NEWPORT, NEW HAMPSHIRE

# Preliminary Design Report

FEBRUARY 2023

# Wastewater Treatment Facility Upgrade

WRIGHT-PIERCE
Engineering a Better Environment

# Wastewater Treatment Facility Upgrade

## Newport, New Hampshire

2/1/23

STATE OF NEW HAMPSHIRE
MICHAEL
A.
CURRY
No. 14956
LICENSED
PROFESSIONAL ENGINEER

**FEBRUARY 2023**

**Prepared By:**

**Wright-Pierce**
230 Commerce Way, Suite 302
Portsmouth, NH 03801
603.430.3728 | wright-pierce.com

**WRIGHT-PIERCE**
Engineering a Better Environment

# Memorandum

Date: 1/30/2023

Project No.: 20828B – Newport, NH Preliminary Design Submittal

To: Town of Newport, NH: Mr. Hunter Rieseberg, Mr. Paul Brown
USDA – Rural Development: Mr. Jonathan Harries, PE
NHDES: Dennis Greene, PE

From: Michael Curry, PE, Jeff Mercer, PE

Subject: Response to Comments – Preliminary Design Report (30%)

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The following memorandum presents comments from the New Hampshire Department of Environmental Services (NHDES) and the Town, and the responses from Wright-Pierce which are identified in ***bold italics.***

## NHDES Comments and Responses

### Mr. Dennis Greene, PE email dated 1/18/2023

### Design Flows and Loads (Section 2.2)

1. Per Table 2-2, average design flow (ADF) is 0.66 mgd; peak design flow (PDF) is 4.96 mgd. Is PDF the design value for the existing WWTF with ADF of 1.3 mgd? ***The 4.96 mgd PDF is not associated with the original plant ADF of 1.3 mgd. The 4.96 mgd is a historical flow value measured on 4/16/2007 associated with a record noreaster and represents the highest recorded influent flow at the WWTF.***

2. Current NPDES permitted annual average flow is 1.3 mgd, WWTF upgrade will provide an ADF capacity 0.66 mgd. The PDR should provide a summary table that lists all major WWTF elements that would need to be upgraded/expanded if the Town seeks to increase capacity above 0.66 mgd in the future. The table should present the current average/peak capacity of each limiting element. Such a table will help future Town management and DES during WWTF expansion planning efforts. ***Please see attached summary which is included as Appendix I in the final PDR.***

3. What is minimum design flow? ***The minimum design flow is 0.24 MGD as identified in the Flows and Loads Memorandum in Appendix B.***

### Effluent Limits (Section 2.3)

4. Conceptually, what WWTF upgrades would be required if a future effluent limit of 8 mg/L TN is imposed? 3 mg/L TN? ***Requirements for a WWTF upgrade for future effluent TN limitations are difficult to provide without knowing specifics of the limit(s) (seasonal, based on monthly or annual average values, etc.). Efforts to determine the maximum TN removal performance of the recommended upgrade include evaluating the adjustment of SBR cycles and evaluating the use of the lagoons to equalize influent flows for conditions less than the proposed 1.5 MGD (but no less than 1 MGD). By increasing the Town's frequency of influent equalization, the minimum low water level in the SBRs may be increased thus increasing the mass of bacteria in***

*the system while maintaining design mixed liquor concentrations and hydraulically accepting the design max month load flow. This would allow the Town to theoretically achieve a higher degree of TN removal. The other, more costly alternative would be to expand the secondary treatment system with additional treatment volume (i.e., more SBR tankage).*

### Facility Hydraulics (Section 2.4)

5. What is peak capacity of existing screening system? ***The existing influent screening and grinder system is rated for up to 5.1 mgd based on information provided by the manufacturer. It must be noted that this capacity is highly dependent upon the downstream water depth which would be controlled by pump operation during high flows.***

6. Project must comply with EO 13690 (attached). Can the WWTF pass 4.96 mgd at the 100 yr + 3ft river elevation, without overtopping tanks or lagoons? ***The Sugar River water surface elevation at 100-year flood plus 3-ft would be elevation 781.5-ft. Under this flood condition, the ground surface elevation at a majority of the site would be submerged. The new Process Building design takes this into consideration and maintains critical infrastructure above this elevation. In terms of treatment tanks and existing structures:***

    a. ***Control Building: Elev. 783 +/-***
    b. ***Lagoon dikes: Elev. 782.6***
    c. ***Disinfection Building: FFE of 783 +/-***
    d. ***Filter Building ((critical infrastructure): Elev. 781.75 +/-***
    e. ***Process Building (critical infrastructure): 782 +/-***

### Grinding and Screening (Section 2.5.1)

7. Is the existing grinding system potentially detrimental to downstream equipment due to reformation of rag material after screening? ***The existing grinding system is not anticipated to cause issues to downstream equipment due to the 3 mm perforated plate screening downstream of the grinder.***
8. What is the condition and hydraulic capacity of the existing mechanical screen? ***The screening and grinder system is rated for up to 5.1 mgd per equipment manufacturer. The equipment was installed in 2016 and was reported to be in good working order by the Town and prior engineering assessments.***
9. If mechanical screen fails or is overloaded, is flow automatically diverted to bypass channel with manual bar screen, per Env-Wq 709.02 (j)? ***The top of the slide gate for the bypass channel is located below the top of the concrete and would allow flow to enter the bypass channel without operator intervention. The bypass channel contains a manually cleaned bar rack.***

### Influent Pump Station (Section 2.5.3)

10. How efficient are proposed pumps at low influent flow? Was a jockey pump considered? ***A single jockey pump was considered, but determined to not be practical based 1) evaluation of pump runtimes and forcemain velocities, and 2) operational considerations of having two different sized pumps. The PDR proposed three equal size pumps in this application to allow even runtimes between three pieces of equipment and better long-term performance of the influent pump system in this application.***

## Septage Receiving (Section 2.5.4)

11. Basis of design memorandum indicates that septage will be conveyed to SBRs during nighttime hours (when SBR organic loads are low) to avoid shock loading. Will this process be automated? ***Yes, this process will be automated through SCADA using operator adjustable repeat cycle timer set points and SBR cycle schedule (i.e., during the react phase of SBR sequencing).***
12. Proposed septage receiving system does not have grit removal. Proposed discharge from septage receiving is to upstream manhole (SMH2). What are provisions for prevention of excess grit accumulation in gravity sewers? O&M should reflect quarterly lamping of this section of the collection system due to possibility of grit build up, at a minimum. ***The proposed submersible septage pump will be sized to provide sufficient velocity in the new force main such that grit accumulation does not occur within the forcemain. Regular sewer inspection and quarterly flushing will be recommended for the gravity sewer downstream of SMH-2, as necessary.***

## Influent Equalization (Section 2.5.5)

13. What is current effective volume of lagoons with current sludge depths? ***A sludge depth survey has not been conducted and is not currently included as part of the project scope. The Town periodically removed sludge beginning in 2012 but has since discontinued lagoon sludge removal in advance of the WWTF upgrade project. Lagoon No. 1 has been reported to contain significant sludge accumulation in the corners and unaerated areas throughout the lagoon, while reports of Lagoon No. 2 indicate that it does not have the same degree of sludge accumulation.***
14. Is full volume of lagoons (17 MG) needed for IEQ? Can portion of Lagoon 1 be utilized instead? ***The full volume of the lagoons is not currently needed for influent EQ but could be utilized in the future if flows increase or the Town must modify SBR operation to achieve a higher degree of TN removal than currently projected.***

## Secondary Treatment (Section 2.5.7)

15. A 2-basin SBR layout is only allowed if sufficient influent equalization or continuous flow through capability is provided (Env-Wq 713.07 (c)). It appears that sufficient influent equalization is provided. However, a 3-basin SBR system would provide increased operational reliability. Was a 3-basin configuration considered for this project? ***A three-basin configuration was considered, however future expansion and buildout of the plant is envisioned to be a four-basin system which is the preferred operation from a cycling perspective for a traditional SBR system (over a 3 or 6 basin configuration). A two-basin system was determined to be the most appropriate selection.*** Per Env-Wq 713.07 (e), what is impact on SBR decanters during 1-basin SBR operation? ***It should be noted that single basin mode will only be used for emergency purposes and will be a requirement for the SBR pre-selection system. During single basin mode, the influent valve will always remain open even in non-filling phases of the SBR cycle. The SBR control strategy will automatically modify based on timing and flow level setpoints to operate in single basin mode. The result of single basin cycle timing modifications is likely to result in the SBR receiving influent flow during the decant phase. The influent is located on the opposite end of the tank, reducing the risk of short circuiting in the tank if this condition occurs. In addition, single-basin SBR mode programming will be evaluated to consider a short-term, increased reliance on influent EQ to allow the single-basin SBR mode to maximize treatment.***
16. Can blower system meet full peak hour demand with one blower out of service? ***The criteria used to size aeration blowers is typically peak-day demand based on the NPDES permit requirements and not peak hour***

***demand. The blower system will be designed to meet full peak demand (using a peaking factor to account for the SBR cycling times) of the max day load with one blower out of service.***

17. Per Env-Wq 713.02 (a),(b), does blower system have sufficient turn-down capability to provide efficient energy utilization over the expected range of operating conditions? ***The blower system is designed to maximize turn-down capabilities for energy efficient operation while still meeting peak demand. Furthermore, since the SBR contains a mixer the air can be cycled on and off for additional periods of anoxic treatment if aeration is determined to not be needed.***
18. What is approach for WAS pump redundancy? What is impact is a WAS pump is out of service? ***A spare WAS pump will be provided as part of the SBR package.***
19. Per Env-Wq 713.07 (h), does system have in-place capability to transfer mixed liquor between SBR basins? ***The proposed design does not have "in-place" capability to transfer mixed liquor between the SBR basins; however, given the basin layout, mixed liquor can easily be transferred from tank to tank using a submersible pump typical to WWTFs.***
20. Each SBR Basin should be equipped with an influent stilling well to prevent short circuiting. ***An influent baffle will be provided to direct influent flow to the bottom of the tank.***
21. Effluent EQ PS – does pumping system have ability to pump peak design forward flow with one pump out of service? ***Yes.***
22. Sludge storage decant pump redundancy? Impact if pump is out of service? ***Sludge decanting is not a critical operation to the process. If the decant pump is out of service the Town will not be able to decant liquids until the pump is replaced. An overflow port will be included between sludge tanks and the adjacent SBR tank should liquid levels get too high. The Town could also decant using a portable pump with flexible discharge hose if needed.***

## Tertiary Treatment (Section 2.5.8)

23. What are possible approaches for future expansion of tertiary filtration system > 1.5 mgd, if needed? The existing tertiary filtration system is completely redundant, so each unit has a 1.5 MGD capacity. ***See attached Appendix I for future tertiary filtration expansion considerations for flows > 1.5 MGD. Given the anticipated timeline for this need (> 20 years) and the likely innovations which will occur in tertiary filtration/total phosphorus removal, prediction of tertiary expansion design beyond the planning period is likely not constructive.***

## Disinfection (Section 2.5.9)

24. Effluent disinfection is a critical treatment process that is not optional. What is condition and projected remaining service life of existing UV system? If insufficient, then UV upgrade must be part of the base bid. ***After discussions with the Town, the UV disinfection system upgrade will not be a bid alternate and will be included with the base bid.***
25. UV reactors are proposed to be installed in one channel. Per Env-Wq 715.05 (f), what is approach for draining the UV channels for cleaning/maintenance while storing forward flow. How much time is required for this operation? ***The UV reactors channels will be drained via a mud valve located upstream of the UV effluent weir. With appropriate planning, forward flow can be retained in the effluent equalization tanks and influent EQ when influent flows are at their lowest. Given that the UV Disinfection system is preceded by a tertiary cloth disk filter, it is not expected that the channel cleaning will be frequent.***

26. Design UVT of 65% is based on limited UVT data collected during prior pilot testing of tertiary treatment systems. What is contingency if UVT falls below 65%? ***In the event the UVT falls below 65%,the system will need to operate with the second UV bank (versus a single UV bank) more frequently than currently anticipated. Two UV banks are designed to disinfect a peak capacity of 1.5-MGD, while typical ADF conditions are < 0.7 MGD. The proposed UV setup provides the Town with adequate UV disinfection system buffer in the event of a higher UVT conditions. It should be noted that effluent processes with secondary clarification and tertiary filtration typically have a high UVT when operated properly.***
27. Where is the current compliance point UV compliance point for E.coli, in relation to UV disinfection system? Potential for regrowth of E.coli prior to compliance point? ***The effluent sampler is located within the disinfection building and draws sample from the effluent point of the plant water tank just downstream of the disinfection system. The plant water tank is comprised of the CCT open top channels and will be readily accessible for inspection and cleaning should any solids or re-growth occur within the tank. The tank also has a mud valve which will allow it to be drained and cleaned. In addition, the disinfected influent is filtered upstream which mitigates the potential for solids accumulation and bacterial re-growth in downstream processes.***
28. Can emergency generator handle full UV electrical demand? ***The standby generator is sized to handle the full UV electrical demand and will be staged to prioritize the disinfection process in load-stepping.***
29. A formal waiver request for UV UPS requirement must be submitted. Describe how automatic prevention of flow through UV will be achieved during power outage, until the UV system comes back to full power. ***A waiver request UV UPS will be submitted.***

## Solids Handling System (Section 2.5.12)

30. What is contingency plan if centrifuge is out of service (Env-Wq 716.13 (l))? ***If the centrifuge is out of service and the sludge holding tanks are at capacity (after decanting) then liquid sludge will need to be hauled off-site. A valved piping connection will be provided in the sludge container room for emergency liquid sludge loading, if required.***
31. If desired by the Town in the future, is room available in the proposed layout for a sludge dryer? ***There is currently no planned space for a sludge dryer. Given the specific NFPA classification requirements for sludge drying operations, and the significant variations in sludge drying technologies, the building requirements for a future sludge dryer should be designed only when a specific technology is selected.***

## Plant Water System (Section 2.5.13)

32. What is condition of existing plant water system? What are implications if bid alternate cost is too expensive? ***The Town does not currently have a plant water system. Should this alternate not be selected, the Town would need to use backflow protected potable water (i.e., process water). Regardless of whether the plant water system is included, process water cross connections will be included at all locations where there is a plant water requirement.***

## WWTF Support Systems/O&M

33. Note requirement for WWTF O&M manual submittal to DES for review/approval. Engineering scope should include this item. ***Noted. An O&M manual will be included in the Construction Services Engineering scope.***
34. Confirm that emergency power system has capacity to handle all critical operating processes listed in Env-Wq 708.14. ***Confirmed.***

35. Confirm that SCADA system will have ability to monitor all applicable processes/functions listed in Env-Wq 708.15. ***Confirmed.***

Sludge Management

36. What is long term plan for sludge removal from existing lagoons? ***The 2012 project included lagoon sludge piping tied into the lagoons to assist with lagoon sludge dewatering using geobags. This piping will be extended to the proposed sludge holding tanks allowing the Town to periodically convey lagoon sludge from the lagoons to the new solids handling process and dewater/dispose of it along with the SBR waste sludge.***

DESIGN PLANS

37. Hydraulic Profile (PR-9) Add lagoons and flow path for Q> 1.5 mgd. ***A hydraulic profile for the influent equalization flow path will be provided with the next submittal (60%) once the piping and plan for existing structures is finalized.***
38. Influent PS (PR-16) Is Isolation gate provided between wet well? ***The influent pump station wet wells include an existing isolation gates.***

## Town of Newport Comments and Responses

### Mr. Hunter Reiseberg, Mr. Paul Brown, and Mr. Todd Cartier

1. The intent is to expand the solar array adjacent to the WWTF with Norwich Solar to match the increased demand from the facility upgrades. Wright-Pierce should coordinate with Norwich Solar through the design to provide an anticipated electrical demand to help with array expansion. ***Noted. Wright-Pierce will coordinate with Norwich Solar closer to the 60% design mark, as design decisions become more finalized.***

2. How much will polyaluminum chloride (PaCl) impact effluent aluminum levels if that chemical were used as a coagulant for the proposed tertiary treatment system? ***Dosing aluminum-based coagulants (i.e., PaCl) for total phosphorus removal is anticipated to significantly impact effluent aluminum levels. Wright-Pierce has experienced this result during a bench testing analysis conducted for the Whitefield WWTF Upgrade. This is the reason why ferric chloride was selected for a coagulant.***

3. How is it more cost effective to propose 3-UV banks in place of 2-UV banks? ***Per NHDES regulations, disinfection of peak wastewater capacity must be achievable at all times. Therefore, full redundancy of the system is necessary. By utilizing 3-banks, each bank can designed for a smaller capacity which better suits the typical daily flows through the plant. This will allow a single bank to operate a majority of the time and a second bank to be brought online as flow increases, thereby reducing electrical consumption overall. The proposed UV banks do not have the ability to turndown (standard for this size unit). Therefore, consideration of units with turndown capacities to match flow variability through the unit was not pursued as it was not cost effective (would require a much larger system).***

4. The Town would like to proceed with the alternative Process Building Layout identified in Appendix H with a reduced overall square footage. ***Noted. Wright-Pierce will incorporate PCO Option No. 1 into the project moving forward.***

5. The Town would like to proceed with incorporating the disinfection upgrade as part of the base bid project as it is a necessary upgrade given the age of the system and should not be left open as an option. ***Noted. Wright-Pierce will remove PCO Option No. 4 as a potential bid alternative to the project. The disinfection upgrade will be included as part of the base bid of the project.***

6. Can we expect that the total project cost will decrease as design progresses? ***In general, design contingency percentages and mid-point to inflation percentages will decrease as the design continues. If no additional scope or unaccounted for items are found during the design process and assuming a competitive bidding market and inflation within the estimated ranges, the total project cost estimate will reduce as the contingencies are lowered through the design phase. However, many of these cost factors are outside of the Town and engineer's control (i.e., contractor bidding competition, inflation, etc.). It is not unreasonable to assume that a competitive bidding market with better-than-expected construction bids could result in a construction cost less than the estimate presented herein. Conversely, the risk exists for the actual cost to be higher.***

## Town of Newport WWTF Operations Comments and Responses

### Mr. Arnold Greenleaf, Superintendent

1. The existing manual bar rack at the septage receiving tank was constructed by Town staff and the bar spacing is 3/8-inch. It is preferred to keep the bar opening spacing the same as existing. ***Noted. Wright-Pierce will propose a new 3/8-inch manual bar rack with the septage receiving tank upgrades.***

2. Can the existing and proposed equipment near the entry gate be pushed further into the grass area? This includes the transformer, utility pole, bollards and the hydrant. The existing driveway extents has proven to be difficult for delivery trucks to maneuver and moving those utilities away from the pavement will provide the trucks more flexibility. *Yes, **Wright-Pierce will assess and propose adjustment to the locations of those utilities if determined to be feasible (for existing equipment). We will assess feasibility of extending the driveway further to allow better flexibility for vehicular traffic. We will also eliminate bollards around the septage tank.***

3. Please make sure building entrance pads are sloped to the ground for easier snow removal. ***Noted, new entrance pads will take snow removal activities into consideration.***

4. Is there an accommodation proposed for removing sludge from the lagoons? ***Based on the current PDR, there is not an automated method of removing sludge from the lagoons. Based on discussions with the Town, the existing buried lagoon sludge line will be extended to a quick connect at the sludge holding tanks. This would allow the Town would like to periodically remove sludge from the lagoons and pump directly into the sludge holding tanks.***

5. Is it possible to extend the pavement further past the back side of the Control Building to allow trucks to turn more easily? That is the area that delivery trucks typically turn and we're not sure where else they'd find space to turn when leaving the facility. *Yes, **Wright-Pierce will propose leveling out the grading next to the pavement north of the Control Building and set either gravel, reclaim or hard pack in that area. Wright-Pierce will evaluate those materials and the new extents as part of final design. In addition, catch basin 1 (CB-1) will be relocated to allow that area to be used for occasional delivery/turning access to the Control Building.***

6. One of the existing lagoon airlines travels up the center of the back road before entering Lagoon 1. ***This will be corrected on future plan sets.***

7. The Town has concern that a new outfall from the new stormwater BMP will require a new stormwater discharge permit as it is a point source. ***During final design this will be modified to be a rip-rap overflow.***

8. Operations staff prefer to have the existing viewing port/window to the Chemical Room. Please remove note to demo. ***Noted. The existing window will be maintained with the proposed upgrades.***

9. The proposed new additional bathroom will remove the windows from the existing Control Room. Operations staff prefer that natural light be maintained in the space with the upgrades, if possible. ***Noted. Wright-Pierce will assess feasibility of either adjusting the location of the new Women's bathroom or installing new windows in the space.***

10. The eastern side of Storage Room A (formerly the coil filter room) is enclosed from the exterior by wooden panels. The panels are not sealed completely. Since major upgrades will be taking place at the facility, it may make sense to include this as part of the improvements. ***Noted. Wright-Pierce will propose improvements to this space and the recommendations for that wall will be further developed in final design.***

    The doors to the Chemical Room do not fully seal and operations staff are concerned that they will swing open. With the room being repurposed for chemical storage and feed equipment, it may make sense to include door replacement as part of the project scope. Also, if the monorail is no longer going to be usable in the space, the Town would like to see if the monorail and hoist could be reused elsewhere in the facility. ***Noted. Wright-Pierce will include door replacement as part of the project scope and will evaluate options further in final design. Wright-Pierce will also assess whether the existing monorail and hoist could be reused for equipment in the Process Building.***

11. Is Wright-Pierce proposing to put sumps in the new ferric chloride containment area. ***Yes, Wright-Pierce can include a small sump in the corner of the containment area.***

12. The Town would prefer to enclose the tertiary filters bays with railing, not grating overtop of the filter units. ***Noted, we will plan to leave the filters open and provide railings around them.***

13. Can the door from the Process Building to the exterior grit facility be upgraded to a double door in place of a single swing door for ease of moving equipment? ***Wright-Pierce will evaluate a wider door entrance to the Process Building from the grit system as part of final design and proposed new Process Building layout.***

14. The Town anticipates that the bottom floor of the Process Building, where the sludge feed pumps are housed, will be a vulnerable area to flooding. ***Wright-Pierce will include duplex sump pumps for the space.***

15. What is the proposed material for the slide gates throughout? Would prefer stainless steel. ***Wright-Pierce will specify stainless steel gates throughout the project.***

16. The Town noted that the pipe wall penetration seals for the influent pump suction lines are lead and oakum. Given the age and material, the engineer should anticipate that they will need to be replaced as part of the

influent pump station piping modifications. ***Wright-Pierce will include demo and replacement of the suction piping through the wall and into the wet well. Overall extents and materials of the proposed wet well/dry well piping configurations will be evaluated further in final design.***

17. Is the 6-inch chemical feed line a 6-inch diameter pipe? ***No, it is a 6-inch PVC carrier pipe for the chemical feed tubing.***

18. Is the proposed duplex basket strainer wedge wire or perforated plate? Our preference is perforated plate. ***Perforated plate. This is typical for what Wright-Pierce recommends in these applications.***

19. It should be noted that the Pump Room gets humid and the pipes and walls sweat. With the new process equipment being installed in that space, can a dehumidifier be installed in that space? ***Yes, Wright-Pierce will include a dehumidifier in the space as part of final design.***

20. Please provide accessible influent pump controls on the ground floor for the influent pumps. ***The influent pumps will include local pump controls near the main office area at ground floor.***

21. Will the centrifuge be running everyday? ***Based on estimated sizing, it is anticipated that the centrifuge will operate between 16 – 20 hours per week, depending on the loading of the WWTF and the season.***

22. It should be noted that staff had to unwire connections at the rapid tank mixer in the Filter Building and that this will need to be rewired as part of the upgrades. ***Wright-Pierce will call for re-wiring of the mixer as part of Filter Building improvements.***

23. Rather than constructing a new filter backwash drain line, can the backwash be directed to one of the existing drains? ***Wright-Pierce will evaluate redirecting the new filter backwash drain line to the existing drains as part of final design.***

24. It should be noted that LEP-1 is a rebuilt pump and the other proposed is original. If they are being reused, should they be replaced or required to be refurbished? ***Wright-Pierce will specify that the pumps be factory refurbished or replaced. LEP scope will be evaluated further during final design.***

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# Section 1 Introduction & Executive Summary

## 1.1 Purpose of this Report

The purpose of this Preliminary Design Report (PDR) is: to document the basis of design for the components of the project for use in final design; to develop preliminary layout plans for the proposed improvements; to document alternatives analyses used in the selection of equipment or approaches; to refine the estimated project costs; and to obtain Town, USDA-Rural Development, and NHDES comments on the proposed project prior to proceeding with final design.

## 1.2 Report Organization

This Preliminary Design Report is divided into the following sections:

1. Introduction
2. Design Considerations
3. Project Implementation
4. Preliminary Cost Estimate

Select information regarding equipment systems, technical memoranda, and preliminary drawings can be found in the appendices to this report.

## 1.3 Background

The Town of Newport, New Hampshire owns, operates, and maintains a wastewater collection and treatment system. The WWTF discharges effluent to the Sugar River (Class B waterbody), which eventually discharges to the Connecticut River, a tributary of Long Island Sound. The WWTF is permitted to discharge under specific effluent water quality requirements set forth in its National Pollutant Discharge Elimination System (NPDES) permit which is administered by the US Environmental Protection Agency (EPA).

The wastewater treatment facility (WWTF) was originally constructed in 1971 as a 1.3 million gallon per day (mgd) primary treatment facility consisting of influent pumping, a grit detritor and grit classifier, primary sedimentation basins, and a vacuum filter for the primary sludge. The facility was upgraded in 1988 to a secondary treatment facility consisting of two aerated lagoons, an upgraded grit removal facility, and chlorine contact chamber for disinfection. Outside of these major WWTF upgrades, the Town has also upgraded the influent fine screening equipment, fine bubble lagoon aeration system, and disinfection system to an ultra-violet (UV) disinfection system.

In 2012, the WWTF was upgraded with a tertiary filtration process with chemical precipitation to meet the effluent total phosphorus (TP) limit. However, the tertiary filtration system was unable to reliably achieve compliance with effluent TP limits and was abandoned. Subsequently, the Town completed the Facility Plan (December 2017, Fuss and O’Neill) and resulting 30% Preliminary Design (December 2019, Fuss and O’Neill) for a ballasted flocculation process.

In June 2020, the Town was issued a new NPDES permit with new effluent discharge requirements including ammonia nitrogen, metals limits, and total nitrogen monitoring and optimization. Based on these new effluent permit limits, in particular the ammonia nitrogen requirement, the proposed recommendations made in the Facility Plan (2017) and Preliminary Design (2019) would not provide the Town with a WWTF process capable of reliably meeting the Town’s new effluent discharge requirements. A Facility Plan Amendment (May 2022, Wright-Pierce) was completed to re-evaluate and amend the original Facility Plan and provide final recommendations for a WWTF upgrade approach that will meet the Town's current wastewater treatment needs and provide flexibility to meet a range of potential future NPDES permit discharge requirements.

This Preliminary Design Report (PDR) builds upon the analysis, conclusions and recommendations outlined in the Facility Plan Amendment to comply with the Town's NPDES Permit and Administrative Order (AO) described in the next section.

## 1.4 NPDES and Administrative Order Summary

The Town's WWTF is currently regulated by two documents included in **Appendix A**:

NPDES Permit (Permit No. NH0100200): This permit, issued in September of 2020, established new effluent limitations and monitoring requirements (total phosphorus, ammonia-nitrogen, total nitrogen, aluminum, lead, copper) from the previous permit which was issued in 2007. Of note, the NPDES permit also contains an interim effluent aluminum monitoring requirement and a 3-year compliance schedule. Further discussion of current and future aluminum compliance can be found in Section 2.

Administrative Order (CWA-AO-R01-FY23-01): Following effluent violations to the total phosphorus and ammonia-nitrogen effluent limits in the 2020 NPDES permit, EPA issued the Town an Administrative Order (AO) in October 2022. The AO provided the Town with a schedule to bring the WWTF into compliance with total phosphorus and ammonia-nitrogen effluent limits in the NPDES permit, as summarized in the next section of this report. In the interim period, the AO sets interim effluent limitations for total phosphorus and ammonia-nitrogen which the Town must comply with.

### 1.4.1 Administrative Order Schedule

The Town's AO provides a detailed project schedule with respect to key design, bidding and construction phase assumptions and milestones which the Town must meet. The following is a brief summary of critical compliance dates included in the AO:

- **January 31, 2023**: Completion of the Preliminary Design Report (PDR) and submission to EPA and NHDES.
- **March 31, 2023**: Completion of a Value Engineering Process. Proposed changes resulting from the Value Engineering (VE) process shall be incorporated into the final PDR. *Since the issuance of the AO in October 2022, NHDES and USDA-RD have provided the Town with a waiver for this VE requirement based on prior engineering efforts completed to date.*
- **December 31, 2023**: Completion of the Final Design Phase.
- **March 31, 2024**: Completion of the Bidding Phase.
- **June 30, 2026**: Completion of construction of the WWTF upgrades.
- **September 30, 2026**: Compliance with NPDES permit effluent limits.

The Town is currently on track to satisfy the compliance schedule of the proposed AO. The proposed project schedule is discussed in further detail under Section 3 of this report.

## 1.5 Cost Estimate

The project cost estimate and the construction cost estimates for the project are presented as Table 4-1 and Table 4-2, respectively. The project cost estimate for the full scope of construction described herein is $29.3M. This is greater than the amount originally allocated to the project based on the Facilities Plan Amendment by approximately $5.3M. However, NHDES has indicated that should the proposed WWTF project exceed the current estimated project funding limit of $24M, the CWSRF program will work with the Town to assist with additional funding to support through the Infrastructure Investment and Jobs Act (IIJA) subsidies to assist with project overages to the maximum extent possible. NHDES has committed to providing up to an additional $4M in grant (100% subsidy) for project costs over the $24M, bringing the updated project budget to $28M.

This project differential is due to a number of factors including modifications to the project approach based on an improved understanding of project needs, variability in costs in infrastructure market (i.e., materials, labor), and general inflation in the construction market.

It is not unreasonable to assume that a competitive bidding market with better-than-expected construction bids could result in a construction cost less than the estimate presented herein. Conversely, the risk exists for the actual cost to be higher. Given the current proposed funding approach described in Section 3, it is recommended that the Town consider a list of potential cost-saving options as “bid alternates” for the project. These options include project items which are not crucial to the Town fulfilling their requirements to meet the AO and are identified in Section 4. Based on review of the PCO’s 1 – 6 with the Town, it was determined that the Town would incorporate PCO Option No. 1 (reduce new Process Building footprint) and move PCO Option No. 4 (UV Disinfection System Upgrades) to the Base Bid scope based on the criticality and condition of the current system. The reduced scope Project Cost Estimate for construction including PCO’s No. 2, 3, and 5 is approximately $28.5 M, which is approximately $500,000 over the Town’s updated project budget. Cost savings measures, including Bid Alternate options, will continue to be evaluated with the Town throughout the Final Design phase in an effort to meet the current project budget of $28M.

A more detailed discussion of project cost estimate is presented in Section 4.

## 1.6 Next Steps

There are numerous, critical and high priority tasks that need to be completed as the design phase continues, including:

- Obtain Town, NHDES, EPA, and Rural Development technical comments on the PDR
- Provide public outreach and informational sessions to the Town voters
- Conduct grant and loan agency outreach to confirm funding approach and project waivers
- Obtain authority to borrow (warrant article) at the Town Meeting in May 2023

## 1.7 Acknowledgements

The Preliminary Design Report is the culmination of many months of work. During this time, Town Public Works staff, the Wastewater Treatment Facility staff, the Town Manager’s office, elected officials (the Board of Selectmen), USDA-Rural development and NHDES staff generously provided their time and input to help guide the process.

# Section 2 Design Considerations

## 2.1 General

This Section of the PDR is intended to define the scope of work and basis of design for the WWTF upgrade. The basis of design for the WWTF builds upon the analysis, conclusions and recommendations outlined in the Facility Plan Amendment (Wright-Pierce, May 2022) as well as client preferences. Specific unit process design criteria and sizing data are presented in the basis of design memoranda included in **Appendix B**. Specific design considerations related to architectural, structural, HVAC/plumbing, instrumentation/SCADA, and electrical disciplines are included in **Appendix C.**

## 2.2 Design Flows and Loads

The existing and design flows and loads for the project are presented in Table 2-1 and Table 2-2 are based on refined information from the Facilities Plan Amendment (May 2022, Wright-Pierce). Both current and future design year flow and loads data was used to determine plant hydraulics and equipment size. Additional information is presented in **Appendix B.**

**Table 2-1 Existing Flows and Loads Summary**

| Condition | Flow | BOD | | TSS | | TKN[1] | | Total Phosphorus[1] | |
|---|---|---|---|---|---|---|---|---|---|
| | MGD | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| Annual Average | 0.55 | 237 | 1,089 | 278 | 1,277 | 37 | 170 | 5 | 23 |
| Maximum Month | 0.82 | 274 | 1,872 | 376 | 2,573 | 35 | 241 | 8 | 52 |
| Maximum Day Flow (99.8%) | 1.25 | - | - | - | - | - | - | - | - |
| Maximum Day Load (99.7%) | 0.61 | 560 | 2,861 | 497 | 2,540 | 78 | 400 | 4 | 23 |
| Peak Hour (99.8%) | 2.23 | - | - | - | - | - | - | - | - |
| Peak Hour (100%) | 4.96 | - | - | - | - | - | - | - | - |

**Table 2-2 Design Flows and Loads Summary**

| Condition | Flow | BOD | | TSS | | TKN[1] | | Total Phosphorus[1] | |
|---|---|---|---|---|---|---|---|---|---|
| | MGD | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| Minimum Day | 0.24 | - | - | - | - | - | - | - | - |
| Annual Average | 0.66 | 237 | 1,308 | 278 | 1,533 | 37 | 204 | 5 | 27 |
| Maximum Month | 0.98 | 274 | 2,248 | 376 | 3,089 | 35 | 289 | 8 | 62 |
| Maximum Day Flow[2] | 1.50[2] | - | - | - | - | - | - | - | - |
| Maximum Day Load | 0.74 | 560 | 3,435 | 497 | 3,049 | 78 | 480 | 4 | 28 |
| Peak Hour[3] | 4.96[3] | - | - | - | - | - | - | - | - |

**Note 1**: Sampling data for influent TKN and total phosphorus from weekly composite samples taken April 2022 – July 2022.
**Note 2:** Design maximum day forward flow to the secondary treatment system limited to 1.5 MGD. Flows more than 1.5 MGD will be diverted to the IEQ basins for future treatment.
**Note 3:** Peak hour flowrate is estimated to remain the same or decrease due to on-going inflow and infiltration reduction efforts.

## 2.3 Effluent Discharge Limits

The Town's effluent discharge limitations are identified in its NPDES permit (Permit No. NH0100200, issued June 2020) and included in **Appendix A**. The NPDES permit limits for the WWTF effluent (Outfall #001 to the Sugar River) are summarized in Table 2-3. The Sugar River is a Class B waterway, as designated by the New Hampshire Department of Environmental Services (NHDES). The NPDES permit provides for a dilution factor of 5.6:1 using the permitted design flow. The mass limits for the WWTF are based on a permitted design flow of 1.3-mgd.

**Table 2-3 NPDES Effluent Limits for WWTF**

| PARAMETER | Average Monthly Effluent Limits | Average Weekly Effluent Limits | Maximum Daily Effluent Limits |
|---|---|---|---|
| Flow, MGD[1] | 1.3 | | |
| Biochemical Oxygen Demand (BOD5), mg/L | 30 | 45 | 50 |
| Total Suspended Solids (TSS), mg/L | 30 | 45 | 50 |
| pH | 6.5 – 8.0 S.U. | | |
| Escherichia coli, colonies / 100 ml | 126 | - | 406 |
| Ammonia Nitrogen, mg/L (lbs/day) (May 1 – October 31) | 6.4 (Report) | - | Report |
| Ammonia Nitrogen, mg/L (lbs/day) (November 1 – April 30) | 24.3 (Report) | - | Report |
| Total Phosphorus, mg/L (lbs/day) (April 1 – October 31) | Report (5.2) | - | Report |
| Total Phosphorus, mg/L (lbs/day) (November 1 – March 31) | 1 (Report) | - | Report |
| Total Recoverable Aluminum (µg/L) | 87 | - | Report |
| Total Recoverable Copper (µg/L) | 13.2 | - | Report |
| Total Recoverable Lead (µg/L) | 2.3 | - | Report |
| Total Nitrogen[2] | Report | - | Report |

**Note 1:** The average flow value reported each month shall be on an annual average basis.
**Note 2:** The current permit only requires the Town to "optimize" TN treatment and does not set an effluent TN limit.

### 2.3.1 Total Nitrogen Discharge Limits

The effluent from the Newport WWTF eventually flows to Long Island Sound (via the Sugar and Connecticut Rivers). Long Island Sound (LIS) has been identified as an impaired water body with respect to total nitrogen (TN) impacts. Since 2000, the EPA and individual State regulatory agencies have evaluated effluent wastewater facility TN limits within this watershed with the goal of reducing loadings to Long Island Sound and preventing further degradation.

The EPA intends to include a TN rolling annual average mass-based loading numerical limit (in pounds/day) in all permits issued to WWTFs with design flow greater than or equal to 1.5 MGD average design flow that discharge to the LIS watershed in New Hampshire. For WWTFs like the Town of Newport which are < 1.5 MGD average design flow, a TN "optimize" approach is required as reflected in the current NPDES permit. Table 2-4 provides a summary of the annual average TN effluent limits for New Hampshire WWTFs discharging to Long Island Sound watershed:

**Table 2-4 Annual Average TN Effluent Limits[1]**

| Facility Design Flow, $Q_d$(MGD) | Annual Average Total Nitrogen Limit (lbs/day) |
|---|---|
| $Q_d > 6$ MGD | $Q_d$ (MGD) × 8 mg/L × 8.345 + optimize |
| $1.5 \leq Q_d \leq 6$ | $Q_d$ (MGD) × 10 mg/L × 8.345 + optimize |
| $0.1 \leq Q_d \leq 1.5$ | Optimize |
| $Q_d < 0.1$ | TN Monitoring only |

Note 1: Adapted from the 2020 NPDES Permit Fact Sheet (**Appendix A**)

#### 2.3.1.1 Current Total Nitrogen Limits

Based on the Town's WWTF average day permitted design flow (1.3 MGD), the current NPDES permit contains a TN treatment "optimization" requirement as identified in Table 4-2. This optimization requirement directs the permittee to optimize the existing treatment process to minimize the annual average mass discharge of TN. Currently, there is no effluent TN limit requirement in the Town's NPDES permit and given the Town's existing treatment process, this optimization requirement is being met.

#### 2.3.1.2 Future Total Nitrogen Limits

The TN reduction optimization requirement in the current permit is intended be part of a long-term nitrogen control strategy by EPA in the LIS watershed. This strategy recognizes that more work may need to be done to reduce TN levels. Upon completion of establishing thresholds and assessing water quality conditions of the estuarine waters of the Connecticut River, allocation of TN loadings may be lowered if further reductions are necessary. If reductions are needed for the Newport discharge, a lower water quality-based effluent limit will be added in future permits.

Although not a current permit requirement, the EPA & NHDES have recommended that Newport consider alternatives during any planning efforts to account for further enhancing nitrogen reduction beyond the permit required optimization activities. Based on the recommendations in the Facilities Plan Amendment (May 2022, Wright-Pierce), the proposed WWTF upgrade will be designed to meet an effluent annual average TN limit of 10 mg/L.

### 2.3.2 Metals Limits

The NPDES permit includes effluent limits for total recoverable metals including aluminum, copper, and lead. For the first 36 months of the new permit, the effluent aluminum interim requirement is for reporting only. Metals removal in wastewater typically occurs through a combination of biological adsorption and chemical precipitation which can occur in co-precipitation reactions when phosphorus is being removed. Based on a review of the WWTF's existing effluent data of the lagoon process, the Town has been in compliance with copper and lead effluent limits. However, the Town has experienced periods high effluent aluminum concentrations which exceed the potential future effluent permit limit of 87 µg/L.

#### 2.3.2.1 Current Aluminum Limits

Since influent and effluent aluminum monitoring began at the WWTF in February of 2020, the WWTF has observed highly variable influent aluminum concentrations to the WWTF ranging from less than 150 µg/L to greater than 1000 µg/L. Periodically since 2020, the WWTF effluent has exceeded the new aluminum effluent permit limit of 87 µg/L. Effluent aluminum exceedances are believed to be linked to high influent aluminum loadings within the Town's collection system. As a results, the Town has actively been investigating major industrial sources of aluminum in an effort to identify and reduce loading to the WWTF.

In October 2022, NHDES conducted an industrial wastewater pre-treatment compliance inspection at the WWTF which recommended the following:

I. Review and update the Town's Sewer Use Ordinance (SUO, 2008) and Local Limits requirements (Section 2.6 of the SUO);
II. Develop of a formal procedure to assure new industrial users are properly vetted, categorized, and tracked.

The proposed recommendation to update the Town's local limits would provide the Town with the technical basis to control industrial user discharges to the WWTF if these industrial users are contributing to NPDES permit exceedances (i.e., aluminum). The Town is currently in the process of evaluating these SUO, local limits, and industrial procedure updates. It is recommended that the Town continue to investigate the major industrial users and other potential aluminum sources to reduce concentrations entering the WWTF, and resulting effluent aluminum concentrations being discharged from the WWTF.

#### 2.3.2.2 Future Aluminum Limits

The NPDES permit includes a special condition for the current 87 µg/L effluent aluminum limit. The special condition states that if, during the 36-month compliance period, the state of New Hampshire adopts new aluminum criteria developed by the EPA, then the Town may apply for a permit modification to extend additional time for compliance until EPA reviews and approves the new criteria. This permit condition was included in anticipation of an expected revision to the New Hampshire freshwater aluminum criteria. This revision may allow for re-calculation of the effluent aluminum limit based on site specific parameters (i.e., pH, hardness, dissolved organic carbon). In many instances, the revised aluminum calculation has resulted in a more favorable effluent aluminum limit. However, New Hampshire has yet to formally adopt EPA's criteria and EPA is therefore unable to implement the criteria to recently issued NPDES permits at this time. It is recommended that the Town continue to monitor the status of this aluminum criteria topic in 2023 for potential updates from NHDES.

## 2.4 Facility Hydraulics

Plant hydraulic calculations are developed to estimate the hydraulic gradeline under a variety of influent flow, river flood stage elevation, and unit process capacity scenarios. The range of flows for this project are summarized in Table 2-5.

**Table 2-5 Facility Hydraulic Conditions**

| Scenario | Flow Condition | Flow (mgd) Headworks | Flow (mgd) Post Influent Equalization |
|---|---|---|---|
| I | Initial Minimum Month Flow | 0.28 | 0.28 |
| II | Initial Average Flow | 0.54 | 0.54 |
| III | Design Average Flow | 0.65 | 0.65 |
| IV | Design Maximum Month Flow | 1.10 | 1.10 |
| V | Design Maximum Day Flow (99.8%) | 1.50 | 1.50 |
| VI | Design Maximum Day Flow (100%)[1] | 2.28 | 1.50 |
| VII | Design Peak Flow (99.8%)[1] | 2.23 | 1.50 |
| VIII | Design Peak Flow (100%)[1] | 4.96 | 1.50 |

**Note 1:** The forward flow limit to the secondary treatment process and beyond will be limited to 1.50 MGD. Excess flows shall be conveyed to the influent equalization basins (existing lagoons) for future re-equalization and treatment.

The maximum day and peak hour flows scenarios are expressed as a percentile to provide a reasonable range of hydraulic conditions based on historical flow rates. The 100th percentile represents the highest value recorded while the 99.8th percentile is the recorded flow which is greater than 99.8% of the other values.

The preliminary design hydraulic analysis was based on information shown on the Wastewater Treatment Facility Record Drawings (HTA, 1987) and Phosphorous Removal Upgrade Bidding Documents (AECOM 2012) as well as the preliminary drawings provided herein. Existing site elevations were supplemented/confirmed by a survey conducted as part of this preliminary design in 2022. The hydraulic analysis assumes that no significant deterioration or restrictions, other than the normal pipe aging process, are present at the existing outfall or the existing-to-remain site piping. Additional calibration of the model will be conducted in final design phase.

A summary of the key modifications to the WWTF hydraulics includes the following:

- A new influent pump station discharge forcemain to the new influent grit channel and new grit removal system;
- A new grit removal system located at the Process Building which discharges de-gritted effluent to the SBR influent channel via an inverted siphon;
- Two new SBRs and associated effluent equalization tanks designed to treat and convey maximum daily flows up to 1.5 MGD;
- A new influent SBR channel equipped with an overflow fixed weir to the influent equalization basins (existing lagoons) for daily flows greater than 1.5 MGD. The influent overflow will be activated based if the active SBR reaches its high-water surface elevation prior to the second SBR completing its full treatment sequence;
- Submersible effluent equalization pump system design to convey up to 1.5 MGD to the tertiary and disinfection process;

- An upgraded tertiary treatment system installed within the existing Filter Building which will retain major hydraulic features with modifications to the filter inlet and outlet channels;
- Modification of the existing chlorine contact tank to include a new UV disinfection system;
- Retain the existing effluent Parshall flume and Sugar River outfall without modifications.

The FEMA Flood Insurance Rate Map (FIRM Map #33019C0195, May 2006) indicates the current 100-year flood elevation in the river in the vicinity of the WWTF to be an elevation of 778.5-ft (NAVD 1988) based on interpolation between flood elevation cross sections. Accordingly, this project will utilize the following flood protection criteria based on TR-16 Guides for the Design of Wastewater Treatment Works (Revised 2011 Edition):

- All new critical equipment should be constructed at a minimum elevation of + 3-ft (781.5’) from the 100-year flood elevation;
- All non-critical equipment should be constructed a minimum elevation of + 2-ft (780.5’) from the 100-year flood elevation.

## 2.5 Unit Process Descriptions

The following sections list a summary of the existing-to-remain and proposed unit processes for the WWTF Upgrades.

### 2.5.1 Grinding & Screening

- The existing influent channel grinder and perforated plate fine screen (3 mm) were replaced by the Town in 2016. This equipment will remain and continue operating in a similar fashion to serve the new facility.
- The existing Grinder and Screening Control Panel will be relocated to accommodate modifications to be made in the Control Room.

### 2.5.2 Influent Flow Measurement and Sampling

- The new influent force main will be equipped with a magnetic flow meter located in the Process Building. The existing influent flume system will be demolished with the existing Grit Building.
- The existing influent sampler in the Screen Room will be relocated to the Dry Well to comply with electrical classification requirements (NFPA 820).

### 2.5.3 Influent Pump Station

- The existing duplex pump station will be upgraded to a triplex pump configuration with three new dry-pit pumps capable of meeting the design conditions required to pump up to the new grit facility located in the new Process Building and the new SBR process.
- New suction and discharge piping, valves and fittings will be constructed to accommodate the new pumps.
- New 12-inch plastic (HDPE or PVC) buried forcemain will be constructed from the Control Building to the Process Building. The existing 12-inch forcemain will be capped and abandoned in place.
- The new influent forcemain will be equipped with a magnetic flow meter in the Process Building to measure influent flow.

### 2.5.4 Septage Receiving (Bid Alternate)

- The existing septage holding tank will remain and be upgraded to accommodate a new manual septage screenings station and septage conveyance system. The tank will be upgraded including pressure injecting concrete cracks, concrete surface repair (unit price basis), and adding instrumentation for level measurement.

- A new septage receiving manual bar rack and septage unloading spill pad will be installed adjacent to the existing septage receiving tank. The manual bar rack will drain to the septage holding tank and be equipped with a hatch to cover the screenings drain plate when not in-use. Per the Town's request, the manual bar rack will have 1/2" or less clear bar openings. Typically, manual septage screening is completed using ¾" – 1" clear spacing; however, the Town's existing manual septage bar rack has operated well and has not caused the operations staff any problems with ½" or less clear spacing.
- The existing manual bar rack will remain in-place as a backup septage receiving rack.
- The existing mechanical mixer and diffused aeration system will remain-in-use.
- A new septage chopper type pump will be constructed within the existing septage holding tank.
- A new septage force main will be constructed to convey screened septage to sewer manhole upstream of influent screenings.

### 2.5.5 Influent Equalization

- Aerated Lagoon No. 1 and Aerated Lagoon No. 2 will be used as the off-line Influent Equalization (IEQ) basins. Combined, these lagoons include a total volume of approximately 17-million gallons at their maximum water surface elevations. The IEQ Basins will be utilized to limit the peak flows conveyed to the new secondary treatment process allowing downstream sizing of downstream processes (i.e., SBR, Tertiary Treatment, UV disinfection) to be minimized.
- Influent flow will pass through the influent grinding and screening, pumping, and grit removal prior to being diverted to the IEQ basins.
- A fixed weir will be constructed in the SBR influent channel to divert excess influent flow to the IEQ basins. The forward flow to the SBR process will be limited to 1.5-mgd based on the flows and loads analysis. Flow will be directed to the IEQ basins during a portion of the day less than 5 days per year based on historical data and wet weather events.
- The existing Lagoon Inlet/Outlet structures will be reused and modified to connect the SBR influent channel to the IEQ basins. A level element located in the Lagoon Effluent Tank wet well of the Filter Building will monitor the water surface elevation in the IEQ basins.
- The existing lagoon aeration equipment (i.e., floating laterals, air piping manifolds, interior air piping/valving) will remain in-use. The new Aeration Blowers will be cross connected to the lagoon aeration system piping network, allowing for manual, periodic cycling of air to the existing Lagoons for mixing and oxygenation if found to be necessary during use of the IEQ system.
- Excess flow will be diverted via a new gravity pipe to Lagoon No. 1. Lagoon No. 1 outlet structure will be re-used to convey flows from Lagoon No. 1 to Lagoon No. 2. From Lagoon No. 2, flows will return to the Filter Building Lagoon Effluent Tank wet well which is repurposed from the existing Lagoon Effluent Pump Station. Flows from the IEQ basins to the Lagoon Effluent Tank can be manually isolated through an existing buried butterfly valve located immediately upstream of the wet well. This allows the operations staff to convey IEQ back to the process when WWTF flows are low, isolate flow from the IEQ basins, and empty the Lagoon Effluent Tank wet well during periods where it's not being utilized.

### 2.5.6 Grit Removal

- The existing Grit Building and all of its components will be demolished as part of the new process. A new grit removal system will be constructed within the new Process Building.
- Grit removal will be completed by one mechanically induced vortex style system from the influent wastewater using centrifugal forces. Vortex units are capable of maintaining grit removal rates across a moderate range of flows (10:1 turndown ratio). The vortex grit system has the advantage of not contributing unwanted dissolved

oxygen to the secondary treatment influent. Requirements for the vortex grit system include a concrete grit structure and a paddle drive or axial flow propeller assembly.

- Concentrated grit collected on the bottom of the grit chamber will be pumped via one recessed impeller centrifugal grit pump to a grit classifier located in the Dewatering Room of the Process Building. The grit classifier utilizes a hydrocyclone and inclined screw to separate organic matter from the grit, return organics back to the process, and provide a washed grit product for disposal. Classified grit will be discharged to a dedicated grit cart located in the through a floor opening through a chute into the Dewatering Room to a grit cart located in the Dewatering Room container bay below.

### 2.5.7 Secondary Treatment

- Two new Sequencing Batch Reactors (SBRs) and corresponding effluent equalization tanks (EETs) will be provided for secondary treatment.
- Each SBR will include retrievable fine bubble diffuser grids, a floating mechanical mixer, a decanter assembly, and a waste activated sludge pump.
- Submersible waste activated sludge pumps in each SBR will pump secondary sludge at the end of each batch cycle to the sludge storage tanks.
- The SBRs will be aerated via three positive displacement blowers (two duty, one standby) located in the existing Blower Room of the Control Building. SBR air supply to each basin will be controlled by the SBR control panel via actuated air valves at each SBR basin.
- The standby blower will be connected to the existing lagoon aeration piping. The operations staff will have the capability to periodically aerate the IEQ basins (existing lagoons) based on operator control setpoints and valving.
- Dissolved oxygen (DO), oxidation reduction potential (ORP), and pH probes will be provided for each SBR for process control. The SBR process control panel will be in the Control Room of the Process Building.
- The SBRS will each have a floating decanter assembly designed to convey secondary effluent from the SBRs to the EEQ tanks. The decanter will consist of an electrically actuated movable weir.
- Two EETs will be provided. Slide gates will provide isolation of either effluent equalization tank from the effluent pump station.
- The EETs will not be mixed for the proposed upgrade. Under typical operation, both EETs will operate as a single tank. If one of the EETs needs to be cleaned, the Town may operate temporarily on a single EET.
- The effluent pump station will be nested between the two EETs. The pump station will include three submersible effluent equalization pumps (two duty, one standby) and will convey SBR supernatant to the Tertiary Filter Building for filtration. The pump station shall be designed to convey a maximum forward flow of 1.5-MGD.

### 2.5.8 Tertiary Treatment

- Tertiary treatment will be completed via chemical phosphorus precipitation and subsequent filtration to remove particulate phosphorus from the SBR effluent. The disc filtration units will utilize a pile-cloth media for mechanical solids separation.
- The existing Filter Building will be retrofitted with two new disc filtration units, each redundant and capable of filtering up to 1.5 MGD. The existing filter bay will require concrete divider wall modifications to accommodate the new filter units.
- The disc filtration units will be provided with solids removal and will include backwash pumps and actuated waste solids manifolds. A metal grating stairway will be provided to access the backwash system in the existing filter basins.

- Ahead of the filtration system, a new metal salt coagulant system shall be provided for phosphorus precipitation. Based on the Town's effluent aluminum limits, ferric chloride was selected in lieu of aluminum coagulant products.
- The chemical feed storage shall consist of two 900-gallon chemical storage tanks installed in the Chemical Area of the Control Building. A chemical containment wall will be constructed around the Ferric Chloride storage tanks, chemical metering pumps, piping manifold, and chemical fill area. An existing ladder to enter the chemical containment area will be re-located from the Filter Building to the Chemical Area of the Control Building.
- Three peristaltic chemical metering pumps (two duty, one standby) will convey ferric chloride to two different discharge locations:
    - Primary Location: Tertiary filter rapid mix chamber inside the Filter Building to precipitate phosphorus out of SBR effluent.
    - Secondary Location: Dewatering centrate dosing manhole located outside of the Control Building to precipitate phosphorus out of centrifuge centrate recycle flowing from the Process Building to the influent pump station.

### 2.5.9 Disinfection

- The existing Disinfection Building and existing UV system will be demolished, and the existing chlorine contact tanks (CCT) will be re-purposed to accommodate a new UV disinfection system.
- A low-pressure UV disinfection system will be constructed in the currently unused half of the existing chlorine contact tank structure, enclosed within a new Disinfection Building. Cracks and concrete deterioration will be repaired as necessary.
- The proposed UV disinfection system will comprise of a 3-bank, horizontal bulb system installed within the existing CCT channels. The UV system will be capable of treating a maximum of 1.50 MGD with one UV bank offline.
- The UV system will be connected to the WWTFs standby power source.
- The proposed UV system would not need to be installed with an uninterruptable power supply (UPS) based on the proposed SBR process which would have the ability to either 1) temporarily stop effluent pumping, or 2) divert influent flow to the equalization lagoons.
- Following the UV system will be a dedicated portion of the existing CCT channels to be used as a plant water tank, dedicated to storage for the new plant water system.
- A new Disinfection (UV Building) will be constructed above half of the chlorine contact tank. The new structure will provide a protected and operator friendly environment for year-round operation of the disinfection process. The building will house the disinfection system, disinfection controls, plant water tank and effluent sampler.

### 2.5.10 Effluent Flow Measurement and Sampling

- The existing effluent flow measurement device is a Parshall flume constructed in a structure downstream of UV disinfection. The existing Parshall flume is in adequate condition and there are no known issues with its performance. The existing Parshall flume will remain in-use and a new ultrasonic level instrument will be installed and calibrated.
- The existing effluent sampler is a composite sampler located upstream of the Parshall flume. As part of the UV disinfection system and building upgrade, a new effluent composite sampler will be furnished and installed downstream of UV disinfection.

### 2.5.11 Outfall

- No modifications to the outfall are anticipated as part of the project.

### 2.5.12 Solids Handling Systems

- A new Process Building will be constructed to include a sludge roll-off container garage bay, solids handling equipment including a dewatering centrifuge and conveyor system, sludge blowers, grit removal and classification equipment, and process Control Room.
- Two new Sludge Storage Tanks will be constructed including fill and draw piping (waste sludge, scum, dewatering suction), sluice gate and overflow port, fine bubble mixing/aeration system, decanting system and instrumentation (level elements, float switches). Sludge decanting will be provided by a manual slide rail submersible pumping system.
- The Sludge Storage Tanks combined operating volume is 130,000 gallons based on the NHDES regulation requirement to provide for 5 days of storage at design maximum month conditions.
- The aeration system will consist of two variable speed, positive displacement blowers and fine bubble diffused aeration grids (sized for 30 to 40 scfm per thousand cubic feet).
- Dewatering of sludge will be by one centrifuge, with space provided for a future unit. Centrifuges provide high cake solids production for waste activated sludge and can adapt to varying sludge feed characteristics. The centrifuge will discharge to a jockey screw conveyor connected to a loading conveyor. The loading conveyor will be a reversing sludge bay conveyor with multiple discharge chutes to evenly fill the sludge roll-off container.
- Two sludge feed pumps located in the lower level will convey sludge from the sludge storage tanks to feed sludge to the centrifuges. The feed pumps will be rotary lobe positive displacement type. Accommodations will be made for future in-line sludge grinders preceding the sludge feed pumps (one on each feed pump suction line) to protect the pumps.
- One polymer make-down system will be provided with space accommodations for a future system. The system will be liquid emulsion polymer type. Emulsion polymer systems are comprised of a neat polymer pump, in-line mechanical mixing device, and dilute polymer pumps. The polymer make-down unit will have the ability to use either process water or plant water for dilution. The neat polymer pump will be progressing cavity type pump. Emulsion polymer will be provided and stored in 275-gallon tote containers stored in the new Process Building.

### 2.5.13 Plant Water System (Bid Alternate)

- A new plant water system will be provided in the Control Building Pump Room to satisfy the new process systems (i.e., grit removal, dewatering, yard hydrants) with flushing/wash water demands. Process water will be used as necessary to meet continuous or frequent low flow demand (carrier water). The system has been sized to accommodate plant water flows at the WWTF including: process wash water (e.g., centrifuge, grit flushing); and yard hydrants and hose bibs.
- The plant water pump system shall consist of two, vertical multi-stage centrifugal pumps operating in lead and lag configuration. Backflow protected process water will be used for redundancy of the plant water system.
- The plant water system will include a manually cleaned duplex basket strainer, magnetic flow meter, discharge pressure element, and a hydropneumatic tank.

### 2.5.14 Aeration Lagoons (IEQ Basins)

- Retain the existing lagoons and lagoon aeration/mixing systems and convert into IEQ basins (Section 2.5.5)
- Reconnect the lagoon air piping to the proposed new SBR blower system for periodic aeration/mixing
- Provide spot lagoon liner repairs for exposed portions of the lagoon liners which show signs of degradation

- The existing lagoons contain an unknown volume of sludge based on historical use. The proposed centrifuge dewatering system will be sized with capacity (hydraulic and solids throughput) to allow the Town to dewater and dispose of additional sludge from the lagoons if the Town chooses to manage the existing lagoon sludge in this manner. The Town would need to manually pump sludge from the lagoons to the sludge holding tanks via a mobile pump for eventual dewatering via the centrifuge. The lagoon sludge could then be dewatered and disposed of over the course of many years. The existing IEQ basins would remain in-use as influent equalization.

### 2.5.15 Influent Equalization (IEQ) Pump Station

- The existing Filter Building Lagoon Effluent Pump Station will be repurposed to convey equalized influent flow back into the treatment process. Two of the existing Lagoon Effluent submersible pumps will be re-used to convey lagoon equalized flow back to the process via a new 6-inch force main connected to SMH-2 before flowing by gravity back to preliminary treatment. The third submersible pump will be rendered inactive based on piping modifications required to accommodate the new SBR effluent EQ piping arrangement.
- Equalized flow will be conveyed back to the process at an estimated rate of 300 – 400 gpm using the existing submersible pumps and will be controlled manually by Town staff when the influent flows to the WWTF allow excess flow to be diverted back to the process.

## 2.6 Building and Ancillary Infrastructure Improvements

### 2.6.1 Process Building

- The proposed project will require a new Process Building to support the new wastewater treatment systems including grit removal, SBR process, and solids handling.
- The new Process Building construction will be a concrete foundation with frost walls, slab on grade, and a below grade sludge pumping area. The walls will consist of CMU block with insulation and a combination of CMU veneer and metals side. A pitched wood truss roof system and standing seam metal roof will be provided.
- Exterior doors, roll-up doors, and windows will be baked aluminum construction with a baked-on finish. Interior doors will be painted hollow metal doors.
- Interior wall finish will be sealed concrete and painted CMU except where insulation is required. Insulated walls will include FRP faced plywood.

### 2.6.2 Disinfection Building

- The proposed project includes a new Disinfection Building to support the new UV system installed in the existing chlorine contact tank structure.
- The new Disinfection Building construction will utilize the existing chlorine contact tank as the foundation. The walls will consist of CMU block with insulation and metal siding. A single pitched steel beam roof system and standing seam metal roof deck will be provided.
- Exterior doors and roll-up doors will be baked aluminum construction with a baked on finish.

### 2.6.3 Civil-Site

- The new WWTF site will experience an increase in traffic compared to the current operations for chemical deliveries and sludge hauling. The main access road to the WWTF will continue to be Putnam Road.
- New and/or upgraded site piping systems for influent/effluent flow, air piping, sludge piping, grit piping, chemical piping, and plant water piping will be constructed.

- Construction of the SBR Tank complex and Process Building will require a large excavation (cut/fill) that will impact much of the area east of the existing Control Building. A 10-ft wide gravel access drive is proposed around the Process Building and SBR Tank Complex to provide the Town with vehicle access for operations and maintenance activities of these new structures.
- Removal/reinstallation of new fencing on the easterly portion of the project site to accommodate construction of the new SBR Tank complex. Removal and disposal of existing fence, trees, stumps, vegetation, site piping, and retaining wall.
- Stormwater management will be addressed for new and existing impervious areas, including a new stormwater collection system and installation of a stormwater filtration basin. Stormwater will be discharged to the existing oxbow.
- Based on the existing condition of the pavement, proposed new site piping requirements, and the need for modified grading to accommodate the new structures, drainage modifications, and improved vehicle accessibility, full depth pavement reconstruction is recommended.
- The existing Control Building heating system utilizes an existing 10,000-gallon double wall fiberglass underground diesel fuel storage tank located south of the Filter Building. This tank was installed in approximately 2001 and has had buried fuel line modifications completed as recently as 2021. The Town has indicated a preference towards propane heating system which would make this UST obsolete. The tank and associated underground piping are proposed for removal as part of a Bid Alternate for the project.

### 2.6.4 Architectural

- A new Process Building and Disinfection Building will be constructed, as described above.
- Work in existing buildings is governed by the Existing Building Code. The existing building code classifies work in existing buildings in 6 categories; Repairs, Alteration – Level 1, Alteration – Level 2, Alteration – Level 3, Change of Occupancy and Additions. The Level of Alterations will be reviewed with the Town's Code Enforcement Officer at the onset of the final design. Additional information regarding the level of alteration for existing spaces can be found in **Appendix C**.
- The existing Control Building will be renovated to accommodate a new electrical room, new blower room, new chemical room, and a new separate women's bathroom.
- The existing Filter Building will be reused with no major architectural modifications anticipated.
- The existing Primary Sedimentation Building, Grit Building, and UV structure will be demolished.
- A hazardous materials inspection was completed for existing structures which are planned for demolition. The data collected as a part of investigations and recommendations are detailed in the *Hazardous Materials Inspection Report* (November 2022 included as **Appendix F**). Based on the inspection results, a supplemental field survey is planned for December 2022 to further delineate and quantify the extent of polychlorinated biphenyls (PCBs) materials which will require special handling and disposal measures.

### 2.6.5 Structural and Geotechnical

- New concrete tanks will be constructed on-site for the treatment process, identified as the SBR Tank Complex consisting of the SBR tanks, Effluent Equalization Tanks, and Sludge Holding Tanks. Both precast post-tensioned concrete tanks and traditional cast-in-place tank designs will be considered for the final design.
- New concrete structures will be designed for snow and wind loadings, lateral earth pressures, hydrostatic lateral pressures, hydrostatic uplift pressures (buoyancy) and seismic forces (as applicable).
- The existing chlorine contact tank will be reused and repaired to maximize the life of the structure as the foundation for the new Disinfection Building.

- Existing Lagoon Splitter Structures will be modified to operate as equalization flow through structures. Existing structures will be filled, and aluminum grating fastened for safety.
- The project geotechnical engineer (Haley & Aldrich) completed a site investigation consisting of test borings in September 2022 at the WWTF site. The data collected as a part of those investigations are detailed in the draft Geotechnical Data Report (dated November 2022, included as **Appendix E**). The Geotechnical Data Report indicated that the subsurface conditions at the site generally consists of, in order of increasing depth below ground surface, man placed fill, alluvial deposits, and glaciofluvial deposits overlying a layer of glaciolacustrine deposits (silt and clay), with bottom of the layer extending to a depth of 99 ft below ground surface. The groundwater table was encountered between 10 and 11 ft below ground surface.
- Preliminary geotechnical discussions with Haley & Aldrich have indicated that the bearing capacity of the existing soils within the zone of influence of the proposed structures is relatively low, which could result in SBR Tank Complex structure settlement. However, this settlement may be mitigated through strategic construction sequencing, allowing for the SBR Tank complex leak testing to occur prior to permanent tank connections being made (i.e., piping, electrical conduits) to structures. This sequencing would "preload" the bearing soils below the tank mat which would allow the tank to settle prior to making the tank connections.
- Results of preliminary seismic evaluations completed by Haley & Aldrich indicate that the soils below the SBR Tank Complex and Process Building are susceptible to liquefaction during a seismic event. Additional shear wave velocity field testing of the soils at the site is currently underway to provide additional information and allow for a more rigorous evaluation of liquefaction susceptibility and potential seismically induced settlement. Based on the results of the supplemental geotechnical investigation and evaluations (using the shear wave velocity data), it is possible that a ground improvement system may be required to support the new structures on-site. The cost for such a ground improvement system is not currently covered in the cost estimate.

### 2.6.6 Mechanical/Plumbing

- The new Process Building will include a new high efficiency, direct vent, gas-fired propane boiler with remote hydronic unit heaters. The Process Building will be served by a new, exterior 1,000-gallon propane storage tank and associated underground piping and appurtenances.
- A new potable water service will be extended to the new Process Building.
- The existing Control Building will include heating/cooling and ventilation modifications to accommodate area-use changes in the building including the Chemical Room, Women's Bathroom, Aeration Blower Room, Pump Room, and Electrical Room.
- The existing Filter Building HVAC system is designed for continuous ventilation at 12 air changes per hour. A switch for manual occupancy is proposed to control the ventilation rates and the makeup air unit in the existing space.
- Bid Alternate considerations:
    - Control Building HVAC modifications: Conversion of the existing Control Building heating system from oil to propane, including boiler upgrades, propane service upgrades, and removal of the existing 10,000-gallon underground storage oil tank.
    - Filter Building HVAC modifications: Provide new indirect-fired heater units and upgrade the mechanical systems to accommodate lower supply/exhaust air flow rates more appropriate for the space classification.

### 2.6.7 Instrumentation/SCADA

- A new SCADA system will be provided to incorporate the WWTF upgrade instrumentation, monitoring, control, and alarming systems.
- The new SCADA system will have two local workstations, one in Control Building and other in Process Building.
- Remote SCADA access will be available to operations staff through the internet.
- A new alarm dialer will be utilized for primary alarm notification, the existing Raco alarm dialer will be used for backup.
- Future integration of wastewater pump stations SCADA monitoring and telemetry communication will be considered in the final design.
- Future integration of security cameras will be coordinated in final design.

### 2.6.8 Electrical

- The utility service and main power distribution to the WWTF will be upgraded. The preliminary sizing of the new service entrance is 1600 ampere. The service entrance will be located in the existing Control Building and all new and existing-to-remain equipment and buildings will be powered from this location.
- Eversource is currently in the midst of a major transmission line upgrade along Route 10 (anticipated in 2022/2023), which includes the service for the WWTF. Coordination with Eversource is on-going.
- New standby generator housed in a sound-attenuated, skintight enclosure. The automatic transfer switch is anticipated to be located within the Electrical Room for the Control Building.
- The preliminary generator size for the WWTF is 450-kW unit. Given the size of the standby generator, this until will be a diesel-powered generator with a double-containment underbelly storage tank. Sizing will be confirmed during final design.
- The WWTF is connected to a photovoltaic array which was installed across the Sugar River. The existing AC disconnect for the solar array will be relocated for connection to the new utility main service.
- The site duct bank system will be upgraded for power/signal/control distribution to existing and new buildings and tanks.
- Exterior site lighting for the driveway, tankage and buildings will be provided. Interior existing lighting will remain existing except for the new Chemical Room which will have a new lighting system. New systems will include energy efficient lighting, emergency lighting/exit signs, receptacles and addressable fire alarm system.
- Local disconnects and ESTOPS at process equipment will be provided, as appropriate.

# Section 3 Project Implementation

## 3.1 Project Funding

The Town of Newport will require both interim and long-term financing to fund this project. The potential funding mechanisms for the project will be sourced from several different sources described in detail below based on recommendations of project cost estimates developed in the Facilities Plan Amendment (Wright-Pierce, May 2022).

Based on the funding sources described below, it is anticipated that the project will include provisions for American Iron and Steel (AIS) requirements and Davis-Bacon wage rate requirements, and Disadvantaged Business Enterprise (DBE) procurement goals. Currently, Build American Buy America (BABA) Act requirements (“buy American”) are not anticipated pending final approval of project specific waivers for Congressionally Directed Spending, USDA-RD, and CWSRF.

### 3.1.1 USDA - Rural Development

The Town has secured a funding offer through USDA Rural Development (RD) for a total of up to \$16.2M. The RD funding package consists of a 30-year loan in the amount of \$9,999,000 at a 1.5% annual interest rate and a grant in the amount of \$6,164,000. The USDA-RD grant portion of the funding offer will not be expended until all other funding components have been expended.

In addition, Rural Development funding will not cover interim financing for the design and construction portion of the upgrade project. Therefore, the Town must secure interim project financing up outside of the Rural Development funding. Interim financing is anticipated to be provided through the Clean Water State Revolving Fund (CWSRF) described in Section 3.1.4.

USDA-RD funding packages include Build America, Buy America (BABA) Act provisions since 2022. The BABA Act requires that all iron, all steel, and all manufactured products and construction materials used in federally funded projects must be produced in the United States. This provision can result in an increase to the construction cost of the project. However, USDA-RD was able to seek a waiver for these BABA Act provisions for the Town’s funding offer.

The secured RD funds will still include American Iron and Steel (AIS) requirements which have been in place for USDA-RD funding since 2017.

### 3.1.2 Congressional Directed Spending (CDS)

The Town received a Congressionally Directed Spending (CDS) Community Grant offer for \$1,936,000 funded through the 2022 Appropriations Act. The Appropriations Act requires that each Community Grant recipient provide a 20% cost share from a non-federally funded source. The cost share or matching requirement will be met through the Town’s long-term Rural Development loan.

Although Community Grants are subject to the BABA Act, the Office of Management and Budget (OMB) Made in America Office approved a waiver to the requirements of BABA. Provided the waiver application is submitted by March 1, 2023, and approved by the EPA, the BABA waiver will apply, and the Community Grant funds will be exempt from BABA requirements.

### 3.1.3 American Rescue Plan Act (ARPA)

The Town received an ARPA Grant offer included as part of the 2021 CWSRF Project Priority List (November 2021). Based on coordinating with the USDA-RD funding package, this grant offer is for up to $1,350,000. The ARPA grant does not include federal provision requirements such as AIS, Davis-Bacon, or BABA provisions.

### 3.1.4 Clean Water State Revolving Fund (CWSRF)

The Town received authority to borrow in 2019 for a principal amount not to exceed $4.5M. The Town entered into a CWSRF loan agreement in 2020 for $1.5M and has an outstanding authority to borrow the balance of the principal remaining ($3M). NHDES has indicated that the CWSRF program would honor the original principal forgiveness rate for this CWSRF loan (30%) for $1.35M, leaving the Town with a long-term debt obligation of $3.15M for the existing CWSRF loan.

The CWSRF and NHDES have indicated that they will make an exception to their current funding rules and will extend the Town of Newport an interim, low interest rate construction loan offer, if requested. This interim construction financing offer would provide the Town with a low interest interim construction loan (1%) to finance the interim construction project costs until project has reached the Rural Development loan value ($9.99M).

In addition to the CWSRF funding options identified above, NHDES has indicated that should the proposed WWTF project exceed the current estimated project funding limit of $24M identified below, the CWSRF program will work with the Town to assist with additional funding to support through the Infrastructure Investment and Jobs Act (IIJA) subsidies to assist with project overages to the maximum extent possible. NHDES has committed to providing up to an additional $4M in grant (100% subsidy) for project costs over the $24M.

### 3.1.5 Funding Summary

A summary of the current funding sources in place are shown in Table 3-1:

**Table 3-1 Anticipated Project Funding Breakdown**

| Funding Source | Grant or Principal Forgiveness | Loan | Total |
|---|---|---|---|
| USDA-Rural Development | $6,164,000 | $9,999,000 | $16,163,000 |
| Congressionally Directed Spending (CDS) | $1,936,000 | - | $1,936,000 |
| American Rescue Plan Act (ARPA) | $1,350,000 | - | $1,350,000 |
| Clean Water State Revolving Loan Fund (CWSRF) | $1,350,000 | $3,150,000 | $4,500,000 |
| CWSRF Infrastructure Investment and Jobs Act Grant (IIJA)[1] | $4,000,000[1] | - | $4,000,000[1] |
| Local Funds | - | $51,000 | $51,000 |
| **TOTAL AVAILABLE PROJECT FUNDING** | **$14,800,000** | **$13,200,000** | **$28,000,000** |

**Note 1:** CWSRF/IIJA subsidy of up to $4M for required funds beyond the total project costs of $24M.

Additional discussions regarding project funding can be found in Section 4.

## 3.2 WWTF Staffing Analysis

Currently, two personnel operate and maintain the WWTF. The existing aerated lagoon WWTF is a Grade II facility per the criteria established by NHDES in ENV-Wq 304.27 "Classification and Reclassification of Wastewater Plants". The Town's wastewater pump stations are operated and maintained by a separate department. Using the criteria established by NHDES in Env-Wq 304.27 "Wastewater Treatment Plant Owner Responsibilities" the proposed WWTF will be upgraded to a Grade IV facility. The proposed Grade IV WWTF is estimated to require between three and four full-time personnel (excluding supervisory and administrative personnel) based on criteria established by New England Interstate Water Pollution Control Commission (NEIWPCC) "The Northeast Guide for Estimating Staffing at Publicly and Privately-Owned Wastewater Treatment Plants".

During the construction of the new WWTF, the Town may consider hiring staff during the middle to later stages of the construction process to allow integration prior to the start-up of the new WWTF. Due to a relative shortage of licensed operators, many communities have had to advertise for six to twelve months to find qualified wastewater operators.

## 3.3 Procurement

Construction of the project will be competitively bid and a qualified contractor selected based on the lowest responsive and responsible bid (i.e., conventional design-bid-build method). The project will be publicly bid using an online advertising platform. The Town will have the option of advertising the project in a local newspaper as well. For a project this size we anticipate a 45-day bidding period to allow time for Addenda.

### 3.3.1 Sole-Source Equipment

Based on discussions with the operations staff, the Town has standardized on specific manufacturers and/or providers for the following equipment/services at the WWTF:

- **PLC & SCADA Programming Services**: The Town uses LCS Controls, Inc. for all of their PLC, SCADA, and integration services for both wastewater and drinking water infrastructure. LCS is very familiar with the Town's existing systems and has served the Town for many years through PLC and integration services.
- **SCADA Software**: The Town utilizes iFix SCADA software for the drinking water infrastructure (GE Digital). To maintain consistency and commonality for operations, the Town has indicated a preference towards this SCADA software platform.
- **Chemical Feed Pumps**: The Town has standardized on Blue-White chemical feed pumps across the wastewater and drinking water applications. Common chemical feed pumps allows the Town to minimize spare parts stocking and allows the Town to interchange chemical feed pumps when necessary.
- **Gas Detection Systems:** The Town has standardized on Enmet Industrial Gas Detection equipment throughout the WWTF to allow for ease of calibration and operation/maintenance.
- **Magnetic Flow Meters:** The Town has standardized on Siemens magnetic flow meters throughout the WWTF to allow for ease of calibration and operation/maintenance.

Based on the funding sources, the Town will be required to submit a sole-source justification request to USDA-RD and NHDES for consideration. This justification letter is anticipated to be submitted at the beginning of the final design phase.

### 3.3.2 Pre-Selection

Based on the significant differences between equipment across manufacturers, the following components of the project are proposed to be pre-selected prior to issuing Bidding documents:

- Tertiary Filtration Units (Disc filters)
- Sequencing Batch Reactors

The preselection process is completed using a competitive bid progression that evaluates different manufacturer proposals based on cost, qualifications, and experience - amongst other factors. The selected manufacturer for each process would be held to a negotiated bid allowance in the final contract documents. It is recommended that a specific tertiary filter and SBR manufacturer is competitively preselected as one of the first tasks in final design to enable an efficient design and bidding process.

For the purposes of the PDR, the equipment shown is that of Aqua-Aerobics. This will be adjusted in the Final Design based on the results of the preselection procurement process.

## 3.4 Project Schedule

The Town is under Administrative Order (AO) to complete the WWTF portion of this project. The AOC, which was issued in June 2020, calls for the design to be completed by December 31st, 2023, and for the project to be substantially completed by June 30th, 2026. A WWTF project of this size would typically take between 24 to 36 months to construct from notice to proceed to substantial completion. Based on the current project status, an updated project schedule is provided below:

### Table 3-2 Project Schedule

| Milestone | Date |
|---|---|
| Submit Draft PDR to Town, Rural Development, and NHDES | December 2022 |
| Submit Final PDR to Town, Rural Development, and NHDES | Wednesday, January 11, 2023 |
| SBR & Tertiary Filter Evaluated Bid | February – March 2023 |
| Submit 60% Client/RD/NHDES Final Design[1] | Tuesday, May 30, 2023 |
| Submit 90% Client/RD/NHDES Final Design[1] | Friday, September 15, 2023 |
| 90% Submittal Comments Received | Friday, October 13, 2023 |
| Submit 95% Client/RD/NHDES Final Design[1] | Friday, November 10, 2023 |
| Submit 100% Bidding Documents – Stamping for Approval | Monday, December 11, 2023 |
| Advertisement for Bid | December 2023 |
| Bid Opening and Engineer Review | January/February 2024 |
| Notice to Proceed | February 2024 |
| Construction Period (Estimated) | March 2024 – September 2026 |

Note 1: Schedule contingent upon timely reviews (2 weeks) from the Town and Funding Agencies

Note 2: The anticipated duration for construction will be further refined during the final design.

## 3.5 Permitting

The project involves renovation of existing facilities and construction of significant new facilities. Based on our understanding of the current project scope, expected permits are summarized below. Contact with the various permitting agencies, including pre-application meetings, has occurred already during the preliminary design process and will continue early in final design.

### 3.5.1 Federal Permits and Approval

1. NPDES Construction General Permit: Construction sites of greater than one acre are subject to a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit for construction. The disturbed area for this project is anticipated to be greater than one acre; and a NPDES Construction General Permit will be required. This permit is applied for by the General Contractor as part of construction and will be covered in the Construction Costs.

2. NPDES General Permit for Dewatering: Construction dewatering activities in New Hampshire are subject to a General Permit for Dewatering. The depth of excavation will require a Dewatering Permit. This permit is applied for by the General Contractor as part of construction and will be covered in the Construction Costs.

3. Army Corps of Engineers (ACOE): The ACOE has regulatory jurisdiction over any navigable waterway, including the Sugar River. Since the proposed facilities will not impact the river a Programmatic General Permit from the ACOE will not be needed.

4. Federal Emergency Management Association (FEMA): FEMA provides guidance for projects within floodplains which is the basis for the Town local Floodplain Development Ordinance. There will be no specific federal requirements since the project will not impact the regulatory floodway of the Sugar River. Local requirements pertinent to the Floodplain Development Ordinance are discussed in the Local Permit Section below.

5. Federal Aviation Administration (FAA): Notification of Proposed Construction is required due to proximity of the Parlin Field Airport (2B3) in accordance with 14 CFR Part 77. This process will require coordinating with the FAA to determine impacts on airport operating procedures and air traffic from the construction project.

### 3.5.2 State Permits and Approval

1. Shoreland Zone Permit: The Sugar River is subject to the Shoreland Water Quality Protection Act. Any proposed ground disturbance within 250 ft of the Sugar River requires a New Hampshire Department of Environmental Services (NHDES) Shoreland Permit. Portions of the proposed WWTF upgrades will occur within the 250-foot Protected Shoreland area and will require a Shoreland Water Quality Protection Act (SWQPA) permit. Based on preliminary evaluations, the project appears to qualify for the Shoreland Permit by Notification (PBN) application process.

2. Alteration of Terrain (AOT) Permit: Construction sites with greater than 100,000 SF of contiguous disturbance or 50,000 SF if any portion is within a protected Shoreland (the WWTF is within a protected Shoreland) shall obtain approval from the NHDES AOT Bureau. The contiguous area of disturbance associated with the proposed upgrade is less than 50,000 SF, excluding those areas where disturbance is

associated with asphalt maintenance activities. The proposed scope of work for the subject project was discussed with the NHDES AOT Bureau in October 2022. NHDES has determined that the proposed project may proceed under a General Permit by Rule.

3. Wetlands: The existing WWTF site was surveyed for wetlands which may be impacted as part of the proposed upgrade. Based on the wetlands survey (**Appendix G**), the proposed project is not anticipated to disturb any areas within the delineated wetland setbacks.

4. New Hampshire Department of Historic Resources: It is not anticipated that this project will encounter or disturb any historic resources. However, a review of the project by the New Hampshire Department of Historic Resources (NHDHR) is required. This review is currently being processed through NHDHR and is anticipated to be completed in December 2022. If additional investigation efforts are required, they will be conducted following NHDHR's review.

5. Environmental Review: The NHDES Wastewater Engineering Bureau and USDA Rural Development Engineering Office will conduct an Environmental Review for the project in support of the Town's request for funding under the State Revolving Fund and Rural Development. Based on the project scope, it is anticipated that the project should be eligible for a categorical exclusion (CE) or "finding of no significant impact" (FONSI).

6. Design Review: The NHDES Wastewater Engineering Bureau and USDA Rural Development Engineering Office will also conduct a Design Review of the PDR, 60% Review Submittal and 95% Regulatory Review Submittal for review and comment. The 100% Contract Set will be provided to both agencies for final approval to advertise and for their records.

7. Underground Storage Tank (UST) Removal: The contractor will be required to subcontract a Certified Tank Remover for the UST removal in compliance with Env-Or 400. Based on the age and material of the tank, it has been assumed that the 20-year-old UST is not a source of contamination.

### 3.5.3 Local Permits and Approval

1. Site Plan Review: Site Plan Review is generally required for all major projects in the Town of Newport. The review is completed by the Town's Planning Board. Based on communication with the Town's Planning and Zoning Administrator Department, the Town's review process will occur concurrently during the Client Review stages of the design (30% and 90%).

2. Building, Mechanical, Plumbing, and Electrical Permits: A building permit and inspection is required for the construction of new structures. These permits are available at the Town office and must be completed by the contractor completing the work. The Code Enforcement Office reviews each permit to ensure it meets applicable codes and regulations. These permits will be obtained by the Contractor. Based on discussions with the Town, these permit fees will be waived.

3. Floodplain Development Ordinance: Much of the existing WWTF site is located within Special Flood Hazard Area (Zone AE) as identified on the FIRMette. However, no impacts are proposed within the Regulatory Floodway; therefore, the proposed project is not anticipated to impact the Base Flood Elevation (BFE).

Impacts within the floodplain are regulated through the Town of Newport Floodplain Zoning Ordinance Section 212 and will be coordinated throughout the final design. Based on TR-16 Guides for the Design of Wastewater Treatment Works (Revised 2011 Edition), all critical equipment should be constructed at a minimum elevation of + 3-ft (781.5') from the 100-year flood elevation, and all non-critical equipment should be constructed a minimum elevation of + 2-ft (780.5') from the 100-year flood elevation.

## 3.6 Construction Sequencing

The construction activities must be sequenced to maintain treatment performance and the contractor must ensure that permit limits and requirements are met for the duration of the project. The contractor must consider the following general constraints:

- Existing Lagoons No. 1 and 2 and all ancillary air supply systems will remain online during and after construction of the WWTF. Wastewater will continue to be treated by the lagoons until the new secondary process passes all performance requirements and has been accepted by the engineer and owner.
- Disinfection permit limits are in effect year-round. The new disinfection system must be installed and tested prior to removing the existing disinfection which must be kept operational until the new system has been accepted.
- The new Tertiary Filtration system will not be brought online until the secondary process system has been substantially completed.
- Modifications to the lagoon distribution structures will not be completed until the secondary process system has been substantially completed. Work will be completed during a dry-weather time window.
- All mechanical/heating system work must be completed during the non-heating season (i.e., May 1 to September 30) and shall be fully functional during the heating season. Alternatively, the General Contractor may provide a temporary heating system.
- Installation of the new electrical service and generator will require careful coordination between Owner, General Contractor, and Electrical Contractor. A temporary generator and feeder breaker will be required while the existing power is transitioned to the new generator. Once this is accomplished the new and existing power feeds can be installed. Temporary power shutdowns to make connections will need to be coordinated with the Owner.

The estimated construction period is between 24 – 30 months depending on contractor availability, contractor sequencing, materials availability, amongst other variables. There are many possible ways a contractor could sequence the proposed project. A dedicated bypass pumping system is anticipated for several parts of the work as described below, including the influent pump station modifications and the influent forcemain re-routing. Other bypass pumping or piping may be needed but is not anticipated to be significant. The preliminary project constraints and preliminary sequence of construction are outlined below:

- Demolish existing sedimentation tanks and former primary sedimentation building.
- Demolish the existing Grit Building and temporarily connect the influent lagoon forcemain for influent flow conveyance.
- Excavate for construction of new Process Building and the SBR Tank Complex.
- Construct new Process Building and SBR Tank Complex in their entirety.
- Complete installation of new electrical utility service and transformer.
- Complete Control Building upgrades (blower replacement, chemical room upgrades).
- Complete Tertiary Filter Building upgrades (filter replacement, controls upgrades, etc.).

- Provide temporary influent pump station bypass piping to install new influent forcemain and upgrade influent pump station (i.e., piping, valves, pumps)
- Initiate start-up and testing operations for the new secondary treatment process including the SBR Tank Complex and Process Building. It is anticipated that SBR treated effluent will be discharged to Lagoon No. 1 for the first two to four weeks of the secondary process start-up until the effluent performance is satisfactory.
- Once the SBR treatment process has met performance requirements, flow will be conveyed permanently to the Process Building/SBR systems/Tertiary filtration systems for treatment.
- Modifications to the existing lagoon influent and effluent piping and distribution structures will be completed once the new SBR and Filter processes have been started-up and are performing acceptably. These lagoon piping modifications will require coordination with the Owner and lowering of the lagoon water level to allow pipe modifications.
- Disinfection system modifications and installation of new plant water intake pipe can occur with minimal impacts to other processes. The existing disinfection system must remain operational until the new system has been accepted. Short-term bypass pumping (or bypass to the lagoons) will likely be required to redirect effluent flow around the existing influent UV channel so that modifications can be made to the CCT to direct flow to the new UV channel.
- Septage upgrades will be coordinated with the upgrade of the existing lagoon blower to ensure air is available. Coordination with the Owner will be required prior to shutting down the existing septage system for the upgrades. During construction, the Owner may be required to notify local septage haulers of the short-term lack of septage receiving capability at the WWTF.

# Section 4 Preliminary Cost Estimate

## 4.1 Project Cost Estimate

The Facilities Plan Amendment presented study level (10% design level) for the engineer's opinion of probable total project cost for a range of \$23.5M – \$26M. The Facilities Planning Amendment project estimates were developed using the Association for the Advancement of Cost Engineering (AACE) Class 3 estimates which are typically utilized to form the basis for budget authorization, appropriation, and/or funding planning. Based on discussions with the Town and coordinating with funding agencies described in Section 3.1, the total project cost for the recommended project presented in this Facilities Plan Amendment was refined to \$24M based on an ENR Construction Cost Index 12791 (March 2022).

A preliminary design project cost estimate (30% design level) has been prepared for the work described in this report in accordance with industry standards and AACE Class 2 estimating procedures using 30% design drawings, equipment quotes, and unit cost information. The cost estimate includes new equipment costs and associated ancillary costs such as process piping, architectural and structural modifications, instrumentation and controls, and electrical modifications to support the equipment. The estimate also incorporates the following components:

- Design contingency of 15% of the construction cost estimate to account for undeveloped items.
- General Contractor overhead and profit of 6.5%.
- Estimated construction inflation to the mid-point of construction of 7%, based on the mid-point occurring in the spring of 2025 and current construction market trends.
- Construction contingency of 5% of the construction cost estimate (\$1.24M)
- Interim construction financing costs of 0.65% of the total project cost
- \$40K allowance for hazardous materials removal (e.g., lead paint, asbestos, PCBs)
- \$50K allowance for existing heating oil underground storage tank removal
- Cost estimate based on an ENR Construction Cost Index of 13175 (November 2022)

The updated Project Cost Estimate and the Construction Cost Estimates for the project are presented in Table 4-1 and Table 4-2 respectively at the end of this section. The Project Cost Estimate for the full scope of construction described in the PDR is \$29.3M (including the adoption of PCO Option No. 1 as identified in the next section). This is greater than the amount originally allocated to the project based on the Facilities Plan Amendment by approximately \$5.3M, and approximately \$1.3M greater than the proposed funding total identified in Section 3 (\$28M). This total project cost differential is due to a number of factors including:

- Modifications to the project approach from that identified in the Facilities Plan Amendment based on an improved understanding of the project needs
  - Significant variability and inflation in equipment, material costs (specifically for structural and electrical bids observed in construction year 2022), and construction markets
  - Selection of a triplex influent pump station versus duplex pump station based on the need for greater pump turndown and operational/electrical efficiency
  - Relocation of the existing chemical coagulant storage, feed, and piping systems to isolate corrosive chemical storage from other equipment
  - Hazardous material abatement allowance based on results identified in Hazardous Material Survey (Appendix F)

  - Increased SBR tank design volume to provide effluent total nitrogen treatment (< 10 mg/L) across a wider range of influent conditions for process control benefits
  - Architectural and NFPA 820 code issues identified in the existing Control Building
- Town requested HVAC modifications to the existing Control Building heating system

## 4.2 Cost Savings Opportunities

It is not unreasonable to assume that a competitive bidding market with better-than-expected construction bids could result in a construction cost less than the estimate presented herein. Conversely, the risk exists for the actual cost to be higher. Given the current proposed funding approach described in Section 3, there are several approaches to addressing this budget issue including eliminating items from the project and/or modifying the scope of the project (bid alternates). A list of potential cost savings opportunities (PCO) that could be considered, along with the preliminary estimate of project cost reduction for each item is identified below. These options include project items which are not crucial to the Town fulfilling their requirements to meet the AO. However, each of these PCO options contain various financial, technical, and operational benefit to the Town of Newport. This list is not prioritized, and the associated cost savings values are approximate.

1. **PCO Option No. 1 ($800,00) – Process Building Layout:** The new Process Building was originally designed with a building layout of 56'L x 48'W (2,688 SF) to accommodate a variety of new process equipment needs, including a Grit Pumping Room (Appendix D, Drawings A-6 through A-12). An alternative Process Building layout was developed which removes this Grit Pumping Room and locates the grit pump in an exterior heated enclosure located on top of the Grit Vortex unit. This modification allows for the building layout to be reduced to 47'L x 42'W (1,974 SF), a reduction of approximately 25% of the new Process Building square footage. This alternative Process Building layout is located in Appendix H for the Town's consideration. The Town will need to provide input on the preferred Process Building layout prior to proceeding with the Final Design. *Based on the PDR review meeting with the Town, PCO Option No. 1 will be selected for the final design and has been incorporated into the cost estimates in this PDR.*
2. **PCO Option No. 2 ($140K) – Septage Receiving:** Keep the existing septage receiving station as-is. Eliminate all modification work associated with the Septage Receiving System including new submersible septage pump, manual bar rack and spill pad, and septage force main. This will limit the Town's ability to process septage in the new SBR treatment process and could impact the Town's ability to benefit from revenue associated with septage.
3. **PCO Option No. 3 ($230K) – Plant Water System:** Eliminate the new plant water system including plant water pumps, manual basket strainer, and interior/exterior piping modifications; retain existing potable process water system and connect to new process equipment (i.e., grit system, dewatering system). This would require the Town to continue to utilize potable process water for all process purposes (i.e., grit removal, sludge dewatering).
4. **PCO Option No. 4 ($1.4M) – UV Disinfection Upgrades:** Eliminate the new UV disinfection system and associated Disinfection Building and retain the existing UV disinfection system and superstructure. *Based on the PDR review meeting with the Town and comments from NHDES, PCO Option No. 4 will be included as part of the base bid for the proposed project due to the UV systems current condition and criticality to NPDES permit compliance.*
5. **PCO Option No. 5 ($340K) – Control Building & Tertiary Building HVAC Upgrades:** Eliminate HVAC conversion of the existing Control Building from heating oil to propane, including removal of the existing 10,000-gallon heating oil underground storage tank (UST). Eliminate HVAC updates to the existing Tertiary

Building to allow for increased heating/cooling efficiency based on the new space classification/ventilation requirements.

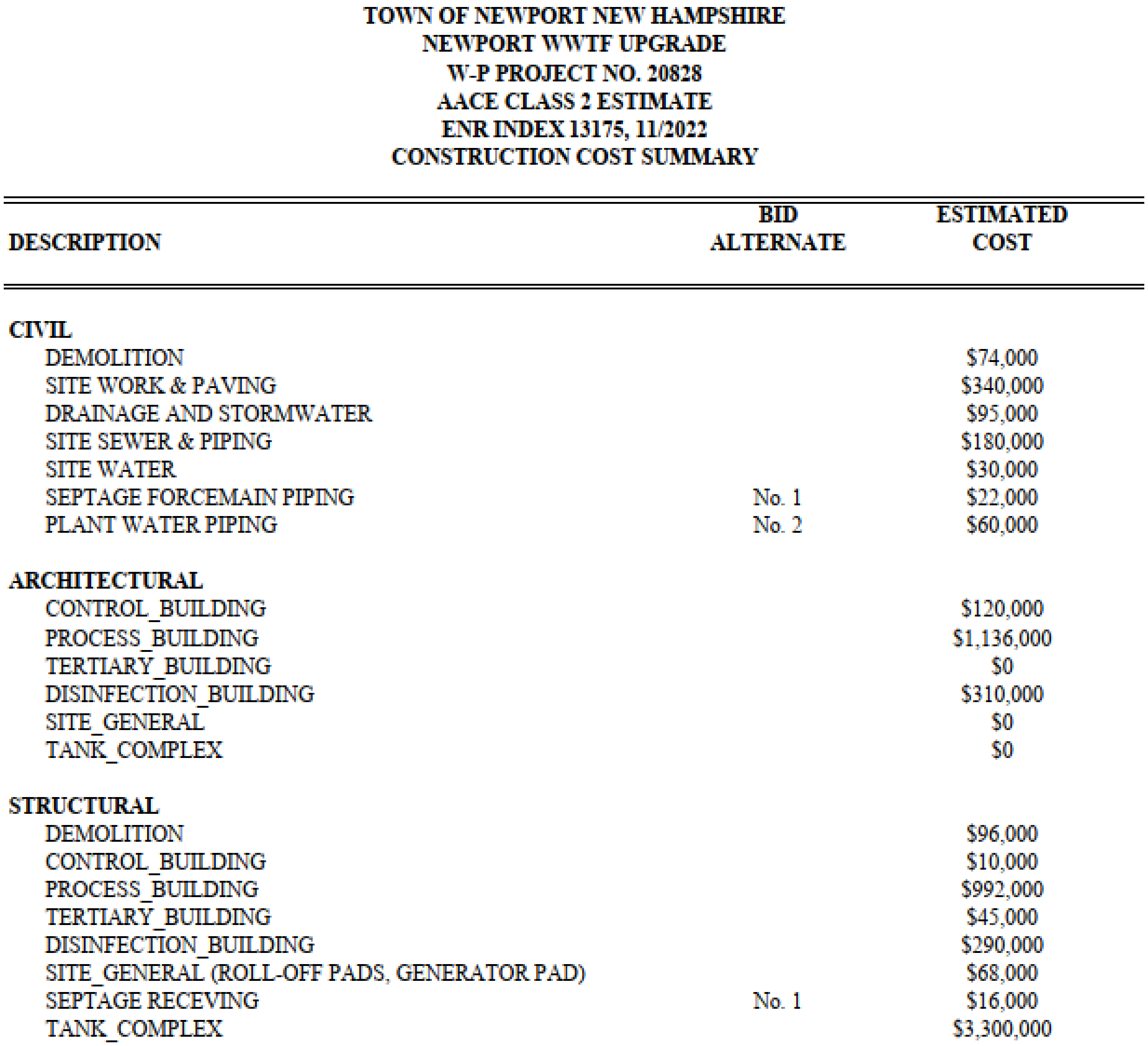
Based on the PDR review comments and consideration of the PCO's No. 2, No. 3, and No. 5 noted above, the reduced scope Project Cost Estimate for construction is approximately $28.5M.  This includes the UV Disinfection Upgrade which will be included as part of the Base Bid project.  This value is approximately $500,000 greater than the Town's anticipated funding budget identified in Section 3 when accounting for the additional IIJA funding subsidies offered through NHDES/CWSRF/IIJA.  Cost savings measures will continue to be considered and evaluated throughout the Final Design phase.  Project cost estimates and bid alternate considerations will be reviewed at the 60% and 90% milestones alongside the project budget.  Ultimately, the Town will have to make the cost saving decisions considering both the capital cost savings and the associated operational trade-offs.  All cost-saving measures, phasing and/or bid alternates decisions will need to be selected prior to the commencement of final design.

