

- Aquaray® 40 HO Vertical UV modules with Automatic Cleaning Wipers, 316L stainless steel components
- Mounting Rail/Eye Shields, 304 stainless steel
- Power Distribution & Data Center(s) (PDDC) – Includes Allen Bradley CompactLogix PLC with Panelview 1000 Plus Operator Interface
- Wireway
- Stepdown Transformer(s)
- Interconnecting Cables between the Modules and the Data Control Center and between the Modules and Power Distribution Center(s)
- Lamp Row by Row Flow Pacing
- In-Channel Cleaning System (automatic cleaning wipers)
- Level Control Weirs
- Lifting Spreader Bar
- Anchor Bolts
- Recommended Spare Parts

The following will also be included:

- Freight to the jobsite
- Start-up service: five (5) days in one (1) trip
- Four (4) O&M manuals

Note that the following items are to be provided by others (unless indicated otherwise above):

- Jib Crane and Hoist (1/2 ton capacity)
- Channel Grating
- Slide Gates
- Remote Computer System
- Installation
- Embedded Conduits
- Sampling and Effluent Performance Testing

BUDGET PRICE: Our current budget estimating price, not including the optional adders above, is (PRICE TO BE PROVIDED BY SUEZ TREATMENT SOLUTIONS REPRESENTATIVE). This price will be valid for one (1) year; payment terms will be as below and commercial terms and conditions are given on the following page. The price is in accordance with the Scope of Supply and terms of this proposal and any changes may require the price to be adjusted.

Payment Terms:

10% Net Cash, Payable in thirty (30) days from date of submittal of initial drawings for approval;

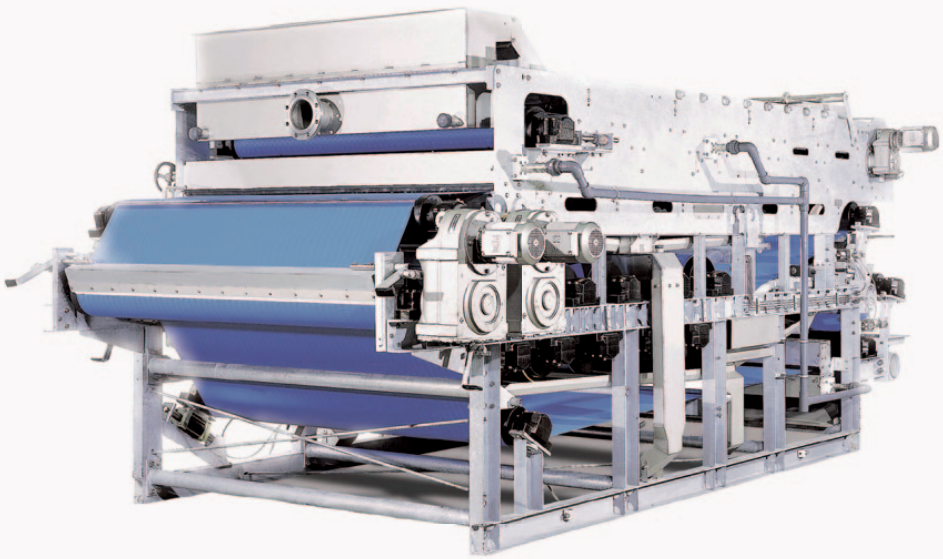
80% Net Cash, Payable in progress payments thirty (30) days from dates of respective shipments of the Products;

10% Net Cash, Payable in thirty (30) days from Product installation and acceptance or Ninety (90) days after date of final Product delivery, whichever occurs first.

SCHEDULE: Approval drawings and data can be submitted approximately 4-6 weeks after agreement to all terms, as evidenced by SUEZ's receipt of this proposal, fully executed; or, in the event that Purchaser issues a Purchase Order, SUEZ's receipt of fully executed letter agreement. SUEZ estimates that shipment of the Products can be made in approximately 14-16 weeks after SUEZ has received from Purchaser final approval of all submittal drawings and data.

3 Belt Klampress Belt Press

Sludge thickening and dewatering machine



Features

The Klampress 3 Belt with independent gravity deck has the capability to take feed sludges that are less than 1% dry solids and thicken more efficiently in the gravity section, so that the sludge is better prepared for the high pressure zone. The independent gravity deck has the ability to run at different speeds than the pressure zone, therefore, thinner sludges can be fed at high hydraulic feed rates to a faster moving belt on the gravity section. The result is a machine that is not limited to the standard hydraulic and loading rates of typical two belt machines.The 3-Belt machine is specifically designed for sludges with feed solids less than 1.5%, which means that the plant can eliminate the need for a gravity thickener or holding tank to thicken sludge prior to the belt press.

Benefits

- Up to 5 times higher throughputs using same footprint as conventional belt press
- 1-2% points higher cake solids performance with dilute sludges
- Independent belts for gravity and pressure section
- More forgiving/flexible with different incoming feed solids
- Dual function as gravity belt thickener or belt filter press option
- Available in variety of pressure profiles, including high solids version

Configuration

- Available in 8 roller and 12 roller designs in the pressure section
- Open frame design maximizes access
- Available in a fully odour-enclosed format with removable panels allowing for easy access
- Available with 3-Belt design - independent gravity deck for sludge that has less than 1.5% dry solids

Ashbrook Simon-Hartley

Bearings
The Klampress® is equipped with lifetime-rated bearings. Each bearing is protected from contaminates with triple-labyrinth seals and shaft -mounted splash guards

Belt alignment
Operator specified belt tensioning is automatically maintained by the Klampress® SmartPress™ system, recognising subtle condition variations such as belt stretching or process changes.

Gravity dewatering zone
The arrangement of the Klampress® gravity drainage zone ensures the even distribution of the conditioned slurry over the effective width of the moving filter belt

Sludge/poly mixer valve
The Klampress® is equipped with a proprietary variable orifice, in-line polymer mixer that combines polymer and slurry instantly (in less than one second). This advanced, non-clog, static mixer is known for the mixing precision and adjustable throat which allow direct control of mixing energy. Its design optimises polymer effectiveness and minimises polymer consumption

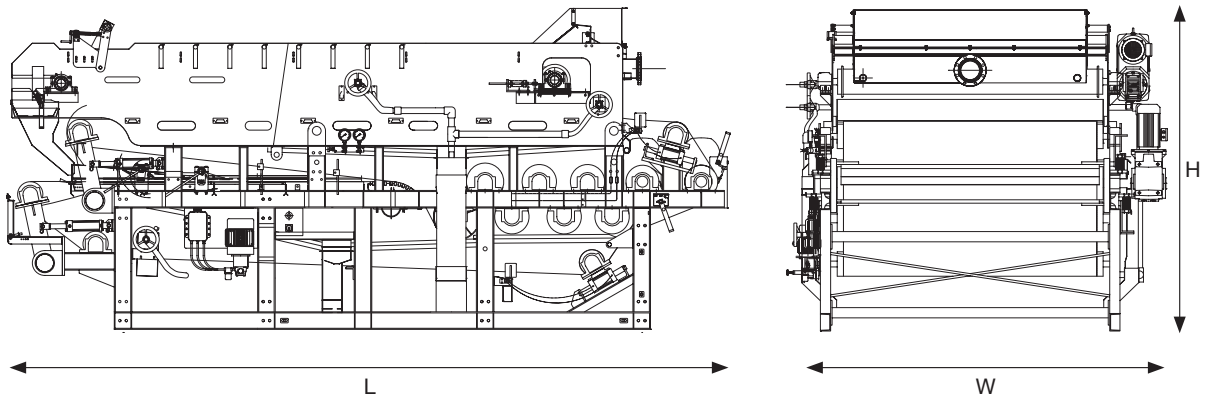
Bearings
- Heavy duty bearings with triple-labyrinth seals
- Extended lubrication cycle (six monthly)
- Shaft mounted splash guards
- Positioned for easy installation

