Aldrich + Elliott
WATER RESOURCE ENGINEERS

April 28, 2022

Jill Draper
DEC
Watershed Management Division
Wastewater Program
1 National Life Drive, Davis Building 3
Montpelier, VT, 05620

Re: Town of Hinesburg
Wastewater Treatment Facility
Discharge Permit #3-1172 Amendment/Renewal

Dear Jill,

The Town of Hinesburg plans to construct an upgrade/expansion of their wastewater treatment facility. Upgrades will include an increase in treatment capacity from 250,000 gpd to 325,000 gpd, and this increase to permitted capacity has been included in the submitted permit fees.

The submitted permit documents include both the application for the permit amendment as well as the renewal of the existing permit. The Town's current discharge permit 3-1172 will expire on 12/31/2022. As the upgrade to the WWTF will not be completed at this time, Town is submitting payment for both the renewal and amendment. The total permit fee submitted is $965.00.

The upgrade project is currently in final design, with plans to begin construction in the Spring of 2023. A project schedule is included as an attachment as part of the discharge permit amendment.

Sincerely,

Aldrich + Elliott, PC

Wayne Elliott, P.E.
President

Attachments:
- A Permit Form WR-82
- B WR82 - Schedule A

Attachment A – WR-82

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
WASTEWATER PROGRAM

RECEIVED
4/28/2022
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION

Permit Application Form WR-82

10 V.S.A. Chapter 47

NPDES# VT0101028

For DEC Use:
Application #: 3-1172.2204 PIN: EJ95-0286 Reviewer: JB Complete Receive date: 05/06/2022 Title 3: (•) Y ( ) N
#13879
Check #: Amount: $965.00 Paid By: Town of Hinesburg

Application For: (Check one)	**Attach Schedule**:
[✓] Municipal Discharge Permit	A
[ ] Industrial Discharge Permit	B
[ ] Pretreatment Discharge Permit	B
[ ] Emergency Pollution Permit	E

Action Requested: (Check one)

- [ ] Original Permit
- [✓] Renewal
- [✓] Amendment
- [ ] Transfer — Permit # 3-1172

Status of Discharge: (Check one)

- [ ] Proposed
- [✓] Existing

Nature of Waste: (Check one)

- [✓] Sanitary (domestic sewage only)
- [ ] Non-Sewage/Industrial

A. Applicant

1a. Name: Town of Hinesburg

1b. Legal Entity (Individual, corporation, partnership, firm, state agency, municipality, etc.): Municipality

2a. Mailing Address: 10632 VT Route 116

2b. Town: Hinesburg | 2c. State: VT | 2d. Zip: 05461

3. Phone: 802-482-2281 | 4. Email: todithvt@gmavt.net

B. Project Activity

1. Name of Activity: Hinesburg WWTF Upgrade - Phase II

2. Description of waste: Municipal Sewage

3. Type of Activity: (Residential subdivision, paper mill, state park, motel, etc.) Treatment plant upgrade/expansion

4. Name of Landowner: Town of Hinesburg

5. Location: 290 Lagoon Rd | 6. Town: Hinesburg

C. Discharge Schedule

Using a separate serial number (S/N), identify each independent discharge which will result from the activity described above. Attach a separate schedule for each discharge identified below.

Use an attached sheet for additional discharges.

Discharge	Receiving Water	Latitude (optional)	Longitude (optional)
S/N 001	LaPlatte River	44.333380	73.125997
S/N 002			
S/N 003			
S/N 004			
S/N 005			

D. Permit Renewal

If this application is for a permit renewal, is the previous application still valid in all respects?

( ) Yes (•) No If no, document changes on a separate attachment.

(Note: appropriate Schedule must be completed regardless if changes have occurred.)

E. Application Fees

3 V.S.A. Section 2822 Fees:

email jill.draper@vermont.gov for assistance calculating the application review fee.

$240.00 Administrative Processing Fee	$240.00	Does not apply to Emergency Pollution Permits
Plus Application Review Fee	$725.00	Applies to all applications (except for name change)
Total Fee Enclosed	$965.00	

F. Signature

I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THE INFORMATION SUBMITTED ABOVE IS TRUE, ACCURATE AND COMPLETE. I RECOGNIZE THAT BY SIGNING THIS APPLICATION I AM GIVING CONSENT TO EMPLOYEES OF THE STATE TO ENTER THE SUBJECT PROPERTY FOR THE PURPOSE OF PROCESSING THIS APPLICATION.

Todd Odit, Town Manager

NAME AND TITLE OF APPLICANT OR LEGALLY AUTHORIZED REPRESENTATIVE (please print)

SIGNATURE 4/18/2022 DATE

NAME AND TITLE OF CO-APPLICANT OR LEGALLY AUTHORIZED REPRESENTATIVE (please print)

SIGNATURE DATE

☑ ***By checking this box, I certify that all adjoining property owners have been sent a DEC Adjoiner form via US mail prior to submission of this application.***

This application must be signed by the applicant or an officer in the applicant's business, a municipal official, etc. The application CANNOT be signed by the applicant's attorney, engineer, contractor, etc.

Submittal of Application: Attach appropriate schedules, administrative processing and application review fees, plans, specifications and other supporting material.

Refund Policy:

- If an application is modified, withdrawn or denied after technical review has commenced; all fees are retained.
- If an application is withdrawn prior to administrative review; all fees will be refunded.
- If an application is withdrawn after administrative review but prior to commencement of technical review, deemed administratively incomplete and returned to applicant, or determined that a permit is not required; administrative fees are retained and permit application review fees will be refunded.

Please submit this form and payment using ANROnline at: https://anronline.vermont.gov/app/?allowAnonymous=true#/formversion/c9717f74-c4c4-4fcd-869c-c536a01007c6?formtag=WSMD_Intake. Direct questions to ANR.WSMDWastewater@vermont.gov If unable to submit online, mail the completed application form along with all required supporting materials including a check in the correct fee amount made payable to State of Vermont to: Vermont DEC - Watershed Management Division, Wastewater Program - 1 National Life Drive, Davis 3 - Montpelier, VT 05620-3522

Attachment B – WR-82 (SCHEDULE A)

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
WASTEWATER PROGRAM

SCHEDULE A: MUNICIPAL TREATMENT PLANTS WR-82A

10 V.S.A. Chapter 47

A. Applicant		
1. Name: Town of Hinesburg		
2a. Mailing Address: 10632 VT Route 116		
2b. Town: Hinesburg	2c. State: VT	2d. Zip: 05461
3. Phone: 802-482-2281	4. Email: todithvt@gmavt.net	

B. Discharge Activity	
1. Activity: Direct Discharge from a WWTF	
2. Discharge: LaPlatte River	
3. S/N Designation: 3-1172	For each discharge point, enter a S/N designation (001, 002, 003, etc)

4. Exact location on receiving water (describe and locate on map). Include the outfall from the treatment facility, emergency bypass/s at the treatment facility, emergency bypass/s within the sewer system, combined sewer overflows and dry weather overflows:

Discharge from the existing WWTF is piped from the chlorine contact tanks to the existing outfall in the LaPlatte River. The existing and proposed outfall locations are at the same location as described in the Basis of Final Design (BOFD). Due to the increase in capacity, a larger outfall pipe is required and will replace the original outfall pipeline. The BOFD is included as Appendix A.

There are no combined sewer overflows, dry weather overflows, or emergency bypass/s within the sewer system.

5. Describe, and attach map of corporate boundaries, including boundaries of sewered area or area to be sewer and served by this discharge, to which this discharge applies:

The entire collection system is collected at the Main Pump Station located on Route 116 and then pumped west via an 8" forcemain to the treatment facility (located outside of the collection area). A map of the existing sewer service area can be found in Appendix B.

6. Current estimated population in above boundaries:	1400
7. Percentage of this population served by this discharge:	100

8. If less than 100%, how are wastes from remaining population disposed of?

9. Approximate daily volume of wastes (other than stormwater) collected by system:

Residential	83,700	GPD
Commercial	32,300	GPD
Industrial	11,000	GPD
Other	34,000	GPD
Total	161,000	GPD

10. List and describe individual contributors whose discharge is expected to exceed 5% of the total in item 9 or whose wastes contain toxic or other components which may effect composition of total waste load:

Vermont Smoke and Cure is the largest contributor based on a sewer allocation at 6,050 gpd but is less than the 5% of the total.

Name	Activity	Waste	Volume (GPD)

11. Collection system: ☑ Separate sanitary sewer ☐ Combined sewer

12. Number of pumping stations in collection system :	1	13. Number of air ejections stations:	0

14. Are wastes currently being treated? ☐ No ☐ Yes (if "yes", answer question 15.)

15. If yes, what level of treatment is provided? ☐ Primary ☑ Secondary ☑ Other: (describe below)

Currently, the existing lagoon facility provides a secondary level of treatment with disinfection. The new upgraded/expanded facility will provide tertiary treatment with flocculation/cloth media filters for total phosphorus removal followed by ultraviolet disinfection.

16. Are wastes currently being chlorinated prior to discharge? ☐ Yes ☐ No

17. Are new treatment facilities or modifications to existing facilities in planning, design or under construction?

☑ No

☑ Yes (If yes, describe type of facilities to be constructed, level of treatment, design capacity, current status of project and anticipated schedule leading to attainment of operational level in the space provided below)

Project is approaching the 60% design milestone for Phase II. The aerated lagoons will be abandoned and the new treatment facility with a permitted capacity of 325,000 gpd constructed in Lagoon No. 1. The new facility consists of: headworks with screening, two (2) sequential batch reactors (SBR) with pre and post equalization, filtration with chemical addition, ultraviolet disinfection, aerated sludge sludge storage tank, and control building. See Appendix A, Basis of Final Design for details on the proposed facilities and design details. An overall project schedule can be found in Appendix C.

18. Is the person who is, or will be, responsible for operation and maintenance of the treatment facility certified by the Office of Professional Regulation as a Treatment Plant Operator? ☐ Yes ☑ No

19. Number of operators currently employed at the treatment facility: 3

20. Total number of hours per week spent on operation and maintenance of the treatment facility: 965.00

21. Describe methods and procedures used for sludge processing and disposal (not applicable to aerated lagoons or stabilization periods)

Currently, the plant operates a lagoon system. Two (2) sludge waste pumps in the basement of the Control Building will transfer secondary sludge from the SBR tanks to a 2-cell 90,000 gallon aerated storage tank. Supernatant will be decanted to the in-plant pump station for thickening of the solids. Sludge will be hauled off-site to the Burlington Main WWTF or other location for dewatering and disposal on a regular basis.

22. Are sludge disposal procedure and/or sites certified (including interim certification) under Vermont's Solid Waste Management Rules? ☑ Yes ☐ No

Send completed application to:

VT Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Davis 3
Montpelier VT 05620-3522

BASIS FOR FINAL DESIGN

Aldrich + Elliott
WATER RESOURCE ENGINEERS

SECTION 1

BASIS FOR FINAL DESIGN SUMMARY

TOWN OF HINESBURG
WASTEWATER TREATMENT FACILITY UPGRADE

BASIS FOR FINAL DESIGN
February 2021

BASIS FOR FINAL DESIGN SUMMARY

I. Hydraulic / Organic Information

Influent Loading	Current [1]	Original[2] Design	Design Year 2043
Flow			
Average Daily	0.167 MGD	0.308 MGD	0.325 MGD
Peak Daily	0.421 MGD	0.600 MGD	0.780 MGD
Peak Hourly	---[3]	0.800 MGD	1.040 MGD
BOD_5			
Concentration	420 mg/L	157 mg/L	400 mg/L[4]
Loading	570 lbs/day	319 lbs/day	1,085 lbs/day[4]
TSS			
Concentration	330 mg/L	151 mg/L	205 mg/L[4]
Loading	430 lbs/day	319 lbs/day	550 lbs/day[4]
Total Phosphorus			
Concentration	---[3]	6 mg/L	6 mg/L
Total Ammonia Nitrogen			
Concentration	---[3]	---	25 mg/L

Notes:
1. The current conditions are based on January 2018 – November 2020 operating data.
2. Design criteria is based on the January 2008 upgrade, but the current Discharge Permit limits the flow to 250,000 gpd.
3. Parameter is not typically measured at the facility.
4. The loading conditions suggest that an increase in BOD and TSS capacity is warranted.

The Hinesburg WWTF does not accept septage from outside sources. A side stream will be generated by the proposed solids handling process. A new in-plant pumpstation will return flow upstream of the proposed headworks facility. The side stream will include supernatant from the sludge holding tanks, filter backwash, and control building waste.

The project proposes to increase treatment capacity of the facility from 0.308 MGD to 0.325 MGD. An analysis of current and future wastewater capacity demands is presented in the project's preliminary engineering report. In summary, the town has seen steady population growth over the past 20 years and has multiple proposed or developing projects which will further increase the residential population. To account for anticipated residential growth it is recommended that increased hydraulic capacity should be included.

II. Effluent Characteristics

June 1 through September 30

Effluent Parameters	Current[1]	Permitted[2]	Design Year 2043[3]
Flow			
Average Daily	0.163 mgd	0.250 mgd	0.325 mgd
Ultimate Oxygen Demand			
Maximum Day	173 lbs/day[5]	400 lbs/day	400 lbs/day
Biochemical Oxygen Demand			
Monthly Average	8.1 mg/L 13 lbs/day	30 mg/L 63 lbs/day	23.2 mg/L 63 lbs/day
Weekly Average	--	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Total Suspended Solids			
Monthly Average	21 mg/L 30 lbs/day	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Weekly Average	--	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Total Ammonia Nitrogen			
Monthly Average	14.3 mg/L[5]	3.5 mg/L	2.7 mg/L
Maximum Day	15.0 lbs/day[5]	7.3 lbs/day	7.3 lbs/day
Total Phosphorus			
Annual Pounds	362 lbs	152 lbs	152 lbs
Monthly Average	0.63 mg/L	0.8 mg/L	0.8 mg/L
Settleable Solids		1.0 mL/L	1.0 mL/L
E. Coli	<77 col/100 mL	77 col/100 mL	77 col/100 mL
Total Residual Chlorine	<0.1 mg/L	0.02 mg/L	---
pH	Between 6.9 and 7.9 S.U.	Between 6.5 and 8.5 S.U.	Between 6.5 and 8.5 S.U.

Notes:

1. The current conditions are based on January 2018 – November 2020 operating data.
2. Based on the current Discharge Permit effluent limitations.
3. The future effluent limitations as proposed in the amended Discharge Permit.
4. No total residual chlorine is shown as disinfection is converted to UV disinfection.
5. Current effluent condition represents the period from June through September during the observation period of January 2018 through November 2020 when this effluent limitation is in effect.