## Table 4-1 Project Cost Estimate (ENR CCI 13175)

**TOWN OF NEWPORT NEW HAMPSHIRE**
**NEWPORT WWTF UPGRADE**
**W-P PROJECT NO. 20828**
**AACE CLASS 2 ESTIMATE**
**ENR INDEX 13175, 11/2022**
**PROJECT COST SUMMARY**

| PROJECT COMPONENT | | | | COST | COMMENTS |
|---|---|---|---|---|---|
| CONSTRUCTION | | | | $24,020,000 | See Table 4-2 |
| CONSTRUCTION CONTINGENCY | | | 5.0% | $1,200,000 | |
| TECHNICAL ENGINEERING & INSPECTION SERVICES | | | 16% | $3,740,000 | Estimate |
| PRELIMINARY DESIGN | 2.4% | $572,000 | | | |
| FINAL DESIGN | 4.7% | $1,140,000 | | | Estimate |
| BIDDING | 0.2% | $45,000.00 | | | Estimate |
| CONSTRUCTION ADMINISTRATION | 8.2% | $1,980,000 | | | Estimate |
| MATERIALS TESTING | | | | $45,000 | Allowance |
| ELECTRICAL UTILITY SERVICE | | | | $50,000 | Allowance |
| LEGAL/ ADMINISTRATIVE | | | | $10,000 | Bond Counsel |
| SUBTOTAL | | | | $29,065,000 | |
| FINANCING | | | 0.65% | $190,000 | |
| **ENGINEER'S ESTIMATE OF PROJECT COST** | | | | $29,255,000 | |

## Table 4-2 Construction Cost Estimate (ENR CCI 13175)



**TOWN OF NEWPORT NEW HAMPSHIRE**
**NEWPORT WWTF UPGRADE**
**W-P PROJECT NO. 20828**
**AACE CLASS 2 ESTIMATE**
**ENR INDEX 13175, 11/2022**
**CONSTRUCTION COST SUMMARY**

| DESCRIPTION | BID ALTERNATE | ESTIMATED COST |
|---|---|---|
| **CIVIL** | | |
| DEMOLITION | | $74,000 |
| SITE WORK & PAVING | | $340,000 |
| DRAINAGE AND STORMWATER | | $95,000 |
| SITE SEWER & PIPING | | $180,000 |
| SITE WATER | | $30,000 |
| SEPTAGE FORCEMAIN PIPING | No. 1 | $22,000 |
| PLANT WATER PIPING | No. 2 | $60,000 |
| **ARCHITECTURAL** | | |
| CONTROL_BUILDING | | $120,000 |
| PROCESS_BUILDING | | $1,136,000 |
| TERTIARY_BUILDING | | $0 |
| DISINFECTION_BUILDING | | $310,000 |
| SITE_GENERAL | | $0 |
| TANK_COMPLEX | | $0 |
| **STRUCTURAL** | | |
| DEMOLITION | | $96,000 |
| CONTROL_BUILDING | | $10,000 |
| PROCESS_BUILDING | | $992,000 |
| TERTIARY_BUILDING | | $45,000 |
| DISINFECTION_BUILDING | | $290,000 |
| SITE_GENERAL (ROLL-OFF PADS, GENERATOR PAD) | | $68,000 |
| SEPTAGE RECEVING | No. 1 | $16,000 |
| TANK_COMPLEX | | $3,300,000 |

## Table 4-2 Construction Cost Estimate (ENR CCI 13175) - Continued

**TOWN OF NEWPORT NEW HAMPSHIRE**
**NEWPORT WWTF UPGRADE**
**W-P PROJECT NO. 20828**
**AACE CLASS 2 ESTIMATE**
**ENR INDEX 13175, 11/2022**
**CONSTRUCTION COST SUMMARY**

| DESCRIPTION | BID ALTERNATE | ESTIMATED COST |
|---|---|---|
| **PROCESS** | | |
| DEMOLITION | | $21,000 |
| INFLUENT PUMPING SYSTEM | | $382,000 |
| PLANT WATER | No. 2 | $102,000 |
| LAGOON EQ MODIFICATIONS | | $40,000 |
| GRIT REMOVAL & CLASSIFICATION SYSTEM | | $307,000 |
| SEQUENCING BATCH REACTORS | | $1,376,000 |
| POST EQ | | $85,000 |
| TERTIARY DISC FILTRATION | | $500,000 |
| UV-DISINFECTION | | $215,000 |
| CHEMICAL FEED SYSTEMS | | $115,000 |
| SOLIDS HANDLING | | $822,000 |
| SEPTAGE RECEIVING | No. 1 | $58,000 |
| PROCESS EQUIPMENT AND PIPING FINISHES | | $35,000 |
| **HVAC/ PLUMBING** | | |
| CONTROL BUILDING (BASE BID) | | $207,000 |
| CONTROL BUILDING (PROPANE CONVERSION) | No. 3 | $125,200 |
| TERTIARY BUILDING (BASE BID) | | $6,000 |
| TERTIARY BUILDING (BID ALTERNATE) | No. 4 | $65,000 |
| PROCESS BUILDING | | $551,000 |
| DISINFECTION BUILDING | | $10,000 |
| **INSTRUMENTATION** | | |
| CONTROL PANELS | | $145,000 |
| UV BUILDING CONTROL PANEL | | $26,000 |
| FIELD INSTRUMENTS AND SPARE PARTS | | $127,000 |
| SCADA HARDWARE AND SOFTWARE | | $64,000 |
| SYSTEMS INTEGRATOR LABOR | | $194,000 |
| **ELECTRICAL** | | |
| CONTROL_BUILDING | | $1,770,000 |
| PROCESS_BUILDING | | $999,000 |
| TERTIARY_BUILDING | | $45,000 |
| DISINFECTION_BUILDING | | $112,000 |
| SITE_GENERAL | | $734,000 |
| TANK_COMPLEX | | $217,500 |
| **SPECIALS** | | |
| PERMITTING FEES | | $2,500 |
| PROCESS BY-PASS PUMPING | | $25,000 |
| HAZARDOUS MATERIALS ABATEMENT | | $40,000 |
| UNDERGROUND STORAGE TANK REMOVAL | No. 3 | $50,000 |

## Table 4-2 Construction Cost Estimate (ENR C CI 13175) - Continued

**TOWN OF NEWPORT NEW HAMPSHIRE**
**NEWPORT WWTF UPGRADE**
**W-P PROJECT NO. 20828**
**AACE CLASS 2 ESTIMATE**
**ENR INDEX 13175, 11/2022**
**CONSTRUCTION COST SUMMARY**

| DESCRIPTION | BID ALTERNATE | ESTIMATED COST |
|---|---|---|
| GENERAL CONTRACTOR, SUBTOTAL | | $6,543,000 |
| GENERAL CONTRACTOR OH&P | 6.5% | $425,000 |
| SUBCONTRACTORS, SUBTOTAL | | $10,215,000 |
| GENERAL CONTRACTOR MARKUP | 5.0% | $511,000 |
| UNIT PRICE ITEMS | 0.30% | $50,000 |
| GENERAL CONDITIONS | 10.0% | $1,774,000 |
| SUBTOTAL, CONSTRUCTION COSTS | | $19,518,000 |
| PROJECT MULTIPLIER, DESIGN CONTINGENCY | 15% | |
| PROJECT MULTIPLIER, INFLATION TO MIDPT CONST. | 7.00% | |
| **ENGINEERS ESTIMATE OF CONSTRUCTION COST** | | **$24,017,000** |

# Appendix A
# Regulatory Documents

A-1: NPDES Permit

A-2: Administrative Order

# AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Clean Water Act, as amended, (33 U.S.C. §§1251 et seq.; the "CWA"),

**Town of Newport, New Hampshire**

is authorized to discharge from the facility located at

**Newport Wastewater Treatment Facility**
**20 Putnam Road**
**Newport, NH 03773**

to receiving water named

**Sugar River**
**Connecticut River Watershed**

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on the first day of the calendar month immediately following 60 days after signature.

This permit expires at midnight, five years from the last day of the month preceding the effective date.

This permit supersedes the permit issued on April 18, 2007.

This permit consists of **Part I** including the cover page; **Attachment A** (Freshwater Acute Toxicity Test Procedure and Protocol, February 2011); **Attachment B** (Freshwater Chronic Toxicity Test Procedure and Protocol, March 2013); and **Part II (**NPDES Part II Standard Conditions, April 2018).

Signed this 4th day of June, 2020

/S/SIGNATURE ON FILE
Ken Moraff, Director
Water Division
Environmental Protection Agency
Region 1
Boston, MA

## PART I

## A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through the expiration date, the Permittee is authorized to discharge treated effluent through Outfall Serial Number 001 to the Sugar River. The discharge shall be limited and monitored as specified below; the receiving water and the influent shall be monitored as specified below.

| **Effluent Characteristic** | **Effluent Limitation** | | | **Monitoring Requirements**[1,2,3] | |
|---|---|---|---|---|---|
| | **Average Monthly** | **Average Weekly** | **Maximum Daily** | **Measurement Frequency** | **Sample Type**[4] |
| Effluent Flow[5] | 1.3 MGD Rolling Annual Average | --- | --- | Continuous | Recorder |
| Effluent Flow | Report MGD | --- | Report MGD | Continuous | Recorder |
| $BOD_5$ | 30 mg/L<br>325 lb/day | 45 mg/L<br>488 lb/day | 50 mg/L<br>542 lb/day | 1/week | Grab |
| $BOD_5$ Removal | ≥ 85 % | --- | --- | --- | --- |
| TSS | 30 mg/L<br>325 lb/day | 45 mg/L<br>488 lb/day | 50 mg/L<br>542 lb/day | 1/week | Grab |
| TSS Removal | ≥ 85 % | --- | --- | --- | --- |
| pH Range[6] | 6.5 - 8.0 S.U. | | | 1/day | Grab |
| *Escherichia coli*[7] | 126 E. coli/100 mL | --- | 406 E. coli/100 mL | 2/week | Grab |
| Ammonia Nitrogen (May 1 – October 31) | 6.4 mg/L<br>Report lb/day | --- | Report mg/L | 1/week | Grab |
| Ammonia Nitrogen (November 1 - April 30) | 24.3 mg/L<br>Report lb/day | --- | Report mg/L | 1/week | Grab |
| Total Nitrogen[8] | Report mg/L<br>Report lb/day | --- | Report mg/L | 1/week | Grab |
| Total Kjeldahl Nitrogen[8] | Report mg/L | --- | Report mg/L | 1/week | Grab |
| Total Nitrate+Nitrite[8] | Report mg/L | --- | Report mg/L | 1/week | Grab |

| **Effluent Characteristic** | **Effluent Limitation** | | | **Monitoring Requirements[1,2,3]** | |
|---|---|---|---|---|---|
| | **Average Monthly** | **Average Weekly** | **Maximum Daily** | **Measurement Frequency** | **Sample Type[4]** |
| Total Phosphorus<br>(April 1 - October 31st) | 5.2 lb/day<br>Report mg/L | --- | Report lb/day<br>Report mg/L | 1/week | Grab |
| Total Phosphorus<br>(November 1st - March 31st) | 1 mg/L<br>Report lb/day | --- | Report mg/L<br>Report lb/day | 1/week | Grab |
| Interim requirement (first 36 months from the effective date)<br>Total Recoverable Aluminum[9] | Report µg/L | --- | Report µg/L | 2/Month | Grab |
| Total Recoverable Aluminum[9] | 87 µg/L | --- | Report µg/L | 2/Month | Grab |
| Total Recoverable Copper | 13.2 µg/L | --- | 17.2 µg/L | 2/Month | Grab |
| Total Recoverable Lead | 2.3 µg/L | --- | Report µg/L | 2/Month | Grab |
| **Whole Effluent Toxicity (WET) Testing[10,11]** | | | | | |
| $LC_{50}$ | --- | --- | ≥ 100 % | 1/quarter | Grab |
| C-NOEC | --- | --- | ≥ 17.8 % | 1/quarter | Grab |
| Hardness | --- | --- | Report mg/L | 1/quarter | Grab |
| Ammonia Nitrogen | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Aluminum | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Cadmium | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Copper | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Nickel | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Lead | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Zinc | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Organic Carbon | --- | --- | Report mg/L | 1/quarter | Grab |
| Dissolved Organic Carbon | --- | --- | Report mg/L | 1/quarter | Grab |

| **Ambient Characteristic[12]** | **Reporting Requirements** | | | **Monitoring Requirements[1,2,3]** | |
|---|---|---|---|---|---|
| | **Average Monthly** | **Average Weekly** | **Maximum Daily** | **Measurement Frequency** | **Sample Type[4]** |
| Hardness | --- | --- | Report mg/L | 1/quarter | Grab |
| Ammonia Nitrogen | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Aluminum | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Cadmium | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Copper | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Nickel | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Lead | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Zinc | --- | --- | Report mg/L | 1/quarter | Grab |
| Total Organic Carbon | --- | --- | Report mg/L | 1/quarter | Grab |
| Dissolved Organic Carbon | --- | --- | Report mg/L | 1/quarter | Grab |
| pH[13] | --- | --- | Report S.U. | 1/quarter | Grab |
| Temperature[13] | --- | --- | Report °C | 1/quarter | Grab |
| Total Phosphorus[14] (April 1 – October 31) | --- | --- | Report mg/L | 1/month | Grab |

| **Influent Characteristic** | **Reporting Requirements** | | | **Monitoring Requirements[1,2,3]** | |
|---|---|---|---|---|---|
| | **Average Monthly** | **Average Weekly** | **Maximum Daily** | **Measurement Frequency** | **Sample Type[4]** |
| $BOD_5$ | Report mg/L | --- | --- | 2/month | Composite |
| TSS | Report mg/L | --- | --- | 2/month | Composite |

Footnotes:

1. Effluent samples shall yield data representative of the discharge. A routine sampling program shall be developed in which samples are taken at the same location, same time and same days of the week each month. The Permittee shall report the results to the Environmental Protection Agency Region 1 (EPA) and the State of any additional testing above that required herein, if testing is in accordance with 40 C.F.R. § 136.

2. In accordance with 40 C.F.R. § 122.44(i)(1)(iv), the Permittee shall monitor according to sufficiently sensitive test procedures (i.e., methods) approved under 40 C.F.R. Part 136 or required under 40 C.F.R. Chapter I, Subchapter N or O, for the analysis of pollutants or pollutant parameters (except WET). A method is "sufficiently sensitive" when: 1) The method minimum level (ML) is at or below the level of the effluent limitation established in the permit for the measured pollutant or pollutant parameter; or 2) The method has the lowest ML of the analytical methods approved under 40 C.F.R. Part 136 or required under 40 C.F.R. Chapter I, Subchapter N or O for the measured pollutant or pollutant parameter. The term "minimum level" refers to either the sample concentration equivalent to the lowest calibration point in a method or a multiple of the method detection limit (MDL), whichever is higher. Minimum levels may be obtained in several ways: They may be published in a method; they may be based on the lowest acceptable calibration point used by a laboratory; or they may be calculated by multiplying the MDL in a method, or the MDL determined by a laboratory, by a factor.

3. When a parameter is not detected above the ML, the Permittee must report the data qualifier signifying less than the ML for that parameter (e.g., <50 ug/L, if the ML for a parameter is 50 mg/L). For reporting an average based on a mix of values detected and not detected, assign a value of "0" for all non-detects for that reporting period and report the average of all the results.

4. A grab sample is an individual sample collected in a period of less than 15 minutes. Each composite sample will consist of at least twenty-four (24) grab samples taken during one consecutive 24-hour period, either collected at equal intervals and combined proportional to flow or continuously collected proportional to flow.

5. The limit is a rolling annual average. The value will be calculated and reported as the arithmetic mean of the monthly average flow for the reporting month and the monthly average flows of the previous eleven months.

6. The pH shall be within the specified range at all times. The minimum and maximum pH sample measurement values for the month shall be reported in standard units (S.U.). See Part I.G.2. below for a provision to modify the pH range.

7. The monthly average limit for *E. coli* is expressed as a geometric mean.

8. Total Kjeldahl nitrogen and nitrate + nitrite samples shall be collected concurrently. The results of these analyses shall be used to calculate both the concentration and mass loadings of total nitrogen.

   Total Nitrogen (mg/L) = Total Kjeldahl Nitrogen (mg/L) + Nitrate (mg/L) + Nitrite (mg/L)

   Total Nitrogen (lb/day) = [(average monthly Total Nitrogen (mg/L) * total monthly effluent flow (Millions of Gallons (MG)) / # of days of discharge in the month] * 8.345

   See Part I.G.3 for special conditions related to nitrogen.

9. See Part I.G.1 for special conditions related to Aluminum.

10. The Permittee shall conduct acute toxicity tests ($LC_{50}$) and chronic toxicity tests (C-NOEC) in accordance with test procedures and protocols specified in **Attachment A and B** of this permit. $LC_{50}$ and C-NOEC are defined in Part II.E. of this permit. The Permittee shall test the daphnid, *Ceriodaphnia dubia*, and the fathead minnow, *Pimephales promelas*. Toxicity test samples shall be collected and tests completed during the same weeks each time of calendar quarters ending March 31st, June 30th, September 30th, and December 31st. The complete report for each toxicity test shall be submitted as an attachment to the DMR submittal which includes the results for that toxicity test.

11. For Part I.A.1., Whole Effluent Toxicity Testing, the Permittee shall conduct the analyses specified in **Attachment A and B**, Part VI. CHEMICAL ANALYSIS for the effluent sample. If toxicity test(s) using the receiving water as diluent show the receiving water to be toxic or unreliable, the Permittee shall follow procedures outlined in **Attachment A and B**, Section IV., DILUTION WATER. Minimum levels and test methods are specified in **Attachment A and B**, Part VI. CHEMICAL ANALYSIS.

12. For Part I.A.1., Ambient Characteristic, the Permittee shall conduct the analyses specified in **Attachment A and B**, Part VI. CHEMICAL ANALYSIS for the receiving water sample collected as part of the WET testing requirements. Such samples shall be taken from the receiving water at a point immediately upstream of the permitted discharge's zone of influence at a reasonably accessible location, as specified in **Attachment A and B**. Minimum levels and test methods are specified in **Attachment A and B**, Part VI. CHEMICAL ANALYSIS.

13. A pH and temperature measurement shall be taken of each receiving water sample at the time of collection and the results reported on the appropriate DMR. These pH and temperature measurements are independent from any pH and temperature measurements required by the WET testing protocols.

14. See Part I.G.4 Special Conditions

**Part I.A. continued.**

2. The discharge shall not cause a violation of the water quality standards of the receiving water.

3. The discharge shall be free from substances in kind or quantity that settle to form harmful benthic deposits; float as foam, debris, scum or other visible substances; produce odor, color, taste or turbidity that is not naturally occurring and would render the surface water unsuitable for its designated uses; result in the dominance of nuisance species; or interfere with recreational activities.

4. Tainting substances shall not be present in the discharge in concentrations that individually or in combination are detectable by taste and odor tests performed on the edible portions of aquatic organisms.

5. The discharge shall not result in toxic substances or chemical constituents in concentrations or combinations in the receiving water that injure or are inimical to plants, animals, humans or aquatic life; or persist in the environment or accumulate in aquatic organisms to levels that result in harmful concentrations in edible portions of fish, shellfish, other aquatic life, or wildlife that might consume aquatic life.

6. The discharge shall not result in benthic deposits that have a detrimental impact on the benthic community. The discharge shall not result in oil and grease, color, slicks, odors, or surface floating solids that would impair any existing or designated uses in the receiving water.

7. The discharge shall not result in an exceedance of the naturally occurring turbidity in the receiving water by more than 10 NTUs.

8. The Permittee must provide adequate notice to EPA-Region 1 and the State of the following:

   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to § 301 or § 306 of the Clean Water Act if it were directly discharging those pollutants or in a primary industry category (see 40 C.F.R. §122 Appendix A as amended) discharging process water; and

   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

   c. For purposes of this paragraph, adequate notice shall include information on:

      (1) The quantity and quality of effluent introduced into the POTW; and

      (2) Any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

9. Pollutants introduced into the POTW by a non-domestic source (user) shall not pass through the POTW or interfere with the operation or performance of the works.

## B. UNAUTHORIZED DISCHARGES

1. This permit authorizes discharges only from the outfall listed in Part I.A.1, in accordance with the terms and conditions of this permit. Discharges of wastewater from any other point sources, including sanitary sewer overflows (SSOs), are not authorized by this permit and shall be reported in accordance with Part D.1.e.(1) of the Standard Conditions of this permit (24-hour reporting). See Part I.H below for reporting requirements.

## C. OPERATION AND MAINTENANCE OF THE SEWER SYSTEM

Operation and maintenance (O&M) of the sewer system shall be in compliance with the Standard Conditions of Part II and the following terms and conditions. The Permittee is required to complete the following activities for the collection system which it owns:

1. Maintenance Staff

   The Permittee shall provide an adequate staff to carry out the operation, maintenance, repair, and testing functions required to ensure compliance with the terms and conditions of this permit. Provisions to meet this requirement shall be described in the Collection System O&M Plan required pursuant to Section C.5. below.

2. Preventive Maintenance Program

   The Permittee shall maintain an ongoing preventive maintenance program to prevent overflows and bypasses caused by malfunctions or failures of the sewer system infrastructure. The program shall include an inspection program designed to identify all potential and actual unauthorized discharges. Plans and programs to meet this requirement shall be described in the Collection System O&M Plan required pursuant to Section C.5. below.

3. Infiltration/Inflow

   The Permittee shall control infiltration and inflow (I/I) into the sewer system as necessary to prevent high flow related unauthorized discharges from their collection systems and high flow related violations of the wastewater treatment plant’s effluent limitations. Plans and programs to control I/I shall be described in the Collection System O&M Plan required pursuant to Section C.5. below.

4. Collection System Mapping

   Within 30 months of the effective date of this permit, the Permittee shall prepare a map of the sewer collection system it owns (see page 1 of this permit for the effective date). The map shall be on a street map of the community, with sufficient detail and at a scale to allow easy interpretation. The collection system information shown on the map shall be based on current conditions and shall be kept up-to-date and available for review by federal, state, or local agencies. Such map(s) shall include, but not be limited to the following:

a. All sanitary sewer lines and related manholes;

b. All combined sewer lines, related manholes, and catch basins;

c. All combined sewer regulators and any known or suspected connections between the sanitary sewer and storm drain systems (e.g. combination manholes);

d. All outfalls, including the treatment plant outfall(s), CSOs, and any known or suspected SSOs, including stormwater outfalls that are connected to combination manholes;

e. All pump stations and force mains;

f. The wastewater treatment facility(ies);

g. All surface waters (labeled);

h. Other major appurtenances such as inverted siphons and air release valves;

i. A numbering system which uniquely identifies manholes, catch basins, overflow points, regulators and outfalls;

j. The scale and a north arrow; and

k. The pipe diameter, date of installation, type of material, distance between manholes, and the direction of flow.

5. Collection System O&M Plan

The Permittee shall develop and implement a Collection System O&M Plan.

a. Within six (6) months of the effective date of the permit, the Permittee shall submit to EPA and the State

   (1) A description of the collection system management goals, staffing, information management, and legal authorities;
   (2) A description of the collection system and the overall condition of the collection system including a list of all pump stations and a description of recent studies and construction activities; and
   (3) A schedule for the development and implementation of the full Collection System O&M Plan including the elements in paragraphs b.1. through b.8. below.

b. The full Collection System O&M Plan shall be completed, implemented and submitted to EPA and the State within twenty-four (24) months from the effective date of this permit. The Plan shall include:

(1) The required submittal from paragraph 5.a. above, updated to reflect current information;
(2) A preventive maintenance and monitoring program for the collection system;
(3) Description of sufficient staffing necessary to properly operate and maintain the sanitary sewer collection system and how the operation and maintenance program is staffed;
(4) Description of funding, the source(s) of funding and provisions for funding sufficient for implementing the plan;
(5) Identification of known and suspected overflows and back-ups, including manholes. A description of the cause of the identified overflows and back-ups, corrective actions taken, and a plan for addressing the overflows and back-ups consistent with the requirements of this permit;
(6) A description of the Permittee's programs for preventing I/I related effluent violations and all unauthorized discharges of wastewater, including overflows and by-passes and the ongoing program to identify and remove sources of I/I. The program shall include an inflow identification and control program that focuses on the disconnection and redirection of illegal sump pumps and roof down spouts;
(7) An educational public outreach program for all aspects of I/I control, particularly private inflow; and
(8) An <u>Overflow Emergency Response Plan</u> to protect public health from overflows and unanticipated bypasses or upsets that exceed any effluent limitation in the permit.

6. Annual Reporting Requirement

The Permittee shall submit a summary report of activities related to the implementation of its Collection System O&M Plan during the previous calendar year. The report shall be submitted to EPA and the State annually by March 31. The first annual report is due the first March 31st following submittal of the collection system O&M Plan required by Part I.C.5.b. of this permit. The summary report shall, at a minimum, include:

a. A description of the staffing levels maintained during the year;

b. A map and a description of inspection and maintenance activities conducted and corrective actions taken during the previous year;

c. Expenditures for any collection system maintenance activities and corrective actions taken during the previous year;

d. A map with areas identified for investigation/action in the coming year;

e. A summary of unauthorized discharges during the past year and their causes and a report of any corrective actions taken as a result of the unauthorized discharges reported pursuant to the Unauthorized Discharges section of this permit; and

f. If the average annual flow in the previous calendar year exceeded 80 percent of the facility's 1.3 MGD design flow (1.04 MGD), or there have been capacity related overflows, the report shall include:

(1) Plans for further potential flow increases describing how the Permittee will maintain compliance with the flow limit and all other effluent limitations and conditions; and
(2) A calculation of the maximum daily, weekly, and monthly infiltration and the maximum daily, weekly, and monthly inflow for the reporting year.

## D. ALTERNATE POWER SOURCE

In order to maintain compliance with the terms and conditions of this permit, the Permittee shall provide an alternative power source(s) sufficient to operate the portion of the publicly owned treatment works it owns and operates, as defined in Part II.E.1 of this permit.

## E. INDUSTRIAL USERS

1. The Permittee shall submit to EPA and the State the name of any Categorical Industrial User (IU) subject to Categorical Pretreatment Standards under 40 C.F.R. § 403.6 and 40 C.F.R. Chapter I, Subchapter N (§§ 405-415, 417-430, 432, 447, 449-451, 454, 455, 457-461, 463-469, and 471 as amended) who commences discharge to the POTW after the effective date of this permit.

   This reporting requirement also applies to any other IU who is classified as a Significant Industrial User which discharges an average of 25,000 gallons per day or more of process wastewater into the POTW (excluding sanitary, noncontact cooling and boiler blowdown wastewater); contributes a process wastewater which makes up five (5) percent or more of the average dry weather hydraulic or organic capacity of the POTW; or is designated as such by the Control Authority as defined in 40 C.F.R. § 403.3(f)) on the basis that the industrial user has a reasonable potential to adversely affect the wastewater treatment facility's operation, or for violating any pretreatment standard or requirement (in accordance with 40 C.F.R. § 403.8(f)(6)).

2. In the event that the Permittee receives originals of reports (baseline monitoring reports, 90-day compliance reports, periodic reports on continued compliance, etc.) from industrial users subject to Categorical Pretreatment Standards under 40 C.F.R. § 403.6 and 40 C.F.R. Chapter I, Subchapter N (§§ 405-415, 417-430, 432-447, 449-451, 454, 455, 457-461, 463-469, and 471 as amended), or from a Significant Industrial User, the Permittee shall forward the originals of these reports within ninety (90) days of their receipt to EPA and copy the State.

## F. SLUDGE CONDITIONS

1. The Permittee shall comply with all existing federal and state laws and regulations that apply to sewage sludge use and disposal practices, including EPA regulations promulgated at 40 C.F.R. § 503, which prescribe "Standards for the Use or Disposal of Sewage Sludge" pursuant to § 405(d) of the CWA, 33 U.S.C. § 1345(d).

2. If both state and federal requirements apply to the Permittee's sludge use and/or disposal practices, the Permittee shall comply with the more stringent of the applicable requirements.

3. The requirements and technical standards of 40 C.F.R. § 503 apply to the following sludge use or disposal practices:

   a. Land application - the use of sewage sludge to condition or fertilize the soil
   b. Surface disposal - the placement of sewage sludge in a sludge only landfill
   c. Sewage sludge incineration in a sludge only incinerator

4. The requirements of 40 C.F.R. § 503 do not apply to facilities which dispose of sludge in a municipal solid waste landfill. 40 C.F.R. § 503.4. These requirements also do not apply to facilities which do not use or dispose of sewage sludge during the life of the permit but rather treat the sludge (e.g., lagoons, reed beds), or are otherwise excluded under 40 C.F.R. § 503.6.

5. The 40 C.F.R. § 503 requirements include the following elements:

   - General requirements
   - Pollutant limitations
   - Operational Standards (pathogen reduction requirements and vector attraction reduction requirements)
   - Management practices
   - Record keeping
   - Monitoring
   - Reporting

   Which of the 40 C.F.R. § 503 requirements apply to the Permittee will depend upon the use or disposal practice followed and upon the quality of material produced by a facility. The EPA Region 1 Guidance document, "EPA Region 1 - NPDES Permit Sludge Compliance Guidance" (November 4, 1999), may be used by the Permittee to assist it in determining the applicable requirements.[1]

6. The sludge shall be monitored for pollutant concentrations (all Part 503 methods) and pathogen reduction and vector attraction reduction (land application and surface disposal) at the following frequency. This frequency is based upon the volume of sewage sludge generated at the facility in dry metric tons per year, as follows:

| | |
|---|---|
| less than 290 | 1/ year |
| 290 to less than 1,500 | 1 /quarter |
| 1,500 to less than 15,000 | 6 /year |
| 15,000 + | 1 /month |

   Sampling of the sewage sludge shall use the procedures detailed in 40 C.F.R. § 503.8.

7. Under 40 C.F.R. § 503.9(r), the Permittee is a "person who prepares sewage sludge" because it "is … the person who generates sewage sludge during the treatment of domestic sewage in a treatment works …." If the Permittee contracts with *another* "person who prepares sewage sludge" under 40 C.F.R. § 503.9(r) – i.e., with "a person who derives a material from sewage sludge" – for use or disposal of the sludge, then compliance with § 503 requirements is the responsibility of the contractor engaged for that purpose. If the Permittee does not engage a

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[1] This guidance document is available upon request from EPA Region 1 and may also be found at: http://www.epa.gov/region1/npdes/permits/generic/sludgeguidance.pdf

"person who prepares sewage sludge," as defined in 40 C.F.R. § 503.9(r), for use or disposal, then the Permittee remains responsible to ensure that the applicable requirements in § 503 are met. 40 C.F.R. § 503.7. If the ultimate use or disposal method is land application, the Permittee is responsible for providing the person receiving the sludge with notice and necessary information to comply with the requirements of 40 C.F.R. § 503 Subpart B.

8. Compliance with the requirements of this permit or 40 C.F.R. § 503 shall not eliminate or modify the need to comply with applicable requirements under RSA 485-A and Env-Wq 800, New Hampshire Sludge Management Rules.

## G. SPECIAL CONDITIONS

1. Aluminum

The effluent limit for total aluminum shall be subject to a schedule of compliance whereby the limit takes effect three years after the effective date of the permit. For the period starting on the effective date of this permit and ending three (3) years after the effective date, the permittee shall report only the monthly average aluminum concentration on the monthly DMR. After this initial three (3) year period, the permittee shall comply with the monthly average total aluminum limits of 87 µg/L ("final aluminum effluent limit"). The permittee shall submit an annual report due January 15th of each year of the permit that will detail its progress towards meeting the final aluminum effluent limit.

At a minimum, the permittee shall include the following:

a. An evaluation of all potentially significant sources of aluminum in the sewer system and alternatives for minimizing these sources.

b. An evaluation of alternative modes of operation at the wastewater treatment facility in order to reduce the effluent levels of aluminum.

If during the three-year period after the effective date of the permit, New Hampshire adopts revised aluminum criteria then the permittee may request a permit modification, pursuant to 40 C.F.R. § 122.62(a)(3), for a further delay in the effective date of the final aluminum effluent limit. If new criteria are approved by EPA before the effective date of the final aluminum effluent limit, the permittee may apply for a permit modification, pursuant to 40 C.F.R. § 122.62(a)(3), to revise the time to meet the final aluminum effluent limit and/or for revisions to the permit based on whether there is reasonable potential for the facility's aluminum discharge to cause or contribute to a violation of the newly approve aluminum criteria.[2]

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[2] The final effluent limit of 87 µg/L for aluminum may be modified prior to the end of the three-year compliance schedule if warranted by the new criteria and a reasonable potential analysis ad consistent with antidegradation requirements. Such a modification would not trigger anti-backsliding prohibitions, as reflected in CWA 402 § (o) and 40 C.F.R. § 122.44(l).

2. The pH range may be modified if the Permittee satisfies conditions set forth in Part I.I.5 below. Upon notification of an approval by the State, EPA will review and, if acceptable, will submit written notice to the Permittee of the permit change. The modified pH range will not be in effect until the Permittee receives written notice from EPA.

3. Total Nitrogen

    a. Within **one year of the effective date of the permit**, the permittee shall complete an evaluation of alternative methods of operating the existing wastewater treatment facility to optimize the removal of nitrogen in order to minimize the annual average mass discharge of total nitrogen and submit a report to EPA and NHDES documenting this evaluation and presenting a description of recommended operational changes. The methods to be evaluated include, but are not limited to, operational changes designed to enhance nitrification (seasonal and year round), incorporation of anoxic zones, septage receiving policies and procedures, and side stream management. This report may be combined with the permittee's annual nitrogen report under Part I.G.3.b, if both reports are submitted to EPA and NHDES by February 1st.

    b. The permittee shall also submit an annual report to EPA and the NHDES, by February 1st each year, that summarizes activities related to optimizing nitrogen removal efficiencies, documents the annual nitrogen discharge load from the facility, and tracks trends relative to the previous year. If, in any year, the treatment facility discharges of TN on an average annual basis have increased, the annual report shall include a detailed explanation of the reasons why TN discharges have increased, including any changes in influent flows/loads and any operational changes. The report shall also include all supporting data.

4. Seasonal Ambient Total Phosphorus Sampling

    a. Beginning in April of the first odd numbered year following permit issuance, that occurs six or more months after permit issuance, and during odd numbered years thereafter, the Permittee shall collect monthly samples from the receiving water at a location upstream of the facility and analyze the samples for total phosphorus. Sampling shall be conducted on any calendar day following at least 72 hours with less than 0.1 inches of cumulative rainfall. A sampling plan shall be submitted to EPA and the State at least three months prior to the first planned sampling date as part of a Quality Assurance Project Plan for review and State approval. For the years that monitoring is not required, the Permittee shall report NODI code "9" (conditional monitoring not required).

## H. REPORTING REQUIREMENTS

Unless otherwise specified in this permit, the Permittee shall submit reports, requests, and information and provide notices in the manner described in this section.

1. Submittal of DMRs Using NetDMR

   The Permittee shall continue to submit its monthly monitoring data in discharge monitoring reports (DMRs) to EPA and the State no later than the 15th day of the month electronically using NetDMR. When the Permittee submits DMRs using NetDMR, it is not required to submit hard copies of DMRs to EPA or the State. NetDMR is accessible through EPA's Central Data Exchange at https://cdx.epa.gov/.

2. Submittal of Reports as NetDMR Attachments

   Unless otherwise specified in this permit, the Permittee shall electronically submit all reports to EPA as NetDMR attachments rather than as hard copies. This includes the NHDES Monthly Operating Reports (MORs). *See* Part I.H.6. for more information on State reporting. Because the due dates for reports described in this permit may not coincide with the due date for submitting DMRs (which is no later than the 15th day of the month), a report submitted electronically as a NetDMR attachment shall be considered timely if it is electronically submitted to EPA using NetDMR with the next DMR due following the report due date specified in this permit.

3. Submittal of Biosolids/Sewage Sludge Reports

   By February 19 of each year, the Permittee must electronically report their annual Biosolids/Sewage Sludge Report for the previous calendar year using EPA's NPDES Electronic Reporting Tool ("NeT") found on the internet at https://www.epa.gov/compliance/npdes-ereporting.

4. Submittal of Requests and Reports to EPA Water Division (WD)

   a. The following requests, reports, and information described in this permit shall be submitted to the NPDES Applications Coordinator in EPA Water Division (WD):

      (1) Transfer of permit notice;
      (2) Request for changes in sampling location;
      (3) Request for reduction in testing frequency;
      (4) Request for change in WET testing requirement; and
      (5) Report on unacceptable dilution water / request for alternative dilution water for WET testing.
      (6) Report of new industrial user commencing discharge
      (7) Report received from existing industrial user

   b. These reports, information, and requests shall be submitted to EPA/OEP electronically at R1NPDESReporting@epa.gov .

5. Submittal of Reports to EPA Enforcement and Compliance Assurance Division (ECAD) in Hard Copy Form

a. The following notifications and reports shall be signed and dated originals, submitted as hard copy, with a cover letter describing the submission:

(1) Prior to 21 December 2020, written notifications required under Part II.B.4.c, for bypasses, and Part II.D.1.e, for sanitary sewer overflows (SSOs). Starting on 21 December 2020, such notifications must be done electronically using EPA's NPDES Electronic Reporting Tool ("NeT"), or another approved EPA system, which will be accessible through EPA's Central Data Exchange at https://cdx.epa.gov/.

b. This information shall be submitted to EPA ECAD at the following address:

U.S. Environmental Protection Agency
Enforcement and Compliance Assurance Division
Water Compliance Section
5 Post Office Square, Suite 100 (04-SMR)
Boston, MA 02109-3912

6. State Reporting

Unless otherwise specified in this permit or by the State, duplicate signed copies of all reports, information, requests or notifications described in this permit, including the reports, information, requests or notifications described in Parts I.H.3 through I.H.5 shall also be submitted to the New Hampshire Department of Environmental Services, Water Division (NHDES–WD) electronically to the Permittee's assigned NPDES inspector at NHDES-WD or as a hardcopy to the following address:

New Hampshire Department of Environmental Services
Water Division
Wastewater Engineering Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

7. Verbal Reports and Verbal Notifications

a. Any verbal reports or verbal notifications, if required in Parts I and/or II of this permit, shall be made to both EPA and to the State. This includes verbal reports and notifications which require reporting within 24 hours (e.g., Part II.B.4.c. (2), Part II.B.5.c. (3), and Part II.D.1.e.).

b. Verbal reports and verbal notifications shall be made to EPA's Office of Environmental Stewardship at:

617-918-1510

c. Verbal reports and verbal notifications shall also be made to the Permittee's assigned NPDES inspector at NHDES –WD at:

603-271-2985

## I. STATE PERMIT CONDITIONS

1. The Permittee shall not at any time, either alone or in conjunction with any person or persons, cause directly or indirectly the discharge of waste into the said receiving water unless it has been treated in such a manner as will not lower the legislated water quality classification or interfere with the uses assigned to said water by the New Hampshire Legislature (RSA 485-A:12).

2. This NPDES discharge permit is issued by EPA under federal and state law. Upon final issuance by EPA, the New Hampshire Department of Environmental Services-Water Division (NHDES-WD) may adopt this permit, including all terms and conditions, as a state permit pursuant to RSA 485-A:13.

3. EPA shall have the right to enforce the terms and conditions of this permit pursuant to federal law and NHDES-WD shall have the right to enforce the permit pursuant to state law, if the permit is adopted. Any modification, suspension, or revocation of this permit shall be effective only with respect to the agency taking such action, and shall not affect the validity or status of the permit as issued by the other agency.

4. Pursuant to New Hampshire Statute RSA 485-A13,I(c), any person responsible for a bypass or upset at a *wastewater facility* shall give immediate notice of a bypass or upset to all public or privately owned water systems drawing water from the same receiving water and located within 20 miles downstream of the point of discharge regardless of whether or not it is on the same receiving water or on another surface water to which the receiving water is tributary. Wastewater facility is defined at RSA 485-A:2XIX as the structures, equipment, and processes required to collect, convey, and treat domestic and industrial wastes, and dispose of the effluent and sludge. The Permittee shall maintain a list of persons, and their telephone numbers, who are to be notified immediately by telephone. In addition, written notification, which shall be postmarked within 3 days of the bypass or upset, shall be sent to such persons.

5. The pH range of 6.5 to 8.0 Standard Units (S.U.) must be achieved in the final effluent unless the Permittee can demonstrate to NHDES-WD: 1) that the range should be widened due to naturally occurring conditions in the receiving water; or 2) that the naturally occurring receiving water pH is not significantly altered by the Permittee's discharge. The scope of any demonstration project must receive prior approval from NHDES-WD. In no case, shall the above procedure result in pH limits outside the range of 6.0 to 9.0 S.U., which is the federal effluent limitation guideline regulation for pH for secondary treatment and is found in 40 C.F.R. § 133.102(c).

6. Pursuant to New Hampshire Code of Administrative Rules, Env-Wq 703.07(a):

   a. Any person proposing to construct or modify any of the following shall submit an application for a sewer connection permit to the department:

      (1) Any extension of a collector or interceptor, whether public or private, regardless of flow;

(2) Any wastewater connection or other discharge in excess of 5,000 gpd;
(3) Any wastewater connection or other discharge to a WWTP operating in excess of 80 percent design flow capacity based on actual average flow for 3 consecutive months;
(4) Any industrial wastewater connection or change in existing discharge of industrial wastewater, regardless of quality or quantity; and
(5) Any sewage pumping station greater than 50 gpm or serving more than one building.
(6) Any proposed sewer that serves more than one building or that requires a manhole at the connection.

7. For each new or increased discharge of industrial waste to the POTW, the Permittee shall submit, in accordance with Env-Wq 305.10(b) an "Industrial Wastewater Discharge Request."

8. Pursuant to Env-Wq 305.15(d) and 305.16(f), the Permittee shall not allocate or accept for treatment more than 90 percent of the headworks loading limits of the facility.

9. Pursuant to Env-Wq 305.21, at a frequency no less than every five years, the Permittee shall submit to NHDES:

   a. A copy of its current sewer use ordinance if it has been revised without department approval subsequent to any previous submittal to the department or a certification that no changes have been made.

   b. A current list of all significant indirect dischargers to the POTW. At a minimum, the list shall include for each significant indirect discharger, its name and address, the name and daytime telephone number of a contact person, products manufactured, industrial processes used, existing pretreatment processes, and discharge permit status.

   c. A list of all permitted indirect dischargers; and

   d. A certification that the municipality is strictly enforcing its sewer use ordinance and all discharge permits it has issued.

10. When the effluent discharged for a period of three (3) consecutive months exceeds 80 percent of the 1.3 MGD design flow (1.04 MGD) or design loading capacity, the permittee shall submit to the permitting authorities a projection of flows and loadings up to the time when the design capacity of the treatment facility will be reached, and a program for maintaining satisfactory treatment levels consistent with approved water quality management plans. Before the design flow will be reached, or whenever treatment necessary to achieve permit limits cannot be assured, the permittee may be required to submit plans for facility improvements.

## UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
## REGION I

| | | |
|---|---|---|
| IN THE MATTER OF | ) | |
| | ) | DOCKET NO. |
| Town of Newport, New Hampshire | ) | CWA-AO-R01-FY23-01 |
| NPDES Permit No. NH0100200 | ) | |
| | ) | ADMINISTRATIVE ORDER |
| Proceedings under Sections 308(a) and | ) | |
| 309(a)(3) of the Clean Water Act, | ) | |
| as amended, 33 U.S.C. §§ 1318 and | ) | |
| 1319(a)(3) | ) | |

### I. STATUTORY AUTHORITY

The following Findings are made and Administrative Order on Consent ("Order") issued pursuant to Sections 308(a) and 309(a)(3) of the Clean Water Act, as amended (the "Act" or "CWA"), 33 U.S.C. §§ 1318(a) and 1319(a)(3). Section 309(a)(3), 33 U.S.C. § 1319(a)(3), of the Act grants to the Administrator of the U.S. Environmental Protection Agency ("EPA") the authority to issue orders requiring persons to comply with Sections 301, 302, 306, 307, 308, 318 and 405 of the Act and any permit condition or limitation implementing any of such sections in a National Pollutant Discharge Elimination System ("NPDES") permit issued under Section 402 of the Act, 33 U.S.C. § 1342, including any permit issued under an authorized state NPDES program. Section 308(a), 33 U.S.C. § 1318(a), of the Act authorizes EPA to require the submission of any information required to carry out the objectives of the Act. These authorities have been delegated to the EPA, Region I Administrator, and in turn to the Director of the EPA, Region I Enforcement and Compliance Assurance Division ("Director").

The Order herein is based on findings of violation of Section 301 of the Act, 33 U.S.C. § 1311, and the conditions of NPDES Permit No. NH0100200. Pursuant to Section 309(a)(5)(A) of the Act, 33 U.S.C. § 1319(a)(5)(A), the Order provides a schedule which the Director has determined to be reasonable.

## II. DEFINITIONS

Unless otherwise defined herein, terms used in this Order shall have the meaning given to those terms in the Act, 33 U.S.C. §§ 1251 *et seq*., the regulations promulgated thereunder, and any applicable NPDES permit. For the purposes of this Order, “Permit” means the Town of Newport NPDES Permit, No. NH0100200 and all amendments and modifications thereto, and renewals thereof, as are applicable and in effect at the time.

## III. FINDINGS

The Director makes the following findings of fact:

1. The Town of Newport (the “Town” or “Permittee”), established under the laws of the State of New Hampshire, is a “municipality” as defined in Section 502(4) of the Act, 33 U.S.C. § 1362(4).
2. The Town is a person under Section 502(5) of the Act, 33 U.S.C § 1362(5). The Town is the operator of a Wastewater Treatment Facility (“WWTF”) from which it discharges pollutants, as defined in Sections 502(6) and (12) of the Act, 33 U.S.C. §§ 1362(6) and (12), from a point source, as defined in Section 502(14) of the Act, 33 U.S.C. § 1362(14), to the Sugar River.
3. The Sugar River is a “navigable water” under Section 502(7) of the Act, 33 U.S.C. § 1362(7).
4. On June 4, 2020, the Town was re-issued NPDES Permit No. NH0100200 (the “Permit”) by the Director of the Water Division of EPA, Region 1, under the authority given by the Administrator of EPA by Section 402 of the Act, 33 U.S.C. §1342. This authority has been delegated by the Administrator of EPA to the Regional Administrator of EPA, Region 1, and in turn to the Director of the Water Division. The Permit became effective on September 1, 2020.
5. The Permit authorizes the Town of Newport to discharge pollutants, including phosphorus and ammonia nitrogen, from outfall serial number 001, to the Sugar River, subject to the effluent limitations, monitoring requirements and other conditions specified in the Permit. Part I.A.1 of the Permit establishes effluent limitations and monitoring requirements for the discharge of treated effluent from outfall serial number 001.

6. The 2020 Permit established new seasonal limits for Ammonia Nitrogen and a monthly average load seasonal limit for Total Phosphorus. The prior permit, issued in 2007, had established concentration seasonal limits for Total Phosphorus.

7. The Town is subject to a Total Phosphorus monthly average load limit of 5.2 lb/day from April 1st to October 31st, and a monthly average concentration limit of 1.0 mg/L from November 1st to March 31st.

8. The Town is subject to an Ammonia Nitrogen monthly average concentration limit of 6.4 mg/L from May 1st to October 31st, and a monthly average concentration limit of 24.3 mg/L from November 1st to April 30st.

9. From at least September 2020 through the present, in violation of the Permit, the Town has discharged wastewater containing Total Phosphorus and Ammonia Nitrogen in concentrations greater than the effluent limitations for outfall serial number 001 contained in the Permit.

10. In May 2022, the Town submitted to NHDES for review a Facility Plan Amendment. The purpose of the Facility Plan Amendment was to provide a technical basis upon which to make wastewater management decisions necessary to comply with the effluent limits in the Town's NPDES permit.

11. Based on the recommendations in the Facility Plan Amendment, in July 2022, the Town entered into an "Agreement Between Owner and Engineer for Professional Services" with Wright-Pierce which includes as Attachment A to the Agreement "Preliminary Design Phase Scope of Services, Newport, NH – WWTF Upgrade" (Attachment 2).

12. Section 301(a) of the Act, 33 U.S.C. § 1311(a), makes unlawful the discharge of pollutants to waters of the United States except in compliance with, among other things, the terms and conditions of an NPDES permit issued pursuant to Section 402 of the Act, 33 U.S.C. § 1342.

13. The Town's discharges of pollutants from the WWTF to the Sugar River in excess of the effluent limits for Total Phosphorus and Ammonia Nitrogen contained in the Permit, have occurred in violation of Section 301(a) of the Act, 33 U.S.C. § 1311(a).

## IV. ORDER

Accordingly, pursuant to Sections 308 and 309(a)(3) of the Act, it is hereby ordered that:

1. By January 31, 2023, the Town shall complete items 1 through 5 under Task 1 (Preliminary Design Phase) of Attachment 2. The Preliminary Design Phase will define most of the key design decisions that shall be carried into the final design. In this phase, the Town and its contractor will identify options available to achieve the Town's objectives, along with advantages and disadvantages of each option, in order to make an informed decision about bringing the WWTF into compliance with its Permit limits.
2. By January 31, 2023, the Town shall submit a Preliminary Design Report ("PDR") to EPA and NHDES, for review and comment, summarizing the results of the Preliminary Design Phase. The PDR shall be consistent with Task 1 (Preliminary Design Phase) item 6 (Preliminary Design Report) and shall summarize the preliminary design efforts and include, but not be limited to, the following information:
    a. Summarize the issues associated with each component, options considered, proposed solutions and basis for selection, and associated estimated capital and Operation and Maintenance ("O&M") costs.
    b. Advise if additional report, data, or other information or services are necessary.
    c. Describe the recommended improvements, including new buildings and new or modified building support systems.
    d. Establish the design criteria, unit processes sizing, redundancy, and materials of construction.
    e. Provide preliminary design layouts, including site layout, site piping, existing buildings/tankage, and new buildings/ tankage.
    f. Provide electrical and control system concepts defining local control station, equipment controls and system control. Provide preliminary functional control concepts for each system. Describe the interface with the existing electrical and control systems.
    g. Estimate the construction and project costs.
    h. Refine the project schedule for design, permitting, funding, bidding, and construction.
    i. Describe the construction sequencing requirements.

3. EPA and NHDES shall review the PDR, and if necessary, shall discuss the possible solutions based on the report submitted in Paragraph IV.2 with Town representatives. EPA, after consultation with NHDES, may provide comments on the PDR submitted in Paragraph IV.2, to the Town.
4. By March 31, 2023, the Town shall complete the Value Engineering Process as described in Task 2 of Attachment 2, which involves review of the preliminary design by an independent engineering team, and which may result in recommended changes to the final design. Proposed changes resulting from the Value Engineering Process shall be incorporated into the final PDR.
5. By December 31, 2023, based on the PDR submitted under Paragraph IV.2, consistent with any comments provided to the Town under Paragraph IV.3, and incorporated changes proposed under Paragraph IV.4, the Town shall conclude its Final Design Phase consistent with Task 3 in Attachment 2. Any substantial modifications to the PDR submitted under Paragraph IV.2, shall be reported to EPA and NHDES. The Town shall implement the Final PDR during the Final Design Phase, subject to any comments provided by EPA after consultation with NHDES related to any substantial modifications to the PDR, pursuant to this Order.
6. By March 31, 2024, the Town shall have concluded Task 4, Bidding Phase in Attachment 2, including awarding contracts for implementation of the work required under the Final Design.
7. By June 30, 2026, the Town shall complete all construction phases of the Final Design.
8. By September 30, 2026, the Town shall meet all permit limits, including Total Phosphorus and Ammonia Nitrogen.
9. The schedules described in Part IV of this Order shall be incorporated and enforceable hereunder, or as amended by EPA.
10. All work pursuant to this Order shall be performed using sound engineering practices to ensure that construction, management, operation and maintenance of the Town’s WWTF, complies with the CWA.

### Interim Limits and Monitoring Requirements

11. Upon the effective date of this Order, the Permittee shall, at a minimum, comply with the interim effluent limitations for Total Phosphorus and Ammonia Nitrogen, set forth in Attachment 1 of this Order.

12. The Permittee shall comply with all other effluent limitations, monitoring requirements and other conditions specified in the Permit for the parameters not covered in Part IV of this Order or Attachment 1.

### Reporting Requirements

13. The Town shall submit semi-annual reports to EPA and NHDES summarizing its compliance with the provisions of this Order. Progress reports shall be submitted on, or before, January 15th and July 15th of each year, starting January 15, 2023. Each progress report submitted pursuant to this paragraph shall: a) describe activities undertaken during the reporting period directed at achieving compliance with this Order; b) identify all plans, reports, and other deliverables required by this Order that have been completed and submitted during the reporting period; c) describe the expected activities to be taken during the next reporting period in order to achieve compliance with this Order; and d) identify any anticipated or potential areas of noncompliance with this Order.

## V. NOTIFICATION PROCEDURES

l. Where this Order requires a specific action to be performed within a certain time frame, the Town shall submit to EPA and NHDES a written notice of compliance or noncompliance with such action within seven (7) days following the applicable deadline; however, written notice of compliance is not necessary if the action required by the Order includes submission of a document, report, or other written material, and the Town has timely submitted such document, report, or written material to EPA and NHDES.

2. If noncompliance is reported, notification should include the following information:

    a. A description of the noncompliance;

b. A description of any actions taken or proposed by the Town to comply with the required action.

c. A description of any factors that explain or mitigate the noncompliance; and

d. The date by which the Town will perform the required action. [1]

3. After a notification of noncompliance has been filed, compliance with the past-due requirement shall be reported by submitting all required documents or providing EPA with a written report indicating that the required action has been achieved. Submissions required by this Order shall be in writing and sent via email to the addresses below. EPA or NHDES may request that some items, such as design reports, to be sent in hard copy as well to the following addresses:

U.S. Environmental Protection Agency
Region 1, New England
Enforcement and Compliance Assurance Division
5 Post Office Square – Suite 100
Boston, MA 02109-3912
Attn: Solanch Pastrana-Del Valle (Mail Drop 4-MO)
Pastrana-Del-Valle.Solanch@epa.gov

and

New Hampshire Department of Environmental Services
Water Division
Wastewater Engineering Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095
Attn: Teresa Ptak
Teresa.b.ptak@des.nh.gov

## VI. GENERAL PROVISIONS

1. This Order does not constitute a waiver or a modification of the terms and conditions of the Town's NPDES Permit. The Town's NPDES Permit remains in full force and effect.

2. EPA reserves the right to seek any and all remedies available under Section 309 of the Act, 33 U.S.C. § 1319, as amended, for any violation cited in this Order.

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[1] Note that this is not an extension to the original deadline.

3. The Town may seek federal judicial review of the Order pursuant to Chapter 7 of the Administrative Procedure Act, 5 U.S.C. §§ 701-706.

4. This Order shall become effective upon receipt by the Town.

__________________
Date

___________________________________
Karen McGuire, Director
Enforcement and Compliance Assurance Division
EPA Region 1

# ATTACHMENT 1

## Interim Effluent Limits and Monitoring Requirements

The Town shall comply with the following interim effluent limit and monitoring requirement from the effective date of the Order until the date the applicable improvements implemented pursuant to Paragraph IV of this Order are fully operational or by the date that EPA determines that the Town has not complied with the milestones set forth in this Order, whichever is earlier.

| **Effluent Characteristic** | **Effluent Limitation** | | | **Monitoring Requirements** | |
|---|---|---|---|---|---|
| | Average Monthly | Average Weekly | Maximum Daily | Measurement Frequency | Sample Type |
| Ammonia Nitrogen<br>(May 1 – October 31) | 33.50 mg/L<br>Report lb/day | --- | Report mg/L | 1/week | Grab |
| Ammonia Nitrogen<br>(November 1 - April 30) | 26.1 mg/L<br>Report lb/day | --- | Report mg/L | 1/week | Grab |
| Total Phosphorus<br>(April 1 - October 31) | 22.5 lb/day<br>Report mg/L | --- | Report lb/day<br>Report mg/L | 1/week | Grab |
| Total Phosphorus<br>(November 1st - March 31) | 3.6 mg/L<br>Report lb/day | --- | Report lb/day<br>Report mg/L | 1/week | Grab |

# ATTACHMENT 2

Preliminary Design Phase Scope of Services, Newport, NH – WWTF Upgrade

From the Agreement Between Owner and Engineer for Professional Services" with Wright-Pierce,
Attachment A to the Agreement

(Separate Document)

# Appendix B
# Basis of Design Memoranda

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade | | |
| Subject: | WWTF Flows and Loads Analysis | | |
| Prepared By: | Dylan Atkins | Date: | 8/4/2022 |
| Reviewed By: | Michael Curry, Jeff Mercer | Date: | 8/11/2022 |
| Revised By: | Dylan Atkins | Date: | 8/26/2022 |

## Introduction

A complete flows and loads analysis was developed for the Town of Newport WWTF Facilities Plan Amendment (May 2022). The analysis used data contained in Monthly Operation Reports (MOR) from January 2006 through September 2021. Evaluation of the flows and loads from 2006 – 2021 indicated that the influent flows to the WWTF have shown an overall decrease since 2006. This observed decrease can be attributed, at least in part, to the Town's efforts to reduce inflow and infiltration (I/I) from the collection system over the past five to seven years including the First, Second, Third, and Fourth Street Infrastructure upgrades. Subsequently, influent flows and loads data prior to 2015 was excluded from the analysis because the data prior to 2015 does not accurately represent current (or future projection) flow and load conditions at the WWTF.

The purpose of this memorandum is to:

1. Update the flows and loads analysis performed for the Facilities Plan Amendment (May 2022) with monthly operating report (MOR) data recorded from October 2021 through July 2022
2. Update flows and loads analysis performed for the Facilities Plan Amendment with supplemental sampling data which the Town completed from April 2022 through July 2022
3. Update both the current (2022) and design (2042) flows and loads for the WWTF upgrade considering the additional data from items 2 and 3 above
4. Develop updated buildout flows and loads for the WWTF for future expansion considerations

The design flows and loads presented in this memorandum will be referenced as the basis of design for sizing equipment and structures for each operation and process of the WWTF Upgrade.

## Description of Relevant Existing Facilities

The Town of Newport's wastewater is generated from two general sources: sewage flow from residential, commercial, and industrial sources; and infiltration and inflow (I/I), which is water from extraneous sources such as storm drains, cellar drains and roof leaders and is generally associated with rainfall or ground water. Existing flow metering at the WWTF captures the sum of both sources (sewage flow and I/I) but does not capture the fraction of each. In addition, the Town receives septage from surrounding Towns in a dedicated septage receiving tank.

Influent flow is currently measured by an influent Parshall flume meter installed in the Grit Building and effluent flow data is currently measured by a Parshall flume with ultrasonic flow element located after UV disinfection. Influent samples are collected upstream of the influent screen and effluent samples are collected upstream of the Parshall flume just before the ultrasonic level by a composite sampler. Total, minimum, and peak flows are recorded daily, however $BOD_5$ and TSS data are recorded once per week.

## Flows and Loads Basis of Design

Key flow and load conditions utilized as the basis of the evaluation are identified and defined below:

- Annual Average: This is the average of daily data for the study period. The average flows and loadings are important benchmarks, but capacity is typically controlled by other design criteria.
- Maximum Month: This is the maximum 30-day running average for the study period. The maximum month conditions are an important measure of sustained treatment capacity requirements and typically control biological process design.
- Max Day: This is the maximum single day that occurs for each parameter during the period. The single maximum day values for the data set are reported along with the percentile values (99.8th% for flow and 99.4th% for load).
- Peak Hour: This is the peak instantaneous recorded value during any one day and is only determined (and available) for flow. The peak hour flow is an important hydraulic consideration for the design of unit processes. Sufficient hydraulic capacity is typically provided for the peak recorded flow rate to prevent overtopping of channels and structures. However, individual unit processes would typically be sized for the 98th- 99.8th percentile flow rate.
- Minimum Day: This is the minimum recorded value during any one day. The minimum flow is an important hydraulic consideration for the design of unit process to ensure that velocities are adequate to prevent solids deposition and that the process equipment are not oversized. The minimum load is an important process consideration for the design of aeration equipment to ensure efficient turndown of the equipment is available during low organic loadings and oxygen demands.

## Existing Flows and Loads

Influent wastewater data from January 2015 through July 2022 were characterized for flows and loads characteristics separately. Figure 1 (Flow Trends) displays the daily influent flows recorded, 30-day rolling average influent flows, and annual average influent flows recorded at the WWTF. Figure 2 (Load Trends) displays the recorded influent daily $BOD_5$ loads, TSS loads, 30-day rolling average $BOD_5$ loads, and 30-day rolling average TSS loads. Table 1presents a summary of both the existing flows and loads observed at the WWTF.

Figure 1 Historical Influent Flows (2015-2022)

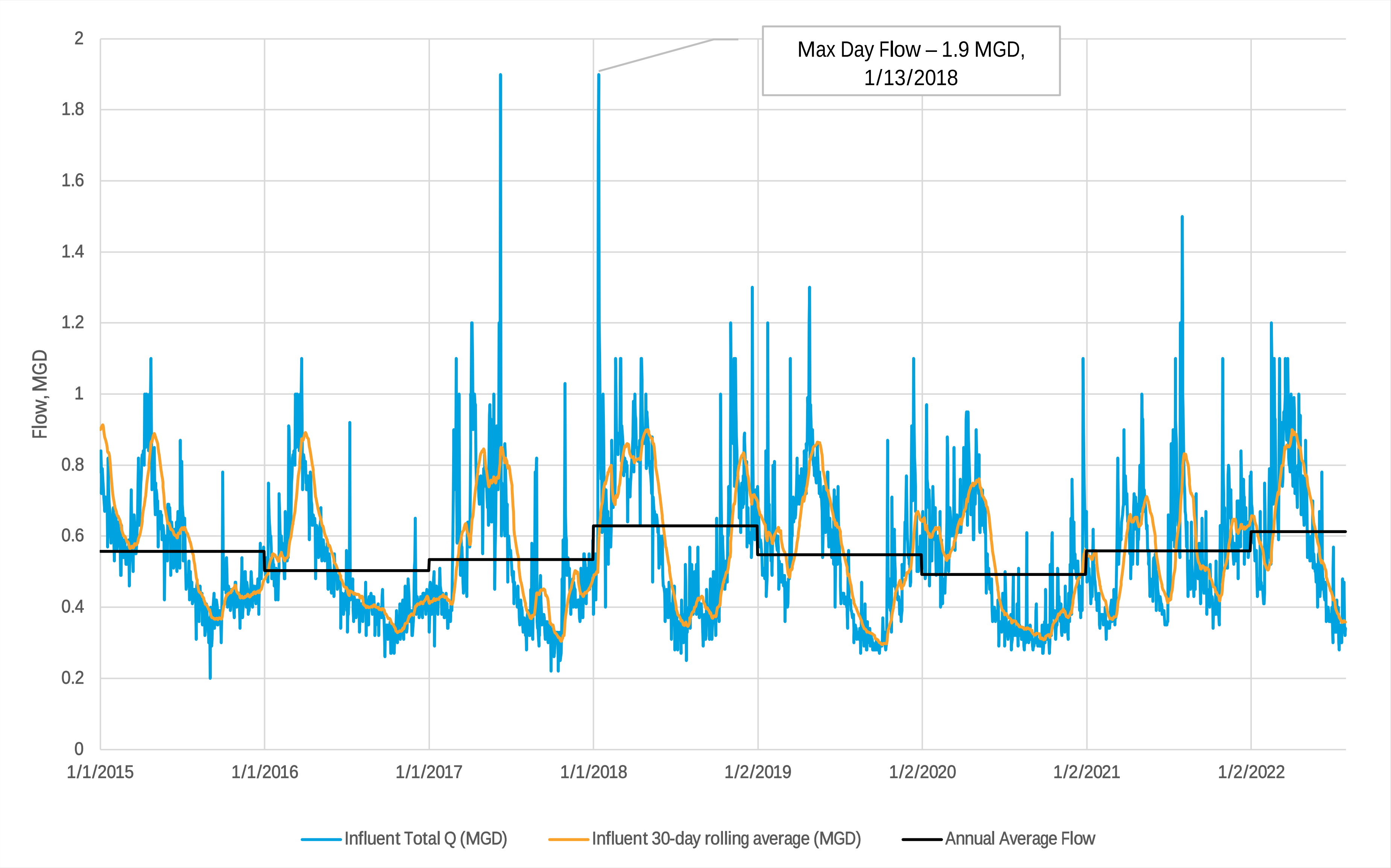


Figure 2 Historical Influent Loads (2015-2022)

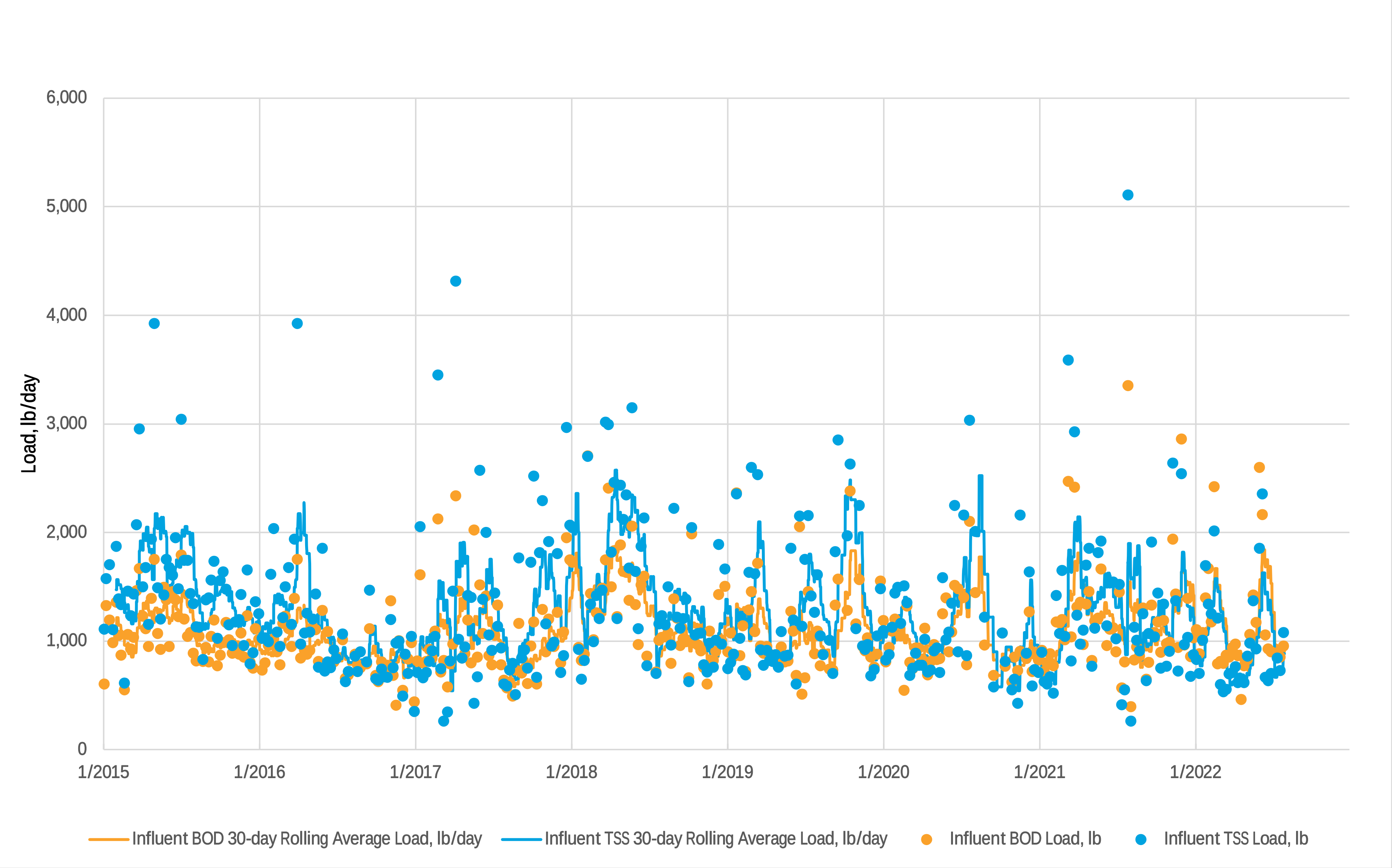


Table 1 Current Flows and Loads Summary (2015 - 2022)

| **Condition** | Flow | | BOD$_5$[6] | | | TSS[6] | | |
|---|---|---|---|---|---|---|---|---|
| | **MGD** | **PF** | **mg/l** | **lb/day** | **PF** | **mg/l** | **lb/day** | **PF** |
| Minimum Day Flow | 0.20 | 0.36 | - | - | - | - | - | - |
| Minimum Day Load[1] | 0.28 | 0.51 | 176 | 410 | 0.38 | 113 | 264 | 0.21 |
| Average Day Flow and Load | 0.55 | 1.00 | 237 | 1,089 | 1.00 | 278 | 1,277 | 1.00 |
| Maximum Month Flow | 0.91 | 1.66 | - | - | - | - | - | - |
| Maximum Month Load[2] | 0.82 | 1.49 | 274 | 1,872 | 1.72 | 376 | 2,573 | 2.02 |
| Maximum Day Flow (99.8th Percentile) | 1.25 | 2.26 | - | - | - | - | - | - |
| Maximum Day Flow (100th Percentile) | 1.90 | 3.45 | - | - | - | - | - | - |
| Maximum Day Load (99.7th %)[3] | 0.61 | 1.11 | 560 | 2,861 | 2.63 | 497 | 2,540 | 1.99 |
| Maximum Day Load (100th %)[4] | 1.20 | 2.18 | 335 | 3,353 | 3.08 | 510 | 5,107 | 4.00 |
| Peak Hour (99.8th Percentile ) | 2.23 | 4.05 | - | - | - | - | - | - |
| Peak Hour (100th Percentile)[5] | 4.96 | 9.00 | - | - | - | - | - | - |

Notes:

1. Minimum day load from 11/16/2016. No TKN, Ammonia, TP, or VSS data available for the minimum day load, however the minimum day organic load will be sufficient for evaluating the turndown requirements of secondary process aeration equipment.
2. Maximum month TSS and BOD$_5$ loads occurred during the same 30- day period from 3/16/2018 to 4/15/2018. The average influent wastewater temperature during this time period was 8°C.
3. Maxim Day 99.7th% load from 12/2/2021 and is the second largest organic load observed at the WWTF.
4. Maximum Day 100th% load from 7/29/2021.
5. Peak hydraulic flow observed at the WWTF occurred on 04/16/2007 and shall be used for hydraulic conveyance purposes only.
6. BOD$_5$ and TSS data are not reported for flow conditions because flow conditions are for hydraulic basis of design only.

### Influent Flow and Load Distribution and Peaking Factor Selection

Peaking factors for the existing max month, max day, and peak hour flows and loads are used to develop design max month, max day, and peak flows and loads by multiplying the appropriate peaking factor times the design average daily flow or load. Additionally, design flows and loads are not typically based on the 100% max day and 100% peak hour peaking factors because the flows and loads based on these peaking factors may be derived from outlier data, resulting in oversized equipment and structures. Wright-Pierce performed a statistical analysis of the daily influent flows and loads to identify appropriate peaking factors to use in development of the design flows and loads.

Table 2 presents results of the statistical analysis of the existing flows and loads and Figure 3 summarizes the flow distribution observed at the WWTF.

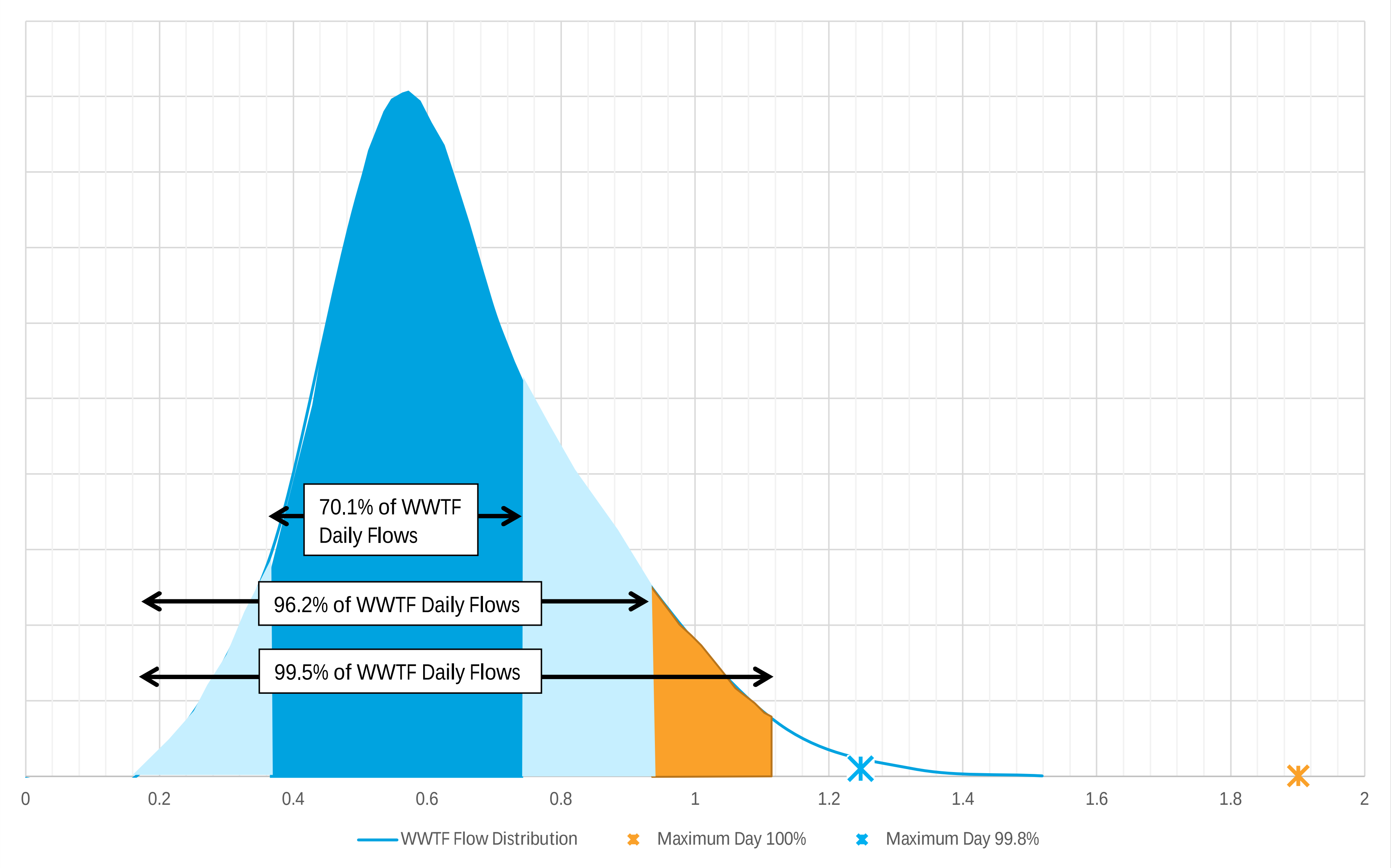
Table 2 Existing Influent Flow and Load Distribution (2015-2022)

| Description of Range | Percentage of Flows within Range[1] | Range of Flows, MGD | Percentage of Loads within Range[2] | Range of Loads, lb $BOD_5$ / day |
|---|---|---|---|---|
| Within One Standard Deviation of the Average | 70.1% | 0.36 – 0.74 | 82.2% | 669 – 1,509 |
| Within Two Standard Deviations of Average | 96.2% | 0.28 – 0.94 | 94.3% | 493 – 1,929 |
| Within Three Standard Deviations of Average | 99.5% | 0.28 – 1.13 | 97.1% | 493 – 2,349 |
| Within Four Standard Deviations of the Average | 99.96% | 0.28 – 1.32 | 99.4% | 493 – 2,769 |

Notes:

1. The average flow is 0.55 MGD and the standard deviation of influent flows is 0.19 MGD.
2. The average $BOD_5$ load is 1,089 lb/day and the standard deviation of influent $BOD_5$ loads is 420 lb/day.

Figure 3 Historical Influent Flow Distribution - MGD (2015-2022)



The 99.8th % maximum day flow peaking factor and 99.7th% maximum day load peaking factors were used to derive the design maximum day flow and load conditions. This approach avoids oversizing equipment and structures based on observed outlying occurrences in the data which may not be representative of true maximum day flow or load conditions.. Flows in excess of the design max day flow (1.5 MGD) will be attenuated in the existing lagoons by a passive flow diversion structure immediately upstream of secondary treatment process. The existing/repurposed Lagoon Pump Station will return these excess flows to the Screen Room once flows have subsided.

### Supplemental Sampling

Beginning in April 2022 the Town began composite sampling of the following supplemental influent data to assist with the WWTF upgrade design:

- TKN
- Ammonia
- Total Phosphorus
- Alkalinity
- VSS

Table 3 presents the critical average, maximum month, and maximum day loads observed during the time supplemental sampling was conducted.

Table 3 Supplemental Sampling Loads Summary (April, 2022 – July, 2022)

| Load | Flow | BOD | | TSS | | TKN | | Alkalinity | | Total Phosphorus | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MGD | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| Minimum Day Load[1] | 0.85 | 65 | 461 | 92 | 652 | 18 | 129 | 85 | 605 | 3 | 18 |
| Average Day Load[2] | 0.53 | 254 | 1,119 | 222 | 979 | 40 | 175 | 175 | 769 | 5 | 22 |
| Maximum Month Load[3] | 0.51 | 433 | 1,840 | 605 | 2,573 | 56 | 237 | 218 | 929 | 8 | 32 |
| Maximum Day Load[4] | 1.20 | 260 | 2,598 | 185 | 1,855 | 36 | 363 | 94 | 944 | 4 | 45 |

Notes:

1. Minimum day load from 04/21/2022.
2. Average day load from 04/07/2022 to 07/31/2022
3. Maximum month BOD load from 05/12/2022 to 06/10/2022.
4. Maximum Day load from 06/03/2022.

## Design Flows and Loads

The design flows for the WWTF are a function of anticipated sewered population growth, commercial and industrial development, and Inflow & Infiltration (I/I). Projected wastewater flows are typically developed over a 20-year planning period (2022-2042) for infrastructure planning efforts. According to the US Census Bureau data on population, the Town of Newport's population has increased by approximately 1% over the last 20 years and 4% over the last 30 years. These modest population growth rates are typical for similar rural areas in New Hampshire. The WWTF also serves a significant industrial manufacturer; however, based on discussions with the Town, this industrial user has taken steps to reduce their wastewater impacts to the Town's WWTF. Based on discussions with the Town, no further significant growth projections are anticipated within the sanitary sewer system in the 20-year planning period.

Based on historical population trends and the commercial/industrial users within the Town, the proposed design wastewater flows for the proposed WWTF are recommended to include a 10% growth factor for residential users, and a 10% growth factor for commercial/industrial users. This results in an overall growth factor of 20% for the 20-year buildout and a projected average day flow of 0.66 MGD for 2042. Based on historical wastewater trends within the Town and analysis of historical census data, this growth factor will allow the Town to accommodate economic and residential growth opportunities throughout the 20-year planning period and beyond. Table 4 presents design flows and loads for the design average day flow of 0.66 MGD.

Table 4 Design[1] Flows and Loads Summary (2042)

| Condition | Flow | BOD | | TSS | | TKN[2] | | Alkalinity | | Total Phosphorus | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MGD | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| Minimum Day Flow | 0.24 | | | | | | | | | | |
| Minimum Day Load | 0.34 | 176 | 493 | 113 | 317 | 49 | 138 | 85 | 239 | 3 | 7 |
| Average Day Flow and Load | 0.66 | 237 | 1,308 | 278 | 1,533 | 37 | 204 | 175 | 964 | 5 | 27 |
| Maximum Month Flow | 1.10 | | | | | | | | | | |
| Maximum Month Load[4] | 0.98 | 274 | 2,248 | 376 | 3,089 | 35 | 289 | 218 | 1,793 | 8 | 62 |
| Maximum Day Flow[5] | 1.50 | | | | | | | | | | |
| Maximum Day Load | 0.74 | 560 | 3,435 | 497 | 3,049 | 78 | 480 | 94 | 579 | 4 | 28 |
| Peak Hour Flow[3] | 4.96 | | | | | | | | | | |

Notes:

1. Design flows and loads were calculated using a 20% growth factor from the existing flows and loads data presented in Table 1.
2. TKN concentration calculated for each condition using the observed BOD:TKN ratio from supplemental sampling and design BOD concentrations.
3. Peak hour flows from 04/16/2017 do not include a 20% growth factor flow due to the Town's ongoing efforts to reduce significant sources of inflow and infiltration.
4. Design wastewater temperature for the max month load condition is 8°C.
5. Daily flows in excess of 1.5 MGD will be conveyed to the lagoons for temporary flow attenuation and re-equalization to the process after influent flows have subsided.

## Future Expansion Considerations

The Town's NPDES discharge permit allows for the Town to discharge up to 1.3 MGD on a rolling annual average basis. Since the proposed 20-year projected annual average flows are approximately 50% of the permitted wastewater flow, the proposed WWTF upgrade project will include process and site planning provisions to allow the new WWTF to be upgraded beyond the 20-year planning period to meet the permitted WWTF capacity. Future planning provisions for the 1.3 MGD WWTF shall be considered in the design including:

- Future process tank siting requirements,
- Future process requirements (i.e., solids handling, tertiary filtration),
- Future site piping and distribution structures and considerations

Table 5 presents the future buildout projected wastewater flows and loads for the permitted capacity of the WWTF.

Table 5 Future Buildout - Permitted Capacity Flows and Loads

| Condition | Flow Rate, MGD | BOD | | TSS | |
|---|---|---|---|---|---|
| | | mg/L | lb/day | mg/L | lb/day |
| Minimum Day Flow | 0.47 | - | - | - | - |
| Minimum Day Load | 0.66 | 176 | 969 | 113 | 623 |
| Average Day Flow and Load | 1.30 | 237 | 2,570 | 278 | 3,012 |
| Maximum Month Flow | 2.15 | - | - | - | - |
| Maximum Month Load | 1.93 | 274 | 4,417 | 376 | 6,071 |
| Maximum Day Flow | 2.94 | - | - | - | - |
| Maximum Day Load | 1.45 | 560 | 6,750 | 497 | 5,992 |
| Peak Hour Flow[1] | 4.96 | - | - | - | - |

Notes:

1. Peak hour flows from 04/16/2017 do not include a 20% growth factor flow due to the Town's ongoing efforts to reduce significant sources of inflow and infiltration.

## File Location

J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process_DMRs_Flows_Loads

| | | | | |
|---|---|---|---|---|
| PROJECT NAME: | Newport, NH WWTF Upgrade | ISSUED DATE: | 12/1/2022 | BLUE TEXT IS FOR DATA ENTRY, BLACK TEXT IS FOR CALCULATED DATA |
| PHASE: | Preliminary Design | REV NO.: | 5 | **BOLD TEXT IS FOR NEW EQUIPMENT** |
| PROJECT NO: | 20828B - Preliminary Design | | | *ITALIC* TEXT IS FOR EXISTING-TO-REMAIN EQUIPMENT |

MASTER EQUIPMENT LIST FOR PROCESS EQUIPMENT

| EQUIPMENT NAME | EQUIPMENT TAG | NO OF UNITS & STANDBY POWER LOAD STEPS | | | | | ELECTRICAL INFORMATION | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | TOTAL HP | | | | | | | |
| | | NO. TOTAL | NO. OPER. | NO. FUTURE (if any) | NO. RUNNING ON STANDBY POWER | STANDBY LOAD STEP | EACH | CONN. | OPER. | FUTURE | ON STANDBY POWER | POWER (VOLTAGE) | CLASSIFIED | STARTER TYPE |
| HEADWORKS | | | | | | | | | | | | | | |
| *Mechanical Screen (Auger Monster)* | *SCR-1* | *1* | *1* | *0* | *1* | *1* | *2* | *2* | *2* | *0* | *2* | *460* | *C1/D1* | *-* |
| *Screenings Grinder* | *GR-1* | *1* | *1* | *0* | *1* | *1* | *3.5* | *3.5* | *3.5* | *0* | *3.5* | *460* | *C1/D1* | *-* |
| *Influent Composite Sampler* | *AS-1* | *1* | *1* | *0* | *1* | *1* | *0* | *0* | *0* | *0* | *0* | *120* | *C1/D1* | *-* |
| Influent Pumps | INFP-1, -2, -3 | 3 | 2 | 0 | 2 | 1 | 35 | 105 | 70 | 0 | 70 | 460 | UNCL BY VENT | VFD |
| Grit Removal System | GTMX-1 | 1 | 1 | 0 | 1 | 1 | 0.75 | 0.75 | 0.75 | 0 | 0.75 | 460 | UNCL BY VENT | VFD |
| Grit Classifier | GTC-1 | 1 | 1 | 0 | 1 | 4 | 0.50 | 0.5 | 0.5 | 0 | 0.5 | 460 | UNCL BY VENT | FVNR |
| Grit Pump | GTP-1 | 1 | 1 | 1 | 1 | 4 | 15 | 15 | 15 | 15 | 15 | 460 | UNCL BY VENT | VFD |
| | | | | | | | | | | | | | | |
| SECONDARY TREATMENT | | | | | | | | | | | | | | |
| Aeration Blowers | ATB-1, ATB-2, ATB-3 | 3 | 2 | 1 | 2 | 3 | 60 | 180 | 120 | 60 | 120 | 460 | UNCL | VFD |
| Motor Operated Valves (Air) | MOV-3, -4 | 2 | 1 | 1 | 2 | 1 | 0.25 | 0.5 | 0.25 | 0.25 | 0.5 | 460 | UNCL | - |
| Motor Operated Gates (Influent) | FCV-1, -2 | 2 | 1 | 1 | 2 | 1 | 0.5 | 1 | 0.5 | 0.5 | 1 | 460 | UNCL | - |
| Motor Operated Valves(Effluent) | MOV-1, -2 | 2 | 1 | 1 | 2 | 1 | 0.25 | 0.5 | 0.25 | 0.25 | 0.5 | 460 | UNCL | - |
| Floating Mixers | MX-1, -2 | 2 | 2 | 1 | 2 | 2 | 15 | 30 | 30 | 15 | 30 | 460 | C1/D2 | FVNR |
| Waste Sludge Pumps | WSLP-1, -2 | 2 | 1 | 1 | 1 | 2 | 2 | 4 | 2 | 2 | 2 | 460 | C1/D2 | VFD |
| Effluent Equalization Pumps | EEQP-1, -2, -3 | 3 | 2 | 0 | 2 | 2 | 5 | 15 | 10 | 0 | 10 | 460 | C1/D2 | VFD |
| | | | | | | | | | | | | | | |
| SOLIDS HANDLING | | | | | | | | | | | | | | |
| Sludge Tank Blowers | SLTB-1, -2 | 2 | 2 | 0 | 1 | 4 | 15 | 30 | 30 | 0 | 15 | 460 | UNCL | VFD |
| Centrifuge | CEN-1, -2 (Future) | - | - | - | - | - | - | - | - | - | - | - | UNCL BY VENT | - |
| Centrifuge - Main Drive | CEN-1A, -2A (Future) | 1 | 1 | 1 | 1 | 4 | 40 | 40 | 40 | 40 | 40 | 460 | UNCL BY VENT | VFD |
| Centrifuge - Back Drive | CEN-1B, -2B (Future) | 1 | 1 | 1 | 1 | 4 | 20 | 20 | 20 | 20 | 20 | 460 | UNCL BY VENT | VFD |
| Sludge Screw Conveyors (Jockey) | SC-1, SC-3 (Future) | 1 | 1 | 1 | 1 | 4 | 2 | 2 | 2 | 2 | 2 | 460 | UNCL BY VENT | FVR |
| Sludge Screw Conveyors (Container Loading) | SC-2 | 1 | 1 | 1 | 1 | 4 | 5 | 5 | 5 | 5 | 5 | 460 | UNCL BY VENT | FVR |
| Sludge Grinders (Future) | DSLG-1 (Future), DSLG-2 (Future) | 0 | 0 | 2 | 1 | 4 | 5 | 0 | 0 | 10 | 5 | 460 | UNCL BY VENT | FVR |
| Dewatering Sludge Feed Pumps | DSLP-1, -2 | 1 | 1 | 1 | 1 | 4 | 10 | 10 | 10 | 10 | 10 | 460 | UNCL BY VENT | VFD |
| Emulsion Polymer System - Dewatering | PBU-1, PBU-2 (Future) | 1 | 1 | 1 | 1 | 4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 110 | UNCL BY VENT | - |
| Sludge Tank Decant Pump | DECP-1 | 1 | 1 | 0 | 0 | 4 | 2 | 2 | 2 | 0 | 0 | 110 | C1/D2 | FNVR |
| Odor Control Unit (Future) | OC-1 (Future) | 0 | 0 | 1 | 0 | 4 | 10 | 0 | 0 | 10 | 0 | 460 | C1/D2 | VFD |
| | | | | | | | | | | | | | | |
| TERTIARY TREATMENT | | | | | | | | | | | | | | |
| *Rapid Mix Tank Mixers* | *RMM-1* | *1* | *1* | *0* | *1* | *3* | *1.5* | *1.5* | *1.5* | *0* | *1.5* | *460* | *UNCL* | *FVNR* |
| *Flocculation Tank Mixer* | *FLM-1* | *1* | *1* | *0* | *1* | *3* | *1.5* | *1.5* | *1.5* | *0* | *1.5* | *460* | *UNCL* | *FVNR* |
| *Coagulation Tank Mixer* | *COM-1* | *1* | *1* | *0* | *1* | *3* | *1.5* | *1.5* | *1.5* | *0* | *1.5* | *460* | *UNCL* | *FVNR* |
| Tertiary Disc Filters | TDF-1, TDF-2 | | | | | 3 | | | | | | | | |
| Disc Filter Drives | DF-1, -2 | 2 | 1 | 0 | 1 | 3 | 1 | 2 | 1 | 0 | 1 | 460 | UNCL | FVNR |
| Disc Filter Backwash Pumps | FBWP-1, -2 | 2 | 1 | 0 | 1 | 3 | 7.5 | 15 | 7.5 | 0 | 7.5 | 460 | UNCL | VFD |
| *Tertiary Spent Backwash Water Pumps (abandon)* | *SBWP-1, -2* | *0* | *0* | *0* | *0* | *3* | *0* | *0* | *0* | *0* | *0* | *460* | *UNCL* | *VFD* |
| Coagulant Chemical Feed Pumps | FECLP-1, -2 | 2 | 1 | 0 | 1 | 3 | 0.1 | 0.2 | 0.1 | 0 | 0.1 | 110 | UNCL | VFD |
| | | | | | | | | | | | | | | |
| SEPTAGE | | | | | | | | | | | | | | |
| Septage Pump | SEPP-1 | 1 | 1 | 0 | 0 | 4 | 7.5 | 7.5 | 7.5 | 0 | 0 | 460 | C1/D1 | VFD |
| Septage Blower (Future) | SEPB-1 (Future) | 0 | 0 | 1 | 0 | 4 | 5 | 0 | 0 | 5 | 0 | 460 | UNCL | VFD |
| *Septage Tank Mechanical Mixer* | *STMX-1* | *1* | *1* | *0* | *1* | *0* | *5* | *5* | *5* | *0* | *5* | *460* | *C1D1* | *FVNR* |
| | | | | | | | | | | | | | | |
| MISCELLANEOUS | | | | | | | | | | | | | | |
| Plant Water Pumps | PWP-1, -2 | 2 | 1 | 0 | 1 | 3 | 10 | 20 | 10 | 0 | 10 | 460 | UNCL BY VENT | VFD |
| Lagoon Equalization Pump Station | LEP-1, -2 | 2 | 1 | 0 | 1 | 3 | 7.5 | 15 | 7.5 | 0 | 7.5 | 460 | UNCL | VFD |
| | | | | | | | | | | | | | | |
| DISINFECTION | | | | | | | | | | | | | | |
| UV Disinfection | UV-1, -2, -3 | 3 | 2 | 0 | 2 | 2 | 7 | 22 | 15 | 0 | 15 | 460 | UNCL | - |
| Effluent Composite Sampler | AS-2 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 120V | UNCL | - |
| | | | | | | | | | | | | | | |
| PROCESS TOTALS | | | | | | | | 558 | 422 | 196 | 404 | | | |

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | **20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade** | | |
| Subject: | **Influent Pump Station** | | |
| Prepared By: | **S. Viola** | Date: | **10/3/2022** |
| Reviewed By: | **J. Mercer** | Date: | **10/5/2022** |
| Revised By: | **S. Viola** | Date: | **10/18/2022** |

## Introduction

This technical memorandum provides a summary of considerations for the Influent Pump Station and discharge force main as part of the wastewater treatment facility (WWTF) upgrade preliminary design.

## Description of Relevant Existing Facilities

The wastewater treatment facility (WWTF) was originally constructed in 1971 as a primary treatment facility. The process consisted of influent pumping from the Control Building to grit removal and primary treatment prior to final discharge to the Sugar River. In 1988, the WWTF was upgraded to a secondary treatment facility. As part of that upgrade, the Town upgraded the influent pump station with fine screening equipment and replaced the pumps, piping, and valves.

The existing influent pump station consists of a two-part wet well and an adjacent dry well containing two centrifugal pumps. The wet well consists of two separate wet wells divided by a concrete wall, each isolated by a manual slide gate. The wet well levels are controlled by a single, shared bubbler system that was installed in 1987. Wet Well No. 1 consists of a screenings grinder and mechanical fine screen (Auger Monster) installed in the influent channel and Wet Well No. 2 consists of a manual bar rack that was installed in the influent channel during original construction. The wet wells are connected via an 8-inch wet well balance line that is conveyed through the dry well to maintain the same water depth between wet wells when the line valves are open.

The wet well shares a common wall with the dry well, which houses two Worthington 8MB013, 60 hp, 1176 rpm pumps, with a design point of 3,500 gallons per minute (gpm) at 53 feet of total dynamic head (TDH). Currently, these pumps convey wastewater from the wet wells to the Grit Building via a single 12-inch ductile iron force main. From the Grit Building, flows are recorded via a Parshall Flume before being conveyed to the aerated lagoons. Although each pump is rated for 3,500 gpm at 53 ft TDH, discharge piping from each pump has a small diameter recirculation line that conveys a portion of the pumped flow back to the wet well. Recirculating a portion of the flow back to the wet well allows each pump to operate for a 24-hour period with minimal pump cycling. The recirculating flow was designed to reduce the risk of cavitation since the recirculated flow keeps the wet well level from dropping too fast. Due to this, the Parshall flume does not accurately record the total flow being pumped by the influent pumps. Without the recirculation line the pumps would cycle on and off much more frequently because the pumps cannot turn down low enough to match influent flows. Additionally, unless the recirculation line is valved off the pumps cannot convey the peak hour flow for which they were originally designed for.

The existing pump removal system consists of a 2-ton monorail with hoist and trolley designed to lift the influent pumps from the Pump Room up to the Motor Control Room on the first floor of the Control Building. Plant personnel indicated that the current hoist system configuration makes maintaining the pumps and motors difficult since the hatch opening is not situated over the pumps.

The existing pumps have served the Town well but have surpassed their useful life. Further, with the proposed secondary treatment upgrades, the pumps will require different head capacities due to new force main piping configurations, prompting the evaluation of the pumps and the recommendations provided herein.

## Facility Plan Recommendations

The Facility Plan Amendment recommends the following:

- Influent pump replacement to ensure continued long-term reliability and efficient pump performance in the new application.
- Demolish existing influent Parshall flume and replace with a magnetic influent flow meter or new Parshall flume prior to the secondary treatment process.

## Client Preferences

The client has indicated the following preferences:

- Electrical quick disconnects installed on the influent pumps.
- Ease of maintenance and access to the pumps.
- Replacement in-kind of wet well level measurement device.

## Design Guidelines

NH Code of Admin., Env-Wq 700-

- A minimum of two pumps, each designed to handle peak hourly flows, shall be provided.
- Where three or more pumps are provided, they shall be designed such that, with any one unit out of service, the remaining units shall have the capacity to handle peak hourly flows.
- Sewerage pumping stations with capacities more than 250 gpm or equipped with variable speed pumps shall have continuous flow recording and totalizer capability.

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- The wet well should be divided into two sections that are properly interconnected and gated to facilitate repair and cleaning.

## Acceptable Manufacturers

- Flygt, Norwalk, CT
- KSB Inc., Richmond, VA
- Or equal

## Basis of Design

Based on the Flows and Loads analysis of WWTF data, the existing influent pumps are sized appropriately for current and projected flows. The design peak hourly flow determined as part of the Flows and Loads analysis is 4.96 MGD, or 3,445 gpm. Based on the existing configuration of the pumps, there are two viable options for modifications: replace the influent pumps in-kind and re-use existing piping or upgrade to a triplex configuration and replace with new piping in the dry well.

The Flows and Loads analysis determined that although the design peak hourly flow is 4.96 MGD, the design average is much less, at 0.66 MGD. Therefore, in order for the influent pump station to remain a duplex pump station, the recirculation on the discharge piping would need to remain or if removed, the pumps would cycle much greater than six times in an hour. To abate the recirculation flows and 24-hour pump operation, it is recommended to upgrade the station to a triplex configuration. In this configuration, the pumps can each operate at a design point of less capacity and still meet peak hourly flow redundancy requirements.

The new pump configuration will be retrofitted within the existing Pump Room of the Control Building. New suction and discharge piping within the dry well will be required to accommodate the additional pump. The third pump will be constructed between the two existing influent pump pads and will feed off a common suction header between INFP-1 and INFP-3. INFP-2 will serve as the standby pump, while INFP-1 and INFP-2 operate as lead and lag configuration.

| Influent Pumps | |
|---|---|
| Application: | Pump screened raw wastewater to grit facility |
| Type: | Dry-pit, vertical non-clog centrifugal |
| Number of Units: | 3 (INFP-1, -2, -3) |
| Design Condition: | 1,722 gpm @ 41 ft TDH |
| Minimum Flow: | 750 gpm @ 30.2’ TDH |
| Suction/Discharge Diameter | 10-inch/8-inch |
| Motor: | 35 HP; 460V/3ph/60 Hz |
| Pump Room Rating: | Unclassified |
| Other | 10-inch Flow Meter, variable speed (VFD) |

Suction and discharge piping for the triplex pumps will be replaced as part of this upgrade. Suction piping for the three pumps and the new common suction header will be 12-inch ductile iron pipe. New 10-inch ductile iron discharge piping will be constructed for all three pumps. The discharge header will be replaced to accommodate the additional pump. New 12-inch ductile iron pipe will penetrate the Control Building wall at a new location and a new 12-inch high density polyethylene (HDPE) force main will convey influent flows underground to the new Process Building where flows discharge to the new grit facility.

## Building / Structure Implications

### Piping System

Suction piping will be fed through two suction intakes, one for each wet well, that will feed the three pumps through a common suction header. Consideration was given to include three separate suction intakes, however, the existing wet well configuration would require major modification to accommodate space for the additional piping. Based on the space constraints within the dry well, suction and discharge piping around the pump will be stacked.

### Wet Well

No modifications are anticipated for the wet well slide gates, the influent screens or the wet wells themselves. Although a portion of the suction piping will be replaced to support the new pump configuration, the suction piping intake and wall pipe penetrations will remain existing.

### Dry Well

The dry well will be upgraded to accommodate the new triplex configuration. The existing suction pipe wall penetrations will be reused. The discharge piping will be constructed through a new wall penetration prior to departing the Control Building. A new discharge pipe penetration is necessary to accommodate the triplex pump configuration within the existing space.