Wedge zone
Adjustable wedge dewatering zone initiates the application of pressure to the dewatering process

Belt alignment
SmartPress™ Belt Alignment System ensures continuous, smooth guidance control without the need for operator intervention.

Belt tensioning
- Operator specified belt tensioning is automatically maintained, recognizing subtle condition variations such as belt stretching or process changes
- Easy to operate and maintain

Thickening and dewatering zones
- Independent gravity section
- Full-pressure dewatering zone – pressure is gently increased as the sludge passes through 8 or 12 pressure rollers
- Radial grid and perforated roller accelerate dewatering through shear forces Better process performance



Dimensions

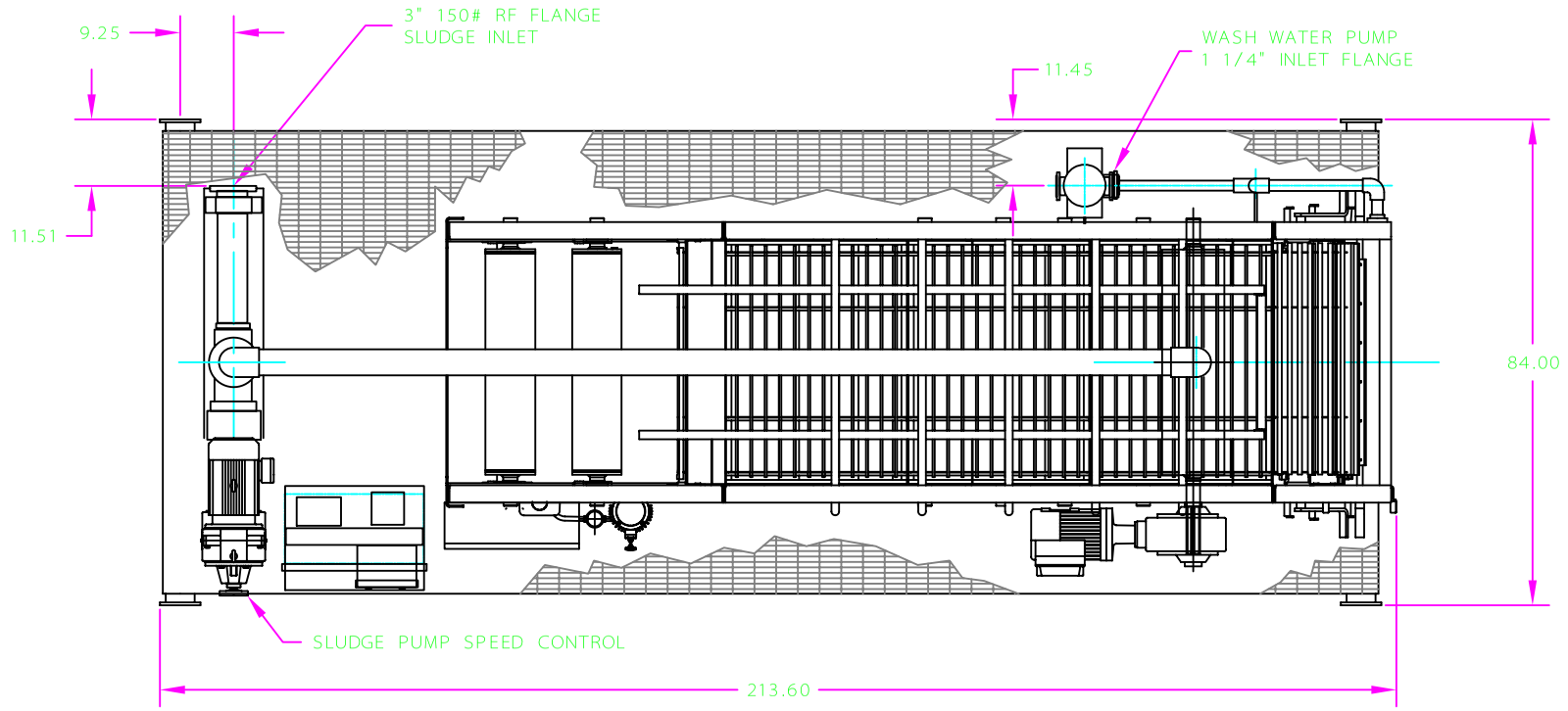
Model	Length	Width	Height	Weight (dry)
1 m	6,240 mm (245 inch)	2,077 mm (82 inch)	3,900 mm (153 inch)**	9,235 kg (20,359 lbs)
1.5 m	6,240 mm (245 inch)	2,585 mm (102 inch)	3,900 mm (153 inch)**	11,360 kg (25,044 lbs)
2 m	6,240 mm (245 inch)	3,094 mm (122 inch)	3,900 mm (153 inch)**	13,900 kg (30,644 lbs)

* Overall machine heights include standard 300mm high plinth. ** Includes odour hood.

PEE00324EN 1304

How to contact Alfa Laval
Up-to-date Alfa Laval contact details for all countries are always available on our website at www.alfalaval.com

B4MATR2.DWG REV. 2



FIELD HOOK UP INFO.