October 1 through May 31

Effluent Parameters	Permitted[1]	Design Year 2043[2]
Flow		
Average Daily	0.250 mgd	0.325 mgd
Biochemical Oxygen Demand		
Monthly Average	30 mg/L 63 lbs/day	23.2 mg/L 63 lbs/day
Weekly Average	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Total Suspended Solids		
Monthly Average	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Weekly Average	45 mg/L 94 lbs/day	34.6 mg/L 94 lbs/day
Total Ammonia Nitrogen		
Monthly Average	20.2 mg/L	15.5 mg/L
Maximum Day	42.1 lbs/day	42.1 lbs/day
Total Phosphorus		
Annual Pounds	152 lbs	152 lbs
Monthly Average	0.8 mg/L	0.8 mg/L
Settleable Solids	1.0 mL/L	1.0 mL/L
E. Coli	77 col/100 mL	77 col/100 mL
Total Residual Chlorine	0.02 mg/L	---
pH	Between 6.5 and 8.5 S.U.	Between 6.5 and 8.5 S.U.

Notes:
1. Based on the current Discharge Permit effluent limitations.
2. The future effluent limitations as proposed in the amended Discharge Permit.
3. No total residual chlorine is shown as disinfection is converted to UV disinfection

III. Overview of the Treatment Process

The Hinesburg WWTF is an aerated lagoon facility. Wastewater flows by gravity from the sewer collection system to the Main Pump Station. The main pump station conveys influent flow to Lagoon #1 through an 8” forcemain using a 20-horsepower pump. Wastewater continues through four aerated lagoons arranged in series for biological treatment and settling. Lagoon effluent continues to a chlorine contact chamber for disinfection and dechlorination before discharge to the LaPlatte River.

Operators add aluminum sulfate upstream of the final lagoon for phosphorus removal. Aerated lagoons are not well suited for nutrient removal and the facility is unable to comply with the annual total phosphorus Waste Load Allocation. The process is also unable to comply with nitrogen limitations at the facility.

Sludge accumulates at the bottom of the lagoons and is occasionally removed by dredging.

The existing WWTF was last upgraded in 2008, and existing facilities have not exceeded their projected service life of 20-25 years. The aerated lagoon treatment process provides a cost-effective means of providing secondary treatment to domestic wastewater, however it is not well

suited to provide nutrient removal currently required by the facility's discharge permit. Additionally, the Town has been the focus of ongoing development and population increase. The average daily flow from 2016 through 2018 was 163,000 gallons per day. Projected developmental projects are believed to add an additional 135,140 gallons per day of flow to the system. Recent influent loadings to the facility have had an elevated biochemical oxygen demand which suggests that recent development is increasing constituent loading to the facility.

The objectives of the proposed wastewater treatment facility upgrade project are as follows:

1) Construct a headworks facility to house a rotary fine screening unit to protect the downstream sequential batch reactors.
2) Upgrade the treatment process from an aerated lagoon facility to a sequential batch reactor treatment process to comply with nitrogen removal requirements.
3) Upgrade the WWTF by incorporating tertiary treatment in the form of tertiary filters to comply with phosphorus removal requirements.
4) Construct an ultraviolet disinfection system to comply with disinfection requirements. The existing chlorine contact chamber is not well suited to treat variable flow generated by the sequential batch reactor process. The existing chlorine contact chamber will be converted to a process water storage tank.
5) The proposed process will require intermittent wasting of sludge from the sequential batch reactors and will require construction of sludge storage tanks onsite.
6) New support infrastructure will be constructed for the facility including a new Control Building, emergency generator, and in plant pump station.
7) Increase the WWTF treatment capacity to 325,000 gpd to meet projected demands.

The proposed site plan is included in Section 2 of this report. The proposed process schematic and hydraulic profile is included in Section 3 of this report.

IV. Headworks

a. Description

A new Headworks structure will be constructed in the southeast corner of the consolidated site. The new 20 ft by 35 ft structure will include an influent channel room and a control room. Influent will enter the facility by an 8-inch influent forcemain and discharge to a 12" rectangular influent channel. The influent channel will be equipped with a rotary fine screen with 0.25" openings. Stops gates and a bypass channel will be constructed to isolate flow during maintenance of the screen. Technical information related to the proposed equipment is included in Section 4.

The interior of the building will be defined as a Class 1, Division 1, location per NFPA 820. All electrical will be suitable for this hazardous location. Automatic ventilation and gas monitoring will be provided. Control panels will be located in an adjacent unclassified room in the structure.

The rotary screen uses a perforated plate to remove solids from the waste stream. Screenings are removed from the perforated screen and conveyed away from the channel using a screw conveyor. Screenings are washed and dewatered in the screw conveyor and are stored in a

small dumpster. The screen will have a diameter of 12". The perforated plate will have 0.25" perforations and is designed to fully treat peak hourly flows up to 1.255 MGD.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Screening		Required
Type	Rotary Screen	
Quantity	1	
Hydraulic Capacity	1.255 MGD	> 1.040 MGD
Channel Width	12"	
Openings	¼"	
Incline	35-45 degrees	
Drive Motor	2 hp	
Max Wash Flowrate	15 gpm	
Min Wash Pressure	60 psig	
Bypass Channel	Manual Bar Rack	Required

V. Biological Treatment

a. Description

Biological treatment will be provided by a two-cell sequential batch reactor (SBR) system. The SBR system operates in a timed sequence of aerobic, anoxic, and anaerobic conditions to provide a suitable environment for biological treatment. This is typically achieved in five phases as follows:

1. Mix-Fill: Influent flow enters the reactor tank and contents are completely mixed in the absence of aeration creating anoxic conditions allowing for potential denitrification (conversion of nitrites/nitrates formed in nitrification to nitrogen gas). In systems incorporating phosphorus removal, the Mix-Fill phase is extended to create anaerobic conditions (absence of oxygen and nitrites/nitrates) where phosphorus accumulating organisms (PAO) release phosphorus and are then ready for subsequent uptake under aerobic conditions.
2. React-Fill: Influent flow continues under continued mixed and now aerated conditions. Intermittent aeration can be incorporated to alternate between aerobic or anoxic conditions. Biological/chemical oxygen demand (BOD/COD) reduction and nitrification (the conversion of ammonia nitrogen to nitrite/nitrate) occur under aerated conditions. Uptake of phosphorus as part of biological phosphorus removal is achieved during aerated conditions. Additional denitrification occurs under anoxic conditions.
3. React: Influent no longer flows into the reactor tank during the react phase. Mixing and aeration continue for BOD/COD reduction and to support nitrification with aerated conditions.

4. Settle: Mixing and aeration are terminated to allow for solids settling forming a sludge blanket at the bottom of the reactor tank.
5. Decant/Sludge Waste: Mixing and aeration remain off. A decanter removes liquid from the reactor surface. Waste activated sludge (WAS) is wasted as near the end of decant/sludge waste phase.

Two (2) new cast-in-place SBR tanks will be constructed to the north of the new Headworks structure. Flow will enter a pre-equalization tank prior to being directed to one of the SBR tanks. Pre equalization will provide an added measure of flexibility in operating the SBR process and will assist in managing variations in flow and pollutant levels. The cast-in-place pre-equalization tank will measure 30 ft by 20 ft and have a volume of 94,000 gallons. The tank will be equipped with mixers to keep solids from settling. Two 8" electrically actuated valves will release flow to either SBR during the mix-fill phase of the process in alternating fashion. The pre-equalization tank provides sufficient holding volume to operate the facility with one SBR tank out of service.

The two (2) new cast-in-place concrete SBR tanks will each measure 40 ft by 35 ft and will operate with a minimum water level of 13.6 ft and a maximum water level of 21.0 ft. The tanks will be constructed to provide a minimum of 2 ft of freeboard. Under typical operating conditions, each SBR will complete 5 treatment cycles per day, with a cycle duration of 4.8 hours/cycle. Cycle timing and operations will be controlled by a programable logic controller (PLC) which will be adjustable for optimization of the process. Each SBR will be equipped with a 5-horsepower floating mixer for tank mixing and a coarse air diffusion system for aeration. Three (3) 25-horsepower positive displacement blowers will be constructed in the filtration/disinfection building to supply the aeration system. Two blowers will be capable of meeting the maximum aeration needs, while the third will serve as a redundant back-up. A copy of the design parameters for the Sequential Batch Reactors is provided in Section 5.

The coarse air diffusion system will consist of a two 3" side-mounted drop legs which will branch into 10 coarse tube diffusers. This will result in 20 coarse air diffusers in each SBR. The air diffusion system will include a dissolved oxygen monitoring system. Variable frequency drives will be installed on the positive displacement blowers which will be adjusted to achieve the target dissolved oxygen level during each phase. The coarse air diffusers and floating mixers are serviceable without draining the SBR tank to minimize disruption of the process.

A new PLC (programmable logic controller) will be added for monitoring of process instrumentation and equipment status for the entire treatment process. The supervisory control and data acquisition (SCADA) system will include central monitoring and control and will include telemetry to transmit remote alarms for all critical treatment units to the Operator on call. The PLC and SCADA systems will be housed in the Control Building.

Treated effluent is removed from each SBR tank by a floating decanter unit. The decanter unit allows wastewater to flow by gravity during the decant/sludge waste phase of the cycle. Flow will be conveyed to a 30 ft by 20 ft post equalization tank with an operating volume of 55,000 gallons. The post equalization tank allows downstream processes to properly function by limiting

surge loading following each batch release. Two (2) 5-horsepower submersible pumps will be provided to remove flow from the post-equalization tank via a 6" forcemain to downstream treatment processes. A coarse air diffusion system will be installed in the post-equalization tank for mixing which will be supplied by a 7.5 HP positive displacement blower. The post-equalization tank will be equipped with a level monitoring system and the facility PLC and SCADA will monitor and control discharge to downstream processes.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Tanks (Basins)		
Number	2	2 minimum
Dimensions, Each		
Width	40 feet	
Length	35 feet	
Water Depths		
Top Water Level (TWL)	21.0 feet	
Bottom Water Level (BWL)	13.6 feet	
Volume, Each Tank	220,000 gallons	
Cycles		
Normal	4.8 hours	
Aeration/Mixing System		
Aeration Type	Diffused Air/ Coarse Bubble	
Mixing Equipment		
Number	2	2 minimum
Type	Floating	
Aeration Blowers		
Number Capacity, Total Motor Horsepower	3 (1 standby) 563 scfm 25 hp	
Influent Design Parameters		
Influent BOD_5	400 mg/L	
Influent TSS	205 mg/L	
Influent TKN	30 mg/L	
Influent TP	8 mg/L	
Decanters		
Number	2	
Type	Floating	
Decant Rates		
Normal	1,444 gpm	
Pre Equalization Tank		
Dimensions		
Width	30.0 feet	
Length	20.0 feet	
Top Water Level	21.0 feet	
Volume	94,000 gallons	

Post Equalization Tank		
Dimensions		
Width	30.0 feet	
Length	20.0 feet	
Volume	55,500 gallons	
Pumps		
Number Type Capacity, Total	2 Submersible 540 gpm	
Anticipated Removals		
BOD_5	95%	
TSS	95%	
Maximum Anticipated Effluent Concentration		
BOD_5	30 mg/L	
TSS	45 mg/L	
Ammonia Nitrogen	2.7 mg/L	
Total Phosphorus	0.6 mg/L	

VI. Sludge (WAS) Pumps

a. Description

Sludge generated in the Sequential Batch Reactors is regularly removed to maintain target solids retention times as part of the operating process. Two (2) 5 horsepower double disc sludge waste pumps will be provided in the basement of the Control Building to transfer sludge from the SBR tanks to a new 2-cell aerated sludge storage tank. The pumps operate during the decant/sludge waste phase of the cycle. Wasting will be preformed automatically by the PLC control system.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Sludge Waste Pumps		
Number	2	1 minimum each tank
Type	Double Disk	
Capacity	40 gpm @ 100 rpm	
Motor Horsepower	5 hp	

VIII. Tertiary Rapid Mix and Flocculation

a. Description

Effluent from the SBR post-equalization basin will be pumped to a rapid-mix and flocculation tank within the proposed 1,700 SF filtration building. Chemical precipitation converts soluble reactive phosphorus to a solid form which can then be removed by downstream cloth media filters. Flow will first enter a rapid mix chamber where aluminum sulfate (alum) will be dosed.

The rapid mix chamber will be equipped with a submersible rapid mixer to ensure even distribution of alum. Flow will continue to a flocculation tank which will provide a minimum hydraulic residence time of 5 minutes.

The rapid-mix and flocculation basin will be operated with a water depth of 5'-0". At the max daily design flow of 0.78 mgd the flocculation will require a minimum volume of 370 ft^3. The basin will be cast-in-place concrete construction. From the flocculation tank, flow will be conveyed by gravity to the cloth media filter system.

The existing liquid alum storage and distribution system will remain in use following the project. New tubing and appurtenances will be provided to change the chemical addition point from upstream of Lagoon #3B to the new rapid mix chamber.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Tertiary Flocculation Tank		
Volume	2,710 gallons	
Liquid Depth	5 feet	
Hydraulic Retention Time @ MDF	5 minutes	
Rapid Mixer		
Quantity	1	
Chemical Dosage		
Type of Chemical	Liquid Alum	
Feed Pumps Number Type	 2 (1 spare) Peristaltic	 2 minimum
Dosage Rates	25 to 150 mg/l	
Storage Tanks (existing) Number Volume	 1 4,500 gallons	

IX. Filtration

a. Description

Effluent from the flocculation tank will flow to the new filter units. Filtration is provided for phosphorus removal following chemical precipitation. Two (2) new cloth media filters will be installed in the filtration building. Each eight (8) disk filter can treat 100% of the design flowrate. Flow enters the filter basin through an influent pipe and passes through the cloth media filter in an outside-in flow pattern. The cloth media captures remaining suspended solids including precipitated phosphorus. Filtered water, or filtrate, is collected in a centertube and flows, via gravity over an overflow weir into the effluent channel. A copy of the design parameters for the filters is provided in Section 6.