There are multiple capped pipe wall penetrations within the Pump Room not associated with the influent pumps. These penetrations were previously associated with since abandoned plant water pumps, drainage from the primary sedimentation basins, and septage pumps. There is currently a drain line still connected to the pipe penetration from the primary sedimentation basin. This was used for draining decant from a since removed lagoon sludge dewatering system to the dry well sump. The sump, located near the influent pumps, discharges back to the wet well for treatment. Since the Town has since abandoned the dewatering efforts, this drain line is no longer in-use. It is recommended to remove the drain line within the dry well and cap the pipe at the wall penetration or re-purpose for the new plant water system discussed under a separate technical memorandum.

### Structural Information

| Pump Information (Approx.) | |
|---|---|
| Height (approx.) | 4.2 ft |
| Width (approx.) | 2.1 ft |
| Length (approx.) | 3.2 ft |
| Pump Weight | 1,425 lbs |

## Process Control Description & Electrical

The existing influent pumps each run off a VFD that were installed in 2006. The VFD's are located in the Motor Control Centers (MCC's) in the Motor Control Room, above the Pump Room. Each VFD has a Hand-Off-Auto (H-O-A) switch. The new influent pumps will be upgraded with new VFD's, which will be located in the new Electrical Room in the Control Building. The pumps will be provided with a local control station including a H-O-A switch and a speed pot.

Pump speed will be determined by the wet well elevation. The existing wet well level measurement device is a bubbler system that was installed in 1987. Operations staff have been satisfied with the performance and reliability of the bubbler system and noted preference to replace in-kind as part of this upgrade. The bubbler system will be replaced in-kind with a single compressor shared between the two wet wells. A spare compressor will be provided. When the H-O-A switch is in “Hand” mode, the operator can control the selected pump without the level control interface. When the H-O-A switch is in “Auto” mode, the level control system will control the pump sequence and speed. As a safeguard, a backup high-high (LSHH) and low-low (LSLL) level float will be installed in each wet well. The LSHH will activate a lead pump at 100% (adjustable) speed. If the LSHH remains active after an adjustable timer then a standby pump will be brought online. The pumps will be brought offline once the LSLL activates.

## Construction Sequencing

Flow from the Influent Pump Station must be maintained during construction. Demolition and replacement of each pump should be conducted in series so that one pump is operational at all times. Bypass pumping will be required to retain pump redundancy and for the demolition and replacement of the force main to the new grit facility. The bypass pumping can draw influent flow from an outside manhole and temporary discharge piping will need to be installed.

## Future Expansion Considerations

The pumps are sized for current and projected flows.

## File Location

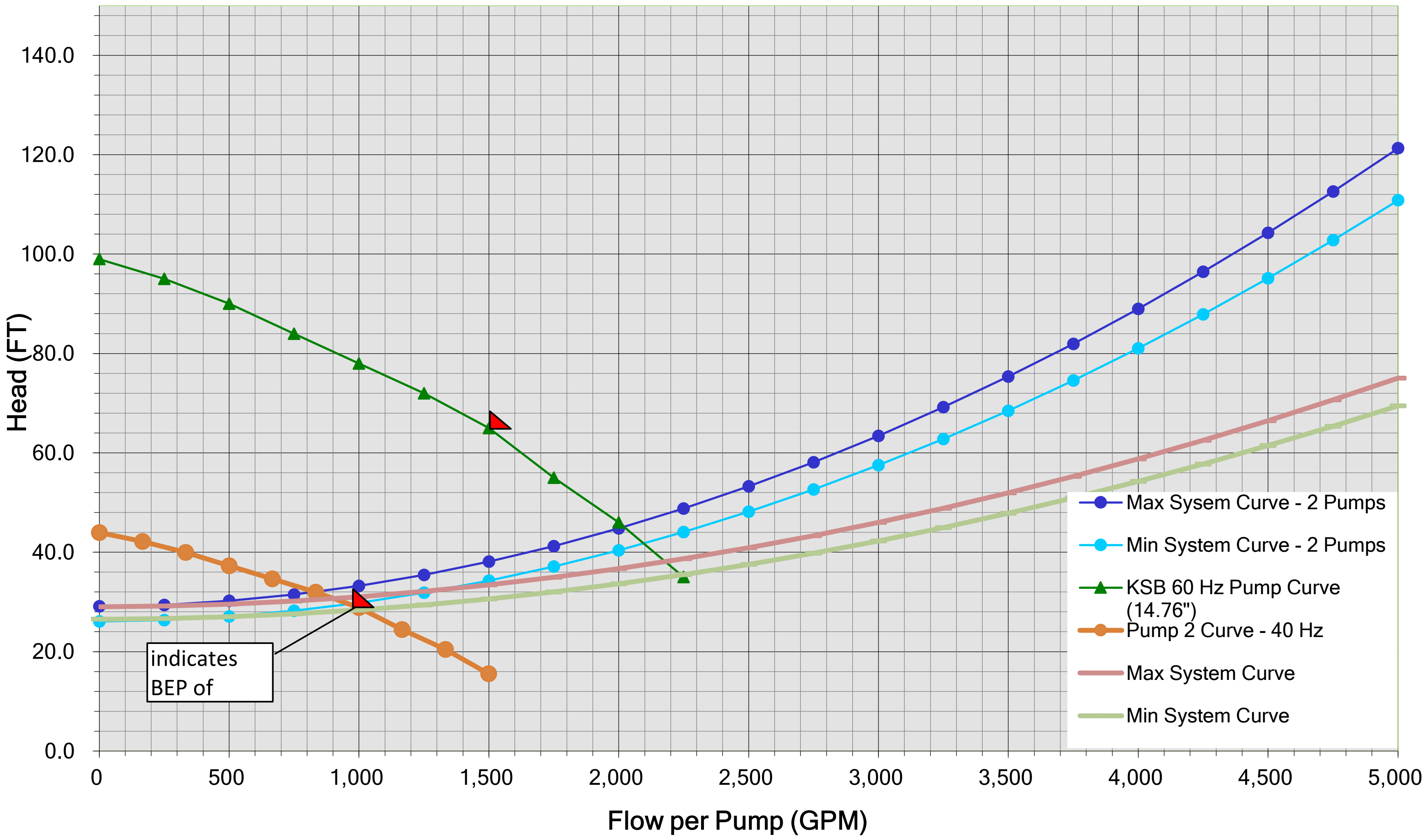
J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B-Preliminary Design\Technical\5-Process\Influent Pumps\Basis_of_Design\Influent Pumps Basis of Design Memorandum

## Attachments

☒ Key Design Calculations

☒ Manufacturer Cut Sheets

# Newport, NH WWTF Upgrade Preliminary Design
# 2 Parallel Pumps Operating in Last Discharge Section
# Low C-Value = 110, High C-Value = 140



# Sewatec VU_ _K 150-403

## Dry-installed Volute Casing Pump

## 3D View

### Zoom

Moves you toward or away from objects in the scene when you drag vertically. You can also zoom with the hand tool by holding down Shift as you drag.

### Pan

Moves the model vertically and horizontally only. You can also pan with the hand tool: Ctrl-drag.

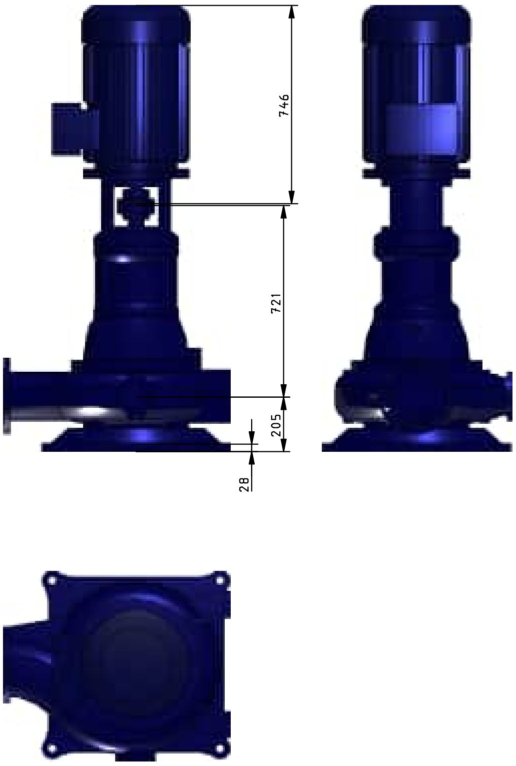
### Rotate

Turns 3D objects around relative to the screen. How the objects move depends on the starting view, where you start dragging and the direction in which you drag.

# Sewatec VU_ _K 150-403

## Dry-installed Volute Casing Pump

## 2D derivation

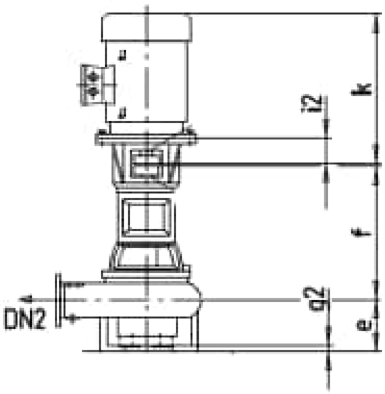


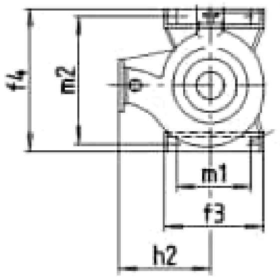
## ISO View

# Sewatec VU_ _K 150-403

Dry-installed Volute Casing Pump

## Technical drawings



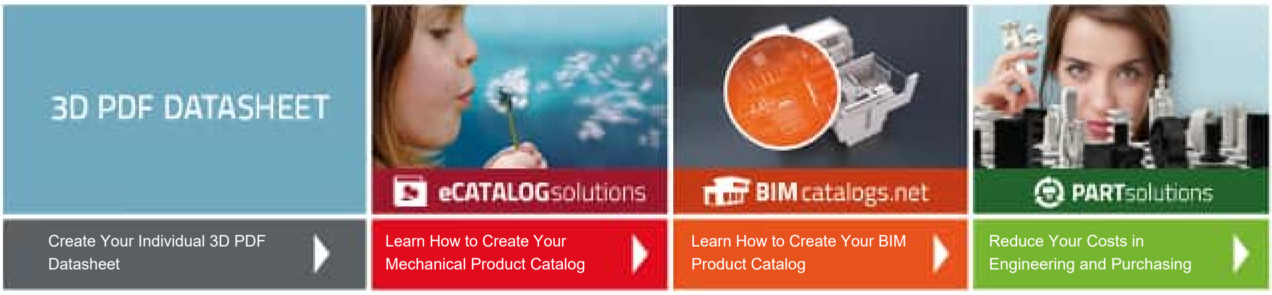


# Sewatec VU_ _K 150-403

Dry-installed Volute Casing Pump

## Technical Data

| | |
|---|---|
| CMPSIZE (Component size) | K 150-403 |
| BRGCKTSIZE (Bearing bracket) | S05 |
| PRDCPT (Design concept) | G |
| CNNSTDDIMDN1 (Dimension standard - suction flange) | EN 1092-2 |
| CNNSTDDRLDN1 (Drilling standard - suction flange) | EN 1092-2 |
| NMNLPRDRLPN1 (Drilling standard - suction flange) | PN 10 |
| NMNLPRDIMPN1 (Nominal pressure - suction flange dim) | PN 10 |
| FLNGSIZEDN1 (Nominal diameter - suction flange) | DN 200 |
| CNNSTDDIMDN2 (Dimension standard - discharge flange) | EN 1092-2 |
| CNNSTDDRLDN2 (Drilling standard - discharge flange) | EN 1092-2 |
| NMNLPRDRLPN2 (Nominal pressure - discharge flange drilling) | PN 16 |
| NMNLPRDIMPN2 (Nominal pressure - discharge flange dim) | PN 16 |
| FLNGSIZEDN2 (Nominal diameter - discharge flange) | DN 150 |
| IE (Drive standard) | IEC |
| MTRPRTCN (Type of motor enclosure) | IP55 |
| MTRCNSTR (Motor construction type) | V1 |
| RTDFRQ (Rated frequency) | 60Hz |
| MTRPOLE (No. of motor poles) | 6 |
| MTRSIZE (Motor size) | 200L |
| MTRTMPCLS (Temperature class motor) | Without |
| PRTCNTYP (Type of explosion protection) | Without |
| MTRMFG (Motor manufacturer) | Siemens |
| EFFCLS (Efficiency class) | NEMA Premium (IE3) |
| RTDPWR (Rated power) | 22 kW |
| MTRMTRL (Motor material) | JL/ Graphite cast iron blades |
| MTRSRSTYP (Type series motor / mm) | 1LE1 |
| EXTSHFT (Extended shaft) | No |
| PHASE (Motor current type) | 3 Phase |
| VLTG (Motor voltage) | 460 |
| MTRMATNO (Motor SAP material number) | 1537183 |
| PMPDRV (Pump drive / mm) | Not applicable |
| CPLNGSIZE (Coupling size) | 140 |
| TSGCODE (Type series generation code) | S02B |



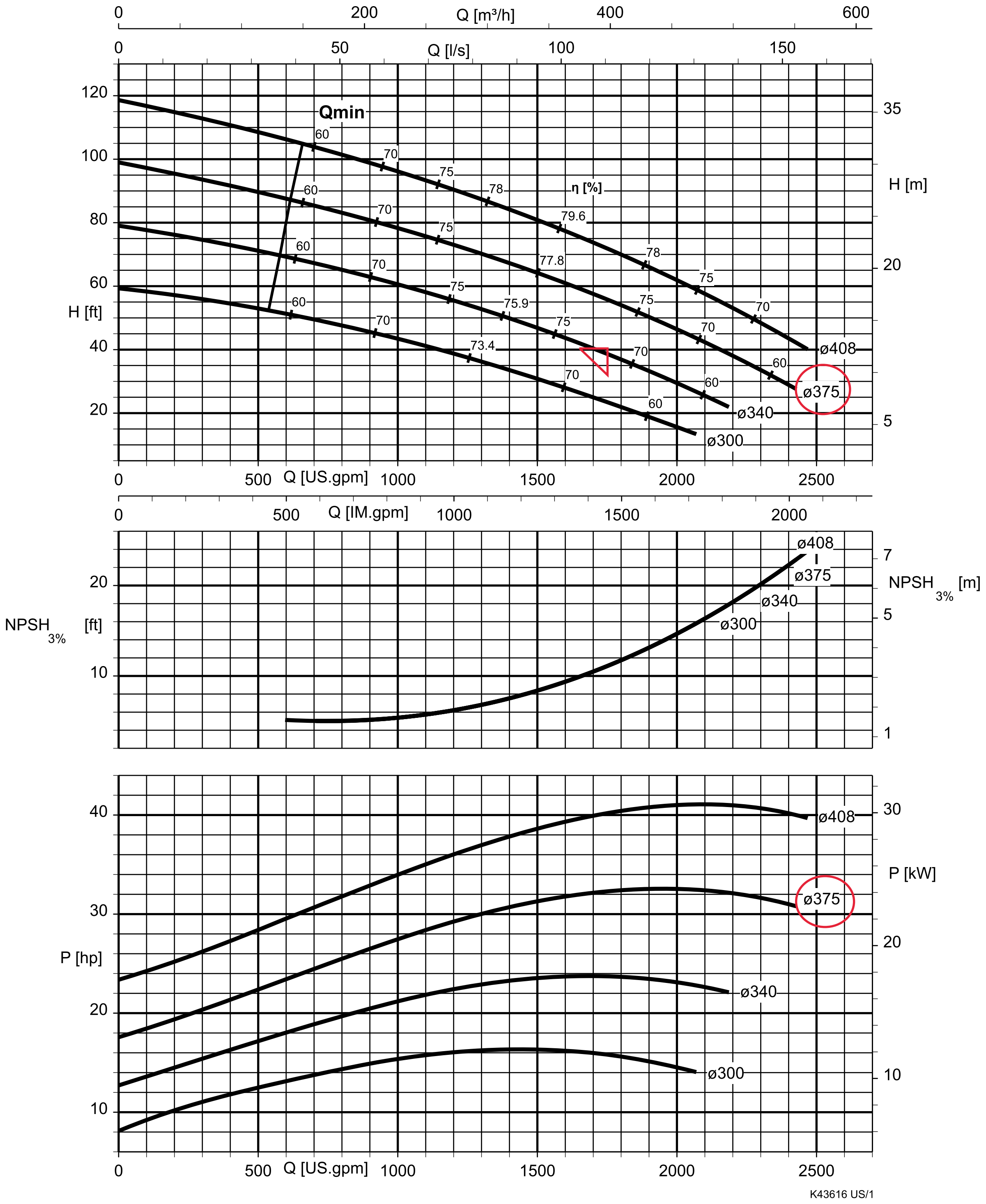
# Sewatec VU_ _K 150-403

## Dry-installed Volute Casing Pump

## Bill of Materials

| N° | Description | Amount |
|---|---|---|
| 1 | Sewatec VU_ _K 150-403 | 1 |

## Sewatec K 150-403, n = 1160 rpm



Free passage = 3″ [76 mm]

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | **20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade** | | |
| Subject: | **Septage Receiving** | | |
| Prepared By: | **S. Viola** | Date: | **10/12/2022** |
| Reviewed By: | **M. Curry** | Date: | **10/24/2022** |
| Revised By: | **S. Viola** | Date: | **12/2/2022** |

## Introduction

This technical memorandum provides a summary of the considerations for the septage receiving station located at the wastewater treatment facility (WWTF).

## Description of Relevant Existing Facilities

The existing septage receiving tank was constructed in 1971 as a sludge holding tank with a volume of approximately 18,000-gallons. In 1988, this tank was converted to a store septage and was modified to include a septage receiving station, top mounted mechanical mixer, and diffused air manifold. Aeration is provided via a 4-inch airline which is currently tied into the existing lagoon blower discharge manifold. Since 1988, a ¼" manual septage bar rack was installed on top of the tank. The Operations staff indicated that they regularly service the moving components of the system; the mixer was replaced in 2002 and one of the five diffusers was replaced in 2022.

The Facility accepts septage on a weekly basis (1-3 trucks per week) limited to Town residents. Operations staff indicated that the facility receives approximately 10,000 gallons/week during the peak season (1 – 3 septage trucks). During off-peak times of year, the facility can see as low as 1,000 gallons/week of septage. Assuming a peak day of five to six times the average, the maximum expected daily volume would be approximately 7,000 to 9,000 gallons.

Typically, septage is discharged from the truck directly into a ¼" manual bar rack atop the septage receiving tank, where screened septage flows by gravity directly into the septage holding tank. Septage is stored in the tank until the tank has reached its capacity. Once at capacity, the operations staff manually add a coagulant before decanting the supernatant to the influent wet well via a gravity overflow line that is connected directly into the 24-inch influent pipe. Solids which accumulate in the septage tank are removed from the tank four or five times a year through a third party for disposal.

## Facility Plan Recommendations

The Facility Plan Amendment recommended upgrades to the septage receiving system as a bid alternate to the WWTF upgrade including:

- Upgrade of the existing mechanical mixing system with either a mechanical or diffused air mixing system
- Abandoning the existing chemical additional operational protocol
- Replacement/reconfiguration of the influent bar rack and septage receiving unloading area
- Interior concrete tank inspection and surface repair

- Installation of a submersible septage transfer pump and septage discharge line to provide the Town with a means for controlling the feed rate of septage into the new WWTF system

## Client Preferences

The Town has indicated the following preferences with respect to septage:

- The existing septage holding tank is in good condition and will remain
- The existing mechanical mixer operates well and will remain
- The existing diffused air system in the tank operates well and will remain
- New septage layout should allow for ease of septage truck access/offloading via gravity
- Consideration of screening/grit removal ahead of WWTF Headworks

## Design Guidelines

NHDES Wq-700 Design Standards for Septage Receiving (Env-Wq 708.25)

- Drainage tied into the WWTP process to prevent runoff of spilled septage
- For gravity off-loading, septage trucks should be able to completely off-load by gravity

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- Septage flow to the process stream should not exceed 2-5% of the actual wastewater flow
- Unloading area should be equipped with quick disconnects and sloped to a drain for spills
- Provisions should be provided for odor control
- Aeration system mixing requirements are as follows:
    - Fine bubble, full-floor coverage: 0-12 scfm per square foot of tank area.
    - Spiral roll: 20-30 scfm per 1,000 cubic feet of tank volume.
    - Mechanical aeration: 0.5 horsepower per 1,000 cubic feet of tank-volume.

## Alternatives Analyses

While the current supernatant/gravity feed system has suited the WWTF well, the proposed Sequencing Batch Reactor system will require an additional degree of control when bleeding septage into the new process in order to prevent organic overloading of the system. In addition to the financial revenue which septage receiving can provide, septage can be also used as a readily available carbon source during low-flow and low-loading conditions (i.e., 1 am – 5 am) to enhance the secondary treatment processes' ability to achieve biological nutrient removal goals.

Based on these considerations and the need for a controlled septage feed system, the new septage system is proposed to utilize a new submersible septage transfer pump. The septage pump will be designed to discharge to SMH-2, upstream of the WWTF headworks allowing all septage to be processed through the WWTF's preliminary treatment process (i.e., screening, grit removal). This submersible pump will be a heavy-duty chopper style pump which have the capability to handle and reduce the size of the solids commonly found in septage.

The existing aeration system diffusers and mechanical mixer were observed to be in fair condition and will remain part of the septage storage system. Based on the existing septage piping and the proposed new SBR aeration blowers, the diffused air will be supplied through the new Aeration Tank Blower headers by manually modulating a butterfly valve. This will allow air to be supplied to the septage system in a cycling basis as the SBR blowers turn

ON/OFF to meet process demands. If additional air is required, the Town may isolate one of the Aeration Tank Blowers to dedicate to the septage tank.

## Basis of Design

Septage receiving at the Newport WWTF will include a new manual bar rack and spill pad station adjacent to the existing septage holding tank. This new bar rack will be set at an elevation which allows septage haulers to discharge to the manual bar rack where screened septage will flow by gravity directly into the septage holding tank and provide an area for screenings draining/removal. Screenings from the septage will be manually raked onto a perforated drainage plate and shoveled into a trash receptacle for disposal. The manual bar rack will be enclosed in concrete, with an aluminum access hatch flush to the septage holding tank top of concrete elevation. Per the Town's request, the manual bar rack will have a ½" or less clear bar openings. Typically, manual septage screening is completed using ¾" – 1" clear spacing; however, the Town's existing manual septage bar rack has operated well and has not caused the operations staff any problems with ½" or less clear spacing.

Screened septage will be stored and septage will be mechanically mixed and aerated, before being conveyed via a submersible chopper pump to SMH-2. The septage submersible pump will be mounted to a guide rail system, removable by a davit crane/hoist. The existing septage holding tank opening will be modified to accommodate the new pump.

Screened septage will be stored in the existing holding tank which will be able to accommodate approximately 15,000 gallons of usable volume. This will allow the Town to receive up to 2-3 septage deliveries per day and feed septage into the process overnight when influent flow and loading to the SBR process is low.

### Septage Receiving, Storage, and Conveyance System

| Parameter | Criteria |
|---|---|
| Receiving & Storage | |
| Application: | Domestic septage |
| Total Solids, % | 1% – 3% |
| Location: | Existing Septage Holding Tank |
| Tank Dimensions, LxWxD: | 20-ft x 20-ft x 8-ft (including fillet) |
| Volume, total effective: | 15,000-gallons (above fillet), 23,000-gallons total |
| Mixing/Aeration: | Mechanical mixer (existing) and diffused air (existing) |
| Screening: | ½" – ¾", manually cleaned bar rack |
| Conveyance | |
| Application: | Manually screened septage |
| Number/Type: | One (1), submersible chopper pump |

| Parameter | Criteria |
|---|---|
| Design condition: | 150 gpm @ 8-ft TDH |
| Discharge Diameter.: | 4-inch pump flange, 4-inch force main |
| Motor: | 7.5 HP, 1150 rpm |
| Speed: | Variable drive, operated at constant speed |
| Acceptable Manufacturers: | Vaughan, Landia or equal |

## Building / Structure Implications

The existing septage holding tank will require several modifications for repurposing including new wall penetrations, new manual bar rack concrete structure, and demolition of existing sections of the interior concrete fillets and access hatch to accommodate the new submersible chopper pump.

It is our understanding that the tank has not undergone recent, comprehensive inspection of the concrete and that the overall condition is unknown. Given the age of the structure, it is anticipated that the concrete walls and floor may require repair. It is recommended that during construction, when the septage tank is pumped down and concrete modifications are to take place, the tank be high pressure washed and concrete inspection and repairs be performed in tandem with any improvements to the septage receiving facility. As the overall condition of the septage holding tank is unknown, construction allowances for high pressure water blasting and concrete repair shall be included in the contract specifications and drawings.

## Process Control Description

Septage receiving tanks are not covered under NFPA; however, the space will be designated a NEMA 7 (Class 1/Division 1) space.

The submersible septage pump will have a local control station with a HAND-OFF-AUTO (HOA) switch, run and fault indicator lights, and speed potentiometer. In HAND, the pump will run continuously at the selected speed. In OFF, the pump will not operate. In REMOTE, the pump control will be from the SCADA system. Pump activation in AUTO will be determined through operator adjustable repeat cycle timers based on an operations schedule. The pump operation will be set based upon SBR cycles, so that flow is split between each SBR. In addition, the septage pumps can be controlled to cycle during the REACT phases of the SBR sequencing.

## Construction Sequencing

The septage receiving facility can be constructed at any time during the WWTF upgrade. However, the upgrade should be coordinated with the upgrade of the existing lagoon blower as the septage aeration system is connected to this blower. Septage flows should only be accepted when the Operators feel secondary treatment is ready to receive them. Bypass pumping will not be required; however, the septage holding tank may need to be emptied and cleaned.

## Future Expansion Considerations

The proposed manual septage receiving facilities will be designed to handle receiving septage from local sources up to 2-3 trucks per day, depending on the influent flow conditions. Should the Town wish to receive septage in higher volumes, additional holding capacity will be required and the Town may also consider addition of a mechanical septage screenings system.

## Attachments

☒ System Sketches/Schematics/Plans

☒ Key Design Calculations

☒ Manufacturer Cut Sheets

Newport, NH
WWTF Upgrade - Preliminary Design
Project #20828B
Septage Receiving Tank

**Septage Tank Volume**

| | | | | |
|---|---|---|---|---|
| Above Fillet | Tank Length | 20 | ft | |
| | Tank Width | 20 | ft | |
| | Volume | 2992 | gal/VF | |
| | | | | |
| Below Fillet | Tank Length | 20 | ft | |
| | Tank Width | 20 | ft | |
| | Volume | 1496 | gal/VF | |
| | | | | |
| | Tank Bottom | 771.0 | ft | |
| | New Septage Invert | 779 | ft | |
| | Min Septage Tank Level | 775 | ft | Min. for submergence in septage tank |
| | Max Septage Tank Level | 780 | ft | 12" Below top of tank |
| | Top of Fillet | 773.6 | ft | |
| | Total Volume up to Septage Invert | 19,149 | gallons | **above fillet* |
| | Total Volume up to Septage Invert | 23,038 | gallons | **above and below fillet* |
| | Usable Septage Volume | 14,960 | gallons | *Usable volume when accounting for max/min taken levels.* |

**Operational Data**

| | | | |
|---|---|---|---|
| | Septage (gallons per week) | | |
| Avg. | | 2,500 | gallons |
| Max | | 5,000 | gallons |
| | | | |
| Typical Unloading Rate | | 300 | gpm |
| Total Unloading Time | | 17 | minutes |

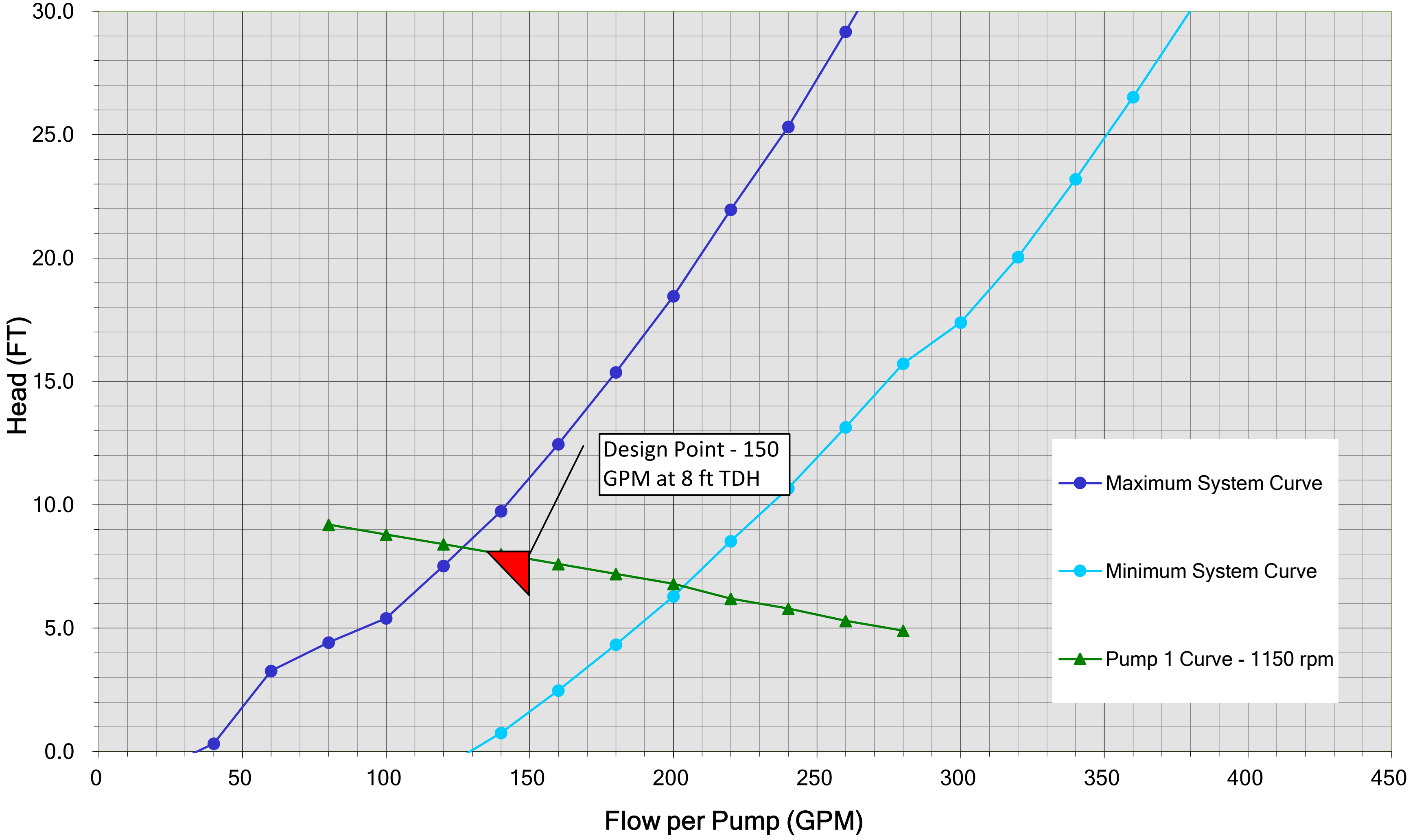
Newport, NH
WWTF Upgrade - Preliminary Design
Project #20828B
Septage Pump

Proposed Pumping Rates:

| | | |
|---|---|---|
| 1 pump at min speed | 150 | gpm |
| 1 pump at max speeed: | 150 | gpm |

| | | | | | | |
|---|---|---|---|---|---|---|
| Suction Piping: | | | | | | |
| | 3 Inch | Area | 0.049 | | | |
| | | Velocity at full speed: | | 6.81 | ft/sec | Min =3 ft/sec, Max = 8 ft/sec |
| | | Velocity at min speed: | | 6.81 | ft/sec | |
| | Flare fitting | | | | | |
| | Diameter: | | 3 inches | | | |
| | Area: | | 0.049 | | | |
| | | Velocity at flare: | | 6.81 | ft/sec | |
| | Depth of water required over flare: | | | 19.6 | in. | |
| | | Flare Open Elev. | | 771.80 | | |
| Discharge Piping | | Pump Off Elev. | | 773.43 | | |
| Pump Discharge | | | | | | |
| | 4 Inch | Area | 0.087 | | | |
| | | Velocity at full speed: | | 3.83 | ft/sec | |
| | | Velocity at min speed: | | 3.83 | ft/sec | |

# Newport WWTF Upgrade Existing Septage Receiving Tank to SMH-2
## 1 Pump Operating in Last Discharge Section
## Low C-Value = 110,    High C-Value = 150



Design Point - 150 GPM at 8 ft TDH

| | |
|---|---|
| Hayes Pump<br>Project: Newport, NH WWTF Upgrade | **Quote Number: Q49181**<br>Dated:10/05/2022<br>Page 1 of 5 |

*DUE TO CONTINUED PRICING INSTABILITIES IN MOTORS, METALS AND CASTINGS ALL PRICING BEYOND 30 DAYS MUST BE VERIFIED PRIOR TO PLACING AN ORDER.*

| ITEM | QTY | UNIT | DESCRIPTION | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|

1 1 EA **Vaughan Model S4K-460V-086 Submersible Chopper Pump consisting of:**

**Casing**, cast ductile iron with 4" ANSI CL 125 discharge flange.
**Impeller, Cutter Bar, Cutter Nut, and Upper Cutter**, cast steel, heat treated to minimum Rockwell C60.
**Mechanical Seal**, cartridge type with ductile iron gland, Viton O-rings, tungsten carbide faces, and integral stainless steel sleeve as manufactured by Vaughan.
**Elastomers**, Buna N
**Bearings**, oil bath lubricated with minimum 100,000-hour L-10 bearing life.
**Bearing Housing**, cast ductile iron with piloted motor mount.
**Automatic Oil Level Monitor**, PVC plastic reservoir with 120V switch and intrinsically safe relay and 25 ft. of hose.
**Shaft**, heat treated steel
**Drive**, 7.5 HP, 1150 RPM, 460V, 3 phase, 60 Hz, 1.15 SF, Explosion Proof (Class 1, Group C & D) 15 minute in air continuous duty submersible motor with tandem mechanical seals, moisture sensors, internal thermostats, and 25 feet of power and control cable, manufactured by ABB/Baldor.
**Pump Finish**: Solvent wash and coat with Tnemec Perma-Shield PL Series 431 epoxy. (Except Motor).

**TOTAL LIST PRICE: $ 19,435.00**

2 1 EA **Spark Proof Guide Rail System consisting of:**

**4" Base Elbow**, cast ductile iron.
**4" Guide Bracket**, cast non-sparking aluminum bronze.
**(1) Intermediate Stiffener Brackets**, 316 stainless steel located every 10 feet.
**Top Mounting Bracket and Chain Holder Bracket**, 316 stainless steel.
**NOTE**: Customer to provide 2" Sch. 40 pipe rails.

**TOTAL LIST PRICE: $3,500.00**

3 1 EA **Vaughan VPMR:**

**Pump Monitor Relay** for mounting in customer control panel to supply seal leakage and over temperature alarms for submersible motor.

**TOTAL LIST PRICE: $525.00** **$525**

| | |
|---|---|
| Submittals: | Submittal time is 4 - 6 weeks after receipt of order. |
| Production Time: | Estimated 8 to 10 weeks after receipt of approved submittals, released to production and executed purchase order. Estimated ship dates are subject to change dependent on motor availability. Vaughan Co. will arrange shipment upon the receipt of approved factory tests, if applicable. |
| FOB: | Montesano, Washington via best way. |
| Terms: | Contingent on credit approval. |
| Expiration: | Quotation valid for 30 days. |

RSF

*DUE TO CONTINUED PRICING INSTABILITIES IN MOTORS, METALS AND CASTINGS ALL PRICING BEYOND 30 DAYS MUST BE VERIFIED PRIOR TO PLACING AN ORDER.*

| ITEM | QTY | UNIT | DESCRIPTION | UNIT PRICE | TOTAL |
|---|---|---|---|---|---|

**FREIGHT:**
Freight not included. Freight quote available upon request

***Freight quotes are for informational purposes only and is not a guarantee of the final shipping charge. Shipping charges are not finalized until the equipment leaves Vaughan's warehouse. Partial shipments are subject to additional freight charges***

**Pump Performance**: 150 GPM @ 24 FT. TDH
**Application**: Septage
**Industry:** Municipal

Reilly Fairchild - Vaughan Co. Inc.

| | |
|---|---|
| Submittals: | Submittal time is 4 - 6 weeks after receipt of order. |
| Production Time: | Estimated 8 to 10 weeks after receipt of approved submittals, released to production and executed purchase order. Estimated ship dates are subject to change dependent on motor availability. Vaughan Co. will arrange shipment upon the receipt of approved factory tests, if applicable. |
| FOB: | Montesano, Washington via best way. |
| Terms: | Contingent on credit approval. |
| Expiration: | Quotation valid for 30 days. |

RSF

# PRODUCT WARRANTY, TERMS & CONDITIONS FOR SALES MADE BY VAUGHAN CO., INC.

1. **GENERAL:** The Terms & Conditions herein established by Vaughan Co., Inc. ("us", "we", "our") as may be amended by us from time to time ("Terms and Conditions") apply to all dealings with our potential and actual customers ("you" and "your"), whether made by you or us, for any solicitation, submission, inquiry, offer, request or arrangement (a "Communication") or sale by us with respect to goods we sell ("Product(s)"). Written authorization is only valid if executed by an authorized officer of Vaughan Co.
2. **SCOPE OF SUPPLY:** Scope of supply will be limited to accepted quotation or approved submittals, if required.
3. **ACCEPTANCE OF ORDERS:** No Communication is binding on us unless written authorization is obtained by an authorized officer of Vaughan Co. Any sample provided by us is not part of an Accepted Order.
4. **SUBMITTALS:** Drawings and submittals for approval will typically be supplied four to six (4-6) weeks from the receipt of the order in pdf format. Vaughan will not be responsible for damages, fees or charges for any additional submittal reviews that were not the fault of Vaughan.
5. **PRODUCTION TIME:** Vaughan's production time will begin after complete submittal approval, release to production, execution of the purchase order and receipt of progress payments, if applicable. Production time excludes time to approve test results.
6. **NO CANCELLATION:** Accepted Orders cannot be cancelled or modified, in whole or in part, without our prior written consent, which consent may be withheld or subject to conditions and reasonable charges we may impose. Any custom ordered parts cannot be cancelled without full payment.
7. **DEFAULT:** If Buyer defaults on the contract, Vaughan shall have the right to be cancel the contract in part or whole. Buyer shall be responsible for reasonable termination charges up to the total agreement value. The termination charge is at Vaughan's discretion dependent upon the percentage of the Agreement price reflecting the percentage of the work fabricated prior to the default plus actual direct costs resulting from default, including cancellation charges directly associated with costs for items that are in production at time of cancellation.
8. **PRICE INCREASE:** Price of Product(s) is subject to increase if equipment is not released to production <u>within six months</u> from the date Vaughan receives the initial purchase order from you.
9. **TAXES:** All prices are subject to all applicable sales and use taxes and any other taxes now or hereafter imposed and/or levied by any governmental authority with respect to the sale of the Product(s) ("Applicable Taxes"). Customers located in states where Vaughan is registered for sales tax sales must pay sales tax on all orders delivered or picked up within said state unless Vaughan Co. has in its possession an accurate and current resale or exemption certificate or other acceptable alternate document on file for your company and/or project. If you have a certificate on file with Vaughan Co., please indicate on the purchase order if tax is to be applied or not at the time of the order. Our failure to charge or collect Applicable Taxes when due shall not relieve you of your obligation for its payment. Regardless of any other payment terms, all Applicable Taxes are due net 30 days from the invoice date.
10. **PAYMENT TERMS:** Terms of sale will be shown on each invoice or purchase order, and it is agreed that invoices will be paid in full when due. Standard payment terms for projects covered by a project payment bond that extends coverage to Vaughan Co. are as follows:
    10% upon submittal approval;
    10% prior to shipment of equipment;
    75% net 30 from shipment of equipment;
    5% due at the earlier of startup or 120 days from shipment of equipment.
    However, Vaughan may at their discretion alter these percentages on a case by case basis. Projects that are not covered by a project payment bond, or payment bonds that do not extend coverage to Vaughan Co., must be 100% prepaid in advance of shipment. Payment is not subject to hold-backs or contingent upon the Buyer receiving payment from the Owner. If payment in full on any invoice is not received when due, or if your credit worthiness is deemed unsatisfactory by us at any time, we may take, without incurring any liability, one or more of the following actions: (a) impose a service charge at the rate that is the lesser of (i) 1.5% per month or (ii) the maximum rate allowed by applicable law, on any amount past due commencing from the date of such invoice, (b) modify or accelerate payments terms, (c) withhold delivery of Product(s) under any Accepted Order not yet shipped and/or delay, recall or reclaim shipments of Product(s) en route to you or delivered until arrangements satisfactory to us are made to secure payment for any outstanding invoice and for all open Accepted Orders and/or (d) file a lien or bond claim for any unpaid labor or material.
11. **RETAINAGE:** Retainage, if applicable, is limited to 5% of the total Accepted Order price less any applicable taxes and is due at the earlier of start-up or 10 days upon owner's acceptance, however, retainage shall not exceed 120 days from the shipment of equipment.
12. **FREIGHT:** Unless otherwise stated in the purchase order or quote, freight for a single shipment is included. Additional freight cost for split-shipments will be the responsibility of the Buyer. Buyer is responsible for providing complete shipping information and requirements including, but not limited to residential delivery, lift gates, limited access, advance notice, construction/jobsite, etc. Failure to provide accurate information may result in additional shipping fees. Those fees are the responsibility of the Buyer and will be billed accordingly
13. **DATE OF SHIPMENT:** Shipment dates are approximate and subject to change based upon Product(s) availability, production schedules, and other prevailing conditions. Shipment date is contingent upon the receipt of approved submittals, execution of purchase order, receipt of progress payments and approved factory tests, if applicable. You must accept delivery after approval of submittals, production time and factory test approval or issue us a change to the Accepted Order that must be accepted by us in writing. . If Vaughan does not receive approval to ship equipment within 30 days from the submission of factory tests, Buyer will pay Vaughan $100 per day for storage of equipment.
14. **LONG TERM STORAGE:** We will hold Product(s) in long term storage contingent upon payment of full purchase order price less retainage. Long term storage duration, fees, and any other considerations will be evaluated on a case by case basis.
15. **YOUR ACCEPTANCE OF PRODUCT(S):** You are responsible to promptly inspect Product(s) delivered and notify us within five (5) calendar days following receipt of the Product(s) for which a claim is filed of any shortages, visible material defects or non-conformance of the Product(s) with the Accepted Order. If the equipment is damaged during transport that was arranged by Vaughan, Vaughan will file the claim with the freight carrier. Any damages will be limited to the amounts recovered by Vaughan from the freight carrier.
16. **RETURNS:** Product(s) may not be returned for any reason without authorization by us. Please refer to the "Returned Goods Authorization Policy" for further information on returns.
17. **WARRANTY:** Vaughan Company, Inc. (Vaughan Co.) warrants to the original purchaser/end user (Purchaser) all pumps and pump parts manufactured by Vaughan Co. to be free from defects in workmanship or material for a period of one (1) year from date of startup or eighteen (18) months from the date of shipment from Vaughan Co., whichever occurs sooner. Startup data must be submitted to Vaughan Co. within 30 days of startup. If Purchaser fails to submit startup data within 30 days of startup, then Vaughan, in its sole discretion, may elect to void this warranty at any time. Purchaser must contact Vaughan Co. prior to commencing any repair attempts, or. removing pump or parts from service. If Purchaser fails to contact Vaughan Co. prior to commencing any repair attempts or removing pumps or parts from service, then Vaughan, in its sole discretion, may elect to void this warranty at any time. If during said warranty period, any pump or pump parts manufactured by Vaughan Co. prove to be defective in workmanship or material under normal use and service, and if such pump or pump parts are returned to Vaughan Co.'s factory at Montesano, WA, or to a Vaughan authorized Service Facility, as directed by Vaughan Co., transportation charges prepaid, and if the pump or pump parts are found to be defective in workmanship or material, they will be replaced or repaired by Vaughan Co. free of charge. Products repaired or replaced from the Vaughan Co. factory or a Vaughan authorized Service Facility under this warranty will be returned freight prepaid. Vaughan Co. shall not be responsible for the cost of pump or part removal and/or re-installation. All warranty claims must be submitted in writing to Vaughan Co. not later than thirty (30) days after warranty breach occurrence. The original warranty length shall not be extended with respect to pumps or parts repaired or replaced by Vaughan Co. under this Warranty. This Warranty is voided as to pumps or parts repaired/replaced by other than Vaughan Co. or its duly authorized representatives. Vaughan Co. shall not be liable for consequential damages of any kind, including, but not limited to, claims for property damage, personal injury, attorneys' fees, lost profits, loss of use, liability of Purchaser to customers, loss of goodwill, interest on money withheld by customers, damages related to third party claims, travel expenses, rented equipment, third party contractor's fees, or unauthorized repair service or parts. The Purchaser, by acceptance of delivery, assumes all liability for the consequences of the use or misuse of Vaughan Co. products by the Purchaser, its employees or others. Equipment and accessories purchased by Vaughan Co. from outside sources which are incorporated into any Vaughan pump or any pump part are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any, which warranty, if appropriate, will be assigned by Vaughan Co. to the Purchaser. It is Purchaser's responsibility to consult the applicable product

documentation for specific warranty information. Specific product documentation is available upon request. Any warranty shall be void if the total contract amount is not paid in full. Vaughan Co. neither assumes, nor authorizes any person or company to assume for it, any other obligation in connection with the sale of its equipment with the exception of a valid Vaughan "Performance Guarantee" or "Extended Warranty," if applicable. Any other enlargement or modification of this warranty by a representative or other selling agent shall not be legally binding on Vaughan Co. Warranty eligibility determination is at Vaughan Co.'s sole discretion. Warranty Limitations: This warranty shall not apply to any pump or pump part which has been subjected to or been damaged by any of the following non-exclusive list of causes; Misuse, abuse, accident, negligence, operated in the dashed portion of the published pump curves, used in a manner contrary to Vaughan's printed instructions, defective power supply, improper electrical protection, faulty installation, maintenance, or repair, wear caused by pumping abrasive or corrosive fluids or by cavitation, dissatisfaction due to buyer's remorse, damages incurred during transportation, damages incurred during installation or maintenance. ***THIS IS VAUGHAN CO.'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.***

18. **FORCE MAJEURE:** Vaughan shall have no liability in respect of failure to deliver or perform or delay in delivering or performing any obligations due to causes such as fire, earthquakes, flooding or other natural disasters, failure of our supplier to deliver on time, war, acts or threats of terrorism, strikes and any other circumstance outside the reasonable control of Vaughan.
19. **DAMAGES:** Vaughan is not responsible for any damages due to delays, special, indirect, consequential or punitive damages.
20. **BACK CHARGES:** You shall not charge Vaughan back charges without first receiving written approval from an authorized officer of Vaughan Co.
21. **COLLECTION CHARGES:** You shall pay all costs and expenses, including without limitation reasonable attorneys' fees and administrative charges, we incur in endeavoring to protect our rights arising out of your failure to perform your obligations to us, including without limitation any attempt to collect any amount you owe us.
22. **CONFIDENTIALITY:** Buyer shall take reasonable efforts to maintain as confidential, such items marked or identified as such by Vaughan. Such confidential information shall not include information which may have been provided to Vaughan in connection with this Agreement. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data, software and other documents or information prepared or disclosed by Vaughan, and all related intellectual property rights, shall remain Vaughan's property. Vaughan grants Buyer and Owner a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the work. Buyer shall not disclose any such material to third parties without Vaughan's prior written consent
23. **EAR COMPLIANCE:** If Product(s) are exported by us, we provide the following statement: "these commodities, technology or software were exported from the United States in accordance with the export Administration Regulations. Diversion contrary to U.S. law is prohibited."
24. **GOVERNING LAW:** The transactions between you and us are made in Washington State, shall be governed by the laws of Washington State, and you agree to submit exclusively to jurisdiction and venue of such state with respect to any dispute arising out of any transaction between you and us. **YOU AND WE KNOWINGLY, VOLUNTARILY AND INTENTIONALLY WAIVE THE RIGHT TO TRIAL BY JURY IN ANY ACTION OR PROCEEDING ARISING OUT OF ANY SUCH DISPUTE.**
25. **DISPUTES:** Any claim or dispute between Vaughan and Buyer, arising out of or relating to either's obligations to the other under this Contract, shall, if possible, be resolved by negotiation between Vaughan's and Buyer's designated representatives. Vaughan and Buyer each commit to seeking resolution of such matters in an amicable, professional and expeditious manner so as to avoid unnecessary losses, delays and disruptions to the Work. If a matter cannot be resolved by the parties' designated on-site representatives, the following dispute resolution procedure shall apply:
    - i. No later than thirty (30) days after the designated representatives fail to reach agreement, representatives from executive management of Seller and Contractor shall attempt to resolve the matter.
    - ii. If resolution cannot be reached by the parties' executive managers, no later than thirty (30) days after the executive managers fail to reach agreement, the parties shall submit the dispute to non-binding mediation. The parties shall select a mediator that is mutually acceptable. The location of the mediation shall be in County wherein the project is located.
    - iii. If resolution cannot be reached by the parties through mediation, within thirty (30) days after the mediation has concluded, either party may file a demand for arbitration. Such arbitration shall be administered by the American Arbitration Association ("AAA") in accordance with its Construction Industry Arbitration Rules. Judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.
26. **NO RIGHT OF SET-OFF:** Each Accepted Order constitutes a separate and distinct contract when accepted by us and you may not withhold payment for an invoice or offset same, in whole or in part, against sums you claim are due you by us with respect to another Accepted Order, invoice or for any other cause or reason whatsoever.
27. **INDEMNITY CLAUSE:** Any indemnification shall not include claims of, or damages resulting from the negligence, gross negligence, or willful, wanton or intentional misconduct of the parties indemnified hereunder. To the extent that conditions, acts, activities or conduct involve the contributory negligence or misconduct of you or other third parties, liability will be apportioned between the parties according to comparative fault.
28. **OUR RIGHTS ARE NOT EXCLUSIVE:** Our rights hereunder are in addition to and not in lieu of any other rights and remedies available to us at law or in equity.
29. **NOTICES:** All notices of claims or disputes given by either you or us with respect to any Communication, Accepted Order or these Terms & Conditions shall be in writing and sent by (a) first class mail with a copy by certified mail, return receipt requested, postage pre-paid, or (b) overnight delivery service, charges prepaid, and address as follows: (i) if intended for us, to our address to which a Communications was sent or an Accepted Order was placed, and (ii) if to you, at your address last known to us. Notice will be effective the first business day after notice is sent.
30. **NO OTHER TERMS ACCEPTED:** No terms or conditions, other than these Terms and Conditions, shall apply to any Accepted Order and no agreement or understanding in any way adding to or otherwise modifying these Terms and Conditions shall be binding on us unless set forth in writing and signed by an officer of Vaughan Co. Vaughan Co. is only bound to the terms of the contract/agreement/purchase order between Vaughan and Buyer. The Buyer's Prime Contract with an Owner shall not affect the contract between Vaughan and Buyer unless specifically accepted in writing by an authorized officer of Vaughan Co.
31. **COUNTERPARTS:** This Agreement may be executed in counterpart, and may be executed by way of facsimile, email or electronic signature, and if so, shall be considered an original.
32. **MISCELLANEOUS:** No waiver of any rights or remedies shall be binding on us unless set forth in a written waiver signed by us. We do not give up any of our rights or remedies if we fail or delay in seeking a remedy or if we accept a payment while there is a breach by you. Any such waiver, delay or failure by us on one occasion shall not be deemed a waiver by us of any future default by you or of any future right or remedy available to us. The Section, Paragraph and other heading in these Terms & Conditions are for convenience of reference only and shall not limit or otherwise affect the meaning of any provision contained in these Terms and Conditions. The invalidity of enforceability of any provision in these Terms and conditions shall in no way effect the validity or enforceability of any other provision.

# VAUGHAN CO., INC. PRODUCT WARRANTY

Vaughan Company, Inc. (Vaughan Co.) warrants to the original purchaser/end user (Purchaser) all pumps and pump parts manufactured by Vaughan Co. to be free from defects in workmanship or material for a period of one (1) year from date of startup or eighteen (18) months from the date of shipment from Vaughan Co., whichever occurs sooner. Startup data must be submitted to Vaughan Co. within 30 days of startup. If Purchaser fails to submit startup data within 30 days of startup, then Vaughan, in its sole discretion, may elect to void this warranty at any time. Purchaser must contact Vaughan Co. prior to commencing any repair attempts, or. removing pump or parts from service. If Purchaser fails to contact Vaughan Co. prior to commencing any repair attempts or removing pumps or parts from service, then Vaughan, in its sole discretion, may elect to void this warranty at any time.

If during said warranty period, any pump or pump parts manufactured by Vaughan Co. prove to be defective in workmanship or material under normal use and service, and if such pump or pump parts are returned to Vaughan Co.'s factory at Montesano, WA, or to a Vaughan authorized Service Facility, as directed by Vaughan Co., transportation charges prepaid, and if the pump or pump parts are found to be defective in workmanship or material, they will be replaced or repaired by Vaughan Co. free of charge. Products repaired or replaced from the Vaughan Co. factory or a Vaughan authorized Service Facility under this warranty will be returned freight prepaid. Vaughan Co. shall not be responsible for the cost of pump or part removal and/or re-installation.

All warranty claims must be submitted in writing to Vaughan Co. not later than thirty (30) days after warranty breach occurrence. The original warranty length shall not be extended with respect to pumps or parts repaired or replaced by Vaughan Co. under this Warranty. This Warranty is voided as to pumps or parts repaired/replaced by other than Vaughan Co. or its duly authorized representatives.

Vaughan Co. shall not be liable for consequential damages of any kind, including, but not limited to, claims for property damage, personal injury, attorneys' fees, lost profits, loss of use, liability of Purchaser to customers, loss of goodwill, interest on money withheld by customers, damages related to third party claims, travel expenses, rented equipment, third party contractor's fees, or unauthorized repair service or parts. The Purchaser, by acceptance of delivery, assumes all liability for the consequences of the use or misuse of Vaughan Co. products by the Purchaser, its employees or others.

Equipment and accessories purchased by Vaughan Co. from outside sources which are incorporated into any Vaughan pump or any pump part are warranted only to the extent of and by the original manufacturer's warranty or guarantee, if any, which warranty, if appropriate, will be assigned by Vaughan Co. to the Purchaser. It is Purchaser's responsibility to consult the applicable product documentation for specific warranty information. Specific product documentation is available upon request.
Any warranty shall be void if the total contract amount is not paid in full.

Vaughan Co. neither assumes, nor authorizes any person or company to assume for it, any other obligation in connection with the sale of its equipment with the exception of a valid Vaughan "Performance Guarantee" or "Extended Warranty," if applicable. Any other enlargement or modification of this warranty by a representative or other selling agent shall not be legally binding on Vaughan Co.

Warranty eligibility determination is at Vaughan Co.'s sole discretion.

Warranty Limitations:
This warranty shall not apply to any pump or pump part which has been subjected to or been damaged by any of the following non-exclusive list of causes:

- Misuse
- Abuse
- Accident
- Negligence
- Operated in the dashed portion of the published pump curves
- Used in a manner contrary to Vaughan's printed instructions
- Defective power supply
- Improper electrical protection
- Faulty installation, maintenance, or repair
- Wear caused by pumping abrasive or corrosive fluids or by cavitation
- Dissatisfaction due to buyer's remorse
- Damages incurred during transportation
- Damages incurred during installation or maintenance

***THIS IS VAUGHAN CO.'S SOLE WARRANTY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, WHICH ARE HEREBY EXCLUDED INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.***

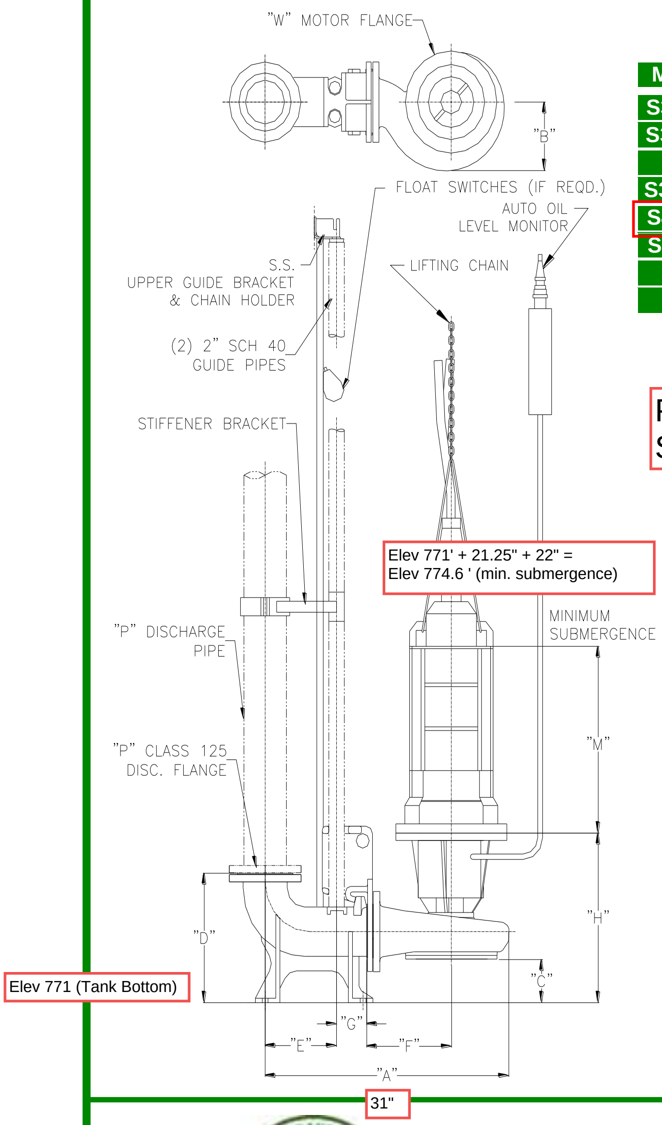
Unmatched Reliability
Vaughan®

# 3"-6" S-SERIES SUBMERSIBLE CHOPPER PUMPS

## Materials of Construction:

**Impeller/Upper Cutter/Cutter Bar/Cutter Nut**: ................Cast alloy steel, heat treated to minimum Rockwell C 60.
**Casing/Bearing Housing/Guide Bracket/Elbow:** ........ Ductile cast iron.
**Mechanical Seal:** ........................................................... Cartridge type with silicon carbide (or tungsten carbide) seal faces and stainless steel sleeve.
**Thrust Bearings**: ........................................................... Back-to-back angular contact ball type or face to face tapered roller type.
**Lubrication**: .................................................................... ISO Grade 46 oil.
**Flange**: ........................................................................... ANSI Class 125.
**Paint:** ............................................................................... Ceramic Epoxy.

DRAWINGS AND DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE. DO NOT USE FOR CONSTRUCTION PURPOSES.
CONTACT VAUGHAN FOR CERTIFIED CONSTRUCTION PRINTS.



DIMENSIONS IN INCHES

| MODEL | A | B | C | D | E | F | G | H | P |
|---|---|---|---|---|---|---|---|---|---|
| S3F/S3G | 27-5/8 | 5-7/8 | 4-7/8 | 15-3/4 | 9-7/16 | 8-1/2 | 4-9/16 | 21 | 3 |
| S3L/S3M | 29 | 6-1/2 | 5 | 15-3/4 | 9-7/16 | 9-1/2 | 4-9/16 | 20-1/2 | 3 |
| S3P | 33-3/4 | 7-11/16 | 5-11/16 | 15-3/4 | 9-7/16 | 11-7/8 | 4-9/16 | 20-7/8 | 3 |
| S3V/S3W | 28-5/8 | 6 | 5-5/8 | 15-3/4 | 9-7/16 | 9-1/2 | 4-9/16 | 21-1/8 | 3 |
| S4K/S4L | 31 | 7-1/2 | 4-5/8 | 15-3/4 | 9-13/16 | 10-3/8 | 4-9/16 | 21-1/4 | 4 |
| S4S/S4T | 34-5/8 | 9 | 4-5/8 | 15-3/4 | 9-13/16 | 12-3/8 | 4-9/16 | 21 | 4 |
| S4V | 42-7/16 | 10-11/16 | 4-3/8 | 15-3/4 | 9-13/16 | 17-7/8 | 4-9/16 | 21-7/16 | 4 |
| S6U | 36-3/4 | 9-5/8 | 6 | 17-7/8 | 11 | 13-1/8 | 4-9/16 | 23-1/4 | 6 |

PRELIMINARY DESIGN MODEL
S4K

15 MINUTE IN-AIR FRAME SIZES ONLY

| HP | SPEED | FRAME | M | W |
|---|---|---|---|---|
| 5 | 1170 | 180TY | 17-1/4 | 12 3/8 |
| | 1750 | 180TY | 17-1/4 | 12 3/8 |
| 7.5 | 1170 | 210TY | 21-7/8 | 15 1/4 |
| | 1750 | 180TY | 17-1/4 | 12 3/8 |
| 10 | 1170 | 210TY | 21-7/8 | 15 1/4 |
| | 1750 | 210TY | 21-7/8 | 15 1/4 |
| 15 | 1170 | 250TY | 25 | 17 |
| | 1750 | 210TY | 21-7/8 | 15 1/4 |
| | 3510 | 210TY | 21-7/8 | 15 1/4 |
| 20 | 1170 | 250TY | 25 | 17 |
| | 1750 | 210TY | 21-7/8 | 15 1/4 |
| | 3510 | 210TY | 21-7/8 | 15 1/4 |
| 25 | 1170 | 250TY | 25 | 17 |
| | 1750 | 250TY | 25 | 17 |
| | 3510 | 250TY | 25 | 17 |

| HP | SPEED | FRAME | M | W |
|---|---|---|---|---|
| 30 | 1170 | 320TY | 25-1/2 | 18-3/4 |
| | 1750 | 250TY | 25 | 17 |
| | 3510 | 250TY | 25 | 17 |
| 40 | 1170 | 320TY | 25-1/2 | 18-3/4 |
| | 1750 | 250TY | 25 | 17 |
| | 3510 | 250TY | 25 | 17 |
| 50 | 1170 | 320TY | 25-1/2 | 18-3/4 |
| | 1750 | 320TY | 25-1/2 | 18-3/4 |
| | 3510 | 320TY | 25-1/2 | 18-3/4 |
| 60 | 1170 | 320TY | 25-1/2 | 18-3/4 |
| | 1750 | 320TY | 25-1/2 | 18-3/4 |
| | 3510 | 320TY | 25-1/2 | 18-3/4 |
| 75 | 1750 | 320TY | 25-1/2 | 18-3/4 |
| 100 | 1750 | 360TY | 32-3/8 | 20-1/4 |
| 125 | 1750 | 360TY | 31-3/8 | 20-1/4 |

**VAUGHAN CO., INC.**
364 Monte Elma Road, Montesano, WA 98563
Phone: 1-360-249-4042 / Fax: 1-360-249-6155
Toll Free Phone (US only): 1-888-249-CHOP (2467)
Web Site: www.chopperpumps.com
Company E-mail: info@chopperpumps.com
*For all current patents, see http://www.chopperpumps.com/patents.htm*

MADE IN THE
USA

# SPECIFICATIONS: 3" – 6" S-SERIES SUBMERSIBLE CHOPPER PUMPS

The submersible chopper pump shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. The pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications. Pump shall be manufactured by Vaughan Co., Inc.

## DETAILS OF CONSTRUCTION

A. **Casing:** Shall be of volute design, spiraling outward to the Class 125 flanged centerline discharge. Casing shall be ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics. Casing shall include a replaceable Rockwell C 60 alloy steel cutter to cut against the rotating impeller pump-out vanes for removing fiber and debris.

B. **Impeller:** Shall be semi-open type with pump out vanes to reduce seal area pressure. Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a set clearance between the impeller and cutter bar of 0.015-0.025" cold. Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced. The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.

C. **Cutter Bar Plate**: Shall be recessed into the pump casing and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.010-0.030" of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area. Chopper pumps utilizing individually mounted shear bars shall not be acceptable. Cutter bar shall be alloy steel heat-treated to minimum Rockwell C 60.

D. **Cutter Nut**: The impeller shall be secured to the shaft using a cutter nut, designed to cut stringy materials and prevent binding using a raised, rotating cutter tooth. The cutter nut shall be cast alloy steel heat treated to minimum Rockwell C 60.

E. **Upper Cutter:** Shall be threaded into the casing or back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the impeller hub, reducing and removing stringy materials from the mechanical seal area. Upper cutter shall be cast alloy steel heat treated to minimum Rockwell C 60. The upper cutter teeth are positioned as closely as possible to the center of shaft rotation to minimize cutting torque and nuisance motor tripping. The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.

F. **Pump Shafting**: Shafting shall be heat treated alloy steel, with a minimum diameter of 1.5 inches in order to minimize deflection during solids chopping.

G. **Bearing Housing:** Shall be ductile cast iron, and machined with piloted bearing fits for concentricity of all components. Piloted motor mount shall securely align motor on top of bearing housing.

H. **Thrust Bearings:** Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings, or a matched set of face to face tapered roller bearings, with a minimum L-10 rated life of 100,000 hours. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.7". A third mechanical seal (two in motor) shall also be provided to isolate the bearings from the pumped media. The third seal, as well as the thrust bearings shall be oil bath lubricated in the bearing housing by ISO Grade 46 oil. Shaft overhang exceeding 1.7 inches from the center of the lowest thrust bearing to the seal faces shall be considered unacceptable.

I. **Pump Mechanical Seal:** The mechanical seal shall be located immediately behind the impeller hub to maximize the flushing available from the impeller pump-out vanes. The seal shall be a cartridge-type mechanical seal with Viton O-rings and silicon carbide (or tungsten carbide) faces. This cartridge seal shall be pre-assembled and pre-tested so that no seal settings or adjustments are required from the installer. Any springs used to push the seal faces together must be shielded from the fluid to be pumped. The cartridge shall also include a 17-4PH, heat-treated seal sleeve and a ductile cast iron seal gland.

J. **Automatic Oil Level Monitor:** An oil level switch shall be mounted at the top of the wet well, with a hose feeding down to the side of the bearing housing to monitor oil level and shut off the motor in event of low oil level. A relay shall be included for mounting in the motor control panel.

K. **Shaft Coupling:** The submersible motor shall be close coupled directly to the pump shaft using a solid sleeve coupling, which is keyed to both the pump and motor shafts. Slip clutches and shear pins between the shaft and the motor are considered unacceptable.

L. **Stainless Steel Nameplate:** Shall be attached to the pump giving the manufacturer's model and serial number, rated capacity, head, speed and all pertinent data.

M. **Submersible Motor:** The submersible motor shall be U/L or FM listed and suitable for Class I, Group C & D, Division I hazardous locations, rated at __ HP, ___ RPM, __ Volts, 60 Hertz and 3 phase, 1.15 service factor (1.0 for Continuous In-Air) with Class F insulation. Motor shall have tandem mechanical seals in oil bath and dual moisture sensing probes. Moisture probes must be connected to indicate water intrusion. The lower motor seal shall be exposed only to the lubricant in the pump bearing housing, with no exposure to the pumped media. Motor shall include two normally closed automatic resetting thermostats connected in series and embedded in adjoining phases. The thermostats must be connected per local, state, and/or the National Electric Code to maintain hazardous location rating and to disable motor starter if overheating occurs. Motor frame shall be cast iron, and all external hardware and shaft shall be stainless steel. Motor shall be sized for non-overloading conditions.

N. **Guide Rail System:** Provide a guide rail system consisting of two galvanized or stainless steel guide rails (by others), cast ductile iron pump guide bracket, cast ductile discharge elbow with mounting feet and Class 125 flanges, 316 stainless steel upper guide rail mounting bracket, and 316 stainless steel intermediate guide rail stiffener bracket every 10 feet.

O. ***Optional*** **Spark Proof Guide Rail System:** Provide a non-sparking guide rail system consisting of two galvanized or stainless steel guide rails (by others), cast bronze pump guide bracket, cast ductile iron discharge elbow with mounting feet and Class 125 flanges, 316 stainless steel upper guide rail mounting bracket, and 316 stainless steel intermediate guide rail stiffener bracket every 10 feet. System design shall prevent spark ignition of explosive gases during pump installation and removal.

P. **Surface Preparation:** Solvent wash and a single coat of Tnemec 431 epoxy applied at 5 MDFT minimum (except motor).

Q. ***OPTIONAL*** **Surface Preparation:** SSPC-SP6 commercial sandblast (except motor), a prime coat of Tnemec 431 epoxy and a finish coat of Tnemec 431 epoxy for total finish of 30 MDFT minimum (except motor).

Unmatched Reliability

**Vaughan®**

**Chopper**

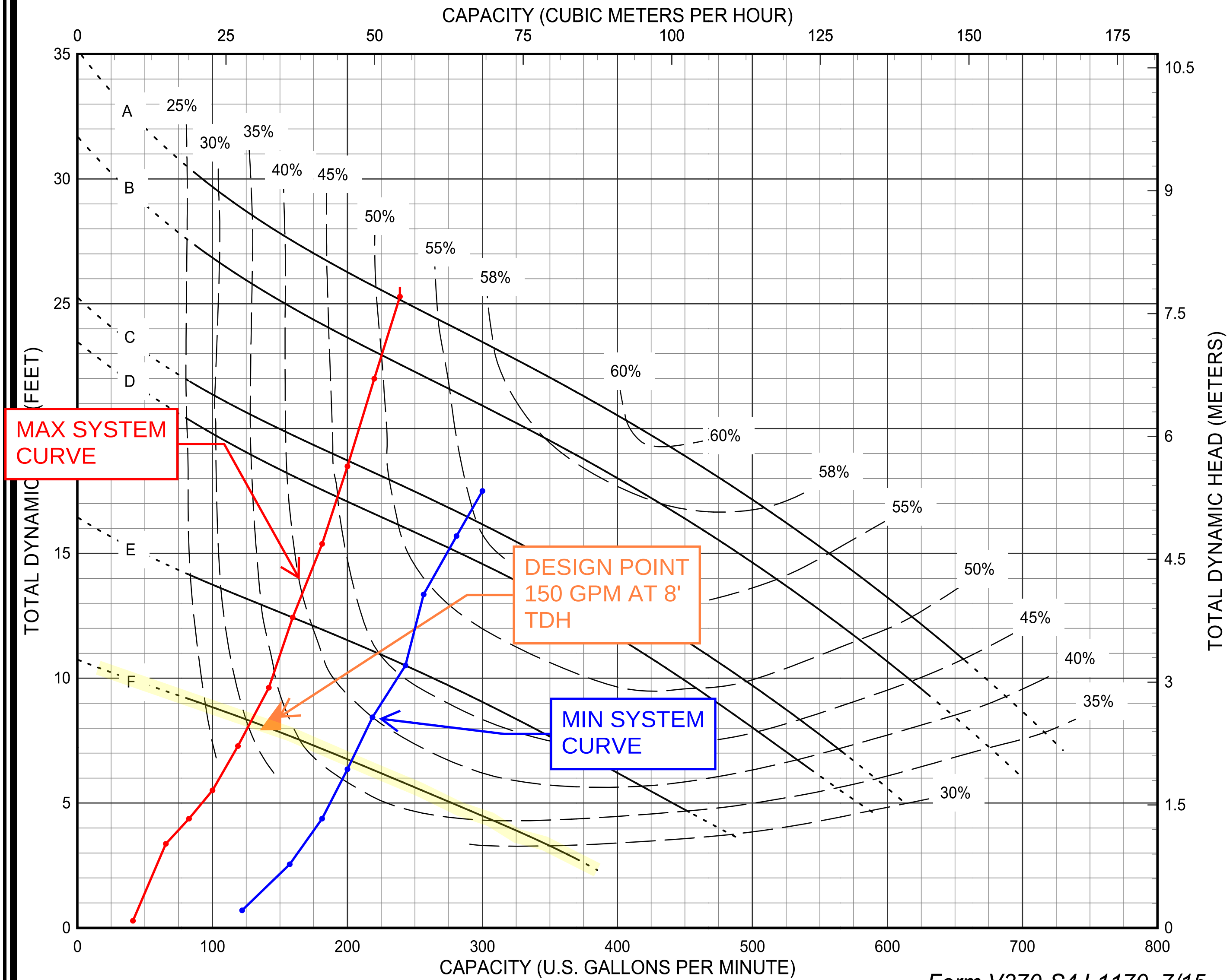
# PERFORMANCE CURVE

**Models:**
**S4K**

**Centerline Casing**
**2-Blade Impeller**
**4” Discharge**
**6” Suction**

| CURVE | POWER (HP/KW) | SPEED (RPM) | IMPELLER DIAMETER |
|---|---|---|---|
| A | 5 / 4 | 1150 | 8.90” (226 mm) |
| B | 5 / 4 | 1150 | 8.60” (218 mm) |
| C | 5 / 4 | 1150 | 8.00” (203 mm) |
| D | 5 / 4 | 1150 | 7.80” (198 mm) |
| E | 5 / 4 | 1150 | 7.00” (178 mm) |
| F | 5 / 4 | 1150 | 6.30” (160 mm) |

DO NOT OPERATE PUMP IN DOTTED PORTION OF CURVES. PUMPS MAY EXCEED HP SHOWN IF OPERATED IN DOTTED PORTION OF CURVE. CURVES ARE SUBJECT TO CHANGE WITHOUT NOTICE. EFFICIENCIES SHOWN ARE NOMINAL BOWL. GUARANTEED MINIMUM EFFICIENCIES PER H.I. LEVEL A.



NOTE: Based on PDR comments from the Town, the proposed Grit Pumping System presented in this Basis of Design will be modified to be located outside in a weather-protected enclosure.

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade | | |
| Subject: | Grit Removal | | |
| Prepared By: | Dylan Atkins | Date: | 10/7/2022 |
| Reviewed By: | Jeff Mercer | Date: | 10/10/2022 |
| Revised By: | Dylan Atkins | Date: | 11/15/2022 |

## Description of Relevant Existing Facilities

The existing grit removal system is a standalone teacup style grit unit located in a dedicated Grit Building. The following ancillary equipment are also located in the Grit Building:

- Influent parshall flume
- Decant grit cart for grit dewatering

The Grit Building is in poor condition and the observed equipment and building support systems have outlived their useful life. Currently, the equipment is not in use and is being bypassed.

## Facility Plan Recommendations

The Facility Plan Amendment recommends the existing Grit Building be demolished and the following new grit removal facilities be constructed:

- Exterior vortex or stacked tray (i.e.,Headcell®) grit removal system located attached to the new SBR tank complex
- Dry pit grit pump in the Process Building Grit Pump Room
- Grit washer for washing and dewatering of grit, located in the Process Building
- New grit dewatering cart in the lower level of the Process Building
- Magnetic flow meter on the Influent Pump Station force-main located in the Process Building Sludge Pump Room.

A value engineering decision was made to construct a grit classifier in lieu of a grit washer.

## Client Preferences

The client prefers to avoid a tea-cup style grit removal system due to the poor performance of their existing system.

## Design Guidelines

Technical Resource – 16 (TR-16) Guides for Design of Wastewater Treatment Works provides the following recommendations for mechanical vortex grit removal systems:

- Straight inlet channel into the vortex grit chamber with a 7:1 length to width ratio or a minimum length of 15 feet, whichever is greater.
- 2-3 ft/sec velocity in the inlet channel for the range of flows defined by 40-80% of the peak flow.
- Minimum acceptable velocity at low flow conditions of 0.5 ft/sec.

- Grit pumps sized to meet high head requirements to remove grit from GTMX-1 and convey it to GTC-1.
- Minimize length of GTP-1 suction piping.
- Minimize bends and use long radius bends on all grit piping.
- Provide cleanout and removable couplings at bends (wyes may be used to provide combination gradual bend/cleanout).
- Grit pipe velocities of 3-6 ft/sec should be maintained
- Minimal grit piping with nominal diameters of at least 4 inches.
- Plant water connections for flushing of GTP-1 suction line.
- GTP-1 discharge piping should be glass-lined ductile iron (DI) wherever possible and connection points should be Victaulic™ or a similar type of quick release connection.

Chapter Env-WQ 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities provides the following guidelines:

- Grit removal facilities shall be provided for all WWTPs for protection of downstream processes and equipment.
- If grit is removed by a means that causes the grit to contain excess organics or water, or both, for the method of final grit disposal to be used, the WWTP shall include grit washing and dewatering facilities as necessary. Impervious surfaces with drains shall be provided for grit handling areas. Grit conveying equipment shall be designed to avoid loss of material and shall be protected from freezing. A pressurized water supply shall be provided for cleanup.
- Where a single mechanically operated grit removal device is used, auxiliary manually-operated grit removal equipment shall be provided. Design shall include provisions for automatic diversion of the entire sewage flow through the by-pass grit removal device should the mechanical unit fail.

## Alternatives Analyses

Wright-Pierce solicited quotes from multiple vortex style grit removal manufacturers including Hydro-international, Hydro-Dyne, and Smith & Loveless. Hydro-international provided budgetary proposals for both a conventional vortex style grit removal system as well as a stacked tray vortex style grit removal system. A stacked tray vortex style grit removal system was identified to be the least cost-effective solution and was eliminated from consideration. Smith & Loveless was chosen as the basis of design manufacturer for mechanically induced vortex style system due to cost effectiveness, guaranteed performance, history of successful installations, and client/design support services.

The Grit Removal System shall be specified to be inclusive of other manufacturers as “or equals.”

## Basis of Design

The Grit Removal System will not be specified as a packaged system; the following components shall be specified as indicated:

- Mechanically induced vortex equipment shall be specified in Section 11320.
- Grit pumping shall be specified in Section 11317
- Grit Concentrator, Classifying and Conveyance shall be specified in Section 11320 (Grit concentrating, classifying, and conveyance equipment shall be from the same manufacturer and will not be required to be the same manufacturer as the mechanically induced vortex equipment).

Table 1 summarizes design data for the recommended Grit Removal System.

Table 1: Grit Removal System

| Vortex System GTMX-1 | |
|---|---|
| Application | Grit removal of screened, influent wastewater |
| Type | Mechanically Induced Vortex Style |
| Location | Process Building (exterior) |
| Classification | Class 1 Div II |
| Design Average Flow, MGD | 0.65 |
| Design Peak Flow, MGD | 2.65 |
| Target Grit Size @ Design Peak Flow, microns | 105 |
| Grit Removal of Target Grit Size at Peak Flow, % | 95 |
| Number of Units | 1 |
| Capacity @ Target Grit Size and Removal, MGD | 2.68 |
| Turndown Ratio | 10:1 |
| Motor | 3/4 HP; TEFC; 460/3/60 |
| Constant/ Variable Speed: | Constant |
| Chamber Dry Weight of Equipment, lbs | ~2,800 |
| Grit Fluidizing Wash-water requirements, gpm @ psi | 20 @ 60 |
| Acceptable Manufacturer(s): | Smith & Loveless, Hydro-Dyne, or Hydro-International |
| **Grit Pump GTP-1** | |
| Application | Grit Slurry Conveyance |
| Type | Dry Pit - Flooded Suction – Centrifugal Recessed Impeller |
| Location | Process Building (Sludge Pump Room) |
| Classification | Unclassified |
| Suction Piping Nominal Diameter, inches | 4 |
| Discharge Piping Nominal Diameter, inches | 4 |

| | |
|---|---|
| Motor | 15 HP; TEFC; 460/3/60 |
| Constant/Variable Speed | Variable |
| Capacity, gpm | 250 |
| TDH, ft | 30 |
| Acceptable Manufacturers | Trillium-Wemco, Egger, Hayward-Gordon, or Equal |
| **Grit Classifier GTC-1** | |
| Application | Grit Slurry Concentration, Classification and Conveyance |
| Classifier/conveyor Type | Inclined Screw |
| Location | Process Building (Dewatering Room) |
| NFPA 820 Classification | Unclassified |
| Motor | 1/2 HP; TEFC; 460/3/60 |
| Classifier Screw Size, inch | 12 |
| Concentrator Type | Cyclone |
| Concentrator Capacity, gpm | 250 |
| Cyclone Nominal Inlet Diameter, inch | 4 |
| Cyclone size, inch | 10 |
| Organics Removal | > 95% |
| Dry Solids Output | >90% |
| Weight dry/wet, lb | ~1,650/4,100 |
| Acceptable Manufacturers | Trillium-Wemco, Lakeside or equal |

## Building / Structure Implications

GTMX-1 (motor operated grit paddle, or axial flow propeller) will be located in an above grade concrete structure sharing a common wall with the East side of the Process Building. Screened influent (3mm perforations) will be pumped to a channel constructed upstream of the vortex system. Grit which settles in the chamber will be periodically removed by GTP-1, located in the Grit Pump Room of the Process Building. GTP-1 suction piping shall penetrate the Process Building East wall and GTP-1 discharge piping will penetrate the finished floor of the Dewatering Room. GTP-1 will pump the concentrated grit slurry from the bottom of the grit chamber to GTC-1, located in the Dewatering Room on the second floor of the Process Building. GTC-1 will discharge classified grit through a hatch in the Dewatering Room floor to a grit cart located in the Grit Pump Room.

### Structural Information

| GTMX-1 Influent/Effluent Channel | |
|---|---|
| Top of Concrete, EL | 797.0 |
| Invert of Influent and Effluent Channels, EL | 793.0 |
| Invert of Bypass Channel, EL | 794.5 |
| Length and Width | Refer to layout |
| Bypass Channel Width, in | 24 |
| Freeboard, ft | 1.5 (Influent) – 2.3 (Effluent) |
| **GTMX-1 Chamber** | |
| Top of Concrete, EL | 797.00 |
| Bottom of Upper Chamber/Top of Lower Chamber, EL | 790.5 |
| Bottom of Lower Channel (Inside), EL | 783.08 |
| Upper Chamber Height (Inside), ft | 6.5 |
| Lower Chamber Height (Inside), ft | 7.42 |
| Total Chamber Height (Inside), ft | 13.92 |

## Process Control Description

The manufacturer of GTMX-1 will supply a local control panel (LCP-X) with an E-stop located on top of the grit chamber. A Div 13 specified process control panel (PLC-X) will be located in the dewatering and grit room and provide programmable logic to control the following grit system sequence of operation and control:

1. GTMX-1 will run continuously
2. GTP-1 can be controlled manually but will normally operate automatically based on an adjustable timed cycle starting the following sequence:
    a. Grit fluidizing cycle will start (controlled by a solenoid valve), last 0-5 minutes, and then stop
    b. GTC-1 will start and signal confirmation of running
    c. GTP-1 will then start, last for 0 – 10 minutes, and then stop
    d. GTC-1 will continue to run for 0 – 5 minutes and then stop, ending the cycle.

A Div 13 flow element will be provided to monitor whether GTP-1 is operating as intended and identify if grit is clogging the suction or discharge piping.  The following instruments, control panels, and local control stations are anticipated:

| Item | NEMA | By Division |
|---|---|---|
| Local Control Panel (E-Stop) | 7 | 11-OEM |
| Process Control Panel (PLC) | 1/12 | 13 |
| Solenoid Valve | 4X | 11-OEM |
| Flow Element | 4X | 13 |

## Construction Sequencing

The new Process Building and Grit Removal System shall be constructed prior to demolition of the existing Grit Building. Once the Process Building and Grit Removal system are operational then INFP-1,-2, -3 discharge piping may be re-routed to the new influent flow metering and Grit Removal System. Temporary bypass pumping will be required during the time it takes to make this connection. Temporary bypass piping (gravity) shall be utilized to convey de-gritted wastewater from the new Grit Removal System to the existing Lagoons while the Tank Complex is constructed.

## Future Expansion Considerations

Future peak flows to the WWTF are not expected to increase from design peak flows due to ongoing Inflow/Infiltration (I/I) reduction efforts by the Town of Newport and thus the recommended Grit Removal System is anticipated to be adequate for future flows.

## File Location

J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Design\Technical\5-Process\Grit Removal\Basis_of_Design

## Attachments

☒ Key Design Calculations

☒ Manufacturer Cut Sheets

Dear Valued Customer,

Thank you for your interest in Smith & Loveless regarding your grit system equipment needs for the **Newport, NH** project. With the original introduction of the **PISTA®** Vortex Grit Removal System in 1973, to the **now over 3,100 installed units**, we are pleased to submit information on our latest generation grit chamber, grit pump, grit washing & dewatering equipment, and system controls. A few key items to consider:

1) The proposed vortex **grit chamber from S&L is designed for 95% capture of grit ≥105 micron (140 mesh) at all flows with a 10:1 turndown**. Not all grit equipment suppliers can achieve these results. Test data is available from numerous S&L projects demonstrating these higher removal rates. Our grit washer/dewatering equipment matches the particle capture of chambers with use of parallel plates in the receiving hopper. A properly designed headworks system will consider how the entire grit system works together to optimize grit removal, not just on individual components.

2) While a vortex chamber looks like a clarifier, it is not a laminar or quiescent basin; the baffled **PISTA®** chamber design is based on a hydraulically induced vortex. With these generated currents, grit removal doesn't rely on gravity-based settling or surface overflow rates (SOR). **This means the S&L vortex chamber isn't de-rated** and captures a wide range of particle specific gravities – not only limited to 2.65. Computational Fluid Dynamics (CFD) modeling and particle cut off equations demonstrating our system design can be provided.

3) With decades of experience, we are helping to shape the grit industry and offer value to our customers through quality and proven technological advances. Value is a word that often gets over-used in buying and selling arenas and thus its true worth is often de-valued. More than just meaning "better" or "lower" price, best value incorporates the total installed cost. Total installed costs include operating costs, durability of the equipment, and post-sale support. With the intent of properly investing in a modern design with future goals, one must look past the emphasis on initial price and be *best value conscious*. **There are three ways to structure the bid format and be *value conscious*: pre-purchase, single source specification, or base bid specification (award on base bid)**. If you need additional details to maintain control over the selection of equipment, please contact us for specific examples and/or pros-and-cons of each format.

We would also invite your team to our manufacturing facility in Lenexa, KS to observe our American Made products and a **full scale 4 MGD R&D grit removal facility**. This hands-on tool shows how the S&L equipment functions and can be utilized for operator training and certification. We can even customize the grit feed entering the demo unit to your specific site needs.

We at S&L and our local representative, appreciate this opportunity and look forward to offering further information as the project progresses, including CAD files, Revit model(s), hydraulic analysis, grit characteristic evaluation and ongoing headworks design assistance backed by decades of industry leading experience.

Sincerely,

Jeffery Hunninghake
Manager, Municipal Treatment Systems

## 1.0 GENERAL DESCRIPTION:

One (1) Model 2.5V **PISTA® VIO™** grit removal system suitable for installation in a concrete chamber with inlet/outlet channels in a 180 degree inlet/outlet configuration. Each **PISTA®** shall be complete with the following: drive motor, spur gear final drive head, propeller, fluidizer vanes, drive tube, grit pump, second stage concentrator, Grit Classifier and PLC electrical controls in NEMA 4X 316 SS enclosure.

**Grit System Performance Requirements**

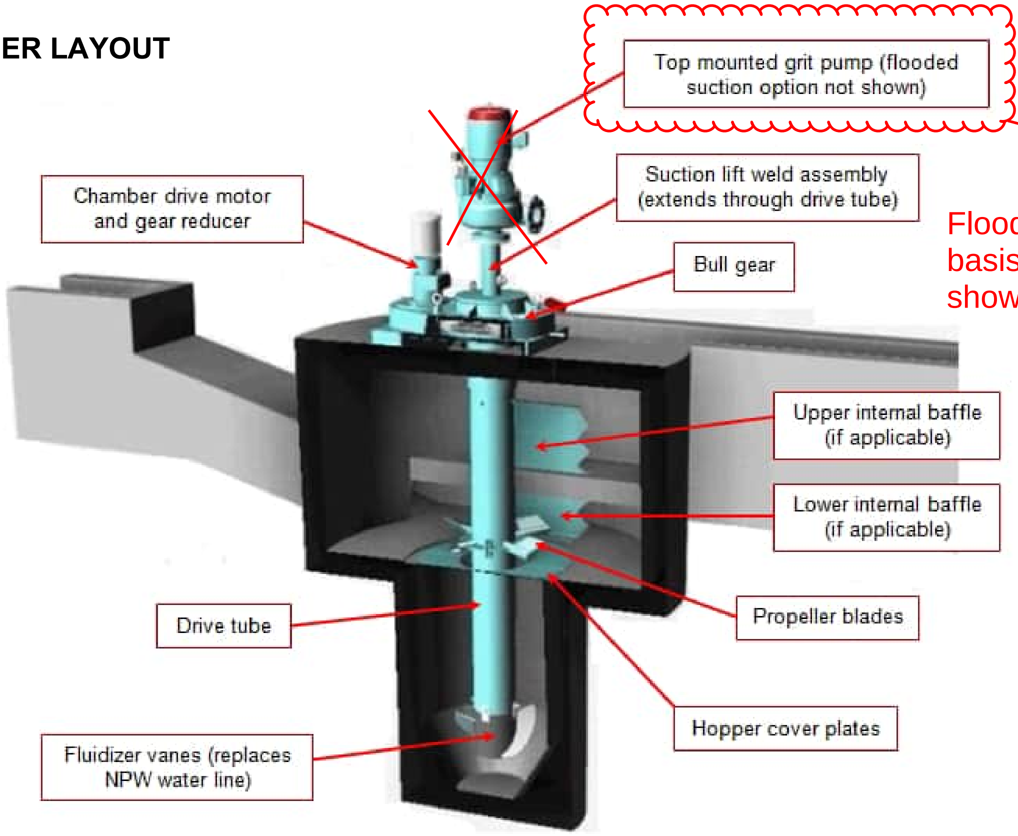
| Design Flows (MGD) | Particle Size | 270 Standard Removal | 360 V-Force® Removal | VIO® Removal | INVORSOR® Removal |
|---|---|---|---|---|---|
| ADF: 0.54<br>PDF: 2.68 | >300 micron | 95% | 95% | 95% | 95% |
| | >210 micron | 85% | 95% | 95% | 95% |
| | >150 micron | 65% | 95% | 95% | 95% |
| | >105 micron | | 95% | 95% | 95% |
| | >75 micron | | | | 95% |

*removal efficiency valid for all flows up to rated peak flow rate.

**Benefits of Smith & Loveless Grit Removal System:**

- Fully Integrated Components: Screen, Grit Chamber, Grit Pump, Grit Classifier/Washer, and Controls
- Industry Leading Grit Removal Performance: 95% of Grit down to 105 microns at all flow conditions
- Capability to Produce Clean, Dry Grit for Disposal (<10% Water, <5% Putrescible Organics)
- Grit Pumps Designed for Long Life (35+ Years Engineering, Design & Mfg Experience)
- PLC Based Controls System to Manage Integrated Components
- All Stainless Steel construction available for the Grit Chamber, Grit Hopper, and Inlet/Outlet Channels

## 2.0 CHAMBER LAYOUT

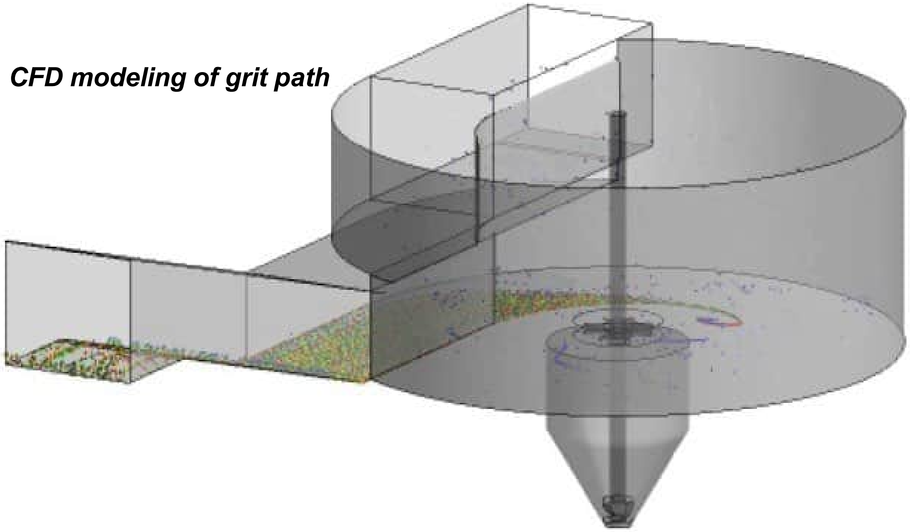


Flooded suction is the basis of design (not shown in this figure)

## 3.0 PISTA® GRIT REMOVAL EQUIPMENT:

The flow in the removal chamber shall travel between the inlet and outlet a minimum of TBD degrees, providing maximum travel of the liquid for effective grit removal. The **PISTA®** system shall handle all flows equal to or less than the rated hydraulic peak flow. The **PISTA® VIO™** shall remove 95% of grit particles down to 140 mesh (105 micron) particle size for the rated hydraulic peak flow rate, with no decrease in efficiency at flows less than peak design rated flow.

**Inlet ramp** used to condition particles of various settling velocities for capture in main chamber hydraulic vortex. **Propeller blades** reduce organic capture and lower burden of the dewatering equipment. **Fluidizer vanes** provide mechanical fluidization of the lower hopper and eliminate the need for additional water lines to the chamber, eliminating at least 20 gpm of continuous water addition. **Lower storage hopper** allows for intermittent pump operation and removal of accumulated grit.

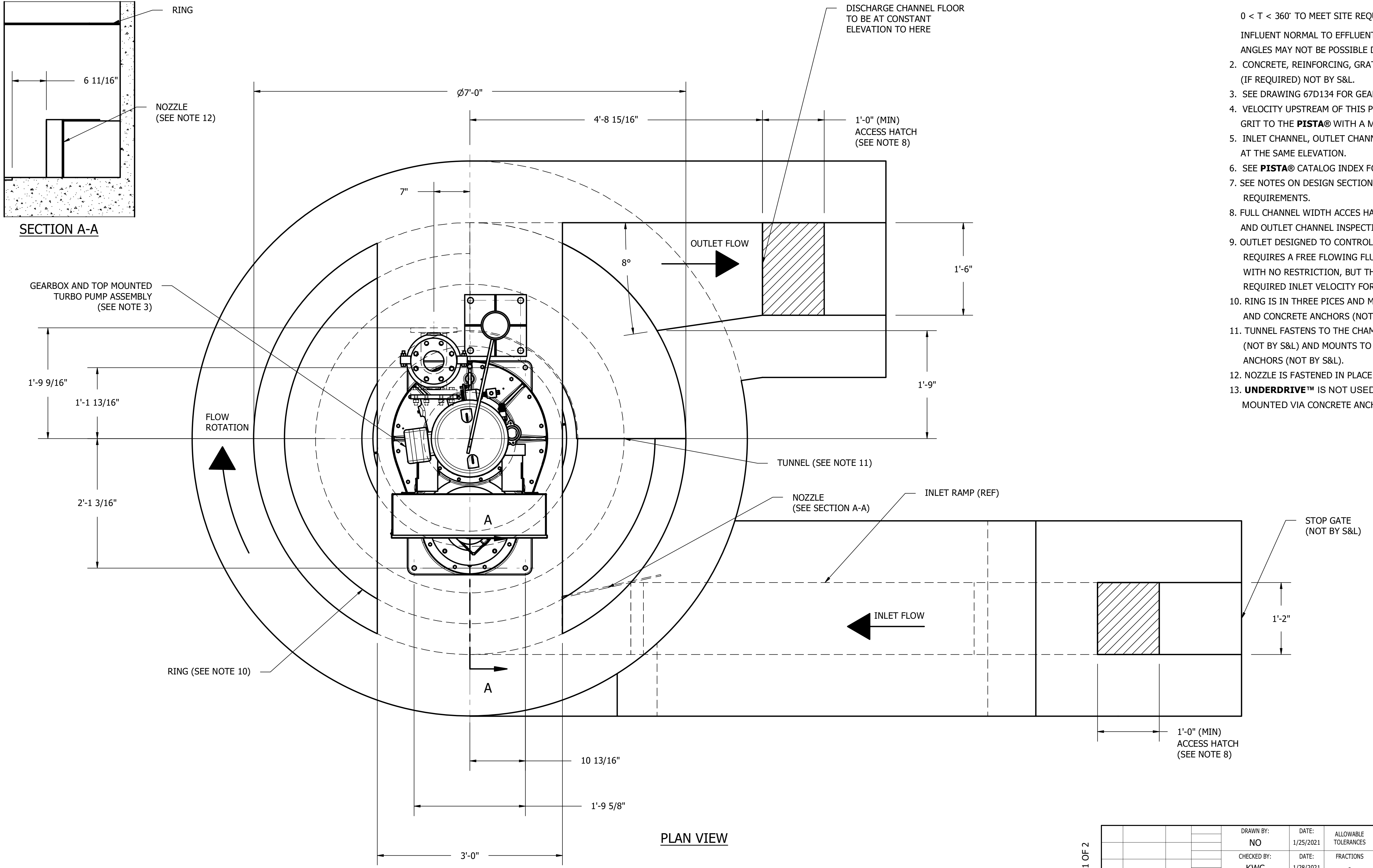


*CFD modeling of grit path*

## 3.1 OPERATIONAL ESTIMATES:

**Headloss** through the non-baffled chamber is less than 1/4 inches at peak flow with other downstream means to maintain inlet channel velocities less than 3.6 ft/s. **S&L recommends** the water level be controlled by **VIO BAFFLE™**, which results in industry leading **10:1 turndown & maintains grit removal performance**. Internal baffle headloss numbers at peak flow shall be provided once chamber size/configuration is specified.

Fine grit removed by a **PISTA®** system



SECTION A-A

PLAN VIEW

NOTES:

1. EFFLUENT CAN BE LOCATED RELATIVE TO INFLUENT AT VARIABLE ANGLE
   0 < T < 360' TO MEET SITE REQUIREMENTS. T IS MEASURE FROM
   INFLUENT NORMAL TO EFFLUENT NORMAL ALONG FLOW DIRECTION. SOME ANGLES MAY NOT BE POSSIBLE DUE TO CHANNEL INTERFERNECE.
2. CONCRETE, REINFORCING, GRATING, HANDRAILS, AND ANCHOR BOLTS (IF REQUIRED) NOT BY S&L.
3. SEE DRAWING 67D134 FOR GEARBOX & TURBO PUMP LIFT MOUNTING ASSEMBLY.
4. VELOCITY UPSTREAM OF THIS POINT MUST BE HIGH ENOUGH TO TRANSPORT GRIT TO THE **PISTA®** WITH A MAXIMUM VELOCITY OF 3.5 FT/S.
5. INLET CHANNEL, OUTLET CHANNEL, AND TOP OF TUNNEL SHOULD ALL BE AT THE SAME ELEVATION.
6. SEE **PISTA®** CATALOG INDEX FOR JOB SPECIFIC OPTIONS.
7. SEE NOTES ON DESIGN SECTION IN **PISTA®** CATALOG FOR HYDRAULIC REQUIREMENTS.
8. FULL CHANNEL WIDTH ACCES HATCHES ARE RECOMMENDED FOR INLET AND OUTLET CHANNEL INSPECTION.
9. OUTLET DESIGNED TO CONTROL THE VELOCITY BY CREATING HEAD LOSS AND REQUIRES A FREE FLOWING FLUME DOWNSTREAM OF THE **PISTA®**. ALSO AVAILABLE WITH NO RESTRICTION, BUT THE HYDRAULIC PROFILE MUST MAINTAIN THE REQUIRED INLET VELOCITY FOR PROPER OPERATION. CONSULT FACTORY.
10. RING IS IN THREE PICES AND MOUNTS TO WALL VIA SUPPORT BRACKETS AND CONCRETE ANCHORS (NOT BY S&L).
11. TUNNEL FASTENS TO THE CHAMBER FLOOR WITH CONCRETE ANCHORS (NOT BY S&L) AND MOUNTS TO WALL VIA SUPPORT BRACKETS AND CONCRETE ANCHORS (NOT BY S&L).
12. NOZZLE IS FASTENED IN PLACE VIA CONCRETE ANCHORS (NOT BY S&L).
13. **UNDERDRIVE™** IS NOT USED FOR MODELS 0.5-2.5. **UNDERDRIVE™** IS MOUNTED VIA CONCRETE ANCHORS (NOT BY S&L).