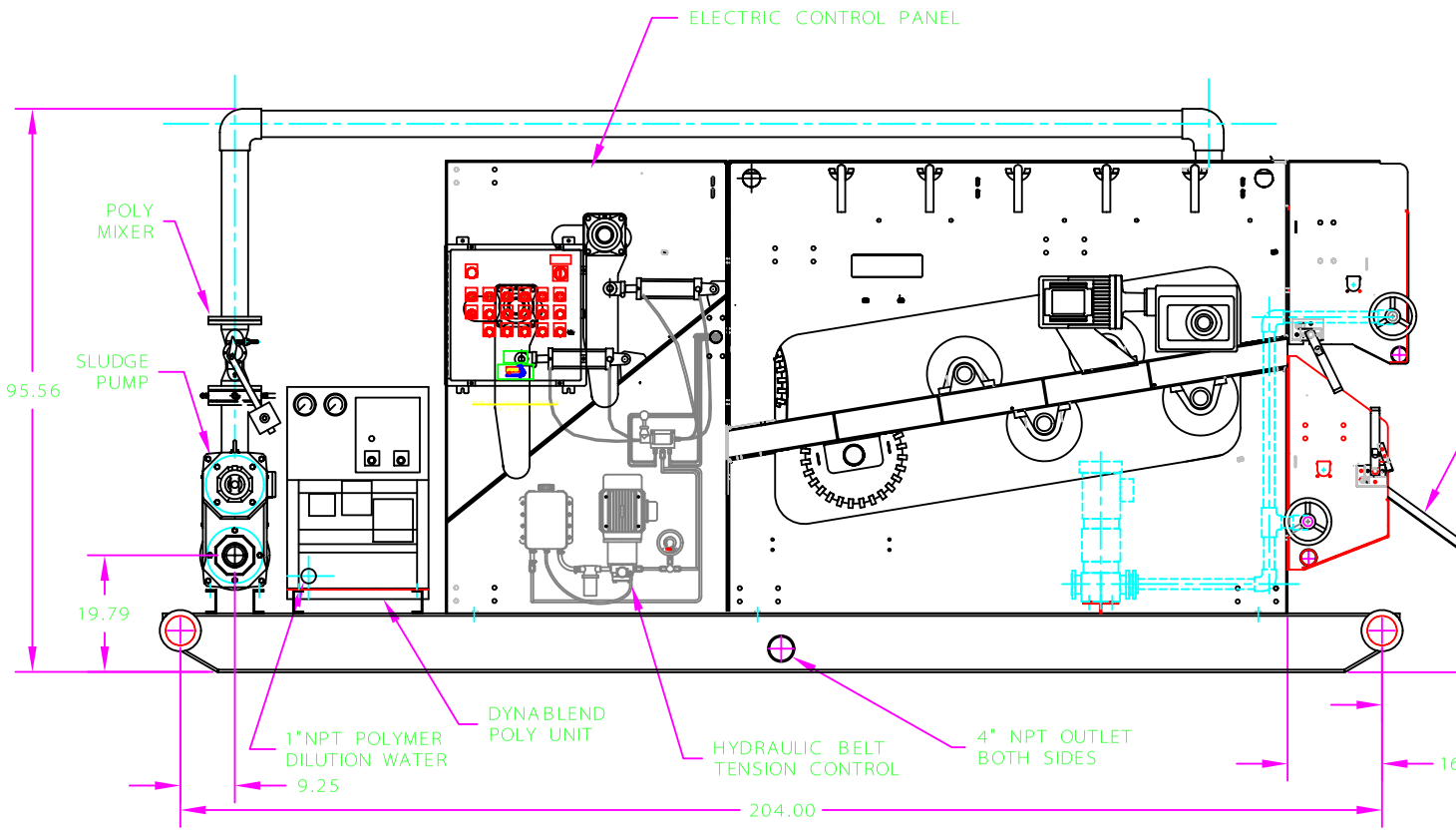
ELECTRICAL
480 VAC, 3 PH, 30 A

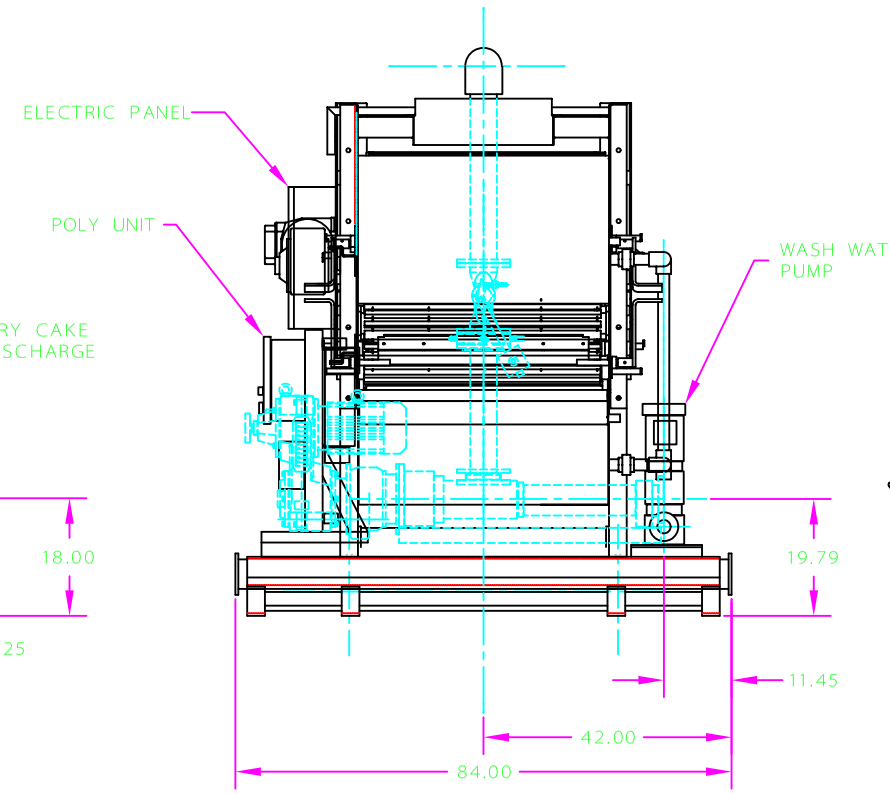
WASH WATER
1 1/4" 15 GPM

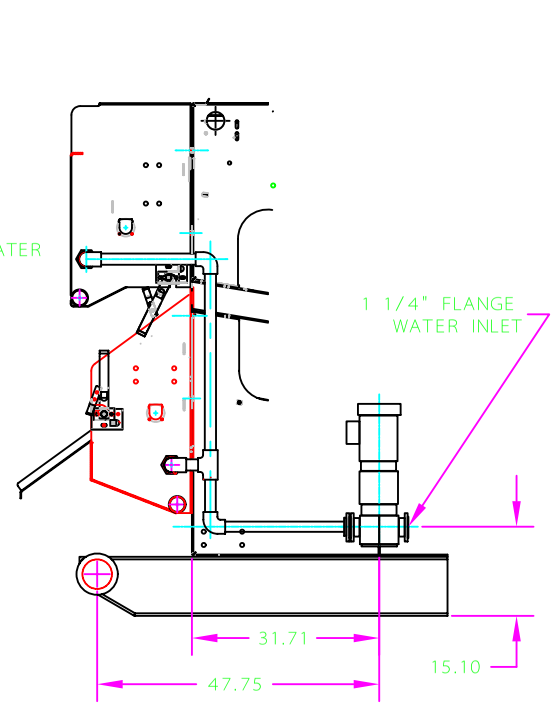
POLY DILUTION WATER
1" 1 GAL/HR (POTABLE)

SLUDGE PUMP
3" 150# RF FLANGE

FILTRATE DRAINS
4" NPT ONE EACH SIDE







NOTE:
THIS DRAWING NOT INTENDED FOR MANUFACTURING OR BUILDING USE.

SEE DRAWING SK001617 FOR DETAILS AND DIMENSIONS OF THE PRESS.