As more particulates are deposited on and within the cloth media, the pressure required to drive water through the media (headloss) increases. This results in a rise in the water level within the filter basin and increased differential pressure. Once the headloss increases and the basin level reaches a setpoint, the filter enters a backwash mode. The following will be provided for the filters:

- Filter Disk Unit: Each filter will be located in a packaged steel tank.
- Drive Assembly: Each filter includes an adjustable drive assembly with a gearbox, nylon drive sprocket, acetal drive chain with 304 stainless steel link pins, and a 304 stainless steel chain guard. The gearbox will be parallel in-line helical type, AGMA Class 1 with a 1/2 HP drive motor rated for 450 volt, 3 phase, 60 Hz.
- Each unit will include eight cloth disk assemblies. Each cloth disk is comprised of six (6) individual segments, each consisting of a cloth media sock supported by an injection molded polypropylene co-polymer frame with corrosion resistant assembly hardware.
- Filter Cloth: The cloths are made with fiber pile construction with a nominal filtration rating of 5 microns.
- Backwash System: The backwash function incorporates a pump that draws filter effluent through the cloth as the media rotates past the fixed backwash shoe, thereby removing accumulated solids from the cloth surface. Each disk is cleaned by a minimum of two backwash shoes, one on each side. The backwash shoes remain in a fixed position. Springs are used to maintain the proper tensioning of the backwash shoe against the media surface.
- Backwash/Waste Pump Assembly: The backwash/waste pump assembly for each filter includes two (2) backwash and solids waste valves, two 2" recirculation ball valves, 2" manually operated flow control gate valve for each pump vacuum gauges, and pressure gauges.
- Controls with Starters: NEMA 4X fiberglass enclosure, starter 12 AMP 3-Pole, Allen Bradley SLC 5/04 programmable controller, and Allen Bradley Panelview 600 touch screen display are provided for each filter.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Number of Units	2 (1 standby)	2 minimum
Type	Cloth media	
Number of Disks per Unit	8	
Filter Area		
Filter Area per Unit	86.4 sq. ft^2	
Total Filter Area Provided	172.8 ft^2	
Hydraulic Loading		
Average Flow (1 filter operating, 1 standby)	2.62 gpm/ft^2	
Maximum Daily Flow (1 filter operating, 1 standby)	6.27 gpm/ft^2	< 6.50 gpm/ft^2
Peak Solids Loading (1 filter	1.9 lbs TSS / day per ft^2	

operating, 1 standby)		
Filter Influent Quality		
Total Suspended Solids $_{Max}$	25 mg/L	
Total Phosphorus	0.6	
Filter Effluent Quality		
Total Suspended Solids	< 5 mg/L	< 45 mg/L
Total Phosphorus	< 0.15 mg/L	< 0.15 mg/L

X. Disinfection

a. Description

The existing chlorination/dechlorination system is not suitable for use following the proposed SBR treatment process. A new ultraviolet disinfection system will be installed to comply with permitted e-coli limitations. Ultraviolet disinfection uses energy from light waves to destroy microorganism's ability to reproduce.

Flow will exit the cloth media filters through the 8" effluent line and be conveyed to a 9" rectangular channel within the filtration building. The channel will be at least 30 ft long and have a depth of 4 ft. Two contact type, low pressure high output, ultraviolet disinfection banks will be installed in series within the channel. Following treatment, effluent will pass over an effluent weir which will control the flow through the system.

Two ultraviolet disinfection banks will be provided, each capable of treating 100% of the design peak flow of 1.04 mgd. Each module will consist of 8 UV Lamps. The UV lamps will be provided with a control system able to adjust the intensity of the bulbs to minimize energy usage of the system during periods of low flow. The design UV dose for the system is 35 mJ/cm^2. UV bulbs will be installed parallel to the flow direction and each module is approximately 7 ft long. The two-module system will be approximately 14 ft long. A copy of the design parameters for the filters is provided in Section 7.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Disinfection System		
Type	Ultraviolet	
Configuration	Horizontal	
Number of Banks	2	2 minimum
Type of Lamps	Low pressure – high Intensity	
Number of Lamps	16	
Peak Design Flow	1.050 mgd	> 1.040 mgd
UV Transmission	60%	60% minimum
Design Dose	35,000 µWs/cm^2	
Channel		
Number	1	

Length	30 feet	
Width	9 inches	
Water Depth (Average)	34 inches	
Level Control Weir		
Type	Rectangular fixed weir	

XI. Effluent Flow Metering

The existing effluent flow meter will remain in use following this project. The existing chlorination tank will be converted to a process water storage tank.

XII. Main Pump Station

a. Description

Influent enters the Main Pump Station and is pumped through an 8" force-main to Lagoon #1. The two (2) existing dry pit centrifugal pumps will be replaced by a three (3) pump triplex system. The new pumps will be 25 HP vertical non-clog centrifugal pumps installed in the same dry pit as the existing duplex system. Each pump will have a maximum capacity of 550 gpm to handle 50% of the design flow conditions. The third pump will serve as a redundant back-up. Existing piping and appurtenances in the main pump station will be replaced to accommodate the shift to a triplex system.

A new triplex control panel will be provided in the exiting dry pit structure. The control panel will include PID based control with variable frequency drives and a level control system. The main pump station controls will be interconnected to the new SCADA/telemetry systems at the WWTF site. The existing standby power with automatic transfer switch configuration will remain in place following the project.

The existing 8" forcemain will continue to be used to transport flow to the wastewater treatment facility site. The forcemain will be adjusted to discharge to a new manhole adjacent to the new Headworks structure.

b. Design Criteria

Item Description	Existing	Proposed Upgrade	Design Standard
Pumps			
Number	2 (1 standby)	3 (1 standby)	2 minimum
Type	Dry pit vertical centrifugal	Dry pit vertical centrifugal	
Capacity, Each pump			
Minimum	450 gpm @ 45'	450 gpm @50'	
Maximum	700 gpm @ 72'	725 gpm @ 80'	
Motor Horsepower	20 hp	25 hp	

Drive Type	Variable Frequency	Variable Frequency	
Level Control System	Level Transducer with back-up float	Level transducer with back-up float	

XIII. Sludge Storage Tanks

a. Description

A new 90,000 gallon cast-in-place concrete storage tank will be constructed to the south west of the filtration/disinfection building to store sludge generated in the sequential batch reactors. The tank will consist of 2 individual cells and a concrete cover. A fine air diffusion system will be installed along the floor of the sludge storage tank for mixing and to provide an opportunity for further aerobic treatment. Sludge will regularly be removed from the sludge storage tanks and hauled to the Burlington Main WWTF for dewatering and disposal.

Aeration will be provided by the existing aerated lagoon blowers which are 20 horsepower positive displacement units. The system will provide 420 SCFM of air against 6.5 psig. The sludge storage tank will be covered to reduce odor concerns.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Tank		
Number of Cells	2	1 minimum
Type of Tank	Cast-in-place Concrete	
Type of Cover	Concrete	
Total Volume	90,000 gallons	
Maximum Liquid Level	12 feet	
Aeration/Mixing System		
Type	Diffused Air/ Fine Bubble	30 scfm/ 1,000 c.f.
Aeration Blowers (existing)		
Number	2 (1 standby)	1 minimum
Type	Positive displacement	
Capacity	420 scfm @ 6.5 psig	
Motor Horsepower	20 hp	
Drive Type	Variable speed	

XIV. In Plant Pump Station

a. Description

A new in-plant pump station will be constructed to the southwest of the filtration/disinfection building. A new 6' diameter precast concrete wet well will be installed with an operating volume of at least 1,500 gallons. The pump station will accept flow generated in the control building, backwash from the filter units, and supernatant from the new sludge holding tanks. Two 7.5 horsepower submersible pumps will be installed on slide rails within the wet well to convey flow. A 4" diameter forcemain will be constructed to discharge just upstream of the headworks structure. The pump station will include a level monitoring system with backup floats to monitor the wet well water level. A duplex control system will call for one or both pumps to turn on, as necessary.

b. Design Criteria

Item Description	Proposed Upgrade	Design Standard
Type	Above ground pump station/wet well	
Pumps		
Number	2 (1 standby)	2 minimum
Type	Self priming centrifugal	
Capacity, Each pump	150 gpm	
Total Head	25'	
Motor Horsepower	7.5 hp	
Wet Well		
Volume	1,500 gallons	

XV. Standby Power

In the event of a power outage the WWTF is required to maintain Primary Treatment and Disinfection. To fulfill this requirement a new diesel 150 KW emergency generator equipped with an automatic transfer switch will be constructed as part of this project. The emergency generator will be sized to power the Sequential Batch Reactors (automatic valves, blowers, and decanters), SBR effluent pumps, the tertiary filters, and the Ultraviolet Disinfection system. The emergency generator will also power the facility PLC and SCADA systems to maintain monitoring and control of the facility.

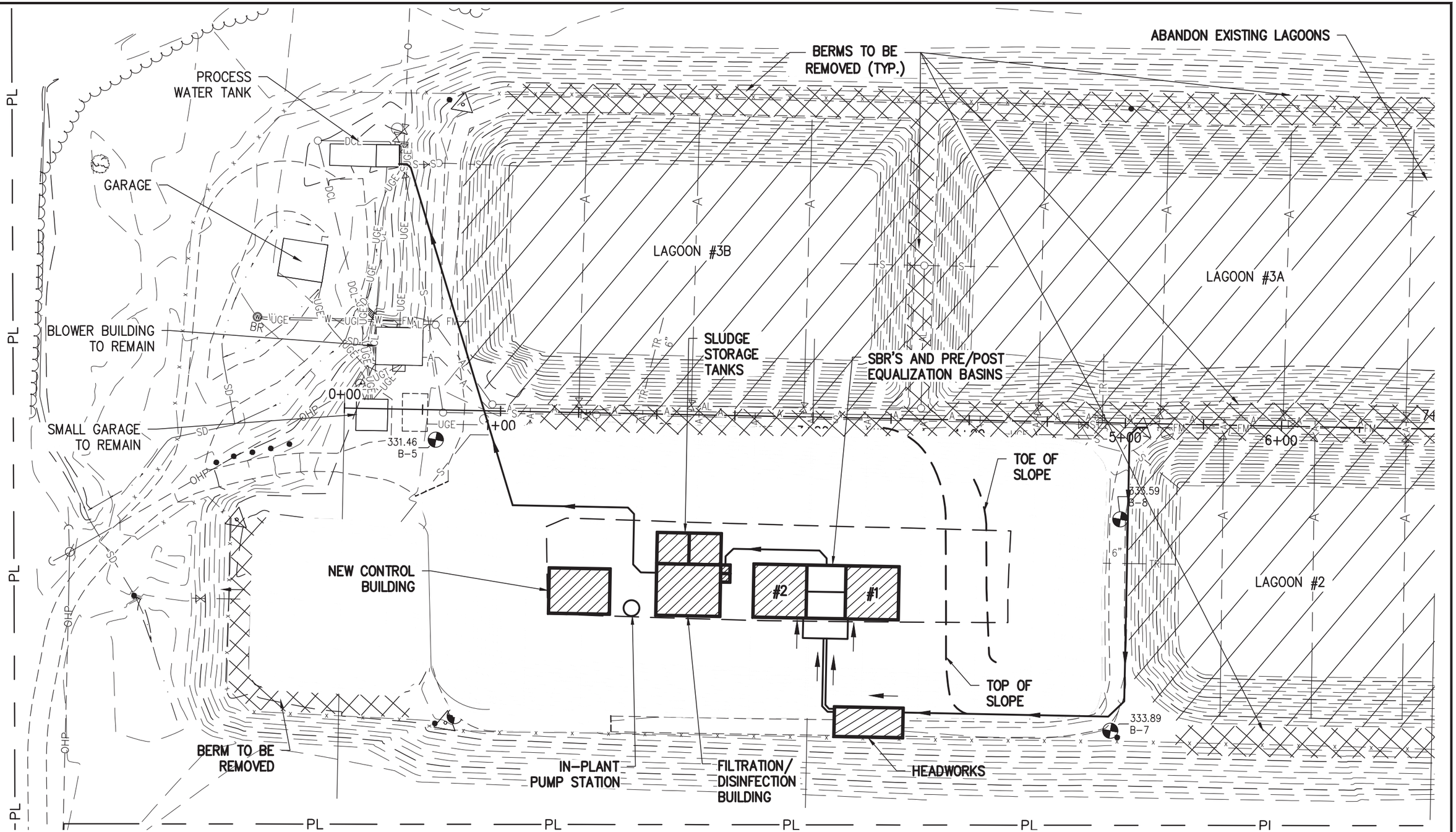
Item Description	Proposed Upgrade	Design Standard
Type	Diesel	
Size	150 KW	
Treatment Components Served	SBR's, UV, PLC	Required

XIII. Base Flood Elevation

The 100-year and 500-year base flood elevations were determined for the Hinesburg wastewater treatment facility site. Panel 35P of Federal Emergency Agency (FEMA) Flood Insurance Rate Map (FIRM) number 50007C0403D was used to determine that the wastewater /treatment facility is closest to the LaPlatte River floodplain. The map was created 7/18/2011 to accompany flood insurance study number 50007CB002B. LaPlatte River flood profile 35P of this study indicates the facility has a 100-year flood elevation of 324.1' and a 500-year flood elevation of 324.7'. The proposed upgrades will include flood resiliency measures above the 500-year flood elevation.