67B686/A

SHEET 1 OF 2

| LET | ECN NO | DATE | BY APPV'D |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

ORIGINAL ISSUE

DRAWN BY: NO
DATE: 1/25/2021
CHECKED BY: KWC
DATE: 1/28/2021
APPROVED BY: RMV
DATE: 1/28/2021
SCALE: NTS
CODE:
ALLOWABLE TOLERANCES
FRACTIONS -
DECIMALS -
ANGLES -

FOR GOODING, ID

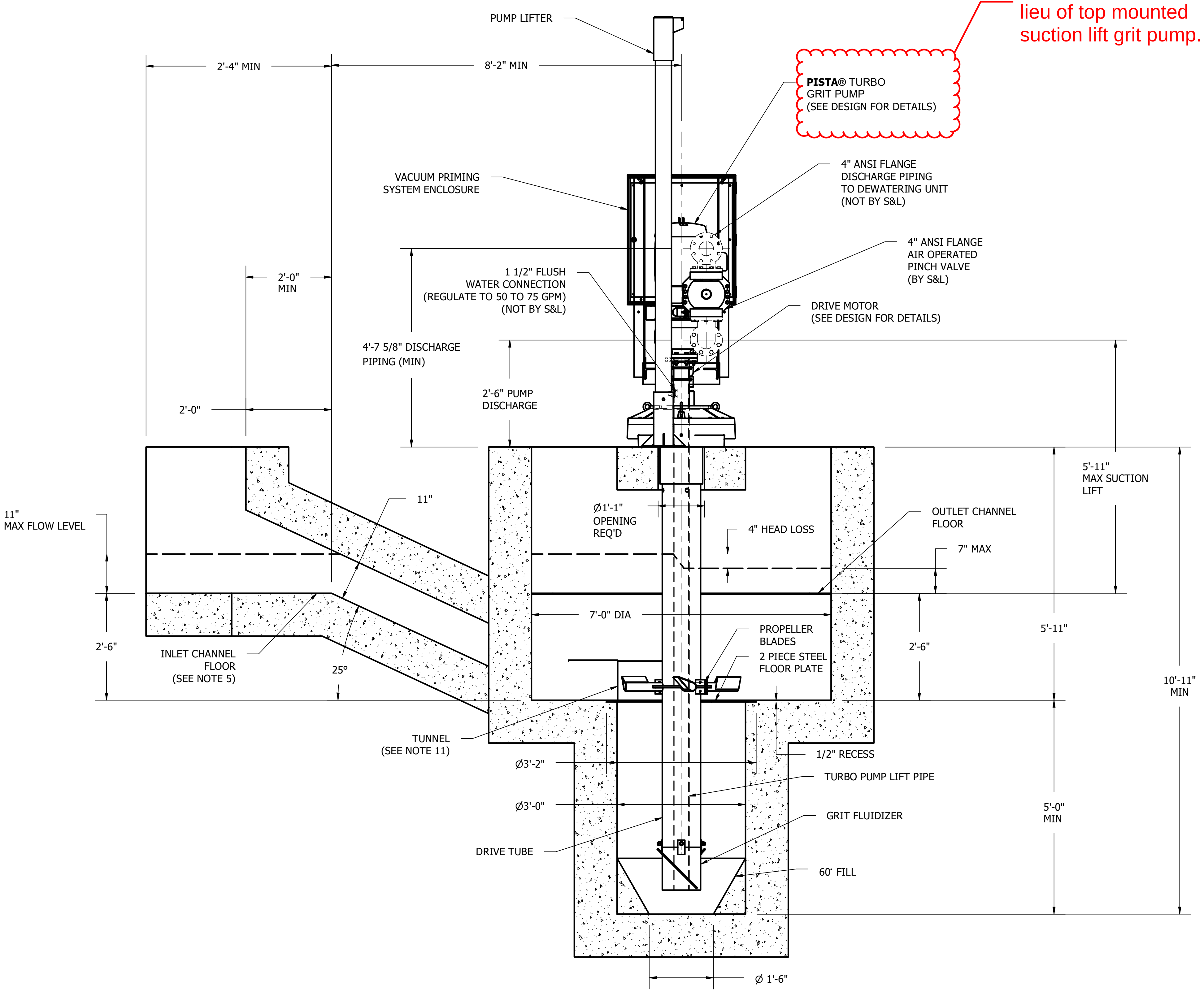
# PISTA® VIO™ GRIT CHAMBER 180 DEG CW MODEL 2.5 VIO W/4" TOP-MOUNTED TURBO PUMP

SIZE
U/M EA
WT.
FILE NAME 31160-03-001.dwg
PLOT SCALE 1:1
SERIAL NO INQ#31160
DWG NO 31160-03-001
REV

THIRD ANGLE PROJECTION

Smith & Loveless, Inc.

Flooded suction grit pump to be used in lieu of top mounted suction lift grit pump.



SECTIONAL ELEVATION

67B686/A

SHEET 2 OF 2

| LET | ECN NO | DATE | BY APPV'D | DRAWN BY: NO | DATE: 1/25/2021 | ALLOWABLE TOLERANCES |
|---|---|---|---|---|---|---|
| | | | | CHECKED BY: KWC | DATE: 1/28/2021 | FRACTIONS - |
| | | | | APPROVED BY: RMV | DATE: 1/28/2021 | DECIMALS - |
| | | | | SCALE: NTS | CODE: | ANGLES - |

ORIGINAL ISSUE

© Smith & Loveless, Inc. 2021

FOR GOODING, ID

PISTA® VIO™ GRIT CHAMBER 180 DEG
CW MODEL 2.5 VIO W/4"
TOP-MOUNTED TURBO PUMP

SIZE
U/M EA
WT.
FILE NAME 31160-03-001.dwg
PLOT SCALE 1:1
SERIAL NO INQ#31160
DWG NO 31160-03-001
REV

THIRD ANGLE PROJECTION

Smith & Loveless, Inc.

**Trillium Pumps USA Inc**

# Quotation

13 Oct 2022

| | | | |
|---|---|---|---|
| Wescor Associates Inc.<br>P.O. Box 370 686 South Street<br>Wrentham, MA 02093 | | Quotation number: | 1791652 |
| | | Revision: | Budget Selection - Pump |

Attn:

Project: Newport, NH Hydrogritter
Your reference:

We thank you for your above referenced inquiry, and are pleased to submit our quotation for your consideration.

Please see the next page for a summary of our offer. Full details can be found in subsequent pages.

30' TDH assumed. 11' TDH Piping + 18' TDH at WEMCLONE (250 GPM @ 7.5psi)

We hope you find our quotation in line with your requirements. However, if you have any questions, please do not hesitate to contact us.

Sincerely,

Robert Haws
Trillium Pumps USA Inc

# Pump Performance Datasheet

Customer : Wescor Associates Inc.
Customer reference :
Item number : 002: Grit Pump
Service :
Quantity : 1

Quote number : 1791652
Size : 4" Model C
Stages : 1
Based on curve number : 4C_P10C-D56
Date last saved : 13 Oct 2022 10:15 AM

## Operating Conditions

Flow, rated : 250.0 USgpm
Differential head / pressure, rated (requested) : 30.00 ft
Differential head / pressure, rated (actual) : 29.89 ft
Suction pressure, rated / max : 0.00 / 0.00 psi.g
NPSH available, rated : Ample
Site Supply Frequency : 60 Hz

## Performance

Speed criteria : Synchronous
Speed, rated : 755 rpm
Speed, maximum : 1500 rpm
Speed, minimum : 600 rpm
Efficiency : 29.15 %
NPSH required / margin required : - / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow) : 1,830 / - US Units
MCSF : 20.00 USgpm
Head maximum, rated speed : 33.65 ft
Head rise to shutoff : 12.09 %
Flow, best eff. point : 509.0 USgpm
Flow ratio, rated / BEP : 49.12 %
Speed ratio (rated / max) : 50.33 %
Head ratio (rated speed / max speed) : 23.92 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010] : 1.00 / 1.00 / 1.00 / 1.00
Selection status : Acceptable

## Liquid

Liquid type : User defined
Additional liquid description :
Solids diameter, max : 0.00 in
Solids concentration, by volume : 0.00 %
Temperature, max : 68.00 deg F
Fluid density, rated / max : 1.000 / 1.000 SG
Viscosity, rated : 1.00 cP
Vapor pressure, rated : 0.00 psi.a

## Material

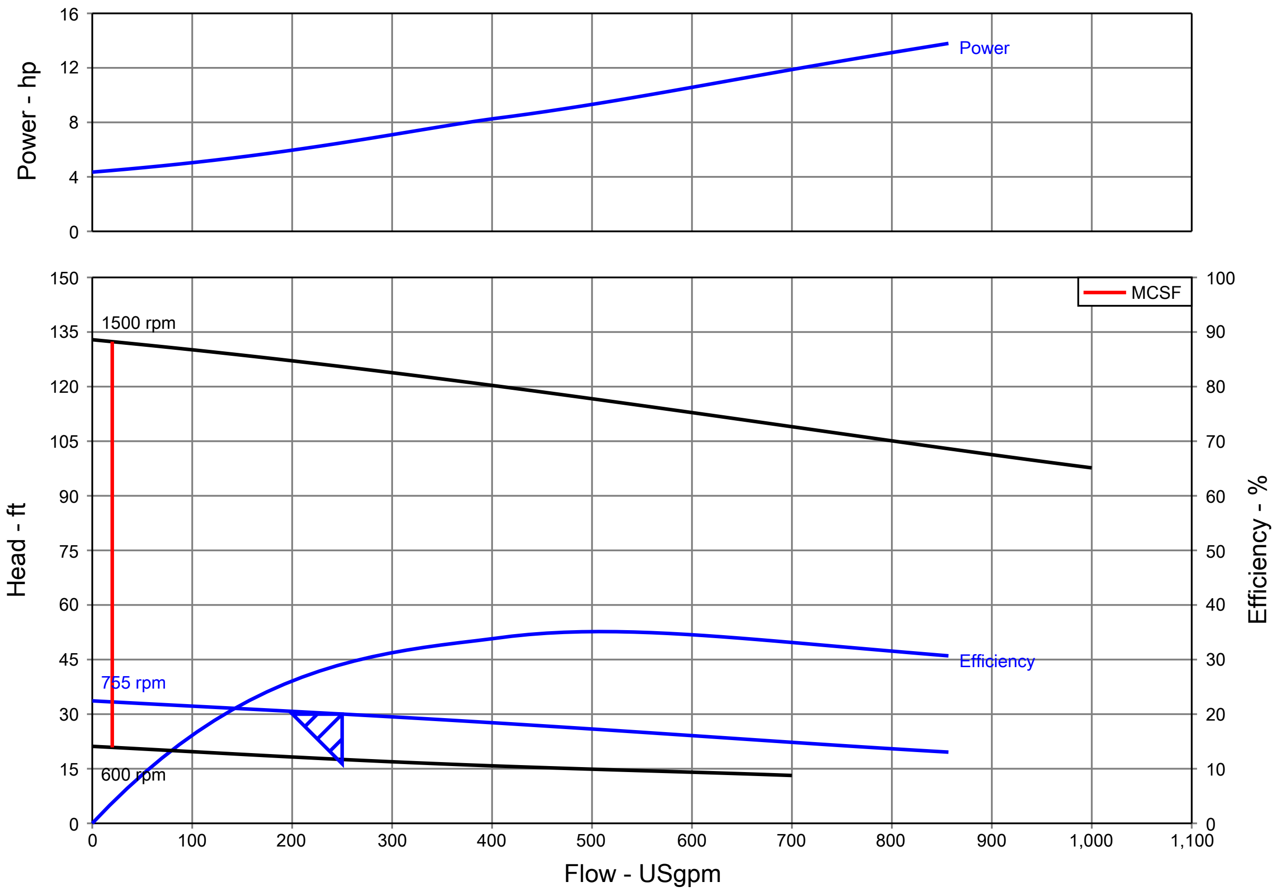
Material selected : Standard

## Pressure Data

Maximum working pressure : 14.57 psi.g
Maximum allowable working pressure : 85.00 psi.g
Maximum allowable suction pressure : N/A
Hydrostatic test pressure : N/A

## Driver & Power Data (@Max density)

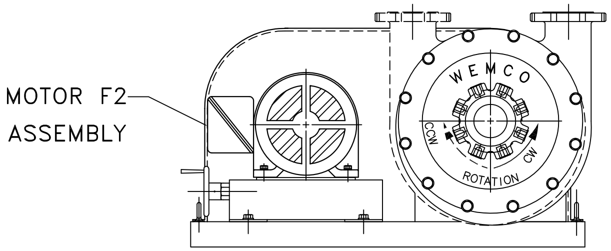
Driver sizing specification : Rated power
Margin over specification : 0.08 %
Service factor : 1.00
Power, hydraulic : 1.90 hp
Power, rated : 6.50 hp
Power, maximum, rated diameter : 13.79 hp
Minimum recommended motor rating : 15.00 hp / 11.19 kW



THIRD-ANGLE PROJECTION

## PUMP SIZED BY: SUCTION X DISCHARGE / ALL DIMS. IN INCHES

| PUMP SIZE | MOTOR FRAME | E | F | G | L | N | NX | V | X | Z | CB | CC | CD | RA | RX | SHAFT CTR.-TO-CTR. | T | W |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4X4 OR 5X4 | 182T - 284T | 9 1/4 | 13 | 15 | 9 | 38 3/16 | 48 1/2 | 5 3/4 | 17 1/2 | 20 | 10 1/4 | 47 | 45 | 5 1/2 | 15 | 18 1/8 - 23 | 4 | 4 1/16 |
| | 286T - 365T | | | | | | 48 1/4 | 3 | 20 | 22 1/2 | 13 | 60 | 58 | | | 22 5/8 - 31 1/2 | 6 3/4 | |
| 6X4 | 182T - 284T | | | | 12 | 41 3/16 | 51 1/2 | 5 3/4 | 17 1/2 | 20 | 10 1/4 | 47 | 45 | | | 18 1/8 - 23 | 4 | |
| | 286T - 365T | | | | | | 51 1/4 | 3 | 20 | 22 1/2 | 13 | 60 | 58 | | | 22 5/8 - 31 1/2 | 6 3/4 | |



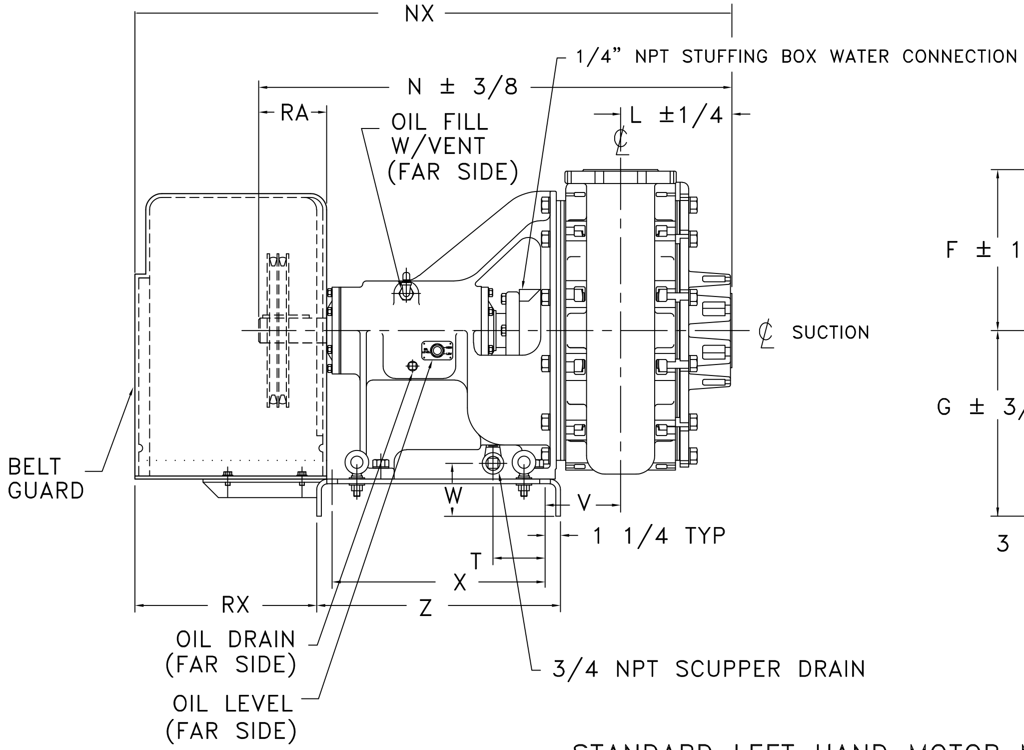
OPTIONAL RIGHT HAND MOTOR MOUNT

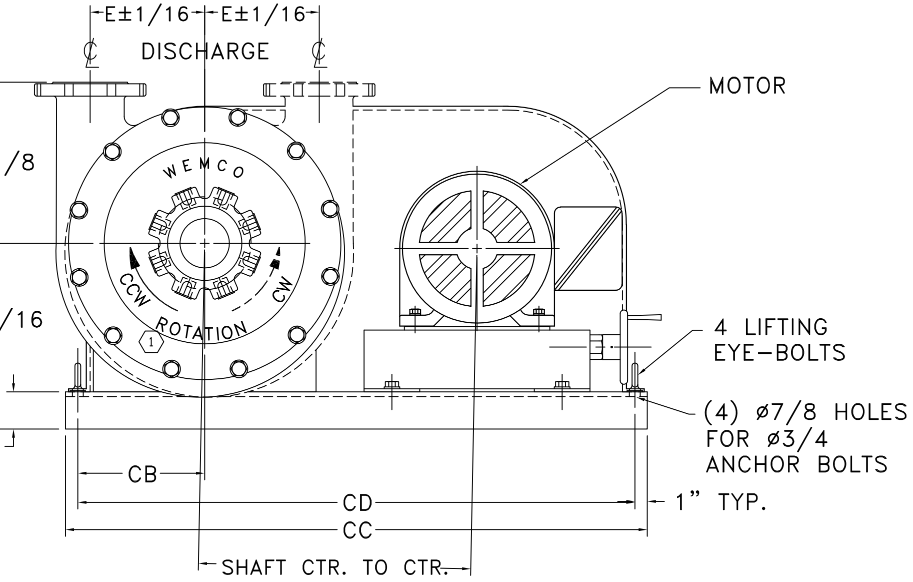
NOTES:

① PUMP AS SHOWN IS AS VIEWED FROM SUCTION END. DESIGNATED ROTATION AND MOTOR LOCATION IS AS VIEWED FROM SHAFT END.

2. SUCTION AND DISCHARGE FLANGES MATE WITH STD. 150 LB. ANSI FLANGES.

3. DIMENSIONS ARE NOT FOR INSTALLATION PURPOSES UNLESS CERTIFIED.





STANDARD LEFT HAND MOTOR MOUNT
VERTICAL UP DISCHARGE

REVISIONS

| NO. | BY | DATE | CHK'D | LCL ECN | INT'L ECN | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | CLM | | | 43169 | | ADDED NOTE 3 TO SHEET 3 AD 6X4 TO TAB |
| 2 | CLM | | | 43603 | | REVISED NOTES ON SHEET 3 |
| 3 | MD | RF | RF | 57810 | | ADDED PART NUMBERS TO BOM |

REFERENCE

| DWG. NO. | DESCRIPTION |
|---|---|
| 54355 | AUTOCAD |

BREAK ALL SHARP CORNERS AND EDGES

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
MACHINED SURFACES 125
TOLERANCES
.X ±.06
.XX ±.03
.XXX ±.010
FRACTIONAL ±1/16
ANGULAR ±0°-30'

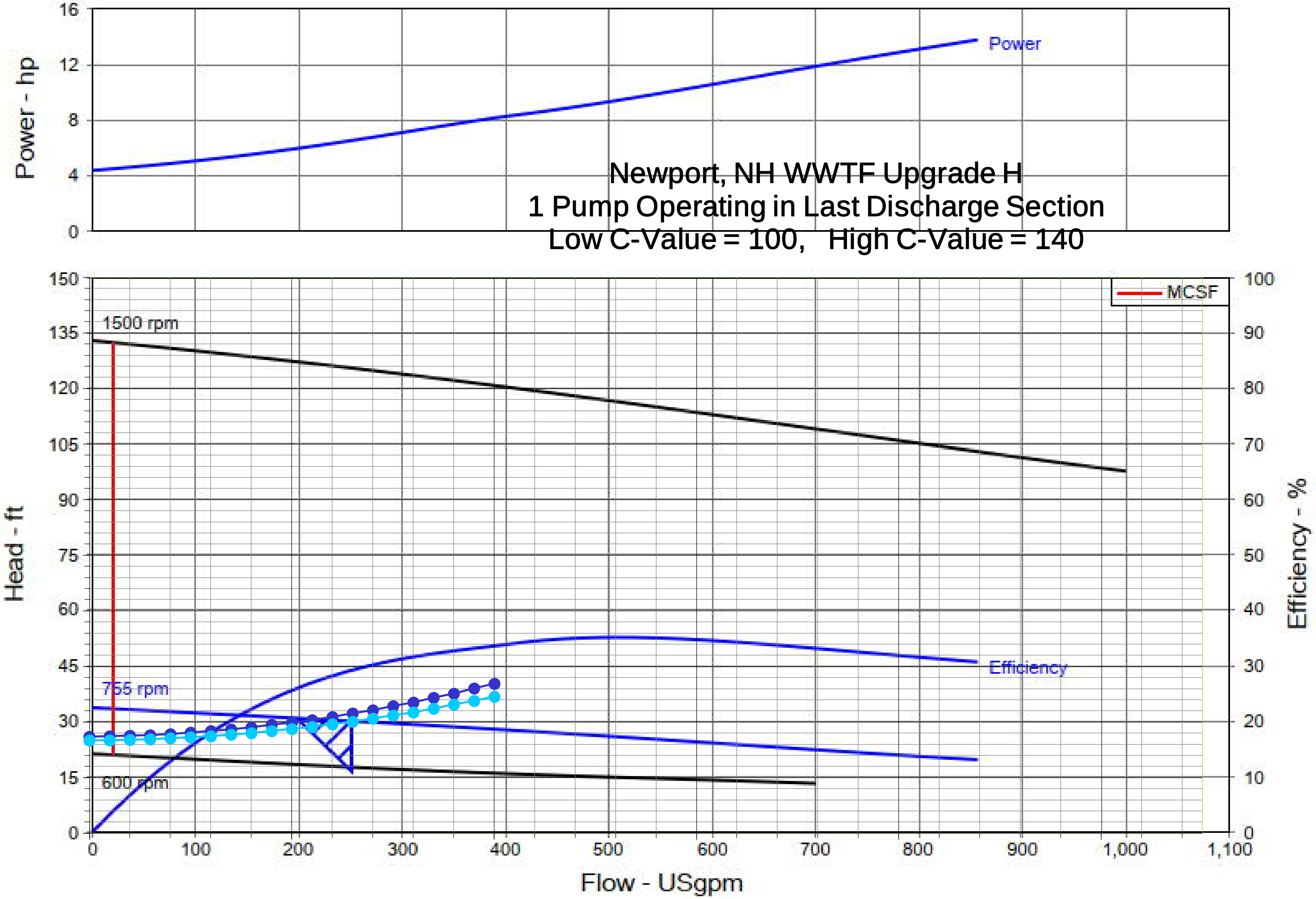
DRAWN BY CAS DATE 4-26-93
CHECKED SMS DATE 1-12-94
APPROVED RS DATE 1-18-94
CHG

TRILLIUM FLOW TECHNOLOGIES™

**WEMCO®**
**ROTO-JET®**

GENERAL ARRANGEMENT
4" MODEL "C"
SIDE MOTOR MOUNT
WEMCO TORQUE-FLOW PUMP

CAD NO. 78213-1
SHEET 1 OF 3
CODE NO. 405/AAA 320
SCALE NONE
SIZE D
DWG NO. 78213
REVISION 3



Newport, NH WWTF Upgrade H
1 Pump Operating in Last Discharge Section
Low C-Value = 100,   High C-Value = 140

**Trillium Pumps USA Inc**

# Quotation

13 Oct 2022

| | | | |
|---|---|---|---|
| Wescor Associates Inc.<br>P.O. Box 370 686 South Street<br>Wrentham, MA 02093 | | Quotation number:<br>Revision: | 1791652<br>Budget Selection - Hydrogritter |

Attn:

Project: Newport, NH Hydrogritter
Your reference:

We thank you for your above referenced inquiry, and are pleased to submit our quotation for your consideration.

Please see the next page for a summary of our offer. Full details can be found in subsequent pages.

We hope you find our quotation in line with your requirements. However, if you have any questions, please do not hesitate to contact us.

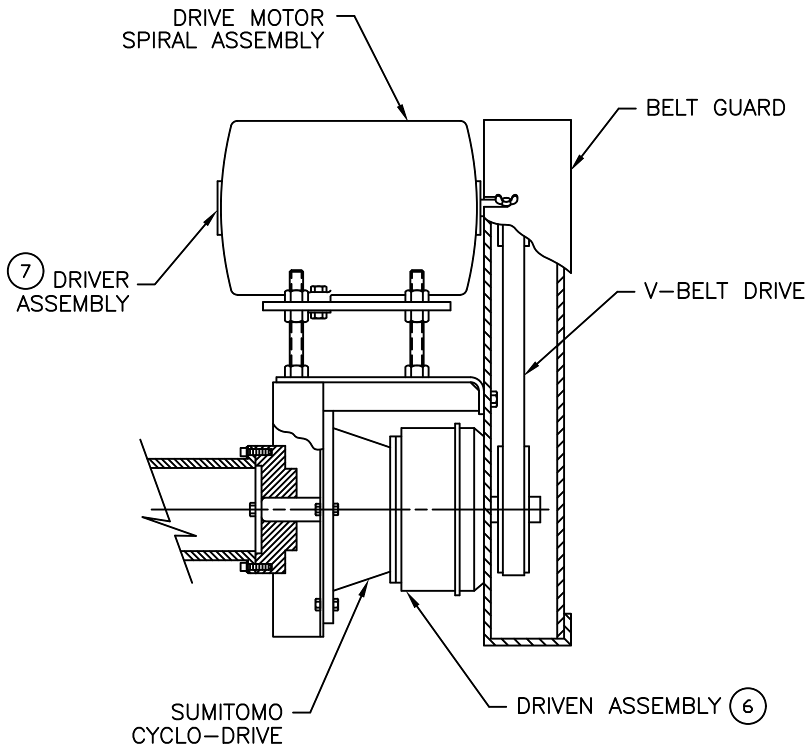
Sincerely,

Robert Haws
Trillium Pumps USA Inc

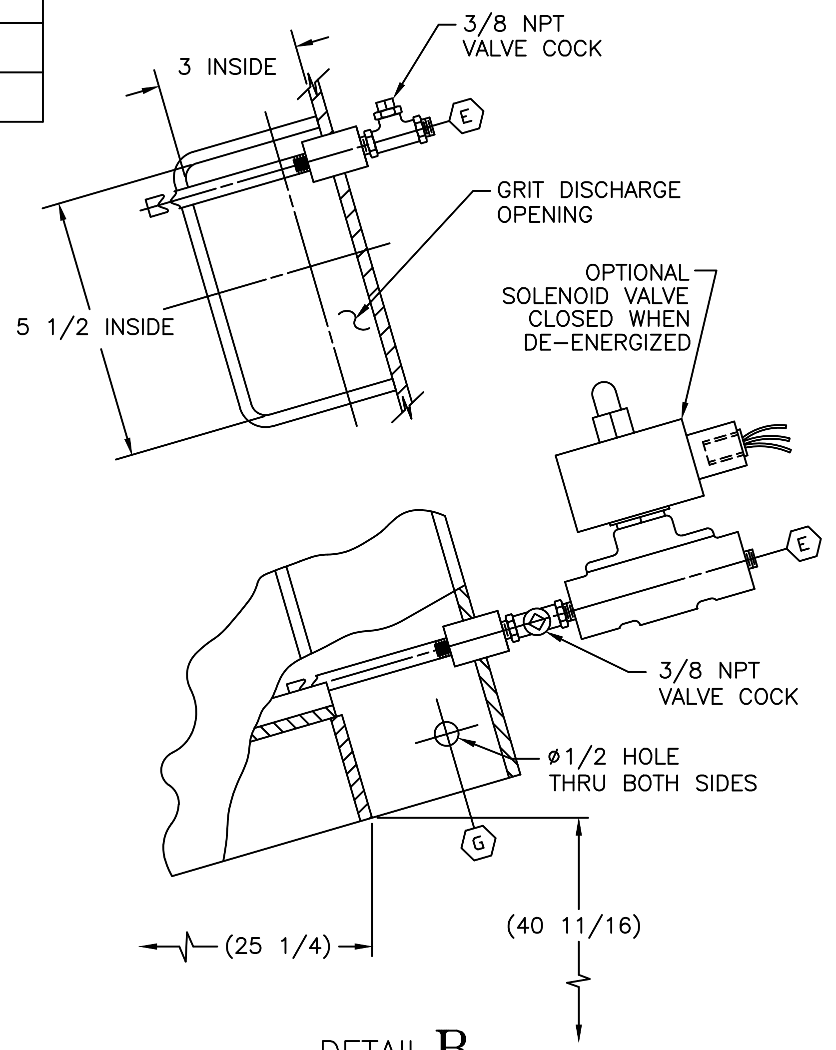
# NOZZLE SCHEDULE

| SYMBOL | QTY. | SIZE | RATING | TYPE | SERVICE/NOTE |
|---|---|---|---|---|---|
| A | 1 | 6" | CLASS 125 | FLAT FACE | OVERFLOW CONNECTION ① |
| B | 1 | 4" | CLASS 125 | FLAT FACE | INLET CONNECTION |
| C | 1 | 2 1/2" | SCH 40 | NPTF | TANK OVERFLOW |
| D | 1 | 2" | SCH 40 | NPTF | TANK DRAIN (PLUGGED) |
| E | 1 | 3/8" | SCH 40 | NPTM | SLUICE WATER WASH, 3/8" NPT |
| F | 1 | 1" | 3000PSI | NPTF | POSSIBLE VENT (PLUGGED) |
| G | 1 | 3x5 1/2 | --- | RECT. | GRIT DISCHARGE OPENING |

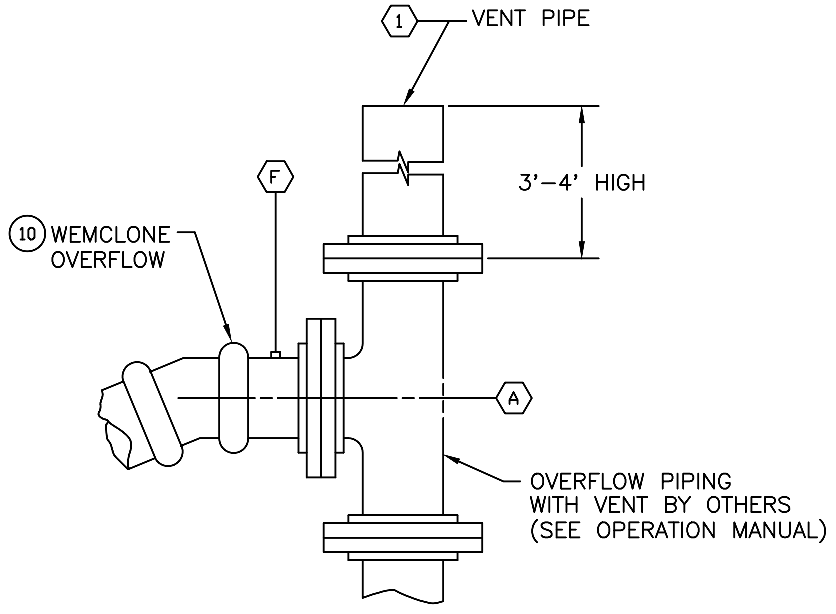
| ITEM NO. | DESCRIPTION |
|---|---|
| 1 | WELDMENT, TANK - 12" FULL FLARE |
| 2 | PLUG, DRAIN - 2" NPT |
| 3 | SPIRAL ASSEMBLY - SINGLE OR DOUBLE RIBBON |
| 4 | WEIR BAR |
| 5 | LIFTING DEVICE ASSEMBLY |
| 6 | DRIVEN ASSEMBLY |
| 7 | DRIVER ASSEMBLY |
| 8 | TANK SUPPORT ASSEMBLY |
| 9 | SLUICE WATER ASSEMBLY |
| 10 | WEMCLONE PIPING ARRANGEMENT |
| 11 | WEMCLONE ASSEMBLY |
| 12 | WEMCLONE PIPING GAUGE ASSEMBLY |
| 13 | FEEDBOX ASSEMBLY |
| 14 | SPIRAL GUARD ASSEMBLY |
| 15 | WEMCLONE SUPPORT ASSEMBLY |
| 17 | DECAL KIT |



DETAIL A
DRIVEN & DRIVER ASSEMBLIES
(N.T.S.)



DETAIL B
CLEAN OR FILTERED EFFLUENT
SLUICE WATER WASH
(N.T.S.)



VENT DETAIL
(N.T.S.)

| APPROXIMATE WEIGHTS | |
|---|---|
| 12" FULL FLARE TANK | 510 LB |
| WATER | 336 LB |
| SPIRAL, SINGLE RIBBON | 235 LB |
| WEMCLONE 1000C WITH WATER | 450 LB |
| WEMCLONE SUPPORT | 200 LB |
| **TOTAL OPERATING WEIGHTS** | |
| SINGLE RIBBON ASS'Y | 1731 LB TOTAL |
| ADD FOR DOUBLE RIBBON | 138 LB |
| DOUBLE RIBBON ASS'Y | 1869 LB TOTAL |

NOTES:

1. GRIT FREE DISCHARGE FROM CYCLONE AND TANK MUST BE VENTED BY OTHERS. (SEE DETAIL)
2. SPIRAL COVERS AND BELT GUARD MUST BE IN PLACE BEFORE OPERATING THE MACHINE.

REVISIONS

| NO. | BY | DATE | CHK'D | LCL ECN | INT'L ECN | DESCRIPTION |
|---|---|---|---|---|---|---|
| – | ens | 07/11 | CCS | – | – | NEW ISSUE |
| 1 | CAL | 05/15 | CCS | – | – | REVISED BORDER |

CERTIFIED FOR CONSTRUCTION
DATE
BY

REFERENCE

| DWG. NO. | DESCRIPTION |
|---|---|
| 707721 | FINAL ASS'Y STRAIGHT TANK |
| 78227 | FINAL ASS'Y MADE FROM |

CHG

CUSTOMER
USER
SERIAL NO.
CUSTOMER ORDER NUMBER
EPS SALES SHEET NO.

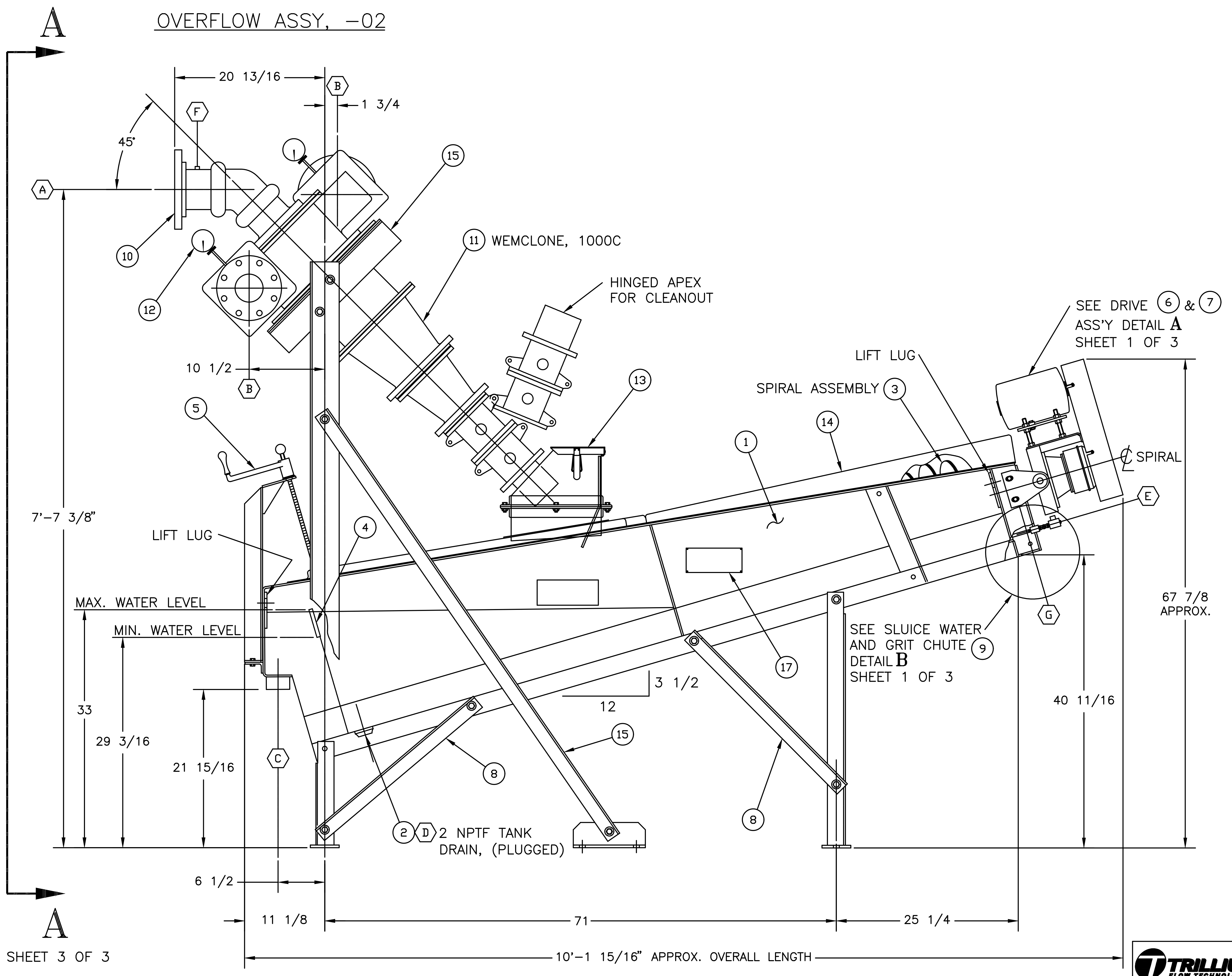
| | |
|---|---|
| DRAWN BY<br>ens | DATE<br>08JUL11 |
| CHECKED<br>CCS | DATE<br>7/13/11 |
| APPROVED<br>CCS | DATE<br>7/13/11 |

TRILLIUM FLOW TECHNOLOGIES
WEMCO® ROTO-JET®

FINAL ASSEMBLY
WEIR END MOUNTED 1000C WEMCLONE
ARRANGEMENTS 'A', 'B', 'C', 'D'
FULL FLARE TANK
12" HYDROGRITTER

CAD NO. 705491-1
SHEET 1 OF 4
CODE NO. /
SCALE 1:1
SIZE D
DWG NO. 705491
REVISION 1

DRAWING NO. 705491



## 12" HYDROGRITTER WITH
## WEIR END MOUNTED 1000C WEMCLONE

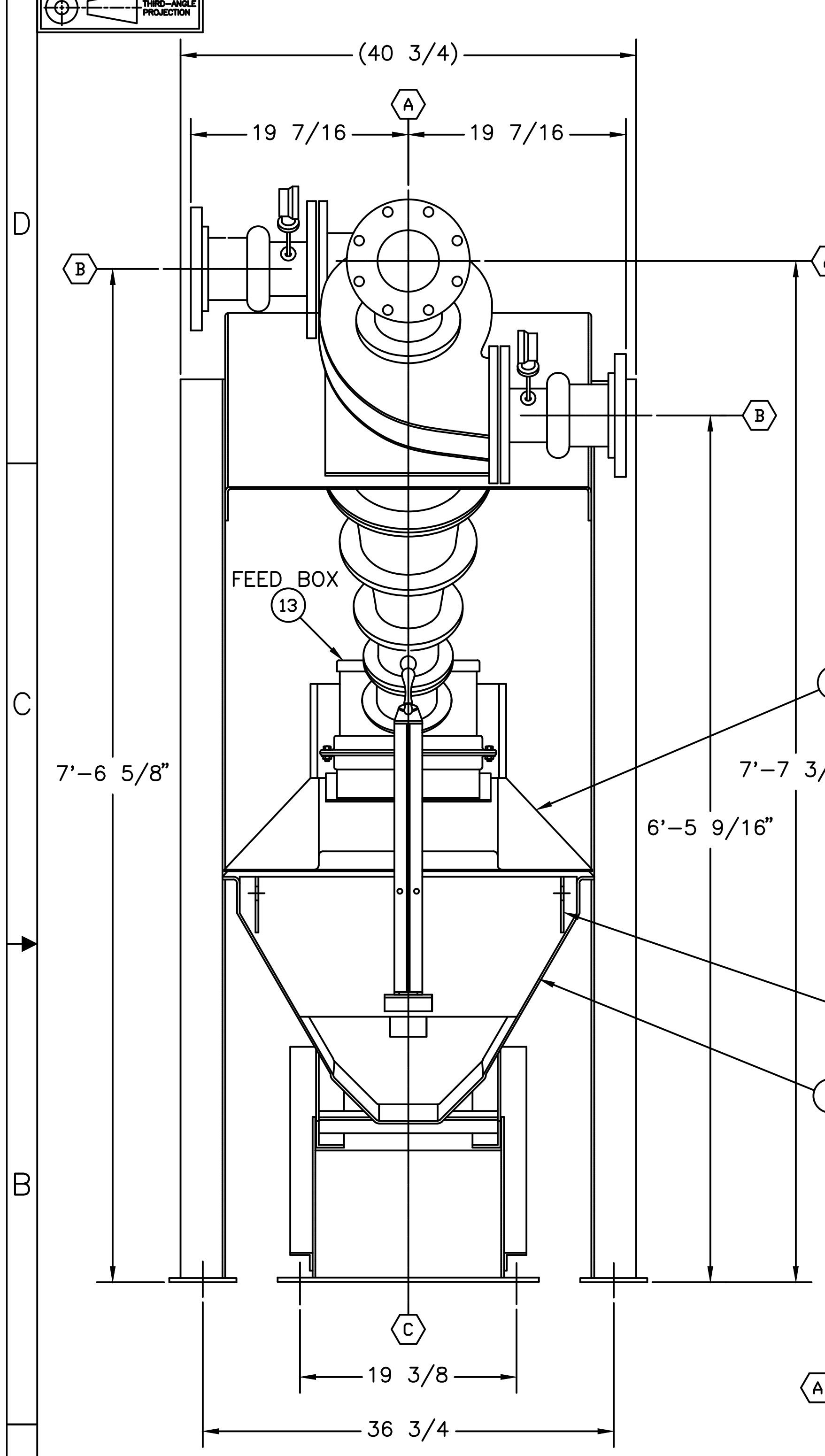
TRILLIUM FLOW TECHNOLOGIES™

**WEMCO®**
**ROTO-JET®**

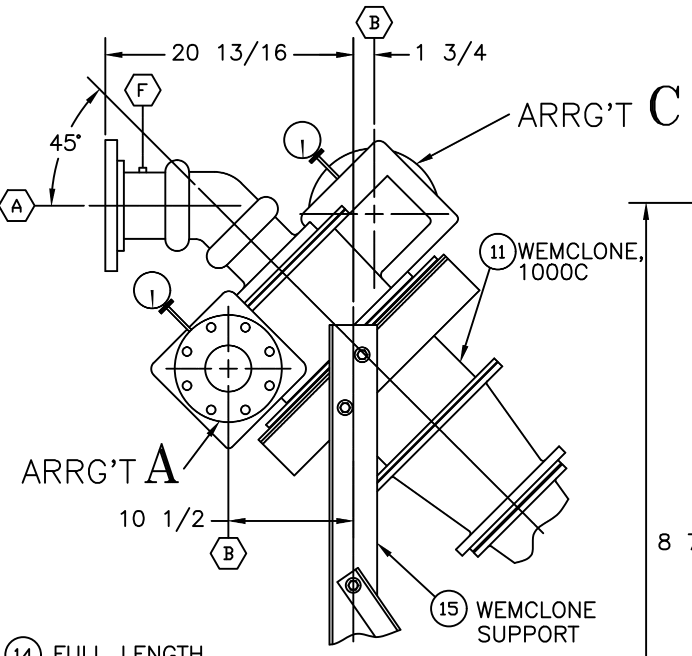
CAD NO. 705491-2
SHEET 2 OF 4
SCALE 9:64
SIZE D
705491
REVISION 1
CHG

DRAWING NO. 705491

THIRD-ANGLE PROJECTION



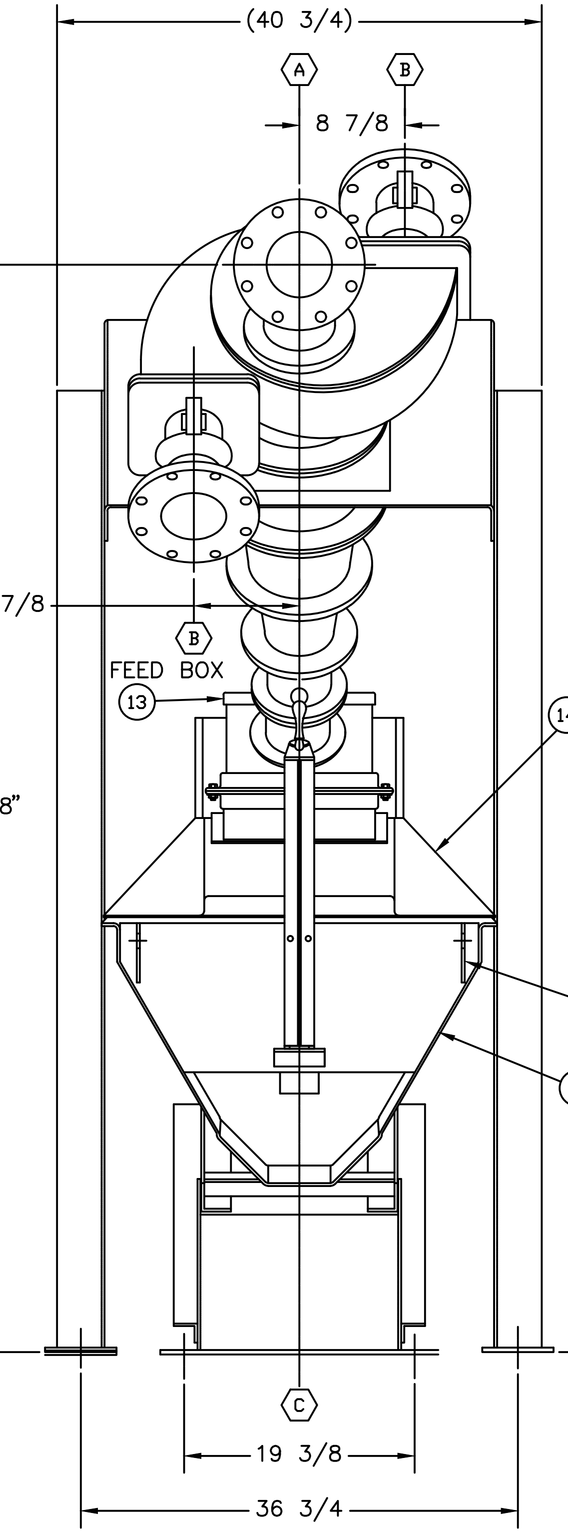
INLET ARRANGEMENTS 'A' & 'C'



14 FULL LENGTH SPIRAL COVER

2X LIFT LUG

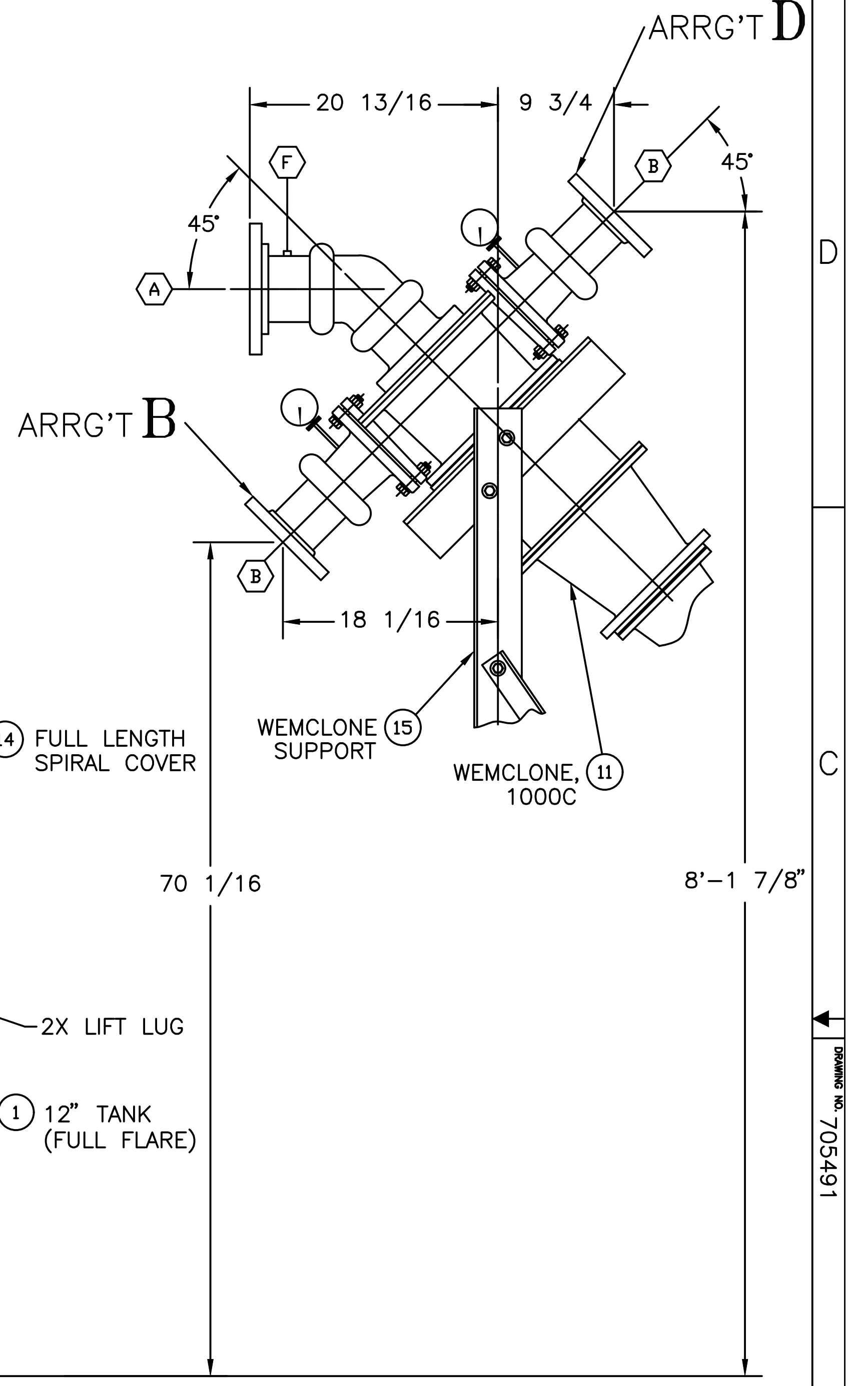
1 12" TANK (FULL FLARE)



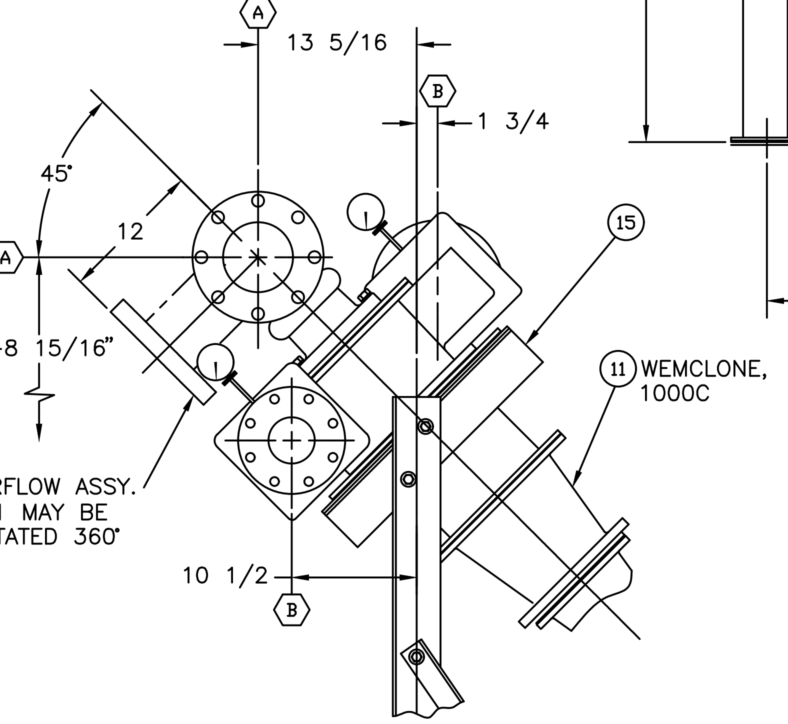
14 FULL LENGTH SPIRAL COVER

2X LIFT LUG

1 12" TANK (FULL FLARE)



INLET ARRANGEMENTS 'B' & 'D'



OVERFLOW ASSY. -01 MAY BE ROTATED 360°

OPTIONAL OVERFLOW ASSY, -01

VIEW A—A

DRAWING NO. 705491

TRILLIUM FLOW TECHNOLOGIES™

**WEMCO® ROTO-JET®**

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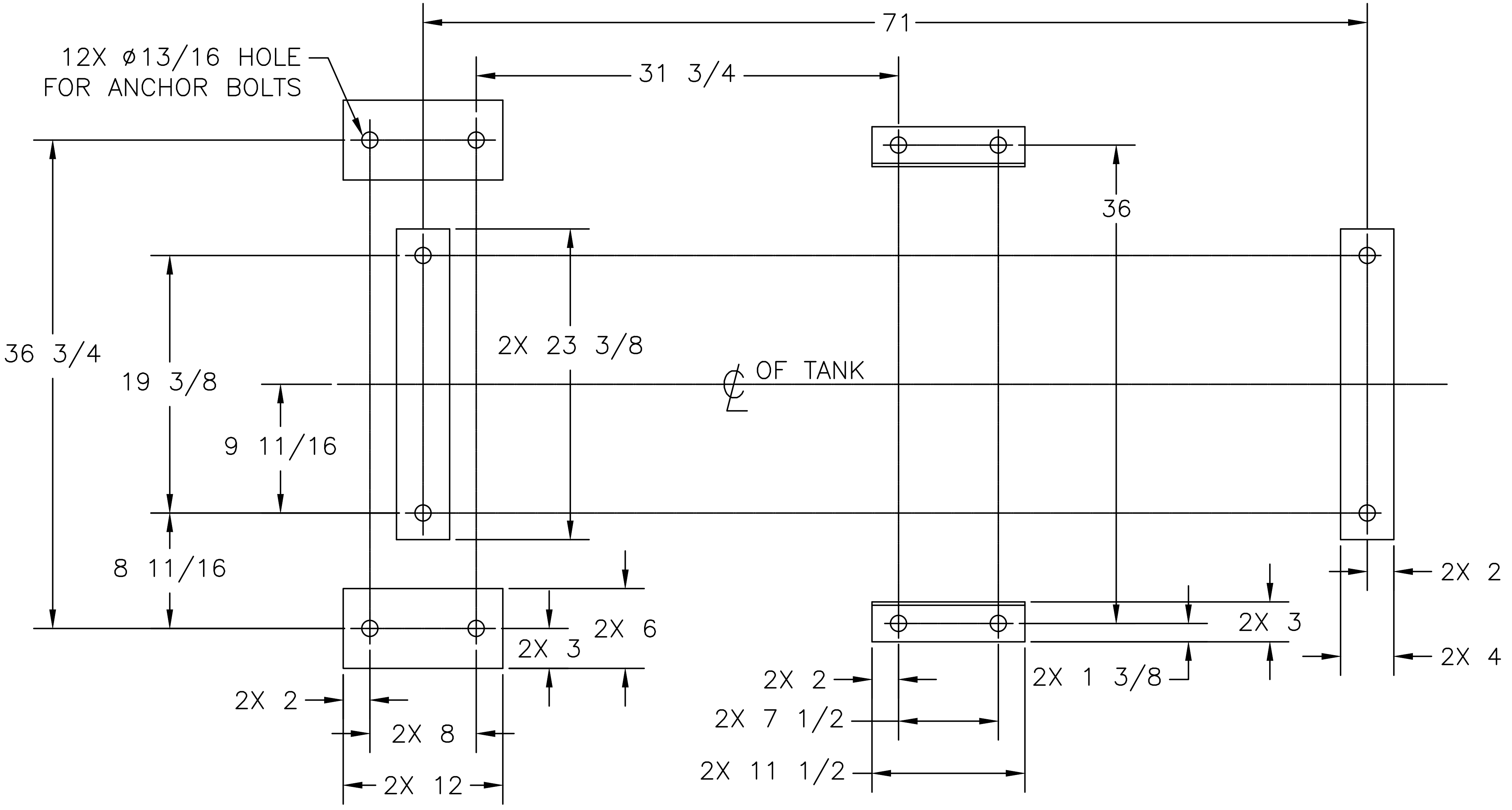
CAD NO. 705491-3
SHEET 3 OF 4
SCALE 1:8
SIZE D
705491
REVISION 1
CHG



ANCHOR BOLT PLAN VIEW

**TRILLIUM FLOW TECHNOLOGIES™**

**WEMCO® ROTO-JET®**

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CAD NO. 705491-4
SHEET 4 OF 4
SCALE 3:16
SIZE D
705491
REVISION 1
CHG

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade | | |
| Subject: | Sequencing Batch Reactor | | |
| Prepared By: | Dylan Atkins | Date: | 9/22/2022 |
| Reviewed By: | Michael Curry, PE | Date: | 10/8/2022 |
| Revised By: | Dylan Atkins | Date: | 11/15/2022 |

## Description of Existing Facilities

The existing secondary treatment process at the WWTF consists of two aerated lagoons designed to oxidize the biochemical oxygen demand ($BOD_5$) and remove the total suspended solids (TSS) from the influent wastewater. Aeration to the lagoons is provided via one 50 hp Houston Service Industries, inc. (HSI) HT50 turbo blower. Fine bubble diffused aeration is provided through a fine bubble lagoon aeration system originally installed in 1987 and since replaced by the Town with an EDI Reef style lagoon aeration system.

## Facility Plan Amendment Recommendations

The Facilities Plan Amendment (Wright-Pierce, May 2022) recommended a sequencing batch reactors (SBRs) process followed by a tertiary filtration system. The Facilities Plan Amendment also recommended re-purposing the existing lagoons as influent flow equalization basins. Repurposing the existing lagoons as influent equalization allows the Town to minimize the size requirements of some downstream processes (i.e., SBR, Tertiary Treatment) thereby helping to reduce capital costs for the proposed SBR upgrade.

## Client Preferences

The following Client preferences will be considered in the design of the new sequencing batch reactor (SBR) secondary process:

- Aeration blowers should be isolated from general work areas and be provided with sound attenuating enclosures and inlet silencers to reduce exterior noise.
- Preference towards removable fine bubble diffused air systems for ease of maintenance.
- Preference towards Limitorque/Rotork motorized actuators for influent/effluent gates or valves. AUMA-brand actuators are not preferred.
- KSB submersible pumps are not preferred based on the Town's experience/maintenance requirements with existing submersible effluent pumps.
- Submersible pumps removal mechanisms should be designed to avoid intermediate "pick" points, where possible

## Design Guidelines

The New Hampshire Code of Administrative Rules details Standard of Design and Construction for Sewerage and Wastewater Treatment Facilities (Env-Wq 700) which includes a section on SBR design (713.07). A summary of some of the key SBR design requirements are summarized below:

- More than 2 tanks shall be provided unless one of the following is provided: (1) an influent equalization basin, or (2) SBR provisions to operate in a continuous flow-through mode during emergency operations

- SBR sizing shall be based on aerated solids retention time (SRT)
- Scum removal shall be provided
- Decanters shall not create a vortex or take in floatables or sludge
- Provide ability to transfer mixed liquor between SBR tanks
- Provide independent mechanical mixers from aeration where denitrification is required
- SBR effluent equalization with ability to redirect flow to the Headworks and remove solids from bottom if needed
- Controls shall provide a minimum 20-minutes of settling time between react and decant phases

The New England Interstate Water Pollution Control Commission (NEIWPCC) published an SBR design guidance manual in 2005 in addition to TR-16, both of which include similar design recommendations which are summarized below:

- Two-tank SBR systems should have an adequate supply of spare parts (i.e., actuators, controllers, waste sludge pumps)
- Flow-paced batch operation controls are preferable to time based to match influent conditions and balance loading between SBR cycles
- Each decant phase should discharge a maximum of 1/3 tank volume
- SBR tank bottoms should be sloped to a common location to facilitate draining and cleaning
- Each SBR basin should include a dedicated dissolved oxygen (DO), pH, and oxidation reduction potential (ORP) instrument which is monitored by the SCADA system
- Aeration blowers should be VFD driven and controlled by a PLC utilizing readings from in-basin DO probes
- Multiple smaller blower units are preferred over a single dedicated blower for each SBR basin due to long-term energy savings

## Alternatives Analyses

The Facilities Plan Amendment (Wright-Pierce, May 2022) performed a secondary process alternatives analysis to compare three secondary treatment options for the Town to consider for meeting effluent limits (i.e., total phosphorus, ammonia-nitrogen, future total nitrogen). The three secondary treatment options which were evaluated included: sequencing batch reactors (SBRs), oxidation ditches, and a custom plug flow reactor. Based on the evaluation, the Facilities Plan amendment recommended a new SBR process based on monetary and non-monetary factors.

## Basis of Design

### Sequencing Batch Reactor

The proposed SBR system shall consist of a two-basin system designed to provide advanced secondary treatment for BOD, TSS, ammonia, phosphorus, and total nitrogen. The SBR system will receive influent wastewater which has been screened (3 mm perforated plate), pumped, and de-gritted. The SBRs will be constructed with an influent channel cantilevered on the interior of the SBR Tank Complex. Motor operated influent slide gates will direct flow to the appropriate SBR basin. The SBR system is anticipated to be selected via a pre-selection process and shall include the following main components: floating mechanical mixing system, retrievable fine bubble aeration grids and removal systems, submersible waste sludge pumping systems, floating decanters, and process controls. The SBR controls shall be capable of automatically sequencing the two basins between fill, mix-fill, mix-react-fill, react, settle, and decant phases. The SBR shall automatically decant treated effluent to the effluent equalization basins after treatment.

During high influent flow periods, the common influent SBR channel will be designed to overflow to the existing lagoon system where the instantaneous influent flow rate has exceeded the SBR's hydraulic design capacity, the influent actuator controllers shall automatically close to ensure that the design maximum SBR liquid depth during the fill phase is not exceeded and the SBRs will continue the normal treatment cycle for the desired operating mode. Under this circumstance and upon influent actuators closing, the influent flow volume will be diverted in the existing lagoons via a passive bypass in the SBR influent channel. This SBR bypass will continue until the start of the next scheduled fill phase of the second SBR.

The NPDES Permit contains seasonal monthly average and maximum day effluent limitations for both ammonia-nitrogen and total phosphorus in addition to an annual average total nitrogen monitoring requirement. Based on the occasional low influent wastewater alkalinity and goal to minimize chemical consumption (ferric chloride for chemical phosphorus removal), the SBR system will be designed to achieve biological nutrient removal (BNR) under all conditions except the design maximum day condition. The SBR system will be designed to achieve full nitrification under the design max day condition and phosphorus will be removed through tertiary chemical precipitation and filtration under all conditions. At lower flow and loading conditions, the SBR system will have additional sequencing time during the mix-fill stage (anaerobic/anoxic) which can provide the Town with some beneficial biological phosphorus removal.

### SBR Design Flows and Loads

| Parameter | Initial Condition | | | Design Condition | | |
|---|---|---|---|---|---|---|
| | Minimum Day | Annual Average | Max Month | Annual Average | Max Month[1] | Max Day[2] |
| Mode of Operation | BNR | BNR | BNR | BNR | BNR | Nitrification |
| Wastewater Temperature, °C | 6 | 14 | 8 | 14 | 8 | 15 |
| Flow, MGD | 0.28 | 0.55 | 0.82 | 0.66 | 0.98 | 1.50[2] |
| BOD, lbs/day | 410 | 1,089 | 1,872 | 1,308 | 2,248 | 3,435 |
| TSS, lbs/day | 264 | 1,277 | 2,573 | 1,533 | 3,089 | 3,049 |
| TKN, lbs/day | 115 | 170 | 241 | 204 | 289 | 480 |
| Total Phosphorus, lbs/day | 6.0 | 23 | 52 | 27 | 62 | 28 |
| SBR Residual D.O., mg/L | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 1.0 |

Notes:

1. SBR shall be sized for BNR mode with a 12-day aerobic SRT during the Design Max Month condition.
2. Influent flows > 1.5 MGD will be diverted to the existing lagoon basins for influent equalization.

SBR Effluent Requirements

| Parameter | Effluent Design Performance | |
|---|---|---|
| | Monthly Average | Daily Maximum |
| BOD, mg/L | < 30 | 50 |
| TSS, mg/L | < 30 | 50 |
| Total Ammonia-N, mg/L | < 1.0 | — |
| Total Nitrogen, mg/L | < 10 | — |

SBR System Design Data

| Parameter | Design Criteria |
|---|---|
| No. of SBR Basins | 2 (SBR-1, SBR-2) |
| Volume per basin, gallons | 528,417 |
| Basin dimensions, LxWxH ft | 58x58x23 |
| Influent Control Device | Motor actuated slide gate |
| Effluent Control Device | Motor actuated butterfly valve |
| Maximum liquid depth, ft | 21.0 |
| Average liquid depth, ft (approx.) | 18.9 |
| Minimum liquid depth, ft | 15.0 |
| Max MLSS at low water level, mg/L | 4,500 |
| Minimum Aerobic Solids Retention Time at coldest temperature, days | 12 |
| Number of cycles per day per basin | 5 |
| Complete cycle time, hrs/cycle | 4.8 hours |

Additional key SBR design criteria are identified below:

- The SBR shall be capable to hydraulically receive the maximum day design flow rate of 1.5 MGD for a sustained 24-hour period without exceeding the design maximum SBR liquid depth.

SBR Equipment Design Data

| Parameter | Design Criteria |
|---|---|
| **Diffuser System** | |
| Equipment Type | Fine Bubble Diffusers, retrievable |
| Location | SBR No. 1 & 2 |
| Number of Units | 5 retrievable units per tank |
| Max Day oxygen req., lb/day (AOR) | 5,156 |
| Submergence (ft, max) | 20 |
| Diffusers | EPDM membrane |
| Drop Leg | 3", 304 SS, Sched. 10S |
| **Aeration Blowers** | |
| Equipment Type | Positive Displacement Blowers, acoustically enclosed |
| Number of Units | 3 (Lead-Lag, Standby) |
| Equipment Tag | ATB-1, -2, -3 |
| Power, each | 60 HP, 3 phase 460 V |
| Drive Type | Variable frequency drive |
| Capacity per Blower, ICFM | 783 |
| Max Discharge pressure, psi | 10.7 |
| Control | Electrically actuated butterfly valves, dissolved oxygen and timer controlled |
| Auxiliary Equipment | Exterior inlet piping shall be provided with an inlet filter/silencer |
| **Mixers** | |
| Equipment Type | Floating Mixers |
| Number of Units | 2 (one per SBR) |
| Equipment Tag | MX-1, -2 |
| Power, each | 15 HP, 3 phase, 460 V |
| Float Material | Fiber-reinforced polyester skin around foam |
| Motor Base, impeller, volute | Stainless steel |
| Mooring Type | SS Pivotal mooring arm or cable |
| Control | Timer based control |
| **Decanter** | |
| Equipment Type | Floating decanters |
| Number of Units | 2 (one per SBR) |

| **Decanter (continued)** | |
|---|---|
| Equipment Tag | DEC-1, -2 |
| Power, each | < ¼ HP (fractional), 3 Phase 460V |
| Float Material | Fiber-reinforced polyester skin around foam |
| Weir | Stainless steel |
| Mooring Type | Steel mooring post with dewatering stop |
| Control | Timer based control via a motorized weir and electrically actuated effluent butterfly valves |
| **Waste Sludge Pumps** | |
| Equipment Type | Submersible, recessed impeller pumps |
| Number of Units | 2 (one per SBR) |
| Discharge Piping | 4-inch |
| Equipment Tag | WSLP-1, -2 |
| Power, each | 3 HP, 3-phase, 460V |
| Design Condition | 150-gpm @ 15' TDH |
| Removal System | Galvanized steel slide rail with davit crane |
| Control | Cycle timer, magnetic flow meter for monitoring |

## Effluent Equalization

The proposed effluent equalization (EQ) system shall consist of a two effluent EQ tanks with a common effluent EQ pump station tank located in between. The effluent EQ system will be designed to attenuate the maximum volume of decanted supernatant from each settled SBR prior to conveyance to the Tertiary Filter process. The effluent EQ pump station shall include three submersible pumps effluent equalization pumps and submerged slide gates to allow the two EQ tanks to operate as a common tank. Effluent EQ tank aeration, mixing and associated blowers are proposed as future additions to the process should the Town want this functionality.

### Effluent Equalization System Design Data

| Parameter | Design Criteria |
|---|---|
| No. of EQ Basins | 2 (EQ-1, EQ-2) |
| Maximum SBR Decant Rate, gpm | 2,778 |
| Maximum EQ Storage Volume Req'd, gal | 106,946 |
| Volume per EQ basin, gallons | 53,473 |
| Basin dimensions, each LxWxH ft | 58x10x23 |
| Maximum liquid depth, ft | 12.2 |
| Minimum liquid depth, ft | 1.5 |

Effluent EQ Equipment Design Data

| Parameter | Design Criteria |
|---|---|
| **Effluent Equalization Pumps** | |
| Equipment Type | Submersible pumps |
| Number of Units | 3 (Lead, lag, standby) |
| Discharge Piping | 6-inch, ductile iron |
| Outlet Connection | 4-inch |
| Equipment Tag | EEQP-1, -2, -3 |
| Power, each | 5 HP, 3-phase, 460V |
| Max Speed | 1760 rpm |
| Fixed/Variable Speed | Variable |
| Design Condition | 520-gpm @ 18' TDH |
| Removal System | Galvanized steel slide rail with davit crane |
| Control | Level control, magnetic flow meter |
| **Diffuser System (Future)** | |
| Equipment Type | Coarse Bubble Diffusers, Fixed (Future) |
| Location | EQ Tank No. 1 & 2 |
| **EQ Tank Blower (Future)** | |
| Equipment Type | Positive Displacement Blowers, acoustically enclosed |
| Number of Units | 1 |
| Equipment Tag | EQB-1 |

### Building / Structure Implications

The SBRs will be part of the new Tank Complex which will include common walls with the Sludge Holding Tanks and Effluent Equalization Tanks. The tanks will be located partially below-grade, with the top of all tanks having the same top of concrete elevation. The SBRs will be constructed with an influent channel cantilevered on the interior of the SBR Tank Complex with stairs leading down to SBR tank walkways. SBR tank walkways should be coordinated with the selected SBR manufacturer to ensure that proposed SBR equipment is accessible.

## Process Control Description

The SBR system will be controlled by a Manufacturer supplied SBR process control panel (SBRCP -1). SBRCP-1 will control the following:

- SBR Influent Gates (SLG-1, -2) open/close status (discrete I/O) with motor actuators based on time and SBR liquid level.
- SBR Floating Mixers (MX -1, -2) on/off status (discrete I/O) based on a timed cycle input for each of the SBR modes of operation (BNR or Nitrification).
- SBR Aeration Blowers (ATB -1, -2, -3) status (on/off), operating speed (analog I/O) and SBR Motor Operated Valves (Air) open/close status (analog I/O).
- SBR Decant Assemblies (DEC -1, -2) Motor Operated Valves (Effluent) (MOV -1, -2) open/close status (discreet I/O) based on SBR liquid level and a timed cycle for each of the SBR modes of operation.

- SBR Waste Sludge Pumps (WSLP -1, -2) on/off status (discreet I/O) based on a target volume of sludge wasted during the on status for each SBR cycle. The target volume of sludge wasted will be calculated to maintain a user input value for the SBR total solids retention time (SRT) or mixed liquor suspended solids (MLSS) concentration.
- Effluent Equalization Pumps (EEQP -1, -2, -3) speed (analog I/O) and on/off status (discreet I/O) based on the Effluent Equalization Tanks liquid level.

### Control Panels, Instruments, and Control Stations

| Item | No. of Items | NEMA | By Division |
|---|---|---|---|
| SBR Process Control Panel | 1 | 12 | 11-OEM |
| SBR Level Element (submersible transducer) | 2, 1 per SBR | 7 | 11-OEM |
| SBR High Level Float, Low Level Float | 2 ea., 1 per SBR | 7 | 11-OEM |
| Dissolved Oxygen | 2 ea., 1 per SBR | 7 | 11-OEM |
| ORP, pH probes | 2 ea., 1 per SBR | 7 | 11-OEM |
| WSLP-1, -2 Magnetic Flow Meter | 2, 1 per WSLP | 4x | 13 |
| Effluent Equalization Tanks Level Element (submersible transducer) | 1 | 7 | 13 |
| Effluent Equalization Tanks High-Level, Low-Level Float | 2 | 7 | 13 |

## Construction Sequencing

The SBRs, part of the Tank Complex, will be excavated to approximately 10-12’ deep and construction sequencing shall be well coordinated during the planning stages to avoid unfavorable weather conditions for work relating to excavation and concrete curing.

## Future Expansion Considerations

Future expansion of the SBR system to reach Newport permit or “build-out” conditions will include the construction of one-two additional SBR basins similar in size and geometry to the SBR constructed with the current WWTF Upgrade.

## File Location

\\wright-pierce.com\wpmfs\Vol4\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\Sequencing Batch Reactor\Basis_of_Design

## Attachments

☒ System Sketches/Schematics/Plans

☒ Manufacturer Proposal and Cut Sheets

☒ Aqua Aerobics SBR proposal (design basis)

# Process Design Report

## NEWPORT WWTP, NH

Design# 169309
Option: Plans and Specs Design

## AquaSBR®

Sequencing Batch Reactor

November 7, 2022
Designed By: Thea Davis

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

## Upstream Recommendations

- Neutralization is required ahead of the biological system if the pH is expected to fall outside of 6.5-8.5 for significant durations.

- Coarse screening and grit removal is recommended (by others) ahead of the biological system.

- 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.

## Flow Considerations

- The maximum flow, as shown on the design, has been assumed as an organic maximum that represents an increased organic load. An oxygen peaking factor of 1.28 has been included to accommodate this additional load while maintaining a residual DO concentration of 1 mg/l.

- When flows are in excess of the maximum daily flow of 1.5 MGD, the biological system has been designed to modify cycles in order to process a peak hydraulic flow of 2.68 MGD.

- Depending upon the magnitude and duration of the peak flow, effluent quality may be degraded.

## Biological Process

- 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, while maintaining a residual DO concentration of 2 mg/l.

- A common standby blower will be shared among the biological reactors.

- Depending on the actual yard piping from the blowers to the diffuser system and the heat losses associated with the yard piping, additional provisions for cooling of the air (i.e. incorporating heat exchangers) and/or modification of in-basin piping and/or diffuser sleeve material may be required. Aqua-Aerobic Systems, Inc. may need to modify the following equipment offering to ensure compatibility of all in-basin components with actual air temperatures.

## Process/Site

- The anticipated effluent nitrogen requirement is predicated upon an influent waste temperature of 8 °C or greater. While lower temperatures may be acceptable for a short-term duration, nitrification and (if required) denitrification 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).

- To achieve the 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.

- 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.

- pH monitoring and control in a range of 6.8-7.2 of the 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. Since only insoluble, particle-associated phosphorous is capable of being removed by filtration, 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.

- The average, maximum and peak design flow and loading conditions, shown within the report, are based on maximum month average, maximum day and peak hour conditions, respectively.

## Post-Secondary Treatment

-The following processes follow the Biological process:
  - Effluent flow equalization.
  - Tertiary filtration

## 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 filter influent should be free of algae and other solids that are not filterable through a nominal 10 micron pore size media. Provisions to treat algae and condition the solids to be filterable are the responsibility of others.

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

## Equipment

- Changes in basin geometry 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 water level, away from the decanter, and to avoid splashing or direct discharge in the immediate vicinity of other equipment. If the influent enters the basin below the water level, adequate hydraulic capacity shall be made in the headworks to prevent backflow from one reactor to the other during transition of influent.

- Based on the process requirements and selected equipment, the reactor wall height should be at least 23 ft.

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

- Equipment selection is based upon the use of Aqua-Aerobic Systems' standard materials of construction and electrical components, suitable for non-classified electrical environments.

- 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 or rectangular with construction materials including concrete or steel.

- The control panel does not include motor starters or VFDs, which should be provided in a separate MCC (by others).

- Provisions should be made, by others, for overflows in each of the recommended basins.

- 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.

- If the cloth media filter will be offline for extended periods of time, protection from sunlight is required.

# *AquaSBR® - Sequencing Batch Reactor - Design Summary*

**Design#: 169309**

**Project:** **NEWPORT WWTP, NH**

**Option:** **Plans and Specs Design**

***Designed by Thea Davis on Friday, October 21, 2022***

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

## *DESIGN INFLUENT CONDITIONS*

**Avg. Design Flow (ADF)** = 0.98 MGD = 3,710 m³/day

**Max Design Flow (MDF)** = 1.5 MGD = 5,678 m³/day

**Peak Hyd. Flow (PHF)** = 2.68 MGD = 10,145 m³/day (modifying cycles)

## *DESIGN PARAMETERS*

| | | | **Effluent (After Filtration)** | | | |
|---|---|---|---|---|---|---|
| | **Influent** | **mg/l** | **Required** | **<= mg/l** | **Anticipated** | **<= mg/l** |
| **Bio/Chem Oxygen Demand:** | BOD5 | 275 | BOD5 | 30 | BOD5 | 30 |
| **Total Suspended Solids:** | TSS | 378 | TSSa | 10 | TSSa | 10 |
| **Total Kjeldahl Nitrogen:** | TKN | 35.4 | -- | -- | -- | -- |
| **Ammonia Nitrogen:** | -- | -- | NH3-N | 1 | NH3-N | 1 |
| **Total Nitrogen:** | -- | -- | TN | 10 | TN | 10 |
| **Total Phosphorus:** | TP | 11.26 | TP | 0.45 | TP | 0.45 |

## *SITE CONDITIONS*

| | **Maximum** | | **Minimum** | | **Elevation (MSL)** |
|---|---|---|---|---|---|
| **Ambient Air Temperatures:** | 90 F | 32.2 C | -10 F | -23.3 C | 779 ft |
| **Influent Waste Temperatures:** | 72 F | 22.0 C | 46 F | 8.0 C | 237.4 m |

## *SBR BASIN DESIGN VALUES*

| | | | **Water Depth** | | | **Basin Vol./Basin** | | |
|---|---|---|---|---|---|---|---|---|
| **No./Basin Geometry:** | = 2 Square Basin(s) | | **Min (LWL)** | = 15.0 ft | = (4.6 m) | **Min (Vlwl)** | = 0.378 MG | = (1,432.6 m³) |
| **Freeboard:** | = 2.0 ft | = (0.6 m) | **Avg (AWL)** | = 18.9 ft | = (5.8 m) | **Avg (Vawl)** | = 0.476 MG | = (1,803.6 m³) |
| **Length of Basin:** | = 58.0 ft | = (17.7 m) | **Max (HWL)** | = 21.0 ft | = (6.4 m) | **Max (Vhwl)** | = 0.528 MG | = (2,000.4 m³) |
| **Width of Basin:** | = 58.0 ft | = (17.7 m) | | | | | | |

---

**Number of Cycles:** = 5 per day/basin

**Cycle Duration:** = 4.8 hr/cycle

**Food/Mass (F/M) ratio:** = 0.079 lbs. BOD5/lb. MLSS-Day

**MLSS Concentration:** = 4,500 mg/l @ LWL

**Hydraulic Retention Time:** = 0.972 days @ AWL

**Solids Retention Time:** = 12.0 days

**Est. Net Sludge Yield:** = 0.942 lbs. WAS/lb. BOD5

**Est. Dry Solids Produced:** = 2,118.4 lbs. WAS/day = (960.9 kg/day)

**Est. Solids Flow Rate:** = 150 gpm (25,400 gal/day) = (96.2 m³/day)

**Decant Flow Rate @ MDF:** = 2,778 gpm (as avg. from HWL to LWL) = (175.3 l/sec)

**LWL to CenterLine Discharge:** = 1.0 ft = (0.3 m)

**Lbs. O2/lb. BOD5** = 1.2

**Lbs. O2/lb. TKN** = 4.6

**Peak O2 Factor:** = 1.28

**Actual Oxygen Required:** = 5,156 lbs./day = (2,338.7 kg/day)

**Air Flowrate/Basin:** = 1,438 SCFM = (40.7 Sm³/min)

**Max. Discharge Pressure:** = 10.7 PSIG = (74 KPA)

**Daily Max. Month Avg. Estimated Power*:** = 1,081.3 kWh/day

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* Power consumption calculations in this document are based on maximum month conditions. Detailed power vs. loadin calculations can be provided if requested.

## DESIGN INFLUENT CONDITIONS

| | | |
|---|---|---|
| **Avg. Design Flow (ADF)** | = 0.98 MGD | = 3,710 m³/day |
| **Max Design Flow (MDF)** | = 1.5 MGD | = 5,678 m³/day |
| **Peak Hyd. Flow (PHF)** | = 2.68 MGD | = 10,145 m³/day |

| | | Conc. mg/l | Mass lb/day | kg/day |
|---|---|---|---|---|
| **Bio/Chemical Oxygen Demand:** | BOD5 | 275 | 2,247.6 | 1,019.5 |
| **Total Suspended Solids:** | TSS | 378 | 3,089.5 | 1,401.4 |
| **Total Kjeldahl Nitrogen:** | TKN | 35.4 | 289.3 | 131.2 |
| **Total Phosphorus:** | TP | 11.26 | 92.4 | 41.9 |

## SITE CONDITIONS

| | Maximum | | Minimum | |
|---|---|---|---|---|
| **Ambient Air Temperatures:** | 90 F | 32.2 C | -10 F | -23.3 C |
| **Influent Waste Temperatures:** | 72 F | 22.0 C | 46 F | 8.0 C |
| **Elevation (Mean Sea Level):** | 779 ft | 237 m | | |

## EFFLUENT OBJECTIVES

| | | Conc. mg/l | Mass lb/day | kg/day |
|---|---|---|---|---|
| **Bio/Chemical Oxygen Demand:** | BOD5 | 30 | 245.2 | 111.2 |
| **Total Suspended Solids:** | TSS | 10 | 81.72 | 37.1 |
| **Ammonia Nitrogen:** | NH3-N | 1 | 8.2 | 3.7 |
| **Total Nitrogen:** | TN | 10 | 81.7 | 37.1 |
| **Total Phosphorus:** | TP | 0.45 | 3.7 | 1.7 |

## BASIN SIZING CALCULATIONS

**1. Mass of Bio-Solids necessary for treatment (lbs MLSS)**

Based upon an F/M ratio of 0.079/day, the mass of mixed liquor suspended solids (MLSS) is:

lb MLSS = (lb BOD5/day) / (F/M) = 28,404.0 lb MLSS = (12,883.9 kg)

**2. Total Reactor Volume at Low Level (Vlwl-T)**

Based upon an MLSS concentration of 4,500 mg/l measured at the lowest water level, the total React Volume at low water level (Vlwl) is:

Vlwl-T = lb MLSS/(MLSS mg/l x 8.34 lb/gal) = 0.757 MG-Total = 101,181.0 ft³-Total = (2,865.1 m³-Total)

**3. Reactor Volume for each Basin at Low Level (Vlwl/basin)**

The AquaSBR shall utilize a 2 reactor system. The resultant unit volume for each reactor at the minimum water depth is:

Vlwl/basin = (Vlwl-T)/(Number of Reactors) = 0.378 MG/basin = 50,590.5 ft³/basin = (1,432.6 m³/basin)

4. **Average Decantable Volume for each basin (ADV)**

   Each AquaSBR basin shall perform treatment via 5 Cycle(s)/Day with each cycle comprising 288 Minutes (4.8 Hours). At the average daily flow (ADF) of 0.98 MGD, the batch volume at average conditions is:

   ADV = ADF/(No. of Basins x No. Cycles/Day/Basin) = 98,000 gal = (371.0 $m^3$)

5. **Reactor Volume per basin at Average Flow Conditions (Vawl/Basin)**

   Vawl/Basin = Vlwl/Basin + ADV = 0.476 MG/basin = 63,692.1 $ft^3$/basin = (1,803.6 $m^3$/basin)

6. **Maximum Decantable Volume for each basin (MDV)**

   The AquaSBR has been specifically designed to maintain 5 Cycle(s)/Day/Basin up to the Maximum Daily Flow stated above. Based upon the Maximum Daily Flow (MDF) of 1.5 MGD, the batch volume at maximum conditions is:

   MDV = MDF/(No. of Basins x No. Cycles/Day/Basin) = 150,000 gal = (567.9 $m^3$)

7. **Reactor Volume per basin at Maximum Flow Conditions (Vhwl/Basin)**

   The maximum volume of each basin in the AquaSBR system is:

   Vhwl/Basin = Vlwl/Basin + MDV = 0.528 MG/basin = 70,644 $ft^3$/Basin = (2,000.4 $m^3$/basin)

8. **Low Water Level (LWL)**

   The low water level (LWL) must allow proper storage of sludge during the settle phase while providing a reasonable maximum water level. Based upon the design MLSS, the lowest operating water level is:

   LWL = 15.0 ft = (4.6 m)

9. **Selection of reactor geometry and dimensional requirements**

   The AquaSBR can be configured for a variety of reactor geometries, quantities, and materials of construction. Typical construction may employ circular, square, or rectangular tanks in concrete, steel, or earthen-sloped basins. The following has been either assumed by Aqua or designated based upon supplied information:

| | | |
|---|---|---|
| Number of Basins (Nb): | = 2 | |
| Selected Reactor Geometry: | = Square | |
| Length of Reactor: | = 58.0 ft | = (17.7 m) |
| Width of Reactor: | = 58.0 ft | = (17.7 m) |
| Low Water Level (LWL): | = 15.0 ft | = (4.6 m) |
| Average Water Level (AWL): | = 18.9 ft | = (5.8 m) |
| High Water Level (HWL): | = 21.0 ft | = (6.4 m) |
| Minimum Reactor Volume/Basin: | = 0.378 MG | = (1,432.6 $m^3$) |
| Average Reactor Volume/Basin: | = 0.476 MG | = (1,803.6 $m^3$) |
| Maximum Reactor Volume/Basin: | = 0.528 MG | = (2,000.4 $m^3$) |

## *PROCESS CALCULATIONS*

### Cycle Structure

1. **Cycle Configuration**

In order to perform the necessary physical and biological treatment for the specified conditions, the following treatment phases shall be used:

A.) Mix Fill - True anoxic mixing, independent of aeration, with influent.
B.) React Fill - Aeration/Anoxic mixing with presence of influent.
C.) React - Aeration/Anoxic mixing under true Batch conditions.
D.) Settle - Quiescent solids/liquid separation.
E.) Decant/Idle - Effluent withdrawal via solids excluding, dual control decanter.
F.) Sludge Waste - Removal of excess biological sludge.

2. **Cycle Times**

The following process segments have been determined specifically for this application based upon a combination of empirical data and established kinetic models adapted for the AquaSBR. The following summarizes the process conditions:

A.) No. Of Cycles (Ncdb) = 5
B.) Total Cycle Time (Tc) = 4.8 Hours
C.) Filling Time/Cycle (Tf) = 2.4 Hours
D.) Aeration (Tair) = 2.1 Hours/cycle
E.) Mixing (Tmix) = 3.15 Hours/cycle
F.) Settling (Tset) = 0.75 Hours/cycle
G.) Decanting (Tdec) = 0.9 Hours/cycle
H.) Sludge Waste (Tsig) = 16.93 Minutes/cycle

### Hydraulic Rentention Time (HRT)

1. **Hydraulic Retention @Average Design Conditions (HRT-avg)**

Based upon an average volume of 0.476 MG/reactor and 2 reactor(s), the HRT at an average flow of 0.98 MGD is:

HRT-avg = (Vawl/Reactor x # Reactors)/ADF = 0.97 days (23.3 hours)

2. **Hydraulic Retention @ Maximum Design Conditions (HRT-mdf)**

Based upon a maximum volume of 0.528 MG/reactor and 2 reactors, the HRT at a maximum flow of 1.5 MGD is:

HRT-mdf = (Vhwl/Reactor x # Reactors)/MDF = 0.71 days (16.9 hours)

### Sludge Production

1. **Net Sludge Yield (Yn)**

Based upon the design MLSS concentration, influent loading, and volume requirements stated above, the AquaSBR shall produce a certain quantity of sludge, as is typical of activated sludge processes. The sludge yield factor, Yn is:

Yn = 0.942 lb Waste activated sludge (WAS)/lb BOD5/day

Please note that the calculated sludge yield, Yn, was estimated via a kinetic model which accounts for the influent organic and inorganic TSS as well as the developed active, endogenous, inert-organic, and inert-inorganic fractions of the MLSS.

2. **Net Sludge Production (lb WAS/Day)**

The net sludge production (dry solids basis) is:

lb WAS/day = lb BOD5/day x Yn = 2,118.4 lb WAS/day = (960.9 kg/day)

3. **Sludge Volume (Vs)**

The volume of sludge produced, assuming a settled sludge concentration of 1.00% is:

Vs = lb WAS/day/(sludge conc. x 8.34) = 25,400 gpd = (96.2 $m^3$/day)

4. **Mean Cell Retention Time (Ts)**

The mean cell retention time (Sludge age, Ts, SRT, MCRT) of the proposed system necessary to attain the specified effluent objectives is:

Ts = lb MLSS/(lb WAS/day + lb TSSe/day) = 12.0 days

5. **Oxygen Utilization Rates for Synthesis, Oxidation & Nitrification**

Based upon a kinetic evaluation of the influent data with respect to the proposed design considerations, the estimated oxygen uptake rate (OUR) at average conditions is 37.0 mg/l/hr. The process oxygen required is:

OUR lb/hr = OUR mg/l/hr x Vawl/basin x 8.34 = 147.0 lb O2/hr/basin = (66.7 kg/hr/basin)

## ***AERATION SYSTEM EQUIPMENT REQUIREMENTS***

### Actual Oxygen Requirement (AOR)

1. **Oxygen Required For Organic Reduction (Rb)**

The aeration system shall be designed to provide 1.2 lb O2 for each lb BOD5, as influent to the SBR system. This oxygen provision shall account for the oxygen utilization for synthesis, as well as endogenous respiration.

Rb = 1.2 lb O2/lb BOD5 x lb BOD5 applied/day = 2697.1 lb O2/day = (1,223.4 kg/day)

2. **Oxygen Required For Nitrification (Rn)**

Additional oxygen may be necessary for nitrification of TKN to NO3-N. While an effluent requirement may or may not exist, it may be difficult to prevent nitrification from exerting an oxygen demand (when nitrogen is present in the influent). Nitrification requires 4.6 lb O2 to oxidize each lb of TKN to NO3-N.

Rn = lb O2/lb TKN x lb TKN applied/day = 1,330.8 lb O2/day = (603.6 kg/day)

3. **Carbon Stabilized via Denitrification (Rd)**

No credits for oxygen recovery via denitrification have been taken (Rd = 0).

4. **Total Actual Oxygen Requirement (AORt)**

The total oxygen demand under process (field) conditions with a peaking factor of 1.28 is (refer to design notes for further explanation):

AORt = (Rb + Rn – Rd) x Peaking Factor = 5,155.9 lb O2/Day (total) = (2,338.7 kg/Day)

5. **Hourly Actual Oxygen Requirement (AORh)**

Based on 2.1 hours of aeration per cycle, 5 cycles/day/basin, and 2 Basin(s), the hourly AORh is:

AORh = 245.5 lb O2/hr/basin = (111.4 kg/hr/basin)

6. **Actual Aeration Time Required To Meet Average Demand (At)**

The aeration system has been designed to meet the design maximum oxygen requirement in 2.1 hours/cycle/basin. Since average conditions will not require as much oxygen, the actual aeration time shall be adjusted to generate a power draw reflective of average conditions. The aeration time required at average conditions is:

At = (OUR/AOR) x Design aeration/cycle/basin = 1.3 hr/cycle/basin

**Process Wastewater Conditions (FINE BUBBLE DIFFUSERS)**

1. **Field Oxygen Transfer Factor (FTF)**

While the AOR quantifies the necessary oxygen to satisfy the biochemical reactions, the process water possesses inherent characteristics that typically inhibit oxygen transfer as it compares to tap (clean) water. The FTF coefficient adjusts the oxygen transfer requirements in field (dirty) conditions to standard (clean) water conditions as follows:

FTF = Alpha x Theta^(T-20) x [(Beta x Csm) – Cr]/Cstm = 0.604

Where:

Alpha = Ratio of mass transfer rate of O2 in process water to clean water = 0.80

Beta = Ratio of saturation of O2 in process water to clean water = 0.95

Theta = Temperature correction factor for O2 transfer = 1.024

T = Design reactor temperature = 22.0 C

Cstm = Saturation DO at mid-depth and standard conditions = 11.49 mg/l

Csm = Cstm corrected for site elevation and temperature = 10.82 mg/l

Cr = Residual dissolved oxygen concentration = 2.0 mg/l

**Standard Conditions**

1. **Standard Oxygen Requirement (SORh)**

The oxygen transferred at standard conditions necessary to satisfy the required process oxygen demand at field conditions is:

SORh = AORh / FTF = 406.2 lb O2/hr/basin = (184.2 kg/hr/basin)

2. **Standard Cubic Feet of Air per Minute (SCFM)**

The ability to transfer oxygen into the water under standardized conditions is:

SCFM = (SOR lb/hr/basin)/(60 x 0.0175 x SOTE/ft x Dsub) = 1,438 SCFM = (40.7 m³/min)

Where:

0.0175 = lb O2 per cubic foot of air at standard conditions.

SOTE/FT = Standard Oxygen Transfer Efficiency per foot submergence = 1.50%/ft = (4.92%/m)

Dsub= Average diffuser submergence = 17.9 ft = (5.5 m)

**Blower Inlet Conditions**

1. **Actual Inlet Pressure (Pa due to elevation and inlet filter/silencer/piping losses)**

Note: An assumed inlet loss due to blower fittings/piping of 0.25 psig has been assumed.

Pa = 14.696 – (Elevation, ft/2116.3) – 0.25 = 14.08 P.S.I.A. = (97.14 KPA)

2. **Blower Inlet Air Temperature in Degrees Rankine**

Ta = Ambient air temp (Deg F) + 460 = 550.0 Degrees R = (305.2 K)

3. **Inlet Cubic Feet of Air per Minute (ICFM)**

From the perfect gas law, the universal gas constant (MR) can relate standard conditions to inlet conditions, as:

ICFM = SCFM x (14.696 x Ta)/(Pa x 528) = 1,565.4 ICFM/basin = (44.1 m³/min/basin)

**Blower Discharge Conditions**

1. **Discharge Pressure (Pd)**

The discharge pressure includes the static pressure above the diffusers and dynamic losses from the blower discharge through the diffusers, as expressed by:

Pd = (0.4333 x Diffuser submergence, ft) + System losses, PSIG, Where the assumed system losses account for 0.20 PSIG blower discharge losses, 0.50 PSIG piping losses from blower to diffuser, and 1.30 PSIG diffuser losses.

Average discharge pressure (Pda) = 9.77 PSIG = (67.41 KPA)
Maximum discharge pressure (Pdm) = 10.67 PSIG = (73.62 KPA)

## Average Blower Power Estimate

### 1. Estimated Average Power Draw (BHP)

The following is a general equation that estimates the power draw of the blower at the average oxygen demand and average pressure. While the actual blower selection shall be made from manufacturer supplied curves, programs, or recommendations at maximum conditions, this equation shall be used to estimate the annual average aeration power. Unless stated otherwise, a blower efficiency (e) of 0.70 shall be used (typical range 0.60 to 0.70).

BHP = 0.227 x ICFM x [((Pa + Pda)/Pa)^0.283 – 1]/e = 80.6 BHP = (60.1 kW)

### 2. Estimated Daily Power Required for Blowers (Pwa)

Pwa = (BHP x 0.7457 x At x Ncdb x Nb) = 755.2 kWh/day

## Blower Selection

### 1. Blower Recommendation

The actual blower and motor sizing must consider inlet conditions under operating temperature and pressure extremes. Motor size, for example, must be selected to handle inlet air at maximum density, which occurs at lowest operating temperatures. Blower size must be selected to deliver the required air volume at minimum density (maximum operating temperature) throughout the range of pressures. The following has been recommended to meet the design extremes:

Number of blowers operating/basin: = 2
Number of total blowers operating: = 2
Number of standby units: = 1
Total number of installed units: = 3
Motor size of each blower: = 60 HP = 44.7 kW
Airflow capacity of each blower: = 719 SCFM = 20.4 $m^3$/min
Maximum design discharge pressure: = 10.7 PSIG = 73.6 KPA

## *MIXING SYSTEM EQUIPMENT REQUIREMENTS*

1. **Energy Requirements (HP-mix)**

   To provide uniform mixing of biological solids to a level typically encountered in activated sludge, approximately 25.0 HP/MG is necessary with the AquaDDM mixer. The mixing level required is:

   HP-mix = 25.0 HP/MG x Vhwl/basin = 13.2 HP = (9.9 kW)

   Based upon the above approximate energy requirements, recommend: (1) - 15.0 NPHP AquaDDM mixer(s)

2. **Reactor Turnover Time (Tm)**

   To confirm the unit has been selected appropriately, the reactor contents must be completely mixed within 5 minutes. The selected mixer shall produce a recirculated flow (Qr) of 287,000 GPM, resulting in a turnover time:

   Tm = Vhwl/basin x 10^6/Qr = 1.8 min

3. **Average Power Estimation (Pwm)**

   Pwm = NPHP x Lm x 0.7457 x Mixing hrs/cycle x Nb x Ncdb = 324.2 kWh/day

   Where:

   Lm is the motor loading, typically 88-92% of full nameplate horsepower.