REVISIONS

REV	DATE	DESCRIPTION	BY	APPR
1	5/99	CORRECTED SKID DESIGN, & PLACEMENTS.	JS	JET
2	10/99	CORRECTED DIMS., SEE ECN	JET	JET
3	10/99	ADDED SEW EURODRIVE TO TITLE	JET	JET
4	2/02	ADDED NEW DRIVE AND GEARBOX.	JS	JET
5	2/02	ADDED NEW CONTROL PANEL	JS	JET
6	6/02	ADDED MANUFACTURING NOTE	MM	JET

TOLERANCE UNLESS NOTED:
ALL DIMENSIONS IN INCHES.
BREAK ALL SHARP EDGES
FRACTIONAL = ± 1/32"
ANGLES = ± 1/2°
DECIMAL .XX = ± .03
.X = ± .1, .XXX = ± .015
MACH. SURFACE 125 MAX.

DRAWN: JET	DATE: 11/11/98
CHECKED: JET	DATE: 11/11/98
APPROVED: JET	DATE: 11/11/98
NEXT ASSY: N/A	WEIGHT: 10,600 lb

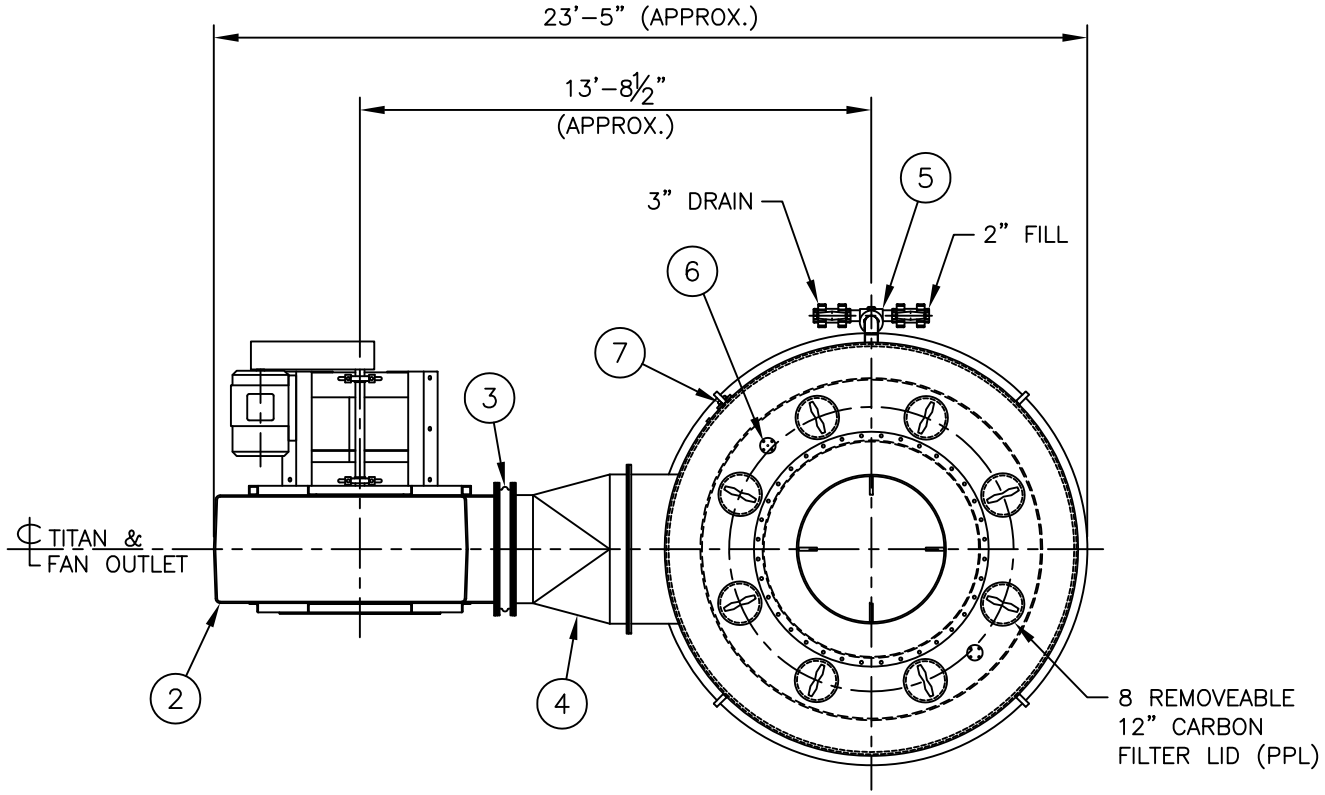
ASHBROOK
LEADERS IN LIQUID / SOLID SEPARATION

Ashbrook Corporation
11600 East Hardy Road
Houston, Texas 77093
Phone: 281-449-0322
FAX: 281-449-1324