SECTION 2

PROPOSED SITE PLAN



N

PLAN
SCALE: 1"=60'

GRAPHIC SCALE

0 60 90 120

(IN FEET)

Aldrich + Elliott
WATER RESOURCE ENGINEERS
6 Market Place, Suite 2
Essex Jct., VT 05452
P: 802.879.7733
AEengineers.com

PROPOSED SITE PLAN

WASTEWATER TREATMENT FACILITY UPGRADE
BASIS FOR FINAL DESIGN

TOWN OF HINESBURG
HINESBURG VERMONT

DESIGNED	PROJECT NO.
DRAWN JEB	20042
CHECKED (PM) WAE	
CHECKED (PE) WAE	FIGURE NO.
SCALE AS NOTED	1
DATE MAR. 2021	

Y:\20042-HINESBURG WWTF\BASIS OF DESIGN\20042-BOD-1.dwg, 2/23/2021 9:53:34 AM

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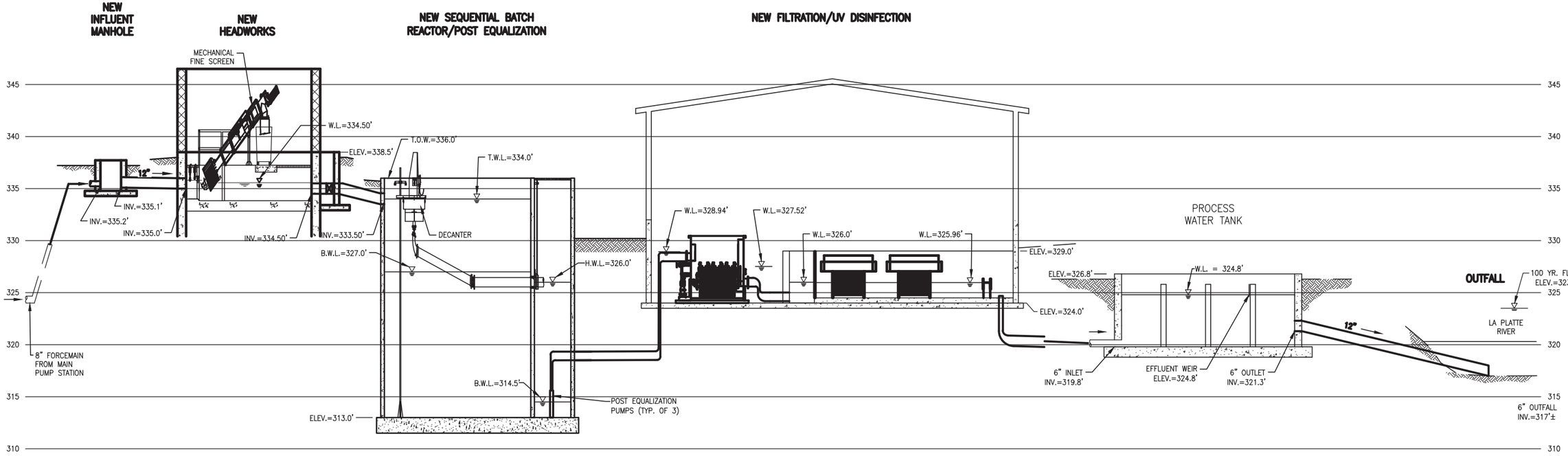
SECTION 3

INITIAL HYDRAULIC PROFILE



HYDRAULIC PROFILE

SCALE: VERT. NONE
HORZ. NONE

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AEengineers.com

INITIAL
HYDRAULIC PROFILE

WASTEWATER TREATMENT FACILITY UPGRADE
BASIS FOR FINAL DESIGN

TOWN OF HINESBURG
HINESBURG VERMONT

DESIGNED WAE	PROJECT NO. 20042
DRAWN JEB	
CHECKED (PM) WAE	
CHECKED (PE) WAE	FIGURE NO. 2
SCALE AS NOTED	
DATE MAR. 2021	

SECTION 4

EQUIPMENT INFORMATION

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.1

Rotary Screen

Raptor®
Micro Strainer

Single Operational Unit
Screens, Compacts and
Dewaters in One Process

LAKESIDE
EQUIPMENT CORPORATION
Water Purification Since 1928

Cleaner Water for a Brighter Future®

Raptor® Inclined Micro Strainer Removes Solids Efficiently

The Lakeside *Raptor*® Micro Strainer is an efficient, proven screening technology for removal of inorganic solids that can be harmful to downstream equipment in municipal and industrial wastewater applications. Ideal for small treatment facilities, the *Raptor*® Micro Strainer utilizes a semicircular screenings basket to capture debris, such as plastics, hygienic articles and fibers. The *Raptor*® Micro Strainer features, including the screw conveyor, are all stainless steel construction (304 or 316) to handle the most severe conditions.

At 35° to 45° angle of inclination, the *Raptor*® Micro Strainer provides high removal efficiency using a perforated plate or wedge wire basket with small openings ranging from 0.04 to 0.25 inches (1 to 6 mm). A central screw conveyor with a cleaning brush removes the captured solids from the screenings basket and transports the debris for disposal. As the solids are being conveyed, they are macerated to break down large fecal matter, and then washed using a two-stage screenings wash system to return organic material back to the wastewater stream. The washed screenings are compacted and dewatered prior to being discharged, thereby reducing the volume and weight to a dry solids content of 40 percent, ultimately reducing disposal cost.

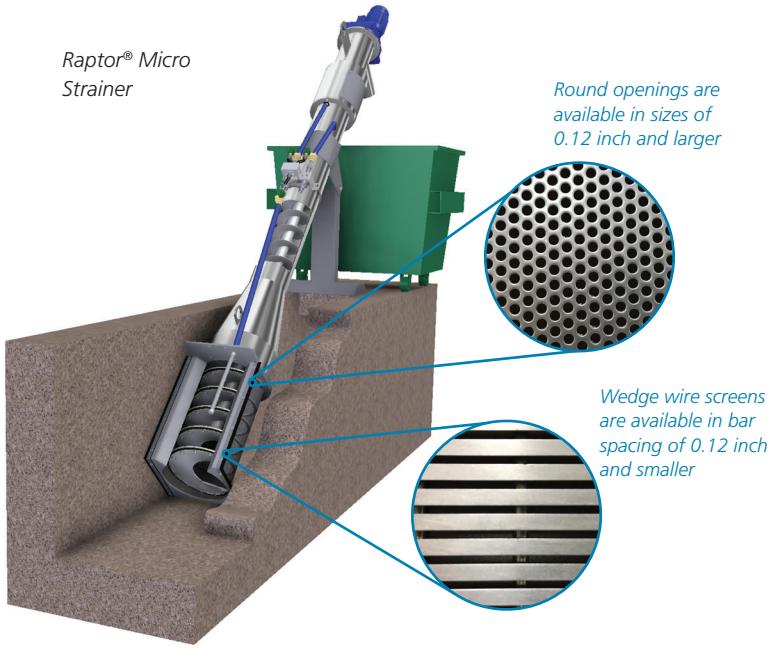
Raptor® *Micro Strainer with Bagger*

Raptor® *Micro Strainer with Weather Protection*

Superior design and construction

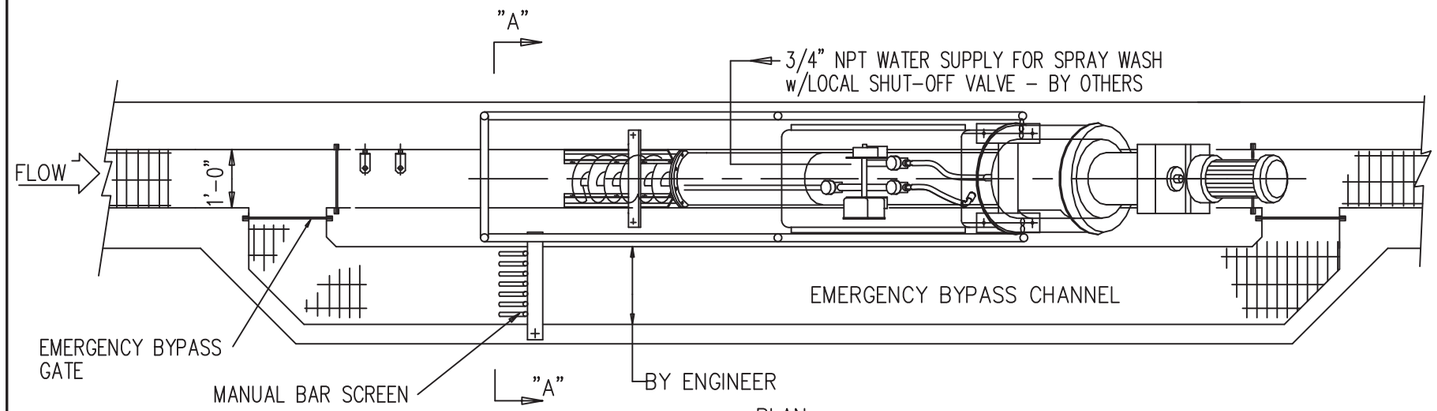
- All stainless steel construction resists corrosion
- Combines 4 processes in one unit (screens, washes, compacts and dewaters)
- Dual spray wash system provides cleaner discharge screenings
- Integrated compaction zone reduces volume and weight for reduced disposal cost
- Enclosed transport tube and optional bagger attachment reduce odors
- Hinged support to pivot screen out of channel for maintenance
- Removable bearing bars promote longer brush life without disassembling the screen
- Tank-mounted screens and explosion-proof designs are available
- Optional weather protection system protects to 13° F below zero (minus 25° C)

Raptor® *Micro Strainer*

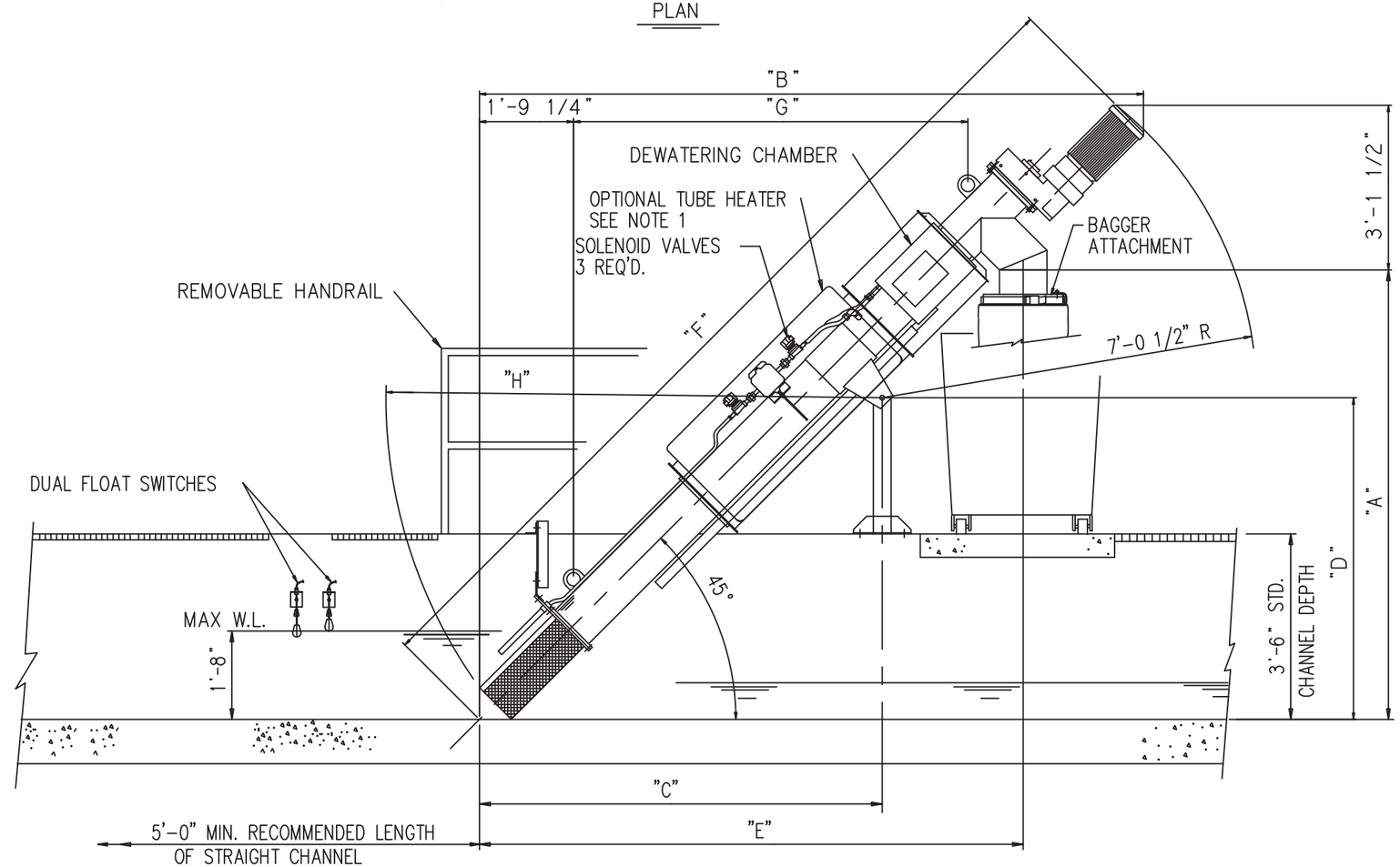


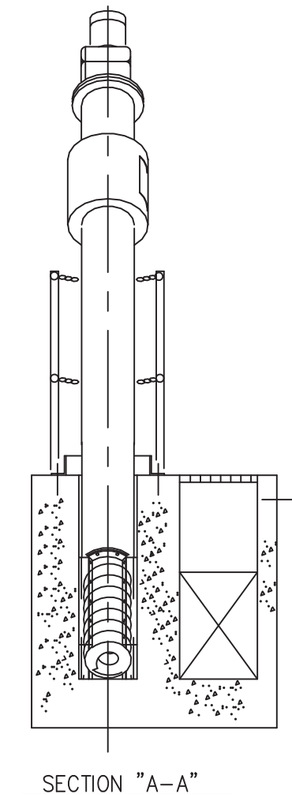
8:35a 10/24/107 DXF

12MS	PART No	A	B	C	D	E	F	G	H
STD	-101	8'-5 1/2"	12'-4 1/4"	7'-7 1/4"	5'-11 1/2"	10'-2 3/4"	16'-7 1/2"	7'-2 1/2"	9'-3 5/8"

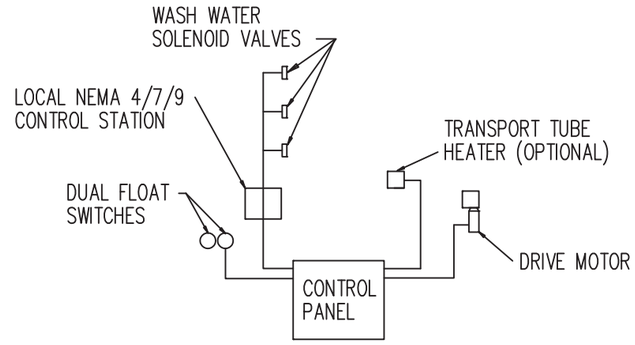


PLAN





SECTION "A-A"



CONTROL INTERCONNECTION DIAGRAM

ALL CONDUIT AND WIRE CONNECTIONS BETWEEN CONTROL PANEL AND SCREEN COMPONENTS BY OTHERS.

NOTES:

1) WHEN HEAT SYSTEM IS TO BE SUPPLIED, CHANNEL WIDTH TO BE 24" IF CHANNEL DEPTH IS GREATER THAN 3'-6".
2) CONTACT LAKESIDE FOR ANY ADDITIONAL REQUIREMENTS OR QUESTIONS.
3) KEEP TOP OF CENTER CHANNEL WALL AS LOW AS POSSIBLE TO ALLOW EASE OF CONSTRUCTION AND MAINTENANCE.
4) WATER SUPPLY LINES AND ELECTRICAL CONNECTIONS TO BE FLEXIBLE or QUICK DISCONNECT TYPE TO ALLOW UNIT TO PIVOT OUT OF CHANNEL.
5) BE SURE UPSTREAM PIPING IS NOT SURCHARGED AT MAX. W.L.
6) FOR PROPER APPLICATION OF THIS PRODUCT REFER TO RMI-95, LAKESIDE SCREEN GENERAL DESIGN NOTES.

REVISIONS	DATE	DR.	CHKD.	REVISIONS	DATE	DR.	CHKD.	REVISIONS	DATE	DR.	CHKD.
								⚠ w/FLOAT SWITCH-REMOVED COARSE BAR RACK	9-27-07	GS/WK	
								⚠ REVISED TO CURRENT STANDARD	12-18-06	G.F.	