## *EFFLUENT DECANTING EQUIPMENT REQUIREMENTS*

1. **Decant Flow Rate Required at Maximum Design Flow (Qdec)**

   The decanter shall remove effluent via gravity flow, reducing the water level from the maximum depth to the minimum depth in the design decant phase time (Tdec). The decant flow required is:

   Qdec = MDV/(Ncdb x Nb x Tdec) = 2,778 gpm = (175.3 l/sec)

   The flow rate calculated above is the average rate (from high water level to low water level) at maximum design conditions. The actual decant flow rate will vary depending on the prevailing driving head, assuming the effluent valves are not throttled, flow is not pumped, or an orifice plate has not been employed. Refer to design notes for further decanter notes.

## *SLUDGE REMOVAL SYSTEM REQUIREMENTS*

1. **Sludge Flow Rate required at Average Design Flow (ADF)**

   Sludge flow rate (Qs):

   Sludge will be removed at the end of each cycle at the following rate:

   Qs = Vs/(Ncdb x Nb x Tslg) = 150 gpm = (9.5 l/sec)

2. **Sludge Energy Required (HP-sludge)**

   Based upon an estimated average driving head of 15.0 ft and an assumed pump efficiency of 60%, the sludge removal energy required is:

   HP-sludge = (Flowrate x head)/(3,960 x efficiency) = 0.9 BHP = (0.71 kW)

3. **Average Power Estimation (Pws)**

   Pws = BHP x Tslg x Ncdb x Nb x 0.7457 = 2.0 kWh/day

   Note: Power estimation assumes sludge is pumped. Refer to design notes for discussion if gravity sludge wasting is employed.

   Power consumption calculations in this document are based on maximum month conditions. Detailed power vs. loading calculations can be provided if requested.

# *Post-Equalization - Design Summary*

**Design#: 169309**

**Project:** **NEWPORT WWTP, NH**

**Option:** **Plans and Specs Design**

***Designed by Thea Davis on Friday, October 21, 2022***

## *POST-SBR EQUALIZATION DESIGN PARAMETERS*

| | | |
|---|---|---|
| **Avg. Daily Flow (ADF):** | = 0.98 MGD | = (3,710 m³/day) |
| **Max. Daily Flow (MDF):** | = 1.5 MGD | = (5,678 m³/day) |
| **Decant Flow Rate from (Qd):** | = 2,778 gpm | = (10.5 m³M) |
| **Decant Duration (Td):** | = 54 min | |
| **Number Decants/Day:** | = 10 | |
| **Time Between Start of Decants:** | = 144 min | |

## *POST-SBR EQUALIZATION VOLUME DETERMINATION*

The volume required for equalization/storage shall be provided between the high and the low water levels of the basin(s). This Storage Volume (Vs) has been determined by the following:

Vs = [(Qd -(MDF x 694.4)] x Td = 93,762 gal = (12,535.0 ft³) = (355.0 m³)

The volumes determined in this summary reflect the minimum volumes necessary to achieve the desired results based upon the input provided to Aqua. If other hydraulic conditions exist that are not mentioned in this design summary or associated design notes, additional volume may be warranted.

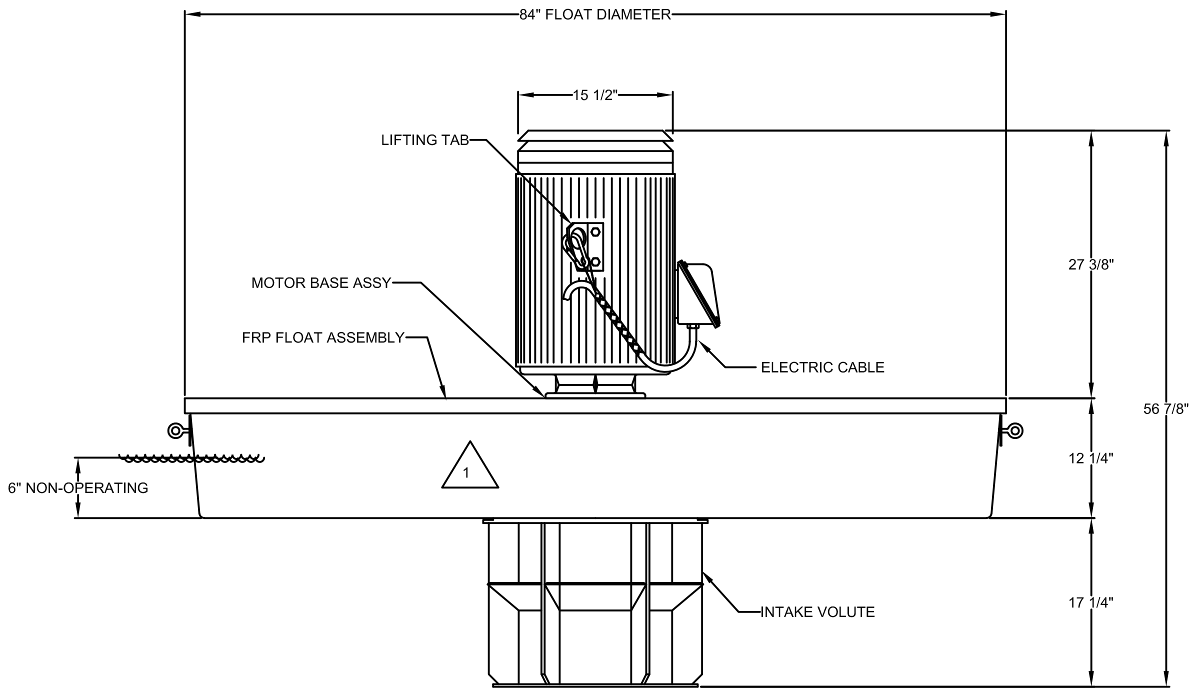
Based upon liquid level inputs from each SBR reactor prior to decant, the rate of discharge from the Post-SBR Equalization basin shall be pre-determined to establish the proper number of pumps to be operated (or the correct valve position in the case of gravity flow). Level indication in the Post-SBR Equalization basin(s) shall override equipment operation.

## *POST-SBR EQUALIZATION BASIN DESIGN VALUES*

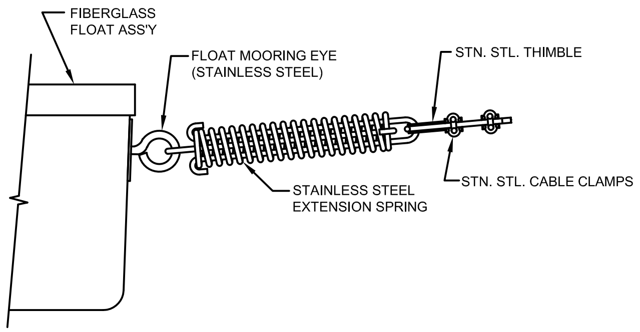
| | | | | | |
|---|---|---|---|---|---|
| **No./Basin Geometry:** | = 1 Rectangular Basin(s) | | | | |
| **Length of Basin:** | = 117.5 ft | = (35.8 m) | | | |
| **Width of Basin:** | = 10.0 ft | = (3.0 m) | | | |
| **Min. Water Depth:** | = 1.5 ft | = (0.5 m) | **Min. Basin Vol. Basin:** | = 13,183.5 gal | = (49.9 m³) |
| **Max. Water Depth:** | = 12.2 ft | = (3.7 m) | **Max. Basin Vol. Basin:** | = 106,945.5 gal | = (404.9 m³) |

## *POST-SBR EQUALIZATION EQUIPMENT CRITERIA*

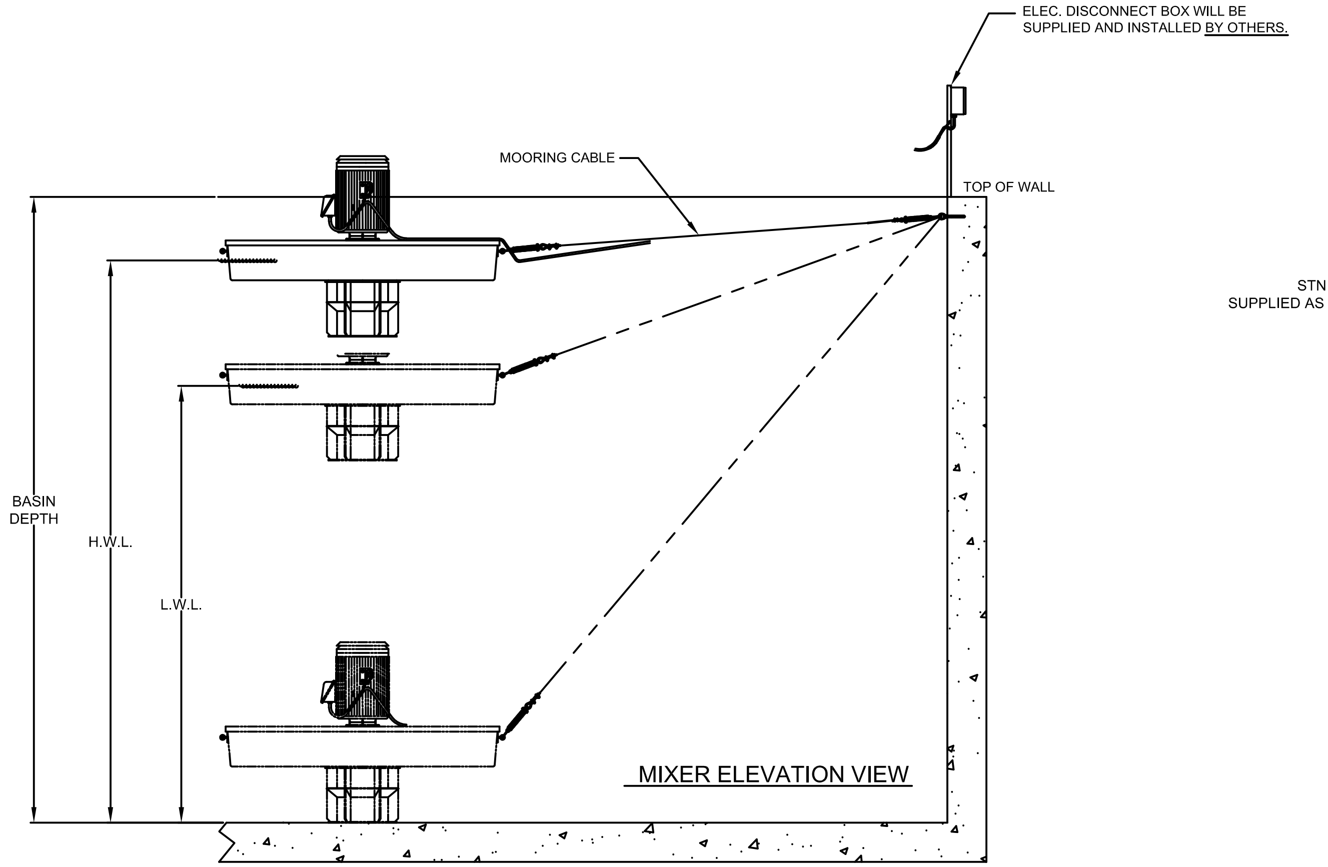
| | | |
|---|---|---|
| **Mixing Energy with Diffusers:** | = 15 SCFM/1000 ft³ | |
| **SCFM Required to Mix:** | = 214 SCFM/basin | = (364 Nm³/hr/basin) |
| **Max. Discharge Pressure:** | = 5.8 PSIG | = (40.30 KPA) |
| **Max. Flow Rate Required Basin:** | = 1,042 gpm | = (3.944 m³/min) |
| **Avg. Power Required:** | = 164.1 kW-hr/day | |



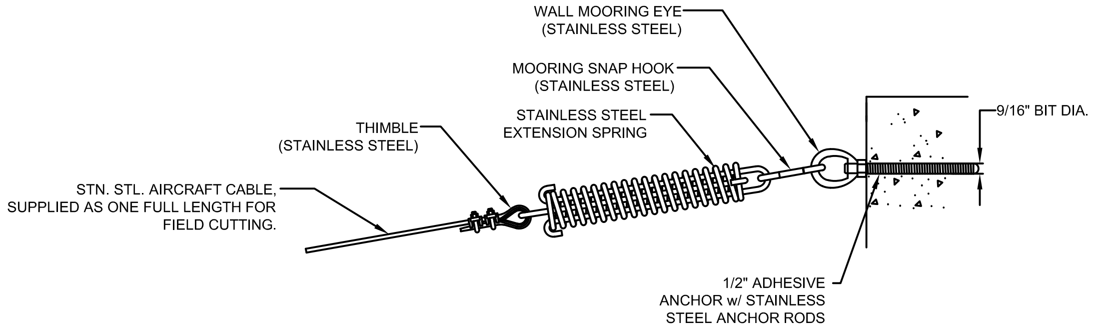
1 FRP FLOAT FILLED WITH CLOSED CELL POLYURETHANE FOAM, APPROX. 2 LBS. / CUBIC FT. DENSITY



FLOAT MOORING DETAIL



MIXER ELEVATION VIEW



MOORING CABLE DETAIL

NOTE: POLYPROPYLENE MAINTENANCE LOOP PROVIDED TO ALLOW UNIT TO REST ON BASIN FLOOR IN DEWATERED POSITION OR TO ALLOW UNIT TO BE ACCESSED FROM THE SIDE OF BASIN FOR MAINTENANCE.

# NOT FOR CONSTRUCTION

JOB NAME: NEWPORT
JOB LOCATION: NH

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

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A Metawater Company

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: GRB
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SHEET: 1 OF
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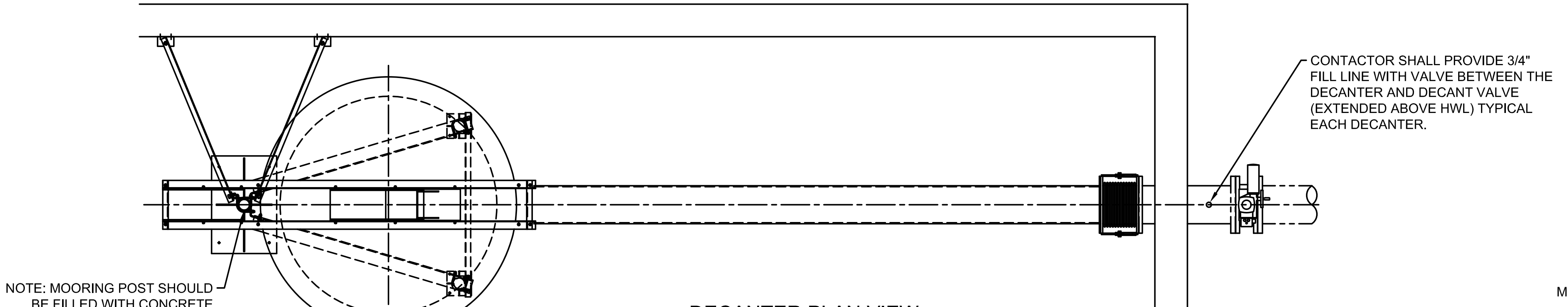
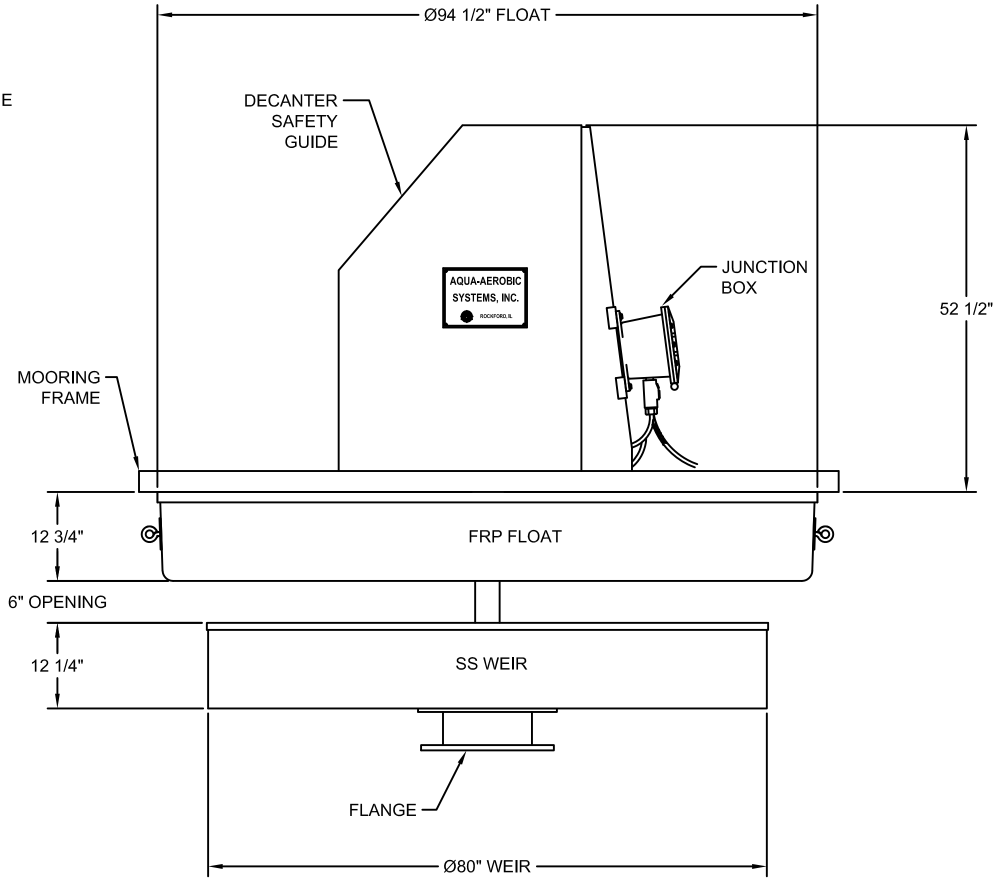


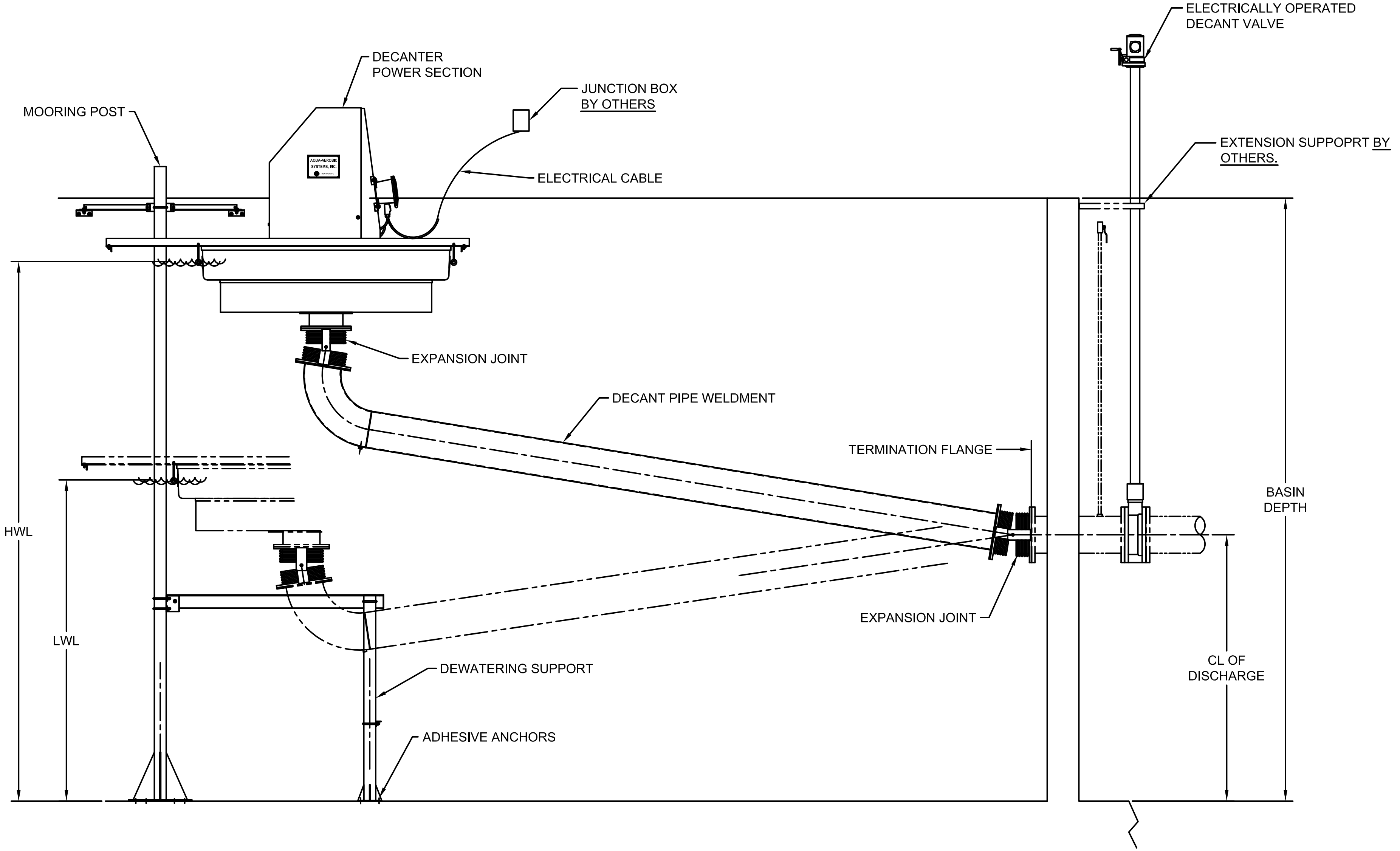
CONTACTOR SHALL PROVIDE 3/4" FILL LINE WITH VALVE BETWEEN THE DECANTER AND DECANT VALVE (EXTENDED ABOVE HWL) TYPICAL EACH DECANTER.

NOTE: MOORING POST SHOULD BE FILLED WITH CONCRETE AFTER ANCHORING IN PLACE.

## DECANTER PLAN VIEW



## DECANTER DETAIL



## DECANTER ELEVATION VIEW

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| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

ANSI

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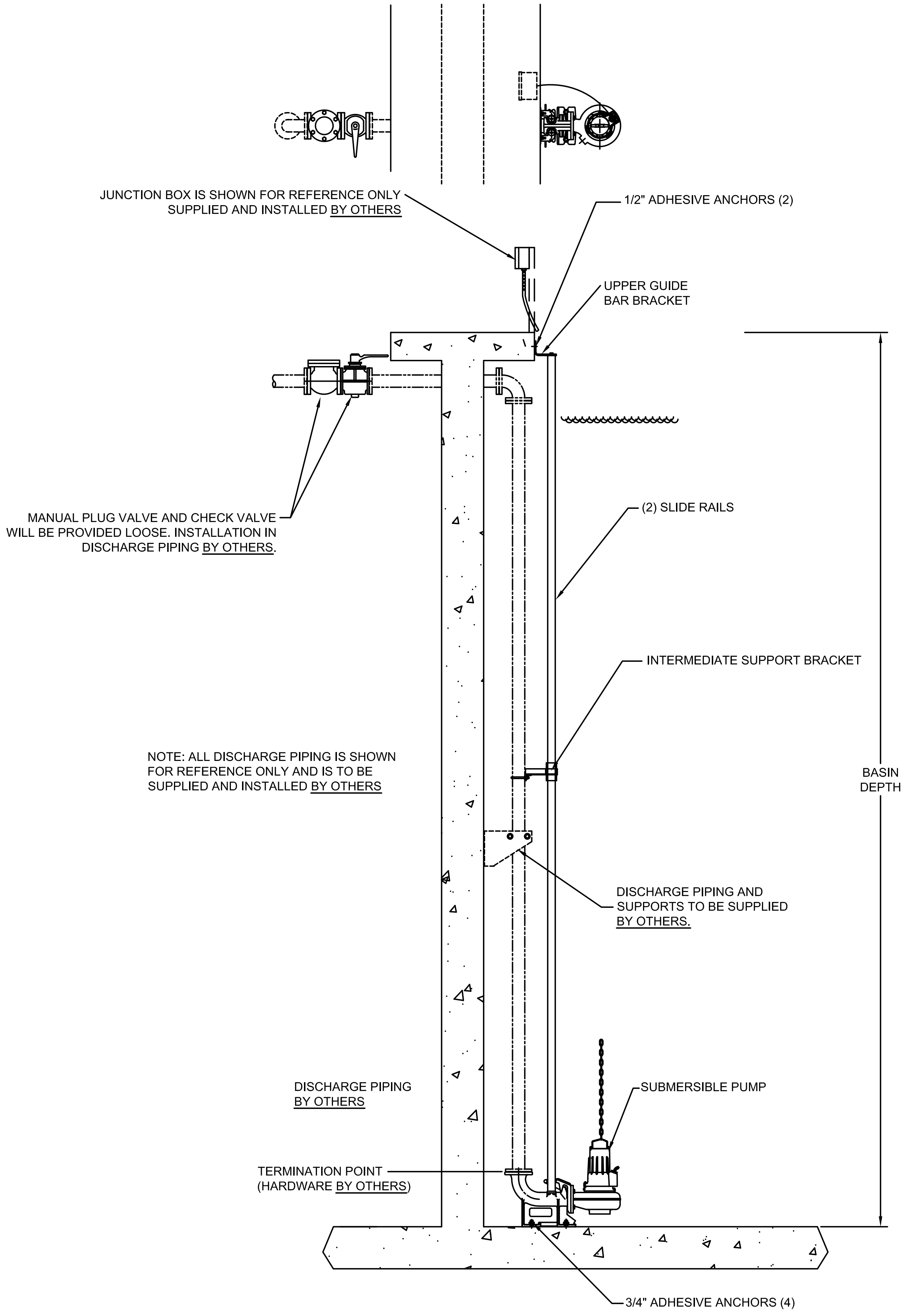
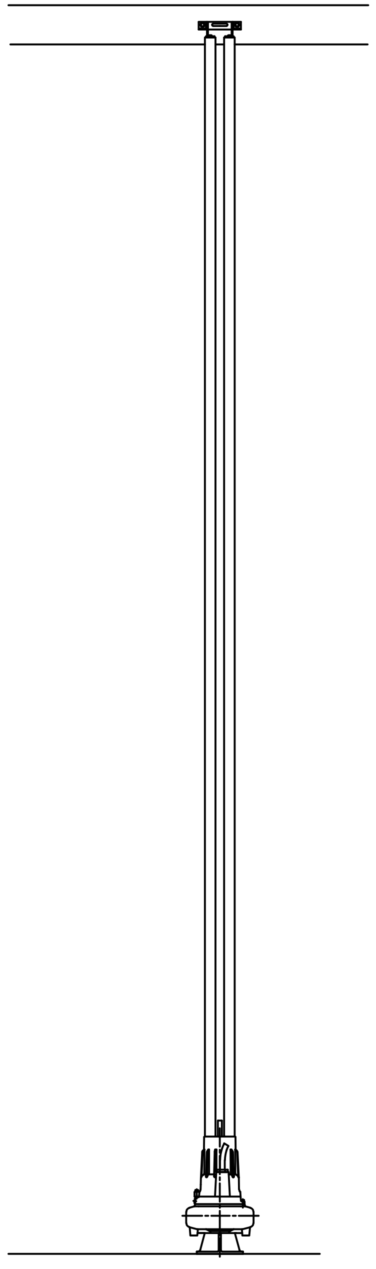
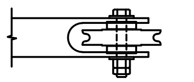
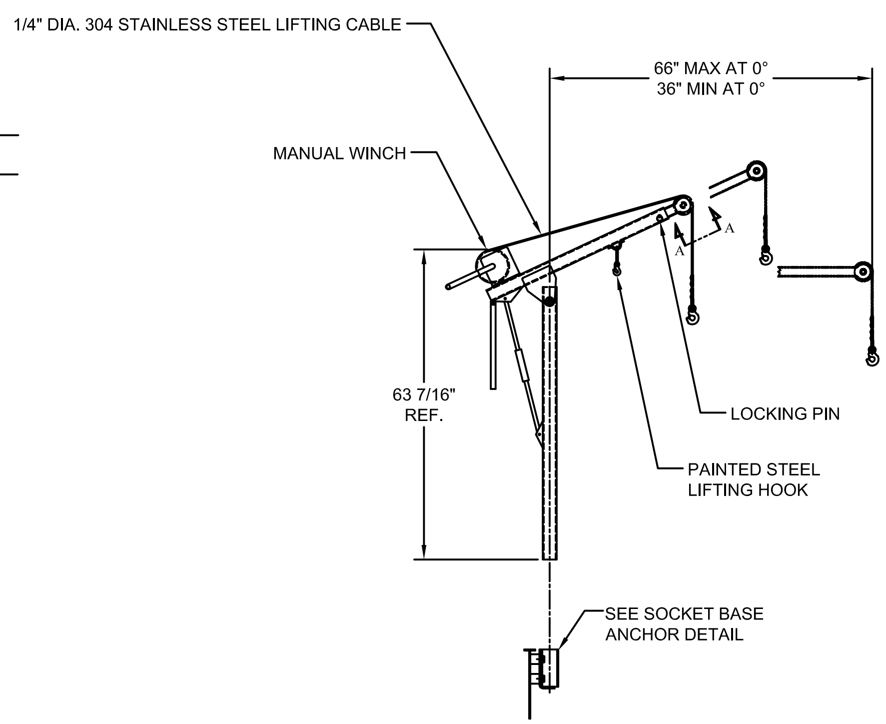


3" DISCHARGE TRANSFER PUMP DETAIL

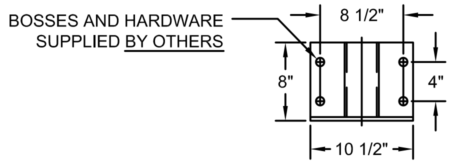




VIEW A-A



HOIST ASSEMBLY VIEW



SOCKET BASE ANCHOR DETAIL

NOT FOR CONSTRUCTION

JOB NAME: NEWPORT
JOB LOCATION: NH

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

DRAWING NAME:
TYPICAL WAS AND POST EQ PUMP DETAILS

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DO NOT
SCALE
DRAWING

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FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
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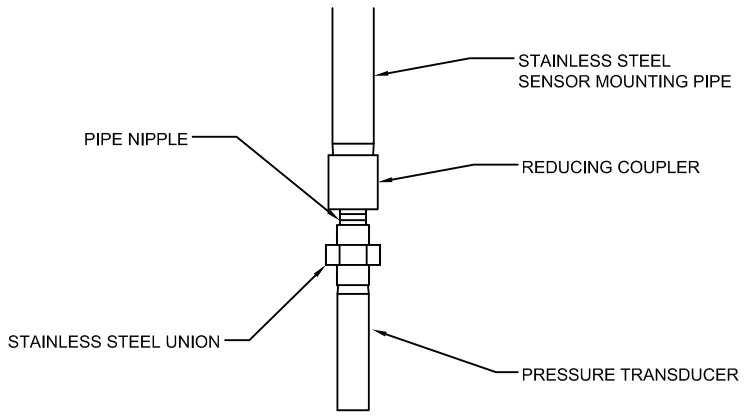
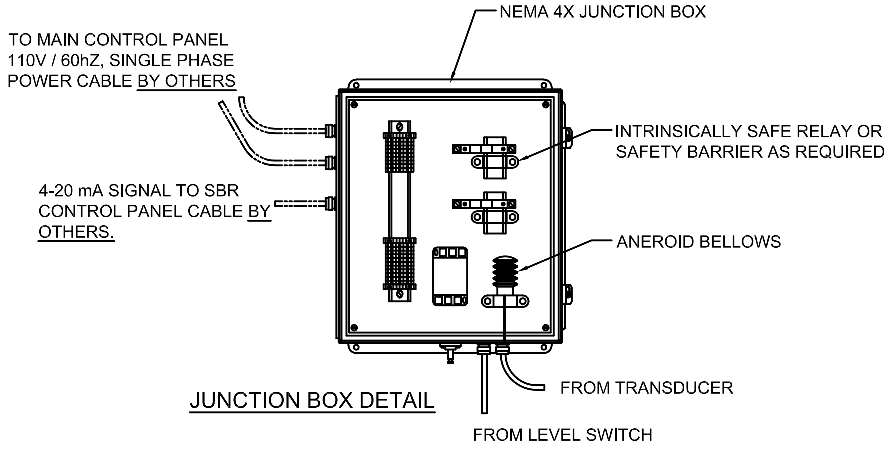
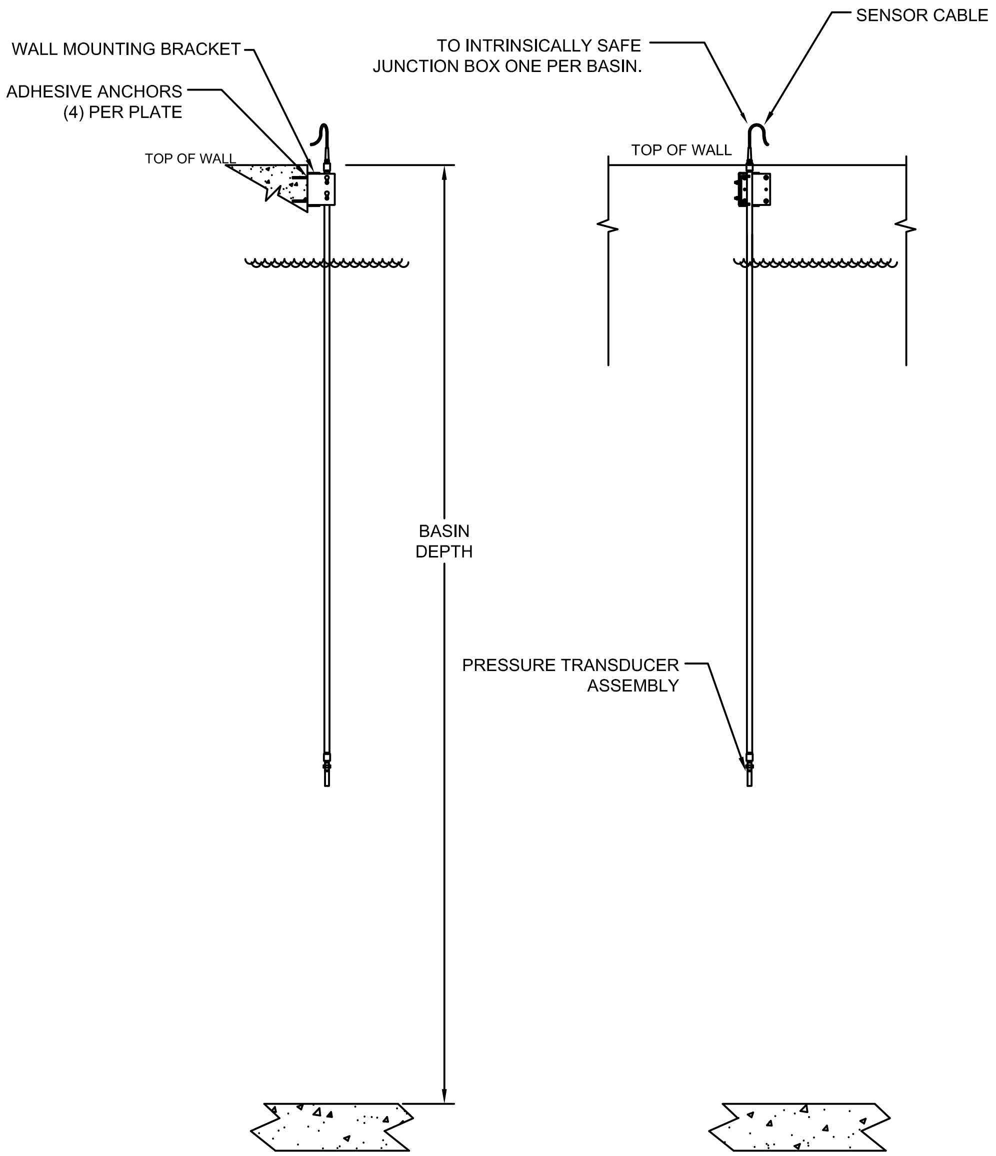


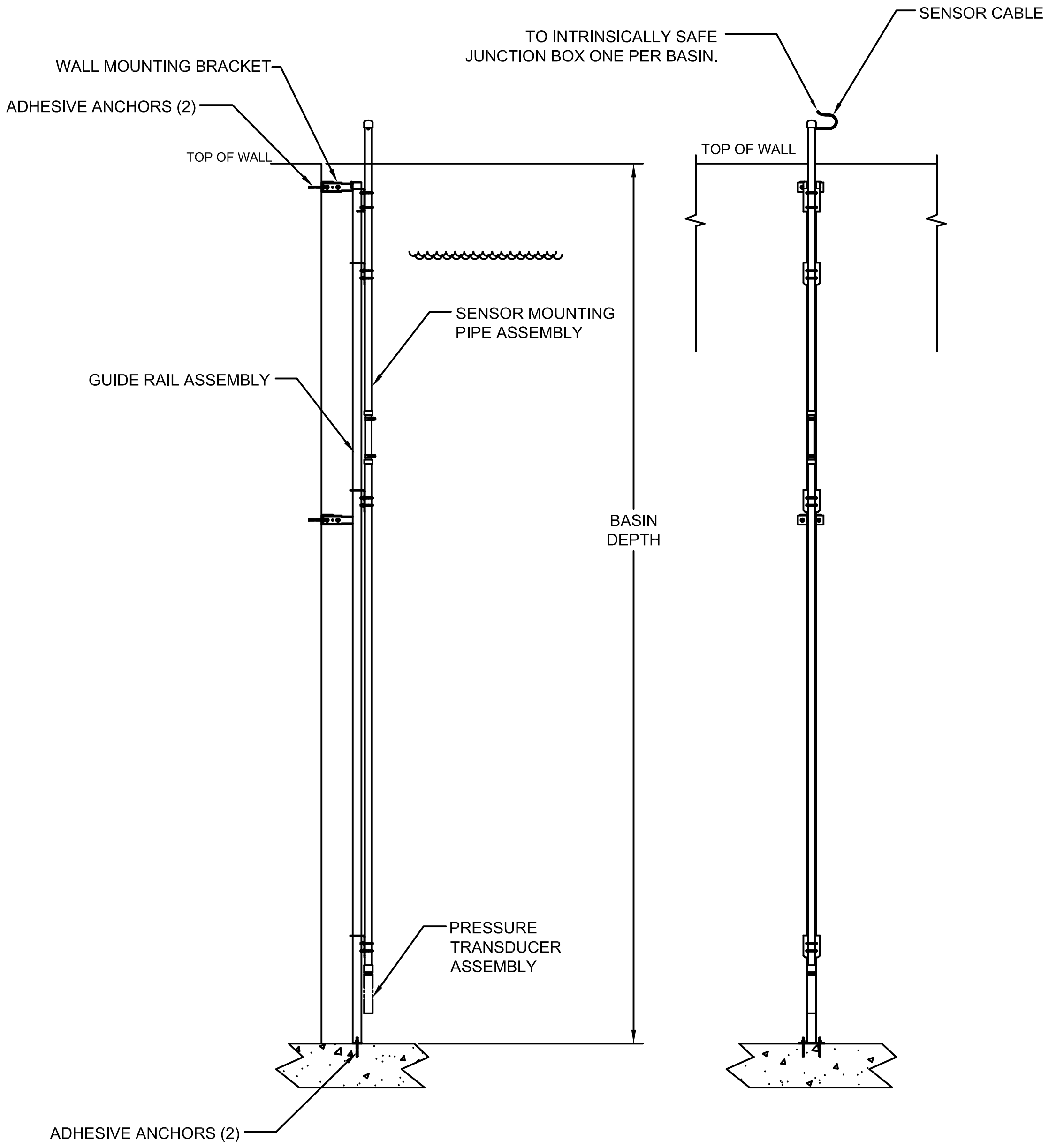
ENLARGED SENSOR ASSEMBLY



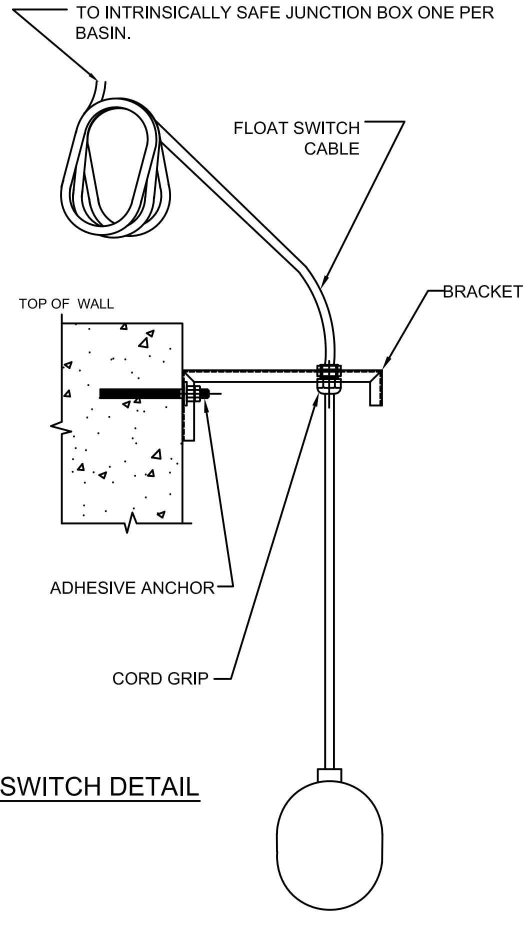
JUNCTION BOX DETAIL



REMOVABLE MOUNT PRESSURE TRANSDUCER DETAILS
FOR SBR BASIN



RETRIEVABLE PRESSURE TRANSDUCER DETAILS
FOR POST-EQ BASIN



FLOAT SWITCH DETAIL

NOT FOR CONSTRUCTION

JOB NAME: NEWPORT
JOB LOCATION: NH

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

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DO NOT
SCALE
DRAWING

UNLESS OTHERWISE SPECIFIED

| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: GRB DATE: 2022-11-07
CHECKED BY: DATE:
WEIGHT: SHEET: 1 OF
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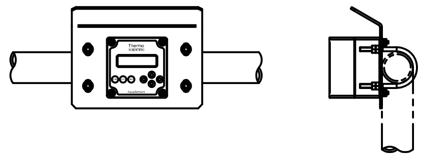
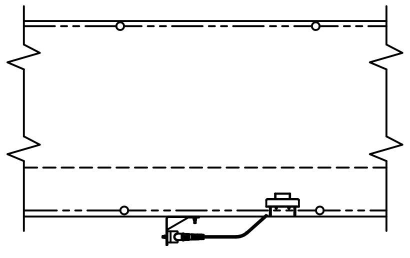
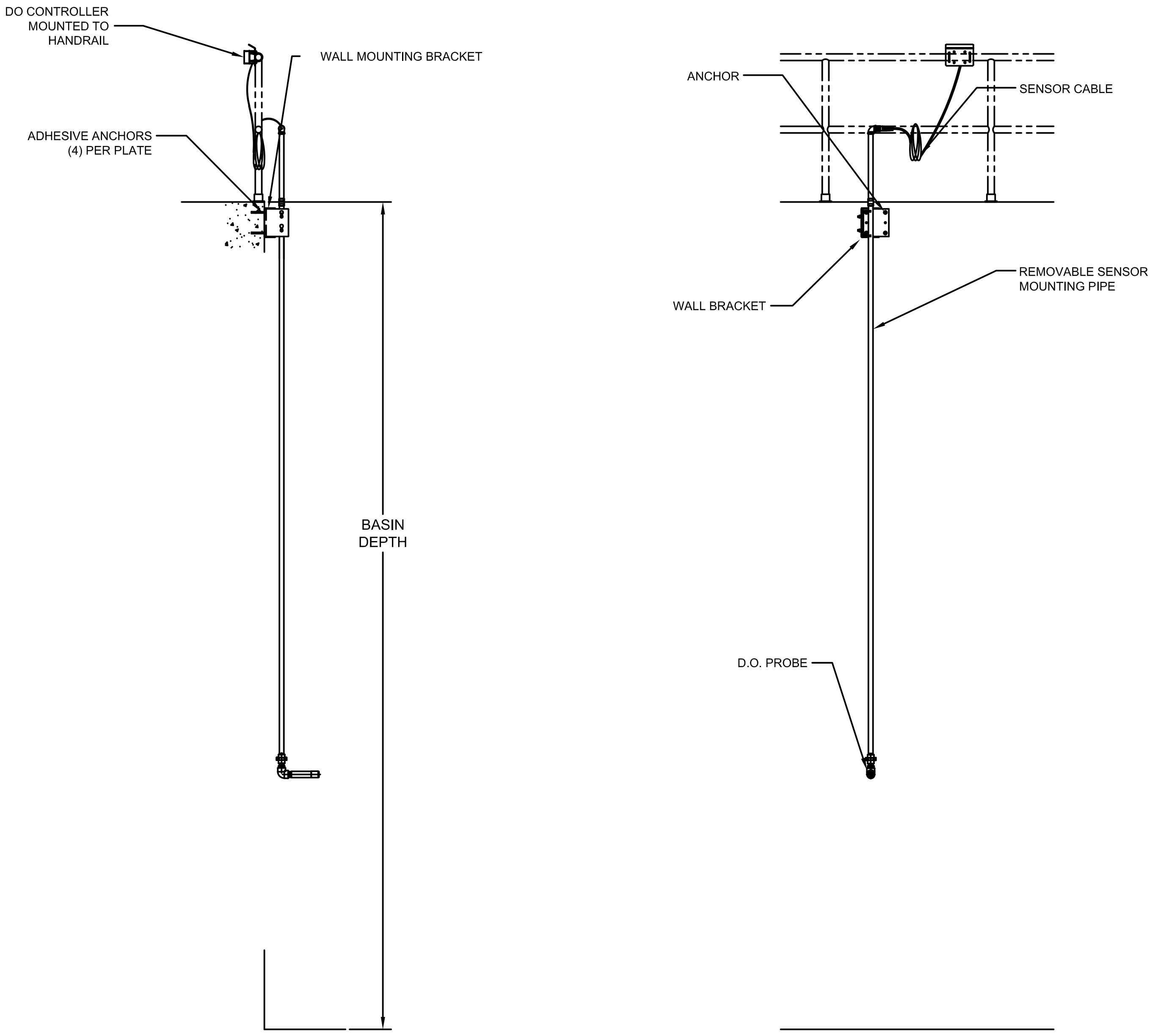
SIZE: D



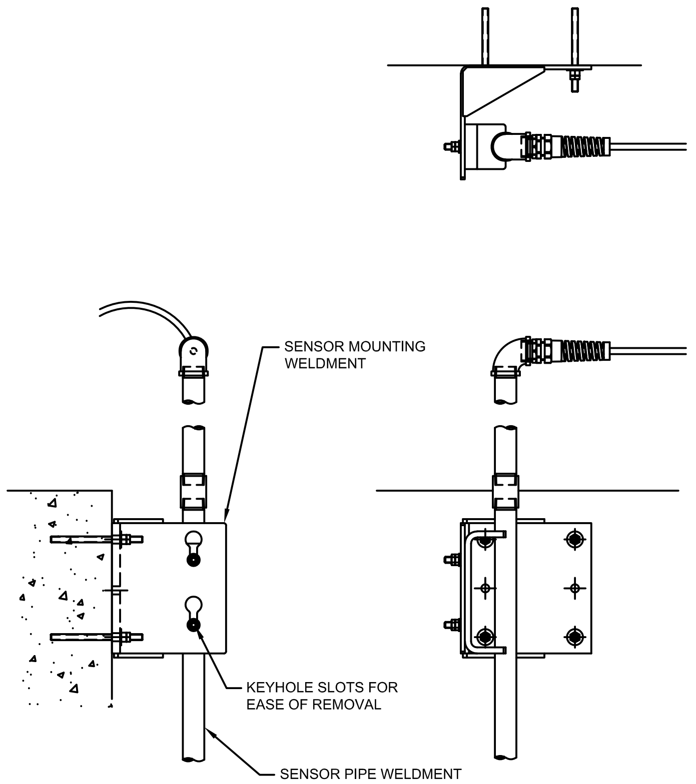
## CONTROLLER DETAIL

* 120 VOLT, 1PH., 60Hz. POWER SUPPLY
REQUIRED AT CONTROLLER.

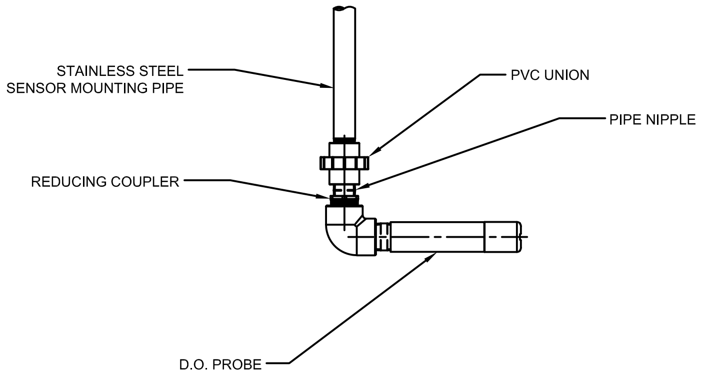




## DISSOLVED OXYGEN PROBE DETAILS



## ENLARGED MOUNTING DETAILS



## ENLARGED SENSOR ASSEMBLY

## NOT FOR CONSTRUCTION

JOB NAME: TYPICAL WWTP
JOB LOCATION: XX

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

DRAWING NAME:
D.O. SENSOR INSTALLATION

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

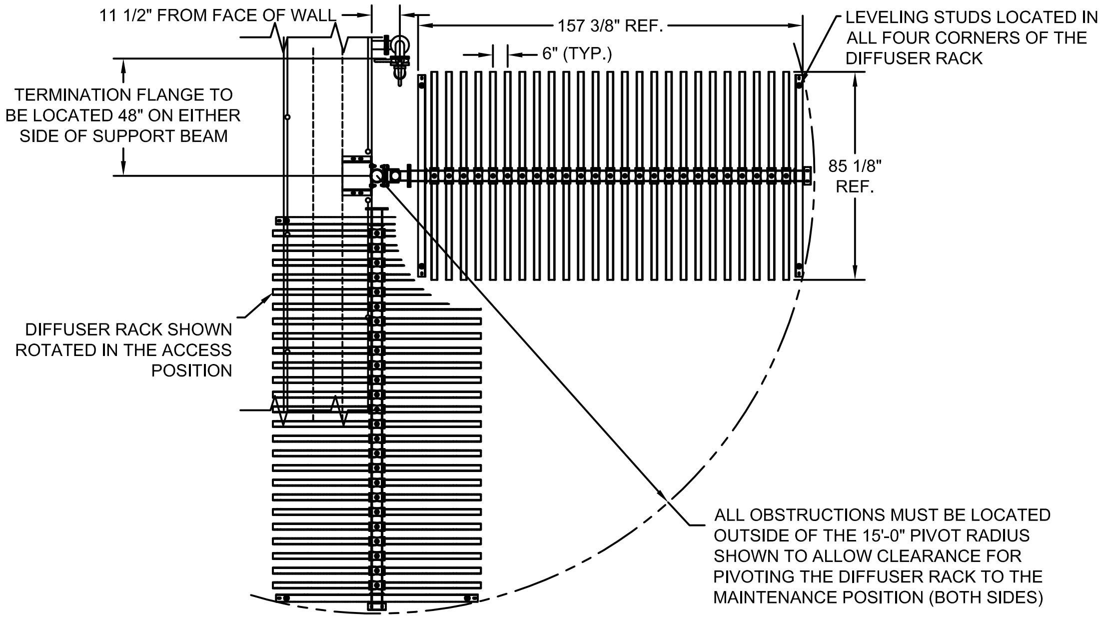
DO NOT
SCALE
DRAWING

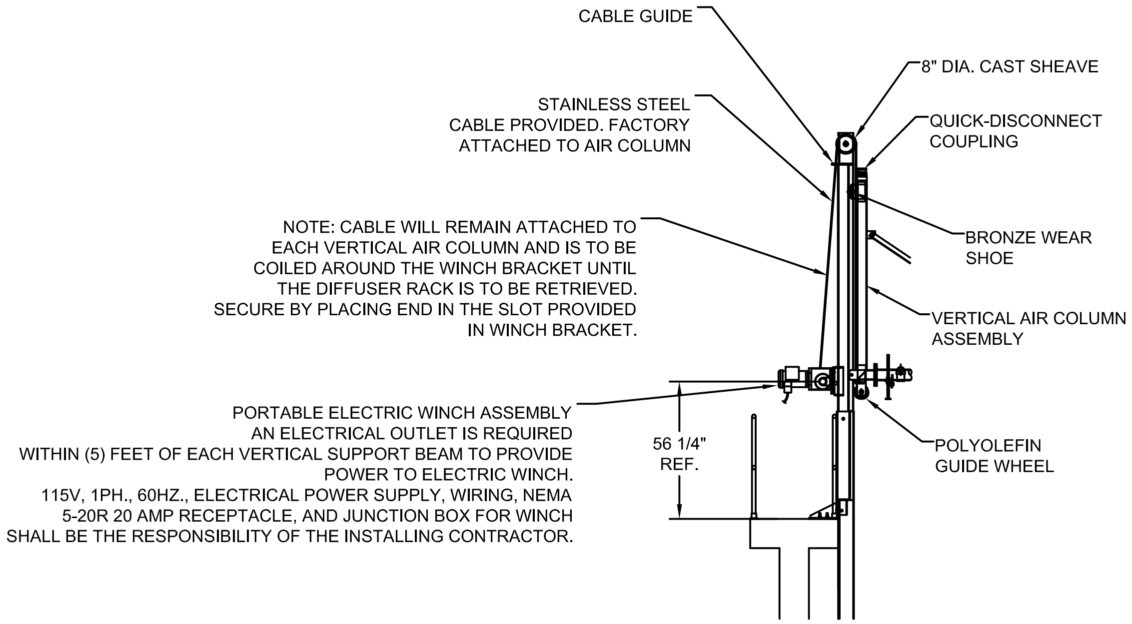
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES

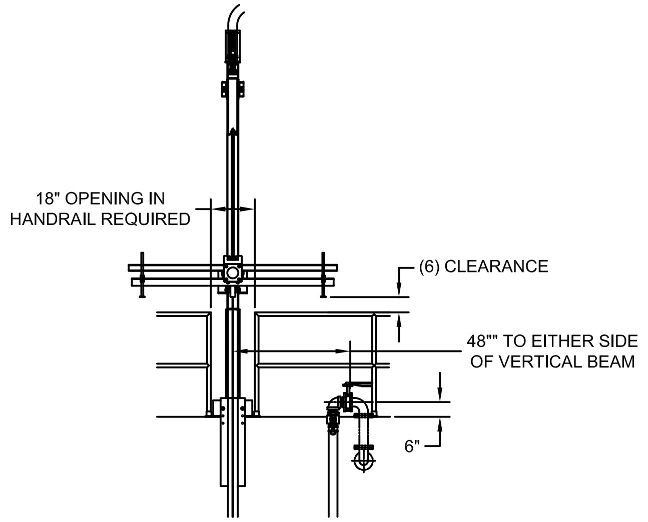
| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

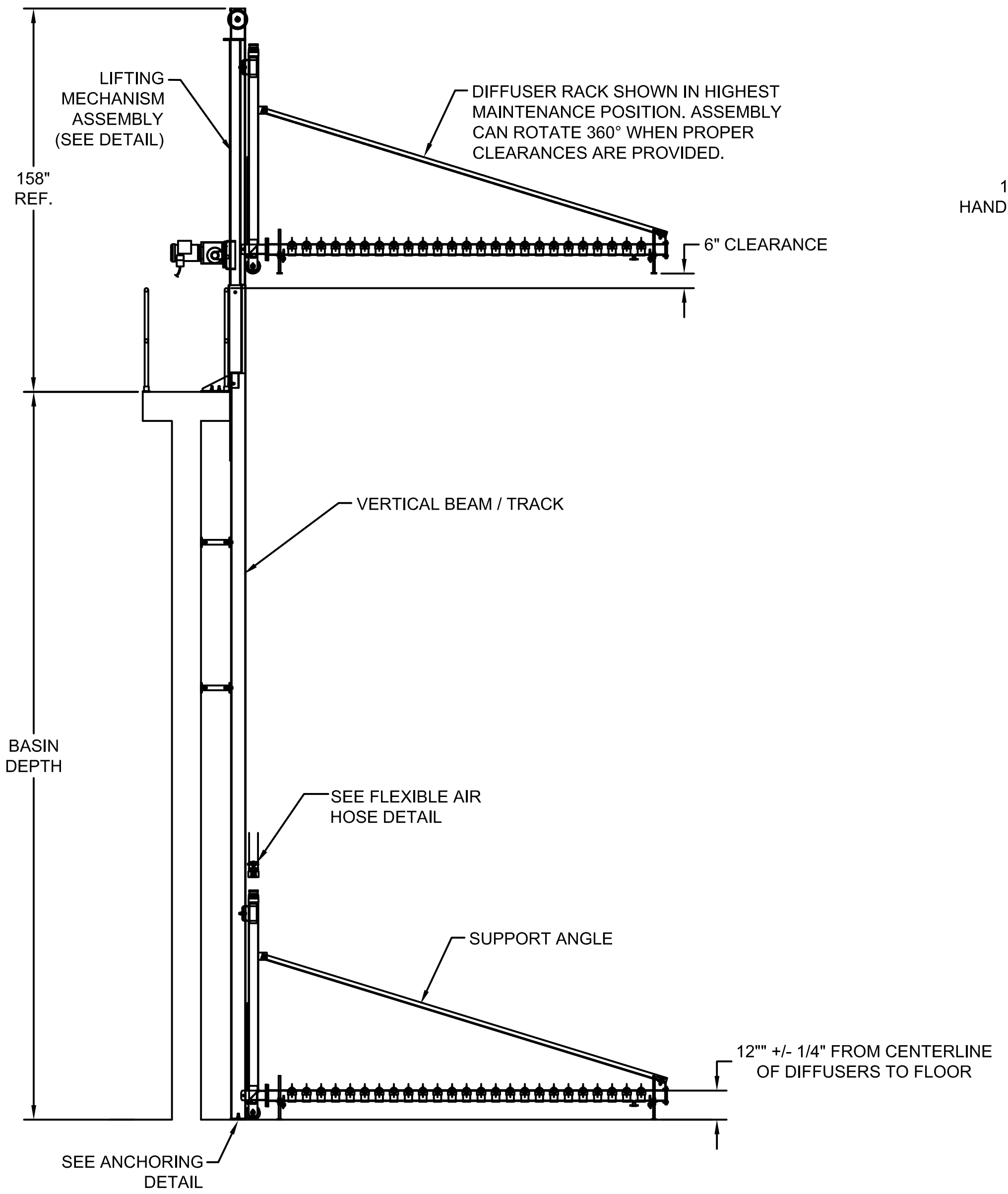
ANSI

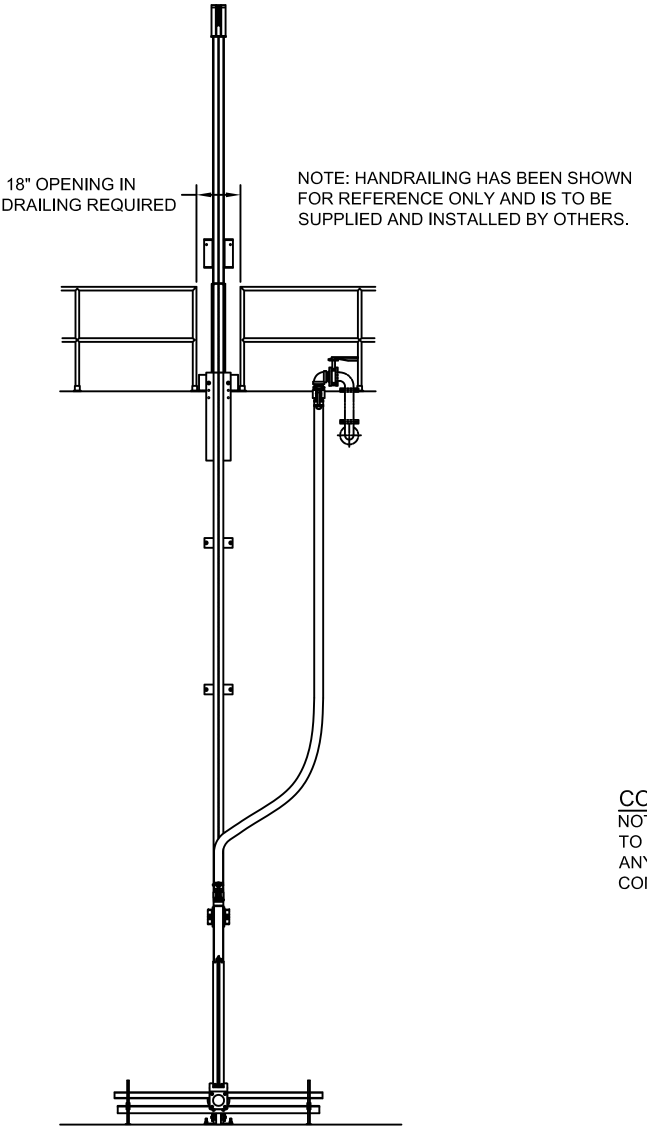
MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: GRB
DATE: 2022-11-07
WEIGHT:
SHEET: OF 1
DRAWING NUMBER: 8110996A3006
SCALE:
SIZE: D

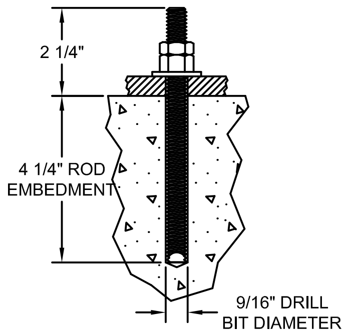










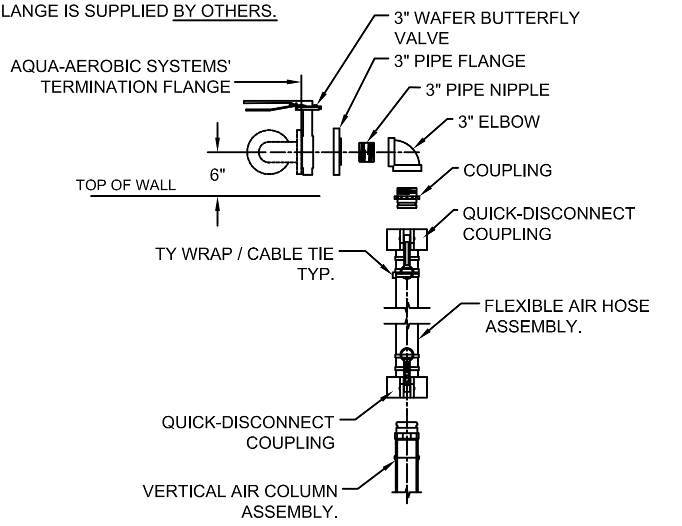


1/2" ADHESIVE
ANCHOR DETAIL

## CONNECTING TO PRESTRESSED CONCRETE BASIN:

NOTE: TYPICAL CONNECTION OF AAS FURNISHED EQUIPMENT TO BASIN STRUCTURE IS WITH CONCRETE ADHESIVE ANCHORS. ANY REVISION TO BASIN STRUCTURE TO ACCOMMODATE THESE CONNECTIONS SHALL BE BY OTHERS.

NOTE: AIR MANIFOLD PIPING SHOWN FOR REFERENCE ONLY. ALL PIPING AND HARDWARE BEYOND THE TERMINATION FLANGE IS SUPPLIED BY OTHERS.



FLEXIBLE AIR LINE DETAIL

NOTE: CLOSE CAM-LOCK LEVER ARMS AND TY-WRAP AROUND HOSE, BOTH ENDS. INSPECT THE GASKET INSIDE OF THE CAM-LOCK FITTINGS PRIOR TO ASSEMBLY. GASKET MAY FALL OUT DUE TO HANDLING. EACH FITTING MUST HAVE GASKET TO PREVENT AIR LEAKS.

# NOT FOR CONSTRUCTION

JOB NAME: NEWPORT
JOB LOCATION: NH

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

AQUA-AEROBIC SYSTEMS, INC.

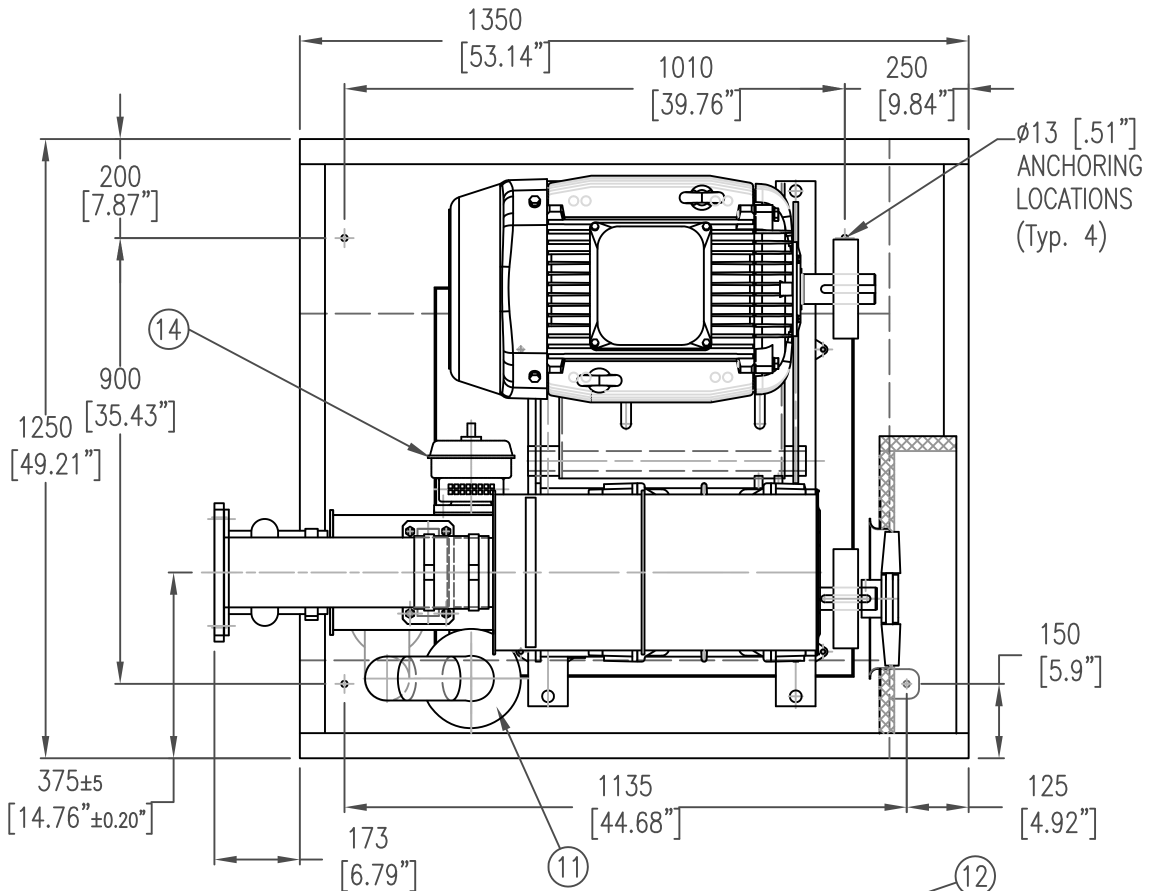
DO NOT SCALE DRAWING

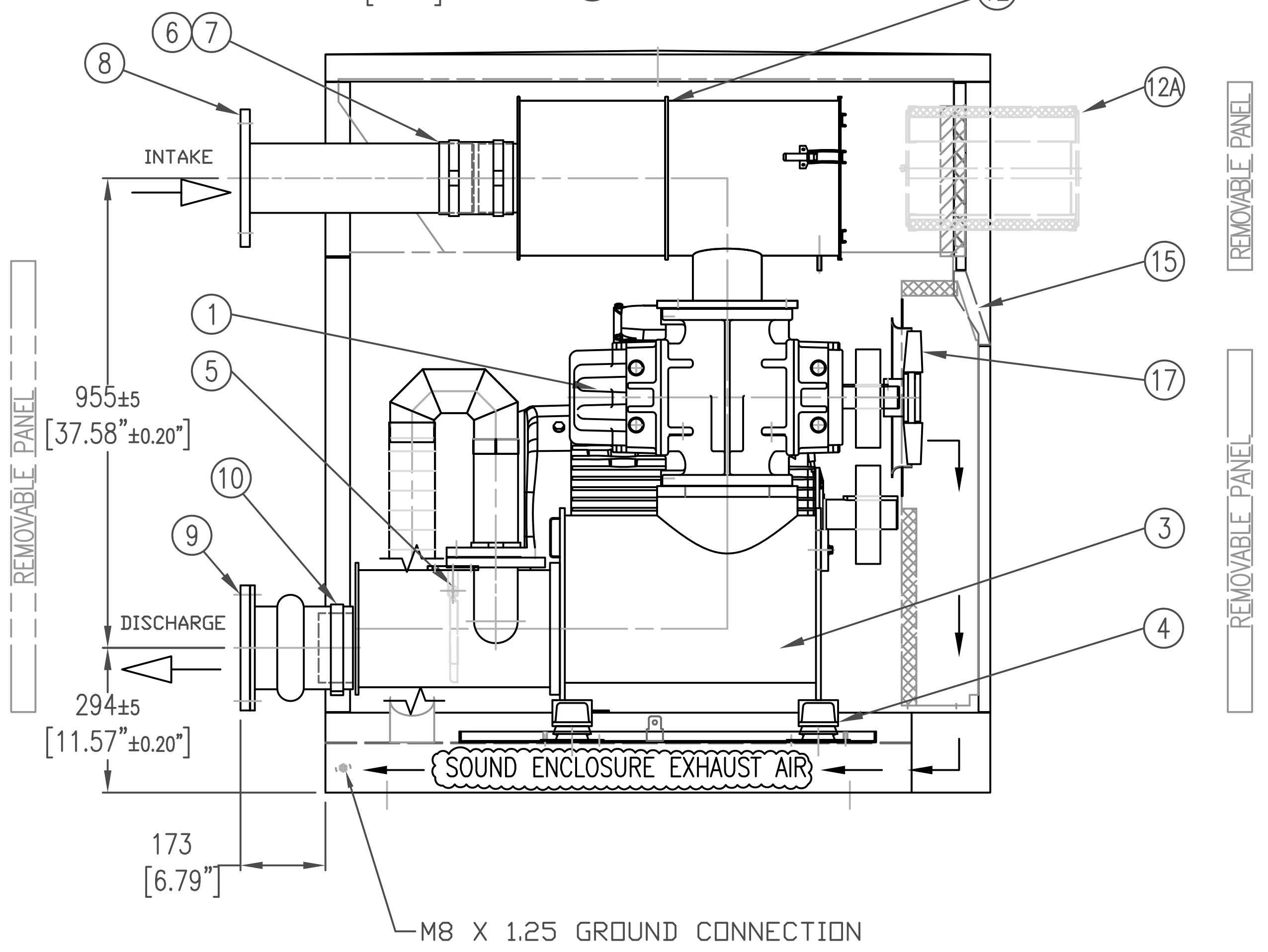
UNLESS OTHERWISE SPECIFIED

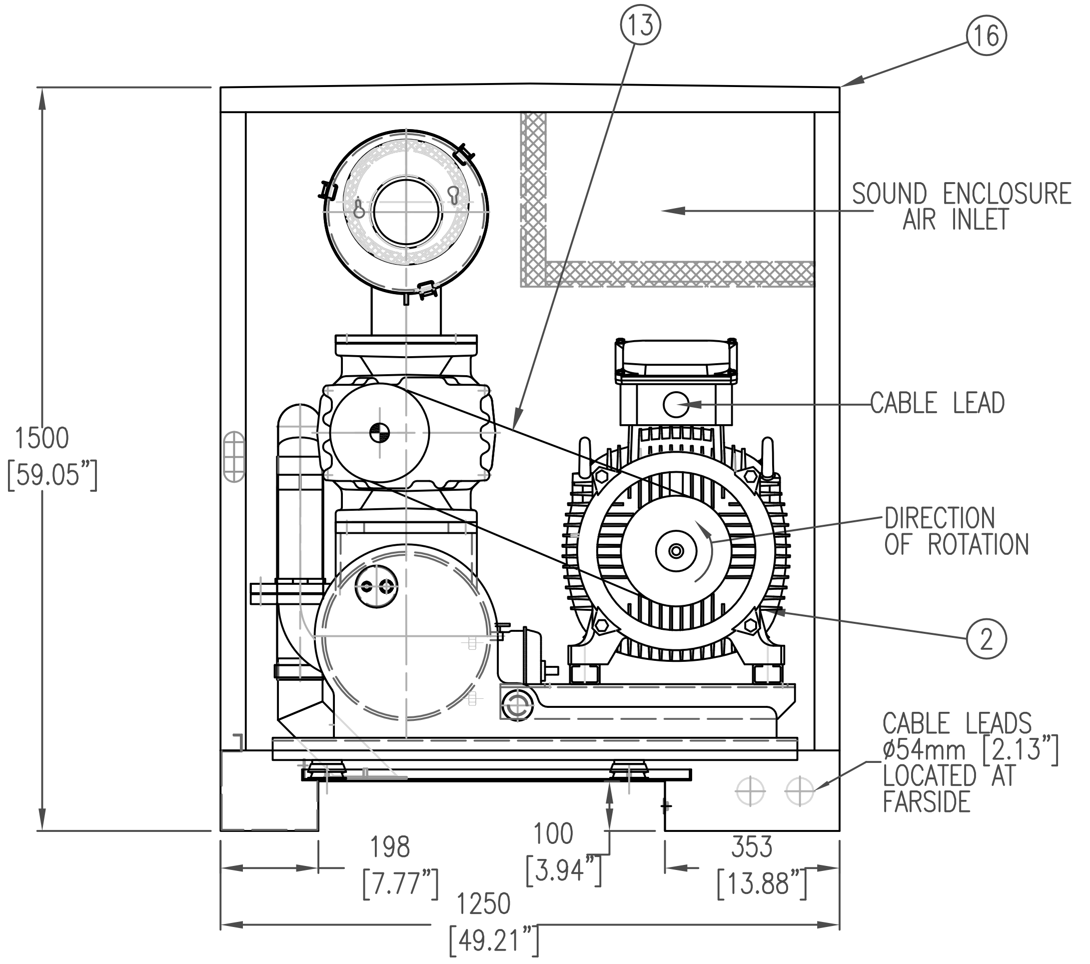
| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: GRB
DATE: 2022-11-07
CHECKED BY:
DATE:
WEIGHT:
SHEET: 1 OF
DRAWING NAME: RETRIEVABLE FINE BUBBLE DIFFUSER RACK DETAILS
DRAWING NUMBER: 8110996A3007
SCALE:
SIZE: D

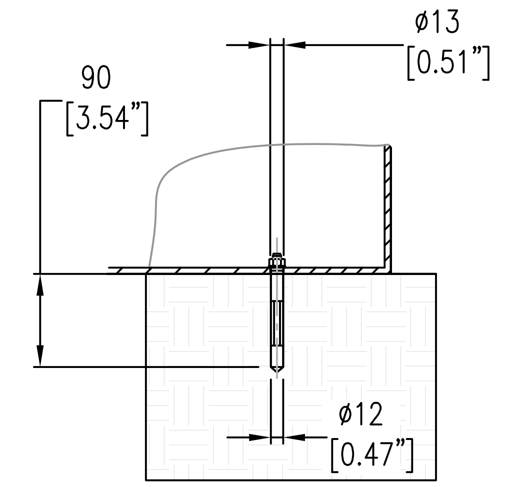






FRONT

RECOMMENDED SOUND ENCLOSURE ANCHORING
SHOWN WITH OPTIONAL LIEBIG #AB 12/15
AERZEN P/N 120813



| ITEM | QTY. | DESCRIPTION |
|---|---|---|
| 1 | 1 | BLOWER |
| 2 | 1 | MOTOR, SHOWN WITH WEG 365T-F3 FRAME |
| 3 | 1 | BASE FRAME |
| 4 | 4 | VIBRATION ISOLATORS |
| 5 | 1 | CONNECTION HOUSING WITH CHECK VALVE |
| 6 | 1 | FLEXIBLE CONNECTOR |
| 7 | 2 | CLAMPS FOR FLEX CONNECTOR |
| 8 | 1 | STUB PIPE – 5" 150# ANSI FLANGE |
| 9 | 1 | EXPANSION JOINT – 5" 150# ANSI FLANGE |
| 10 | 1 | CLAMP FOR EXPANSION JOINT |
| 11 | 1 | SAFETY RELIEF VALVE |
| 12 | 1 | INLET FILTER / SILENCER ASSEMBLY |
| 12A | 1 | INLET FILTER ELEMENT (SHOWN REMOVED) |
| 13 | 1 | BELT DRIVE |
| 14 | 1 | UNLOADING VALVE (OPTIONAL) |
| 15 | 1 | INSTRUMENTATION (SEE JOB SPECIFIC DETAIL) |
| 16 | 1 | SOUND ENCLOSURE (S.E.) |
| 17 | 1 | S.E. VENTILATION FAN (MOUNTED ON BLOWER SHAFT) |
| 18 | – | – |
| 19 | – | – |
| 20 | – | – |

## NOTES

1. TOLERANCE ON DIMENSIONS = ±12mm [0.5"]
2. PACKAGE WEIGHT (W/O MOTOR)
   APPROX. 651 Kg (1434 Lbs)
3. REMOVABLE PANEL WEIGHT:
   PANELS DO NOT EXCEED APPROX. 18 Kg (40 Lbs)
4. CUSTOMER PIPING TO BE INDEPENDENTLY SUPPORTED
5. LIFTING OF PACKAGE: FROM BLOWER SIDE THROUGH FORK LIFT POCKET IN BASE
6. FREE SPACE FOR MAINTENANCE WORK AT FRONT AND REAR SIDE OF UNIT APPROX. 800mm [32"]
7. FOR ADDITIONAL INFORMATION SEE:
   JOB SPECIFIC DATA PACKAGE

NOTICE:

AERZEN
AERZEN USA CORP.
645 SANDS CT, COATESVILLE PA 19320
(610) 380-0244 PH, (610) 380-0278 FX

TITLE
GM 25S - GENERATION FIVE
DN-125 PRESSURE

| DATE | DRAWN BY: | CHECKED BY: | APPROVED BY: | SCALE: |
|---|---|---|---|---|
| 09/28/2007 | K.C.R. | J.P.S. | X.X.X. | MODEL SPACE 1 :1 |

| DRAWING NO: | REVISION NO: | SHEET: |
|---|---|---|
| GB-005472 | – | 1/1 |

JOB NAME: Newport, NH WWTF Upgrade
JOB NO.: 20828
CALC. BY: DJA
CHKD. BY: MAC

DATE: 09/20/22
TIME: 3:00pm

8285559

FILE NAME:
AERATION SYSTEM CALCULATIONS

| | PRELIMINARY DESIGN | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | STARTUP CONDITIONS | | | | DESIGN YEAR CONDITIONS | | | | |
| | MIN DAY | ANNUAL AVG | Max Month | Max Day | MIN DAY | ANNUAL AVG | Max Month | Max Day | Sludge Holding |
| BASIS OF DESIGN | | | | | | | | | |
| AVERAGE FLOW MGD | 0.28 | 0.55 | 0.82 | 0.61 | 0.34 | 0.66 | 0.98 | 1.23 | |
| BOD LBS/D | 410 | 1,089 | 1,872 | 2,861 | 493 | 1,533 | 2,248 | 3,435 | |
| TKN INF LBS/D | 107 | 124 | 238 | 302 | 129 | 175 | 286 | 363 | |
| TKN EFF LBS/D | 28 | 55 | 82 | 61 | 34 | 66 | 98 | 123 | |
| | | | | | | | | | |
| SRT | 12 | 10 | 8 | 8 | 12 | 10 | 8 | 8 | |
| LBS OXYGEN/ LB BOD | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | |
| LBS OXYGEN FOR BOD LBS/D | 492 | 1,307 | 2,246 | 3,433 | 592 | 1,840 | 2,698 | 4,122 | |
| YIELD # Sludge/# BOD Applied | 0.80 | 0.80 | 0.96 | 0.96 | 0.80 | 0.80 | 0.96 | 0.96 | |
| SLUDGE PRODUCTION LB/D | 328 | 871 | 1,790 | 1,790 | 394 | 1,226 | 2,149 | 2,149 | |
| BioWin Estimate | | | | | | | 2,206 | | |
| LBS OXYGEN/LBS SLUDGE | 1.42 | 1.42 | 1.42 | 1.42 | 1.42 | 1.42 | 1.42 | 1.42 | |
| N SYNTH. LB/D | 19 | 54 | 121 | 121 | 23 | 77 | 145 | 145 | |
| TKN OXID, LBS/D | 60 | 15 | 35 | 120 | 72 | 32 | 43 | 95 | |
| LBS OXYGEN/LBS OF TKN | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | |
| LBS OXYGEN FOR TKN, LBS | 277 | 68 | 162 | 554 | 331 | 149 | 197 | 436 | |
| OXYGEN TRANSFER RATE - (OTR or AOR) - SPREADSHEET CALCULATION | | | | | | | | | |
| OTR: OXYGEN TRANSFER RATE. LBS/D | 769 | 1,375 | 2,408 | 3,987 | 923 | 1,988 | 2,894 | 4,558 | |
| LBS OXYGEN/LB OF INF. BOD | 1.88 | 1.26 | 1.29 | 1.39 | 1.87 | 1.30 | 1.29 | 1.33 | |
| OXYGEN TRANSFER RATE - (OTR or AOR)- BIOWIN DEVELOPED VALUE | BIOWIN DEVELOPED VALUES | | | | | | | | |
| OTR: OXYGEN TRANSFER RATE. LBS/D | 724 | 1,295 | 2,268 | 3,754 | 869 | 1,872 | 2,725 | 4,291 | 424 |
| LBS OXYGEN/LB OF INF. BOD | 1.77 | 1.19 | 1.21 | 1.31 | 1.76 | 1.22 | 1.21 | 1.25 | |
| STANDARD OXYGEN TRANSFER RATE - (SOTR or SOR) | | | | | | | | | |
| WATER TEMPERATURE C | 8 | 14 | 22 | 22 | 8 | 14 | 22 | 22 | 22 |
| ALTITUDE FT | 785 | 785 | 785 | 785 | 785 | 785 | 785 | 785 | 785 |
| Pb BAROMETRIC PRESS. PSIA | 14.31 | 14.31 | 14.31 | 14.31 | 14.31 | 14.31 | 14.31 | 14.31 | 14.31 |
| TANK DEPTH FT | 15.0 | 17.0 | 19.0 | 21.0 | 15.0 | 17.0 | 20.0 | 21.0 | 20.0 |
| DIFFUSER DEPTH FT | 14 | 16.0 | 18.0 | 20.0 | 14.0 | 16.0 | 19.0 | 20.0 | 19.0 |
| CL OPERATING D. O. MG/L | 2.0 | 2.0 | 2.0 | 1.0 | 2.0 | 2.0 | 2.0 | 1.0 | 1.0 |
| C* SAT,20 D. O. @ SEA LEVEL | 9.09 | 9.09 | 9.09 | 9.09 | 9.09 | 9.09 | 9.09 | 9.09 | 9.09 |
| C* SAT. DO @ WWTEMP MG/L | 11.84 | 10.31 | 8.74 | 8.74 | 11.84 | 10.31 | 8.74 | 8.74 | 8.74 |
| α ALPHA | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 |
| Organic Loading, lb/1000 CF | 11 | 26 | 39 | 54 | 13 | 36 | 45 | 65 | |
| ß BETA | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| SOTE, % | 30.8% | 34.0% | 34.0% | 34.0% | 30.8% | 34.0% | 34.0% | 34.0% | 34.0% |
| EFFECTIVE DEPTH, % | 37.5% | 37.5% | 37.5% | 37.5% | 37.5% | 37.5% | 37.5% | 37.5% | 37.5% |
| Pvt VAPOR PRESSURE, PSIA | 0.12 | 0.18 | 0.36 | 0.36 | 0.12 | 0.18 | 0.36 | 0.36 | 0.36 |
| $C^*_{\infty}$ 20 | 10.26 | 10.47 | 10.69 | 10.90 | 10.26 | 10.47 | 10.80 | 10.90 | 10.80 |
| Ω =Pb/Ps | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 | 0.97 |
| i= C*sat T/ C*sat 20 | 1.30 | 1.13 | 0.96 | 0.96 | 1.30 | 1.13 | 0.96 | 0.96 | 0.96 |
| SOR STD OXYGEN REQD. LBS/D | | | | | | | | | |
| $\mathrm{SOR} = \frac{\mathrm{AOR}}{C * Ø * \alpha}$ | | | | | | | | | |
| C =(ß * i* Ω* C*∞ 20 - CL)/ C* ∞20 | 1.009 | 0.858 | 0.702 | 0.797 | 1.009 | 0.858 | 0.704 | 0.797 | 0.796 |
| Ø = 1.024^T -20 | 0.752 | 0.867 | 1.049 | 1.049 | 0.752 | 0.867 | 1.049 | 1.049 | 1.049 |
| AOR/SOR = C * Ø * α | 0.418 | 0.409 | 0.405 | 0.460 | 0.418 | 0.409 | 0.406 | 0.460 | 0.459 |
| SOTR OXYGEN REQD. LBS/D | 1,733 | 3,164 | 5,601 | 8,163 | 2,080 | 4,575 | 6,714 | 9,332 | 924 |
| AIRFLOW RATE | | | | | | | | | |
| GROSS OXYGEN REQD. LBS/D | 5,627 | 9,305 | 16,473 | 24,010 | 6,755 | 13,455 | 19,746 | 27,447 | 2,717 |
| STD. WEIGHT OF AIR LBS/CFT | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PROCESS AIR REQD. SCFM | 257 | 424 | 751 | 1,095 | 308 | 614 | 901 | 1,252 | 108 |
| AIR SUPPLY RATIO CF/LB BOD | 901 | 561 | 578 | 551 | 900 | 576 | 577 | 525 | - |
| AUX. AIR REQD. CFM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL AIR REQD. SCFM | 257 | 424 | 751 | 1,095 | 308 | 614 | 901 | 1,252 | 108 |
| AIR TEMP. F | 10 | 68 | 90 | 90 | 10 | 68 | 90 | 90 | 90 |
| RHA | 36% | 36% | 90% | 90% | 36% | 36% | 90% | 90% | 90% |
| WEIGHT OF AIR LBS/CFT | 0.0831 | 0.0740 | 0.0710 | 0.0710 | 0.0831 | 0.0740 | 0.0710 | 0.0710 | 0.0710 |
| OXYGEN CONTENT OF DRY AIR | 0.232 | 0.232 | 0.232 | 0.232 | 0.232 | 0.232 | 0.232 | 0.232 | 0.232 |
| OXYGEN AVAIL. LBS /CFT | 0.0193 | 0.0172 | 0.0165 | 0.0165 | 0.0193 | 0.0172 | 0.0165 | 0.0165 | 0.0165 |
| TA DEG R | 470.00 | 528.00 | 550.00 | 550.00 | 470.00 | 528.00 | 550.00 | 550.00 | 550.00 |
| PB PSIA | 14.66 | 14.66 | 14.66 | 14.66 | 14.66 | 14.66 | 14.66 | 14.66 | 14.66 |
| PA PSIA (AT INTAKE) | 14.46 | 14.46 | 14.46 | 14.46 | 14.46 | 14.46 | 14.46 | 14.46 | 14.46 |
| PVA PSIA | 0.0900 | 0.2600 | 0.7000 | 0.7000 | 0.0900 | 0.2600 | 0.7000 | 0.7000 | 0.7000 |
| TS DEG R | 528.00 | 528.00 | 528.00 | 528.00 | 528.00 | 528.00 | 528.00 | 528.00 | 528.00 |
| PS PSIA | 14.70 | 14.70 | 14.70 | 14.70 | 14.70 | 14.70 | 14.70 | 14.70 | 14.70 |
| RHS | 36% | 36% | 36% | 36% | 36% | 36% | 36% | 36% | 36% |
| PVS PSIA | 0.3391 | 0.3391 | 0.3391 | 0.3391 | 0.3391 | 0.3391 | 0.3391 | 0.3391 | 0.3391 |
| QUANTITY OF AIR FOR PROCESS, ICFM | 231 | 431 | 825 | 1202 | 277 | 623 | 989 | 1375 | 119 |
| BLOWER SIZING | | | | | | | | | |
| TOTAL AIR REQUIRED, ICFM | 231 | 431 | 825 | 1,202 | 277 | 623 | 989 | 1,375 | 119 |
| NUMBER OF BLOWERS | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| NUMBER IN SERVICE | 1 | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 1 |
| CALCULATED BLOWER CAPACITY, EACH ICFM | 231 | 431 | 412 | 601 | 277 | 623 | 494 | 687 | 119 |
| SELECTED BLOWER CAPACITY, EACH ICFM | 723 | 723 | 723 | 723 | 723 | 723 | 723 | 723 | 190 |
| % OF SELECTED BLOWER CAPACITY | 32% | 60% | 57% | 83% | 38% | 86% | 68% | 95% | 63% |
| ESTIMATED DISCHARGE HEAD, PSIG | 6.8 | 7.7 | 8.5 | 9.4 | 7.2 | 8.1 | 9.4 | 10.1 | 9.4 |
| BLOWER/MOTOR COMB. EFF. | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.51 |
| SELECTED BLOWER UNIT HP, EACH | 27 | 30 | 33 | 35 | 28 | 31 | 35 | 38 | 12 |
| SELECTED BLOWER HP, TOTAL | 27 | 30 | 65 | 71 | 28 | 31 | 71 | 75 | 12 |
| OPERATING HP REQUIRED, EACH | 9 | 18 | 19 | 29 | 11 | 27 | 24 | 36 | 8 |
| OPERATING HP REQUIRED, TOTAL | 9 | 18 | 37 | 59 | 11 | 27 | 48 | 71 | 8 |
| TOTAL AIR AVAILABLE, ~~EACH~~ ICFM | 723 | 723 | 1,446 | 1,446 | 723 | 723 | 1,446 | 1,446 | 190 |

| | |
|---|---|
| Project: | Newport, NH WWTF Upgrade |
| Job No. | 20828 |
| Date: | 11/15/2022 |
| Time: | 10AM |
| Calcs by: | DJA |
| Checked By: | D |
| File: | J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\Sequencing Batch Reactor\Calculations\Aeration System |
| Comments: | F |
| Scenario: | G |

**System Conditions**

| | Atmospheric | Standard |
|---|---|---|
| Blower Elevation | 783.96 | |
| Pressure (atm) | 14.40 | 14.69 |
| Pa w/ Storm | 14.65 | N/A |
| Relative Humidity (%) | 90% | 36% |
| Temperature (C) | 32 | 20 |
| Ambient Temperature (F) | 90 | 68 |
| Vapor Pressure (psi) | 0.7000 | 0.2600 |
| Blower Efficiency (%) | 68.0% | |
| Estimated Discharge Pressure (lbf/in$^2$) | 10.20 | |
| Flow Increments | 25 | |
| Inlet Filter Headloss (psi) | 0.11 | |
| Inlet Filter Headloss (in) | 3.0 | |

**System Pressure Losses**

| | Headloss |
|---|---|
| Static Headloss | |
| Min. Diffuser Submergence (ft) | 14.00 |
| Min. Diffuser Submergence (psi) | 6.07 |
| Max. Diffuser Submergence (ft) | 20.00 |
| Max. Diffuser Submergence (psi) | 8.67 |
| Equipment Headloss | |
| Diffuser Headloss (psi) - Maximum Flow | 0.50 |
| Diffuser Headloss (psi) - Minimum Flow | 0.40 |
| Diffuser Piping Headloss (psi) | 0.50 |
| Dirty Diffuser extra headloss (psi) | 0.30 |
| Control System Induced Headloss | |
| Headloss due to pressure header system | 0.00 |
| Main control valve headloss | 0.00 |
| **Summary Conditions** | |
| Max Diff + Max Static Headloss (psi) | 9.97 |
| Min Diff + Min Static Headloss (psi) | 6.97 |

**Notes**

**Suction Losses:**
- Node "0" only
- Headloss calculations for this node are based on ICFM

**Discharge Losses**
- Node "1" thru "11"
- Headloss calculations are based on ACFM after compression.
- For simplicity, ACFM is not recalculated down the length of the discharge piping due to pressure or temperature changes

**Piping Analysis**

| | | Suction Side | | | Discharge Side | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Minor Loss:** | | Node 0 | Node 1 | Node 2 | Node 3 | Node 4 | Node 5 | Node 6 | Node 7 |
| Pipe Size (in) | | 10 | 5 | | 5 | 10 | 10 | 4 | 4 |
| Pipe Size (ft) | | 0.8 | 0.4 | 0.0 | 0.4 | 0.8 | 0.8 | 0.3 | 0.3 |
| Pipe Length (ft) | | 15.0 | 5.0 | | 3.5 | 238.5 | 70.0 | 80.0 | 20.0 |
| % of Total Flow | | 100% | 100% | 100% | 100% | 100% | 100% | 40% | 20% |
| | | | | | 0.02 | 0.01 | 0.00 | 0.02 | 0.00 |
| **Fitting** | **K-Factor** | | | | | | | | |
| Entrance (k = 0.5) | 0.5 | 1 | | | | | | | |
| Exit (k =1.0) | 1 | | | | | | | | |
| 90 Deg ell (k = 0.3) | 0.3 | 3 | 1 | | | 3 | 2 | 1 | 1 |
| 45 Deg Bend (k = 0.2) | 0.2 | | | | | 2 | | | |
| Reducer/Increaser (k = 0.2) | 0.2 | | 1 | | | | 1 | 1 | |
| Butterfly Valve (k = 0.2) | 0.2 | | 1 | | 1 | 1 | 1 | | |
| Check Valve (k = 2.0) | 2 | | | | | | | | |
| Tee Run (k = 0.6) | 0.6 | 2 | | | | 1 | | | |
| Tee Branch (k = 1.8) | 1.8 | | | | 1 | | 1 | 1 | |
| Misc. "k" (Louver) | 0.5 | | | | | | | | |
| Check Valve (k = 2.0) | 0.5 | | | | | | | | |
| **Sum of Minor Losses** | | 2.60 | 0.70 | 0.00 | 2.00 | 2.10 | 2.80 | 2.30 | 0.30 |

**Project:** Newport, NH WWTF Upgrade
**Job No.** 20828
**Date:** 11/15/2022
**Time:** 10AM
**Calcs by:** DJA
**Checked By:** D
**File:** J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary
**Comments:** F
**Scenario:** G

| Blower Information | |
|---|---|
| Blower Manufacturer | Aerzen |
| Blower Model | GM 25S |

System Curve

| Standard Air Flow (ft3/min) | Actual Air Flow (at filter inlet) (ft3/min) | Inlet Air Flow (at blower inlet) (ft3/min) | Actual Air Flow (Discharge side) (ft3/min) | Minor + Major Headloss (in) | Minor + Major Headloss (psi) | Min Diff + Min Static Headloss (psi) | Max Diff + Max Static Headloss (psi) | Minimum Pressure Required (psi) | Maximum Pressure Required (psi) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | #DIV/0! | #DIV/0! | 6.969 | 9.970 | 7.0 | 10.0 |
| 50 | 54 | 55 | 33 | 3.1 | 0.1 | 7.0 | 10.0 | 7.1 | 10.1 |
| 100 | 108 | 109 | 65 | 3.2 | 0.1 | 7.0 | 10.0 | 7.1 | 10.1 |
| 150 | 163 | 164 | 98 | 3.5 | 0.1 | 7.0 | 10.0 | 7.1 | 10.1 |
| 200 | 217 | 219 | 130 | 3.8 | 0.1 | 7.0 | 10.0 | 7.1 | 10.1 |
| 250 | 271 | 273 | 163 | 4.2 | 0.2 | 7.0 | 10.0 | 7.1 | 10.1 |
| 300 | 325 | 328 | 195 | 4.7 | 0.2 | 7.0 | 10.0 | 7.1 | 10.1 |
| 350 | 380 | 382 | 228 | 5.3 | 0.2 | 7.0 | 10.0 | 7.2 | 10.2 |
| 400 | 434 | 437 | 260 | 6.0 | 0.2 | 7.0 | 10.0 | 7.2 | 10.2 |
| 450 | 488 | 492 | 293 | 6.7 | 0.2 | 7.0 | 10.0 | 7.2 | 10.2 |
| 500 | 542 | 546 | 325 | 7.6 | 0.3 | 7.0 | 10.0 | 7.2 | 10.2 |
| 550 | 596 | 601 | 358 | 8.5 | 0.3 | 7.0 | 10.0 | 7.3 | 10.3 |
| 600 | 651 | 656 | 391 | 9.5 | 0.3 | 7.0 | 10.0 | 7.3 | 10.3 |
| 650 | 705 | 710 | 423 | 10.6 | 0.4 | 7.0 | 10.0 | 7.4 | 10.4 |
| 700 | 759 | 765 | 456 | 11.7 | 0.4 | 7.0 | 10.0 | 7.4 | 10.4 |
| 750 | 813 | 819 | 488 | 13.0 | 0.5 | 7.0 | 10.0 | 7.4 | 10.4 |
| 800 | 868 | 874 | 521 | 14.3 | 0.5 | 7.0 | 10.0 | 7.5 | 10.5 |
| 850 | 922 | 929 | 553 | 15.7 | 0.6 | 7.0 | 10.0 | 7.5 | 10.5 |
| 900 | 976 | 983 | 586 | 17.2 | 0.6 | 7.0 | 10.0 | 7.6 | 10.6 |
| 950 | 1030 | 1038 | 618 | 18.7 | 0.7 | 7.0 | 10.0 | 7.6 | 10.6 |
| 1000 | 1084 | 1093 | 651 | 20.4 | 0.7 | 7.0 | 10.0 | 7.7 | 10.7 |
| 1050 | 1139 | 1147 | 684 | 22.1 | 0.8 | 7.0 | 10.0 | 7.8 | 10.8 |
| 1100 | 1193 | 1202 | 716 | 23.9 | 0.9 | 7.0 | 10.0 | 7.8 | 10.8 |
| 1150 | 1247 | 1256 | 749 | 25.7 | 0.9 | 7.0 | 10.0 | 7.9 | 10.9 |
| 1200 | 1301 | 1311 | 781 | 27.7 | 1.0 | 7.0 | 10.0 | 8.0 | 11.0 |
| 1250 | 1356 | 1366 | 814 | 29.7 | 1.1 | 7.0 | 10.0 | 8.0 | 11.0 |
| 1300 | 1410 | 1420 | 846 | 31.8 | 1.2 | 7.0 | 10.0 | 8.1 | 11.1 |
| 1350 | 1464 | 1475 | 879 | 34.0 | 1.2 | 7.0 | 10.0 | 8.2 | 11.2 |
| 1400 | 1518 | 1530 | 911 | 36.3 | 1.3 | 7.0 | 10.0 | 8.3 | 11.3 |
| 1450 | 1573 | 1584 | 944 | 38.6 | 1.4 | 7.0 | 10.0 | 8.4 | 11.4 |
| 1500 | 1627 | 1639 | 976 | 41.1 | 1.5 | 7.0 | 10.0 | 8.5 | 11.5 |

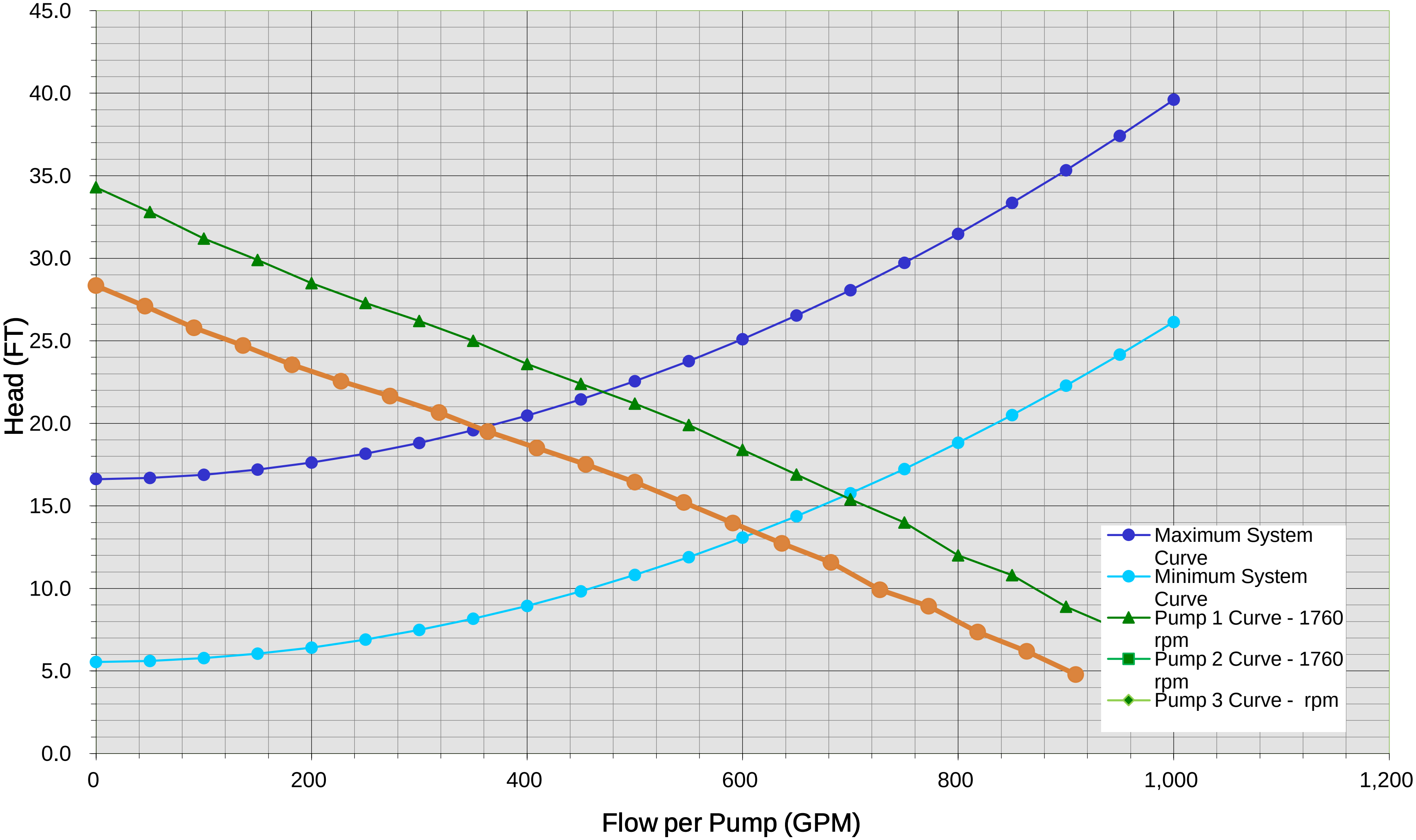
Wright-Pierce Calculated ACFM at inlet: 687

Aqua Proposed ACFM at inlet: 783

Basis of Design: Aqua Proposed ACFM at inlet

|  | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Project: | Newport WWTF Upgrade |  |  |  |  |  |  |  |  |  |  |  |
| 2 | Job No. | 20828 |  |  |  |  |  |  |  |  |  |  |  |
| 3 | Date: | 15-Nov-22 |  |  |  |  |  |  |  |  |  |  |  |
| 4 | Calcs by: | DJA |  |  |  |  |  |  |  |  |  |  |  |
| 5 | Checked By: | E |  |  |  |  |  |  |  |  |  |  |  |
| 6 | File: | J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\Sequencing Batch Reactor\Calculations\Effluent EQ Pumps |  |  |  |  |  |  |  |  |  |  |  |
| 7 | Comments: | G |  |  |  |  |  |  |  |  |  |  |  |
| 8 | Scenario: | H |  |  |  |  |  |  |  |  |  |  |  |
| 9 |  |  | Pump 1 | Pump 2 | Pump 3 |  |  |  |  |  |  |  |  |
| 10 | Pump Manufacturer: |  | Flygt | Flygt |  |  |  |  |  |  |  |  |  |
| 11 | Pump Model: |  | NP 3102 LT | NP 3102 LT 3~ Adaptive 423 |  |  |  |  |  |  |  |  |  |
| 12 | Impeller Size: |  | 158 mm | 158 mm |  |  |  |  |  |  |  |  |  |
| 13 | Pump Speed: |  | 1760 | 1760 |  |  |  |  |  |  |  | **AFFINITY LAWS - CURVE 2** |  |
| 14 | Pumps Operating: | 2 |  |  |  |  |  |  |  |  | Condition 2 Pump 1 Speed |  | 1,600 |
| 15 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 | Q per Pump | Multiple Pump Q | NPSHa | Minimum System | Maximum System | Pump 1 Curve - 1760 rpm | Pump 2 Curve - 1760 rpm | Pump 3 Curve - rpm |  |  | Q per Pump | Multiple Pump Q | Pump 1 Curve - 1600 rpm |
| 17 | 0 | 0 | 34.5 | 5.5 | 16.6 | 34.3 |  |  |  |  | 0 | 0 | 28.3 |
| 18 | 50 | 100 | 34.5 | 5.6 | 16.7 | 32.8 |  |  |  |  | 45 | 91 | 27.1 |
| 19 | 100 | 200 | 34.5 | 5.8 | 16.9 | 31.2 |  |  |  |  | 91 | 182 | 25.8 |
| 20 | 150 | 300 | 34.4 | 6.0 | 17.2 | 29.9 |  |  |  |  | 136 | 273 | 24.7 |
| 21 | 200 | 400 | 34.3 | 6.4 | 17.6 | 28.5 |  |  |  |  | 182 | 364 | 23.6 |
| 22 | 250 | 500 | 34.2 | 6.9 | 18.2 | 27.3 |  |  |  |  | 227 | 455 | 22.6 |
| 23 | 300 | 600 | 34.0 | 7.5 | 18.8 | 26.2 |  |  |  |  | 273 | 545 | 21.7 |
| 24 | 350 | 700 | 33.9 | 8.2 | 19.6 | 25.0 |  |  |  |  | 318 | 636 | 20.7 |
| 25 | 400 | 800 | 33.7 | 8.9 | 20.5 | 23.6 |  |  |  |  | 364 | 727 | 19.5 |
| 26 | 450 | 900 | 33.5 | 9.8 | 21.5 | 22.4 |  |  |  |  | 409 | 818 | 18.5 |
| 27 | 500 | 1,000 | 33.2 | 10.8 | 22.6 | 21.2 |  |  |  |  | 455 | 909 | 17.5 |
| 28 | 550 | 1,100 | 32.9 | 11.9 | 23.8 | 19.9 |  |  |  |  | 500 | 1,000 | 16.4 |
| 29 | 600 | 1,200 | 32.6 | 13.1 | 25.1 | 18.4 |  |  |  |  | 545 | 1,091 | 15.2 |
| 30 | 650 | 1,300 | 32.3 | 14.4 | 26.5 | 16.9 |  |  |  |  | 591 | 1,182 | 14.0 |
| 31 | 700 | 1,400 | 32.0 | 15.8 | 28.1 | 15.4 |  |  |  |  | 636 | 1,273 | 12.7 |
| 32 | 750 | 1,500 | 31.6 | 17.2 | 29.7 | 14.0 |  |  |  |  | 682 | 1,364 | 11.6 |
| 33 | 800 | 1,600 | 31.2 | 18.8 | 31.5 | 12.0 |  |  |  |  | 727 | 1,455 | 9.9 |
| 34 | 850 | 1,700 | 30.8 | 20.5 | 33.4 | 10.8 |  |  |  |  | 773 | 1,545 | 8.9 |
| 35 | 900 | 1,800 | 30.3 | 22.3 | 35.3 | 8.9 |  |  |  |  | 818 | 1,636 | 7.4 |
| 36 | 950 | 1,900 | 29.9 | 24.2 | 37.4 | 7.5 |  |  |  |  | 864 | 1,727 | 6.2 |
| 37 | 1,000 | 2,000 | 29.4 | 26.1 | 39.6 | 5.8 |  |  |  |  | 909 | 1,818 | 4.8 |

# Newport WWTF Upgrade H
# 2 Parallel Pumps Operating in Last Discharge Section
# Low C-Value = 140,  High C-Value = 150



# Basis of Design Memorandum

Project No.: 20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade

Subject: Tertiary Filtration Basis of Design

Prepared By: Dylan Atkins Date: 10/11/2022

Reviewed By: Michael Curry Date: 10/13/2022

Revised By: Dylan Atkins Date: 11/15/2022

## Description of Relevant Existing Facilities

The existing Tertiary Filtration Building is a pre-engineered metal fabricated building constructed in 2012 for a tertiary filtration system to remove total phosphorus (TP). The original tertiary filtration system included two polyester mesh disc units (eight discs per unit) using inside-out filtration technology, a lagoon effluent pump station, coagulation/flocculation tanks and mixers, coagulant and flocculant dosing systems, a coagulant storage tank (aluminum sulfate), and a tertiary sludge backwash pump station. In addition, the building includes a dedicated electrical room to support the tertiary process equipment.