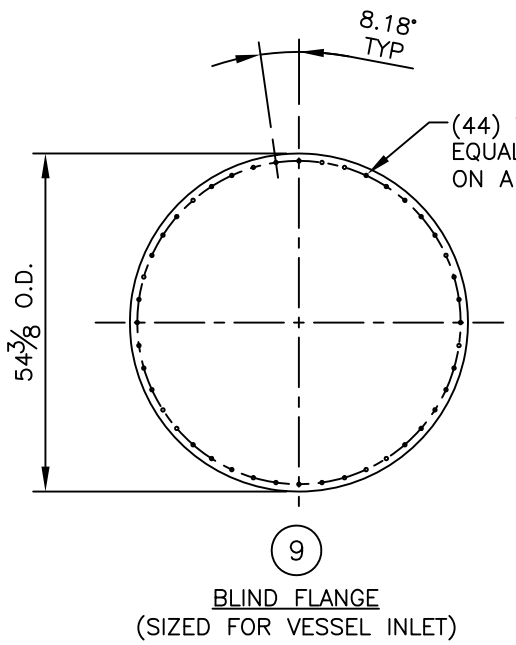
TITLE
GENERAL ARRANGEMENT
KLAMPRESS KP0.5
SKID PACKAGE

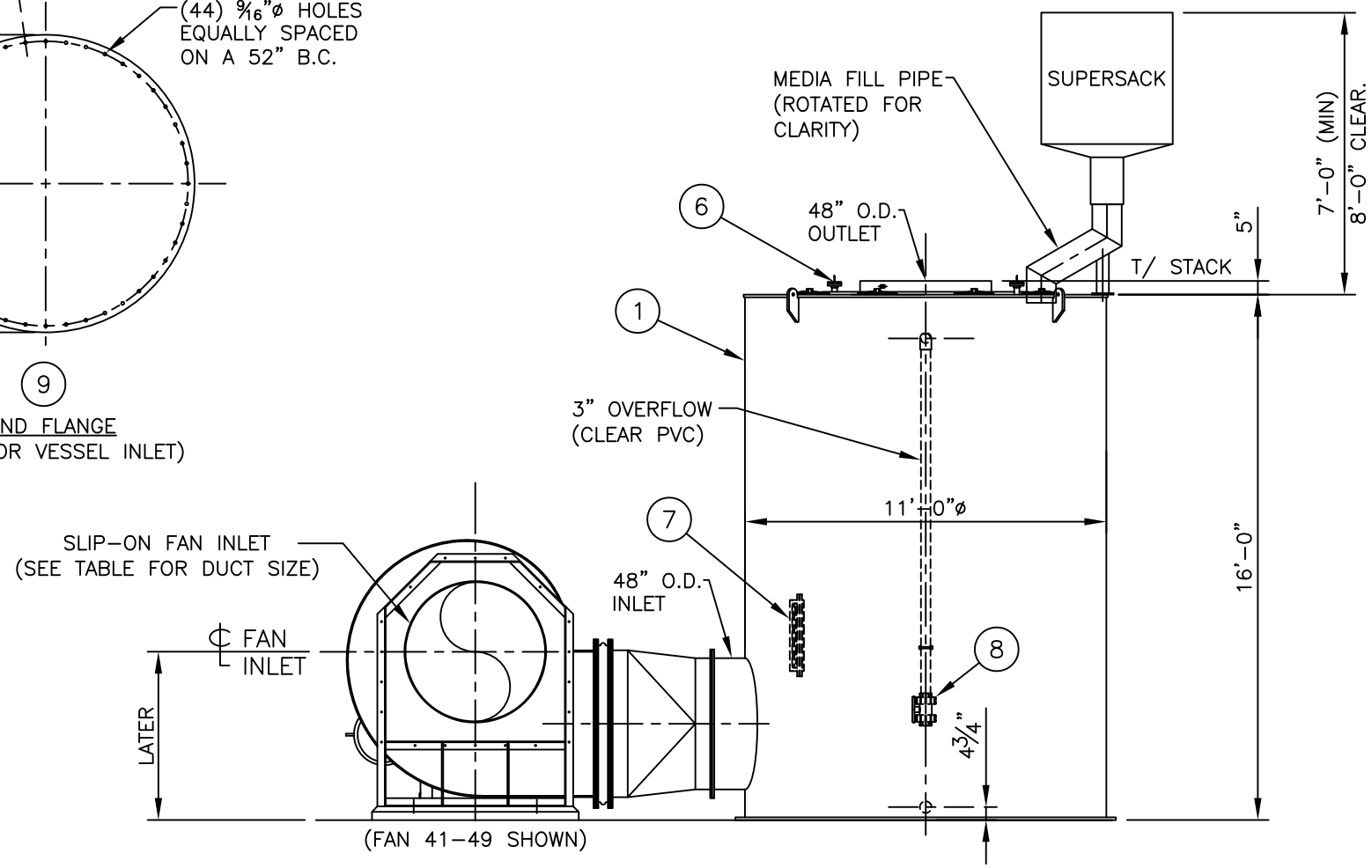
SCALE	DWG. NO.	REV
1/32	SK001689	6

CUSTOMER: N/A



PLAN





ELEVATION

(APPURTENANCES ROTATED FOR CLARITY)
(SEE PLAN VIEW FOR PROPER ORIENTATION)

BILL OF MATERIAL

MK	QTY	DESCRIPTION	MATL.
1	1	TITAN VESSEL – MODEL T110	PPL
2	1	FAN – HARTZELL FAN (SEE FAN DATA)	FRP
3	1	EXPANSION JOINT, FLGD. – CS EPOXY PAINTED BACKUP BARS	EPDM
4	1	TRANSITION PIECE, FLGD. (IF REQUIRED)	PPL
5	1	2" FILL & 3" DRAIN, BALL VALVE CONNECTIONS	CPVC
6	1	GROUNDING ROD ASSEMBLY	PVC/SS
7	1	MANOMETER – DWYER MAGNEHELIC 2000	–––
8	1	OVERFLOW VALVE, 3" BUTTERFLY	CPVC
9	1	BLIND FLANGE (FOR CARBON REGENERATION)	PPL

MODEL & FAN DATA

FLOW RATE	FAN MODEL	CAPACITY	PRES. * (IN. WC)	MOTOR H.P.	FAN INLET (NOM.)		
30000		30000 CFM @ _____ RPM			52"		

STANDARD FAN CONFIGURATION:
MFG.: HARTZELL FAN OR EQ.
ARRG'T: 9
ROTATION: CW–BH
ISOLATORS: NO
GRAPHITE IMPEGNATION

STANDARD MOTOR CONFIGURATION:
VOLTAGE:
SERVICE FACTOR:
ENCLOSURE: TEFC
WEATHER GUARD:

* – STATIC PRESSURE SHOWN INCLUDES 1" AVAILABLE FOR CUSTOMER USE.

DESIGN CONDITIONS

MAX PRESSURE: 15" W.C. (3.75 kPA) POSITIVE	MAX TEMP: 140°R(°C)
SEISMIC: ZONE 2	

NOTES:
1. VESSEL TO BE FABRICATED FROM UV RESISTANT BLACK POLYPROPYLENE.
2. FLANGES ARE NON–LOADBEARING, ALL CONNECTING DUCTWORK TO BE INDEPENDENTLY SUPPORTED.
3. SEE SHEET 2 FOR OPTIONAL COMPONENTS.

ESTIMATED WEIGHTS: (LBS.)

VESSEL (EMPTY):	5,000
VESSEL (OPERATING):	26,000
VESSEL (FLOODED) :	101,000

FOR INFORMATION ONLY NOT FOR CONSTRUCTION

DESIGN SUBJECT TO CHANGE WITHOUT NOTICE

	NAME	DATE
DRAFTER		
DESIGNER		
CHECKER		
APPROVAL		
PROJECT No.	STANDARD	

REV	DESCRIPTION	APP	DATE
C			
B			
A			

REVISIONS

TOLERANCES (unless otherwise specified)

ANGULAR	±0°30'	DECIMAL (2 PLACES)	±.010
FRACTIONAL	±1/16"	DECIMAL (3 PLACES)	±.005
DECIMAL (1 PLACE)	±.015	DECIMAL (4 PLACES)	±.0005

Continental Carbon Group

CLIENT

TITLE
TITAN MODEL T110, CENTAUR
30000 ACFM
GENERAL ARRANGEMENT

DWG. Size	SHEET No.	SCALE
B	1 OF 2	

DWG. No. 90300856 REV. 0

APPENDIX IV

Estimated Final Effluent Mass Balance Based on Average Design Flow

Influent Wastewater					Supplemental Alkalinity			MBR Effluent				Final Effluent				Design Final Effluent Limits	
Flow	0.25676	MGD			50% NaOH	31273	gal/yr										
TSS	365	mg/L	782.5	lb/d				0	mg/L	0	lb/d	0	mg/L	0	lb/d	10	
CBOD	332	mg/L	711.8	lb/d	Phosphorus Removal			0.8	mg/L	1.715	lb/d	1	mg/L	2.14	lb/d	5	
COD	871	mg/L	1867	lb/d	49% Alum*	350	lb/d	59	mg/L	126.5	lb/d	0.33	mg/L	0.71	lb/d		
TN	76	mg/L	162.9	lb/d	*or ferric chloride			37.8	mg/L	81.04	lb/d	50	mg/L	107	lb/d		
NH4-N	13	mg/L	27.87	lb/d				0.08	mg/L	0.172	lb/d	0.1	mg/L	0	lb/d	1.5/2.2	mg/L as NH_3-N (summer/winter)
NOx-N	<1	mg/L	NA	lb/d	10.3% Sodium Hypochlorite	323	gal/yr	35.6	mg/L	NA	lb/d	48	mg/L	NA	lb/d		
TP	14	mg/L	30.02	lb/d	50% Citric Acid	246	gal/yr	10	mg/L	21.44	lb/d	6.6	mg/L	14.2	lb/d	0.5	mg/L as P
Ph	7 to 8	SU						7	SU			7	SU			6 - 9	SU
DO	NA		NA					2	mg/L			>7	mg/L			≥7	mg/L