LAKESIDE EQUIPMENT CORPORATION

DR. R.D. DATE 3-1-95
CHKD. SNYDER 4-18-95 FILE NO. 250

RAPTOR®
12" MICRO STRAINER

DWG. NO. D-51152-S REV. K

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.2

Sequential Batch Reactors

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

AquaSBR®

Sequencing Batch Reactor

AquaSBR®
Typical Applications

Biological Nutrient Removal

- 1.65 MGD Avg. Daily Flow
- Replaced flow-through activated sludge system for enhanced biological nutrient removal (EBNR) to meet Chesapeake Bay Initiative.

Phosphorus Removal

- 2.7 MGD Avg. Daily Flow
- Dissolved oxygen control optimizes power consumption
- Process control achieves 98% removal of typical municipal wastewater's total influent phosphorus

Nitrification

- 0.3 MGD Avg. Daily Flow
- Utilizes the ballast decanter option with process control via the IntelliPro system.

Reuse

- 2.0 MGD Avg. Daily Flow
- 3-basin system followed by (2) AquaDisk® cloth media filters supplies reuse water to the nearby U.S. Army base for irrigation and cooling water

Industrial Pretreatment

- .075 MGD Avg. Daily Flow
- Treating high strength dairy waste since 1991.

Retrofit

- 12 MGD Avg. Daily Flow
- 3-basin retrofit uses existing lagoons to meet today's nitrogen requirements

AquaSBR®
Sequencing Batch Reactor

For over 30 years, Aqua-Aerobic Systems has led the industry in sequencing batch reactor technology with performance proven and cost effective treatment systems capable of effectively removing nutrients and reducing phosphorus with the flexibility of process control that adapts to changing demands.

The AquaSBR® sequencing batch reactor provides true batch technology with all phases of treatment accomplished in a single reactor. All components are easily accessible and the advanced decant system ensures optimum quality effluent withdrawal. Treatment can be optimized with the IntelliPro® process monitoring and control system to further reduce operation and maintenance,energy costs and improve performance.

System Features and Advantages

- Independent aeration and mixing with the Aqua MixAir® system provides process advantages and lower energy consumption
- A true-batch system utilizes Mix-Fill, React-Fill, React, Settle and Decant phases within a single reactor
- The Mix-Fill phase is essential for effective phosphorus removal
- All components of the AquaSBR system are retrievable and easily accessible
- No secondary clarifiers and return activated sludge (RAS) lines
- Capable of enhanced biological nutrient removal:
  - Total nitrogen < 3 mg/l
  - Total phosphorus < 0.3 mg/l
- Hydraulic fluctuations are easily managed through the flexibility of a time managed process operating strategy
- Low cost of ownership

Aqua MixAir® System

The AquaSBR sequencing batch reactor utilizes the Aqua MixAir® system by providing separate mixing with the AquaDDM® direct-drive mixer and an aeration source such as the Aqua-Jet® surface aerator or Aqua-Aerobic diffused aeration. This system has the capability to cyclically operate the aeration and mixing to promote anoxic/aerobic and anaerobic environments with low energy consumption. In addition, the Aqua MixAir system can achieve and recover alkalinity through denitrification, prevent nitrogen gas disruption in the settle phase, promote biological phosphorus removal, and control certain forms of filamentous bacteria.

Advanced Decanter

The Aqua-Aerobic floating decanter follows the liquid level, maximizing the distance between the effluent withdrawal and sludge blanket. It is an integral component to the AquaSBR system and provides reliable, dual barrier subsurface withdrawal with low entrance velocities to ensure surface materials will not be drawn into the treated effluent. The electric actuated or ballast decanter option is easily accessible from the side of the basin and requires minimal maintenance.

AquaSBR®
Phases of Operation

The AquaSBR sequencing batch reactor system features time-managed operation and control of aerobic, anoxic and anaerobic processes within each reactor including equalization and clarification. The AquaSBR system utilizes five basic phases of operation to meet advanced wastewater treatment objectives. The duration of any particular phase may be based upon specific waste characteristics and/or effluent objectives.

1 Mix-Fill

- Influent flow enters the reactor
- Mixing is initiated with the AquaDDM mixer to achieve complete mix of the reactor contents in the absence of aeration
- Anoxic conditions are created which facilitate removal of any residual nitrites/nitrates (NO_x) via the process of denitrification
- In systems requiring phosphorus removal, the Mix-Fill phase is extended to create anaerobic conditions where phosphorus accumulating organisms (PAO) release phosphorus then ready for subsequent luxury uptake during aeration times
- Anoxic conditions assist in the control of some types of filamentous organisms

3 React

- Influent flow is terminated creating true batch conditions
- Mixing and aeration continue in the absence of influent flow
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen (NH_3) reduction continue under aerated conditions
- Oxygen can be delivered on a “as needed” basis via dissolved oxygen probes while maintaining completely mixed conditions
- Provides final treatment prior to settling to meet targeted effluent objectives

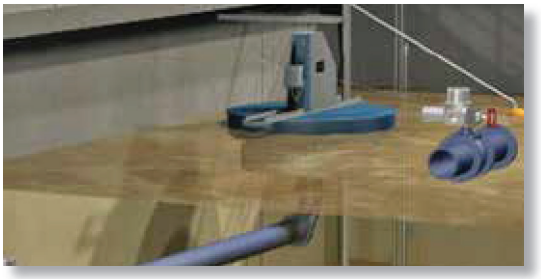
4 Settle

- Influent flow does not enter the reactor
- Mixing and aeration are terminated
- Ideal solids/liquid separation is achieved due to perfectly quiescent conditions
- Adjustable time values allow settling time to match prevailing process conditions

2 React-Fill

- Influent flow continues under mixed and aerated conditions
- Intermittent aeration may promote aerobic or anoxic conditions
- Biological/chemical oxygen demand (BOD/COD) and ammonia nitrogen (NH_3) are reduced under aerated conditions
- Luxury uptake of phosphorus is produced under aerated conditions
- NO_X is reduced under anoxic conditions
- Separation of aeration and mixing allows the aeration source to be turned down during low flow conditions to conserve energy while the system's flexibility allows nitrification/denitrification to be easily managed

5 Decant/Sludge Waste



- Influent flow does not enter the reactor
- Mixing and aeration remain off
- Decantable volume is removed by subsurface withdrawal
- Floating decanter follows the liquid level, maximizing distance between the withdrawal point and the sludge blanket
- Small amount of sludge is wasted near the end of each cycle

IntelliPro®
Process Monitoring and Control System

The IntelliPro system is a personal computer (PC) based program that interfaces with the AquaSBR system's programmable logic controller (PLC) via a network connection to assist operators in optimizing the treatment process of the plant and further reducing operating costs.

System Advantages

- Real-time, online monitoring and control
- "Active Control Mode" which automatically receives, interprets and proactively adjusts in-basin instruments and process variables including biological nutrient removal, chemical addition and energy
- Reduces the operator's sampling time
- Real-time and historical graphical trending of process parameters
- BioAlert™ process notification provides corrective action to eliminate operational interruptions and upsets
- Assists in the optimization of enhanced nutrient removal
- Online operation and maintenance support
- Remote troubleshooting provides on-demand troubleshooting assistance

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.3

Sludge (WAS) Pumps

The World Leader in Free-Disc Pumping Technology

4” Model 4DDSX30 Double Disc Pump

Features:

- Non-close tolerance design provides for extremely low wear and very low life cycle costs
- “Maintain-in-Place” hinged housing design allows servicing w/out disturbing piping
- Seal-less design, no packing or mechanical seals, no seal water required
- Runs dry without damage
- Self-priming with high suction lift capability
- No check valves, no fouling problems
- Passes up to 1” solids and line size semi-solids
- No routine maintenance required
- Two (2) year warranty
- Made in the USA

The Ultimate in Sludge Pumps™

Technical Specifications:

Typical Flow Range:	0 - 160 GPM
Displacement:	0.30 gallons/revolution
Operating Speeds:	Up to 400 RPM
Discharge Pressure:	Up to 60psi operating Up to 110psi stall pressure
Suction Pressure:	28ft lift to 30psi
Fittings:	4” 150# Flanged

Materials of Construction:

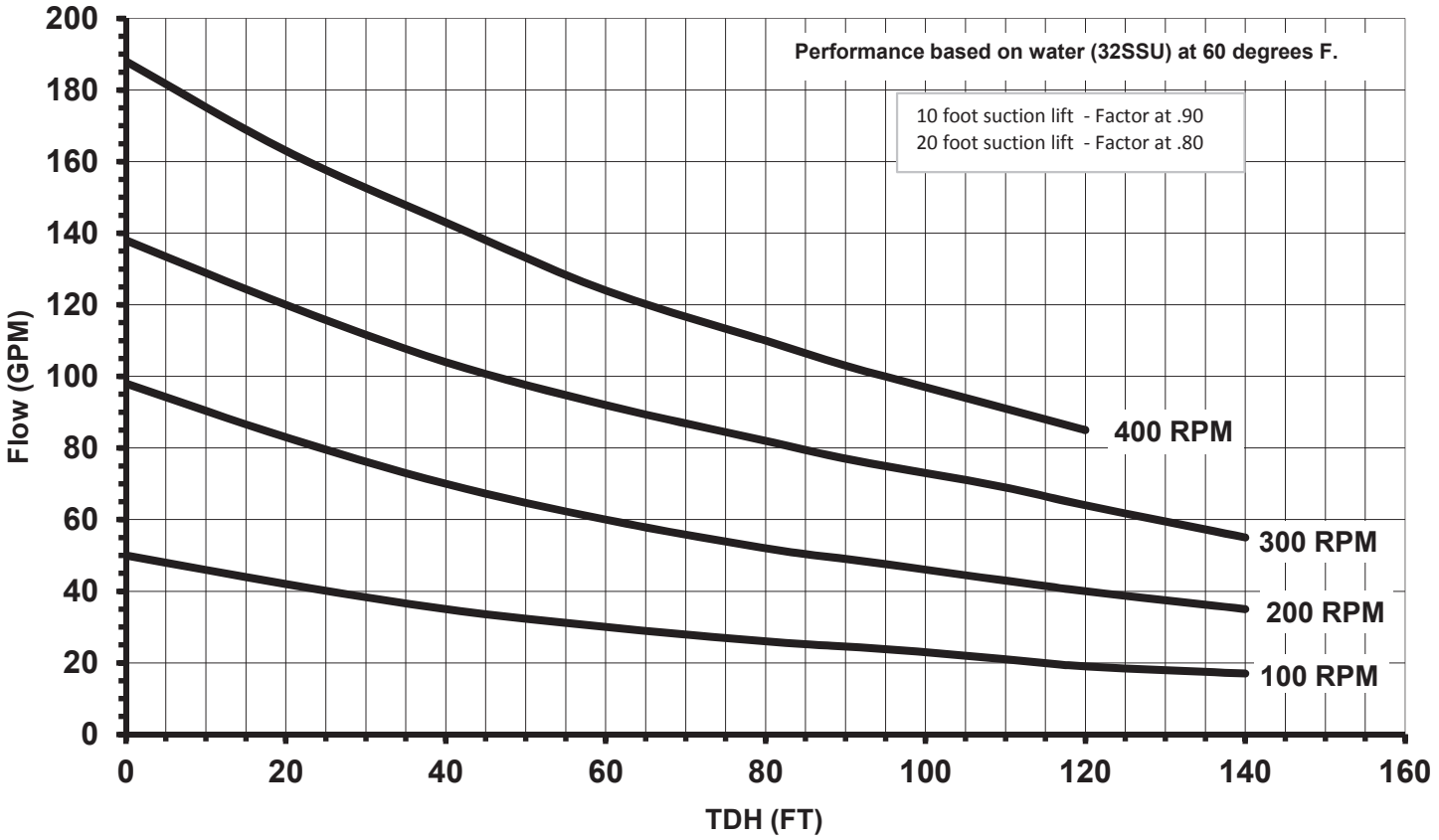
Housings:	Cast iron	Optional:	Lined with Neoprene, Glass, PVC, Tungsten Carbide, others
Elastomers:	Neoprene		Buna-N, EPDM, HNBR, Viton, others
Connecting Rods:	High-tensile Aluminum		
Drive Shaft:	High-tensile 400 Series SS		
Eccentric Cams:	High tensile bronze alloy		
Bearing Pedestals:	Aluminum		
Frame and Covers:	304SS	Optional:	316SS, Galvanized Steel

Drives Systems:

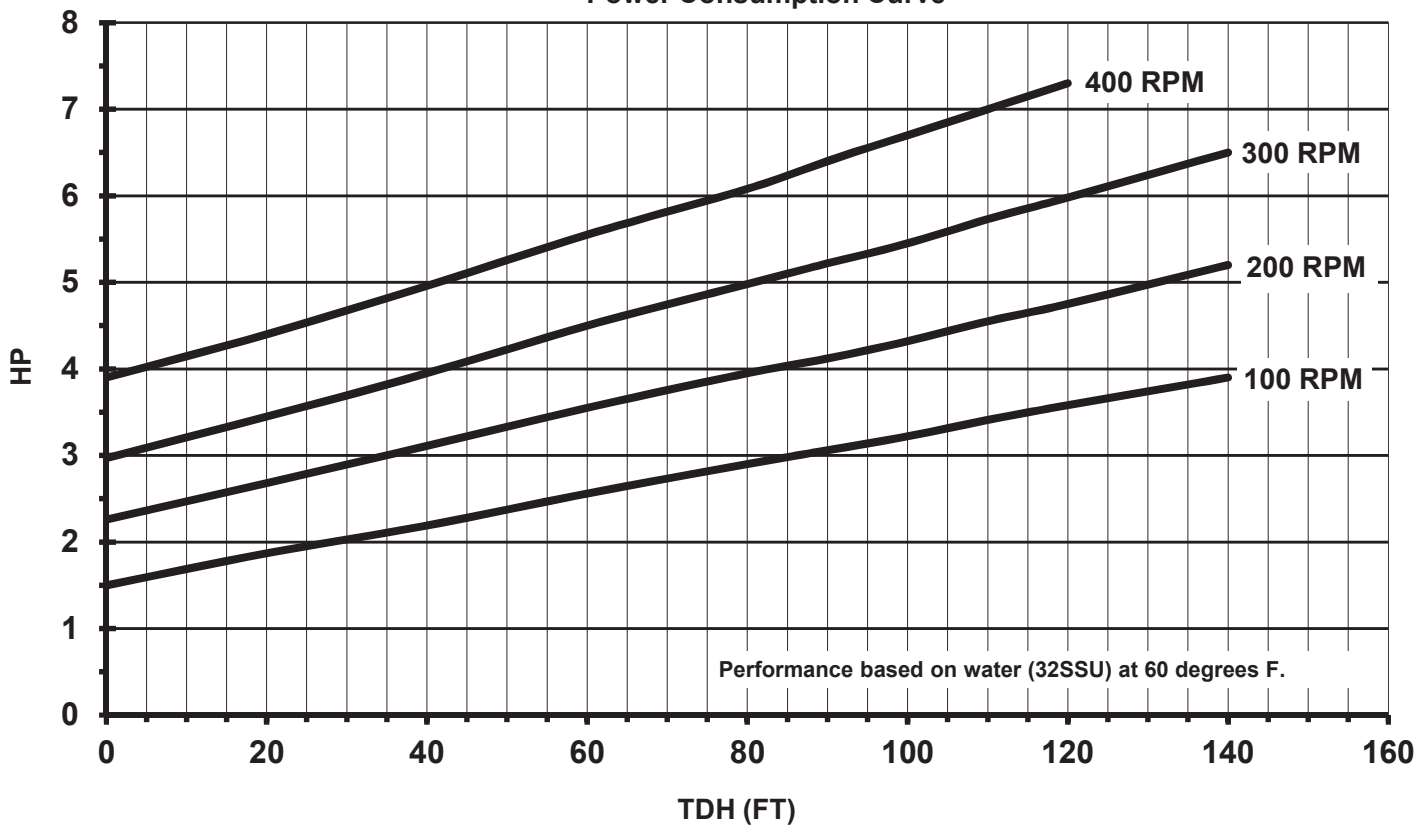
Static:	Electric belt and pulley	Optional:	Gearmotor, Air and Hydraulic motor
Portable:	Electric, Gas and Diesel Engine		