This original tertiary system was unable to reliably achieve compliance with effluent TP limits and was abandoned soon after startup. With the exception of the two disc filter units themselves, the original tertiary system infrastructure and equipment remains installed and in good condition based on observations and discussions with the Town.

## Facility Plan Amendment Recommendations

The Facility Plan Amendment recommended that the existing tertiary filtration building be updated and retro-fitted with two new cloth-disc style filters installed within the existing filter basins. The proposed cloth-disc filters utilize a pile-media fabric and are a proven technology to achieve low-level total phosphorus treatment when installed after an sequencing batch reactor process. The existing rapid mixing and flocculation chambers were recommended to be re-used as part of a new coagulant feed system. The proposed coagulant will be dosed into the rapid mix tank to achieve total phosphorus precipitation ahead of the tertiary filtration units. A summary of the proposed tertiary system upgrade/renovation included:

- Cloth-disc filter basins and influent/effluent channel configurations
- Lagoon Effluent Pump Station
- Chemical coagulant storage, feed, and piping systems
- Electrical support infrastructure
- HVAC equipment

## Client Preferences

No client preferences have been identified at this time.

## Design Guidelines

Technical Resource – 16 (TR-16) Guides for Design of Wastewater Treatment Works provides the following recommendations for disc filters:

- Section 7.2.10.4
    - In cold climates, disc filters should be housed in heated and ventilated enclosures, due to mechanical aspects of the systems.
    - Hydraulic loading rates at peak hourly flow should not exceed 6.5 gpm/ft$^2$ of filter surface area.
    - A minimum of two filter units should be provided.

## Alternatives Analyses

Wright-Pierce evaluated metal mesh, polyester mesh, and pile cloth fabric disc filters. Polyester mesh fabric was removed from consideration given the WWTF history with a failed polyester mesh fabric filtration system. Pile cloth fabric was chosen as the basis of design over metal mesh fabric because pile cloth fabric has a proven history of successful installations in similar applications throughout New Hampshire (i.e., Rochester, Somersworth, Whitefield).

Pile-cloth media disc filters are supplied by several equipment manufacturers including Aqua-Aerobics, Nexom, and Huber Technologies. Based on the preliminary evaluation, each manufacturer would require a varying degree of structural modifications to the existing basins to suit their specific filter design requirements (i.e., influent/effluent configurations, water surface elevations, disc diameter, drive mechanism). Aqua-Aerobics was chosen as the design basis based on their history of successful pile-cloth media filter installations regionally, layout constraints within the existing filter basins, and their equipment support services. The final procurement approach to the proposed pile-cloth media filter design will be determined at the beginning of the final design phase.

## Basis of Design

The following Table summarizes design data for the recommended tertiary cloth-disc pile media filtration system. For the basis of design for the total phosphorus chemical precipitation system, refer to the Chemical Feed Systems technical memorandum.

### Tertiary Disc Filter System

| Parameter | Criteria |
|---|---|
| **Filtration Units** | |
| Application: | Tertiary filtration of SBR effluent after chemical addition for total phosphorus precipitation |
| Average Day Design Flow (ADF), MGD | 0.66 |
| Total Suspended Solids (TSS) Concentration at ADF, mg/L | 10 |
| Peak Day Design Flow, MGD: | 1.50[1] |
| Total Suspended Solids (TSS) Concentration at Peak, mg/L | 15 |
| Filter Configuration: | Disc-style filtration system, outward-in flow path |
| Media Type: | Pile-cloth media; wovenmesh or microstrainer style media will not be accepted |

| | |
|---|---|
| Number of Units: | 2, 1 duty 1 standby unit (TDF -1, -2) |
| Number of Discs per Filter Unit: | 20 |
| Total Number of Discs: | 40 |
| Total Effective Filter Area per Disc, $ft^2$: | 10.8 $ft^2$ |
| Total Filter Area per Unit, $ft^2$: | 216 |
| Total Filter Area, $ft^2$: | 432 |
| Peak Hydraulic Loading Rate, gpm/$ft^2$ (1-Unit out of service) | 2.4 (4.8) |
| Peak Solids Loading Rate, lb TSS/day – $ft^2$ (1-Unit out of service) | 0.43 (0.86) |
| Discharge Piping, inch - material | 10 – stainless steel |
| Drive Assembly Motors (DF-1A, -1B, -2A, -2B): | 1/2 HP; TEFC; 460/3/60 |
| Constant/ Variable Speed: | Constant |
| Acceptable Manufacturer(s): | Aqua-Aerobics or equal |
| **Backwash Pumps** | |
| Application: | Tertiary effluent backwash cleaning of disc filters |
| Type: | Dry-pit Centrifugal |
| Tag: | FBWP -1, -2 |
| Capacity, gpm: | 130 |
| TDH, ft: | 23 |
| Motor: | 2HP; TEFC; 460/3/60 |

Note 1: Any flow in excess of 1.5 MGD shall be diverted upstream of the SBR basin for attenuation and equalization once influent flows subside.

## Building / Structure Implications

The existing filter bays, existing filter effluent channels, and existing filter bypass channel will require modifications to accomodateTDF-1, -2 and a backwash pump vault for FBWP -1, -2. Refer to the attached preliminary layout of the proposed Tertiary Disk Filter layout. Anticipated structural/architectural modifications will include, but not be limited to:

- Demolition of existing filter basin divider walls

- Addition of new concrete basin filter walls
- Modification of influent/effluent filter basin configuration
- Modifications and addition of new plating/grating/handrail configuration above the new tertiary disc filters

### Disc Filter Structural Information

| Parameter | Criteria |
|---|---|
| No. of Units | 2 |
| Length per Unit, inches: | 108 |
| Weight per TDF Unit, lbs (approx.) | 1,500 |
| Mounting description: | Vertical mount to influent and effluent walls of filter bays (i.e., both ends of centertube will be mounted to vertical walls at both ends of the filter bay). |
| Installation Requirements: | All equipment must fit through existing double door (6’- 0” W x 7’ - 2” H) |

## Process Control Description

The tertiary filters will be controlled by the Division 11 manufacturer and in general, will have the following three modes of operation:

- Filtration mode: Flow enters the filter basins by gravity from the influent channel and filtrate is collected inside the individual stationary discs and discharges to the effluent channel for disinfection. Solids which deposit on the outside of cloth media form a mat as filtrate flows through the media, causing the filter basin level to rise before entering a backwash filter cleaning cycle. Heavier solids in the filter basin settle to the bottom of the filter basin.
- Backwash mode: Upon reaching a basin level setpoint, the backwash mode will be activated. Backwash shoes contact the cloth media directly and solids are removed by vacuum pressure created by a dedicated backwash pump. Backwashing is initiated at a predetermined liquid level or time interval. Two discs are backwashed at a time, during which time the discs rotate to contact all area of the filtration media with the backwash shoe. Discs not in backwash remain on-line in filtration mode. Backwash water and associated solids will be pumped back to the beginning of the treatment process.
- Solids Wasting mode: Heavier solids on the tank bottom are removed on an intermittent and adjustable timed interval. Solids will be pumped back to the beginning of the treatment process.

The following instruments, control panels, and local control stations are anticipated:

| Item | No. of Units | NEMA | By Division |
|---|---|---|---|
| High-level Float Switches | 2 | 4X | 11-OEM |
| Level Element/transducer | 2 | 4X | 11-OEM |

| Item | No. of Units | NEMA | By Division |
|---|---|---|---|
| Vacuum gauge and transmitter | 2 | 4X | 11-OEM |
| Backwash Valves | 10 | 4X | 11-OEM |
| Solids Waste Valves | 2 | 4X | 11-OEM |
| Local Control Panel | 2 | 4X | 11-OEM |

## Construction Sequencing

Given the significant modifications which will need to occur in the existing filter basin, bypass pumping will be required from the effluent lagoon pump station to the disinfection process while structural modifications to the existing filter effluent and existing filter bypass channels are in progress. This may be accomplished via a temporary piping connection on the existing effluent lagoon pump station header, or by an alternative means of bypass.

## Future Expansion Considerations

The proposed filters are designed to be completely redundant for the design flows and loads conditions up to 1.5 MGD. Influent flows in excess of 1.5 MGD will be diverted upstream of the SBR process to the existing lagoon system for attenuation and re-equalized into the process once influent flows have subsided. For future tertiary filtration requirements greater than 1.5 MGD, the Town will need to consider expansion of the existing pre-engineered Filter Building or reevaluation of filtration technologies which may be available in the future.

## File Location

J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\Filtration\Basis_of_Design

## Attachments

☒ Key Design Calculations

☒ Manufacturer Cut Sheets

NEWPORT, NEW HAMPSHIRE BY MAC REV
WWTF UPGRADE DATE 10/13/2022 DATE
PRELIMINARY DESIGN - TERTIARY FILTRATION
JOB #20828B

| 2 - 20 DISC UNITS | | | | | | | |
|---|---|---|---|---|---|---|---|
| | DESIGN AVERAGE DAY | | DESIGN MAX MONTH | | DESIGN MAXIMUM DAY | | PEAK LOADING CONDITION |
| FLOW, MGD | 0.66 | 0.66 | 0.98 | 0.98 | 1.50 | 1.50 | 1.50 |
| SOLIDS LOADING | | | | | | | |
| FILTER INFLUENT TSS, mg/L | 10 | 10 | 10 | 10 | 15 | 15 | 30 |
| FILTER INFLUENT TSS, lbs/day | 55 | 55 | 82 | 82 | 188 | 188 | 376 |
| | | | | | | | |
| TERTIARY FILTERS | | | | | | | |
| NO. OF DISC FILTER UNITS | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| NO. OF DISC FILTER UNITS ONLINE | 1 | 2 | 1 | 2 | 1 | 2 | 2 |
| NO. OF DISC FILTERS PER UNIT | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| TOTAL NO. OF AVAILABLE DISC FILTERS | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| NO. OF DISC FILTERS ONLINE | 20 | 40 | 20 | 40 | 20 | 40 | 40 |
| FILTRATION AREA, FT^2 PER DISC | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 | 10.8 |
| TOTAL EFFECTIVE FILTRATION AREA ONLINE, FT^2 | 216 | 432 | 216 | 432 | 216 | 432 | 432 |
| | | | | | | | |
| HYDRAULIC LOADING, GPM/FT^2 | 2.12 | 1.06 | 3.15 | 1.57 | 4.82 | 2.41 | 2.41 |
| | | | | | | | |
| SOLIDS LOADING, lbs per day/FT^2 | 0.25 | 0.13 | 0.38 | 0.19 | 0.87 | 0.43 | 0.87 |

## *AquaDisk® Tertiary Filtration - Design Summary*

**Design#: 169309**

**Project:** **NEWPORT WWTP, NH**
**Option:** **Plans and Specs Design**
***Designed by Thea Davis on Friday, October 21, 2022***

## *DESIGN INFLUENT CONDITIONS*

**Pre-Filter Treatment:** SBR
**Avg. Design Flow** = 0.98 MGD = 680.56 gpm = 3709.70 m³/day
**Max Design Flow** = 1.50 MGD = 1041.67 gpm = 5678.12 m³/day

The filtration system shall be designed based upon flow equalization after the SBR and prior to filtration.

## *AquaDisk FILTER RECOMMENDATION*

**Qty Of Filter Units Recommended** = 2
**Number Of Disks Per Unit** = 20
**Total Number Of Disks Recommended** = 40
**Total Filter Area Provided** = 432.0 ft² = (40.13 m²)
**Filter Model Recommended** = AquaDisk Concrete: Model ADFSC-11 x 10E-X2
**Filter Media Cloth Type** = OptiFiber PA2-13®

## *AquaDisk FILTER CALCULATIONS*

### Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash.

### Average Flow Conditions:

**Average Hydraulic Loading** = Avg. Design Flow (gpm) / Recommended Filter Area (ft²)
= 680.6 / 432 ft²
= 1.58 gpm/ft² (3.85 m/hr) at Avg. Flow

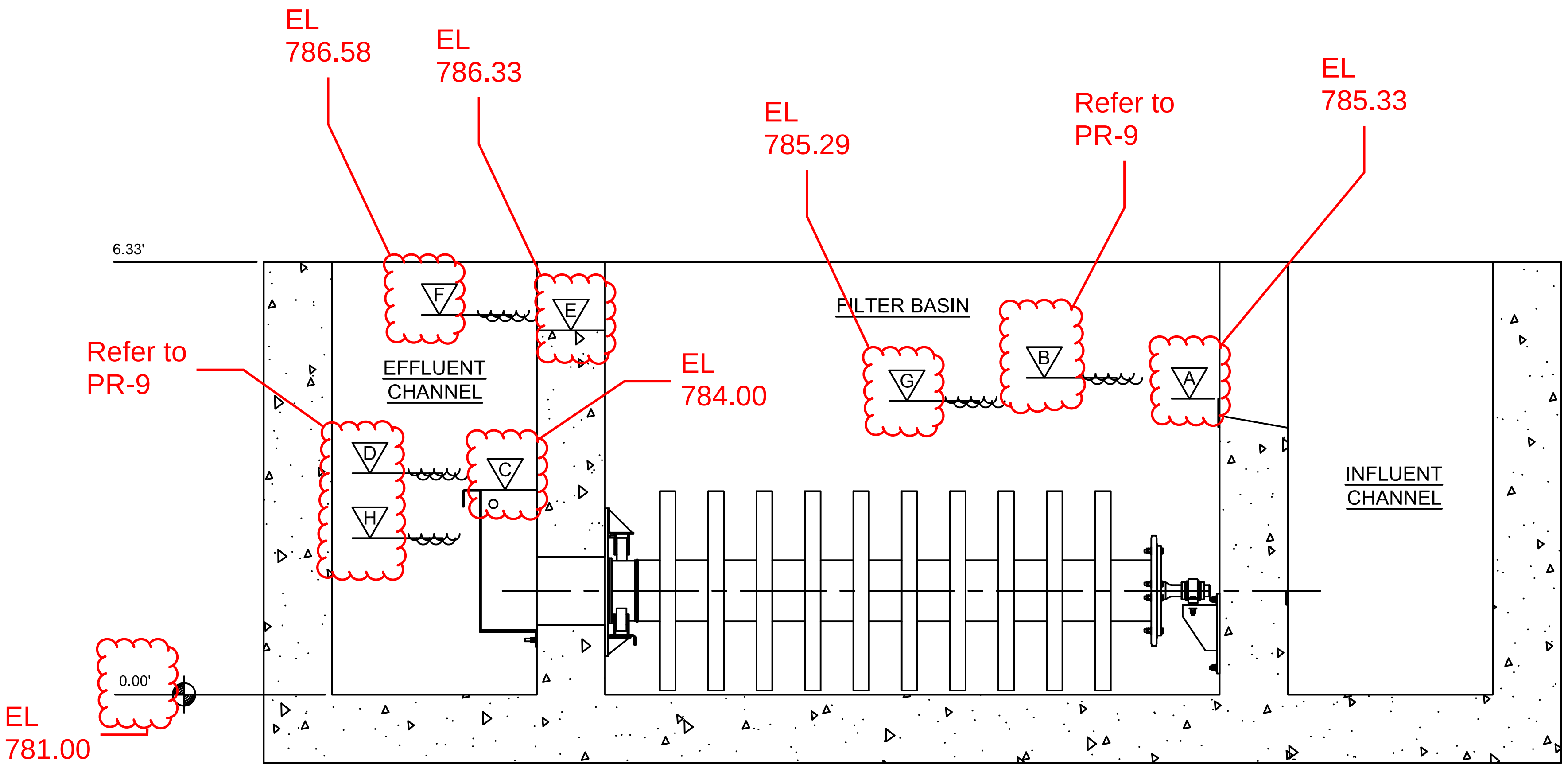
### Maximum Flow Conditions:

**Maximum Hydraulic Loading** = Max. Design Flow (gpm) / Recommended Filter Area (ft²)
= 1041.7 / 432 ft²
= 2.41 gpm/ft² (5.90 m/hr) at Max. Flow

### Solids Loading:

**Solids Loading Rate** = (lbs TSS/day at max flow and max TSS loading) / Recommended Filter Area (ft²)
= 187.6 lbs/day / 432 ft²
= 0.43 lbs. TSS /day/ft² (2.12 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: 4.8 gpm / ft² = (11.8 m/hr )



ELEVATION

| | | |
|---|---|---|
| A | ~~4.33'~~ | INFLUENT WEIR ELEVATION |
| B | ~~4.52'~~ | NAPPE OVER INFLUENT WEIR AVERAGE FLOW |
| | ~~4.64'~~ | NAPPE OVER INFLUENT WEIR MAXIMUM FLOW |
| C | ~~3.00'~~ | EFFLUENT WEIR ELEVATION |
| D | ~~3.19'~~ | NAPPE OVER EFFLUENT WEIR AVERAGE FLOW |
| | ~~3.30'~~ | NAPPE OVER EFFLUENT WEIR MAXIMUM FLOW |
| E | ~~5.33'~~ | OVERFLOW WEIR ELEVATION |
| F | ~~5.56'~~ | NAPPE OVER OVERFLOW WEIR AVERAGE FLOW |
| | ~~5.70'~~ | NAPPE OVER OVERFLOW WEIR MAXIMUM FLOW |
| G | ~~4.29'~~ | BACKWASH START LEVEL |
| H | ~~2.50'~~ | MAXIMUM AVAILABLE LIQUID LEVEL FOR EFFLUENT CONVEYANCE |

HYDRAULIC PROFILE PER FILTER BASIN
BASED UPON AVERAGE FLOW RATE OF 3.25 GPM PER SQUARE FOOT (1.0 MGD)
BASED UPON MAXIMUM FLOW RATE OF 6.5 GPM PER SQUARE FOOT (2.0 MGD)

WEIR LENGTHS
INFLUENT = 5.50'
EFFLUENT = 5.71'
OVERFLOW = 4.25'

JOB NAME:
JOB LOCATION:

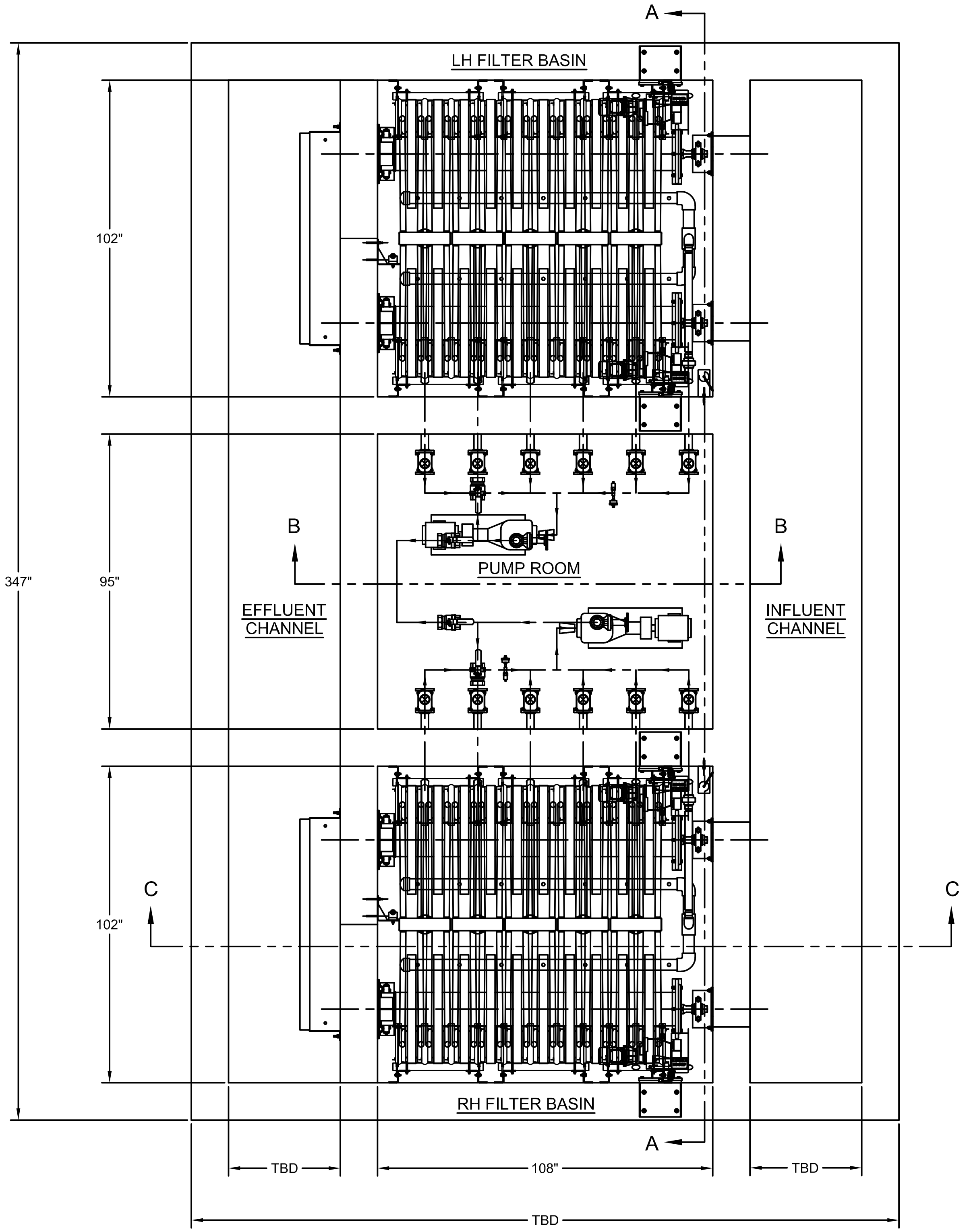
| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 2012-03-28
CHECKED BY: DATE:
WEIGHT: SHEET: 3 OF 4
DRAWING NAME: AQUADISK FILTER MODEL ADFSC-11 X 10E-X2
DRAWING NUMBER: 2801993
SCALE:
SIZE: D



ITEM WEIGHTS
EFFLUENT SEAL PLATE = 66 LBS.
CENTERTUBE = 240 LBS.
EFFLUENT WEIR WELDMENT = 201 LBS.
DRIVE MOTOR ASSEMBLY = 249 LBS.
DISK SEGMENT ASSEMBLY = 6.5 LBS.
PUMP WITH MOTOR MOUNTED ON BASE = 200 LBS.
SOLIDS MANIFOLD = 54 LBS.

1 DRAWING FOR REFERENCE ONLY.
ALL WALLS ARE SHOWN AT 1'.
ALL DIMENSIONS TO BE VERIFIED BY CUSTOMER.

2 AQUA-AEROBIC SYSTEMS PROVIDES PUMPS AND VALVES LOOSE FOR INSTALLATION BY THE INSTALLING CONTRACTOR. ALL INTERCONNECTING PIPING, WIRING, AND WALL SPOOL PIPES AND PIPE SUPPORTS ARE PROVIDED BY THE INSTALLING CONTRACTOR.

3 IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEMS RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING. IF A BUILDING IS NOT PROVIDED, ANY NECESSARY PROTECTION, INCLUDING BUT NOT LIMITED TO, HEAT TRACING AND INSULATION OF PUMPS AND PIPING, AS WELL AS PROTECTION AGAINST INTERNAL TANK FREEZING, SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR.

4 THE GRAPHIC ELEMENTS OF THIS COMPUTER GENERATED DRAWING ARE DRAWN FULL SIZE. THE DIMENSIONS ARE ASSOCIATIVE. IF THE SIZE OF THE GRAPHIC ELEMENTS IS CHANGED THE DIMENSIONS WILL NOT BE CORRECT.

5 TBD THE INFLUENT AND EFFLUENT CHANNELS TO BE SIZED BY THE INSTALLING CONTRACTOR BASED ON THE PLANT FLOW.

6 AN INFLUENT VALVE IS REQUIRED FOR ISOLATION / MAINTENANCE OF EACH FILTER UNIT. INFLUENT VALVES SHALL BE PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

7 WALL SPOOL PIPING AND SUPPORTS SHALL BE STAINLESS STEEL.
PROVIDED BY OTHERS AND INSTALLED BY OTHERS.

JOB NAME:
JOB LOCATION:

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|
| | | | | |

DRAWING NAME:
AQUADISK FILTER MODEL ADFSC-11 X 10E-X2

AQUA-AEROBIC SYSTEMS, INC.

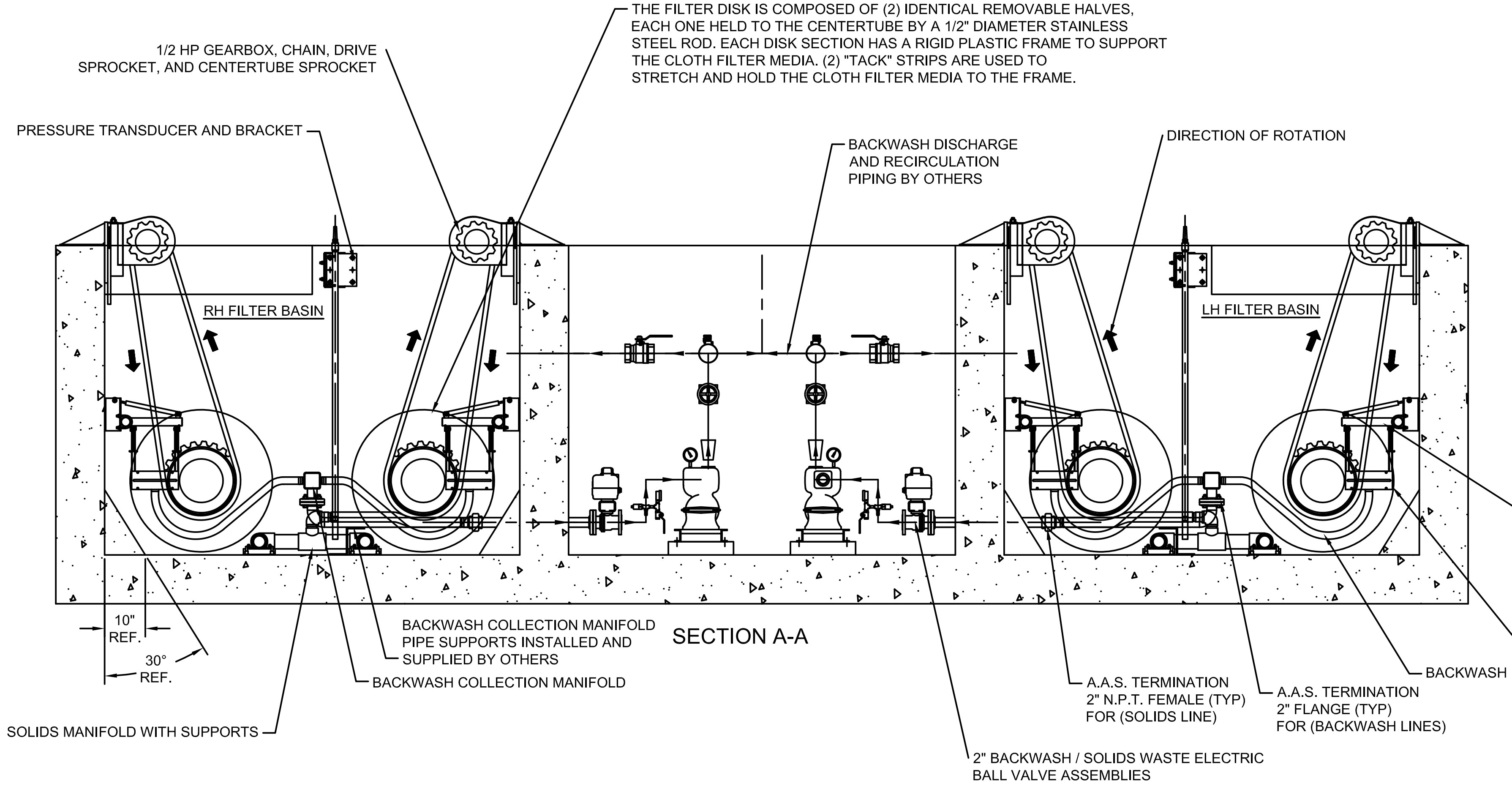
DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED

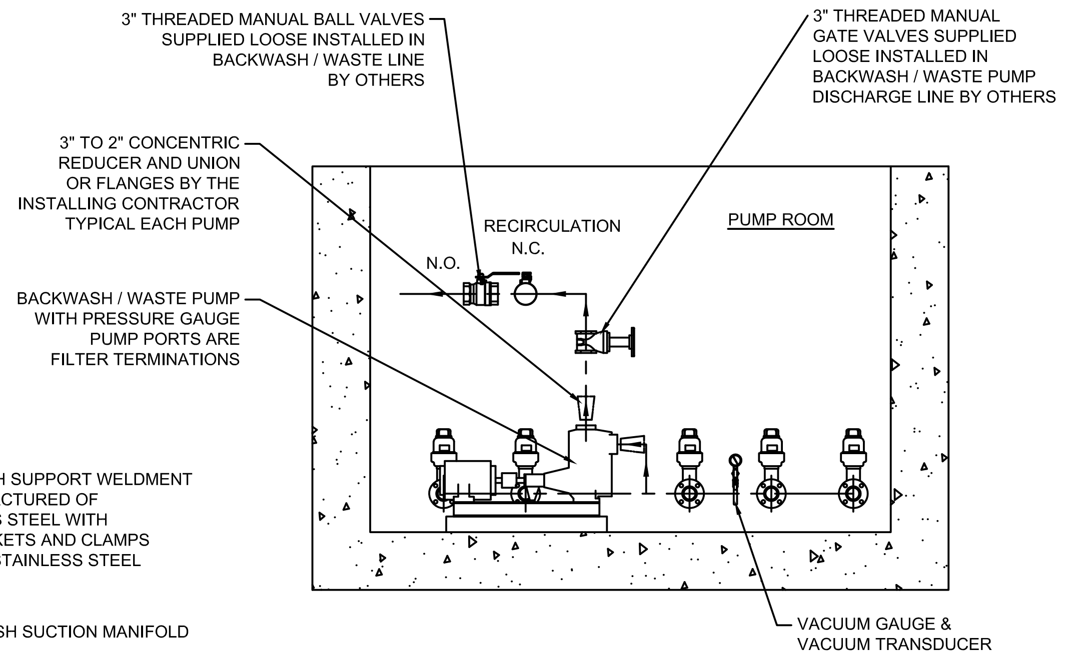
| | |
|---|---|
| FRACTIONAL DIMENSIONS | +/- 1/16 |
| ALL TWO PLACE DECIMALS | +/- 0.010 |
| ALL THREE PLACE DECIMALS | +/- 0.005 |
| ALL ANGLES | +/- 1/2° |

ANSI

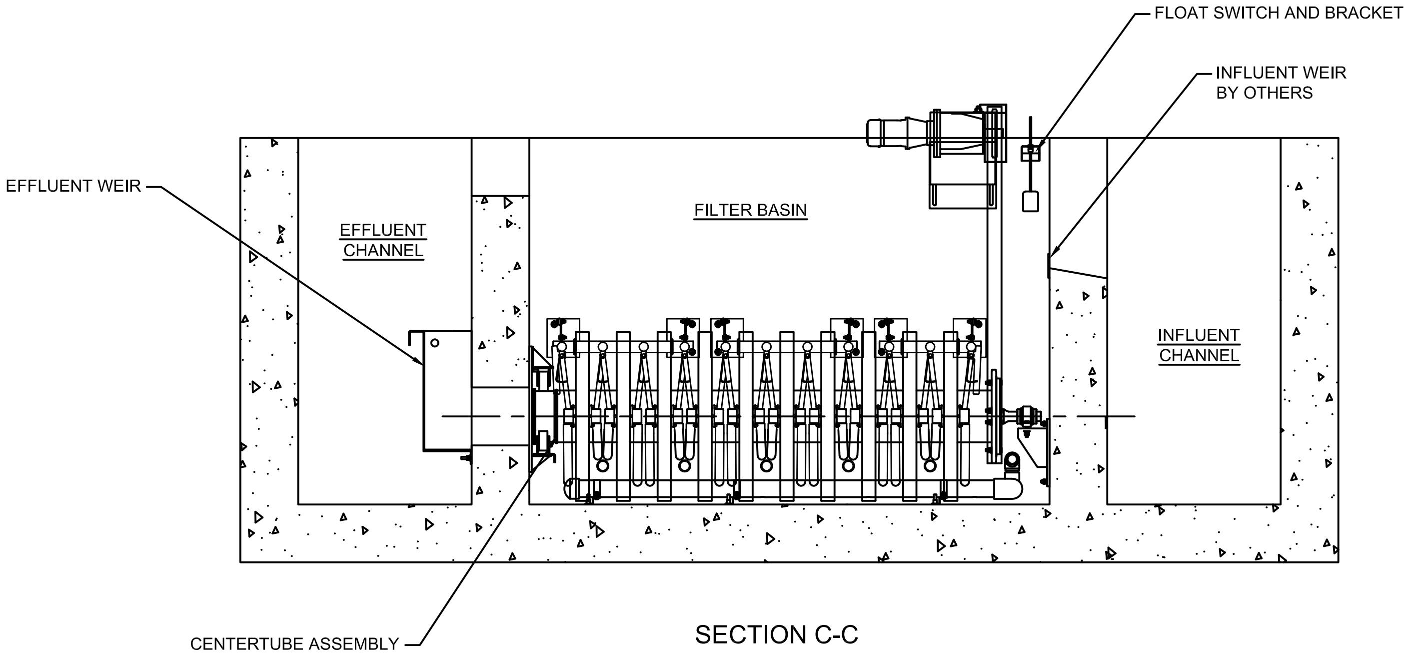
MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 2012-03-28
CHECKED BY: DATE:
WEIGHT: SHEET: 1 OF 4
DRAWING NUMBER: 2801993 SCALE: SIZE: D



SECTION A-A



SECTION B-B



SECTION C-C

1 ALL PIPING AND FITTINGS SHALL BE PROVIDED BY OTHERS ACTUAL PIPING LAYOUT AND PUMP LOCATION TO BE DETERMINED BY OTHERS WHEN THREADED OR WELDED PIPE IS USED IN LIEU OF FLANGED PIPE, UNIONS SHALL BE USED AT EACH PUMP AND VALVE CONNECTION TO FACILITATE SERVICE.

2 BACKWASH / WASTE PUMP CONNECTIONS ARE 2" N.P.T. BACKWASH / WASTE PIPING IS 3" DIAMETER. 3" TO 2" CONCENTRIC REDUCER FITTINGS SHALL BE PROVIDED AND INSTALLED BY OTHERS AT EACH PUMP PORT.

3 THE BACKWASH / WASTE PUMP CAPABILITIES ARE AS FOLLOWS:

- HORSEPOWER: 2 HP
- FLOW: 130 GPM
- TOTAL DYNAMIC HEAD: 23.2 FT
- ALLOWABLE DISCHARGE HEAD, AFTER FILTER LOSSES: 12 FT

FOR INSTALLATIONS THAT REQUIRE MORE DISCHARGE HEAD, ALTERNATIVE PUMPS ARE AVAILABLE. PLEASE CONSULT ENGINEERING TO VERIFY THE SUITABILITY OF THE DISCHARGE PIPING OR FOR SPECIAL PUMP REQUIREMENTS.

JOB NAME:
JOB LOCATION:

| REV | ERN / ECO | DATE | BY | REVISION DESCRIPTION |
|---|---|---|---|---|

DRAWING NAME:
AQUADISK FILTER MODEL ADFSC-11 X 10E-X2

AQUA-AEROBIC SYSTEMS, INC.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
FRACTIONAL DIMENSIONS +/- 1/16
ALL TWO PLACE DECIMALS +/- 0.010
ALL THREE PLACE DECIMALS +/- 0.005
ALL ANGLES +/- 1/2°
ANSI

MATERIAL:
SIMILAR TO:
TYPE:
DRAWN BY: SLT DATE: 2012-03-28
CHECKED BY: DATE:
WEIGHT: SHEET: 2 OF 4
DRAWING NUMBER: 2801993 SCALE: SIZE: D

# Basis of Design Memorandum

Project No.: 20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade

Subject: Chemical Feed System (Tertiary Treatment)

Prepared By: Dylan Atkins Date: 10/13/2022

Reviewed By: Michael Curry Date: 10/13/2022

Revised By: Dylan Atkins Date: 11/4/2022

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## Description of Relevant Existing Facilities

The WWTF is not currently doing any total phosphorus precipitation and therefore, does not have an existing chemical feed system which is currently in operation. As part of the 2012 Tertiary Filtration upgrade, the Town was provided with a chemical phosphorus precipitation chemical storage and feed system (aluminum sulfate) located in the Filter Building. This chemical system was abandoned when the disc filter system was abandoned.

## Facility Plan Recommendations

In order to reliably meet the Town's total phosphorus limit, a chemical phosphorus precipitation combined with a tertiary filtration step was recommended in the Facilities Plan amendment. The existing tertiary filtration building was recommended to be retro-fitted with two new cloth-disc style filters within the existing filter basins. The existing rapid mixing and flocculation chambers were recommended to be re-used and a new chemical phosphorus precipitation chemical feed system was recommended to suit the new tertiary filtration process.

## Client Preferences

The following client preferences were noted:

- The Town has standardized on Blue-White chemical feed pumps and will be requesting sole-source procurement after the preliminary design is finalized
- If possible, the Town has indicated that chemical storage quantities should allow delivery of a full chemical tanker (~3,500-gallons) for bulk pricing benefits

## Design Guidelines

Technical Resource – 16 (TR-16) Guides for Design of Wastewater Treatment Works provides the following recommendations for chemical storage systems:

- Section 7.4.3.2 Chemical Storage
    - Liquid chemical storage tanks and tank fill connections should be located within a containment structure have a capacity of no less than 125% of the total volume of the storage vessel(s), excluding the volume of the storage vessels above the elevation of the containment wall. Valves on the discharge lines should be located adjacent to the storage tank and within the containment structure. No floor drains should be permitted in the containment area.
    - Any auxiliary facilities, including pumps and pump controls located adjacent to the containment area, should be situated above the highest anticipated liquid level.
    - Platforms, ladders, and railings should be provided as necessary for convenient and safe access to all connections, storage tank entries, and measuring devices.
    - Reasonable access to storage tanks to facilitate cleaning should be provided.

- Section 7.4.3.3 Chemical Feed
  - Chemical feed facilities should supply peak demand with the largest unit out of service
  - Chemical feed equipment should continue to function properly in the event of a storage tank or pipe failure.
  - Chemical overfeeding caused by induction siphoning must be prevented.
  - Feed tanks should have drains for maintenance and above-bottom draw offs to avoid the withdrawal of solids into chemical feed lines.
  - Piping should be installed with plugged Ys, Ts, or crosses at changes in direction to facilitate cleaning.
- Section 7.4.3.4 Protective Measures
  - Chemical feed equipment and storage facilities should be constructed of materials resistant to chemical attack.
  - Prevention of freezing or crystallization should be addressed in the design.
  - Any structural shelter for equipment should have adequate ventilation for protection of personnel and equipment.

## Alternatives Analyses

Poly-aluminum chloride (PaCl), ferric chloride, and aluminum sulfate (alum) were considered as alternatives for metal salt coagulants for phosphorus precipitation. PaCl and ferric chloride daily usage and storage volumes were comparable to each other while alum required significantly greater chemical volumes.

In addition, consideration was also given to the Town's NPDES discharge permit requirement. Currently, the NPDES permit contains an aluminum monitoring requirement and compliance schedule for effluent aluminum (87 ppb). Based on this upcoming effluent aluminum limit, the aluminum-based coagulants were eliminated from consideration, leaving ferric chloride as the metal salt coagulant of choice for the basis of design.

## Basis of Design

**Error! Reference source not found.** summarizes design data for the recommended chemical feed systems.

### Coagulant Chemical Feed System

| Parameter | Criteria |
|---|---|
| Application: | Metal salt coagulant for total phosphorus precipitation in wastewater |
| Chemical: | Ferric chloride, 37 – 45% |
| Pump Type: | Peristaltic metering |
| Number of Units (Tag): | Three (FECLP-1, -2, -3) |
| Location, room - building: | Chemical Area – Control Building |
| Dosing Points: | Tertiary System: Rapid Mix Chamber of Tertiary Building<br>Dewatered Solids Centrate: Exterior centrate dosing sewer manhole |
| Chemical Area Classification: | Unclassified, NEMA 4X (Corrosive) |

| Parameter | Criteria |
|---|---|
| Minimum Capacity, gph: | 0.1 |
| Maximum Capacity, gph: | 19.0 |
| Discharge Pressure: | 30 psi |
| Power Supply, V/Hz | 115/60 |
| Inlet/Outlet Connection, inch/connection type/connection material | ½” / MNPT / Kynar (Natural PVDF) |
| Pump Tube, Material / Size (ID) | Flex-A-Prene® / 0.187 |
| Pumphead Material: | Vaolox® (PBT) thermoplastic |
| Tube Adapter Fittings | PVDF |
| Constant/ Variable Speed: | Variable |
| Acceptable Manufacturer(s): | Blue-White, no or equal |
| **Coagulant Storage Tank** | |
| Number of Units: | 2 |
| Location, room - building: | Chemical Area – Control Building |
| Equipment Tag: | FECLT -1, -2 |
| Storage Capacity, gal (each): | 905 per tank, (1,810 total) |
| Tank Weight, lb (empty): | 195 each |
| Weight, lb (full): | 6,704 each |
| Design Max Month Storage time, days: | 40 |
| Material: | High density cross-linked polyethylene |
| Discharge: | Integrally molded flanged (IMFO) |
| Tank Diameter, ft (each): | 5’ 4” |
| Height, ft (each): | 6’ 11 ½ ” |
| Acceptable Manufacturers: | Polyprocessing, Assman, or equal |

## Building / Structure Implications

The existing Filter Building contains a chemical feed system (aluminum sulfate) which was used as part of the prior tertiary upgrade. This chemical storage and pumping system is located in the same room as all of the other equipment associated with the tertiary filter building (i.e., mixers, pumps, HVAC equipment). The new proposed metal salt coagulant (ferric chloride) is a highly corrosive chemical which is known to degrade most metals. Based on this characteristic, a new chemical area is proposed to isolate ferric chloride from other processes and equipment.

The existing Chemical Area in the Control Building is proposed to be used for ferric chloride storage and chemical feed system. Structural and architectural modifications will be required to convert an existing storage room of the Control Building into the proposed Chemical Area. Ferric chloride is a hazardous and corrosive chemical which will require an eyewash and coordination with compatible storage and feed material (i.e., no steel or stainless steel). An example Ferric Chloride Safety Data Sheet (SDS) has been attached to this memorandum.

The Chemical Area will include a new containment wall constructed around FECLT-1, -2 and FECLP -1, -2, -3 and a structural support pad underneath FECLT-1,-2 which will be designed by structural. Given the existing double-door on the parking lot side of the proposed Chemical Room, a cam lock adapter fill station for both FECLT -1 and FECLT -2 will be located inside the building. A 4-inch floor sloped to a 2-inch deep, 18” x 18” sump with bottom elevation equal to the original finish floor will be placed within the containment area.

## Structural Information

| Metal salt Containment | |
|---|---|
| Type: | Concrete wall with chemical resistant epoxy coatings |
| Area, $ft^2$ (inside): | 161.5 |
| Height, ft-inch (from original finish floor): | 3’-8” |
| Minimum Chemical Containment Capacity, % FECLT -1, -2 total capacity: | 125 |
| Minimum Sprinkler Water Containment Capacity, (gpm*20 min)/$ft^2$ | 0.2 |
| Total Capacity, gallons | 2,910 |
| Top of Containment Wall Elevation | 786.66 |
| Description: | Containment to surround FECLT -1, -2 and FECLP -1, -2, -3 in Chemical Area of Control Building |

## Process Control Description

. Operators will set a desired chemical feed application rate for each discharge location and assign a chemical feed pump to each discharge location. A Division 13 Control Panel will pace the speed each pump based on operator inputs. The chemical feed pump assigned to discharge at the Centrate Dosing Manhole will start and stop based on a time delay from feedback of the dewatering equipment. The chemical feed pump to the tertiary filters shall automatically shut off based on a time delay from the stop of all Effluent Equalization Pumps and begin pumping again automatically when any of the Effluent Equalization Pumps start. Operators will be responsible for chemical valving and assigning the correct pump to the correct/desired discharge location and for optimizing metal salt coagulant feed rates to each discharge location.

## Construction Sequencing

There are no identified construction sequencing constraints or bypass pumping related to the proposed chemical feed system.

## Future Expansion Considerations

The proposed chemical feed system is designed to handle process conditions anticipated within the 20-year projections. As loading increases, the Town may need to re-supply with chemicals more frequently. As part of the project carrier conduit infrastructure for the chemical feed piping to the SBR will be constructed in place should, in the future, the Town decide to dose coagulant to the SBR basins directly.

## File Location

J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\Chemical Feed\Basis of Design

## Attachments

☒ Key Design Calculations

☒ Manufacturer Cut Sheets

JOB NAME: Newport WWTF Upgrade
JOB NO.: 20828
CALC. BY: DJA
CHKD. BY: MAC
FILE NAME: ___
NOTES: Total FeCL Demand and Storage

LAST UPDATE 10/13/2022

THIS UPDATE 11/4/2022

The DOSING template is used to determine the appropriate range of chemical needs based on the specific chemicals chosen. If alternate chemicals are needed, consult with WDH.

Once DOSING sheet is completed, use CFS sheet to calculate pump, storage tank, piping and diffuser sizing.

Yellow highlight are manual entry

| | | Minimum Day9 | Annual Average8 | Max Month Filter Influent and Centrate | Max Month Filter Influent | Max Month Centrate | Maximum Day Load3 (100th %) | Minimum Day Load | Average Day Flow and Load | Max Month Filter Influent and Centrate | Max Month Filter Influent | Max Month Centrate | Maximum Day Load | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FLOW | | 0.28 | 0.55 | 0.82 | 0.82 | 0.82 | 1.20 | 0.34 | 0.66 | 0.98 | 0.98 | 0.98 | 1.23 | |
| **DOSING BASIS - CHEMICAL PHOSPHORUS REMOVAL (FERRIC CHLORIDE)** | | | | | | | | | | | | | | |
| FLOW, MGD | | 0.280 | 0.551 | 0.820 | 0.820 | 0.82 | 1.20 | 0.34 | 0.66 | 0.98 | 0.98 | 0.00 | 1.23 | |
| CHEMICAL NAME - FERRIC CHLORIDE | | **FERRIC CHLORIDE (FeCl3)** | | | | | | | | | | | | |
| RAW INFLUENT TOTAL PHOSPHORUS, MG/L | | 3.00 | 6.00 | 8.00 | 11.30 | 11.30 | 9.00 | 3.00 | 6.00 | 8.00 | 11.30 | 11.30 | 9.00 | |
| SBR EFFLUENT TOTAL PHOSPHORUS, MG/L | | 1.50 | 1.50 | 4.00 | 4.00 | 0.00 | 5.75 | 1.50 | 1.50 | 4.00 | 4.00 | 0.00 | 5.75 | <<Assumed conditions, no bio-P |
| CENTRATE TOTAL PHSOPHORUS, MG/L | | 0 | 25 | 45 | 45 | 45 | 45 | 25 | 25 | 45 | 0 | 45 | 0 | <<< AVG VALUE FROM Table 17.2 in MOP8, Refer to snip on ri |
| CENTRATE FLOW RATE, GPD | | 0 | 60,000 | 60,000 | 60,000 | 60,000 | 0 | 60,000 | 60,000 | 60,000 | 0 | 60,000 | 0 | <<< FROM DEWATERING SPREADHSEET, 125 GPD AVERA |
| CENTRIFUGE SCHEDULE, DAYS OPERATING | | 2.00 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 2.00 | 3.00 | 3.00 | 3.00 | 3.00 | 4.00 | <<< FROM DEWATERING SPREADHSEET |
| CENTRATE TOTAL PHOPHORUS, LB/DAY | | 0.00 | 3.57 | 9.65 | 9.65 | 9.65 | 0.00 | 3.57 | 5.36 | 9.65 | 0.00 | 9.65 | 0.00 | |
| SBR EFFLUENT PHOSPHORUS, LB/DAY | | 3.50 | 6.90 | 27.36 | 27.36 | 0.00 | 57.53 | 4.21 | 8.28 | 32.85 | 32.85 | 0.00 | 58.96 | *Excludes centrate recirculation considerations |
| SBR EFFLUENT PHOSPHORUS, MG/L | | 1.50 | 1.50 | 4.00 | 4.00 | 0.00 | 5.75 | 1.50 | 1.50 | 4.00 | 4.00 | 0.00 | 5.75 | |
| SBR EFFLUENT ORTHO-PHOSPHORUS, MG/L | | 0.75 | 0.75 | 2.00 | 2.00 | 0.00 | 2.87 | 0.75 | 0.75 | 2.00 | 2.00 | 0.00 | 2.88 | < Typically 50% in the raw influent, eflfuent will vary by biological |
| | | | | | | ` | | | | | | | | |
| DESIGN TOTAL INFLUENT PHOSPHORUS, LB/DAY | | 3.50 | 10.47 | 37.01 | 37.01 | 9.65 | 57.53 | 7.78 | 13.64 | 42.50 | 32.85 | 9.65 | 58.96 | *Includes centrate recirculation considerations |
| DESIGN TOTAL INFLUENT PHOSPHORUS, MG/L | | 1.50 | 2.21 | 5.25 | 5.25 | 1.37 | 5.75 | 2.64 | 2.38 | 5.04 | 4.00 | 45.00 | 5.75 | |
| DESIGN TOTAL INFLUENT ORTHO-PHOSPHORUS, MG/L | | **0.75** | **1.10** | **2.62** | **2.62** | **0.68** | **2.87** | **1.32** | **1.19** | **2.52** | **2.00** | **22.50** | **2.88** | < Typically 50% in the raw influent, eflfuent will vary by biological |
| EFFLUENT TOTAL PHOSPHORUS, MG/L | | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | 0.51 | TP limit at max month conditions with a 20% safety factor |
| EFFLUENT TSS | | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | |
| EFFLUENT VSS (80% OF TSS) | | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | |
| EFFLUENT PARTICULATE PHOSPHORUS, MG/L (2% OF VSS) | | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 | < Can vary by biological process utilized for treatment |
| EFFLUENT ORTHO-PHOSPHORUS, MG/L | | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | 0.347 | |
| PHOSPHORUS REMOVED, MG/L | | 0.40 | 0.76 | 2.28 | 2.28 | 0.34 | 2.53 | 0.97 | 0.84 | 2.18 | 1.65 | 22.15 | 2.53 | |
| FE TO PHOSPHORUS DOSE RATIO | | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | < From Curves on Notes page |
| REQ'D DOSE AS FE, MG/L | | 1.45 | 2.73 | 8.21 | 8.21 | 1.22 | 9.12 | 3.51 | 3.04 | 7.85 | 5.96 | 79.90 | 9.12 | Based on molar ratio of Fe=[55.85]; P=[30.97] |
| REQ'D DOSE AS FeCl3, MG/L | | 4.28 | 8.04 | 24.15 | 24.15 | 3.58 | 26.81 | 10.33 | 8.94 | 23.07 | 17.54 | 235.00 | 26.82 | < Percent Fe in FeCl3 (34%) |
| INJECTED, LBS/D AS FeCl3 | | 10 | 38 | 170 | 170 | 25 | 268 | 30 | 51 | 194 | 144 | 50 | 275 | |
| TRADE PERCENT (ENTER AS %) | | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | 37.0% | < Chemical specific, see MSDS |
| DOSE RATIO (XX:1) | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | < Chemical specific (1.0 to 1.4) |
| SPECIFIC GRAVITY | | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | 1.40 | < Chemical specific |
| PERCENT FE IN FeCl3 SOLUTION | | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | 12.7% | < Chemical specific |
| DOSAGE AS FERRIC CHLORIDE SOLUTION, MG/L | | 11.6 | 21.7 | 65.3 | 65.3 | 9.7 | 72.5 | 27.9 | 24.2 | 62.4 | 47.4 | 635.1 | 72.5 | < Chemical specific |
| INJECTED, LBS/D AS FeCl3 SOLUTION | | 27 | 103 | 460 | 460 | 68 | 725 | 82 | 139 | 525 | 389 | 136 | 743 | |
| INJECTED, GPD AS FeCl3 SOLUTION | >> | **2.3** | **8.8** | **39.4** | **39.4** | **5.8** | **62.1** | **7.0** | **11.9** | **45.0** | **33.3** | **11.7** | **63.7** | |
| INJECTED, GAL/MONTH AS FeCl3 SOLUTION | >> | **69** | **265** | **1,183** | **1,183** | **175** | **1,863** | **211** | **356** | **1,350** | **1,000** | **350** | **1,910** | << USED FOR STORAGE CONSIDERATIONS, POTENTIALLY |
| INJECTED, GAL/YEAR AS FeCl3 SOLUTION | >> | **833** | **3,176** | **14,195** | **14,195** | **2,104** | **22,360** | **2,536** | **4,271** | **16,201** | **12,002** | **4,200** | **22,916** | << USED FOR STORAGE CONSIDERATIONS, POTENTIALLY |
| COST, $/LB | | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | $ 0.50 | Aries cost estimate for bulk delivery < 3000 gallons |
| COST, $/GAL | | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | $ 5.84 | |
| COST, $/YEAR | | $ 4,864 | $ 18,550 | $ 82,920 | $ 82,920 | $ 12,293 | $ 130,614 | $ 14,813 | $ 24,951 | $ 94,640 | $ 70,107 | $ 24,533 | $ 133,865 | |
| PROPOSED FECL STORAGE VOLUME, GAL | | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | 1,810 | *Assumes two 905 gallon tanks |

JOB NAME: Newport WWTF Upgrade
JOB NO.: 20828 DATE: 10/13/22
CALC. BY: DJA
CHKD. BY: MAC DATE: 11/04/22
FILE NAME: ___
NOTES: GPH dosing demand of filters

This CFS template is intended for use with any chemical once the dosage requirements are
sheet. Copy and paste additional CFS sheets for each chemical system. Update cell refere
appropriate.

Yellow highlight are manual entry.

| | CURRENT | CURRENT | DESIGN | DESIGN | FUTURE | |
|---|---|---|---|---|---|---|
| FLOW | MIN | AVG | DES AVG | MAX MO | MAX DAY | |
| DOSE | AVG | AVG | AVG | MAX | MAX | |
| YEAR | 2022 | 2022 | 2042 | 2042 | 2042 | |
| **DESIGN CRITERIA** | | | | | | |
| CHEMICAL NAME | | | | | | 1.67 hrs per day at 10 min per cycle and 10 cycles |
| INJECTED, GPD | 2.3 | 8.8 | 11.9 | 33.3 | 63.7 | |
| **INJECTED, GPH (For pump sizing)** | **0.10** | **0.37** | **0.49** | **1.39** | **2.65** | 20.00 < < < for SBR direct dosing, one pump will work for all dosing locations |
| INJECTED, GAL/WK | 16 | 62 | 83 | 233 | 446 | |
| INJECTED, GAL/MO | 69 | 265 | 356 | 1,000 | 1,910 | |
| | | | | | | |
| **PRELIMINARY DESIGN DATA** | | | | | | |
| PUMP SELECTION | | | | | | |
| NO OF PUMPS TOTAL | 3 | 3 | 3 | 3 | 3 | |
| NO OF PUMPS ON-LINE | 1 | 1 | 1 | 1 | 1 | |
| SELECT PUMP MAX FLOW, GPH | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | |
| PUMP, % OF FULL SPEED | 0.51% | 1.93% | 2.60% | 7.31% | 13.96% | << Confirm with Pump Manuf if <20% speed |
| | | | | | | |
| PIPE SIZE SELECTION | | | | | | |
| TARGET VELOCITY, FPS | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | << Due to long shelf life of FeCl no issues have been identified with low velocities and long detention times in piping/tubing |
| CARRIER WATER VOLUME, GPH | 0 | 0 | 0 | 0 | 0 | |
| TOTAL FLOW, GPH | 0.1 | 0.4 | 0.5 | 1.4 | 2.7 | |
| PIPE DIAMETER, INCH | 0.187 | 0.187 | 0.187 | 0.187 | 0.187 | |
| ACTUAL VELOCITY, FPS | 0.02 | 0.07 | 0.10 | 0.27 | 0.51 | |

JOB NAME: Newport WWTF Upgrade
JOB NO.: 20828 DATE: 10/13/22
CALC. BY: DJA
CHKD. BY: MAC DATE: 11/04/22
FILE NAME: ___
NOTES: GPH dosing demand for centrate

This CFS template is intended for use with any chemical once the established on the DOSING sheet. Copy and paste additional CFS system. Update cell references and column headings as appropri

Yellow highlight are manual entry.

| | CURRENT | CURRENT | DESIGN | DESIGN | FUTURE | |
|---|---|---|---|---|---|---|
| FLOW | MIN | AVG | DES AVG | MAX MO | MAX DAY | |
| DOSE | AVG | AVG | AVG | MAX | MAX | |
| YEAR | 2022 | 2022 | 2042 | 2042 | 2042 | |
| **DESIGN CRITERIA** | | | | | | |
| CHEMICAL NAME | | | | | | |
| CENTRATE FLOW, GPM | 0 | 125 | 125 | 200 | 250 | |
| CENTRATE FLOW, HRS | 0 | 4 | 8 | 8 | 8 | |
| CENTRATE, GPD | 0 | 30,000 | 60,000 | 96,000 | 120,000 | |
| CENTRATE, LB TP | 0.0 | 6.3 | 22.5 | 36.0 | 45.0 | |
| CENTRATE ORTHO-P TO TP RATIO | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | <<< ASSUMED WORST CASE SCENARIO |
| CENTRATE ORTHO-P, LB/DAY | 0.0 | 6.3 | 22.5 | 36.0 | 45.0 | |
| REQUIRED DOSE AS FE, LB/DAY | 0 | 23 | 81 | 130 | 162 | |
| REQUIRED DOSE AS FeCL, LB/DAY | 0 | 66 | 239 | 382 | 478 | |
| INJECTED, LB/DAY AS FeCL SOLUTION | 0.0 | 179.3 | 645.6 | 1033.0 | 1291.2 | |
| INJECTED GPD AS FeCL SOLUTION | 0.0 | 15.3 | 55.3 | 88.4 | 110.5 | |
| **INJECTED, GPH (For pump sizing)** | **0.00** | **3.84** | **6.91** | **11.05** | **13.81** | |
| | | | | | | |
| **PRELIMINARY DESIGN DATA** | | | | | | |
| PUMP SELECTION | | | | | | |
| NO OF PUMPS TOTAL | 3 | 3 | 3 | 3 | 3 | |
| NO OF PUMPS ON-LINE | 1 | 1 | 1 | 1 | 1 | |
| SELECT PUMP MAX FLOW, GPH | 19.0 | 19.0 | 19.0 | 19.0 | 19.0 | |
| PUMP, % OF FULL SPEED | 0% | 20% | 36% | 58% | 73% | << Confirm with Pump Manuf if <20% speed |
| | | | | | | |
| PIPE SIZE SELECTION | | | | | | |
| TARGET VELOCITY, FPS | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | << Due to long shelf life of FeCl no issues have been identified |
| CARRIER WATER VOLUME, GPH | 0 | 0 | 0 | 0 | 0 | with low velocities and long detention times in piping/tubing |
| TOTAL FLOW, GPH | 0.0 | 3.8 | 6.9 | 11.1 | 13.8 | |
| PIPE DIAMETER, INCH | 0.187 | 0.187 | 0.187 | 0.187 | 0.187 | |
| ACTUAL VELOCITY, FPS | 0.00 | 0.74 | 1.34 | 2.15 | 2.68 | |

JOB NAME: Newport WWTF Upgrade
JOB NO.: 20828
CALC. BY: DJA
CHKD. BY: MAC
FILE LOCATION: J:\ENG\NH\Newport\20828-WWTF-Upgrade\20828B - Preliminary Design\Technical\5-Process\C
NOTES: None

### Chemical Storage Information

| | | |
|---|---|---|
| Chemical Storage Volume | 905 | gallons |
| Diameter of Storage Container | 5.33 | feet |
| Height of Storage Container | 6.96 | feet |
| Surface Area of one 905 gallon tank | 22.34 | square feet |
| No. of Storage Containers | 2 | total |
| Total Surface Area of Storage Containers | 44.68 | square feet |
| Effective Diameter of Both Containers | 7.5 | feet |
| Weight of Storage Container | 195.0 | pounds |
| Density of Ferric | 11.9 | pounds per gallon |
| Weight of Ferric | 10,808 | pounds of Ferric |
| Weight of Ferric Storage when full, per container | 11,003 | pounds |

### Chemical Secondary Containment Requirements

| | | |
|---|---|---|
| Containment Storage Volume as percent Chemical Storage Volume | 125% | |
| Sprinkler Containment Volume, .2 gpm/ft2 for 20 min | 86 | cubic feet |
| Containment Storage Volume | 389 | cubic feet |
| Surface Area of Storage Container | 45 | square feet |
| Length (L) | 19.00 | feet |
| Width (W) | 8.5 | feet |
| Theoretical Height | 3.329 | feet |

### Containment Design

| | | |
|---|---|---|
| Design Containment Length | 19.00 | feet |
| Design Containment Width | 8.50 | feet |
| Design Containment Area | 161.5 | square feet |
| Design Containment Wall Height (Inside Containment Area) | 3.33 | feet |
| Design Containment Volume | 389 | cubic feet << GOOD, DESIGN CONTAIMENT IS ADEQUATE |
| Design Containment Volume | 2,910 | gallon |
| Chemical Area Finish Floor Elevation | 783 | feet |
| Containment Area Floor Height @ Max Height (Sloped to 2" Sump) | 4 | inches |
| Design Containment Wall Height From Chemical Room Finish Floor | 3.66 | feet |
| Top of Containment Wall Elevation | 786.66 | feet |

# M3

## FLEXFLO® Peristaltic Metering Pump

### Features

> 5” touchscreen color LCD display
> User-friendly configurations
> Self priming peristaltic metering pump delivers smooth chemical feed
> Tube Failure Detection (TFD) system senses tube failure
> Inputs include: 4-20mA, Pulse Inputs, Industrial Protocols, Remote Start/Stop

Video link: ▶

NSF Certified to NSF / ANSI Standard 61 · C ETL US LISTED · CE · *NEMA 4X*

## Highlights

**Flow range**
.0002 - 33.3 GPH
.0007 - 126 LPH

**Pressures**
125 PSI
(8.6 bar)

**Turndown ratio**
10,000 : 1

**Exclusive**
Tube Failure Detection (TFD)

**Motor**
Brushless DC Motor

**Warranty**
5 Years

## Control Methods

| Control Methods | Manual Control | 4-20mA Input | Remote Start/Stop | Pulse Input | Frequency Input | Ethernet/ IP | Modbus TCP/IP | Profibus | Alarm Outputs |
|---|---|---|---|---|---|---|---|---|---|
| M3 | • | • | • | • | • | • | • | • | • |

For more help and information regarding **M3**, please visit www.blue-white.com or scan this QR code.

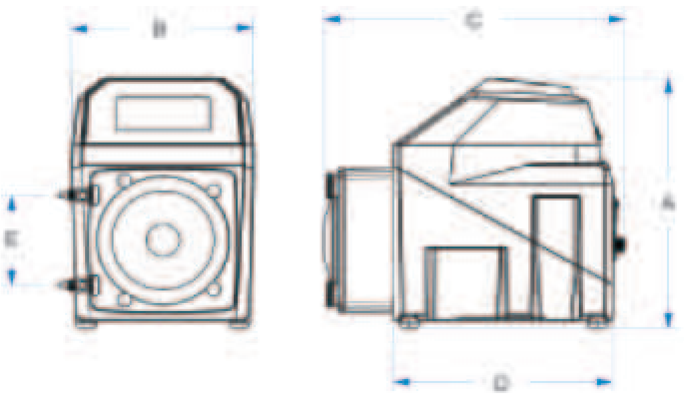
# Engineering Specifications

| | |
|---|---|
| **Maximum Working Pressure (excluding pump tubes)** | 125 psig (8.6 bar) |
| | **NOTE:** See individual pump tube assembly maximum pressure ratings. |
| **Maximum Fluid Temperature (excluding pump tubes)** | 185 °F (85 °C) |
| | **NOTE:** See individual pump tube assembly max. temperature ratings. |
| **Maximum Viscosity** | 12,000 Centipoise |
| **Maximum Suction Lift** | 30 ft. Water, 0 psig (9.14 m, 0 bar) |
| **Ambient Operating Temperature** | 14 °F to 115 °F (-10 °C to 46 °C) |
| **Ambient Storage Temperature** | -40 °F to 158 °F (-40 °C to 70 °C) |
| **Operating Voltage** | 115VAC/60Hz, 1ph (2.0 Amp Maximum) |
| | 230VAC/60Hz, 1ph (1.0 Amp Maximum) |
| | 220VAC/50Hz, 1ph (1.0 Amp Maximum) |
| | 240VAC/50Hz, 1ph (1.0 Amp Maximum) |
| | 230VAC/50Hz, 1ph (1.0 Amp Maximum) |
| **Power Cord Options** | 115V60Hz = NEMA 5/15 (USA) |
| | 230V60Hz = NEMA 6/15 (USA) |
| | 220V50Hz = CEE 7/VII (EU) |
| | 240V50Hz = AS 3112 (Australia/New Zealand) |
| | 230V50Hz = BS 1363/A (UK) |
| **Motor** | Brushless DC, 1/4 hp |
| **Motor Speed Adjustment Range** | 10,000:1 (0.01% - 100% motor speed) Max RPM = 125 |
| **Motor Speed Adjustment Resolution** | 0.1% increments > 1% motor speed and < 100% |
| | 0.01% increments < 1% motor speed |
| **Display** | 5” touchscreen color LCD, UV resistant. |
| **Display Languages** | English, Spanish, French, German, and Portuguese selectable |
| **Maximum Overall Dimensions** | 8-1/4”W x 11-3/4”H x 13-1/4”D (20.9W x 29.8H x 34.5D cm) |
| **Product Weight** | 25.4lb. (11.5 Kg) |
| **Security** | Programmable 6-digit password |
| **Approximate Shipping Weight** | 30 lb. (13.6 Kg) |
| **Enclosure** | NEMA 4X (IP66), Polyester powder coated aluminum & Noryl |
| **RoHS Compliant** | Yes |
| **Standards** | cETLus, CE, NSF61 |

# Dimensions

| Dim | Inch | cm |
|---|---|---|
| **A** | 11-3/4” | 29.8 |
| **B** | 8-1/4” | 20.9 |
| **C** | 13-1/2” | 34.5 |

| Dim | Inch | cm |
|---|---|---|
| **D** | 10-1/2” | 26.5 |
| **E** | 4-1/4” | 10.8 |
| | | |



# Materials of Construction

**Non-wetted Components:**

**Enclosure:** 413 Aluminum (Polyester powder coated) & Noryl

**Pump Head:** Valox® (PBT) thermoplastic

**Pump Head Cover:** Polycarbonate

Permanently lubricated sealed motor shaft support ball bearing.

**Cover Screws:** Stainless steel, polypropylene cap

**Roller Assembly**:

Rotor: Valox® (PBT)

Rollers: Nylon

Roller Bearings: SS Ball bearings

**Motor Shaft:** Chrome plated steel

**TFD System Sensor:** Hastelloy C-276

**Power Cord:** 3 conductor, SJTW-A water-resistant

**Tube Installation Tool:** GF nylon

**Mounting Brackets and Hardware:** 316 Stainless steel

**Wetted Components:**

**Pump Tube Assembly:**

Tubing: Flex-A-Prene®, Flex-A-Chem® or Flex-A-Thane®

Adapter Fittings: PVDF

# Output Specifications

| Feed Rate | | | Max Speed | Max Pressure | Max Temperature | Tube Material / Size |
|---|---|---|---|---|---|---|
| GPH | LPH | ML/Min | RPM | PSI (bar) | °F (°C) | |
| **Flex-A-Prene® M3 Tube Pumps** | | | | | | |
| .0002 - 2.10 | .0007 - 7.92 | .0132 - 132 | 125 | 125 (8.6) | 185 (85) | ND |
| .0025 - 25.3 | .0096 - 96.0 | .1596 - 1596 | 125 | 125 (8.6) | 185 (85) | NJ |
| .0033 - 33.3 | .0126 - 126 | .2100 - 2100 | 125 | 125 (8.6) | 185 (85) | NK |
| .0033 - 33.3 | .0126 - 126 | .2100 - 2100 | 125 | 30 (2.1) | 185 (85) | NKL |
| .0004 - 4.76 | .0018 - 18.0 | .03 - 300 | 125 | 110 (7.6) | 185 (85) | NEE |
| .0019 - 19.02 | .0072 - 72.0 | .12 - 1200 | 125 | 110 (7.6) | 185 (85) | NGG |
| **Flex-A-Chem® M3 Tube Pumps** | | | | | | |
| .0015 - 15.06 | .0057 - 57.0 | .0950 - 950 | 125 | 50 (3.4) | 130 (54) | TH |
| .0028 - 28.5 | .0108 - 108 | .18 - 1800 | 125 | 50 (3.4) | 130 (54) | TK |
| **Flex-A-Thane® M3 Tube Pumps** | | | | | | |
| .0004 - 4.60 | .0017 - 17.4 | .0290 - 290 | 125 | 65 (4.5) | 130 (54) | GE |
| .0010 - 10.1 | .0038 - 38.4 | .0637 - 637 | 125 | 65 (4.5) | 130 (54) | GG |
| .0024 - 24.9 | .0094 - 94.2 | .1570 - 1570 | 125 | 65 (4.5) | 130 (54) | GH |
| .0028 - 28.5 | .0108 - 108 | .1800 - 1800 | 125 | 65 (4.5) | 130 (54) | GK |
| .002 - 18.23 | .007 - 69.0 | .115 - 1150 | 125 | 65 (4.5) | 130 (54) | G2G |

# Model Number Matrix

## FLEXFLO® Model Number

| | |
|---|---|
| **M3** | FLEXFLO® Peristaltic metering pump |

### Power Cord (operating voltage user selectable 115V/240 Vac 50/60Hz)

| | | | |
|---|---|---|---|
| **4** | 115V / 60Hz, power cord NEMA 5/15 plug (US) | **8** | 240V / 50HZ, power cord AS 3112 plug (AU/New Zealand) |
| **5** | 230V / 60Hz, power cord NEMA 6/15 plug (US) | **9** | 230V / 50HZ, power cord BS 1363/A plug (UK) |
| **6** | 220V / 50HZ, power cord CEE 7/VII plug (EU) | **X** | No Power Cord |

### Inlet/Outlet Connection Size, Connection Type, Connection Material

| | |
|---|---|
| **S** | 3/8” OD x 1/4” ID Tube Compression Fitting, Natural PVDF (Kynar) |
| **M** | 1/2” Male NPT Fitting, Natural PVDF (Kynar) |
| **B** | 1/2” Hose Barb, Natural PVDF (Kynar), available for ND, NEE, NGG, NKL and G2G only |
| **C** | 1/2” - 3/4” Tri-clamp connections, Natural PVDF (Kynar), available for ND, NEE, NGG, NKL and G2G only |
| **Q** | Quick Disconnect, Natural PVDF (Kynar), available for ND, NEE, NGG, NKL and G2G only.<br>(valves sold seperately) |
| **MB** | 1/2” Male BSPT Fitting, Natural PVDF (Kynar) |

### Pump Tube Material, Pump Tube Size, Output Range

| | |
|---|---|
| **ND** | Flex-A-Prene® .075 ID \| .0002–2.10 GPH \| 125 PSI |
| **NEE** | Flex-A-Prene® .093 ID \| .0004–4.76 GPH \| 110 PSI |
| **NGG** | Flex-A-Prene® .187 ID \| .0019–19.02 GPH \| 110 PSI |
| **NHL** | Flex-A-Prene® .250 ID \| .0017–17.4 GPH \| 65 PSI |
| **NK** | Flex-A-Prene® .375 ID \| .0033–33.3 GPH \| 125 PSI |
| **NKL** | Flex-A-Prene® .375 ID \| .0033–33.3 GPH \| 30 PSI |
| **GE** | Flex-A-Thane® .125 ID \| .0004–4.60 GPH \| 65 PSI |
| **GG** | Flex-A-Thane® .187 ID \| .0010–10.1 GPH \| 65 PSI |
| **G2G** | Flex-A-Thane® .187 ID \| .002–18.23 GPH \| 65 PSI |
| **GH** | Flex-A-Thane® .312 ID \| .0024–24.9 GPH \| 65 PSI |
| **GK** | Flex-A-Thane® .375 ID \| .0028–28.5 GPH \| 65 PSI |
| **TH** | Flex-A-Chem® .250 ID \| .0015–15.06 GPH \| 50 PSI |
| **TK** | Flex-A-Chem® .375 ID \| .0028–28.5 GPH \| 50 PSI |

### Options (leave this blank for standard model with left facing pump head inlet/outlet)

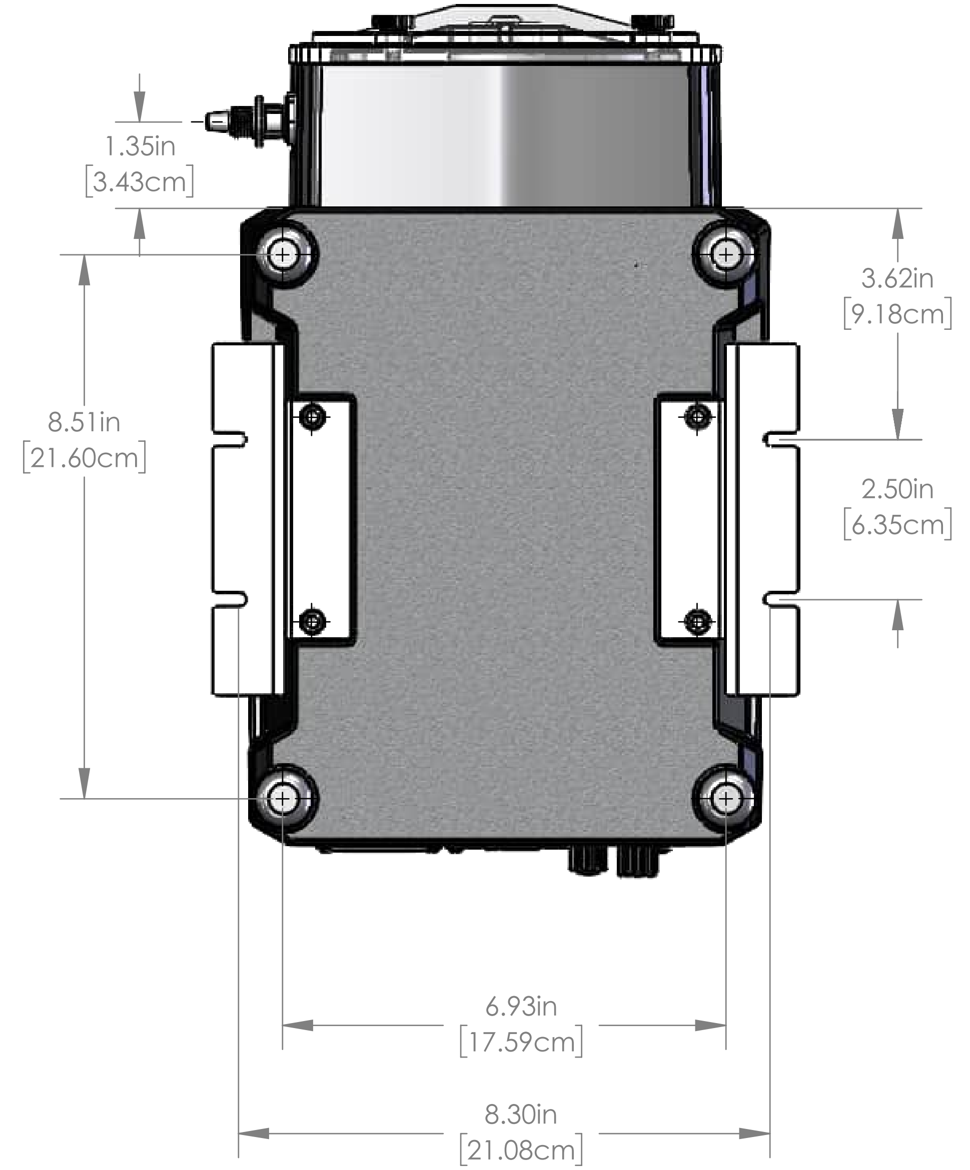
| | |
|---|---|
| **R** | Right facing pump head, input / output (Left facing fluid input / output is standard) |
| **D** | Down facing pump head, input / output (Left facing fluid input / output is standard) |

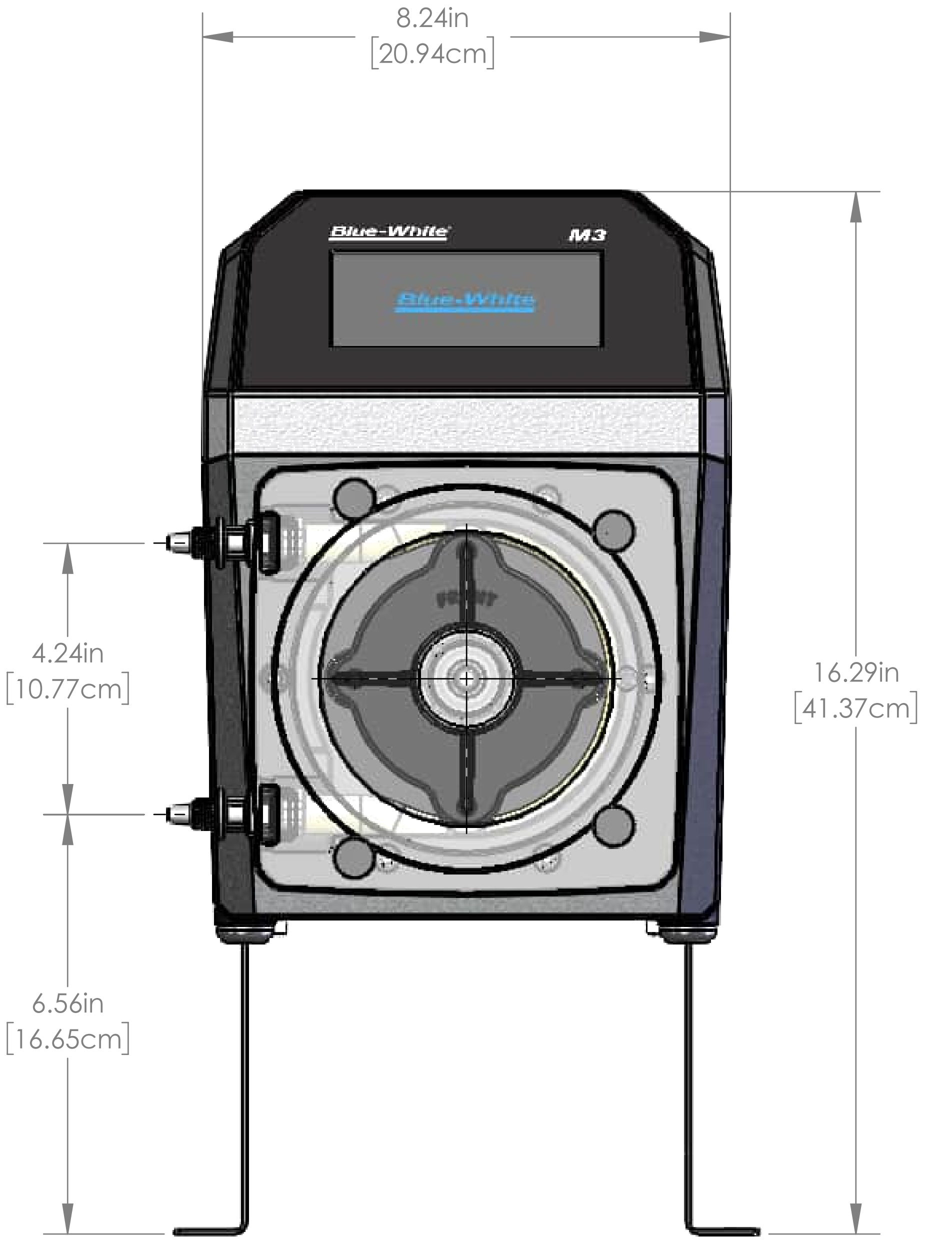
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **M3** | **S** | **2** | **4** | **-** | **S** | **ND** | **R** | **Sample Model Number** |

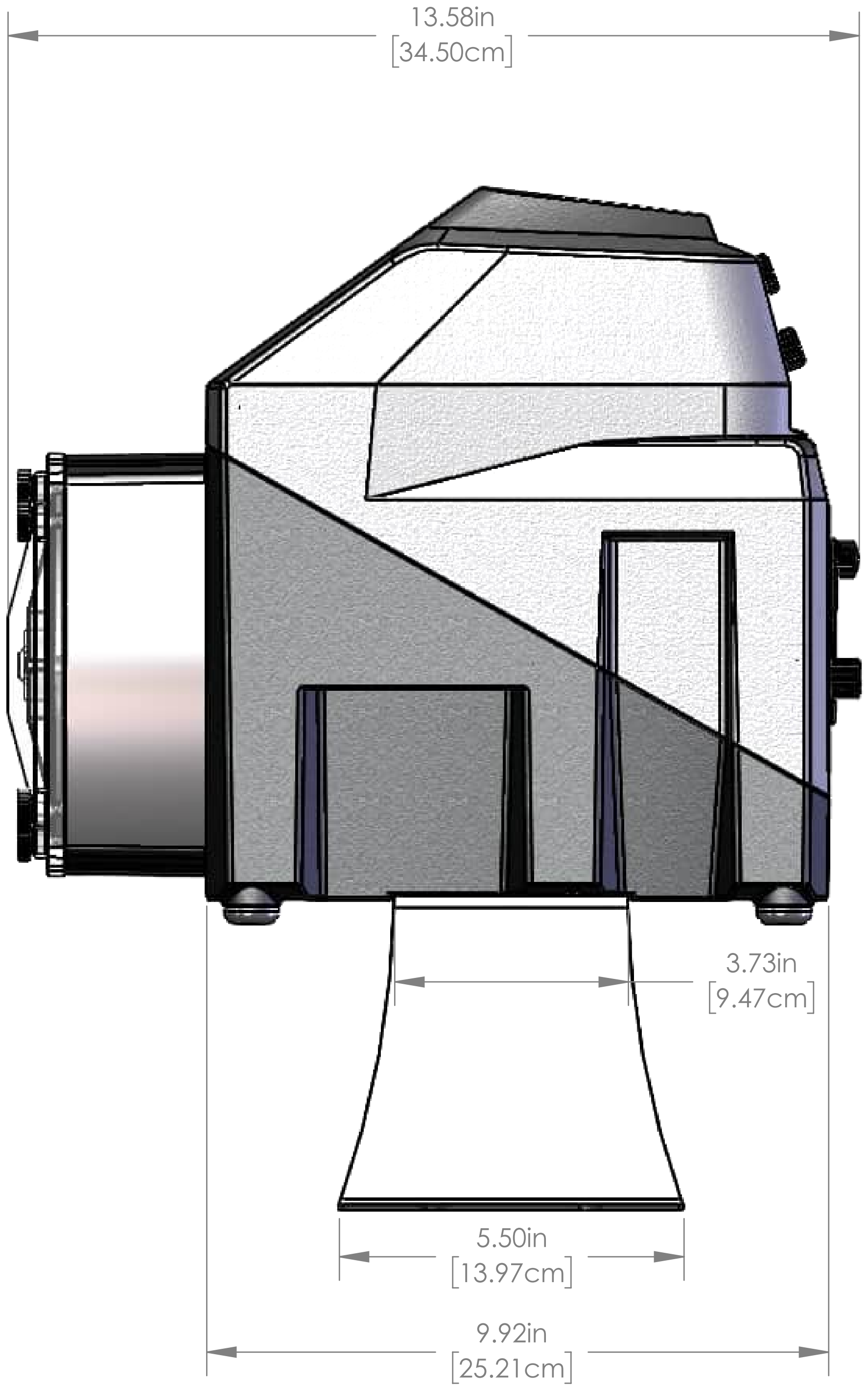
M3 is sold and serviced exclusively by highly skilled, factory authorized technicians.

NOTES:

1. MAT'L:
2.
3.







UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
ALL ANGLES 45°
TOLERANCES:
FRACTIONAL±1/64
ANGULAR: MACH±1° BEND ±1°
NO DECIMAL ±.060
ONE PLACE DECIMAL ±.030
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
SEE NOTE #1

FINISH

DO NOT SCALE DRAWING

| | NAME | DATE |
|---|---|---|
| DRAWN | Matthew C. | 8/2/2021 |
| CHECKED | | |
| ENG APPR. | | |
| MFG APPR. | | |
| Q.A. | | |

COMMENTS:

**BLUE-WHITE INDUSTRIES**
5300 BUSINESS DRIVE HUNTINGTON BEACH CA, 92649

TITLE:

M3 Extended Brackets

SIZE B
DWG. NO. M3
REV -
SCALE: 1:3
WEIGHT: 37.61
SHEET 1 OF 1

**PROPRIETARY AND CONFIDENTIAL**

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| NEXT ASSY | USED ON |
|---|---|
| APPLICATION | |

| REV. | DESCRIPTION | DATE | APPROVED |
|---|---|---|---|

REVISIONS

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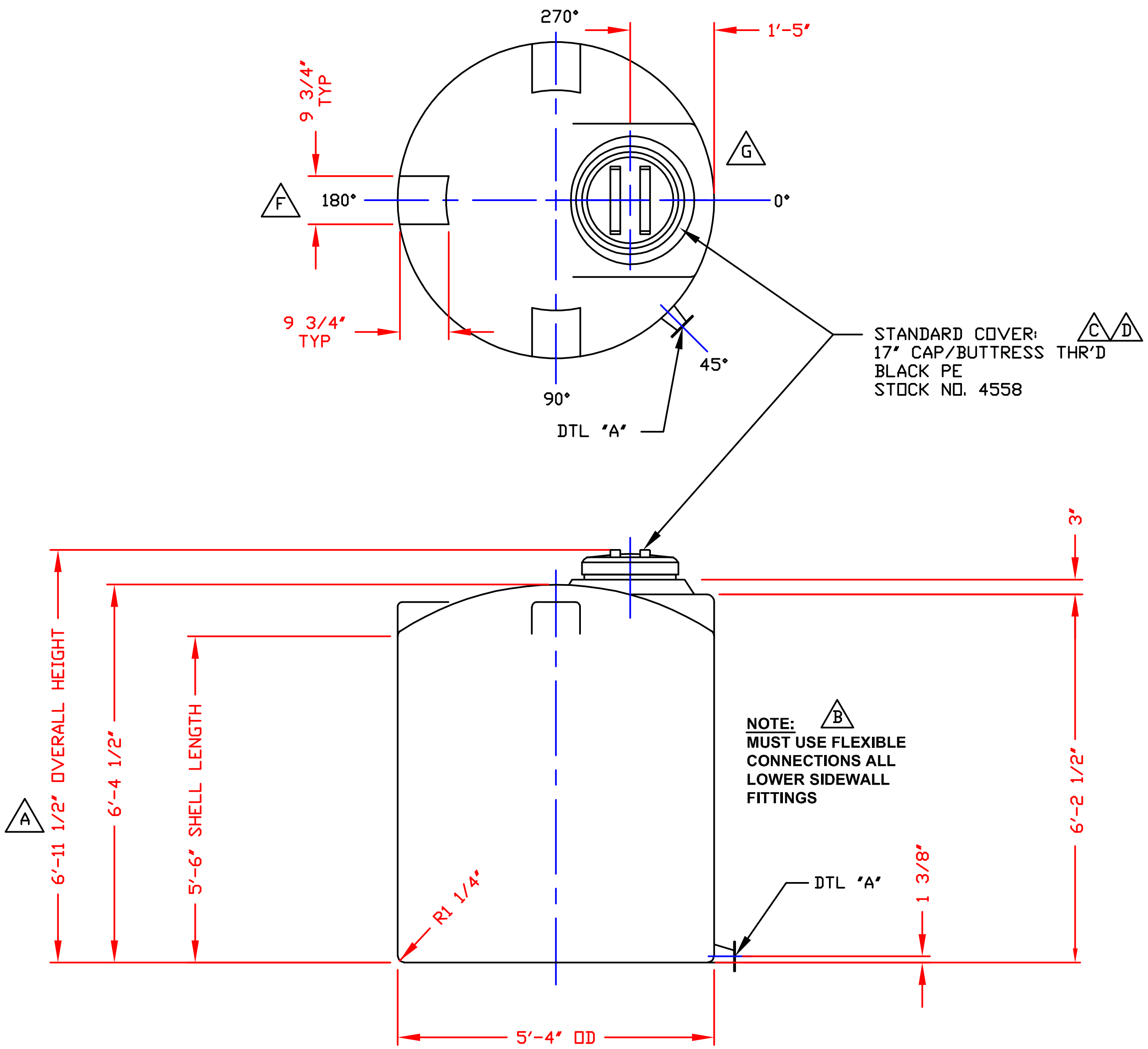

STANDARD COVER:
17" CAP/BUTTRESS THR'D
BLACK PE
STOCK NO. 4558

**NOTE:**
**MUST USE FLEXIBLE CONNECTIONS ALL LOWER SIDEWALL FITTINGS**

NOZZLE SCHEDULE & ACCESSORIES

| SERVICE | MK | STOCK NO. | SIZE | FITTING | DEG | ELEV |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
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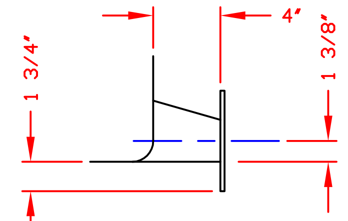
| | | | | | | |
| | | | | | | |

TO BE USED WITH SPLIT BACK-UP RING & COMPANION FLG--AVAILABLE IN 2" SIZE ONLY



DETAIL 'A'
(INTEGRALLY MOLDED FLANGED OUTLET)
SCALE: 1 1/2"=1'-0"

NOTES
1. THIS IS A COMPUTER GENERATED DWG. DO NOT REVISE BY HAND.
2. DIMENSIONS WILL VARY ±3% DUE TO VARIATIONS IN MULTIPLE MOLDS & CONDITIONS PREVALENT DURING MANUFACTURE & USAGE.
3. 4" WIDE MOLDED IN GALLONAGE MARKERS @ APPROX 12" IN 100 GAL INCREMENTS UP TO 900 GALLON.

| CALCULATED CAPACITIES/ VOLUME IN U.S. GALLONS | | |
|---|---|---|
| DESIGN CAP | DOME VOL | TOTAL VOL |
| 907 | 61 | 968 |

CONFIDENTIAL PROPERTY OF POLY PROCESSING COMPANY NOT FOR REPRINT OR USE WITHOUT PERMISSION

DWG TITLE
905 GALLON IMFO TANK

SCALE: 1/2"=1'-0"
DATE: 09/18/19

POLYPROCESSING
SOLUTIONS, SIMPLIFIED.