MLSS	8000	mg/L	
SRT	11.9	days	
Oxygen	2052	lb/d	

Screenings		Grit		Screenings	
1.95	cf/d	0.56	cf/d	1.67	cf/d

Sludge Handling Returns				
Flow	9310	GPD		
TSS	553	mg/L	43	lb/d
BOD	85	mg/L	6.6	lb/d
CBOD	518	mg/L	40	lb/d
TN	59.2	mg/L	4.6	lb/d
TKN	27	mg/L	2.1	lb/d
NH4-N	0.08	mg/L	0.01	lb/d
NOx-N	35.6	mg/L	2.8	lb/d
TP	13.5	mg/L	1.0	lb/d

Sludge Cake				
TS	621	lb/d	21.9	%
TVS	511	lb/d	55.6	% of TS
N	28.6	lb/d	4.6	% of TS
P	8.7	lb/d	1.4	% of TS

APPENDIX V

Simple Mixing Zone Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

SPDES DISCHARGE PERMIT
Simple Mixing Zone Form

Clear Form

Purpose & Instructions

The following information will inform the Department's review of your SPDES permit and the resulting effect on the receiving waterbody. Complete the information (one form for each outfall) based on either field observations or schematics/design drawings to the best of your ability. Please see the Mixing Zone Guidance for additional instructions. If an item is unavailable or non-applicable, please describe. Submit with the NY-2A or NY-2C Application Form to SPDESapp@dec.ny.gov.

Facility Name: Clovewood Transportation Corporation SPDES No.: Application No. 3-3320-00150/00001,2,3 Outfall #: 001

NYSDEC Permit Writer: Tracey L.M. O'Malley Receiving Waterbody Class: C

Email: Tracey.Omalley@dec.ny.gov Phone No.: (845) 256-3059

Observation Information

Name & Title of Observer: Simon Gelb, Representative Date of Observation: 02/07/2023

Phone Number: (845) 774-8000 Email: gelbsimon@gmail.com

Name of Receiving Waterbody: Unnamed Tributary of Satterly Creek

Weather conditions at time of observation (describe any recent rain/melt events):
Partly Cloudy

Avg. Width (ft): 15.00 Avg. Depth (ft): 0.40 Local Depth at Outfall (ft): 0.00

Has the receiving waterbody run dry in the last 5 years? ☐ Yes ☒ No

Are tidal conditions present? ☐ Yes ☐ No

Outfall Location & Configuration

Outfall #: 001 Location at end of pipe: Latitude: 41°22'44.12"N Longitude: 74°10'23.53"W

Describe outfall (location, size, configuration, condition of the structure):
There is currently no existing outfall at this location. Once the Clovewood WWTF is complete and operational, proposed discharges would occur at an exposed, free flow-outlet on the left bank of the Unnamed Tributary of Satterly Creek.

☒ **Option #1**: Bank Discharge (outfall pipe/channel does not extend very far into waterbody)

- ☐ Outfall pipe (12.0 in diameter) discharges to waterbody at 1.00 feet from bank
  OR
- ☐ Channel/Ditch (____ft wide x ____ft deep x ____ft long) discharges to waterbody at bank

☐ **Option #2**: Extended Pipe Discharge (outfall pipe extends into waterbody)

- ☐ Outfall pipe (____in diameter) is a single pipe with an open end or no diffuser
  OR
- ☐ Outfall pipe (____in diameter) has a diffuser with _____ port(s)

Outfall Photos & Schematics

Upload or attach photos/schematics that depict the location of the outfall (i.e. photo of outfall pipe/channel, satellite image with location of outfall, hand sketch, design schematic, view upstream, view downstream).
You will be prompted twice to select your photo/schematic.

Description:
Looking upstream towards location of proposed outfall on left bank of Unnamed Tributary of Satterly Creek

Click to Upload Photo

Description:
Looking upstream towards location of proposed outfall on left bank of Unnamed Tributary of Satterly Creek