4" Model 4DDSX30

Performance Curve



Power Consumption Curve



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WATER RESOURCE ENGINEERS

Section 4.4

Tertiary Filters

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

Aqua-Aerobic® Cloth Media Filtration

Featuring OptiFiber® Pile Cloth Media

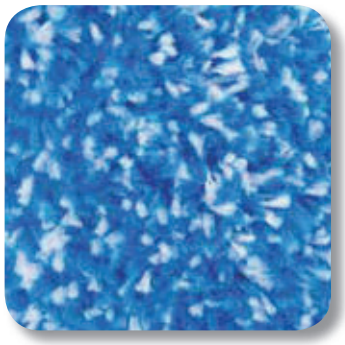
In the early 1990s Aqua-Aerobic Systems revolutionized tertiary treatment by introducing Cloth Media Filtration utilizing a disk configuration. Since then, over 70 different media have been researched and tested with a select few that are currently being applied to five mechanical configurations in a variety of applications including: water reuse, low level phosphorus, stormwater and primary treatment.

Effective Depth Filtration

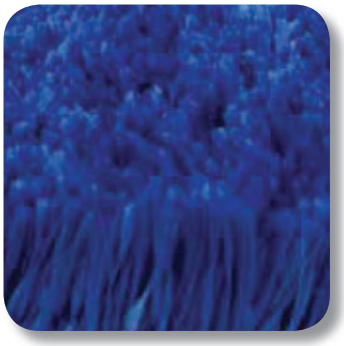
The original OptiFiber® pile cloth media is specifically engineered for water and wastewater applications and designed to maximize solids removal over a wide range of particle sizes. Deep, thick, pile fibers capture particles for the most effective depth filtration. OptiFiber media is exclusive to the entire line of cloth media filter configurations including:

- AquaDisk®
- Aqua MegaDisk®
- AquaDiamond®
- Aqua MiniDisk®
- AquaDrum®

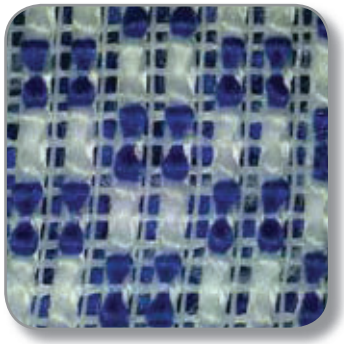
OptiFiber PA2-13®



OptiFiber PES-13®



OptiFiber PES-14®



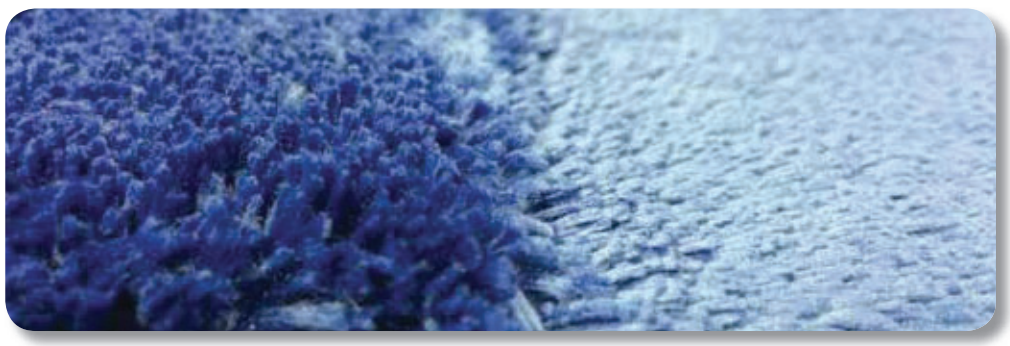
Unique Backing Design

OptiFiber® Media Advantages

- Woven, precision fibers provide strength and durability
- Discrete pile fibers effectively release solids during backwash
- Open backing minimizes potential for biofouling
- Low backwash volume results in water savings and energy reduction
- Variety of application-specific cloth including 5 µm nominal pore size media

OptiFiber® Cloth Filtration Media

Awarded BlueTech® Research Innovation Badge



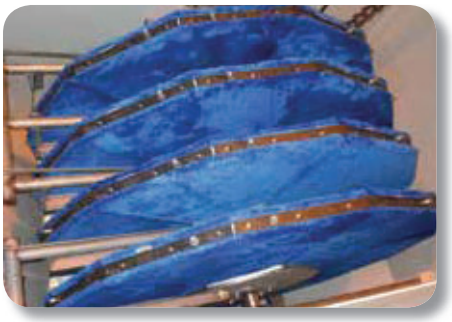
Shown is pile cloth media in its natural state (left) and its conditioned state (right).

Engineered Cloth Media

OptiFiber PES-14®

MICROFIBER CLOTH FILTRATION MEDIA

The latest in cloth media advancements is the OptiFiber PES-14 microfiber media. This media is specifically engineered to remove suspended solids, turbidity and fine particles up to 50% better than other filters or microscreens.



An AquaDisk® filter with Microfiber cloth treats cooling tower blow-down.

OptiFiber PES-14® Media Advantages

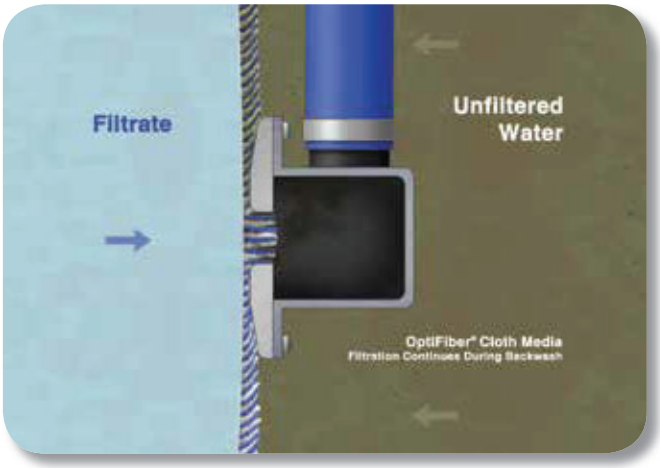
- Ideal for fine polishing applications
- Proven to reduce phosphorus to 0.1 mg/l or less
- More surface area for particle interception
- 5 micron nominal pore size removes small particles to enhance disinfection
- Maintains high filtrate quality even during backwash

An AquaDiamond® filter with Microfiber cloth polishes phosphorus to < 0.1 mg/l.

Backwash System

EFFECTIVE CLEANING WITH LESS WATER AND ENERGY

Maximum cleaning of the OptiFiber® cloth media is accomplished with a unique backwash system. The backwash shoe makes direct contact with the cloth media and solids are vacuumed from the surface. During backwash, fibers fluidize to provide an efficient release of stored solids deep within the fiber depth.



Backwash shoe makes direct contact with the media.

Backwash System Advantages

- Filtration continues during backwash
- Initiated at a pre-determined liquid level or time
- Low backwash rates
- Less water volume required
- Low energy consumption

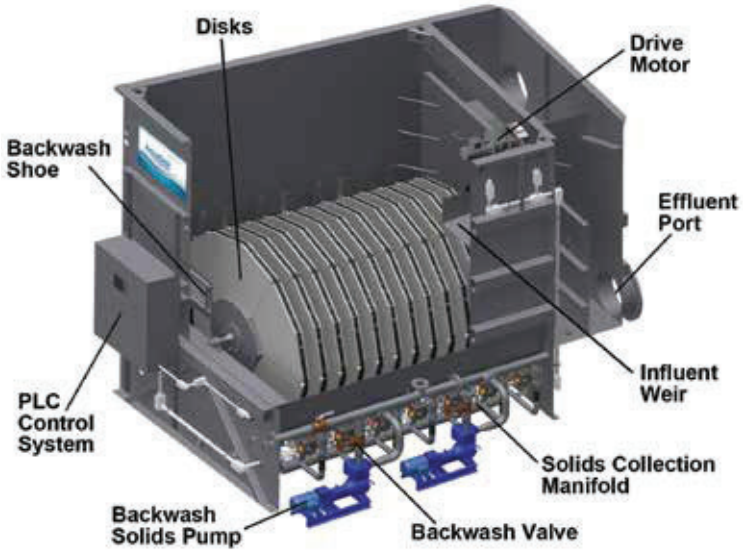
Configurations

AquaDisk®
CLOTH MEDIA FILTER

The cloth media “Disk” configuration was the first to enter the marketplace as an alternative to conventional granular media filtration technologies. This original configuration comprises the majority of Aqua-Aerobic cloth media filters installed today. A history of exceptional operating experience in a variety of municipal and industrial applications continues to make the AquaDisk® the tertiary filter of choice.

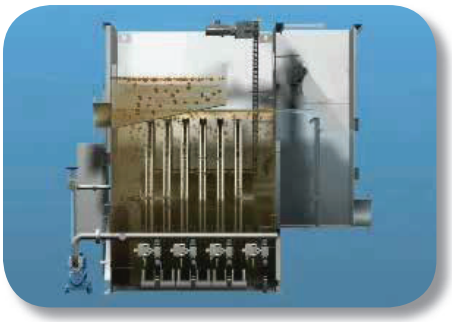
Features and Benefits

- Vertically oriented cloth media disks reduce required footprint
- Each disk has six lightweight, removable segments for ease of maintenance
- Low hydraulic profile
- Higher solids and hydraulic loading rates
- Low backwash rate
- Available in painted steel, stainless steel or concrete tanks
- Fully automatic PLC control system with color touchscreen HMI
- Low cost of ownership



Modes of Operation

All Aqua-Aerobic cloth media filter configurations operate on the same (3) modes of operation: **FILTRATION**, **BACKWASH** and **SOLIDS WASTING**. For graphical representation, the AquaDisk is used to describe each mode below.

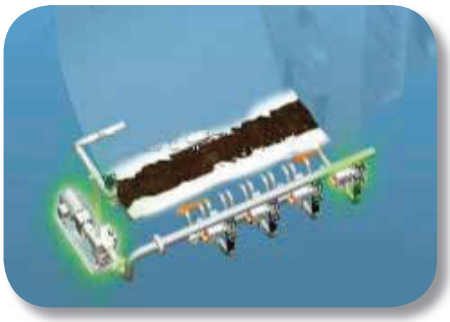


Filtration Mode

- Inlet wastewater enters filter
- Cloth media is completely submerged
- Disks are stationary
- Solids deposit on outside of cloth media forming a mat as filtrate flows through the media
- Tank liquid level rises
- Flow enters the filter by gravity and filtrate is collected inside the disks and discharged
- Heavier solids settle to the tank bottom

Backwash Mode

- Solids are backwashed at a predetermined liquid level or time
- Backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump
- Two disks are backwashed at a time (unless a single disk is utilized)
- Disks rotate slowly
- Filtration is not interrupted
- Backwash water is directed to headworks



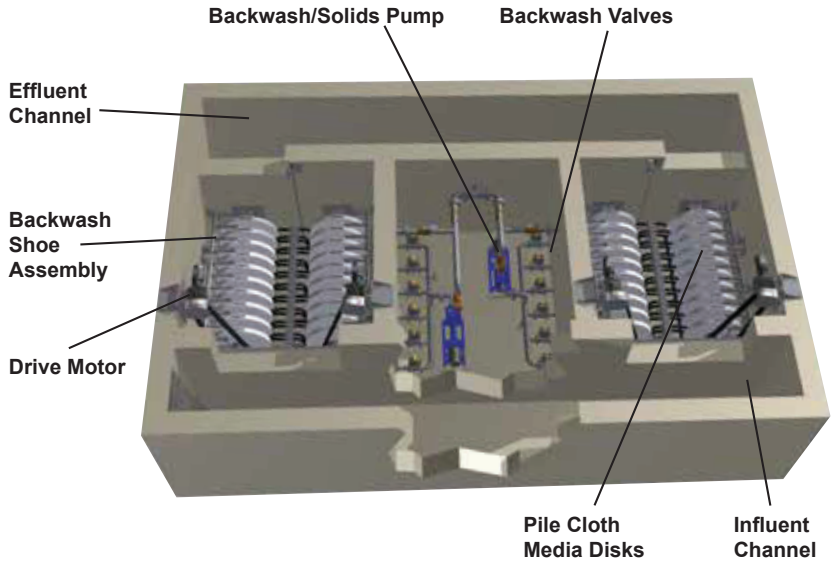
Solids Wasting Mode

- Heavier solids on the tank bottom are removed on an intermittent basis
- Solids are pumped back to the headworks, digester or other solids collection area of the treatment plant

Aqua MiniDisk®

CLOTH MEDIA FILTER

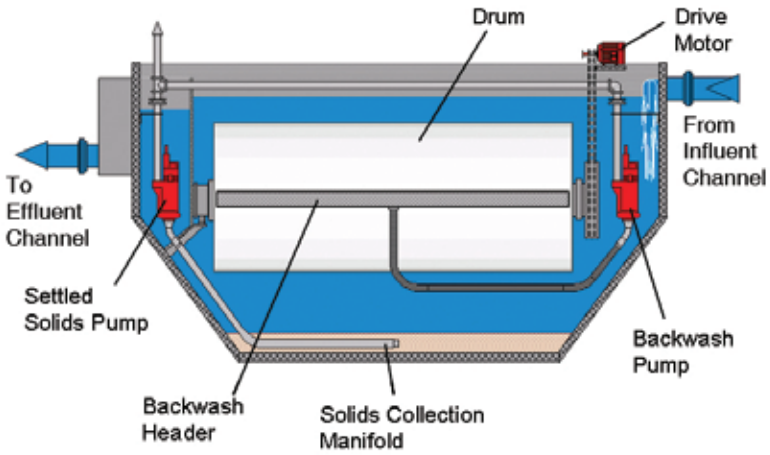
The Aqua MiniDisk and AquaDrum filters feature all the same benefits and (3) modes of operation as the original AquaDisk. Both configurations are designed to provide economical treatment of smaller flows and easily retrofit into existing traveling bridge sand filters. The AquaDrum is particularly ideal where driving head is limited.