Central Region
P.O. Box 4150 (71211)
2201 Old Sterlington Rd.
Monroe, LA 71203
(318) 343-7565
FAX (318) 343-8795

DR: B. HARPER
CK:

SHEET 1 OF 1
COMPUTER FILE IMFO-F-00905
REV G

REV 'G' REVISED MWY CASTLE CONFIGURATION BY:JB1 8/12/13 CK:WM
REV 'F' ADDED FTG FLATS TO DOME BY:JB 12/5/12 CK:WM
REV 'E' REVISED MANWAY CONFIGURATION BY:JB 1/6/11 CK:WM
REV 'D' REVISED COVER BYJB 7/27/09 CK:MW
REV 'C' REVISED LID BY:MBW 3/3/03 CK:JB
REV 'B' ADDED FITTING NOTE BY:MBW 3/3/03 CK:JB
REV 'A' ADDED DIMENSION BY:JB 10/15/02 CK:MBW

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | **20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade** | | |
| Subject: | **Ultraviolet (UV) Disinfection** | | |
| Prepared By: | **S. Viola** | Date: | **10/3/2022** |
| Reviewed By: | **J. Mercer** | Date: | **10/5/2022** |
| Revised By: | **S. Viola** | Date: | **11/9/2022** |

## Introduction

The purpose of this memorandum is to:

1. Describe relevant existing conditions.
2. Summarize and expand upon recommendations made in the 2021 Facility Plan Amendment.
3. Describe alternatives for disinfection systems typically used in wastewater applications.
4. Recommend a proposed disinfection system and proposed modifications to the current facilities.

## Description of Relevant Existing Facilities

In 1987, the WWTF was upgraded from a primary treatment facility to a secondary treatment facility with the addition of aerated lagoons. At that time, chlorine contact tanks (CCTs) were constructed for disinfection of the final effluent prior to discharge into the Sugar River.

In 1995, the CCTs were abandoned and retrofitted with a UV disinfection system. Although the CCT is no longer online, the structure remains in-tact. The portion of the structure not currently in use is partially and temporarily covered. The existing UV disinfection system is a Trojan UV3000 UV lamp system. A CMU block structure was constructed over the UV disinfection system shortly after to protect the UV system from weather. Partially treated wastewater flows from the lagoons to UV disinfection via a 24-inch pipe. The existing system is sized for a peak hour flow of 1.6 MGD and includes the following components:

- One UV bank
- One system control center
- One power distribution center
- One overhead electric hoist
- Weighted gate for water level control

Past reports have identified issues with the current UV system including a lack of redundancy, treatment capacity, and UV bulb dose control and is therefore not in compliance with current design guidelines. In addition, the system has aged and is beyond its useful life.

## Facility Plan Recommendations

The Facility Plan Amendment recommends the following:

- Complete UV system upgrade with a full capacity system that is redundant and has UV bulb dose control.
    - New UV disinfection system to be retrofitted into the existing CCT channels.

- A new, weather tight UV Building constructed over the UV channels to provide for a protected and operator friendly environment.
- Proposed system will not need to be installed with an uninterruptable power supply (UPS) based on the proposed sequencing batch reactor (SBR) process which will have the ability to either:
  - Temporarily halt effluent pumping, and/or
  - Divert influent flows to the equalization lagoons.

## Client Preferences

The Client has selected to continue with UV disinfection for the following reasons:

- Ease of operability
- Hazardous chemical storage not required
- No toxic byproducts produced and discharged to the environment (water or air)
- No risk of overdosing chemicals
- No issues with chloramine formation due to partial nitrification
- The existing chlorine contact tanks have already been retrofitted for use of UV disinfection

The Town desires to replace the existing Trojan UV 3000 system with an upgraded system of similar orientation and operability.

## Design Guidelines

The final design of the UV disinfection system will be in accordance with the *New Hampshire Department of Environmental Services Chapter Env-Wq 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities* and *New England Interstate Water Pollution Control Commission Technical Report 16.* Key guidelines are summarized below:

- Automatic cleaning systems are strongly recommended. If an automatic cleaning system consists only of a mechanical cleaning component (i.e., wipers), a chemical cleaning tank (dip tank) should also be provided.
- Each UV reactor should also have a water level sensor and a safety interlock that automatically shuts off the UV lamps if a low-water level is measured.
- A UV system must be capable of delivering the design dose and disinfecting effluent at peak instantaneous flows with one bank of modules out of service.
- Warning alarms and automatic shutdown shall be provided. Lamp output through the contact area shall be monitored, and a low dosage warning signal shall be furnished.
- For systems that require continued, uninterrupted disinfection [and do not have a means to temporarily store/stop effluent flow] more than one UV reactor (channel) is required to allow maintenance of channel.
- Provisions shall be made for easy removal and inspection of UV lamps for maintenance or replacement without draining the UV channel.
- The UV system shall be connected to the WWTP's standby power source and shall be equipped with an uninterruptable power supply to power unit during transfers to and from the standby power source.
- For facilities with a design average flow in excess of 100,000 gpd, UV system controls shall enable UV disinfection system output to be varied in proportion to the effluent flow, percent transmittance, or a combination of both parameters in order to disinfect over the range of water quality conditions.
- Provisions for measuring UV transmittance shall be provided.

## Alternatives Analyses

As part of Preliminary Design, Wright-Pierce evaluated two alternative systems for the proposed UV disinfection: Trojan UV3000B and Wedeco TAK Smart System. Both systems are horizontally oriented and capable of treating peak disinfection flows with one unit offline. Each of the systems evaluated are sufficient for this application, however, there are several differences between the two systems that should be considered, detailed below.

The Wedeco system includes automatic cleaning with a mechanical wiper system, as well as dose control based on flow variation. The Trojan UV3000B does not include automatic cleaning due to the size of the system and is not flow based dose control. With this alternative, the lamps would be manually lifted out of the channel and cleaned by operational staff, similar to the operation and maintenance requirements currently in place. Since the Trojan system does not have UV dose turndown capabilities, the proposed Trojan system layout consists of three UV banks. The Wedeco system includes two modules per bank requiring an overhead lifting mechanism whereas the Trojan system includes six modules per bank making a lifting mechanism optional. The design intent is to include a lifting mechanism, but for quick removal there are advantages to the smaller modules. The Wedeco system also includes a combined control and 480v power cabinet while the Trojan system has separate 120v power cabinets for each bank and a separate control panel.

Based on the differences between the two systems, the proposed configuration within the CCT channels will require custom modifications.

## Basis of Design

UV disinfection is an effective, safe, and environmentally friendly method to disinfect wastewater. UV rays emitted from bulbs submersed in the secondary treated effluent attack the bacteria, viruses, and protozoa, thereby disinfecting the water before it is discharged. UV bulbs, or lamps, can be installed horizontal, diagonal, or vertical to the flow. The effectiveness of disinfection through UV radiation is dependent on the wastewater characteristics, the residence time, and radiation intensity.

NHDES regulations require that UV disinfection be provided at all times. There are several alternatives for maintaining disinfection during an emergency loss of power:

- Include UPS with UV system,
- Provide backup hypochlorite disinfection system and dechlorination system, or
- Divert all flow to equalization.

As recommended in the Facilities Plan Amendment, proposed WWTF treatment process allows the flexibility to turn off effluent pumping after a power interruption for a pre-set period of time to allow the UV system to cycle back to the required dose. A formal waiver for the UPS requirement will be submitted following the PDR phase.

The table below provides the design criteria that was used as the basis for proposing a UV disinfection technology for this application.

| Description of Unit Process | |
|---|---|
| Application: | Disinfection of secondary treated effluent prior to discharge to the outfall |
| System Configuration: | Submerged in Channel |
| Bulb Orientation: | Horizontal |
| Number of Units: | 3 (UV-1, UV-2, UV-3); 2 duty, 1 standby |
| Minimum Flow: | 0.34 MGD |
| Average Daily Flow: | 0.66 MGD |
| Max Daily Flow: | 1.50 MGD |
| E.Coli Limit: | 126 CFUs/100 mL average monthly, 406 CFUs/100 mL maximum day |
| Total Suspended Solids: | <10 mg/L filtered effluent |
| UV transmittance Minimum: | 65% |
| Aging Factor (NHDES): | 0.8 |
| Fouling Factor (NHDES): | 0.88 |
| UV Dose Minimum: | 30 mJ/cm$^2$ |
| No. of Channels: | 1 |
| Redundancy: | Sized for 1 bank offline during max flow. Each unit designed to treat a maximum 0.75 MGD |
| Channel Size: | 3'-2" – existing CCT channel width |
| Cleaning Type: | Automatic or manual |
| Materials of Construction: | 304 stainless steel |
| Electrical Enclosures: | NEMA 4X Stainless Steel (Unclassified) |
| Power Supply: | 480V/ 3 Phase/ 60hz in Building, 120v supplied to equipment as applicable |
| Maximum Power Consumption: | 8.4 kW |
| Flow Pacing: | ON/OFF |

During the development of the 2017 Facility Plan (Fuss & O'Neil, Stantec) a pilot testing program was conducted to evaluate two tertiary treatment processes for total phosphorus removal during seasonal fluctuations associated with the lagoons – CoMag and Actiflo. As part of the pilot testing, both poly-aluminum chloride (PAC) and ferric chloride were evaluated as primary coagulants. In addition to evaluating the performance for phosphorus removal, additional analyses were conducted during the piloting period to assess the impacts of the pilots on other treatment processes. One of the analyses was UV transmittance.

The data showed that over all seasons that pilot testing took place, the minimum UV transmittance was 71.3%. These results were considered as part of this design as the proposed WWTF upgrade includes a similar type of tertiary treatment system with an improved secondary treatment system. Based on this data, it is anticipated that the UV transmittance will be higher than 70% with the proposed secondary and tertiary system, however; 65% UV transmittance minimum was selected for conservancy.

## Building / Structure Implications

NHDES regulations require that the UV system be housed in a building. The existing UV Disinfection building will be demolished and a new building will be constructed to house the new equipment. A structure will be constructed over a portion of the CCT to house the UV system and shelter it from the weather. The new Disinfection Building will be a CMU block building, accessible via doors for egress and an overhead door for removal of the equipment. Windows will be minimized to prevent the potential for algae growth.

The proposed UV channel appears to be in acceptable condition. Minor structural modifications and repairs to the channels will be required to divert flows to the new UV channel and to support the UV banks. Bid items for concrete crack and surface repairs will be carried for miscellaneous repairs, if encountered.

New stainless steel channel reduction baffles are to be installed in each effluent channel for the UV systems. These baffles will be coordinated with the manufacturer and supplied by the Contractor. With a system that is horizontally configured, the CCT channels will need to be modified to support the UV banks and be adjusted to the required depth, coordinated with the manufacturer. The channels will be filled with flowable fill and capped with concrete to the desired elevation to support the new banks. Channel modifications required to support the Trojan UV3000B system will require fill and cap of approximately 7 feet in the channels.

The UV channels will be covered with aluminum or FRP grating to provide a working surface for the operators. The existing UV bank will be demolished and the abandoned UV channel will be filled with sand and capped with concrete. The CCT channels that will not be in use will also be filled with sand and capped with concrete. The CCT channels following disinfection are reserved capacity for the proposed plant water system, discussed under separate memorandum. Those channels will be covered in FRP grating.

## Process Control Description

The new UV system will consist of three UV banks. These banks will include a new Power Distribution Center (PDC) per bank and a single System Control Center (UVCP) located in the new Disinfection Building. Each UV bank will be designed to treat up to 0.78 MGD, with two units in service treating up to 1.56 MGD. During periods of low effluent flow, one of the duty units will shut-off and have a single bank operational. When additional banks are required the standby unit will come online immediately. If the controller determines a bank can be brought offline then a timer will be initiated. If the timer expires then a bank is brought offline.

Operation of the UV system will be through the UVCP to monitor and control each UV bank. The UVCP will be an integrated control panel with PLC to monitor and control the UV disinfection system. The control system will be integrated with the SCADA system so it can be monitored and controlled by the operators at the Control Building.

Operating the UV systems will be similar to existing. UV intensity will be used to monitor each bank's health and to indicate if additional cleaning is needed.

The new UV system will be equipped with a finger weir at the effluent of the banks to control the water level through the system and ensure proper UV dosing across the water column.

The existing system requires operational staff to individually remove each module for cleaning and maintenance. A lifting mechanism will be accommodated to assist with removal and maintenance of the UV modules. With a mechanical wiper system, the modules will not require removal from the channel for routine cleaning. The proposed system will require manual cleaning of the lamps from operational staff according to manufacturer recommendations. Automatic cleaning is available with an upsized system model (two banks total) if desired. However, due to the larger size and high capital and O&M costs of the upsized model, the smaller, manually cleaned, three bank system is recommended and the basis of design.

## Construction Sequencing

The new UV disinfection system must be constructed and commissioned prior to eliminating and demolishing the existing system. The following work items must occur sequentially, otherwise temporary power or temporary disinfection system may be required:

1. Construct UV disinfection system in new Disinfection channels
2. Construct new Disinfection Building
3. Construct new piping to the new UV channels within the CCT structure without disrupting current operations.
4. Construct concrete modifications to accommodate the new UV system.
5. During nighttime flows, core through CCT channel wall to allow flow to diverted to new UV influent channel. Hold flows in equalization tanks.
6. Commission new UV disinfection system.
    a. Acceptance testing will be conducted for a 5-day period to ensure the system controls are functioning properly, and that adequate disinfection is achieved.
    b. Operate new system for a minimum of two weeks.
7. Insert plate within channel to existing UV disinfection system.
8. Infill new concrete wall in place of plate to existing UV disinfection system.
9. Demolish existing UV disinfection system

## Future Expansion Considerations

The UV disinfection system concrete channel will be designed to add a third future UV bank and additional modules to allow for future peak flow conditions.

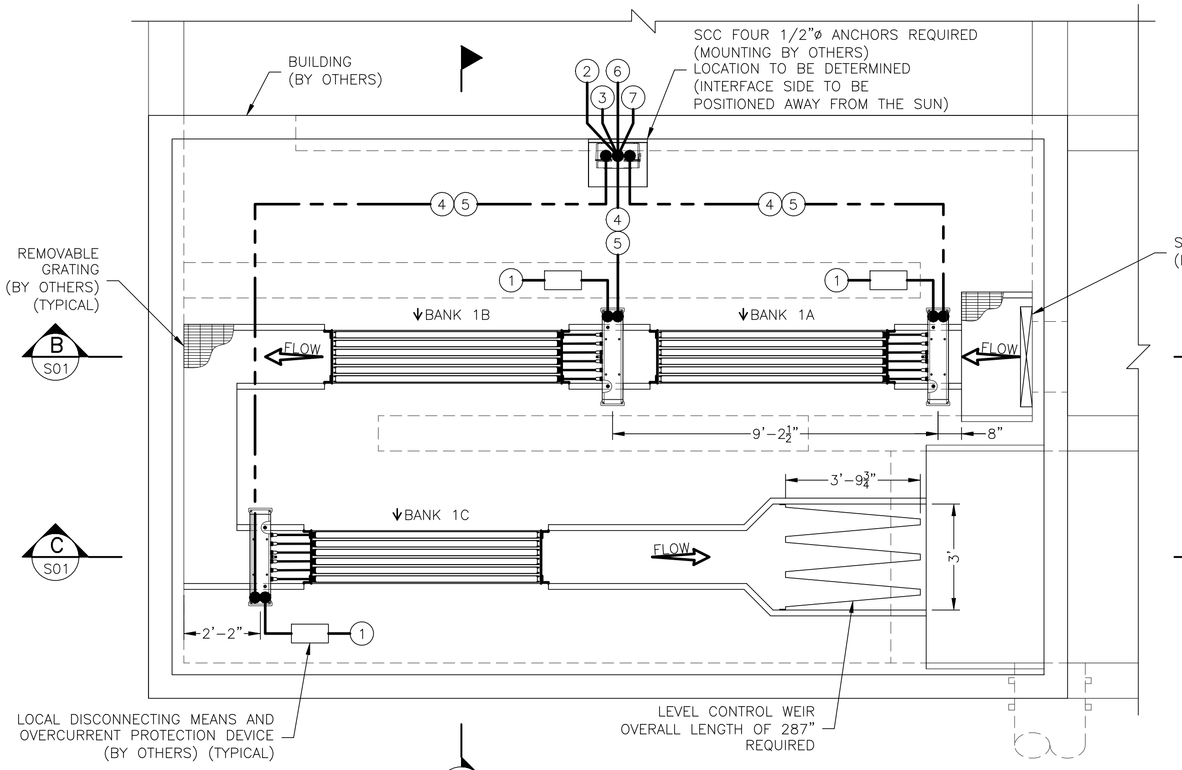
## File Location

UV Disinfection  Basis of Design Memorandum.docx

## Attachments

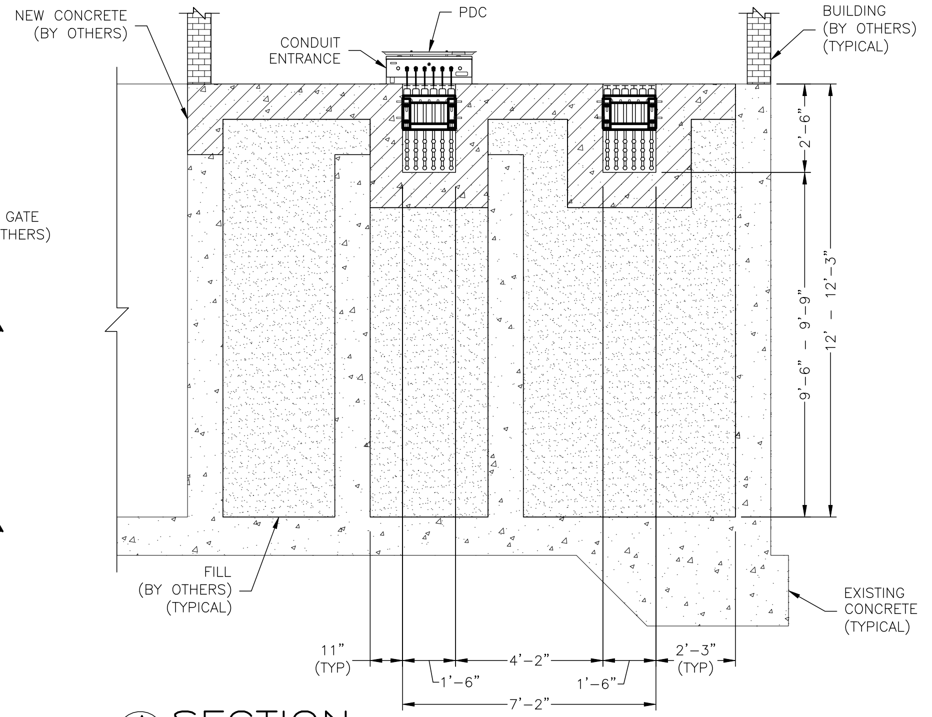
☒ System Sketches/Schematics/Plans

☒ Manufacturer Cut Sheets



## PLAN VIEW

SCALE:AS SHOWN



## A SECTION

S01 SCALE:AS SHOWN

NOTE: SCC, LEVEL CONTROL WEIR, SLIDE GATE (BY OTHERS), AND REMOVABLE GRATING (BY OTHERS) NOT SHOWN FOR CLARITY.

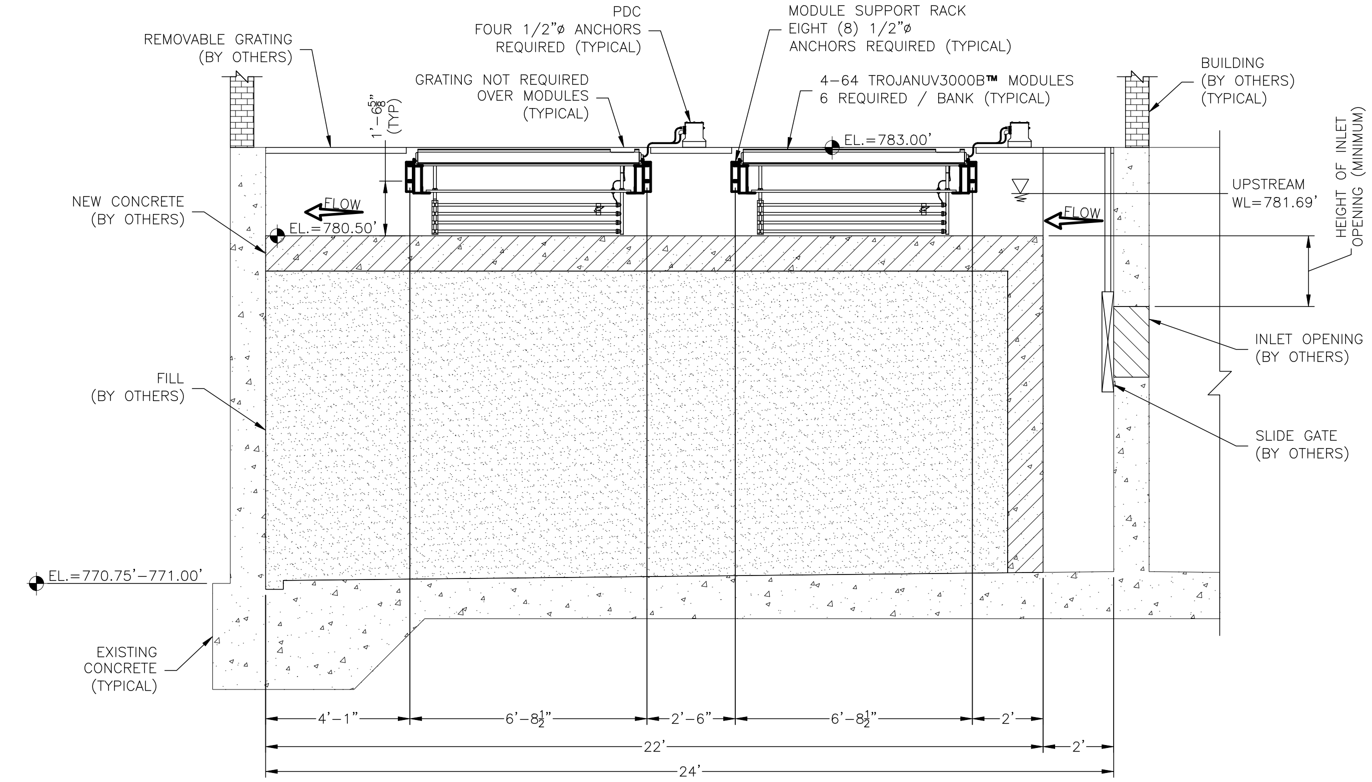
# TROJAN UV 3000™B

## EQUIPMENT INTERCONNECTIONS

| No. | DESCRIPTION | FROM | TO |
|---|---|---|---|
| 1 | POWER DISTRIBUTION CENTER (PDC)<br>POWER SUPPLY<br>120V, 1 PHASE, 2 WIRE + GROUND<br>2.3 kVA/PDC POWER DRAW<br>19 AMPS MAXIMUM CURRENT/PHASE | DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN) | PDCs |
| 2 | SYSTEM CONTROL CENTER (SCC)<br>POWER SUPPLY<br>120V, 1 PHASE, 2 WIRE + GROUND<br>0.15 kVA, 1.3 AMPS | DP (BY OTHERS) (NOT SHOWN) | SCC |
| 3 | FLOW METER<br>4–20 mA, DC ANALOG INPUT | FLOW METER PANEL (NOT SHOWN) (BY OTHERS) | SCC |
| 4 | UV SENSOR<br>4–20 mA SIGNAL<br>1– SHIELDED TWISTED PAIR (24 AWG) | SCC | PDCs |
| 5 | STATUS AND CONTROL LINK/BANK<br>4x 24 AWG CONDUCTORS | SCC | PDCs |
| 6 | COMMON ALARM<br>INDIVIDUAL ON/OFF, BANK STATUS | SCC | CONTROL ROOM (BY OTHERS) (NOT SHOWN) |
| 7 | ETHERNET IP COMMUNICATION | SCC | PLANT SCADA (BY OTHERS) (NOT SHOWN) |

NOTES:

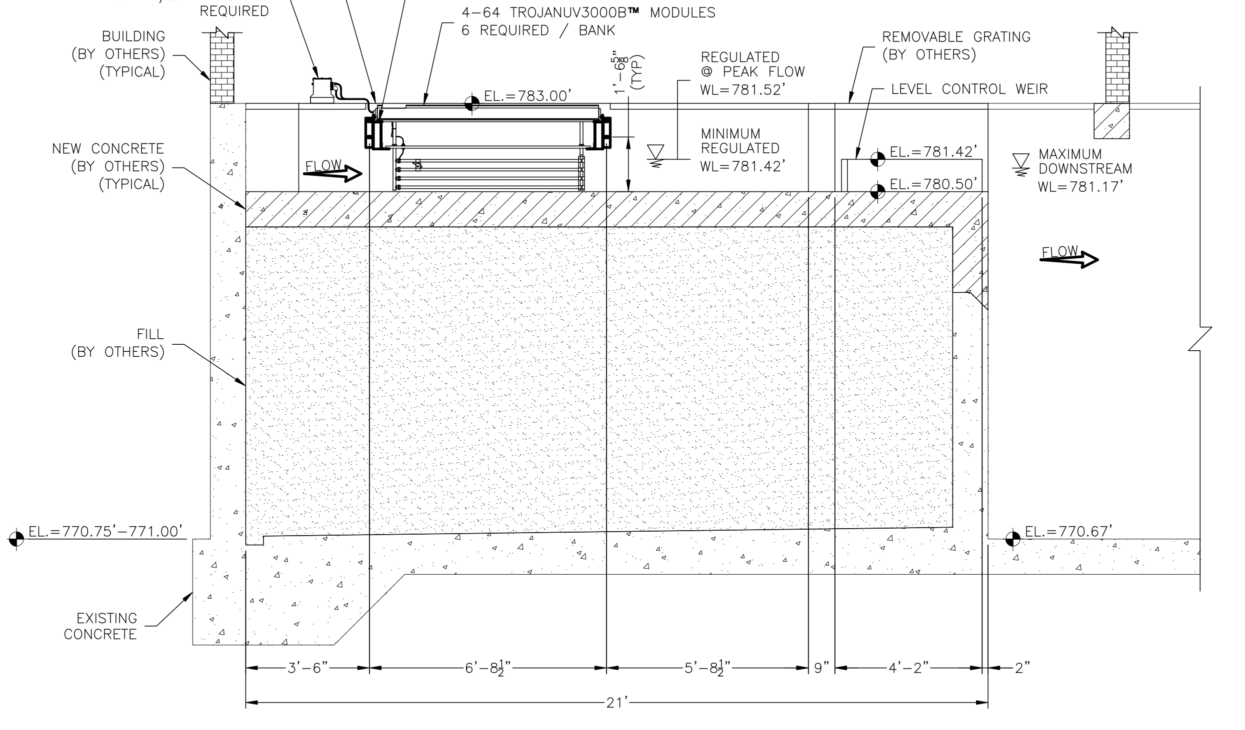
: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH & DEPTH MUST BE KEPT WITHIN A TOLERANCE OF + OR – ¼".
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES,
: SYSTEM CONDUIT, WIRING, CABLES, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS UNLESS OTHERWISE NOTED.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY. ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
**: EFFLUENT LEVELS SHOWN REFLECT HYDRAULICS ASSOCIATED WITH TROJAN EQUIPMENT ONLY. EFFLUENT LEVELS MAY BE ALTERED DUE TO CHANNEL DEBRIS OR GEOMETRY.**
**: SITE TO PROVIDE APPROVED (ENGINEERED) ANCHOR POINTS FOR PERSONNEL TO USE AS PART OF THEIR FALL RESTRAINT SYSTEM AROUND OPEN CHANNELS. THE ANCHOR POINTS MUST BE POSITIONED SO THAT THE PREFERRED RETRACTABLE LIFELINE OF 8 FEET IS OF SUFFICIENT LENGTH TO ACCESS THE WORK AT THE CHANNEL.**



## B SECTION

S01 SCALE:AS SHOWN

NOTE: SCC NOT SHOWN FOR CLARITY.



## C SECTION

S01 SCALE:AS SHOWN

NOTE: SCC, PDCs BEYOND, AND SLIDE GATE (BY OTHERS) NOT SHOWN FOR CLARITY.

(2 DUTY BANKS / 1 REDUNDANT BANK)

PRELIMINARY, NOT FOR CONSTRUCTION

VERIFY DIMENSIONS BEFORE COMMENCING CIVIL OR DESIGN WORK

| DESIGN CRITERIA | | |
|---|---|---|
| | PEAK FLOW | 1.56 MGD |
| | U.V TRANSMITTANCE AT 253.7 nm | 62 % |
| | SUSPENDED SOLIDS | 30 mg / L (30 DAY AVERAGE) |
| | DISINFECTION STANDARD | 126 E.COLI / 100mL (30 DAY GEO MEAN) |

TROJANUV™
A TROJAN TECHNOLOGIES BUSINESS

CONFIDENTIALITY NOTICE

| | |
|---|---|
| DESCRIPTION: LAYOUT, TROJANUV3000B NEWPORT WWTP NH | |
| DRAWN BY : MAN | DATE : 22NO12 |
| CHECKED BY : MC | DATE : 22NO16 |
| APPROVED BY : NP | DATE : 22NO18 |
| SCALE (11x17) : 3/16"=1'–0" | LOG NUMBER : N/A |

QUOTE NO. 236815
PROJECT NO. N/A
DWG NO. S01
REV. A

TROJAN UV
WATER CONFIDENCE™

# UV3000™B PROPOSAL

September 21, 2022

THE MAHER CORPORATION
192 Pleasant Street
MA
02370

Attention: Michael Patrick
Reference: Newport WWTF, New Hampshire
Quote No: 236815

In response to your request, we are pleased to provide the following **Trojan System UV3000™B** proposal for the **Newport WWTF** project. Since Trojan introduced the open channel approach to disinfection in 1982, many municipalities have selected ultraviolet as the preferred method pathogen destruction at their facilities.

The **Trojan System UV3000™B** utilizes low pressure low intensity lamp technology. All of Trojan's UV systems are modular in design, with each design specific to the effluent criteria. The lamps are oriented in a horizontal configuration parallel to the flow.

Please review carefully our design criteria for peak flow rate, total suspended solids, disinfection limit, and UV transmittance to ensure that the criteria used match actual project parameters. When detailed project design commences, please contact our office for a review of all design parameters, including dimensions and equipment requirements. In addition, Trojan is able to provide analytical services to quantify effluent quality and confirm design criteria as required.

Trojan's price for the attached design is **$140,000.00** (USD). This quoted price includes the equipment as described, freight to site and start-up by qualified personnel. This quote **excludes** any taxes that may be applicable. The above information is to be used for budget estimates and is valid for 90 days from this day.

Please do not hesitate to call us if you have any questions or would like additional information. Thank you for the opportunity to quote the **Trojan System UV3000™B** on this project.

With best regards,
**Trojan Technologies**

## DESIGN CRITERIA

| | |
|---|---|
| Current Peak Design Flow: | **1.56 MGD** |
| UV Transmission: | **65%**, minimum |
| Total Suspended Solids: | **30 mg/l** (30 Day Average; grab samples) |
| Max Average Particle Size: | **30 microns** |
| Disinfection Limit: | **126 E.coli** per 100 ml, based on a 30 day Geometric Mean of consecutive daily grab samples |
| Design Dose: | **30** mJ/cm$^2$ **Bioassay Validated** |

## DESIGN SUMMARY

Based on the above design criteria, the Trojan System UV3000$^{TM}$B proposed consists of:

| | |
|---|---|
| Number of Channels: | **1** |
| Total Number of Banks: | **3 (2 Duty Banks, 1 Redundant)** |
| Number of Modules per Bank: | **6** |
| Number of Lamps per Module: | **4** |
| Total Number of Lamps: | **72** |
| Number of Power Distribution Centers: | **3** |
| Number of System Control Centers: | **1** |
| Type of System Control Centers: | **Standard** |
| Number of Level Controllers: | **1** |
| Type of Level Controller: | **Weir** |
| Cleaning System: | **Cleaning Rack** |

## EFFLUENT CHANNEL DIMENSIONS

| | | |
|---|---|---|
| L = | Minimum length required for flow equalization: | **336 in in** |
| W = | Channel width based on number of UV modules: | **18 in in** |
| D = | Maximum depth required for UV Modules access: | **36 in in** |

Dimensions are given for reference only. Consult Trojan Technologies for overall system detailed dimensions.

## ELECTRICAL REQUIREMENTS

1. The UV System Control Center requires an electrical service of
   *(1) One Basic Controller- 120 Volt, 1 phase, 2 wire (plus ground), 1.5 Amps power supply.

2. Each Power Distribution Center requires an electrical service of one (1) 120 Volts, Single Phase phase, 2 Wire + GND wires (plus ground), 6.85 kVA.

## NOTES

1. UV Disinfection Equipment specification is available upon request.
2. If there are site-specific hydraulic constrains that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed system.
3. Standard spare parts and safety equipment are included with this proposal.
4. The weighted gate (automatic level controller) is not designed to handle periods of very low or no flow.
5. Electrical disconnects required as per local state code are not included in this proposal.
6. Trojan Technologies Inc. warrantees all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, which ever occurs first.
7. Payment Terms: 10% after approved submittal, 80% upon delivery of equipment to site, 10% after equipment acceptance.

## OPERATING COSTS FOR TROJAN SYSTEM UV3000$^{TM}$B

### Design Criteria

| | |
|---|---|
| Average Flow: | 0.66 MGD |
| Yearly Usage: | 8,760 hours |
| UV Transmission: | 65%, minimum |

### Power Requirements

| | |
|---|---|
| Total Power Draw: | 6.3 kW |
| Average Power Draw: | 2.15 kW |
| Annual Operating Hours: | 8,760 hours |
| Cost per kW Hour: | $0.05 |
| ***Annual Power Cost:*** | ***$942*** |

### Replacement Lamp Costs

| | |
|---|---|
| Number of lamps replaced per year: | 36 |
| Price per lamp: | $43 |
| ***Annual Lamp Replacement Cost:*** | ***$1,564*** |

***Total Annual Operation and Maintenance Costs are: $2,506***

**NOTES**

1. O&M costs are based on system flow-pacing using a 4-20 mA signal from a flow meter (supplied by others).
2. O&M costs are based on the system operating at the average flow conditions.

# Basis of Design Memorandum

Project No.: **20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade**

Subject: **Solids Handling Basis of Design**

Prepared By: **S. Viola** Date: **10/13/2022**

Reviewed By: **J. Mercer** Date: **10/14/2022**

Revised By: **S. Viola** Date: **11/7/2022**

## Introduction

This technical memorandum provides a summary of considerations for solids handling as part of the Wastewater Treatment Facility (WWTF) upgrade preliminary design. Solids handling includes the proposed sludge storage from the new secondary treatment system and the dewatering process of stored sludge.

## Description of Relevant Existing Facilities

The existing secondary treatment system consists of two aerated lagoons which have a total volume of approximately 17 million gallons. Based on the age of the aerated lagoons and the use of chemical precipitation for phosphorous removal, the lagoons contain an unknown volume of sludge. The current facility does not have dedicated sludge storage.

Although the existing WWTF does not have a solids handling process, the Town has undertaken periodic sludge dewatering and disposal efforts since 2012 to remove sludge from the lagoons using geotextile dewatering "geo-bags" located in the primary sedimentation basins. The Town has recently discontinued this operation and stores all biosolids in the two aerated lagoons. No biosolids have been processed or disposed of from the aerated lagoons since the discontinuation of the geo-bags.

The proposed WWTF Upgrade includes sequencing batch reactors (SBRs) for secondary treatment and chemical precipitation for phosphorous removal. Waste activated sludge will be generated in the SBR treatment process and tertiary solids generated from tertiary treatment. These solids will need to be frequently removed from the process, stored, and disposed of accordingly. As part of the proposed upgrade, sludge storage accommodations and sludge dewatering will be required.

## Facility Plan Recommendations

The Facility Plan Amendment recommends the following:

Sludge Storage

- Two sludge holding tanks are recommended totaling approximately 160,000 gallons of sludge storage, providing the Town with over 5 days of storage before needing to mechanically dewater sludge.
- Sludge holding tanks will be constructed in a common-wall configuration in the new SBR tank complex and will be equipped with diffused aeration systems for mixing and to manage odors, ability to decant for sludge thickening, and two sludge tank blowers.

Dewatering

- A new Process Building will be constructed adjacent to the new SBR tank complex which will house the new sludge dewatering operations with truck bay and sludge conveyors.
- Dewatering technology applicable for the anticipated sludge characteristics is a dewatering centrifuge.
- One dewatering unit with space to accommodate a future unit.
  - The centrifuge will be sized to operate 2-3 days per week at average day start-up conditions.
- The centrifuge will be accompanied by a conveyor system which will transport sludge to a garage bay where a loading conveyor will fill the roll-off container evenly.
- Two sludge feed pumps.
- One Polymer make-down system with space for a future system.

## Client Preferences

The client has requested that noise attenuation be implemented with the installation of new sludge storage tank aeration blowers. The blowers shall be equipped with acoustical enclosures to mitigate sound. No other client preferences have been identified at this point.

## Design Guidelines

Excerpts from the pertinent design guidelines are included below:

TR-16 – Chapter 11 (Residuals Management and Treatment)

- Non-slip floor surfaces are desired in polymer-handling areas.
- Duplicate pumping and conveying units should be provided for redundancy.
- Pump suction and discharge lines should be a minimum of 6-inches in diameter. Pipe velocities should be at least 3 fps at design flow.
- Sludge grinders and/or fine screens should be considered prior to process equipment such as centrifuges, sludge mixing devices, or positive displacement pumps. Grinders are typically installed on the suction side of the pump to reduce clogging.
- Provisions should be made for cleaning, draining, venting and flushing sludge piping.
- At small plants, centrifuge operation should not exceed 30 hours per week. This allows for conditioning, cleanup, and delays.
- Sludge storage tanks preceding centrifuges should be provided. Each centrifuge should be fed by a separate variable speed pump. Means for measuring the quantity of sludge processed should be provided. Storage, makeup, dilution, and feed equipment for polymers should be provided.
- To reduce the need for designing the sludge process for maximum daily sludge production, provisions for sludge storage should be considered. Sludge storage will also provide operating flexibility during equipment outages.
- A sludge storage system should be equipped with mixing devices to prevent separation of solids and to provide a more uniform feed to the dewatering device. Provisions for adding lime, chlorine, or air to prevent septicity and resulting odors is desirable. Decanting systems to provide thicker solids and flushing water to clean out tanks are necessary.
- Typically, a minimum mixing and oxygen requirement for WAS is 25-30 cubic feet per minute per 1,000 cubic feet of tank volume. This volume should be provided with the largest blower out of service. If diffusers are used, the non-clog type is recommended.

- Special considerations should be given to centrifuge operating noise.

Env-Wq – Section 716 (Sludge Handling and Disposal)

- Sludge storage facilities shall be designed to control odors.
- Facilities should be provided to allow the wetting, mixing, and dilution of concentration or dry conditioning agents and for the ageing, storage, and mixing of dilute material in sufficient volume for at least one day of sludge conditioning.
- Positive displacement pumps shall be used to control conditioning feed rate. Duplicate systems shall be provided.
- Mechanical devices acceptable to dewater sludge include belt filter press, centrifuge, rotary press, pressure filter presses, and screw press.
- For facilities in which sludge is not available for pilot testing, successful performance from multiple similar facilities shall be documented.
- Mechanical dewatering units shall be capable of handling maximum weekly sludge production in 30 hours, unless the equipment is designed for continuous operation.
- Sludge conveyors shall be provided with emergency pull cords along the entire length.
- Sludge storage shall precede all mechanical dewatering units.
- For facilities that transport sludge to another facility as the means of disposal, storage capacity shall be designed to accommodate at least 5 days of sludge production based on maximum month design sludge generation rate.
- A minimum mixing requirement of 30 cubic feet of air per minute per 1,000 cubic feet of tank volume shall be provided.
- Multiple tanks shall be designed to operate in series or in parallel.

## Alternatives Analyses

Given the thin characteristics of the anticipated sludge and without a sludge product to conduct pilot testing on, the only technology that was considered appropriate for this application is a dewatering centrifuge. Dewatering centrifuges have a track record of providing reliable dewatering of both secondary and tertiary sludge to solids concentrations acceptable for off-site disposal (18% + solids). There are several communities which have recently installed and had success with dewatering centrifuges in this size for waste activated sludge dewatering operation.

## Basis of Design

Solids handling technology selection is based on the proposed WWTF producing secondary and tertiary sludge from the SBR process. A summary of the facility data and components utilized in developing the basis of design for the new solids handling system is presented in the sections outlined below.

### Sludge Production and Storage

Since the facility does not have a current solids handling process there is limited data for sludge production. Furthermore, since the facility will be implementing a new secondary treatment process, solids generation will differ from current conditions. Sludge production was determined using biological process modeling and estimated solids production from tertiary treatment and is summarized in the table below. Please refer to the Flows and Loads Design Memorandum for more information on how current and projected flows and loads were determined.

| Design Feed Sludge Quantities | | | |
|---|---|---|---|
| PARAMETER | ANNUAL AVERAGE | MAX MONTH | MAX WEEKLY |
| Feed Sludge (% Solids) | 0.80 | 1.30 | 1.30 |
| Feed Sludge (gal/day) | 19,500 | 21,200 | 31,800 |
| Feed Sludge (gal/week) | 136,000 | 148,500 | 222,600 |
| Feed Sludge (dry lbs/day) | 1,300 | 2,300 | 3,400 |
| Feed Sludge (dry lbs/ week) | 9,100 | 15,600 | 23,400 |

Two sludge storage tanks (SSTs) will be constructed with a total storage volume of approximately 135,000 gallons and will provide the following storage capacities:

| Sludge Storage Capacity | | | |
|---|---|---|---|
| SCENARIO | SOLIDS PERCENTAGE | SLUDGE STORAGE TIME (Before Decant) | SLUDGE STORAGE TIME (After Decant) |
| Design Annual Average | 0.8% | 6.8 days | 6.8 days |
| Design Max Month: | 1.26% | 3.9 days | 6.2 days |

The SSTs will be separated by a sluice gate mounted on the common wall. The sluice gate will allow the tanks to operate separately or as an equalized single tank. The SSTs will be mixed via diffused aeration to maintain sludge consistency and minimize odor generation. The SSTs will be equipped with one decanting pump to draw off excess water (supernatant) to allow the WWTF to increase sludge storage capacity and provide some sludge thickening. The decanting pump will be a submersible pump mounted to guide rails with a flexible discharge pipe. It is assumed that during most decanting operation, the sluice gate will be open and both SSTs can be decanted simultaneously. If the SSTs need to be isolated during decanting, then operations staff may utilize the davit crane installed on the walkway to move the submersible pump from one SST to the other.

### Mixing

The SSTs will be mixed by fine bubble aeration (blowers/diffusers). Aeration will be provided by a diffused aeration system consisting of new blowers, a stainless-steel piping network, and a diffuser grid located along the bottom of the SSTs. The diffuser grid network will consist of fine bubble membrane diffusers mounted directly to PVC piping. The air is forced across the diffusers resulting in air bubbles that travel through the liquid to the surface of the sludge. Diffusers are designed to “collapse” when the air is turned off, acting like a check valve.

### Blowers

New blowers will be required to provide air to the SSTs. One blower will be dedicated to each SST with cross connections to allow for operator flexibility. Positive displacement blowers are the industry standard for sludge mixing and aerating applications and have a low initial cost. The blower displaces a constant volume of air against varying pressure conditions and easily adapts to changes in tank level and temperature. The required aeration rates are listed below. The blowers will each be equipped with sound attenuation and housed in acoustical enclosures.

| Required SST Aeration | | |
|---|---|---|
| Operating Level, ft – Sludge Depth | Total Air Requirements at 20-30 SCFM/1000 $ft^3$ of Tank Volume | Air Requirements per Blower (Two Blowers Total) |
| 20-ft (High level) | 352 SCFM | 176 SCFM |
| 12-ft (Average) | 264 SCFM | 132 SCFM |

## Sludge Dewatering

A key factor in sizing dewatering and sludge processing equipment is the number of hours per day and the number of days per week that dewatering is to occur. This affects the capital costs, operations staffing levels, operations budgets, and the ability to perform other WWTF duties. Because of this, the preferred maximum number of hours the sludge dewatering equipment is to run in a week is used to size the throughput capacity of the equipment.

Due to the Town's current level of staffing, a targeted dewatering schedule of 7 to 8 hours per day, 3 to 4 days per week is the basis of sizing the dewatering equipment. This targeted dewatering schedule is designed to meet projected future needs. Table 3 summarizes the equipment capacities that would be required under varying dewatering schedules to meet each of the design conditions.

| Dewatering Operating Schedules Vs. Capacity | | | |
|---|---|---|---|
| PARAMETER | DESIGN ANNUAL AVERAGE | DESIGN MAX MONTH | DESIGN MAX WEEK |
| 8 Hour, 3 Day Per Week Operation (assume 24 hrs/week) | | | |
| Hydraulic Loading Rate (gpm) | 94 | 103 | 155 |
| Solids Loading Rate (lbs/hour) | 377 | 648 | 972 |
| 7 Hour, 4 Day Per Week Operation (assume 28 hrs/week) | | | |
| Hydraulic Loading Rate (gpm) | 81 | 88 | 132 |
| Solids Loading Rate (lbs/hour) | 323 | 555 | 833 |
| 7.5 Hour, 4 Day Per Week Operation (assume 30 hrs/week) | | | |
| Hydraulic Loading Rate (gpm) | 76 | 82 | 124 |
| Solids Loading Rate (lbs/hour) | 302 | 518 | 778 |

Westfalia was consulted to obtain equipment sludge loading rates, hours of operation under design sludge loading rate, and capital cost for various size centrifuges. For this application and the preferred hours of operation, a 16" or 18" bowl diameter machine is recommended.

| Centrifuge Sizing | | |
|---|---|---|
| Model | CF-4000 | PRO5000 |
| Bowl Diameter | 16" | 18" |
| Hydraulic Loading Range (gpm) | 50-150 | 75-200 |
| Design Hydraulic Loading Rate (gpm) | 125 | 125 |
| Annual Average Operation (hrs/week) | 18.3 | 18.3 |
| Maximum Month Operation (hrs/week) | 20.0 | 20.0 |
| Maximum Week Operation (hrs/week) | 30.0 | 30.0 |
| Capital Cost ($) | $250,000 | $300,000 |

Based on the sludge generation estimates, sludge feed rates and operating schedule numbers, the Pro5000 unit has been selected for preliminary design. This unit will be able to reliably accommodate 125 GPM of consistent flow at 0.8-1.25% solids feed concentration. The larger unit provides operational flexibility for future sludge generation rates without needing to increase the operating hours required.

| PRO5000 Dewatering Operating Schedules with Current Flows Vs. Capacity | | | |
|---|---|---|---|
| HYDRAULIC LOADING RATE (GPM) | OPERATING HOURS REQUIRED (HRS/WK) | | |
| | CURRENT ANNUAL AVERAGE | CURRENT MAX MONTH | CURRENT MAX WEEK |
| 75 (MINIMUM) | 25 | 28 | 41 |
| 125 (DESIGN) | 15 | 17 | 25 |
| 200 (MAXIMUM)[1] | 9 | 10 | 15 |

1. Although the centrifuge can operate up to 200 gpm, the polymer consumption, power demand, and cake dryness become less optimal. Typically centrifuges have an optimal hydraulic loading between 60-70% of the total capacity.

## Sludge Dewatering Ancillary Equipment

### Dewatering Feed Pumps

Two positive displacement pumps will be provided in the Sludge Pump Room of the new Process Building for the dewatering system. Both pumps will be dedicated Dewatering Feed Pumps for the centrifuge. The feed pumps will be controlled by VFDs and capable of feeding the centrifuge with flows between 75-200 gpm, with a design point of

125 gpm. A duplex configuration will allow for one duty pump and one standby pump, allowing full pumping redundancy at all times.

## Polymer Feed System

Polymer is added to raw sludge to improve dewatering characteristics. Three types of polymers were considered for this application: liquid solution, dry polymer, and emulsion polymer. Liquid solution polymers were eliminated from consideration due to substantial storage tank requirements. Dry polymer systems require a system for dry feeding, mixing, and aging, and dilution. Dry systems carry a high capital cost and require a large footprint. Emulsion polymer units allow for direct feed of the polymer without requiring large storage volume or complex mixing systems.

Emulsion polymer was chosen as the basis for design based on ease of operation, equipment/storage footprint requirements, and cost. The emulsion polymer make-down skid will consist of a neat polymer pump, in-line mechanical mixing device, dilution water system, and controller. The polymer feed pump will be progressive cavity type due to the lack of feed pulsation which results in a more consistent polymer feed. The diluted polymer solution is injected into the sludge feed piping using pressure from the dilution water. The Town will have the option to use plant water or process water from the municipal water system.

The polymer make-down skid is sized based on the dewatering equipment requirements including the solids loading rate and the desired dewatered cake solids concentration. Other sizing factors include the characteristics of the neat emulsion polymer, the required dilution ratio of active polymer to final diluted polymer solution, and the polymer dosage rate.

Actual polymer dosage rate is normally fine-tuned in the field and is dependent on the characteristics of the sludge being dewatered. The polymer blending unit is designed to supply a 0.2%-0.5% dilute polymer solution to the centrifuge at 15 to 30 lbs active polymer per dry ton of feed sludge. This range provides flexibility for the Town under current and future conditions.

## Sludge Conveyors

Shaftless screw conveyors are the industry standard for transporting dewatered sludge and have been selected for the two sludge conveyors proposed for this project. Conveyor 1 (SC-1) will be inclined at 20 degrees to convey dewatered sludge from the centrifuge to the Conveyor 2 in the Dewatering Container Bay. Conveyor 2 (SC-2) will load the 30-yard container with 2 open ends and 2 pneumatic, curved gates to level the sludge within the roll-off container.

The conveyors are sized assuming maximum dry solids discharge from the centrifuge (799 dry pounds per hour), with a conservative cake solids content of 18%. A sludge density of 65 lb/ft$^3$ was assumed to size the motor, gear box, and the volume of the conveyors. Further design criteria for the conveyance system are specified in the table below. The conveyors will be equipped with latched covers, made of 304SS and each include a drain and flush connection for maintenance.

## Equipment Design Criteria

Sludge Storage

| Sludge Storage Tank Diffusers | |
|---|---|
| Application: | Waste Activated Sludge |
| Type: | Fine bubble membrane discs |
| Number of Units: | 2 (1 grid per tank) |
| Number of Diffusers: | 85 per grid, 170 in total |
| Process Criteria: | |
| Air Flow, SCFM/1000 CF Tank Vol. | 20-30 |
| Air Flow SCFM | 400 |
| Diffuser Submergence, ft | 19 ft |
| Acceptable Manufacturer(s): | Sanitaire, or equal |

| Sludge Storage Tank Blowers | |
|---|---|
| Application: | Sludge Storage Tank Diffused Aeration |
| Type: | Positive Displacement |
| Number of Units: | 2 |
| Process Criteria: | |
| Air Flow SCFM | 200 per blower (max), 100 per blower (min) |
| Maximum Inlet Air Temperature, °F | 100 |
| Barometric Pressure, psia | 14.2 |
| Discharge pressure, psig | 9.4 |
| Motor: | 20 HP; 4-pole, NEMA, TEFC, 208-230/460 V/ 60 Hz; 1,765 rpm (design) |
| Speed: | Variable |
| Acceptable Manufacturer(s): | Aerzen, Roots, or equal |

## Dewatering

| Dewatering Feed Pumps (DSLP-1,-2) | |
|---|---|
| Application: | Waste Activated Sludge |
| Type: | Rotary Lobe, Positive Displacement |
| Number of Units: | 2 – 1 operating, 1 redundant |
| Solids Concentration: | Aerated secondary sludge and tertiary solids<br>(0.8% total solids avg., 0.5-1.30% typical solids range, 6% max solids) |
| Size: | |
| Suction/Discharge | 6-inch / 6-inch |
| Capacity: | 75 to 200 gal/min @ 57 ft TDH (to centrifuge) |
| Ancillary Equipment: | Magnetic Flow Meter<br>High and low Pressure Switches on discharge and suction respectively |
| Power: | 10 HP |
| Speed: | Variable |
| Enclosure: | TEFC, NEMA 4X |
| Volts, Phase/Hz | 460/3/60 |
| Acceptable Manufacturer(s): | Boerger or equal |

| Centrifuge (CEN-1) | |
|---|---|
| Application: | Waste Activated and Tertiary Sludge |
| Type: | Centrifuge |
| Number of Units: | 1 |
| Bowl Size: | 18-inches |
| Capacity: | 75 to 200 gal/min; 786 lbs/hr |
| Solids Feed: | 0.8% - 1.25% |
| Power: | 40 HP – Main Drive<br>20 HP – Back Drive |

| Centrifuge (CEN-1) | |
|---|---|
| Speed: | Variable |
| Enclosure: | TEFC, NEMA 4X in Dewatering Room<br>NEMA 12 in Electrical Room |
| Volts, Phase/Hz | 460/3/60 |
| Acceptable Manufacturer(s): | Westfalia or equal |

| Shaftless Screw Conveyors (SC-1,-2) | |
|---|---|
| Application: | Dewatered secondary and tertiary sludge |
| Number of Units: | 2 |
| Sludge Characteristics: | 18-20% solids |
| Bulk Wet Density: | 60 pcf |
| Type: | Shaftless screw |
| Capacity: | |
| SC-1 (Jockey) | 125-220 cf/hour |
| SC-2 (Loading) | 115-205 cf/hour |
| Trough Diameter: | 12 - 12.5” |
| Trough Fill Factor: | 50% |
| Maximum Screw Speed: | 18 RPM (Jockey)<br>15 RPM (Loading) |
| Ancillary Equipment: | 2 open end, 2 pneumatic, curved gates (4 total on SC-2) |
| Power: | 1.5 HP (Jockey)<br>3 HP (Loading) |
| Speed: | Constant, reversing |
| Enclosure: | TEFC, NEMA 4X |
| Volts, Phase/Hz | 460/3/60 |
| Acceptable Manufacturer(s): | Spirac, JVD, or equal |

| Polymer Blending Unit (PBU-1) | |
|---|---|
| Application: | Sludge Dewatering Feed |
| Number of Units: | 1 polymer blending unit including a progressive cavity neat polymer metering pump |
| Type: | Emulsion polymer |
| Polymer storage: | 275-gallon tote |
| Annual Avg. Storage Duration: | 8.8 days |
| Max. Month Storage Duration: | 2.9 days |
| Neat Polymer Feed: | 0.25 - 5 GPH |
| Water Feed: | 120 – 1,200 GPH |
| Dilute Polymer Feed: | 121 – 1,205 GPH |
| Ancillary Equipment: | Mechanical in-line mixer, polymer tote mixer |
| Power: | 0.5 hp |
| Speed: | Variable |
| Enclosure: | NEMA 4X (FRP) |
| Volts, Phase/Hz | 120/1/60 |
| Acceptable Manufacturer(s): | Velodyne, or equal |

## Building / Structure Implications

The two sludge storage tanks will be constructed east of the existing Control Building and adjacent to the new Process Building. The SSTs will be open to atmosphere and accessible via various elevated walkways between the tank complex. The flow of the tanks will be gradually sloped towards a sludge collection sump. Steps to access the top of the SSTs will be required along with handrails.

A new Process Building will be located in the area of the abandoned Grit Facility adjacent to the Primary Sedimentation Basins. The Process Building will be designed with the following rooms and features pertaining to Solids Handling. Additional spaces and equipment for grit removal will be housed in the Process Building that are not detailed below. Refer to the Grit Removal memorandum for further details.

Below Grade:

- Sludge Pump Room – Will contain the sludge feed pumps to feed the sludge dewatering unit located on the second floor and the sludge tank blowers. This room is located at a lower elevation than the other rooms to allow for a flooded sludge pump suction.

Ground Floor:

- Dewatering Container Bay – Location of a roll-off container for storage of dewatered sludge. This bay will have a large electric overhead garage door to allow for truck access to haul the container off-site for disposal and will be flush with ground for easy truck access. The concrete slab will extend to the exterior of the structure to provide a surface for the container to be rolled into and out of the container bay.
- Electrical Room – Will serve as the power distribution for the equipment located within the Process Building and at the SBR tank complex.
- Mechanical Room – Will house the HVAC equipment for the Process Building.
- Stairwell for access to first floor and Sludge Pump Room.

First Floor:

- Sludge Dewatering Room – Will include the centrifuge accompanied by the sludge conveyor system. A monorail and electric hoist will be centered over the centrifuge for maintenance and to transport materials. An aluminum hatch will be installed on the floor of the sludge dewatering room, allowing access for moving polymer totes into place. Provisions will be proved for removing the centrifuge components through a removal window or access panel in the side of the building.
- Control Room – Will include office space dedicated as the Control Room which will also be a SCADA Terminal.
- Bathroom – Single use bathroom for WWTF staff

These spaces will also contain floor drains as appropriate to allow for ease of wash down and clean-up. The centrifuge and conveyors will be totally enclosed and vented to the atmosphere. These vents could be tied into a future odor control system.

## Structural Information

| Sludge Storage Tank Blower | |
|---|---|
| Height (approx.) | 4.2 ft |
| Width (approx.) | 2.3 ft |
| Length (approx.) | 3.2 ft |
| Blower Weight (each) | 756 lbs |

| Dewatering Feed Pumps | |
|---|---|
| Height (approx.) | 4.2 ft |
| Width (approx.) | 2.0 ft |
| Length (approx.) | 2.2 ft |

| Centrifuge | |
|---|---|
| Height (approx.) | 4.6 ft |
| Width (approx.) | 3.4 ft |
| Length (approx.) | 12.5 ft |
| Decanter Weight (total) | 6,174 lbs |
| Minimum Hoist Capacity | 3,350 lbs |
| Resonance Frequency | 3-8 Hz |

| Polymer Blending Unit | |
|---|---|
| Height (approx.) | 5.8 ft |
| Width (approx.) | 3.3 ft |
| Length (approx.) | 2.5 ft |
| Dry Weight | 300 lbs |
| Polymer Tote Mixer Weight | 71.7 lbs |
| Polymer Tote Weight | 2,300 lbs |

## Process Control Description

### Centrifuge

The dewatering system will be controlled by an OEM furnished Dewatering Control Panel (DCP). The DCP will control everything from the dewatering feed pumps, centrifuge, conveyors, and conveyor slide gates. The DCP will also send run, stop, and speed commands to a polymer blending unit which will have an OEM control panel to control the dilution of the polymer being fed to the sludge feed line. The DCP will be mounted in the Process Building Electrical Room and include remote access for the OEM during construction. Local control stations will be provided near each piece of equipment with a Local-Off-Remote switch and Estop pushbutton. The conveyors will also include a forward – Off- Reverse switch. The DCP will also receive the signals from various parts of the dewatering system to monitor process conditions or alarm status. Some of the items monitored include the following:

- Sludge holding tank levels (one radar level instrument and high level float per tank)
- Sludge Feed Pump alarm conditions including high and low pressure switches and high motor temperature switch
- Centrifuge and SC-1 flush water valves
- Sludge feed flowmeter

- Centrifuge vibration and temperature monitoring
- Conveyor alarm conditions including e-stop cable (SC-1) and loss of rotation
- Conveyor 2 slide gate status
- Sludge container ultrasonic level instruments (2) to monitor the level of solids in the container

The Dewatering System operation will be initiated manually at the DCP. If all equipment is in Remote and no fault conditions exist, all associated equipment shall start and stop automatically based on the OEM panel sequence of operation. Each dewatering feed pump will be driven by a variable frequency drive (VFD) with speed set at the DCP based on the desired feed rate. The pumps will discharge to a common discharge header with a common flowmeter to the centrifuge. Prior to being discharged dilute polymer will be injected into the sludge line. Polymer feed will be set by the operator at the DCP. The centrifuge will follow the OEM start-up conditions including starting the conveyor 1 in reverse and opening the flush water valve to allow the initial low solids discharge to go to the drain. After a timer the conveyor will move in the forward direction and convey solids to conveyor 2 which will distribute sludge to the container. Cake dryness is controlled and monitored by torque control in the centrifuge PID loop. The operators will be able to select where sludge is discharged to the container using the direction of conveyor 2 rotation and opening or closing the two automatic gates. If both gates are shut then sludge will be conveyed to the one of two open ends of the conveyor. The ultrasonic instruments will monitor the level of the sludge in the container to provide warnings based on how full the container is. Once the centrifuge is called to stop the shutdown sequence will initiate including opening flush water valves for the centrifuge and conveyor 1.

## Polymer

The polymer dilution and feed system will have its own OEM-supplied, PLC-based control panel mounted on the skid with the equipment. The polymer blending unit control panel will contain On-Off-Remote switch and Estop pushbutton mounted on the front of the panel. Remote status indication will be supplied via a dry contact output. Run status indication will be supplied via a dry contact output. The unit shall detect a loss of water flow by utilizing a low pressure switch.

Dilution water shall be split into two streams. Primary water flow shall supply the mixing chamber. Secondary water flow shall be used to post dilute the activated polymer stream to the desired feed concentration. The two streams will be completely blended by an integrated static mixer prior to the application injection point. Each unit shall have an electric solenoid valve for On/Off control of dilution water flow.

The following instruments, control panels, and local control stations are anticipated:

| Item | Local/Remote | NEMA | By Division | Range/Units |
|---|---|---|---|---|
| Flow Meter | local | 4X | 13 | 0 to 400 gpm |
| Sludge Pumps Instruments | | | | |
| Low Suction Pressure | local | 4X | 13 | n/a |
| High Suction Pressure | local | 4X | 13 | n/a |
| High Motor Temperature | local | 4X | 11-OEM | n/a |

| Item | Local/Remote | NEMA | By Division | Range/Units |
|---|---|---|---|---|
| Motor Temperature Switch - Centrifuge | local | 4X | 11-OEM | n/a |
| Bearing Temperature Sensors - Centrifuge | local | 4X | 11-OEM | n/a |
| Vibration Monitoring System - Centrifuge | local | 4X | 11-OEM | n/a |
| Speed Proximity Sensors – Centrifuge | local | 4X | 11-OEM | n/a |
| Flushing MOV - Centrifuge | local | 4X | 11-OEM | Open/close |
| Flushing Solenoid Valve – SC-1 | | | | |
| E-stop pull cord – SC-1 | local | 4 | 11-OEM | n/a |
| Motion Failure Alarm – Conveyor (each) | local | 4X | 11-OEM | n/a |
| Ultrasonic Transducers – Roll-off Container | local | 4X | 13 | n/a |
| Control Panel – Dewatering (Dewatering Area) | remote | 4X | 11-OEM | n/a |
| Local Control Station - Centrifuge Scroll Motor | local | 4X | 16 | n/a |
| Local Control Station – Centrifuge Bowl Motor | local | 4X | 16 | n/a |
| Polymer Blending Unit Control Panel | local | 4X | 11-OEM | n/a |
| Local Control Station – Pumps (Sludge Pump Room) | local | 4X | 16 | n/a |
| Local Control Station – SC-1 (Dewatering Area) | local | 4X | 16 | n/a |
| Local Control Station – SC-2 (Dewatering Area) | local | 4X | 16 | n/a |
| Local Control Station – Automatic Slide Gates | local | 4X | 16 | n/a |

## Construction Sequencing

The Sludge Dewatering System will be constructed within the new Process Building. Since the secondary treatment process will be constructed in parallel to existing operations of the facility, there is no construction sequencing that will be required. No bypassing or temporary dewatering systems will be required. The dewatering system will be constructed after the new Process Building is built and the SBR tank complex is constructed.

## Future Expansion Considerations

The sludge dewatering system is designed to meet current and projected flows. The new Process Building is designed to allow for space accommodations of a future centrifuge for redundancy if the Town sees that an additional unit is necessary.

## File Location

Solids Handling Basis of Design Memorandum.docx

## Attachments

☒ Manufacturer Cut Sheets

# GEA biosolids Decanter pro 5000

## Technical data | (Pre-) dewatering and thickening of municipal sludge

The GEA biosolids Decanter pro 5000 is a continuously operating centrifuge with horizontal solid-wall bowl, developed specifically for (pre-) dewatering and thickening of municipal sludge. The frame is of open design with gravity discharge of the clarified phase.

### Features

- Deep pond design for maximum separation efficiency
- Low power consumption (<0.9 kW/h/m³)
- High g-force for maximum dewatering
- High torque for maximum dewatering
- Adjustable bowl speed via VFD
- Automatic control of differential speed via VFD
- Gentle feed geometry for optimum flocculation and low wear
- Lowest space requirement (m³/h per m²)
- Inline secondary motor (no belts) for highest efficiency and low maintenance
- Good accessibility to all components

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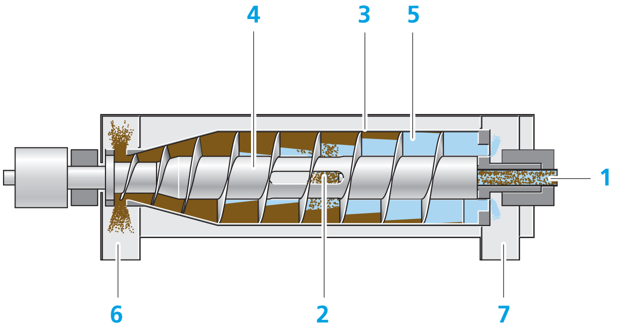
a better world

gea.com

# Technical data GEA biosolids Decanter pro 5000

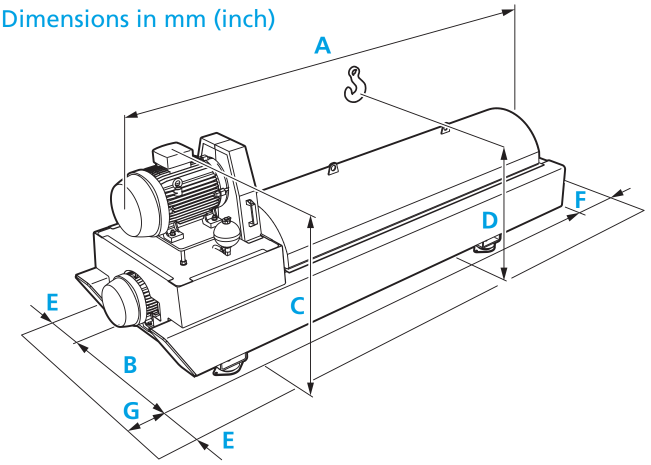
## Operating principles and constructional features



**1** Product feed
**2** Distributor
**3** Bowl
**4** Scroll
**5** Separation chamber
**6** Solids discharge
**7** Discharge of the clarified liquid phase

| | |
|---|---|
| **Bowl** | |
| g-volume | 680 $m^3$ |
| L/D ratio (angle) | 4.0 |
| Speed | 3650 rpm |
| g-force (z) | 3450 g |
| **Bowl drive** | |
| Rating | 30 KW (with VFD) |
| Speed at 50 Hz/60 Hz | 3000 rpm/3600 rpm |
| **Scroll drive** | |
| Rating | DOL 11 KW at 50 Hz /<br>with VFD 17 – 87 Hz max. 15 KW |
| **Shipping data** | |
| Decanter weight | 2800 kg (6174 lb) |
| Case dimensions | 4580 x 1620 x 1860 mm |
| Shipping weight | approx. 3550 kg (7826 lb) |

### Dimensions in mm (inch)



| A | B | C | D |
|---|---|---|---|
| 3800 (150) | 1030 (41) | 1400 (55) | >1600 (63) |
| **E** | **F** | **G** | |
| >500 (20) | >1050 (42) | >700 (28) | |

### Standard scope of delivery

- 3-phase AC motors
  - 400 V, 50 Hz or 460 V, 60 Hz
  - Make: WEG
  - Efficiency class: IE3
  - Color: Black
- PLC make: GEA IO, based on Siemens S7 1200
- VFD make: Schneider Altivar 9xx series
- Covers: Stainless steel
- Frame color: Opal Green RAL 6026
- Product-contacting parts: AISI 316
- Scroll protection: flame sprayed tungsten carbide
- Standard GEA documentation package

### Options

- Motor with space heaters (tropicalization)
- Motor make: ABB
- Set of tools for machine dismantling and assembly
- Vibration control sensor, liquid side
- VFD make: Danfoss FC 300 series
- Noise reduction kit, reducing noise approx. 3-4 dB(A)
- Bowl bearing temperature control, liquid and solids side
- Standard set of spares parts and / or set of revision parts
- Automatic greasing unit, mounted on machine frame
- Feed pipe flange compensator
- Slide gate, solid chute and liquid chutes

GEA Germany
GEA Westfalia Separator Group GmbH
Werner-Habig-Straße 1
59302 Oelde, Germany

Tel +49 2522 77-0
Fax +49 2522 77-2950

sales.germany@gea.com
gea.com

SPIRAC®
Solid Handling Solutions

**Sep 06, 2022**

**To:** **Sarah Viola, EIT**
**Wright-Pierce**

**Project:** Newport NH

**Ref.:** Shaftless Screw Conveyors
50-2206

Gentlemen:

SPIRAC (USA) INC. is pleased to provide its budget proposal for the above referenced project. SPIRAC® invented the modern shaftless screw conveyor 40 years ago, has hundreds of similar US installations.

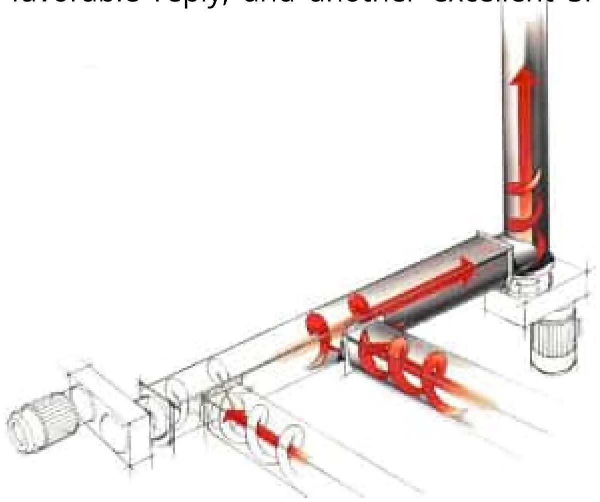
We believe you will find the remainder of our Budget proposal to be complete and self-explanatory. Please review the budget proposal in detail. In the event that you have questions regarding our Budget proposal or scope of supply, please contact our Representative:

Michael Loncoski
AQUA Solutions, Inc
mloncoski@aquasolutionsinc.net
Office: 207-828-5559
Cell:207-831-4935

We appreciate the opportunity to submit our Budget proposal for your review and consideration, look forward to your favorable reply, and another excellent SPIRAC® installation.

Best regards,
SPIRAC (USA) INC.

**Jeff Rice**
Regional Manager



**SPIRAC (USA) INC**
75 Jackson Street, Suite 300
Newnan, Georgia 30263 USA
**Tel:** 770-632-9833
**Fax:** 770-632-9838
**Email:** sales@spirac.com

**www.spirac.com**

## Proposed Scope of Supply (Shaftless screw conveyors)

### Item # 1 - CNV1

**One (1) SPIRAC® Conveyor Type U320-SPX/SS as follows:**

Q = 205 ft3/hr
Total Length 9.2ft mounted at a 20 degree incline
**U-Trough:** 11ga - 304SS
**Trough Lids:** 11ga - 304SS (Bolted / 5ft max with neoprene gasketing)
**Trough Liners:** SPX DURAFLO® nom 1/2 in thick UHMWPE, maximum 4ft lengths
**Inlets/Outlets:**
- One (1) rectangular flanged inlet
- One (1) rectangular flanged outlet

**Spiral:**
- AB280/330 60x25/40x15 High Tensile Micro Alloy Steel (HTMAS)

**Drive End:**
- SEW model FA67 parallel shaft gearbox with SS end cap and hollowshaft mounting or equivalent
- 1.5HP, 460v/3/60 SEW IEC frame high efficiency motor
- 4140CRS driveshaft, bell housing with pressure greased packing gland

**Electrical components:**
- Two (2) Emergency stop switch c/w cable, mounting hardware, 120VAC NEMA 4
- One (1) Loss of rotation (LOR) sensor model MSP-12 + MFA-4P alarm/control panel NEMA 4 enclosure 120vac

**Accessories:**
- Conveyor support legs with feet (anchor bolts not included)
- One (1) Flanged drain pipe connection

### Item # 2 - CNV2

**One (1) SPIRAC® Conveyor Type U320-SPX/SS as follows:**

Q = 205 ft3/hr
Total Length 23.4ft mounted at a 5 degree incline (typically delivered in sections for field assembly and spiral welding by others).
**U-Trough:** 11ga - 304SS
**Trough Lids:** 11ga - 304SS (Bolted / 5ft max with neoprene gasketing)
**Trough Liners:** SPX DURAFLO® nom 1/2 in thick UHMWPE, maximum 4ft lengths
**Inlets/Outlets:**
- One (1) rectangular flanged inlet
- Three (3) rectangular flanged outlets

**Spiral:**
- AB280/330 60x25/40x15 High Tensile Micro Alloy Steel (HTMAS), typically shipped in sections for welding to final length by others.

**Drive End:**

SEW model FA77 parallel shaft gearbox with SS end cap and hollowshaft mounting or equivalent
3HP, 460v/3/60 SEW IEC frame high efficiency motor
4140CRS driveshaft, bell housing with pressure greased packing gland

**Electrical components:**

Two (2) Emergency stop switch c/w cable, mounting hardware, 120VAC NEMA 4
One (1) Loss of rotation (LOR) sensor model MSP-12 + MFA-4P alarm/control panel NEMA 4 enclosure 120vac

**Accessories:**

Conveyor support legs with feet (anchor bolts not included)
Two (2) Pneumatic outlet slidegate (see description below)
One (1) Flanged drain pipe connection

## Item # 3 - Pneumatic outlet slidegates - Qty (2)

304SS frame and blade, minimum 3/16" thickness
UHMWPE runner with machined groove to provide smooth blade travel,
a positive seal, and self clearing operation
Minimum length one spiral pitch, 1.5 where space allows
Maximum vertical dimension of 4" under trough required
SMC (or equivalent) pneumatic actuator
 each c/w 120v solenoid/junction box + 1x proximity sensor

**SCHEDULE** - Based upon prevailing conditions, we estimate the following schedule following our receipt and acknowledgement of an acceptable Purchase Order:

| | |
|---|---|
| • Submittal of Approval Drawings | 8 weeks after contract acceptance and all dimensional information required |
| • Submittal of O&M Manuals | 4 weeks after submittal approval |
| • Deliver to jobsite | 20-22 weeks after submittal approval dependent on factory schedule and project requirements. |

**SERVICES**

The price presented elsewhere in this Budget proposal includes services for (2) days in (2) trips by an authorized Representative of SPIRAC® to site, to inspect the equipment following installation by others, to checkout the installation and certify that the equipment is ready to operate, to train the Owner's personnel in the operation and maintenance of the equipment and to observe the initial operation of the equipment.

## COMMENTS AND SPIRAC® EXCLUSIONS TO SCOPE OF SUPPLY

1) Off-loading and handling at the delivery location.
2) Construction and /or installation work of any kind at the jobsite.
3) SPIRAC® shall provide lubricants for initial operation. Any additional lubricant will be by others
4) Site/field painting or touch up.
5) Controls including panels, PLCs, or VFDs not specifically listed above.
6) Anchor Bolts by others.
7) Stainless steel weather hood, wall enclosure, Interconnecting piping or electrical wiring, etc. as may be required to connect the proposed equipment to the plant system.
8) Insulation or weather proofing.
9) Union labor for all field support services.
10) Video taping of the SPIRAC® training sessions.
11) Performance Bond(s) or sales taxes.
12) Anything not specifically stated in this Budget proposal.

## FREIGHT & HANDLING

1. The price presented below in this Agreement is F.O.B. jobsite, with full freight allowed.

## BUDGET PRICES

**Net price Items # 1 – 3……………………………………………… $________**

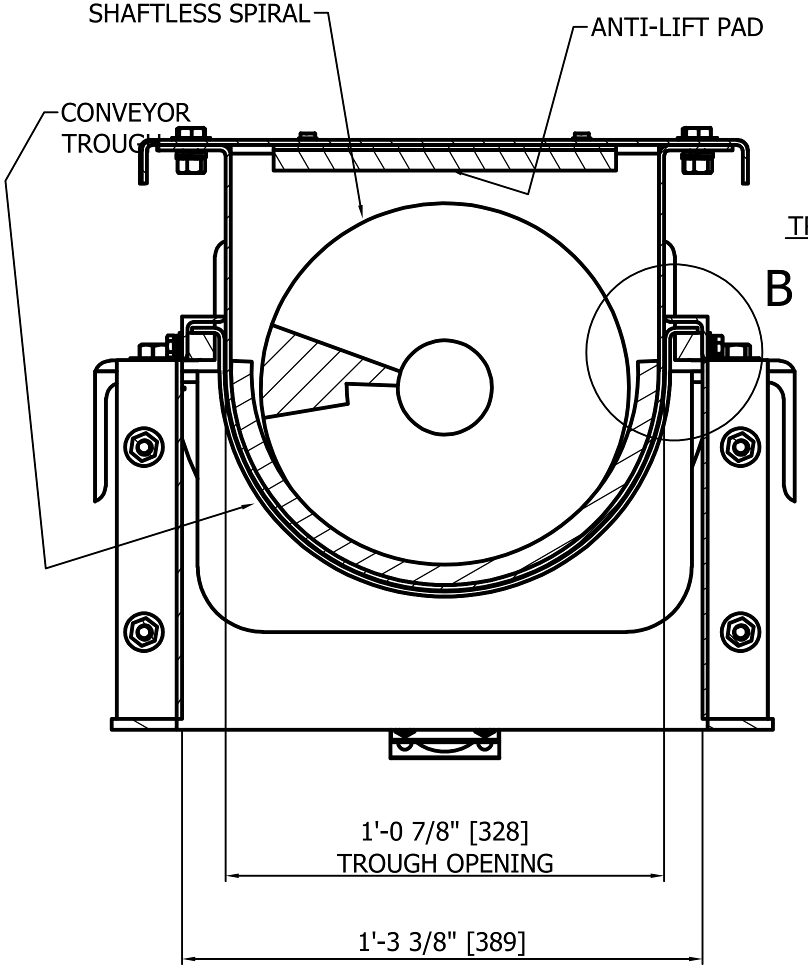
## WARRANTY

Except as noted below, SPIRAC (USA) INC. warrants the goods offered for sale in this Budget proposal to be free from defects in materials and workmanship for a period of twelve (12) months from the date of final acceptance of the equipment or eighteen months from shipment, which shall come first. The screw and liner will have an extended wear warranty as specified. Except for the term and details above, the standard SPIRAC® warranty applies, as stated in the enclosed Terms & Conditions of Sale.

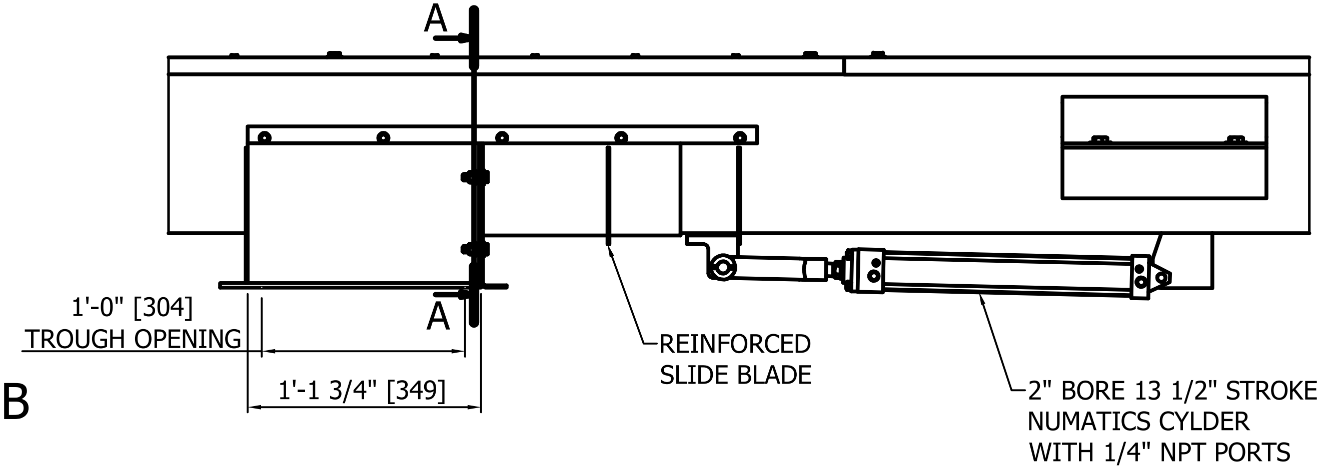
On behalf of SPIRAC (USA) INC

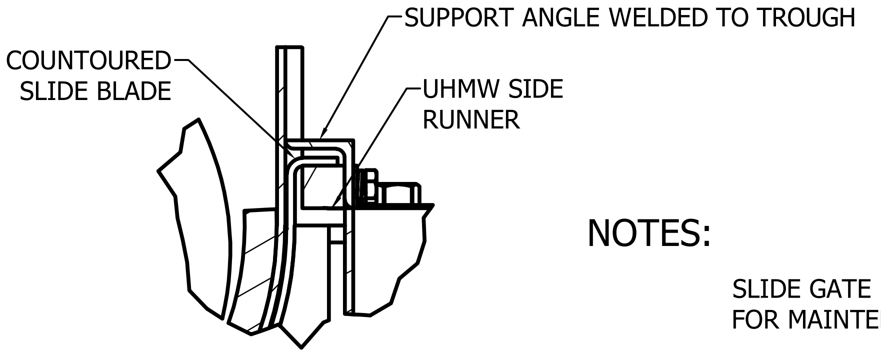
Jeff Rice

Regional Manager



SECTION A-A





VIEW B

## NOTES:

SLIDE GATE BLADE IS REMOVEABLE
FOR MAINTENANCE

CYLINDER SOLENOIDS SHIPPED LOOSE
LOCATE AND MOUNT AT INSTALLATION

| REV | DATE | DESCRIPTION | BY | CHK |
|---|---|---|---|---|

**CONFIDENTIAL INFORMATION**

THIS DRAWING AND DESIGN IS SUPPLIED AS CONFIDENTIAL INFORMATION AS SPECIFIED IN THE CONTRACT OR AS CONFIDENTIAL INFORMATION AS DEFINED IN SPIRAC INC TERMS AND CONDITIONS OF COMPONENT SALES

SPIRAC (USA) INC.
75 Jackson Street Suite 300
Newnan, GA 30263
ph (770) 632-9833
fax (770) 632-9833

TOLERANCES EXCEPT WHERE OTHERWISE STATED:-

| | |
|---|---|
| UP TO 120 IN | ±1/8 in |
| 120 IN AND OVER | ±1/4 in |
| HOLE CENTERS | ±1/16 in |
| CLEARANCE HOLE DIA | ±1/16 in |
| ALL ANGLES | ±1° |

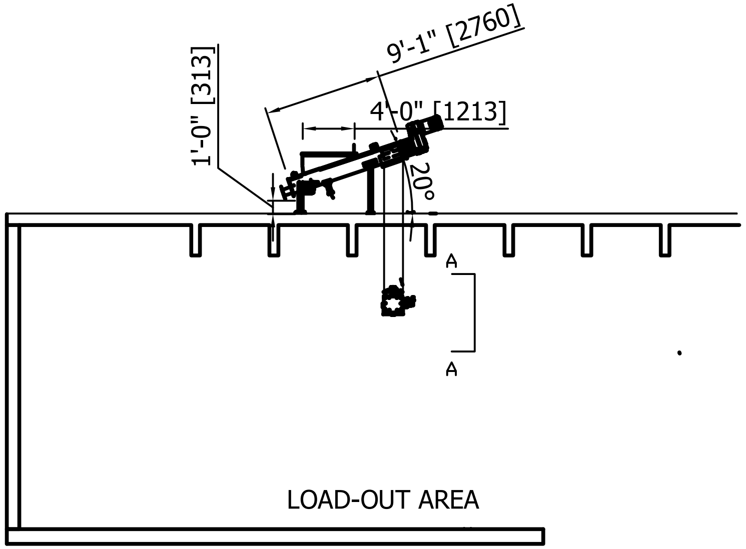
DIMENSIONS IN INCHES
DO NOT SCALE

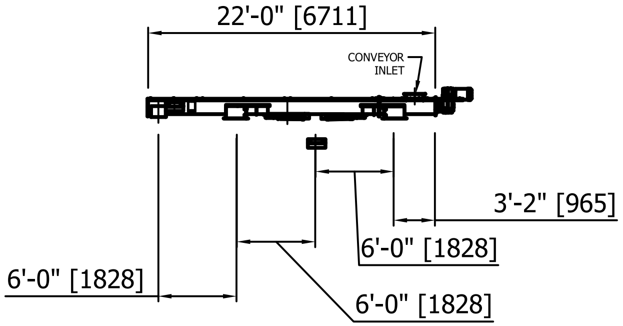
Newport NH
General Arrangement
Slide Gate Assembly
U320-SPX/304 SS

**DRAWN:** RJL
**CHECKED:**
**DATE:** 6/3/15
**SHEET:**
**SCALE:** NTS

DWG. No.
GA-50-2206-01

REV.
0





View A-A

| REV | DATE | DESCRIPTION | BY | CHK |
|---|---|---|---|---|
| B | | | RJL | |
| A | | | RJL | |

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| 120 IN AND OVER | ±1/4 in |
| HOLE CENTERS | ±1/16 in |
| CLEARANCE HOLE DIA | ±1/16 in |
| ALL ANGLES | ±1° |

DIMENSIONS IN INCHES
DO NOT SCALE

Newport NH
General Arrangement
Load Out Conveyor
U320-SPX/304 SS

**DRAWN:** RJL
**CHECKED:**
**DATE:** 6/2/15
**SHEET:**
**SCALE:** NTS

DWG. No.
GA-50-2206-03
REV.

**Rotary Lobe Pumps**
**Macerator Technology**

BÖRGER

Boerger LLC - 2860 Water Tower Place - Chanhassen, MN 55317 - USA

The Maher Corporation
192 Pleasant St.
Rockland, MA 02370-0000

# Quote

**No.:** **31003102**
Date: 09/23/2022

| | | | |
|---|---|---|---|
| **RFQ no.:** | Newport WWTF Upgrade - Boerger Sludge Pu | **Inside Sales Person:** | James Connell |
| **RFQ date:** | 09/23/2022 | **E-mail:** | jco@boergerllc.com |
| **Customer No.:** | 100425 | **Phone:** | 612-435-7334 |
| **Contact:** | | **Code:** | JCOBJJ |
| **Phone:** | | | |
| **Cell phone:** | | | |

| **Pos.** | **Description** | | **Quantity** | **Unit Price:** | **Total Price:** |
|---|---|---|---|---|---|
| 100 | 71002519 | **CL390 Pump Assembly**<br>Lead Time: Consult Factory | 1 | **$26,168.61** | **$26,168.61** |
| | | | | Value of Goods: | $26,168.61 |

| Pos. | Description | Quantity | Unit price: | Total price: |
|---|---|---|---|---|
| **100.0** | **71002519** | | | |

**Blueline CL Assembly**
CL390 Pump Assembly

**Medium specification:**

| | | |
|---|---|---|
| Spec. pumped medium: | Sludge . | |
| Viscosity: | 1 . | cP |
| Solids content: | 2 . | % |
| Solids size: | - . | in |
| Medium temp: | Ambient . | °F |
| pH value: | Neutral . | |

**Operational characteristics:**

| | | |
|---|---|---|
| Location: | dry, indoor | . |
| Ex-Zone Inside: | Not Classified | . |
| Ambient temperature | Ambient | . °F |
| Mode of operation: | Continuous | . |

**Performance data:**

| | gpm | Psi | rpm |
|---|---|---|---|
| Min. Flow rate: | 75 | 27 | 115 |
| Nom. Delivery rate: | 125 | 27 | 164 |
| Max. Flow rate: | 200 | 27 | 237 |

**101.0 PC3SARCFAAAAGCCC15** 1 pc

**Börger Rotary Lobe Pump CL390**
Product series: BLUEline
Version: Classic

Casing:
One-piece Blockcasing
from Grey Cast Iron EN-GJL-250 (GG25)
with easily replaceable axial and radial casing liners
Axial casing protection liners from Hard Metal
Radial casing protection liners from Hard Metal (MIP®)

Rotor geometry:
Tri-lobe, screw form, almost pulsation-free, baseparts from EN-GJS-400-15 (GGG40), with pushed-on tips, easily replaceable
Rotor coating: NBR
Free ball entry D = 50 mm
Displacement: 3,9 l/rev

Shaft seal:
single-acting mechanical seals, type LW
Material code according EN 12756 [DIN 24960]: R1 R1 P D
Seal faces: Duronit V/Duronit V
Dynamic O-rings: NBR
Seal holding bushes: 1.0503
Stationary O-Rings: NBR

**102.0 1300000025** 2 pc

**CL390 to 6in ANSI Flange**
B1 Configuration
001-484
Galvanized CS

## Quote

No.: 31003102

09/23/2022

| Pos. | Description | Quantity | Unit price: | Total price: |
|---|---|---|---|---|
| **103.0** | **5302000646**<br>**Nord SK32VL-210TC-6.74**<br>Inline Reducer w/ VL<br>1750rpm/260rpm | 1 pc | | |
| **104.0** | **5120000859**<br>**WEG 01018ET3E215TC-W22**<br>10hp,1800rpm,Prem Eff<br>208-230/460V<br>213/5TC,1.25SF | 1 pc | | |
| **105.0** | **2510000283**<br>**CL-SK32 Overhead Frame**<br>Painted Door<br>Max Torque: 481 Nm | 1 pc | | |
| | | | **$26,168.61** | **$26,168.61 USD** |

| | | | |
|---|---|---|---|
| Value of goods: | $ | 26,168.61 | USD |
| Net value: | $ | 26,168.61 | USD |
| Tax: (0.00 %): | $ | 0.00 | USD |
| **Total amount:** | **$** | **26,168.61** | **USD** |

## Quote

No.: 31003102

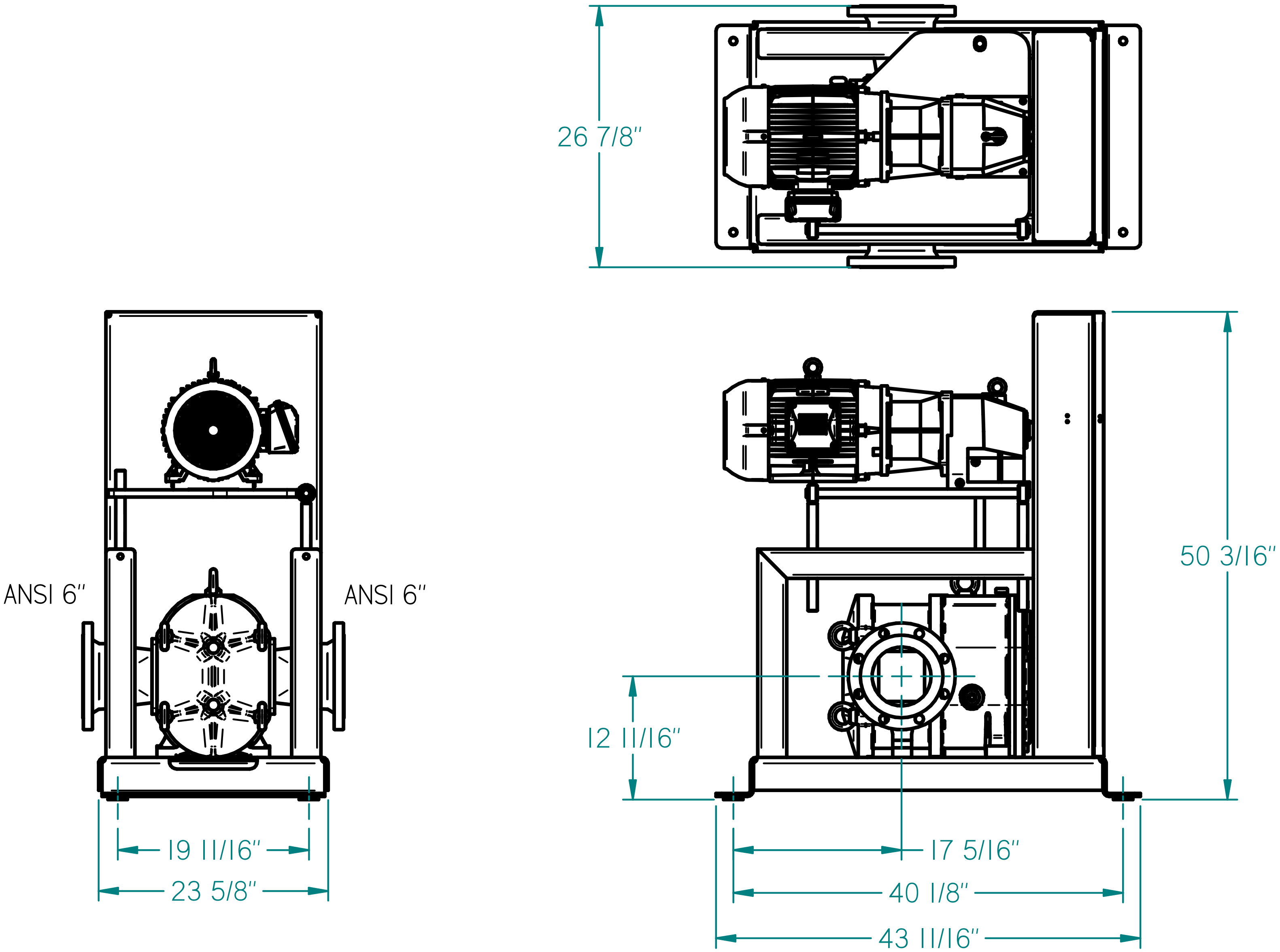
| **Invoice address:** | **Delivery address:** |
|---|---|
| The Maher Corporation | The Maher Corporation |
| 192 Pleasant St. | 192 Pleasant St. |
| Rockland, MA 02370 | Rockland, MA 02370 |

| | |
|---|---|
| **Terms Of Payment:** | Net 30 |
| **Dispatch Type:** | Less than Truck Load |
| **Price Valid To:** | 10/23/2022 |
| **Terms of Delivery:** | |

Best regards

| | | |
|---|---|---|
| Boerger LLC | | Regional Manager: |
| James Connell | | Pete Masson |
| Phone: | 612-435-7334 | 612-435-7324 |
| E-mail: | jco@boergerllc.com | pma@boergerllc.com |
| Website: | www.boerger.com | |

Notes:
1. BOERGER, LLC's standard Terms and Conditions apply and are an integral part of this quotation unless specifically noted otherwise in this proposal.
2. Delivery, installation, wiring, field painting, start-up and instructional services are not included unless specifically noted otherwise in this proposal.
3. Anchor bolts, pressure gauges, valves, drainage piping, starters, variable frequency drives and control equipment or any other items are not included unless specifically noted otherwise in this proposal.
4. BOERGER, LLC will review plans and specifications and will offer technical assistance and certified pump drawings for construction. The responsibility for pump station layout, access, seismic calculations including local PE stamp, etc., shall be by others.
5. This proposal is offered as an acceptable pumping system based upon descriptive items listed above. Deviations from the equipment described could result in price adjustment.
6. A BOERGER, LLC field engineer may be provided, as noted above, in a supervisory capacity only. Any and all costs associated with labor, set-up, etc., for the tests are to be by contractor.
7. Credit Card purchases will incur a 3% Processing Fee.



PROPRIETARY AND CONFIDENTIAL

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF Boerger, LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF Boerger, LLC IS PROHIBITED.