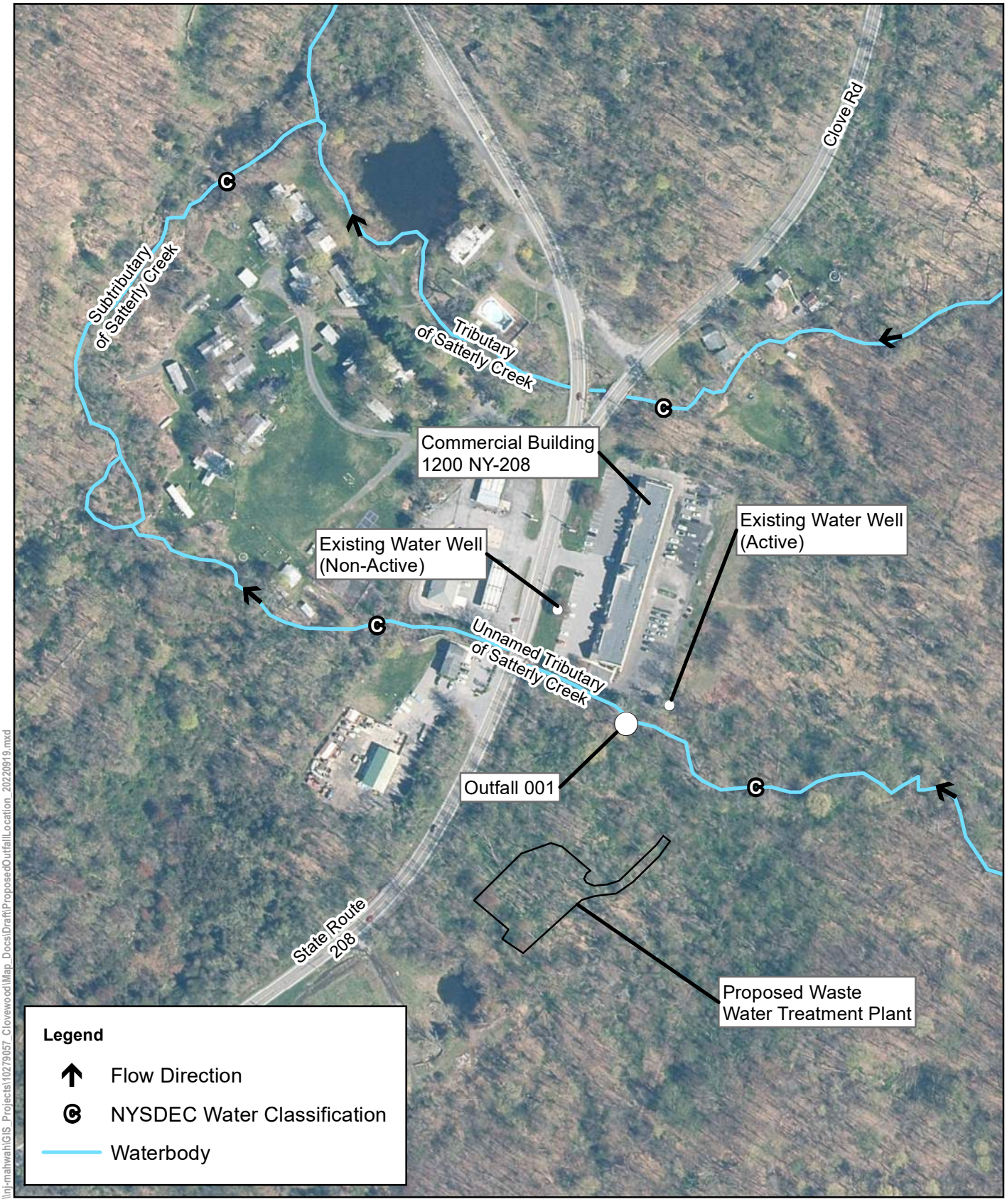
Click to Upload Photo

Description:
Photo taken from right bank, looking towards location of proposed outfall on left bank of Unnamed Tributary of Satterly Creek

Click to Upload Photo

Description:
Looking downstream towards location of proposed outfall on left bank of Unnamed Tributary of Satterly Creek

Click to Upload Photo



Basemap Source:
World Imagery Base - Esri, USGS, NOAA

Figure 1
Proposed Outfall Location at Clovewood WWTF
Village of South Blooming Grove, Orange County

Application Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

State Pollutant Discharge Elimination System (SPDES) Application Form: Private, Commercial & Institutional (P/C/I) Discharge of Treated Sanitary Sewage

(•) New Application ( ) Renewal Application ( ) Modification Application

SPDES Number NY0281727 (NY#######) **DEC Authorization** (#-####-#####)

Applicant/Owner Information

Type of Ownership: (•) Corporate ( ) Individual ( ) Partnership ( ) Public

Name: Clovewood Transportation Corporation
Taxpayer ID:
Mailing Address: C/O CPC P.O. 2020
City: Monroe State: NY Zip: 10949
Phone: (845) 774-8000 Email: gelbsimon@gmail.com

Contact/Agent Information

Name: WSP USA, Inc.
Title: Thomas Payne P.E.
Mailing Address: 166 Valley Street, Building 5
City: Providence State: RI Zip: 02909
Phone: 401-415-9453 Email: thomas.payne@wsp.com

Facility Information

Facility Name: Clovewood
Nature of Business or Facility: Proposed subdivision of 600 residential units
Population Served: 0
Street Address: Clove Road (CR 27) and NYS Route 208
City: Village of South Blooming Gro
State: NY Zip: 10950

Municipality ( ) Town (•) Village ( ) City
Municipality Name: Village of South Blooming Grove
County: ORANGE

Additional Facility Location Information (if needed)
NYS Route 17k, exit 130 to NYS Route 208 North to Clove Road (CR 27)

Tax Map Information: Section 208 Block 1 Lot 2 & 3

Certification: I hereby affirm under penalty of perjury that the information provided on this form and any attached supplemental forms is true to the best of my knowledge and belief. False statements made herein are punishable as a Class A misdemeanor pursuant to section 210.45 of the Penal Law.

Signature of Applicant/Owner: Simon Gelb
Printed Name: Simon Gelb
Title: Representative for Applicant
Date: 7/21/23

Applicable discharge data on the following pages must be completed. Discharges from this facility are not authorized until this application form is attached to the permit signed and authorized by the New York State Department of Environmental Conservation or its designated agency.

Please Indicate Whether Your Facility 'Discharges To Groundwater', 'Discharges To Surface Water', or both.

☐ Discharges To Groundwater

☒ Discharges To Surface Water

SPDES Application for P/C/I Discharge of Treated Sanitary Sewage

Discharges To Groundwater - 1 of 1

Facility Name Clovewood

SPDES Number NY0281727 **DEC Authorization**

To Add or Remove outfalls, click on the Green + or the Red X respectively. + x

Complete this page of the application if your facility has any discharges to groundwater. Use additional copies of this page to list additional groundwater outfalls. Sampling information is only required if the disposal system is designed to discharge, or discharges 30,000 GPD or more.

Outfall Information:

Outfall No.	Outfall Status	Design Flow
	○ Proposed ○ Replacement ○ Existing ○ Expansion	Gal/Day

Outfall Location (if subsurface system, indicate center of disposal system area)

Latitude ° ' "

Longitude ° ' "

Treatment:

Standard On Site Treatment: Septic Tanks with:		Alternative On Site Treatment: Septic Tanks with:	
☐ Absorption Trenches	☐ Cut and Fill Systems	☐ Absorption Trenches Using An Alternative Aggregate	☐ Single-Pass Sand Filters & Pressurized Shallow Narrow Drainfields
☐ Shallow Absorption Trenches	☐ Raised Systems	☐ Shallow Absorption Trenches Using An Alternate Aggregate	☐ Mound Systems
☐ Absorption Beds	☐ Seepage Pits	☐ Absorption Beds Using An Alternate Aggregate	☐ Drip Dispersal or Other Low Profile Dispersal System

☐ Other (describe)

Frequency of Discharge Months/Year Days/Week

Name of Nearest Surface Waters	Distance	Soil Type	Depth To Water Table
	Ft.		Ft.

SPDES Application for P/C/I Discharge of Treated Sanitary Sewage

Discharges to Groundwater

Facility Name Clovewood

SPDES Number NY0281727 **DEC Authorization**

Outfall No.

Sampling Information

Include the following sampling information if the disposal system is designed to discharge, or discharges, 30,000 GPD or more. Please indicate whether the values listed are from sampling results (include the date), estimated from the treatment system design as installed, or estimated from the proposed treatment system design.

Plant Design Pollutant Information	Influent		Effluent		Number of Samples or Source of Estimate
	mg/l	lbs/day	mg/l	lbs/day	
BOD5					
Percent removal, BOD5					
pH, Range					
Nitrate, as N					
Nitrite, as N					
Ammonia, as N					
Nitrogen, Total, as N					
Phosphorus, Total, as P					
Total Residual Chlorine, if used					
Solids, Total Dissolved (Nassau/Suffolk only)					

SPDES Application for P/C/I Discharge of Treated Sanitary Sewage

Discharges To Surfacewater - 1 of 1

Facility Name Clovewood

SPDES Number NY0281727 **DEC Authorization**

To Add or Remove outfalls, click on the Green + or the Red X respectively. + X

Complete this page of the application if your facility has any discharges to surface water. Complete this form for each surface water outfall.