The modular design of the Aqua MiniDisk filter retrofits neatly into existing 9 ft. (2.74 m) wide concrete traveling bridge filter basins, providing more than two times the hydraulic capacity of the original sand filters.

AquaDrum®

CLOTH MEDIA FILTER



Internal view of an AquaDrum® cloth media filter

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.5

Ultraviolet Disinfection

TROJANUV3000PLUS®

Wastewater Disinfection

TROJAN UV®

Water Confidence®

The Reference Standard in UV

UV is an effective, safe and environmentally friendly way to disinfect wastewater. It provides broad-spectrum protection against chlorine-resistant *Cryptosporidium* and *Giardia*.

The TrojanUV3000Plus® is one of the reasons why UV treatment is now a favored technology in wastewater disinfection. This highly flexible system has demonstrated effective and reliable performance around the world in combined sewer overflow, primary and tertiary wastewater reclamation, and reuse applications.

The proven infrastructure of the TrojanUV3000Plus has been continuously refined to enhance easy operation. The result is more dependable performance, simplified maintenance and maximized UV lamp output at end-of-lamp life. The TrojanUV3000Plus also incorporates innovative features to further reduce operation and maintenance (O&M) costs, such as variable output electronic ballasts and our revolutionary ActiClean® automatic chemical/mechanical sleeve wiping system.

TROJAN UV3000PLUS®

Designed for efficient, reliable performance

System Control Center (SCC)

The SCC monitors and controls all UV functions. The microprocessor-based Touch Smart Controller is housed in a small panel and features a user-friendly, touch-screen Human Machine Interface (HMI) along with Modbus Ethernet or Modbus RTU for SCADA connectivity. Along with dose-pacing control, the Touch Smart controller logs data for trending and analysis (flow, power, UVT, UV intensity and dose). A Programmable Logic Controller (PLC) can be supplied for larger systems (with more than 2 channels) for the advanced controls required for multiple channel operation and automatic slide/ sluice gate control.

Alarms

Extensive alarm reporting system ensures fast and accurate diagnosing of system process and maintenance alarms. Programmable control software can generate unique alarms for individual applications.

Power Distribution Center (PDC)

The PDC powers each bank of modules. Its ergonomic, angled design provides easy access to module power cables and hoses for the ActiClean cleaning system. The robust stainless steel enclosure is mounted across the channel, with module fuses and interlock relays visually aligned with module receptacles for fast diagnostics. Modules are individually overload-protected for safety. Like all TrojanUV3000Plus components, the PDC can be installed outdoors and requires no shelter, Heating, Ventilation or Air Conditioning (HVAC).

UV Intensity Sensor

The UV intensity sensor continually monitors UV lamp output. The ActiClean system automatically cleans lamp and sensor sleeves simultaneously.

Electronic Ballasts

The variable-output (60 - 100% power) electronic ballast is mounted in its own TYPE 6P (IP67) rated enclosure within the module frame. Features “quick connect” electrical connections. Cooling is by convection.

ActiClean Cleaning System

The system consists of two components:

1. Hydraulic System Center (HSC)

The HSC actuates the ActiClean cleaning system, and is mounted close to the channel in a stainless steel enclosure. It contains the pump, valves and ancillary equipment required to operate the cleaning system and links to the extend/retract hoses of the module wiper drives via a manifold located on the underside of the PDC.

2. ActiClean Wiper Assembly

A submersible wiper drive on each UV module drives the wiper carriage assembly along the module. Attached wiper canisters surround the quartz sleeves, and are filled with ActiClean-WW Gel. The gel uses food grade ingredients and contacts the lamp sleeves between the two wiper seals. Cleaning takes place while the lamps are submerged and while they are operating.

Water Level Sensor

The system includes an electrode low water level sensor for each channel. If effluent levels fall below defined parameters, an alarm will be activated.

UV Modules

UV lamps are mounted on modules installed in open channels. The lamps are enclosed in quartz sleeves, and positioned horizontally and parallel to water flow. A bank is made up of multiple modules placed in parallel. All ballast and lamp wiring runs inside the module frame.

Water Level Controller

A fixed weir, motorized weir gate, or Automatic Level Control gate (shown), is required in the channel to maintain the appropriate water level over the lamps. Trojan engineers will work with you to select the appropriate level control device for your application.

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.6

Main Pump Station

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 4.7

In Plant Pump Station

Aldrich + Elliott
WATER RESOURCE ENGINEERS

SECTION 5

DESIGN CRITERIA

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 5.1

Sequential Batch Reactors Design Criteria

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

HINESBURG, VT

Design# 153825
Option: Preliminary Design (Scenario 2 SBR)

AquaSBR®

Sequencing Batch Reactor

October 17, 2018
Designed By: Jakob Nowicki

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Design Notes

Pre-SBR

- Elevated concentration of Hydrogen Sulfide can be detrimental to both civil and mechanical structures. If anaerobic conditions exist in the collection system, steps should be taken to eliminate Hydrogen Sulfide prior to the treatment system.

- Neutralization is recommended/required ahead of the SBR if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Coarse solids removal/reduction is recommended prior to the SBR.

SBR

- The maximum flow, as shown on the design, has been assumed as a hydraulic maximum and does not represent an additional organic load.

- The decanter performance is based upon a free-air discharge following the valve and immediately adjacent to the basin. Actual decanter performance depends upon the complete installation including specific liquid and piping elevations and any associated field piping losses to the final point of discharge. Modification of the high water level, low water level, centerline of discharge, and / or cycle structure may be required to achieve discharge of full batch volume based on actual site installation specifics.

Aeration

- The aeration system has been designed to provide 1.25 lbs. O2/lb. BOD5 applied and 4.6 lbs. O2/lb. TKN applied at the design average loading conditions.

Process/Site

- An elevation and temperatures have been assumed as displayed on the design.

- An influent TKN (organic nitrogen plus NH3-N) and TP has been assumed, as displayed on the design.

- The anticipated effluent TAN requirement is predicated upon an influent waste temperature of 10° C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification below 10° C can be unpredictable, requiring special operator attention.

- Sufficient alkalinity is required for nitrification, as approximately 7.1 mg alkalinity (as CaCO3) is required for every mg of NH3-N nitrified. If the raw water alkalinity cannot support this consumption, while maintaining a residual concentration of 50 mg/l, supplemental alkalinity shall be provided (by others).

Anticipated

- Biological phosphorus removal, with chemical addition and filtration is required to meet the effluent objectives.

Post-SBR

- Effluent flow equalization follows the AquaSBR process.

Diffused Aeration

- The discharge pressure that is listed on the design is the blower's discharge pressure. (engineer to verify)

Equipment

- The basin dimensions reported on the design have been assumed based upon the required volumes and assumed basin geometry. Actual basin geometry may be circular, square, rectangular or sloped with construction materials including concrete, steel or earthen.

- Rectangular or sloped basin construction with length to width ratios greater than 1.5:1 may require alterations in the equipment recommendation.

- The basins are not included and shall be provided by others.

- Influent is assumed to enter the reactor above the waterline, located appropriately to avoid proximity to the decanter, splashing or direct discharge in the immediate vicinity of other equipment.

- If the influent is to be located submerged below the waterline, adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- A minimum freeboard of 2.0 ft is recommended for diffused aeration.

- Scope of supply includes freight, installation supervision and start-up services.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

AquaSBR - Sequencing Batch Reactor - Design Summary

Design#: 153825

Project: HINESBURG, VT

Option: Preliminary Design (Scenario 2 SBR)

Designed by Nicholas Fortsas on Friday, February 12, 2021

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

DESIGN INFLUENT CONDITIONS

Avg. Design Flow	= 0.325 MGD	= 1230 m3/day
Max Design Flow	= 0.78 MGD	= 2953 m3/day
Peak Hyd. Flow	= 1.04 MGD	= 3937 m3/day (with advancing cycles)

DESIGN PARAMETERS

	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Bio/Chem Oxygen Demand:	BOD5	400	BOD5	30	BOD5	30
Total Suspended Solids:	TSS	194	TSS	45	TSS	45
Total Kjeldahl Nitrogen:	TKN	30	--	--	--	--
Ammonia Nitrogen:	--	--	NH3-N	2.70	NH3-N	2.70
Phosphorus:	Total P	8	Total P	0.60	Total P	0.60

SITE CONDITIONS

	Maximum		Minimum		Design		Elevation (MSL)
Ambient Air Temperatures:	80 F	26.7 C	25 F	-3.9 C	80 F	26.7 C	554 ft
Influent Waste Temperatures:	68 F	20.0 C	46 F	7.5 C	68 F	20.0 C	168.9 m

SBR BASIN DESIGN VALUES

			Water Depth			Basin Vol./Basin		
No./Basin Geometry:	= 2 Rectangular Basin(s)		**Min**	= 13.6 ft	= (4.1 m)	**Min**	= 0.142 MG	= (537.2 m³)
Freeboard:	= 2.0 ft	= (0.6 m)	**Avg**	= 16.7 ft	= (5.1 m)	**Avg**	= 0.174 MG	= (660.3 m³)
Length of Basin:	= 40.0 ft	= (12.2 m)	**Max**	= 21.0 ft	= (6.4 m)	**Max**	= 0.220 MG	= (832.5 m³)
Width of Basin:	= 35.0 ft	= (10.7 m)						

Number of Cycles:	= 5 per Day/Basin	
Cycle Duration:	= 4.8 Hours/Cycle	
Food/Mass (F/M) ratio:	= 0.102 lbs. BOD5/lb. MLSS-Day	
MLSS Concentration:	= 4500 mg/l @ Min. Water Depth	
Hydraulic Retention Time:	= 1.073 Days @ Avg. Water Depth	
Solids Retention Time:	= 16.2 Days	
Est. Net Sludge Yield:	= 0.493 lbs. WAS/lb. BOD5	
Est. Dry Solids Produced:	= 534.1 lbs. WAS/Day	= (242.3 kg/Day)
Est. Solids Flow Rate:	= 40 GPM (6397 GAL/Day)	= (24.2 m³/Day)
Decant Flow Rate @ MDF:	= 1444 GPM (as avg. from high to low water level)	= (91.1 l/sec)
LWL to CenterLine Discharge:	= 1.0 ft	= (0.3 m)
Lbs. O2/lb. BOD5	= 1.25	
Lbs. O2/lb. TKN	= 4.60	
Actual Oxygen Required:	= 1729 lbs./Day	= (784.4 kg/Day)
Air Flowrate/Basin:	= 772 SCFM	= (21.9 Sm³/min)
Max. Discharge Pressure:	= 9.7 PSIG	= (67 KPA)

Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 5.2

Tertiary Filtration Design Criteria

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

Process Design Report

HINESBURG, VT

Design# 153827
Option: Preliminary Design (Scenario 2 Filter)

Aqua MiniDisk®

Cloth Media Filter

October 17, 2018
Designed By: Jakob Nowicki

6306 N. Alpine Rd Loves Park, IL 61111
(815) 654-2501 www.aqua-aerobic.com

Design Notes

Process/Site

- To achieve an effluent monthly average total phosphorus limit, the biological process, chemical feed systems, and Cloth Media Filters need to be designed to facilitate optimum performance.

- A minimum of twelve (12) daily composite samples per month (both influent and effluent) shall be obtained for total phosphorus analysis.

- Influent to the biological system is a typical municipal wastewater application with a TP range of 6–8 mg/l. Influent TP shall be either in a particle associated form or in a reactive soluble phosphate form or in a soluble form that can be converted to reactive phosphorus in the biological system. Soluble hydrolyzable and organic phosphates are not removable by chemical precipitation with metal salts. A water quality analysis is required to determine the phosphorus speciation with respect to soluble and insoluble reactive, acid hydrolyzable and total phosphorus at the system influent, point(s) of chemical addition, and final effluent.

- Chemical feed lines (i.e. metal salts) shall be furnished to each reactor, aerobic digester and dewatering supernatant streams as necessary. Metal salts shall be added to each reactor during the React phase of the cycle.

- Chemical addition (i.e. metal salts, polymer) shall be furnished prior to the filter. Adequate rapid mixing must be provided as part of the chemical feed system. The chemical dosage should be flow-paced and controlled to avoid overdosing. Jar testing with various metal salts and polymers is recommended to determine the most effective metal salt and polymer as well as the optimum dosages of each, and to estimate the degree of phosphorus removal that can be achieved. In addition, a pilot study may be required to verify the actual performance capability.

- A flocculation tank with a minimum of 5-minute HRT at the maximum daily flow shall be furnished after chemical addition and prior to the filter.

- pH monitoring and control in a range of 6.8-7.2 of the upstream biological reactor is required when adding metal salts.

- The cloth media filter will only remove TP that is associated with the TSS removed by the filter. Solids include both biological and chemical solids. Since only insoluble, particle-associated phosphorous is capable of being removed by filtration with tertiary filtration technology, phosphorous speciation shall be provided by the owner to substantiate the concentrations of soluble and insoluble phosphorous in the filter influent. If the proportions of soluble (unfilterable) and insoluble phosphorous are such that removal to achieve the desired effluent limit is not practical, the owner will provide for proper conditioning of the wastewater, upstream of the filter system, to allow for the required removal.

Filtration

- The cloth media filter recommendation and anticipated effluent quality are based upon influent water quality conditions as shown under "Design Parameters" of this Process Design Report

- The anticipated filtered effluent quality is based on the filter influent conditions as shown under "Design Parameters" of this Process Design Report. In addition, the filter influent should be free of algae and other solids that are not filterable through a nominal 5 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

- For this application, pile filter cloth is recommended.

- The cloth media filter has been designed to handle the maximum design flow while maintaining one unit out of service.

- The cloth media filter design assumes the equalization basin is equipped with a pump system with one standby pump to control flow.