Discharge Data

Outfall No.	Outfall Status	Design Flow
001	(•) Proposed ( ) Replacement ( ) Existing ( ) Expansion	256,760 Gal/Day

Outfall Location (end of pipe or conveyance)

Latitude 41 ° 22 ' 44.16 "

Longitude 74 ° 10 ' 23.56 "

Type of Treatment

Membrane Bioreactor System

Frequency of Discharge Months/Year 12 Days/Week 7

Name of Receiving Water	Classification	Water Index Number
Unnamed Tributary of Satterly Creek	C	H-89-17-4

SPDES Application for P/C/I Discharge of Treated Sanitary Sewage

Discharges to Surface Water

Facility Name Clovewood

SPDES Number NY0281727 **DEC Authorization**

Outfall No. 001

Sampling Information

Include the following sampling information. Please indicate whether the values listed are from sampling results (include the date), estimated from the treatment system design as installed, or estimated from the proposed treatment system design.

Plant Design Pollutant Information	Influent		Effluent		Number of Samples or Source of Estimate
	mg/l	lbs/day	mg/l	lbs/day	
BOD5	344	737.5	5	10.7	Proposed Treatment System Desi
Suspended solids	378	810.4	10	21.4	Proposed Treatment System Desi
Percent removal, BOD/TSS			98.55% B	97.35% T	Proposed Treatment System Desi
pH, Range	7.0-8.0		6.5-8.5		Proposed Treatment System Desi
Settleable solids, ml/l			0.1	0.2	Proposed Treatment System Desi
Solids, total dissolved	781	1,674.4	781	1,674.4	Proposed Treatment System Desi
Dissolved oxygen	0		> or = 7	15.0	Proposed Treatment System Desi
Ammonia, as N	13	27.9	1.5	3.2	Proposed Treatment System Desi
Nitrogen, Total, as N	79	169.4	50	107.2	Proposed Treatment System Desi
Phosphorus, Total, as P	14	30	0.5	1.1	Proposed Treatment System Desi
Fecal Coliform, MPN	5.05E+07		200		Proposed Treatment System Desi
Total Residual Chlorine (if used)	N/A		N/A		UV disinfection
Temperature, Degrees F, Summer	68		68		Proposed Treatment System Desi
Temperature, Degrees F, Winter	50		50		Proposed Treatment System Desi

WTC Notification Form

New York State Department of Environmental Conservation
Division of Water
SPDES Permit - WTC Notification Form Page 1 of 2 (August 2022)

For help completing this form refer to instructions page and to http://www.dec.ny.gov/permits/93245.html .

1.a. Date Signed by Permittee - 2/7/23	1.b. Date Signed by WTC Manufacturer - 2/1/23
2.a. Permittee Name - Clovewood Development	2.b. SPDES No. - NY
2.c. Contact Name - Mr. Simon Gelb	
3.a. WTC Name - Aluminum Sulfate	
3.b. WTC Manufacturer - Slack Chemical Co. Inc	
4.a. WTC Function - Coagulant, phosphorus precipitation	
4.b. If WTC is a biocide is it NYS registered? Yes No	4.c. Registration Number - Not Applicable
5. WTC Point of Addition - MBR Influent	
6. Affected Outfall(s) - 001	
7.a. WTC Daily Dosage: average lbs/day = 350 , maximum lbs/day = 700 (as alum sulfate)	
7.b. Dosage Frequency: minutes/day = 1440 , days/week = 7	
8.a. Outfall Flow Rate: average MGD = 0.25676 , maximum MGD = 0.51352	
8.b. Outfall WTC Concentration: average mg/l = 0.25 , maximum mg/l = 0.33 (as aluminum)	
9.a. System Blowdown Flow Rate: average gpm = 0 , maximum gpm = 0	
9.b. System Blowdown Frequency: minutes/day = 0 , days/week = 0	

10.a. WTC Composition - Ingredients/Impurities (note: ingredients/impurities must total to 100%)	10.b. %	10.c. CAS#	10.d. Outfall Concentration
Aluminum sulfate (A12(SO4)3*14H2O)	30	10043-01-3	0.33 (as aluminum) mg/l
Water	70	7732-18-5	0 mg/l
			mg/l
			mg/l
			mg/l
			mg/l
			mg/l

10.e. Intermediate/Final Degradation Products - No known decomposition products
11. WTC BOD and COD (lb/lb) - 0

New York State Department of Environmental Conservation
Division of Water
SPDES Permit - WTC Notification Form Page 2 of 2 (August 2022)

1.a. Date Signed by Permittee - 2/7/23	1.b. Date Signed by WTC Manufacturer - 2/1/23
2.b. SPDES No. - NY	
3.a.. WTC Name - Aluminum Sulfate	7.a. Avg/Max Daily Dosage = 350 / 700 lbs/day

12. WTC Toxicity Info (most sensitive species) - Attach description of endpoint for each EC50.

12.a. Vertebrate Species	Acute LC50	Acute EC50	Chronic NOEC	Chronic IC25
Pimephales promelas	48h 697 mg/l	mg/l	mg/l	mg/l
12.b. Vertebrate Species	Acute LC50	Acute EC50	Chronic NOEC	Chronic IC25
	mg/l	mg/l	mg/l	mg/l
12.c. Invertebrate Species	Acute LC50	Acute EC50	Chronic NOEC	Chronic IC25
Ceriodaphnia dubia	48h 95 mg/l	mg/l	mg/l	mg/l
12.d. Invertebrate Species	Acute LC50	Acute EC50	Chronic NOEC	Chronic IC25
	mg/l	mg/l	mg/l	mg/l

13. Summarize measures in place to ensure that excessive levels of WTC are not used -
Alum will be dosed to meet the permit effluent phosphorus concentration and precipitates are removed with biosolids. The soluble aluminum concentration in the effluent is determined by the solubility of alum at the pH, and pH will be controlled near neutral. Effluent total alumimum concentration is limited by the use of membranes for effluent separation.

14. WTCs to be discontinued when use of this WTC begins – Not Applicable

15. Permittee Certification - I certify under penalty of law that this notification and all attachments are, to the best of my knowledge and belief, true, accurate and complete. I also certify that the WTC Usage Requirements and any additional requirements specified in the decision letter I will receive will be adhered to.

PRINT NAME - Simon Gelb	SIGNATURE - Simon Gelb
TITLE/COMPANY - Clovewood Transportation Corporation C/O CPC	
TELEPHONE - (845)774-8000	EMAIL - gelbsimon@gmail.com

16. WTC Manufacturer Certification - I certify under penalty of law that Sections 1-4, 10-12 and any additional composition documentation submitted with as part of this notification are, to the best of my knowledge and belief, true, accurate and complete.

PRINT NAME - Loren A Swears	SIGNATURE -
TITLE/COMPANY - Technical Sales / Slack Chemical Co. Inc	
TELEPHONE - 518 209-6123	EMAIL - lswears@slackchem.com