Equipment

- Equipment selection is based upon Aqua Aerobic Systems' standard materials of construction and electrical components.

- Aqua-Aerobic Systems, Inc. is familiar with various “Buy American” Acts (i.e. AIS, ARRA, Federal FAR 52.225, EXIM Bank, USAid, PA Steel Products Act, etc.). As the project develops Aqua-Aerobic Systems can work with you to ensure full compliance of our goods with various Buy American provisions if they are applicable/required for the project. When applicable, please provide us with the specifics of the project’s “Buy American” provisions.

AquaDISK Tertiary Filtration - Design Summary

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: AquaSBR

Avg. Design Flow	= 0.325 MGD	= 225.69 gpm	= 1230 m³/day
Max Design Flow	= 0.78 MGD	= 541.7 gpm	= 2953 m³/day

DESIGN PARAMETERS

	Influent	mg/l	Effluent Required	<= mg/l	Effluent Anticipated	<= mg/l
Avg. Total Suspended Solids:	TSSa	15	TSSa	45	TSSa	5
Max. Total Suspended Solids:	TSSm	25	--	--	--	--
Phosphorus:	Total P	0.60	Total P	0.15	Total P	0.15

AquaDISK FILTER RECOMMENDATION

Qty Of Filter Units Recommended	= 2
Number Of Disks Per Unit	= 8
Total Number Of Disks Recommended	= 16
Total Filter Area Provided	= 172.8 ft² = (16.05 m²)
Filter Model Recommended	= AquaDisk Package: Model ADFSP-11-8E-PC
Filter Media Cloth Type	= OptiFiber PES-14

AquaDISK FILTER CALCULATIONS

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash . Tank shall include a rounded bottom and solids removal system.

Average Flow Conditions:

Average Hydraulic Loading = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 225.7 / 172.8 ft²
= 1.31 gpm/ft² (3.19 m/hr) at Avg. Flow

Maximum Flow Conditions:

Maximum Hydraulic Loading = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 541.7 / 172.8 ft²
= 3.13 gpm/ft² (7.66 m/hr) at Max. Flow

Solids Loading:

Solids Loading Rate = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 162.6 lbs/day / 172.8 ft²
= 0.94 lbs. TSS /day/ft² (4.59 kg. TSS/day/m²)

The above recommendation is based upon the provision to maintain a satisfactory hydraulic surface loading with (1) unit out of service. The resultant hydraulic loading rate at the Maximum Design Flow is: 6.3 gpm / ft² = (15.3 m/hr)

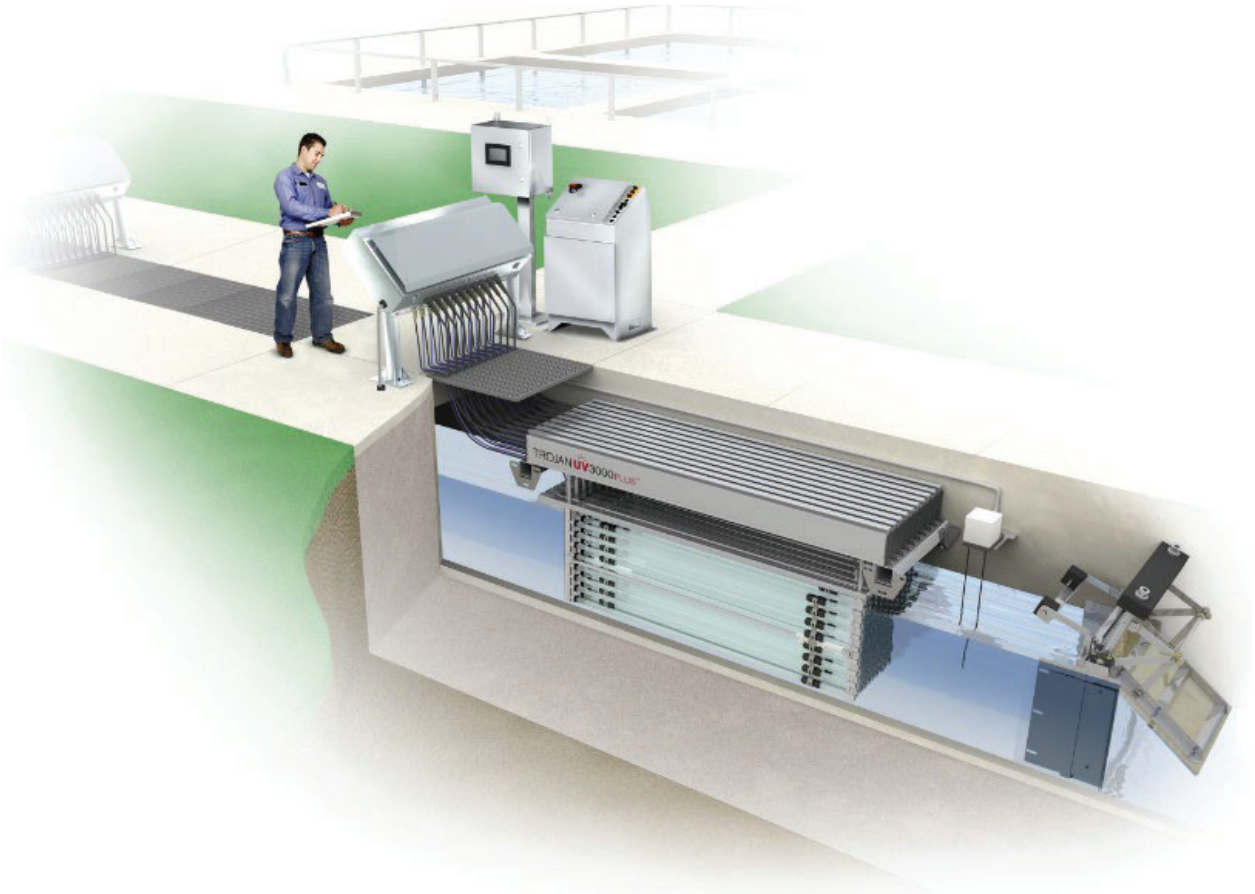
Aldrich + Elliott
WATER RESOURCE ENGINEERS

Section 5.3

Ultraviolet Disinfection Design Criteria

TROJAN UV3000 PLUS™

PROPOSAL FOR THE CITY OF HINESBURG, Vermont
QUOTE: 218800
12/11/2018



The TrojanUV3000Plus™ is operating in **over 2000** municipal wastewater plants around the world. Disinfecting **over 17 billion** gallons a day, the TrojanUV3000Plus™ has become the reference standard in the industry.

December 12, 2018

In response to your request, we are pleased to provide the following TrojanUV3000Plus™ proposal for the HINESBURG – Scenario 2 project.

The TrojanUV3000Plus™ has been shown in over 2000 installations to provide dependable performance, simplified maintenance, and superior electrical efficiency. As explained in this proposal, the system incorporates innovative features to reduce O&M costs, including variable output electronic ballasts to provide dimming capability and Trojan's revolutionary ActiClean-WW™ system – the industry's only online chemical and mechanical quartz sleeve cleaning system. All Trojan installations are supported by a global network of certified Service Representatives providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the TrojanUV3000Plus™ and we look forward to working with you on this project.

With best regards,

Mike Shortt
Trojan Technologies
3020 Gore Road
London, Ontario N5V 4T7
Canada
(519) 457 – 3400 ext. 2235
mshortt@trojanuv.com

Local Representative:

Paul H. Sussman
The MAHER Corporation
192 Pleasant Street
Rockland, MA 02370
psussman@themahercorp.com

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DESIGN CRITERIA

HINESBURG

Peak Design Flow:	**1.05 MGD**
UV Transmittance:	**65 %** (minimum)
Total Suspended Solids:	**5 mg/l** (Maximum, grab sample)
Disinfection Limit:	**77 E.coli per 100 ml,** based on a 1 day maximum
Design Dose:	**35 mJ/cm^2 (**bioassay validated)
Validation Factors:	**0.98** end of lamp life factor (Low-Pressure Amalgam Lamps) **0.95** fouling factor (ActiClean-WW™ Chemical / Mechanical Cleaning System)

DESIGN SUMMARY

QUOTE: 218800

Based on the above design criteria, the TrojanUV3000Plus™ proposed consists of:

CHANNEL (Please reference Trojan layout drawings for details.)	
Number of Channels:	**1**
Approximate Channel Length Required:	**30 ft**
Channel Width Based on Number of UV Modules:	**0.7 ft**
Channel Depth Recommended for UV Module Access:	**3.8 ft**
UV MODULES	
Total Number of Banks:	**2**
Number of Modules per Bank:	**2**
Number of Lamps per Module:	**4**
Total Number of UV Lamps:	**16**
Maximum Power Draw:	**4 kW**
UV PANELS	
Power Distribution Center Quantity:	**2**
System Control Center Quantity:	**1**
MISCELLANEOUS EQUIPMENT	
Level Controller Quantity:	**1**
Type of Level Controller:	**Fixed Weir (Weir)**
Automatic Chemical / Mechanical Cleaning:	**Trojan ActiClean-WW™**
Standard Spare Parts / Safety Equipment:	**Included**
Other Equipment:	
ELECTRICAL REQUIREMENTS	

1.	Each Power Distribution Center requires an electrical supply of one (1) 208V 60Hz, kVA
2.	The Hydraulic System Center requires an electrical supply of one (1), 208V 60Hz, 2.5 kVA. .
3.	Electrical disconnects required per local code are not included in this proposal.

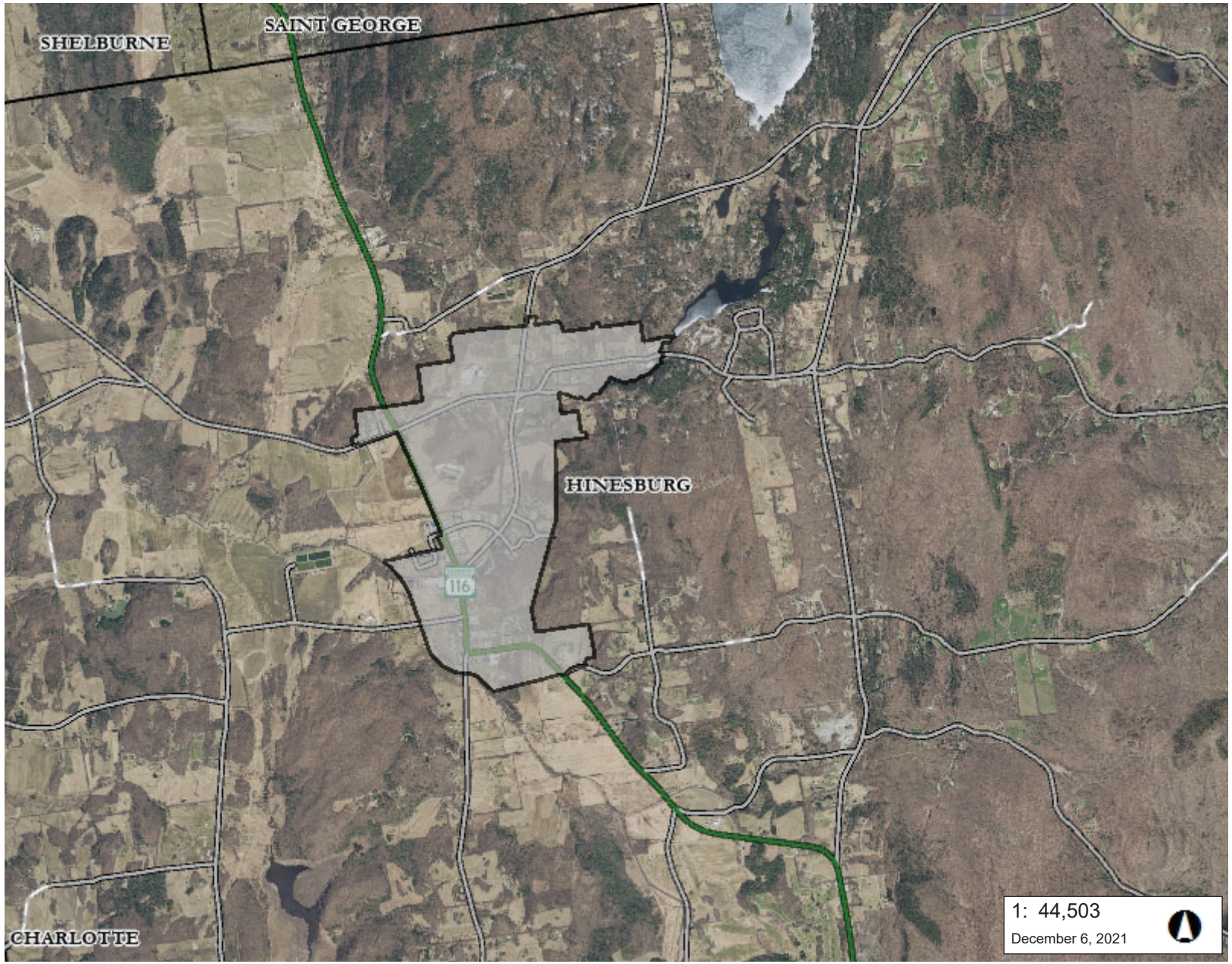
HINESBURG SEWER SERVICE AREA

VERMONT

Hinesburg Sewer Service Area

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Sewer Service Area
- Roads
  - Interstate
  - US Highway; 1
  - State Highway
  - Town Highway (Class 1)
  - Town Highway (Class 2,3)
  - Town Highway (Class 4)
  - State Forest Trail
  - National Forest Trail
  - Legal Trail
  - Private Road/Driveway
  - Proposed Roads
- Stream/River
  - Stream
  - Intermittent Stream
- Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

2,261.0 0 1,130.00 2,261.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 3709 Ft. 1cm = 445 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

WWTF UPGRADE SCHEDULE

Hinesburg WWTF Upgrade/Expansion

February 2022

Task Name	Start	Finish
Hinesburg WWTF Upgrade/Expansion		
Contract No. 1 - Construction	11/13/21	11/13/22
Monitor Wick Drains	11/13/21	11/13/22
Contract No. 2 - Final Design	09/15/21	08/08/22
Begin Final Design	10/01/21	10/01/21
30% Review Meeting	02/15/22	02/15/22
60% Review Meeting	05/15/22	05/15/22
90% Submittal	08/15/22	10/01/22
Permits	04/01/22	10/01/22
Issue Final Documents	11/15/22	11/15/22
Contract No. 2 - Construction	12/01/22	09/01/24
Advertise for Bids	12/01/22	12/01/22
Open Bids	01/15/23	01/15/23
Construction	03/01/23	09/01/24
Substantial Completion	09/01/24	09/01/24