BOERGER, LLC

2860 Water Tower Place
Chanhassen, MN 55317
TEL.: 612-435-7300
FAX: 612-435-7301

THIRD-ANGLE PROJECTION

BÖRGER

Model: CL 390
Gear: Nord - In-Line SK32VL-210TC
Power: 10 HP

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED

TOLERANCES ± 1/2"

DO NOT SCALE DRAWING

| | NAME | DATE |
|---|---|---|
| DRAWN | MLindquist | 08/21/19 |
| CHECKED | | |

SHEET 1 OF 1

| SIZE | DWG. NO. | REV |
|---|---|---|
| A | SD-001-134 | 0 |

# BUDGETARY PROPOSAL

**Date of Proposal:** 28-Sep-22

**Proposal #:** BM22-4027

**Revision:** 1

**Proposal For:** Wright-Pierce

**Project:** Newport, NH WWTF

**Equipment:** VeloBlend Liquid Polymer Activation System

**Specification Section:** N/A

**Bid Opening:** N/A

**Engineering Contractor:**
Wright-Pierce

**Represented By:**
Rich Russell
Walker Wellington
(603) 498-6409
rich@walkerwellington.com

**VeloDyne Contact Information:**
Sales Manager: Brett McQuade
Phone: (303) 530-3298 (241)
Direct: (941) 757-7201
Email: bmcquade@velodynesystems.com

# BUDGETARY PROPOSED SCOPE OF SUPPLY

**Bid Type: Budget**

VeloDyne is pleased to offer the following proposal for the liquid polymer blending equipment, including options and accessories as indicated below.

| QTY. | DESCRIPTION |
|---|---|

**1** **VeloBlend Model VM-5P-1200-Rp-1-A-2 Liquid Polymer Blending System**

Polymer Flow Range: 0.25 to 5 GPH
Dilution Water Flow Range: 2 to 20 GPM

Each unit shall include the following unless otherwise indicated:

1 **POLYMER MIXING CHAMBER ASSEMBLY:**
- A.) VeloBlend Series: VM
- B.) VeloBlend Type: Staged Hydro-Mechanical
- C.) Mixer Motor: 1/2 HP, 90 VDC, 1750 RPM, Washdown Duty
- D.) Mixer Shaft Seal: Mechanical Seal with Seal Flushing Assembly
- E.) VeloCheck™ Neat Polymer Check Valve with Quick Release Pin
- F.) Neat Polymer Activation Chamber Construction:
  - Body: Stainless Steel
  - Impeller: Stainless Steel
  - Mechanical Seal: Ceramic, Carbon, Stainless Steel, Viton
  - Cover: Clear Polycarbonate with Stainless Steel Reinforced Flange & Discharge
- G.) Pressure Rating: 100 psi
- H.) Pressure Relief Valve: Brass

1 **NEAT POLYMER METERING PUMP ASSEMBLY:**
- A.) PVC FNPT Union Style Polymer Inlet
- B.) Neat Polymer Metering Pump Type: Seepex Progressive Cavity with Gear Reducer, Series MD 0015-24
- C.) Neat Polymer Metering Pump Motor: 1/2 HP, 90 VDC, 1750 RPM, Washdown Duty
- D.) Neat Polymer Loss of Flow Sensor: Thermal Flow Sensor, 120 VAC
- E.) Metering Pump Calibration Assembly with Isolation Valves (sized for 1 minute draw-down)
- F.) Plumbing: SCH. 80 PVC

1 **DILUTION WATER INLET ASSEMBLY:**
- A.) Stainless Steel FNPT Water Inlet Connection
- B.) Dilution Water ON/OFF Valve: ASCO Solenoid Valve, 120 VAC, Brass/NBR
- C.) Dilution Water Flow Control Valve: Linear Actuated Automatic Flow Control Valve
- D.) Primary Dilution Water Flow Meter Type: Paddle Meter, Linear Actuated Valve Type
- E.) Pressure Gauge (Stainless Steel, Liquid Filled), 2.5" Dial, 0-160 PSI
- F.) Plumbing: SCH. 80 PVC

1 **SOLUTION DISCHARGE ASSEMBLY:**
- A.) Stainless Steel FNPT Solution Discharge Connection
- B.) Pressure Gauge (Stainless Steel, Liquid Filled), 2.5" Dial, 0-160 PSI
- C.) Plumbing: SCH. 80 PVC

1 **CONTROL PANEL:**
- A.) Enclosure: NEMA 4X (FRP)
- B.) Power Option: 120V / 1PH / 60Hz
- C.) Power Disconnect Type: 10 ft. power cord with 120 VAC plug
- D.) PLC Controller: VeloDyne
- E.) HMI Operator Interface: 6" Color TFT
- F.) Motor Controllers:
  - Neat Polymer Metering Pump
  - Mixing Chamber

G.) Miscellaneous:
- Control Circuit Protection
- Control Relays
- Power Supplies
- Grounding Blocks
- Numbers Terminal Blocks
- Wire Labels, Shrink-Tube Type
- Cabling

H.) Control Level:
- Series Rp (PLC based Controls)

  The control system shall be designed to precisely control water flow in proportion to dilution polymer flow (polymer master) based on an operator input of desired solution concentration. The controller shall have two (2) modes of operation:

  a. Manual Mode: Operator sets polymer pump rate and water rate manually by increase and decrease push buttons on controller face.
  b. Proportional Auto Mode: Operator sets desired solution concentration. Metering pump follows 4-20mA pump pacing input signal. Water rate is controlled to maintained desired solution concentration (i.e. for in-line applications where process flow fluctuates).

  1. Operator Interface Functions:
     - System On/Off
     - Mode (Change Mode, Select Mode):
       a.) Manual Mode
       b.) Proportional Auto Mode
     - Set % Solution (Proportional Modes Only)
     - Set Poly Rate (Manual Mode Only)
     - Polymer Pump Calibrated Value Input
  2. Operator Interface Display:
     - Pump Rate
     - Water Rate
     - Solution Concentration
     - Status / Alarm Indicators:
       a.) Low Water Flow Alarm
       b.) Low Polymer Flow Alarm
     - Mode Select
     - Calibration Mode
  3. Inputs (signals by others):
     - Remote Start / Stop (Discrete Dry Contact)
     - Pacing Signal Based on Process Flow (4-20mA)
  4. Outputs:
     - System Running (Discrete Dry Contact)
     - Remote Mode (Discrete Dry Contact)
     - Common Alarm (Discrete Dry Contact)
     - Polymer Pump Rate (4-20mA)
  5. Special Functions / Features:
     - Proportional control of water to polymer flow (ratio control) as outlined above
     - Programmable auto flush – keeps water control valve open for programmable amount of time when unit is shut-off.
     - Polymer pump rate input for calibration.

I.) Additional Features / Options:
- Ethernet Switch - Stratix 2000

1 **SYSTEM SKID:**

Skid Size (dimensions are for reference only and are subject to change):
- Configuration #2, Tall Skid, (L: 34 in, W: 30 in, H: 70 in)

Frame:
- 304 Stainless Steel, open frame design for access to all components. Designed for bolt-down.

Hardware:
- 18-8 Stainless Steel

1 **SPARE PARTS (QUANTITIES SHOWN ARE TOTAL FOR THE PROJECT & SHIPPED LOOSE):**

- (1) 5P Stator
- (1) Progressive Cavity Packing Set, 4-Ring
- (1) Neat Polymer Check Valve, 1/2"
- (1) Banding Clamp, Progressive Cavity Pump
- (1) 1" Solenoid Valve

1 **ENGINEERING & DOCUMENTATION:**

Submittals for approval (electronic version in PDF, if required)

- Detailed scope of supply
- Mechanical drawings (solid models in shaded isometric and wire orthogonal views)
- Mechanical component data sheets annotated for specific models, features, etc.
- Pump performance curves
- Electrical schematics with interconnecting layout
- Process & Instrumentation Drawings
- Electrical component data sheets annotated for specific models, features, etc.
- O&M Manuals

1 **CRATING / BOXING:**

- Wood Crating Included

1 **FREIGHT:**

- FCA Factory, Prepaid & Allow

1 **START-UP / FIELD SERVICES:**

- Factory Start-Up & Field Services:
  - Number of Trips: 1
  - Number of Days (total on site): 1

# CLARIFICATIONS

**Commercial Clarifications:**
1. This proposal shall become part of the final purchase order documents.
2. This proposal is based on equipment delivery within one year from the date of this proposal.
3. Unless otherwise indicated above, the following are not included in this proposal: Taxes. Tariffs. Duties. Bonds.

**Technical Clarifications:**
1. Any equipment or appurtenances not specifically listed in the scope of supply shall be provided by others.
2. VeloDyne has proposed its standard equipment as detailed above, modified only to the extent to meet the intent of the project requirements.
3. Where there are contradictions between project specifications and drawings or omissions, VeloDyne is providing our best interpretation of the intent of the design as detailed in our scope of supply.
4. Unless otherwise indicated above, standard submittals and O&M manuals are included herein.
5. Unless otherwise indicated above, the following are not included in this proposal: Installation. Chemicals. Interconnecting wiring, conduit, piping, and valves. Anchor bolts. Field Painting.

**Commercial Terms Summary (see complete terms & conditions attached):**

1. Price Valid For 30 Days
2. Incoterms (2020): FCA Factory, Prepaid & Allow
3. *Submittals: 6-8 weeks after acceptance of order
4. *Shipment: 6-8 weeks after acceptance of order or customer's written approval and release for production
5. Payment Terms: (Prices are in US Dollars)
    i. Net 30

*Note: lead times are estimates based on the current engineering and production work load at the time of bid. Actual lead times may vary based on the workloads at the time of order and release for production, consult factory at time for order and release for production to confirm lead times.

**Total Price Including Field Services and Freight: $34, 567.00 USD**

## VELODYNE STANDARD TERMS & CONDITIONS OF SALE

All orders placed with Velocity Dynamics, LLC. d/b/a VeloDyne (the "Company" or "Seller"), if accepted, shall be accepted subject to VeloDyne Standard Terms and Conditions of Sale ("Terms and Conditions") as set forth below and incorporated by reference into the Purchase Contract:

1.**CONTRACT; OFFER AND ACCEPTANCE.** These Terms and Conditions, together with the product descriptions, prices and other terms appearing on the face hereof or in a separate document submitted to you, (collectively, "our Quotation"), as such may result in a final Purchase Contract between us (all such documents collectively referred to as the "Contract"), shall constitute the only terms and conditions of our offer. If our Quotation is submitted in response to an offer made by you, whether your offer is in the form of a request for proposal or otherwise, our Quotation is expressly conditioned on your acceptance of these Terms and Conditions, which are incorporated into any offer, acceptance, response, acknowledgment, invoice, amendment and/or any other document issued by you or the Company in connection with your Order (the "Contract" or "Contract Documents"), and any reference thereto shall include these Terms and Conditions. No waiver, alteration, or modification of these Terms and Conditions shall be valid unless expressly agreed to in writing by the Company. In any event, we object to all additional or conflicting terms and conditions that may appear in your order or other form of acceptance you may submit to us in response to our Quotation. The Company shall supply to Purchaser the equipment and parts (the "Products") in accordance with the design, manufacturing and performance specifications set forth in the Company's Quote and incorporated in the Purchase Contract (including these Terms and Conditions). No representation, promise or warranty of any kind has been made by us except as set forth in the Contract, which conclusively supersedes all prior writings, representations and negotiations with respect thereto. The Company has no obligation to furnish other equipment, materials or services that may be shown in any plans and/or specifications except for those goods actually ordered by you for a project to which the goods ordered herein pertain.

2.**PRICES.** Unless otherwise noted in the Contract, prices are net Ex-Works our facility and firm for 30 days. **Prices do not include:** freight; permitting, licensing and/or export fees; labor charges; storage fees; or taxes. If you require the Company's assistance for installation or set-up, we will invoice you at standard rates (please contact us for current pricing). Regarding taxes as set forth below, you will either (i) pay to the appropriate authority all applicable taxes and other government charges upon the production, sale, shipment or use of the goods and provide us with proof of payment; or (ii) provide us with a tax exemption certificate from the appropriate taxing authorities. You agree to provide us with written proof of payment of taxes (or exemption therefrom) within ninety (90) calendar days of your receipt of the goods. Time is of the essence.

3.**CREDIT AND PAYMENT**. Unless otherwise stated in the Contract, payment terms are net 30 days from the date of our invoice(s). Any payment outstanding beyond sixty (60) calendar days from the date of any Company invoice shall be subject to a late payment charge on the overdue balance in the amount of 1.5% per month calculated on the outstanding payment amount (or such lesser amount as is the maximum rate of interest allowed by law). Purchaser shall be responsible for all reasonable costs (including attorney's fees) incurred by the Company while collecting any delinquent balance. For international shipments, payment terms are cash only (unless otherwise approved in writing buys). The Company may decline to deliver except for cash, or stop goods in transit, should we develop any reasonable doubt as to Purchaser's financial responsibility. Pro-rata payments shall become due with partial shipments. If Purchaser is responsible for any delay in shipment: (a) the Company may treat the date of completion of goods as the date of shipment for purposes of invoice and payment, (b) completed goods shall be held at Purchaser's cost and risk; and (c) Purchaser shall be responsible for reasonable storage and insurance expenses, with storage fees accruing at a rate of two percent (2%) of the Purchase Price per month or $500 per month, whichever is greater, beginning on the first day of the first calendar month following the date the equipment was scheduled to ship. If retainages are accepted by the Company, the retainage shall be based on an agreed upon percentage of the total invoice amount. Unless otherwise agreed in writing, (a) retainage will not be held for more than 180 calendar days from the date of shipment and (b) no retainage will be imposed for approval of shop drawings, O&M manuals or any other documentation.

4.**DELIVERY AND ACCEPTANCE OF PRODUCTS; TRANSFER OFTITLE.**

(A) **Products to be Used in the United States.** Seller will deliver Products manufactured and to be used by Purchaser in the United States Ex-Works at our facility ("Shipping Point") Incoterms 2010, or in such other manner as may be mutually agreed to by us and set forth in separate Shipping Terms under the Contract. On all shipments marked "Ex-Works (or EXW) Shipping Point," the Company shall make the Products available to Purchaser at the Company's facility, which shall constitute delivery, and Purchaser shall bear all costs and risks of moving the Products from our facility to Purchaser's destination. Any claim for loss or damages in transit must be entered with the freight carrier and prosecuted by you.

(B) **Products to be Used Outside of the United States.** Seller will deliver all Products to be used by Purchaser outside of the United States "FAS (Free Alongside Ship) Named Port of Shipment" ("Shipping Point")Incoterms 2010, which means the Company will deliver the Products to the designated port, origin point or designated freight forwarder, with Purchaser bearing all costs and risk of loss or damage from the origin point to Purchaser's destination point outside of the United States. Purchaser shall be responsible for payment of all sales and use taxes, or to recover such taxes through appropriate procedures and documentation under applicable law.

(C) **Shipping.** Goods will be boxed or crated as Seller may deem proper for protection against normal handling, and extra charge will be made for preservation, waterproofing or similar added protection of goods. Routing and manner of shipment will be at Seller's discretion, and maybe insured at Purchaser's expense, value to be stated at order price.

(D) **Delivery, Shipment & Installation Dates**. Delivery, shipment and installation dates are estimates only, not guarantees, and unless otherwise specified, are calculated from the date of Seller's receipt of complete technical data and approved drawings as such may be necessary to fulfill the Contract. In estimating such dates, no allowance has been made, nor shall we be liable directly or indirectly, for delays of third-party vendors, carriers or delays from labor difficulties, shortages, strikes or stoppages of any sort, fires, accidents, failure or delay in obtaining materials or manufacturing facilities, acts of government affecting us directly or indirectly, bad weather, or any cause beyond our control or causes designated as Acts of God or forced by any court of law, and the estimated delivery date shall be extended accordingly without penalty to the Company. We will not be liable for any damages or penalties whatsoever, whether direct, indirect, special or consequential, liquidated or otherwise, resulting from our failure to perform or delay in performing. Overtime and other expenses incurred to hasten delivery at Purchaser's request shall be added to the quoted prices and charged to and paid for by Purchaser. Shipment of goods ready for delivery can be deferred beyond the date for delivery on with Seller's written consent.

(E) **Delivery Terms**. Seller's obligation to deliver the goods shall be fulfilled when we have delivered the same in good condition to a carrier at the designated Shipping Point. Unless otherwise specified in the Contract, Purchaser shall be charged with and pay for the costs of all transportation, freight, insurance, loading, packaging and handling charges, taxes, duties, fees, storage, and all other charges applicable to the goods. Purchaser shall not be responsible for any taxes based on Seller's income.

(F) **Title / Security**. Title to the goods shall be retained by Seller as a vendor's lien until such goods are paid for in full by the Purchaser, even though risk of loss shall be borne by Purchaser as set forth in paragraphs 4(A) and (B) respectively. Purchaser herby grants to Seller, and Seller hereby reserves, a purchase money security interest in and to the goods sold to Purchaser, together with all proceeds thereof, to secure Purchaser's payment and performance. Purchaser agrees upon Seller's request to do all acts and execute all documents reasonably necessary to assist Purchaser's perfection and maintenance of any such security title and right of possession including, but not limited to, executing and filing documents with the appropriate governmental agency.

(G) **Cancellation and Returned Equipment**. Orders may be canceled or amended only with our written consent, and must be returned within30 days of Seller's written authorization at Purchaser's cost. If Purchaser returns the goods in the manner required under the previous sentence, and if the returned goods are (i) in substantially the same condition that existed on the date the Seller delivered the Products to you, undamaged; and (ii) not more than 12 months after the original Invoice date; the returned goods will, subject to the applicable handling charge, be accepted by the Seller for return. Used or discontinued goods or parts or equipment specially manufactured will not be accepted for credit unless specifically agreed to by the Seller in our sole discretion. Purchaser's sole remedy for returns will be a credit for the purchase price less any handling charges. Returned goods are subject to a minimum of 20% restocking and handling charge. Returns found to befree of material and workmanship defects will be held for 30 days and if Purchaser does not provide the Seller with repair or return instructions, then we will scrap or resell the goods. Purchaser will be charged for placing returned goods in saleable condition, any sales expenses then incurred by us, plus a restocking charge and any out-going and in-coming transportation costs which the Company pays.

(H) **Acceptance by Purchaser**. Purchaser shall conduct any incoming inspection tests on delivered Products within 10 days of delivery, and if delivery is made in multiple shipments, then Purchaser shall conduct incoming inspections of Products within 10 days of receipt of each delivery. In the event of a shortage, damage or discrepancy in any shipment, Purchaser shall promptly give notice to Seller in writing (at such address designated by Seller for such purpose) but in no event later than 30 days of the subject delivery, detailing the exact nature of the shortage, damage or discrepancy and provide such supporting documentation as Seller shall deem necessary and appropriate (i.e., photos, insurance reports, etc.). If such evidence indicates, in Seller's reasonable judgment, that such shortage, damage or discrepancy existed at the time of delivery of the goods to the carrier, Seller will promptly deliver additional or substitute goods to Purchaser; provided, however, that Seller may, in its sole and absolute discretion, require Purchaser to return all damaged goods to the Company prior to delivery of substitute goods. If Purchaser shall fail to timely give Seller such written notice, the goods shall be deemed to conform to the requirements of the Contract, and Purchaser shall be deemed to have accepted the goods and shall pay for the goods in accordance there with.

(I) **Purchaser's Specifications**. Purchaser shall be solely responsible for ensuring that all specifications, drawings, information, advice, recommendations or requests provided to the Company by Purchaser or any of its agents are accurate and suitable for Purchaser's purposes. The Company's examination or consideration of any such specifications, drawings, information, advice, recommendations or requests shall not result in any liability on the part of the Company.

5.**TERMINATION**. The Company shall have the right to cancel for default hereunder all or any part of Purchaser's Order. This right of cancellation is in addition to and not in lieu of any other remedies that the Company may have in law or equity.

6.**TAXES & IMPORT- EXPORT CHARGES**.

(A) **Purchaser's Responsibility for Taxes, Reports and Withholding**. Seller shall be responsible for reporting and paying all state and federal income taxes associated with sales of equipment and products to Purchaser under this Contract. However, Purchaser shall be responsible for all liabilities or claims for taxes that any taxing authority having jurisdiction over this Contract may assess or levy relating to the Products or this Contract. Purchaser shall comply with all applicable tax requirements, file all registrations (including all Transaction and Sales Tax registrations) and reports, and take all actions necessary to make its tax payments (or secure exemptions from or reductions in payments of same). Within 90 days from the date of any payment by Purchaser under Seller's Invoice, Purchaser shall provide Seller with tax receipts (or other proof of payment or written evidence of tax exemption) for all taxes to be paid by Purchaser under this Contract.

(B) **Import and Export Charges**. Purchaser shall be solely responsible for all import and export charges, licenses, permits ad any other lawfully payable charge related to the import or export of Products under this Contract.

(C) **Export Controls & Related Regulations**. Purchaser represents and warrants that it is not designated on, or associated with, any party designated on any of the U.S. government restricted parties lists, including without limitation, the U.S. Commerce Department Bureau of Industry and Security ("BIS") Denied Persons List; Entity List or Unverified List; the U.S. Treasury Department Office of Foreign Assets Control ("OFAC") Specially Designated Nationals and Blocked Persons List; or the U.S. State Department Directorate of Defense Trade Controls("DDTC") Debarred Parties List. Purchaser shall comply with all applicable U.S. economic sanctions and export control laws and regulations, including without limitation, the regulations administered byte OFAC, the Export Administration Regulations administered by Bilsland the International Traffic in Arms Regulations administered by DDTC. Seller may terminate this Contract and discontinue any ongoing supply to or business with Purchaser immediately, without notice and without liability, upon Seller becoming aware that Purchaser is named on any restricted party list.

7.**WARRANTY; LIMITED REMEDIES.**

(A) **Seller Warranties**. Seller shall provide the standard warranties provided in the form Warranty Agreement (a copy of which is attached and incorporated by reference into our Contract).

(B) **Assignment**. Seller assigns to Purchaser all warranties given by manufacturers and vendors of Seller as such relate to the Products (equipment or components). These warranties are not exclusive.

(C) **Limitation on Damages**. Other than as set forth in Paragraph 9(Purchaser Indemnification) and any breaches of Paragraph 11 below (Confidentiality), each party's cumulative liability for damages to the other party for any cause whatsoever, and regardless of the form of action, whether in contract or in tort, including but not limited to, negligence, shall be limited to the total Contract price of the goods sold hereunder, plus or minus, as applicable, the amounts of all unpaid accounts payable and receivable between the parties. In no event shall Seller's liability exceed the limits of the Company's insurance coverage.

8. **SOLE REMEDY**. The sole and exclusive remedy for breach of any non-warranty obligation of the Company and the sole remedy for the Company's liability of any kind (including negligence) with respect to the goods and services provided to Purchaser shall be to use all commercially reasonable efforts to promptly cure such breach. Purchaser must prosecute any claim for a cause of action arising hereunder with one year from the date on which the facts that gave rise to the cause of action first occurred subject to the terms set forth in Section 14 (Governing Law and Resolution of Disputes).

9. **INDEMNIFICATION**. Purchaser shall hold harmless, indemnify and defend the Company (at the Company's request) for any and all damages, liabilities, costs and expenses (including the costs of any dispute resolution, including but not limited to, attorneys' fees and another costs and expenses), fines, or losses in connection with any threatened or actual claims, actions, demands, investigations, suits, including but not limited to, claims or suits by third parties, arising out of any of the following: (a) Purchaser's negligent or willful acts, or those of its employees and/or agents, (b) such goods being repaired or altered by persons other than Seller (unless expressly authorized in writing by the Seller), (c) any claim of patent infringement arising out of the manufacture by Seller of goods created in accordance with a design or specifications furnished to Seller by Purchaser, (d) in the event that Purchaser modifies, or combines with any non-Seller goods, any of the goods purchased from Seller, and such modification or combination results in the actual or alleged infringement of any intellectual property rights of any third party, (e) from goods produced by Seller according to Purchaser's specifications, (f) any violations of export control laws by Purchaser, (g) any violations of state or federal tax laws by Purchaser, or (h) Purchaser's breach of any provisions of these Terms and Conditions.

10.**SELLER'S INTELLECTUAL PROPERTY INDEMNIFICATION**. Seller will defend, indemnify and hold harmless Purchaser from and against any and all loss, damage, cost or expense arising as a result of any claim that the goods sold hereunder infringe any third party U.S. patent, copyright, trademark, trade secret or intellectual property right. Otherwise, Seller will not be liable for any claim of infringement. If you notify us promptly of any such claim of infringement and, if we so request, authorize us to defend or settle any suit or controversy involving such claim, we will indemnify you against the reasonable expenses of any such suit and will satisfy any judgment or settlement in which we acquiesce, but only to an amount not exceeding the price paid for the allegedly infringing goods. If an injunction is issued against the further use of allegedly infringing goods, the Company shall have the option of procuring for you the right to use the goods, or replacing them with non-infringing goods, or modifying them so that they become non-infringing or of removing them and refunding the purchase price. The foregoing states the Company's entire and exclusive liability with respect to a claim of infringement, and we will not be liable for any damages whatsoever suffered by reason of any infringement claimed, except as provided herein.

11.**CONFIDENTIALITY**."Confidential Information" means any of the Company's business information, specifications and all related writings, drawings, designs, software applications and similar works or any other information disclosed by the Company that are disclosed as "Confidential" or proprietary. All Confidential Information shall be the exclusive property of the Company and we retain all right, title and interest in and to the same. Purchaser agrees to use Confidential Information for the exclusive purpose of performance under the Contract and not to disclose or provide any Confidential Information to any third-party and to take all necessary measures to prevent any such disclosure by its employees, agents, contractors or consultants. Upon request of the Company or completion of the Contract, Purchaser shall return all Confidential Information to the Company and provide certification of such return.

12. **TOOLING; SPECIAL JIGS, FIXTURES & PATTERNS**. Charges made for tools, jigs, fixtures, patterns and equipment made or acquired by the Company in connection with your Order and utilized in manufacturing will be considered the exclusive property of the Company, without credit to Purchaser.

13. **INSPECTION, RECORDS, AUDITS & PROPRIETARY DATA**. Inspection of goods in our facility by Purchaser and/or its representative will be permitted, provided that (a) Purchaser gives reasonable written notice of its desire to inspect the goods, and (b) the inspection does not unduly interfere with the Company's production work flow. Neither Purchaser nor any of Purchaser's representatives shall have any right to examine or audit the Company's cost accounts, books or records of any kind, or be entitled to, or have control over, any engineering or production prints, drawings or technical data which the Company, in our sole discretion, may consider in whole or in part to be proprietary to our business.

14.**GOVERNING LAW & DISPUTE RESOLUTION.**

(A) **Governing Law**. The Contract and these Terms and Conditions are governed by and interpreted under the laws of the State of Colorado, without regard to its choice of law rules unless the matters in dispute come within the scope of Article 2 of the Uniform Commercial Code(UCC-Sales) prepared under the joint sponsorship of The American Law Institute and the National Conference of Commissioners on Uniform State Laws, in which event the dispute shall be governed by and interpreted under the referenced Code in effect on the date of this Contract.

(B) **Dispute Resolution**. Except for any action where the sole relief sought is an injunction, any controversy or claim arising out of or relating to the Contract and these Terms and Conditions, or the making, performance or interpretation hereof, and the dispute cannot be settled by direct negotiations, either Party may initiate mediation. If the parties fail to settle the dispute within 30 days of notice of mediation, either party may initiate binding arbitration under this paragraph. The place of arbitration shall be in the Boulder-Denver Metro-Area of Colorado, and shall be conducted by one arbitrator in accordance with the Commercial Arbitration Rules of the American Arbitration Association. Judgment upon any binding arbitration award may be entered in any court having jurisdiction thereof.

15.**GENERAL PROVISIONS.**

(A) **Prior Agreements**. This Contract comprises the complete and exclusive agreement between the parties regarding the subject matter of this Contract, and supersedes all oral and written communications, negotiations, representations or agreements made or entered into before the Effective Date.

(B) **Amendments**. No amendment to this Contract is effective unless made in writing and signed by authorized representatives of Purchaser and Seller. Specifications, drawings, price lists and documents of a technical nature prepared by Seller and submitted to Purchaser to describe the equipment and parts being purchased hereunder automatically become part of this Contract.

(C) **Survival**. All provisions set forth herein regarding warranty, confidential information, indemnification, liability and limits thereon, and any other provisions that survive on their terms including all provisions relating to tax, import / export, inspection, dispute resolution and governing laws, and all causes of action which arose prior to completion or termination of this Contract shall survive indefinitely until, by the irrespective terms, they are no longer operative.

(D) **Conflicts**. If a conflict exists between these Terms and Conditions and any other writings connected with this Contract, these Terms and Conditions shall prevail with respect to such conflict. In the event that any provisions of these Terms and Conditions is held to be illegal, invalid or unenforceable under the present or future law, rule or regulation, such provision shall be deemed stricken from these Terms and Conditions, but such illegality, invalidity or unenforceability shall not invalidate any of the other provisions of these Terms and Conditions

VELODYNE

Velocity Dynamics, LLC
543 S Pierce Ave, Louisville, CO 80027
303-530-3298 www.polymersolution.com

Project Name
Standard VeloBlend Ratio

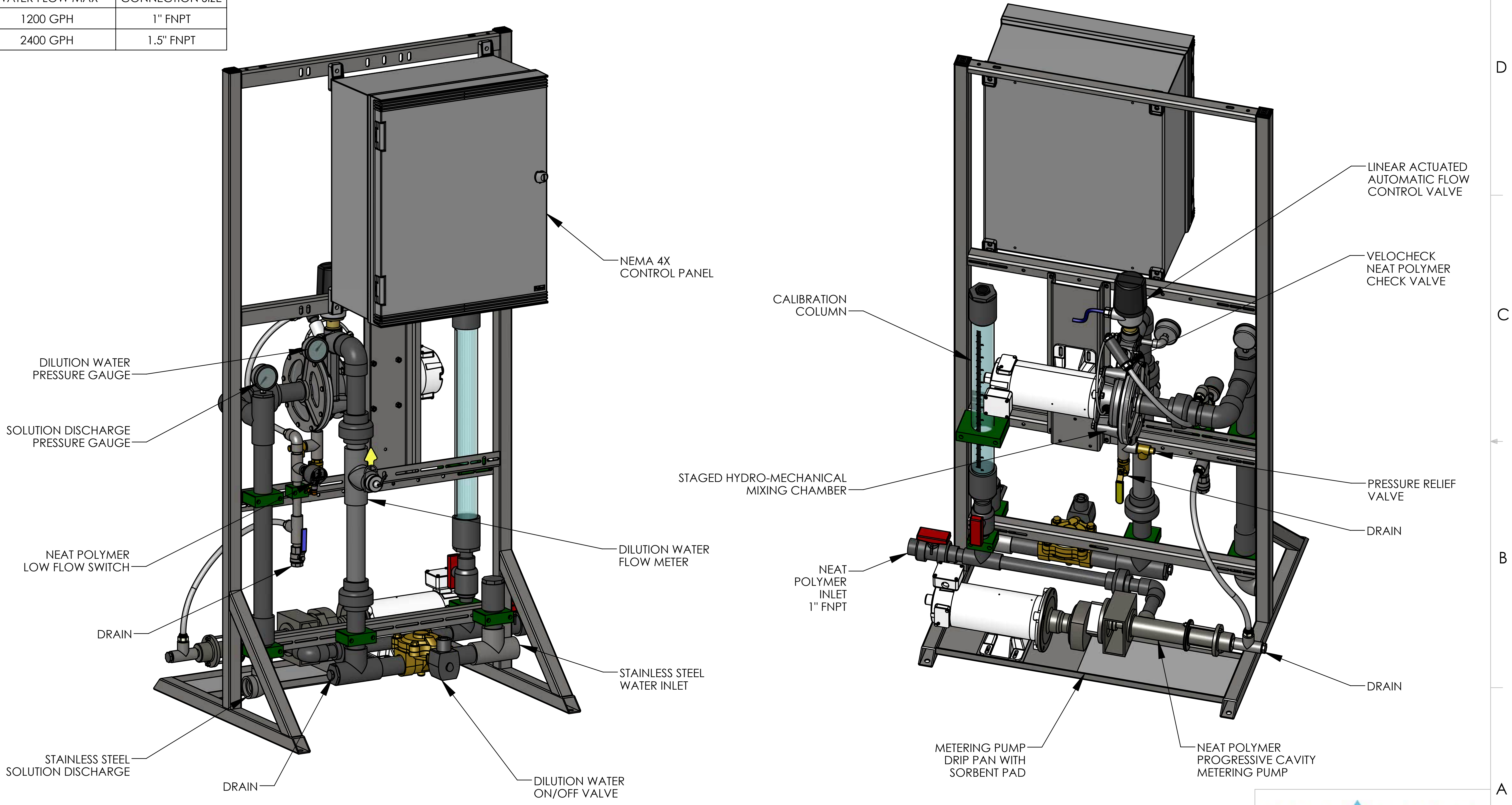
Sales Order

| Rev | Revision Description | Date | By |
|---|---|---|---|
| E | CHANGED DISCONNECT | 1/10/17 | AJS |
| D | UPDATE IN EPLAN | 4/17/15 | JM |
| C | UPDATE STANDARD | 11/21/14 | JM |

| | Date | By |
|---|---|---|
| Created | 08/24/15 | JM |
| Modified | 01/11/17 | AJS |
| Checked | 08/12/15 | SS |

VELOBLEND LIQUID POLYMER SYSTEM
VM-P-Rp-1-A
Drawing Number 970-6000
PID Rev E
Sheet 1 of 1

| WATER FLOW MAX | CONNECTION SIZE |
|---|---|
| 1200 GPH | 1" FNPT |
| 2400 GPH | 1.5" FNPT |



NOTES -

1) APPROXIMATE DRY WEIGHT 300 LBS

2) FOLLOW O&M PROCEDURES FOR DRAINING PRIOR TO STORAGE OR SHIPMENT

3) FRAME MATERIAL IS 304 SS AND HARDWARE IS 18-8 SS UNLESS OTHERWISE NOTED

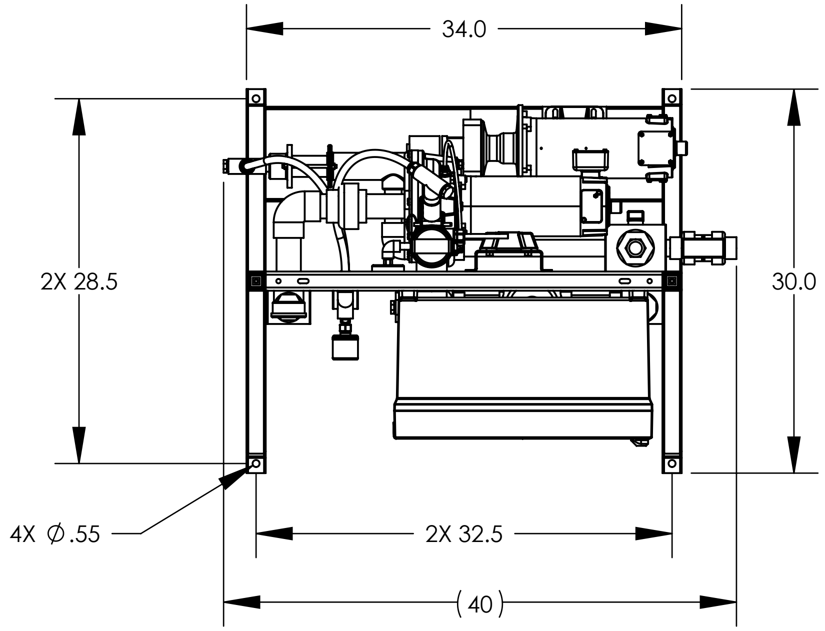
NOTE: DRAWINGS ARE FOR GENERAL LAYOUT USE ONLY.
SEE PROPOSAL FOR DETAILS OF THE PROPOSED SCOPE OF SUPPLY.

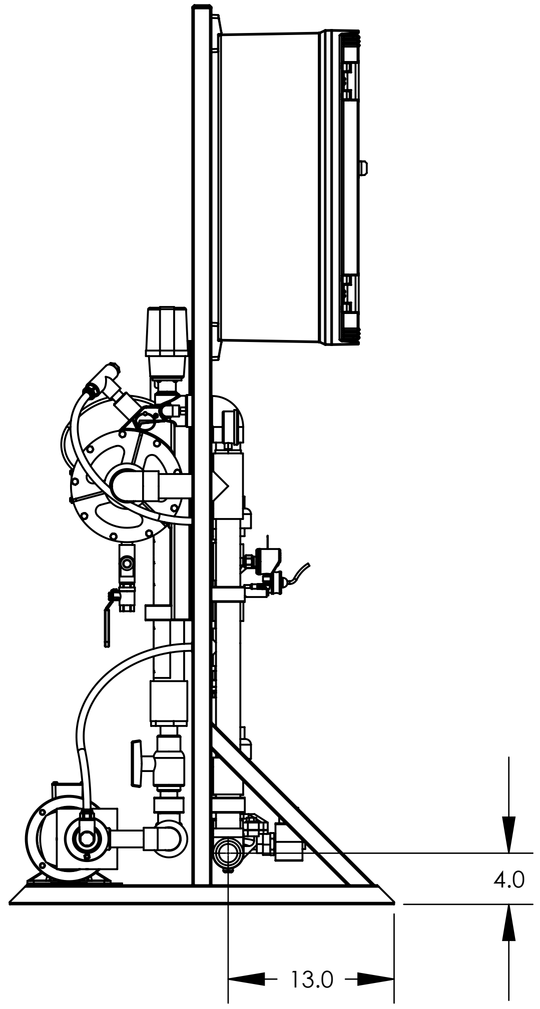
VELODYNE

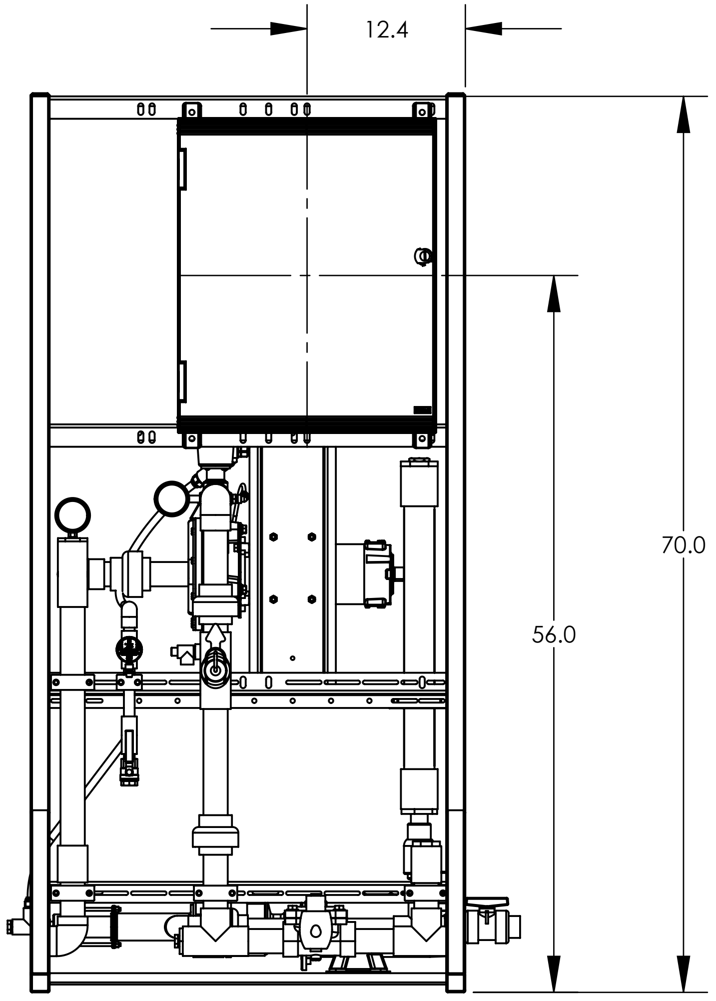
VELOBLEND SALES DRAWING,
SERIES 2400, Rp CONTROLS

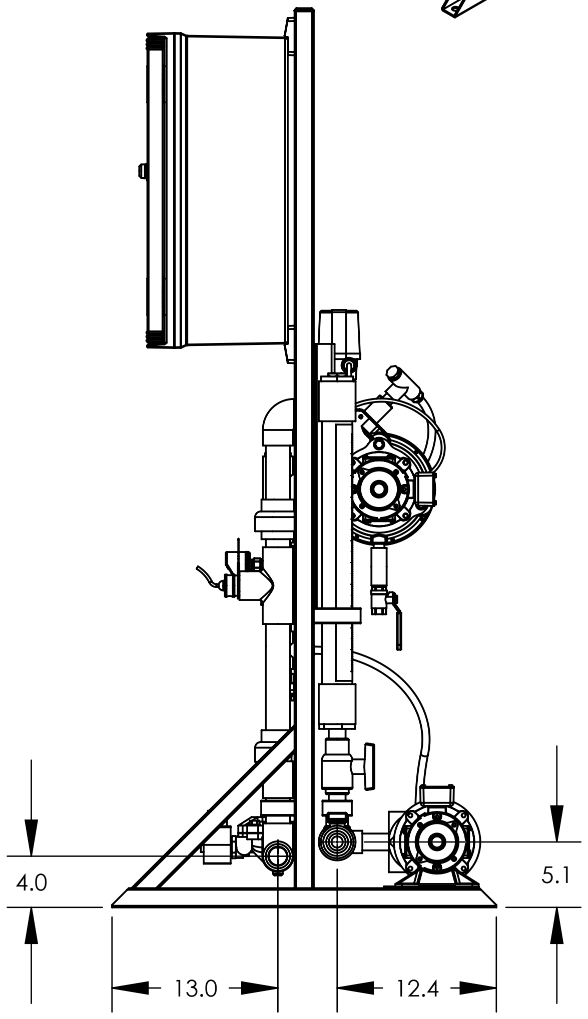
| SIZE | DWG. NO. | REV. |
|---|---|---|
| B | VM-P-2400-Rp-1-A-2 | A |

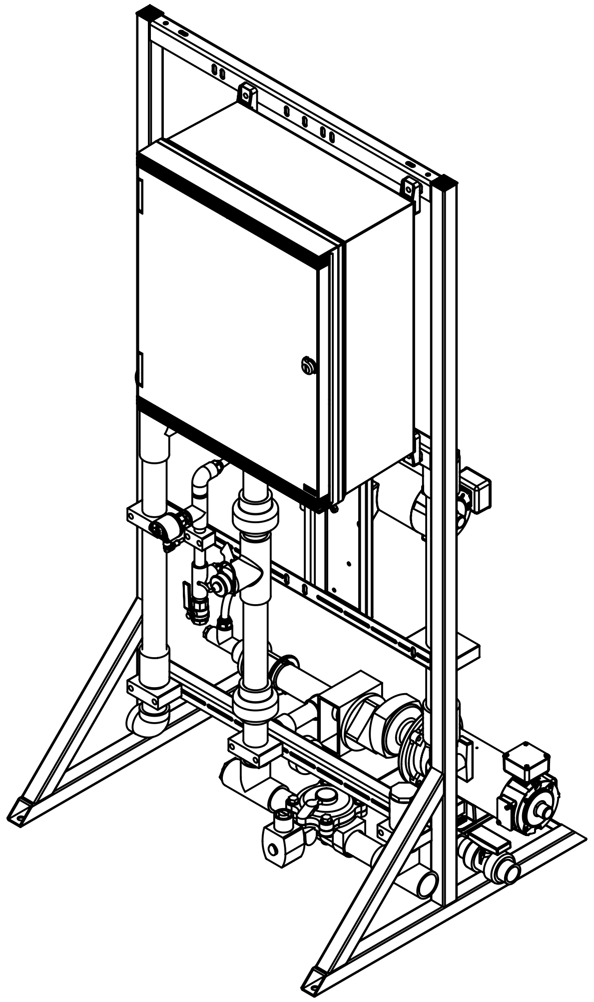
SCALE 1:10 DO NOT SCALE DRAWING SHEET 1 OF 2











NOTE: DRAWINGS ARE FOR GENERAL LAYOUT USE ONLY.
SEE PROPOSAL FOR DETAILS OF THE PROPOSED SCOPE OF SUPPLY.

VELODYNE

VELOBLEND SALES DRAWING,
SERIES 2400, Rp CONTROLS

| SIZE | DWG. NO. | REV. |
|---|---|---|
| B | VM-P-2400-Rp-1-A-2 | A |

SCALE 1:15 DO NOT SCALE DRAWING SHEET 2 OF 2

**AERZEN USA CORPORATION**
108 Independence Way
Coatesville, PA  19320
Tel. (610) 380-0244 ♦ Fax. (610) 380-0278

**Confidential & Proprietary - this document shall not be distributed to anyone other than the intended recipients.**

*AERZEN* Reference Number: ENV-297363.2 27-Oct-22
Re: Newport, NH WWTF Upgrade

| | |
|---|---|
| ***To:*** | Sarah Viola |
| Firm - | Wright-Pierce |
| email - | sarah.viola@wright-pierce.com |
| phone - | 603-570-7129 |
| ***AERZEN*** | Representative Info: |
| Name - | Mike W. Loncoski of Aqua Solutions |
| e-mail - | mloncoski@aquasolutionsinc.net |
| phone - | (207) 828-5559 |

| | |
|---|---|
| ***AERZEN*** | Proposal Prepared By: |
| Name - | Lester Dabu |
| email - | lester.dabu@aerzen.com |
| phone - | (302) 582-1473 |
| ***AERZEN*** | Regional Manager: |
| Name - | Scott Trail |
| e-mail - | scott.trail@aerzen.com |
| phone - | (484) 678-6578 |

**This scope of supply does NOT include the following items: MCC Starter, VFD, External Controls, Isolation Valves, Anchor Bolts and Installation Hardware. VFD is available, either separate or mounted.**

**PD blower** **Model: GM 10S.**

| **Performance Data:** | | **Design** | **Min** |
|---|---|---|---|
| Intake volume, handled at intake condition | icfm | 207 | 115 |
| Volume handled at normal condition | scfm | 180 | 100 |
| Relative humidity | Φ | 80% | 80% |
| Intake pressure (abs.) | psia | 14.22 | 14.22 |
| Discharge pressure | psig | 9.40 | 9.40 |
| Intake temperature | °F | 100 | 100 |
| Discharge temperature | °F | 244 | 275 |
| Main rotor speed | rpm | 2,865 | 1,933 |
| Motor Speed | rpm | 1,765 | 1,191 |
| Power consumption at coupling | bHp | 12.5 | 8.3 |
| Motor Rating | HP | **15** | |
| Tolerance on flow & power | ± 5 % | | |
| Sound pressure level w/o enclosure | dB(A) | 85 | |
| Sound pressure level w/ enclosure | dB(A) | 70 | |

*Measured in free field at 3ft. distance from the outline of the unit
*does not include system piping noise (tol. ± 2 dB(A)).

**Weights & Dimensions:**

| | | |
|---|---|---|
| Discharge connection | EPDM ANSI | 3" |
| Blower pkg weight | lbs. | 1,011 |
| Envelope dim.* | L x W x H in. | 45 x 37 x 51 |
| Cooling Fan | shaft driven | shaft driven |

* non binding dimensions includes, inlet filter silencer, relief valve, check valve, and flex connector

**Confidential & Proprietary - this document shall not be distributed to anyone other than the intended recipients.**

***AERZEN*** Reference Number: ENV-297363.2 27-Oct-22
Re: Newport, NH WWTF Upgrade

**PD blower** **GM 10S.**

**Aerzen Generation 5 Delta Blower Package consists of the following components, assembled in our factory.**

- Aerzen Rotary Lobe Blower GM Series
- base frame with integrated reactive type, discharge silencer
- hinged motor support as automatic belt tensioning device
- set of vibration isolating mounts
- intake filter-silencer
- narrow V-belt drive with guard
- spring loaded pressure relief valve
- discharge manifold with externally accessible integrated check valve
- flexible connector with clamps for schedule 40 pipe, discharge

**Scope of Supply**

2 compact blower package as listed above
2 motor 15 HP, 4-pole, NEMA, TEFC, 208-230/460 V / 60 Hz, prm-eff, 254T, T-Stat, AEGIS ring
2 sound enclosure with integral shaft driven cooling fan
2 set of instrumentation (4" gauges: P1, P2, T2 with High Temp Switch)

**Factory Services**

2 Simplified ISO-1217, Annex B test report(s)
1 submittal data, hard copy
1 O&M manual, hard copy
2 factory set PRV to 10.9 psig

**Onsite Manufacturer Services**

1 trip(s), 2 day(s) total installation inspection, startup, & training

**Spare Parts**

2 air filter, 2 belt set, 1 Delta Lube 1-Gal,

**Freight & Packaging**

1 freight to jobsite
2 domestic packaging

**TOTAL for 2 unit(s) c/o: Mike W. Loncoski of Aqua Solutions**

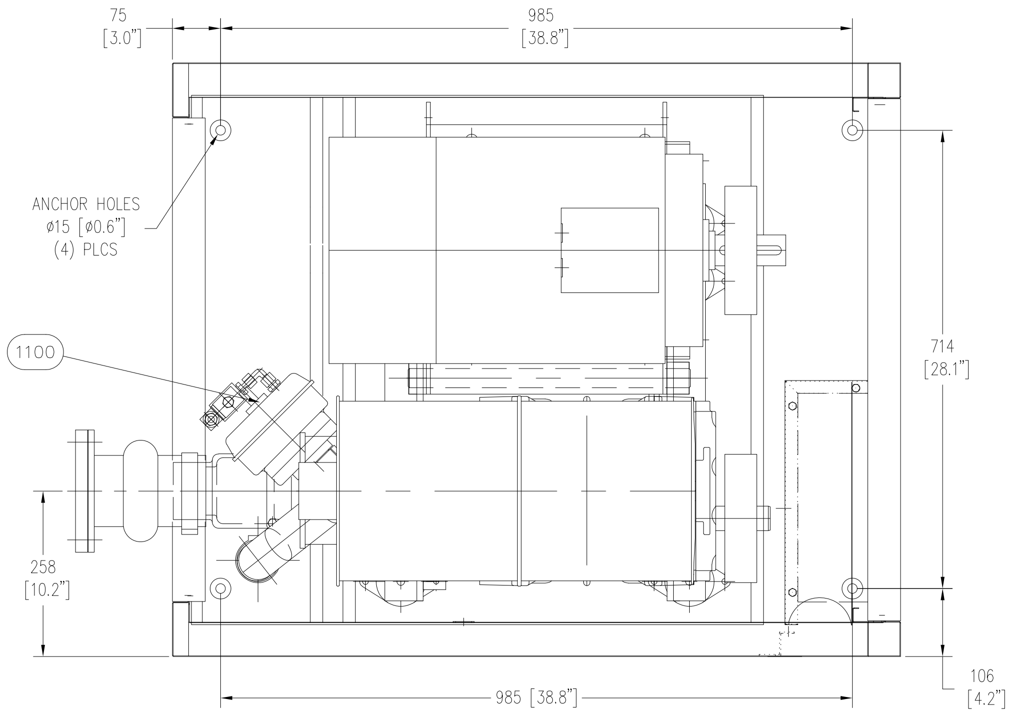
**Optional Adders:** 2 Ducted inlet piping (3" stub pipe) **c/o: Mike W. Loncoski of Aqua Solutions**
2 Danfoss VFD NEMA 12, 15 HP, package mounted

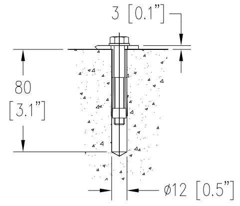
**Confidential & Proprietary - this document shall not be distributed to anyone other than the intended recipients.**

**Freight: CIP Jobsite**
**Terms: This offer is subject to Aerzen Standard Terms and Conditions (A2-001-USA January 2009)**
**Submittals: 4 weeks after receipt of Purchase Order**
**Warranty: 24 months after start up or 30 months after delivery, which ever comes first on Aerzen package***
*Maintenance must be performed per the Instruction Manual using Aerzen spare parts.
*Equipment not manufactured by Aerzen will carry the manufacturer's standard warranty.
**Quote Validity: All prices quoted are valid for 30 days from the date stated on the quotation.**

| ITEM | QTY | DESCRIPTION | DESCRIPTION 2 |
|---|---|---|---|
| 100 | 1 | BLOWER TORSO | GM10S, DN80 |
| 110 | 1 | PRESSURE RELIEF VALVE | |
| 200 | 1 | SOUND ENCLOSURE | |
| 300 | 1 | ELECTRIC MOTOR | SHOWN WITH A 280 NEMA MOTOR |
| 310 | 1 | MOTOR MOUNTING | |
| 320 | 1 | BELT DRIVE | |
| 400 | 1 | BELT GUARD | |
| 500 | 1 | COOLING FAN | |
| 600 | 1 | DISCHARGE CONNECTION | 3"-150# ANSI |
| 800 | 1 | INSTRUMENTATION | |
| 1100 | 1 | UNLOADING VALVE | (OPTIONAL) |

## PLAN VIEW

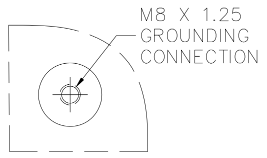




## SOUND ENCLOSURE ANCHOR

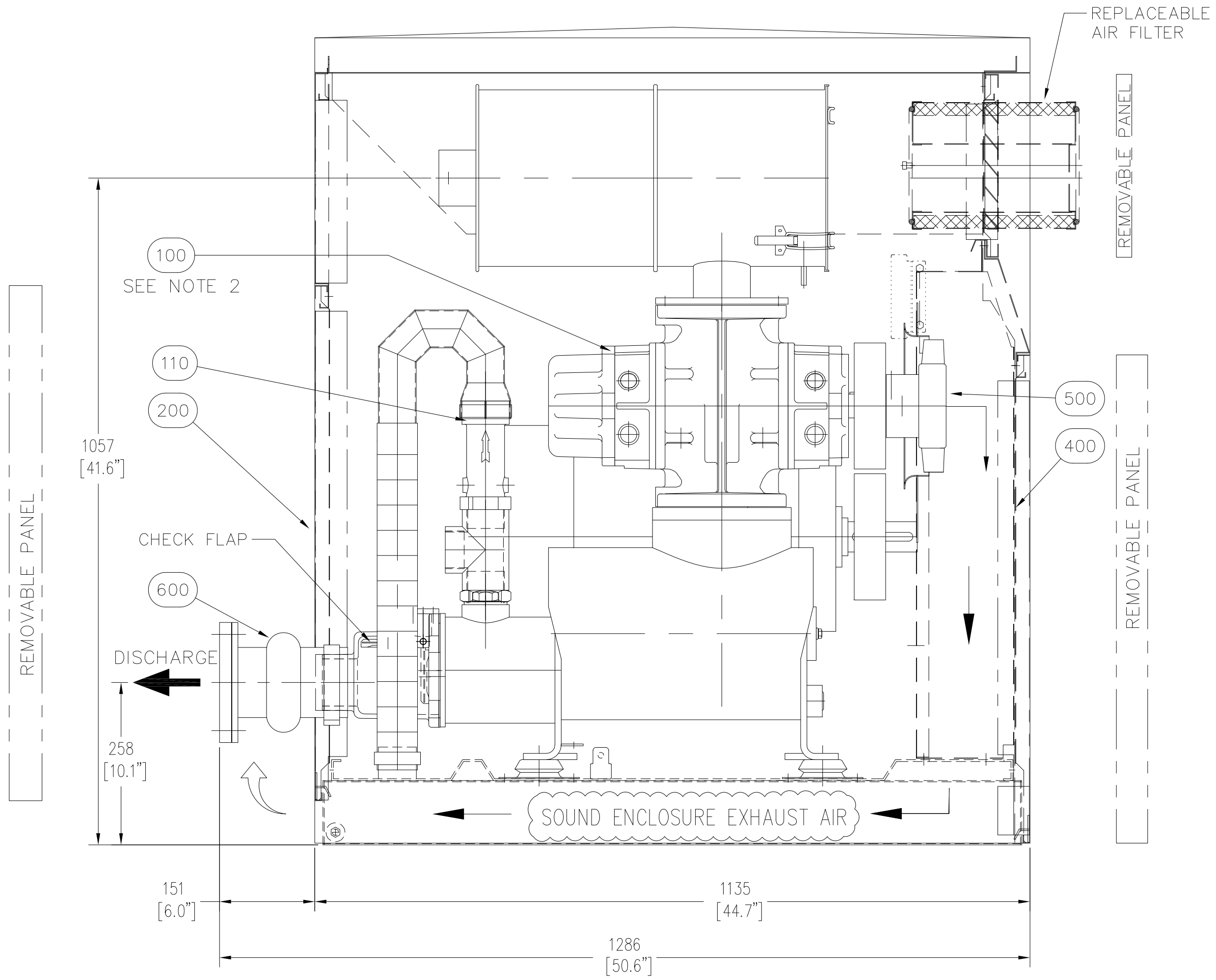
RECOMMENDATION
SHOW WITH OPTIONAL ANCHOR
AERZEN PART NO. 2000053552
2X SCALE

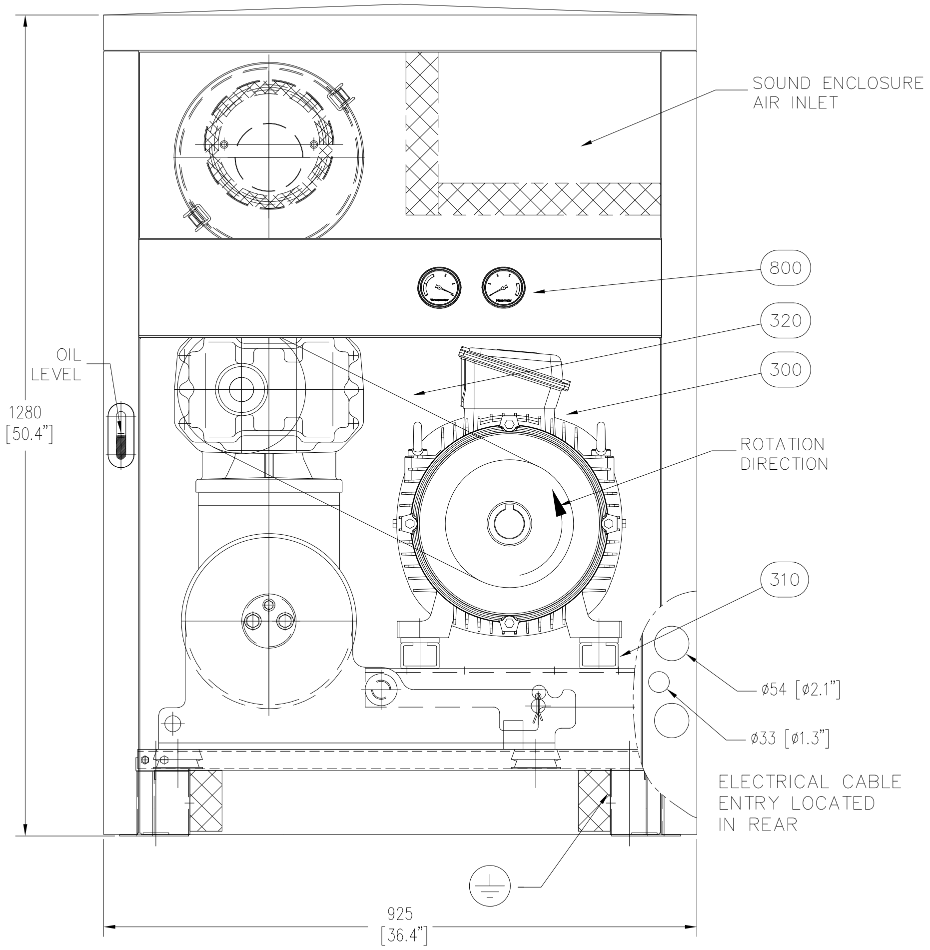
A



## EARTH GROUND

MAT'L: 304 SS
4X SCALE





## FRONT VIEW

## NOTES:

1. TOLERANCE ON DIMENSIONS = ±12mm [0.5"]
2. ITEM 100 (BLOWER TORSO) INCLUDES BLOWER STAGE, INLET SILENCER, BASE FRAME/DISCHARGE SILENCER, VIBRATION ISOLATORS, & CONNECTION HOUSING WITH CHECK FLAP
3. CUSTOMER PIPING TO BE INDEPENDENTLY SUPPORTED
4. LIFT PACKAGE FROM BLOWER SIDE THROUGH FORK LIFT POCKETS IN BASE OR LIFTING HOLES IN CORNER OF BASE USING SPREADER BAR
5. SEE JOB DATA SHEETS FOR PERFORMANCE DATA, PART NUMBERS, TOTAL PACKAGE WEIGHT, INSTRUMENTATION, ANY OTHER OPTIONAL EQUIPMENT & OWNERS MANUAL

## WEIGHT

| | | |
|---|---|---|
| BLOWER PACKAGE (LESS MOTOR) | 344 kg | 756 lbs |
| ELECTRIC MOTOR (ITEM 300) | - | - |
| TOTAL (WET WEIGHT) | | |

AERZEN

**AERZEN USA *CORPORATION***
**108 INDEPENDENCE WAY, COATESVILLE, PA.**
**PH: (610) 380-0244 FX: (610) 380-0278**
**WWW.AERZENUSA.COM**

**CLASS I**

**SCALE: -** **SHEET: 1/ 1**

| | NAME | DATE |
|---|---|---|
| DRAWN BY | JRH | 1.29.2019 |
| CHECKED BY | RJP | 1.29.2019 |
| APPROVED BY | - | - |

DRAWING NO.
**GB-006949-P2031000**
NAVISION PN.
-

TITLE
**GA DRAWING**
**GM10S, DN80, G5**
**F3 SOUND ENCL.**
**3"-150# ANSI (OUT)**
**PRESSURE**
-

| REV. | NAME | DATE |
|---|---|---|
| A | KLS | 03/05/2021 |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |

# Diffused Aeration Equipment

for

## Newport, NH

### Sludge Holding Tanks

Sanitaire #s31706-22
September 27, 2022
tb \\01bdfp02-2\Proposals\s31706-22\s31706.aer

## Sanitaire Aeration Design Inputs for: Newport, NH, Sanitaire #s31706-22

**Tank Geometry**

2 Trains each Consisting of: 1

| Parameter | Units | Pass 1 |
|---|---|---|
| Parallel Reactors | | 1 |
| Pass Process | | Aerobic |
| SWD | ft | 20.0 |
| Submergence | ft | 19.2 |
| Volume | ft³ | 9,600.0 |
| Reactor Geometry: | | Rect |
| Length | ft | 24.0 |
| Width | ft | 20.0 |

**Oxygen/Air Distribution**

| | | |
|---|---|---|
| | Zone | 1 |
| | Pass | 1 |
| Air Flow | | 100.0% |

**Oxygenation**

| Parameter | Units | 200 scfm per tank |
|---|---|---|
| No. Trains Operating | | 2 |
| Air Rate | scfm | 400.0 |

**Standard Oxygen Correction Factor Parameters**

| Parameter | Units | 200 scfm per tank |
|---|---|---|
| Site Elevation | FASL | 500 |
| Ambient Pressure | PSIA | 14.46 |
| Water Temperature | °C | 20 |

Notes:

***Bold, Italicized text indicate assumptions made by Sanitaire***

A - Indicates Actual (AOR) Requirement.

S - Indicates Standard Condition (SOR) Oxygen requirement.

If the AOR/SOR parameter is not given, then its value will be evaluated later if suitable alpha, beta, D.O., theta, pressure, and temperature data is supplied.

Round tanks are evaluated as rectangular tanks diameter equal to length and equal surface area.

Annular tanks are evaluated as rectangular tanks of width equal to the annular width and equal surface area.

**Sanitaire Project Name: Newport, NH**
**Sanitaire Project #s31706-22**
**Design Summary**

| | Units | 200 scfm per tank Air Flow |
|---|---|---|
| No. Trains in Operation | | 2 |
| No. Grids in Operation | | 2 |
| No. Operating Diffusers | | 170 |
| SOR | lb/day | 3,488 |
| SOTE | % | 34.8 |
| Total Air Rate | scfm | 400.0 |
| Min.Diffuser Air Rate | scfm/diff. | 2.35 |
| Max. Diffuser Air Rate | scfm/diff. | 2.35 |
| Static Pressure | psig | 8.31 |
| Diffuser DWP @ Min Air | psig | 0.28 |
| Diffuser DWP @ Max Air | psig | 0.28 |
| | | |
| Pressure @ Top of Dropleg | psig | 8.83 |
| Est. Blower Efficiency | | 70% |
| Est. Motor Efficiency | | 90% |
| Shaft Power | Bhp | 19.19 |
| Est. Motor Electrical Load | kW | 15.91 |
| Est. Standard Aeration Efficiency | #SOR/BHP-hr | 7.57 |

Notes:

(1) Design air is the maximum of process air or mixing air

(2) Delivered oxygen based on design air

(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss

(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.

(5) Diffuser Air Flow based on Active Valve Modulation

(6) Blower Pressure Capability also requires consideration of:
blower and the aeration assembly dropleg connections.
Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other
Fine Pore systems regardless of supplier or type of diffuser element.
C. Increased diffuser submergence during Peak Flow conditions.

(7) Air Flow defined at 20°C

(8) Fine Mixing air based on MOP/8 0.12 scfm/ft²

**Sanitaire Project Name: Newport, NH**
**Sanitaire Project #s31706-22**
Consulting Engineer:
Operating Condition: 200 scfm per tank
Oxygen Distribution: Air Flow

### Aeration System Design

| Parameter | Units | Zone 1 | Totals/Overall |
|---|---|---|---|
| Pass | | 1 | |
| SWD | ft | 20.00 | |
| Subm | ft | 19.19 | |
| Volume | ft³ | 9,600.0 | 19,200.0 |
| No. Parallel Tanks | | 1 | |
| No. Trains in Operation | | 2 | |
| Grid Count | | 1 | 2 |
| Dropleg Diameter | inches | 4 | |
| At/Ad | | 13.7733142 | |
| Diffuser Density | % Floor | 7.26% | |
| Diffusers/Grid | | 85 | 170 |

### Oxygen Transfer

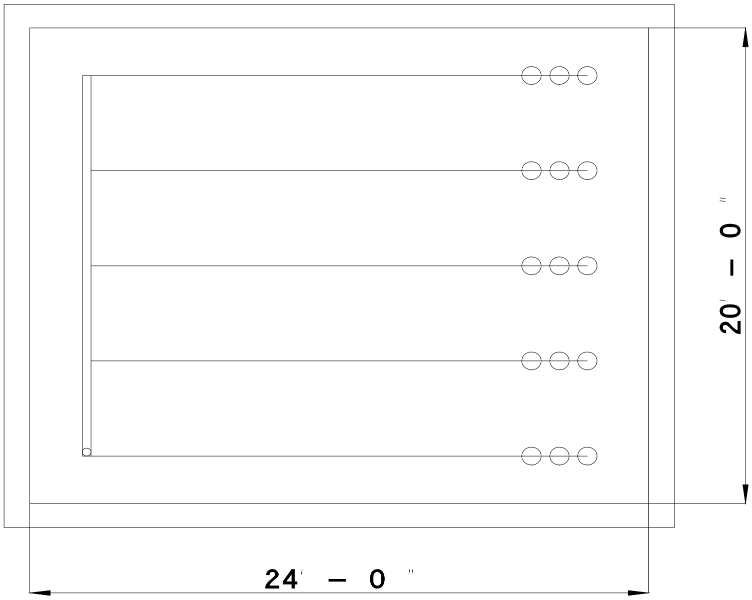
| | | | |
|---|---|---|---|
| Diffuser Type | | SSLP | |
| Alpha | | | |
| Beta | | | |
| Theta | | | |
| D.O. | mg/l | | |
| Water Temp | °C | 20 | |
| AOR/SOR | | | |
| Oxygen Distribution | %/Zone | 100.0% | 100.0% |
| AOR | lb/day | | |
| SOR | lb/day | | |
| Air Rate (7) | scfm | 400.0 | 400.0 |

### Performance

| | | | |
|---|---|---|---|
| Mixing Criteria | scfm/ft² | 0.12 | |
| Safety Factor | % | | |
| Mixing Air (8) | scfm | 115.2 | |
| Process Air (for SOR) | scfm | 400.0 | |
| Design Air (1,7) | scfm | 400.0 | 400.0 |
| Diffuser Air Rate | scfm/Diff. | 2.35 | 2.35 |
| Delivered SOR | lb/day | 3,488.2 | 3,488.2 |
| Delivered SOTE | % | 34.8% | 34.8% |
| Pressure @ Top of Dropleg | psig | 8.83 | 8.83 |
| Shaft Power | Bhp | 19.2 | 19.2 |

Notes:

(1) Design air is the maximum of process air or mixing air
(2) Delivered oxygen based on design air
(3) Brake Horsepower based on adiabatic compression, 70% mechanical efficiency and 0.30 psi lineloss
(4) Performance based on diffuser density (At/Ad), submergence, and diffuser unit air flow.
(5) Diffuser Air Flow based on Active Valve Modulation
(6) Blower Pressure Capability also requires consideration of:
A. The Air Main headloss (piping, fittings, valves, instrumentation, etc.) between the blower and the aeration assembly dropleg connections.
B. Potential for increased headloss resulting from diffuser fouling and/or aging. Please refer to the US EPA Fine Pore Design Manual (EPA/625/1-89/023), WEF Manual of Practice FD-13, and other technical publications for a detailed discussion on this subject. Note that this headloss consideration relates to all Fine Pore systems regardless of supplier or type of diffuser element.
C. Increased diffuser submergence during Peak Flow conditions.
(7) Air Flow defined at 20°C
(8) Fine Mixing air based on MOP/8 0.12 scfm/ft²



Single Train Information

| Grid No | Grid Count | Drop Leg ∅" | Header Count | Header Spc,ft. | Header Len,ft. | Discs/ Grid | At/ Ad | Discs/ Train |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 4 | 5 | 4.00 | 19.58 | 85 | 13.77 | 85 |

Total Discs/Train 85

Note: Some headers may be omitted for clarity

PRELIMINARY - THIS DRAWING IS NOT INTENDED FOR CONTRACT DOCUMENTS, SUBMITTALS, OR CONSTRUCTION

**Sanitaire**
a xylem brand
MILWAUKEE, WISCONSIN 53204

CUST NO.
DWG NO.

Newport, NH
9" Disc Aeration System

DRAWN BY tb
DATE 9/27/22
CHKD BY
DATE
APPVD BY
DATE
JOB s31706–22
SHEET

# Basis of Design Memorandum

Project No.: **20828 Task B (Preliminary Design) – Newport, NH WWTF Upgrade**

Subject: **Plant Water System**

Prepared By: **S. Viola** Date: **10/12/2022**

Reviewed By: **M. Curry** Date: **10/28/2022**

Revised By: **S. Viola** Date: **12/2/2022**

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## Introduction

This technical memorandum provides a summary of considerations for a proposed Plant Water System as part of the wastewater treatment facility (WWTF) preliminary design.

## Description of Relevant Existing Facilities

The WWTF previously had process water pumps which  were installed as a triplex pump skid that pumped water from the effluent channels of the chlorine contact tanks (CCT), servicing several locations throughout the Facility. Since that time, additional upgrades have taken place throughout the facility, and the existing plant water system was abandoned. The process water pumps have since been removed and the plant water distribution system has been abandoned as there are no significant process water needs at the Facility.

## Facility Plan Recommendations

The proposed WWTF upgrade will include the addition of process equipment, some of which have significant water demands (i.e., sludge dewatering, grit removal).  Based on these water demands, a plant water system was proposed as part of Facilities Plan Amendment to allow the Town to utilize effluent wastewater in lieu of relying on the potable water system.  The proposed plant water system is recommended as a Bid Alternate to the project and would consist of the following:

- A new plant water system consisting of a basket strainer and 2-3 plant water pumps
- Installation of plant water distribution system to supply new processes (i.e., grit treatment, sludge dewatering, yard hydrants)
- Modification of the UV disinfection structure to accommodate a plant water suction tank

## Client Preferences

The client has not indicated preferences for a proposed plant water system.

## Design Guidelines

TR-16:

- In-plant water supply should be in ample quantity and adequate pressure, and should provide a means for measurement when preparing specific solution concentrations by dilution.
- Where a separate non-potable water supply will be provided (such as plant effluent water), a backflow prevention device will not be necessary; however, all sill cocks and hose bibs should be posted with a permanent OSHA-approved sign indicating water is not safe for drinking.

NHDES Env-Wq:

- A sign shall be permanently posted at each hose bib, sill cock, or other fixture on the non-potable, in-plant water system indicating that the water is not safe for drinking.
- The number of backflow devices required shall be minimized by providing a separate, non-potable, in-plant water system using a single backflow prevention device.

## Alternatives Analyses

The new WWTF will include equipment/processes which have water demands ranging from 5 gpm – 100 gpm or more depending on the concurrent operations of equipment. While the Town could utilize the existing potable water system for these uses, the Facility would benefit from a dedicated plant water system to reduce potable water use/expenditures.

Projected plant water use indicates that a variable speed, duplex pump system with a hydropneumatics tank will provide the Town with a system that will manage the facility's varying plant water demands. The proposed plant water system would be installed in the same location as the original system (Dry Well). Based on the plant water system's high pressure head requirements relative to flows, vertical multistage centrifugal pumps were chosen over other pump considerations (i.e., horizontal single-stage).

## Basis of Design

A new plant water system will be provided to supply non-potable plant water to support the following operations:

- Yard hydrants
- Wash down hose bib stations
- Flushing water for equipment (grit removal, dewatering, septage, etc.)
- Carrier water for chemicals

The Facility will also be provided with the capability to utilize Town-provided potable water in the circumstance that the plant water system is not operational or is undergoing maintenance. The potable water line will be equipped with a back flow preventor to isolate potable water from process water.

| Plant Water System | |
|---|---|
| **Pumps** | |
| Application: | Disinfected effluent plant water |
| Total Pumps: | 2 (Lead-lag) |
| Type: | Vertical Centrifugal Multistage Pumps, variable speed |
| Design Capacity: | 20 - 90 gpm (one pump)<br>90 - 180 gpm* (two pumps) |
| Design Pressure: | 70 – 90 psi |

| Plant Water System | |
|---|---|
| Power: | 460V/3ph/60Hz |
| Motor: | 10 hp |
| Ancillary System Components | |
| Hydro-pneumatic Tank: | Approx. 300-gallons |
| Suction Basket Strainer: | 6” Duplex Basket Strainer, Cast-iron |
| Strainer Opening | 1/32” – 1/8” perforated |
| Wash Method | Manual |
| Flowmeter: | Magnetic |
| System Redundancy: | Backflow protected, potable water connection (Process Water) |

*Note: Only one or two hydrants can be operational at a time. There will be loss of pressure in the system when two hydrants are operating and major intermittent use occurs.

## Building / Structure Implications

The existing Chlorine Contact Tank (CCT) concrete channels will be repurposed for a new UV system. The effluent channels following UV disinfection will be utilized as plant water tank to ensure that there is adequate disinfected effluent in storage to accommodate the plant water demand. A new plant water suction penetration into the existing UV disinfection tanks and into the existing Control Building is anticipated. Existing penetrations within the Control Building Dry Well are expected to be re-used to accommodate the discharge.

## Process Control Description

The plant water system is a high-pressure system that pumps disinfected effluent to various locations within the facility. Based on anticipated system requirements, plant water pumps vary in speed to maintain an operator adjustable system pressure. The hydropneumatic tank will allow the plant water pumps to turn off during lower flow conditions and passively satisfy the plant water demand. The plant water system will be provided with a manual duplex basket strainer, one hydro-pneumatic surge tank, valves, piping and field instrumentation.

Controls at the plant water system will be via a PLC based Local Control System. The PLC shall interface with discharge pressure transducers, a discharge electromagnetic flow meter, and a duplex basket strainer differential pressure switch. Local controls will include an E-Stop, H-O-A switch, and a speed controller. The plant water system shall have a totalizer, pump run time meter, pump run lights, and alarm lights. The speed of the pumps will be controlled through operator adjustable system ON/OFF pressure set points. PLC alarm indications will be provided at HIGH and LOW PLANT WATER PRESSURE set points, pump FAIL or VFD FAULT status, and strainer HIGH DIFFERENTIAL PRESSURE indication.

## Construction Sequencing

Since there is no plant water system currently in place, installation of the new system will not disrupt any other processes. However, startup will be dependent upon completion of plant water process piping upgrades including, installation of new plant water suction piping from the UV Disinfection structure and installation of plant water feed piping throughout the facility.

## Future Expansion Considerations

Based on the future flow projections, it is unlikely that the WWTF will require additional plant water capacity exceeding what has been predicted and described above. However, if required, there is adequate space in the influent dry well if a future pump should be needed or if existing pumps needed to be upsized.

## File Location

Plant Water Basis of Design Memorandum.docx

## Attachments

☒ Key Design Calculations

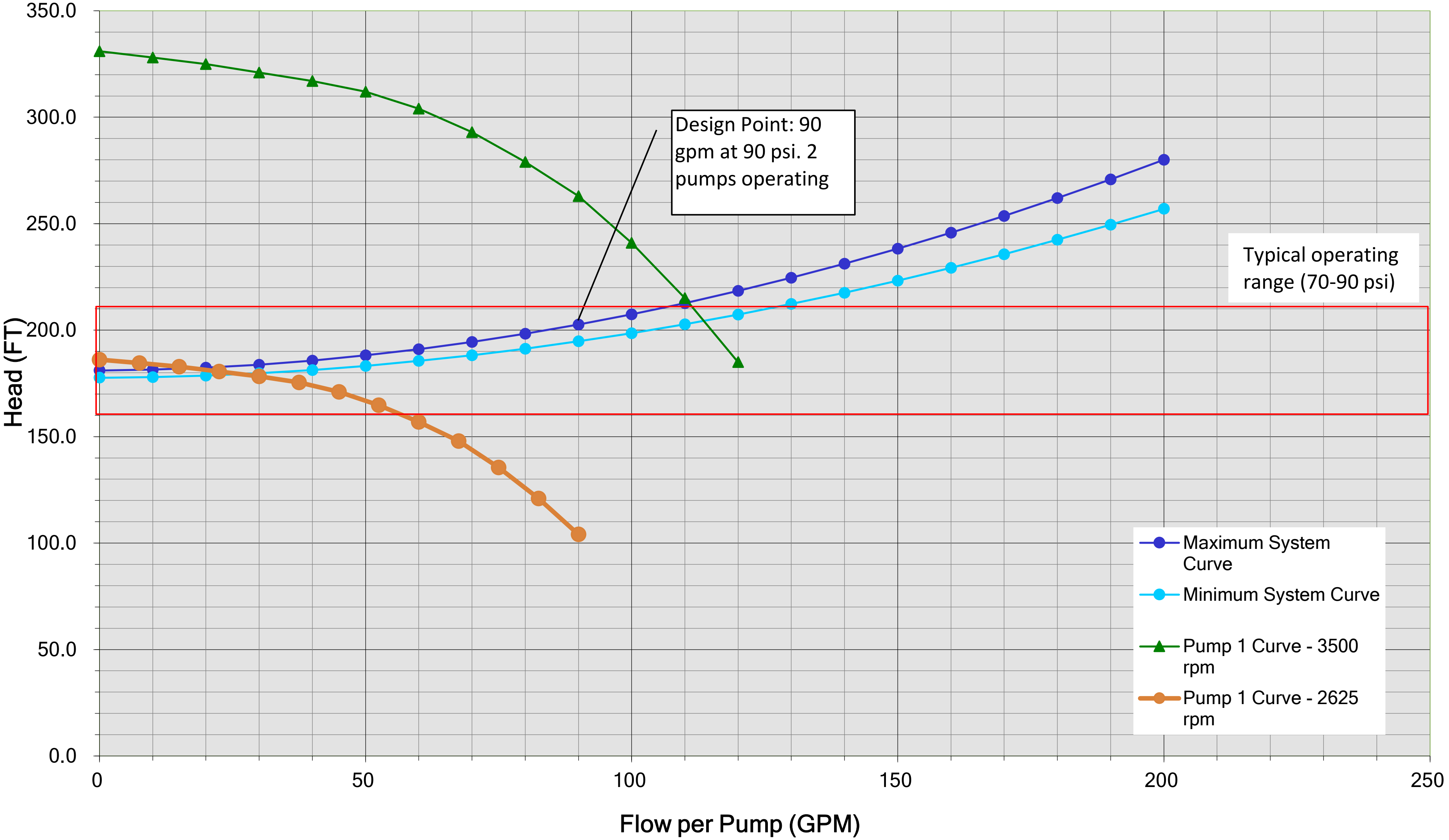
☒ Manufacturer Cut Sheets

| | |
|---|---|
| Job: | Newport, NH WWTF Upgrade |
| Job No.: | 20828B |
| CALC. BY: | SEV | 9-Sep-2022 | REV: |
| CHKD. BY: | JRM/MAC | 28-Oct-2022 | REV: |
| FILE: | |

**PLANT WATER SYSTEM SIZING**

| Location | Service | Flow per Unit, GPM | # of Total Units | Plant Water System Flows | | | | | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | | | | # of Concurrent Units Oper. | C/L/S/W | Continuous Long-term Flow C | Frequent Long-term Flow L | Infrequent Washdown Flow W | |
| **Septage Receiving** | | | | | | | | | |
| | Yard Hydrant | 60 | 1 | 1 | W | | | 60 | 50 psi |
| **Grit Removal** | | | | | | | | | |
| | Hose Bibb Station | 15 | 1 | 1 | W | | | 15 | 50 psi |
| | Grit Slurry Pump | 50 | 1 | 1 | L | | 50 | | 40 psi (Hydrodyne spec) |
| **Solids Handling** | | | | | | | | | |
| | Polymer Dilution Water | 5 | 1 | 1 | L | 5 | 5 | | 2 - 20 gpm estimate, 5 is typical. High potential to use potable for this. |
| | Equipment Flushing | 50 | 2 | 1 | W | | | 50 | 25 - 50 gpm @ 22 psi per centrifuge PID |
| | Hose Bibb Station | 15 | 3 | 1 | W | | | 15 | 50 psi |
| | Conveyor Flushing | 15 | 2 | 2 | W | | | 30 | 3/4" connection, 7-10 gpm @ 22 psi per centrifuge PID. Hold 15 gpm. |
| **Influent Pump Station** | | | | | | | | | |
| | Hose Bibb Station - Dry Well | 15 | 1 | 1 | W | | | 15 | |
| | Hose Bibb Station - Wet Well | 15 | 1 | 1 | W | | | 15 | |
| **Chem Feed** | | | | | | | | | |
| | Carrier Water | 1 | 2 | 2 | C | 2 | | | Assumed 1 gpm per FeCL feed in future, cross connection to potable water if use is low. |
| **SBR Tank Complex** | | | | | | | | | |
| | Yard Hydrant | 60 | 3 | 1 | W | | | 60 | 50 psi |
| **Tertiary Disc Filters** | | | | | | | | | |
| | Hose Bibb Station | 15 | 1 | 1 | W | | | 15 | |
| | Filter Washing | 0 | 0 | 0 | W | | | 0 | No plant water connection for Tertiary filters. |
| **UV Disinfection (Chlorine Contact Tanks)** | | | | | | | | | |
| | Hose Bibb Station | 15 | 1 | 1 | W | | | 15 | |
| | Yard Hydrant | 60 | 1 | 1 | W | | | 60 | 50 psi |
| **Control Bulding - Maintenance Garage** | | | | | | | | | |
| | Hose Bibb Station | 15 | 3 | 1 | W | | | 15 | |
| | | | | | | | | | |
| | TOTAL, GPM | | | | | 7 | 55 | 365 | |
| | MAX. REQUIREMENT PER ELEMENT, GPM | | | | | 5 | 50 | 60 | |
| | MIN. REQUIREMENT PER ELEMENT, GPM | | | | | 2 | 5 | 0 | |
| | | | | | | | | | |
| | TOTAL CONTINUOUS USE | | | | | | 7 | | |
| | TOTAL CONTINUOUS & FREQUENT USE | | | | | Average | 62 | | |
| | TOTAL ALLOWANCE FOR INFREQUENT USE | | | | | | 365 | | |
| | 25% ACTUAL INFREQUENT USE | | | | | | 91 | | |
| | TOTAL MIN REQUIREMENT, GPM | | | | | MIN | 5 | | |
| | TOTAL MAX. REQUIREMENT (C, F, 25% of I), GPM | | | | 2 Pumps | MAX | 153 | | |
| | DESIGN AVERAGE REQUIREMENT, GPM | | | | 1 pump | AVG | 62 | | Increased motor size from 7.5 HP to 10 Hp due to 60 gpm being on the verge of a motor size. |

## Newport WWTF Upgrade 1 pump online
## 2 Parallel Pumps Operating in Last Discharge Section
## Low C-Value = 110, High C-Value = 140



GOULDS WATER TECHNOLOGY
a xylem brand

| | |
|---|---|
| Customer | Date 20.10.2022 |
| Contact | Project |
| Phone number | Project no. |
| Email | |

# 15SV5GJ4F60

## Operating data

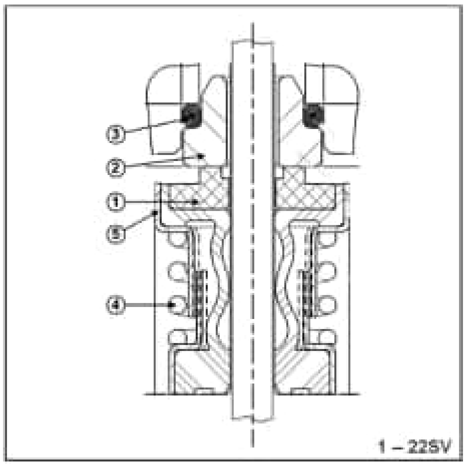
| | | | | | |
|---|---|---|---|---|---|
| Pump type | | Multi-Stage Pumps | Fluid | | Water |
| No. of pumps / Reserve | | 1 / 0 | Operating temperature t A | °F | 39.2 |
| Nominal flow | US g.p.m. | 89.99 | pH-value at t A | | 7 |
| Nominal head | ft | 207.5 | Density at t A | lb/ft³ | 62.4 |
| Static head | ft | 0 | Kin. viscosity at t A | ft²/s | 1.689E-5 |
| Inlet pressure | psi | 0 | Vapor pressure at t A | psi | 14.5 |
| Environmental temperature | °F | 68 | Solids | | 0 |
| Available system NPSH | ft | 0 | Altitude | ft | 0 |

## Pump data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Make | | Goulds Water Technology | | Nominal | US g.p.m. | 98.1 | ( 98.1 ) |
| Speed | rpm | 3500 | Flow | Max- | US g.p.m. | 127 | |
| No. of stages | | 5 | | Min- | US g.p.m. | | |
| Max pressure rating | psi | 362 | | Nominal | ft | 246.8 | |
| Head H(Q=0) | ft | 330 | Head | at Qmax | ft | 160.6 | |
| Weight | lb | 198 | | at Qmin | ft | 330.9 | |
| Efficiency | % | 69.28 | Shaft power | | hp | 8.8 | ( 8.8 ) |
| NPSH 3% | ft | 9.4 | Max. shaft power | | hp | 9.3 | |
| Inlet pressure + zero gpm pressure | psi | 143.5 | Shutoff TDH | | ft | 345 | |
| Pump Flange Rating | | Class 250 / 300 | Square Footage | | | 0.82342 | |

## Shaft Seal

| | |
|---|---|
| Single Seal | Xylem |
| Mechanical Seals | |
| 1 - Rotating Face | Carbon |
| 2 - Stationary Face | Silicon Carbide Graphite Filled |
| 3 - Elastomers | Viton |
| 4 - Spring | 316SS |
| 5 - Metal Components | 316SS |



## Motor data

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Manufacturer | Baldor | Electric voltage | 208 V | Speed | 3500 rpm | Insulation class | F |
| Specific design | 3ph TPE | | | Frame size | 215TC | Colour | RAL 5010 |
| Type | 208-230/460V 215TC (V12A32E5BE2S) | | | Degree of protection | IP 55 | | |
| Rated power | 10 hp | Electric current | 24.9 A | | | | |

## Remarks:

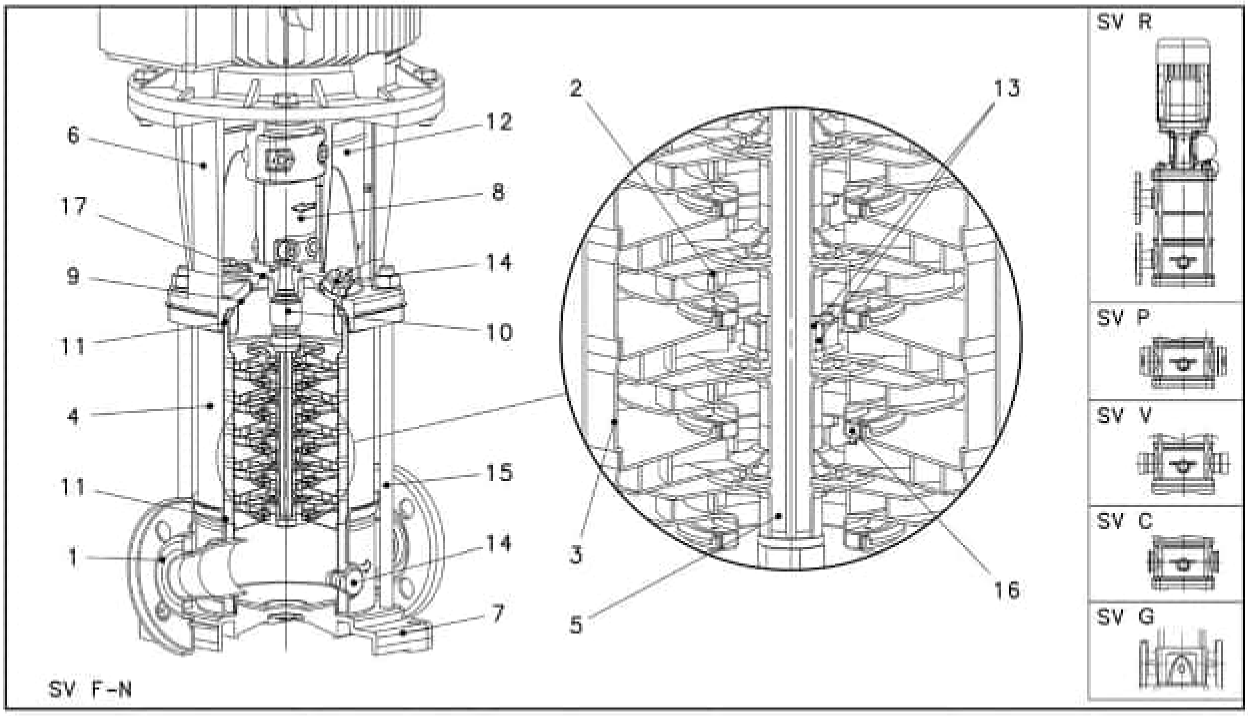
GOULDS WATER TECHNOLOGY
a xylem brand

| | | | |
|---|---|---|---|
| Customer | | Date | 20.10.2022 |
| Contact | | Project | |
| Phone number | | Project no. | |
| Email | | | |

# 15SV5GJ4F60

## Pump Materials

| | |
|---|---|
| 1 - Pump Body | Cast Iron (ASTM Class 35/40B) |
| 2 - Impeller | Stainless Steel (AISI 304) |
| 3 - Diffuser | Stainless Steel (AISI 304) |
| 4 - Casing | Stainless Steel (AISI 316L) |
| 5 - Shaft | Stainless Steel (AISI 316) |
| 6 - Adapter | Cast Iron (ASTM Class 35/40B) |
| 7 - Base | N/A |
| 8 - Coupling | Aluminum (A384.0-F) |
| 9 - Seal Plate | Stainless Steel (AISI 316L) |
| 10 - Mechanical Seal | Refer Mechanical Seals |
| 11 - Elastomers | Refer Mechanical Seals |
| 12 - Coupling Guard | Stainless Steel (AISI 304) |
| 13 - Shaft Sleeve and Bushing | Tungsten carbide |
| 14 - Fill/Drain Plugs | Stainless Steel (AISI 316) |
| 15 - Tie Rods | Carbon Steel / Zinc Plated (A29 Gr.1045) |
| 16 - Wear Ring | PPS |
| 17 - Seal Gland | Stainless Steel (AISI 316) |



**Remarks:**

**GOULDS WATER TECHNOLOGY**
a xylem brand

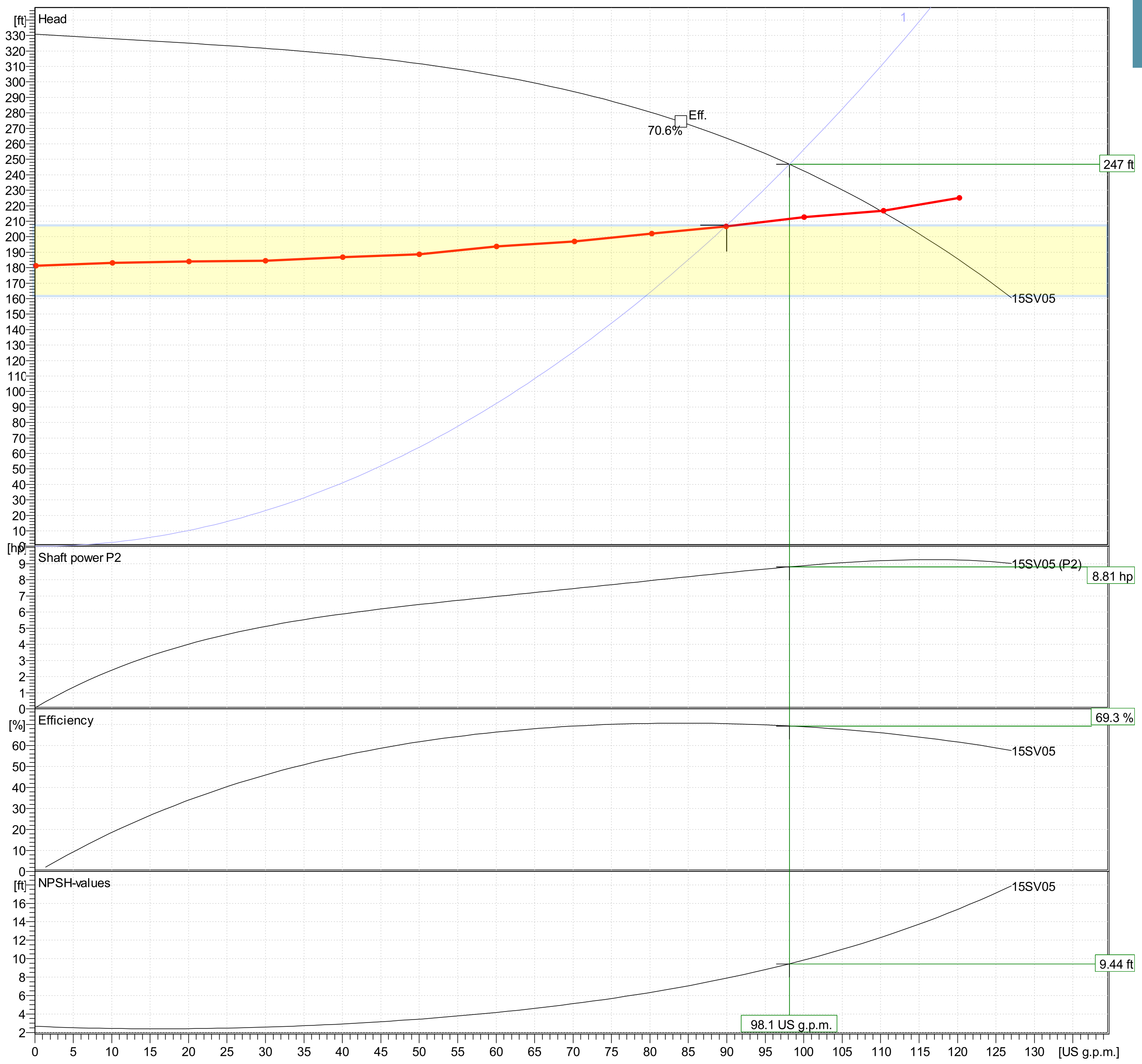
| | | |
|---|---|---|
| Customer | Date | 20.10.2022 |
| Contact | Project | |
| Phone number | Project no. | |
| Email | | |

# 15SV5GJ4F60

## Hydraulic Data

| **Operating Data Specification** | | **Hydraulic data (duty point)** | | **Impeller design** | |
|---|---|---|---|---|---|
| Flow | 90 US g.p.m. | | | Impeller R | 0 inch |
| Head | 207.6 ft | Flow | 98.1 US g.p.m. | Frequency | 60 Hz |
| Static head | 0 ft | Head | 247 ft | Speed | 3500 rpm |

**Power data referred to:**
**Water [100%] ; 39.2°F; 62.4lb/ft³; 1.69E-5ft²/s**
Performance according to ANSI/HI 14.6 - Grade 2B



GOULDS
WATER TECHNOLOGY
a xylem brand

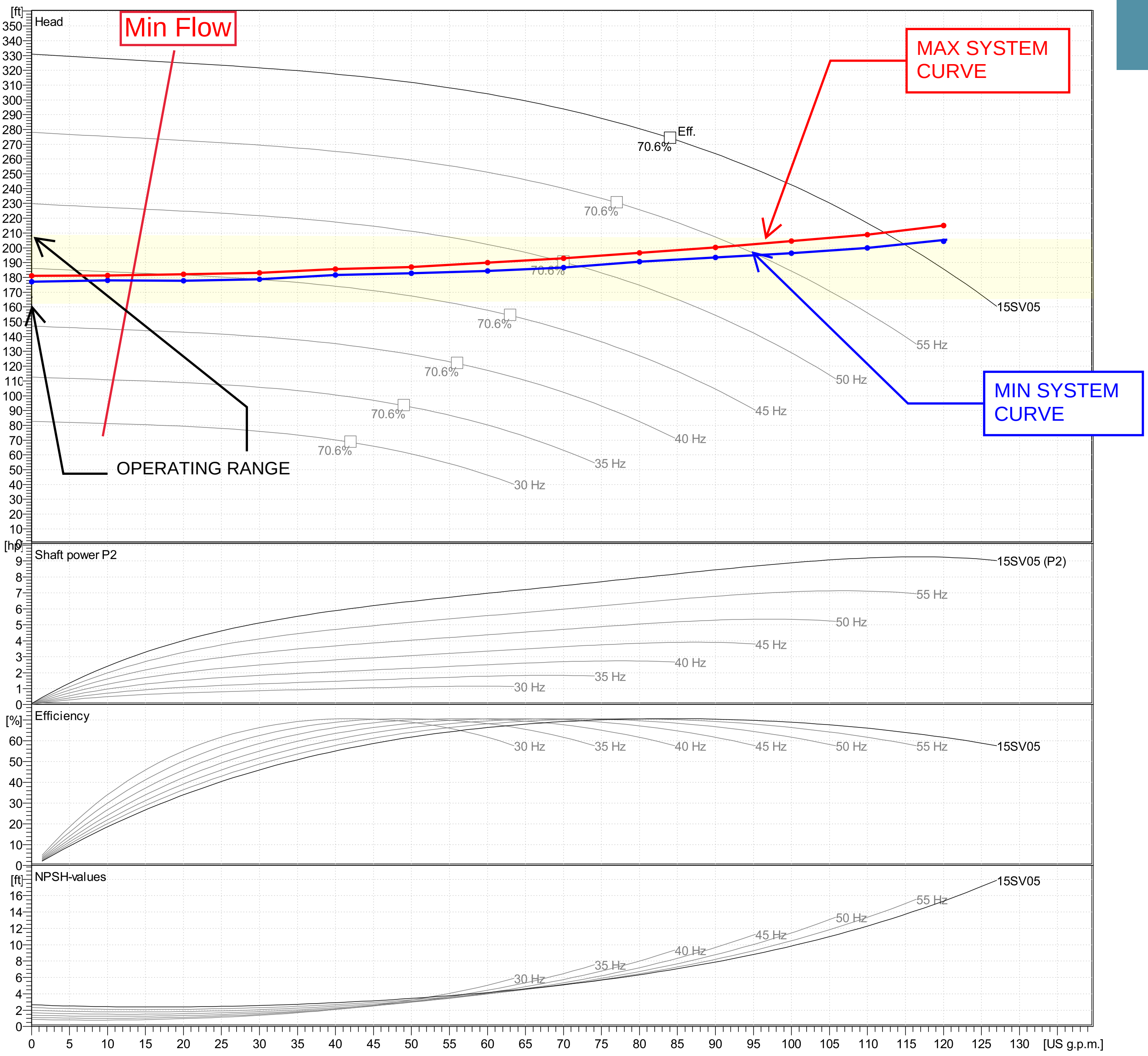
| | | | |
|---|---|---|---|
| Customer | | Date | 28.10.2022 |
| Contact | | Project | |
| Phone number | | Project no. | |
| Email | | | |

## 15SV5GJ4F60

### Hydraulic Data

| **Operating Data Specification** | | **Hydraulic data (duty point)** | **Impeller design** | |
|---|---|---|---|---|
| Flow | 0 US g.p.m. | | Impeller R | 0 inch |
| Head | 0 ft | Flow | Frequency | 60 Hz |
| Static head | 0 ft | Head | Speed | 3500 rpm |

**Power data referred to:**
**Water [100%] ; 39.2°F; 62.4lb/ft³; 1.69E-5ft²/s**
Performance according to ANSI/HI 14.6 - Grade 2B



Min Flow

MAX SYSTEM CURVE

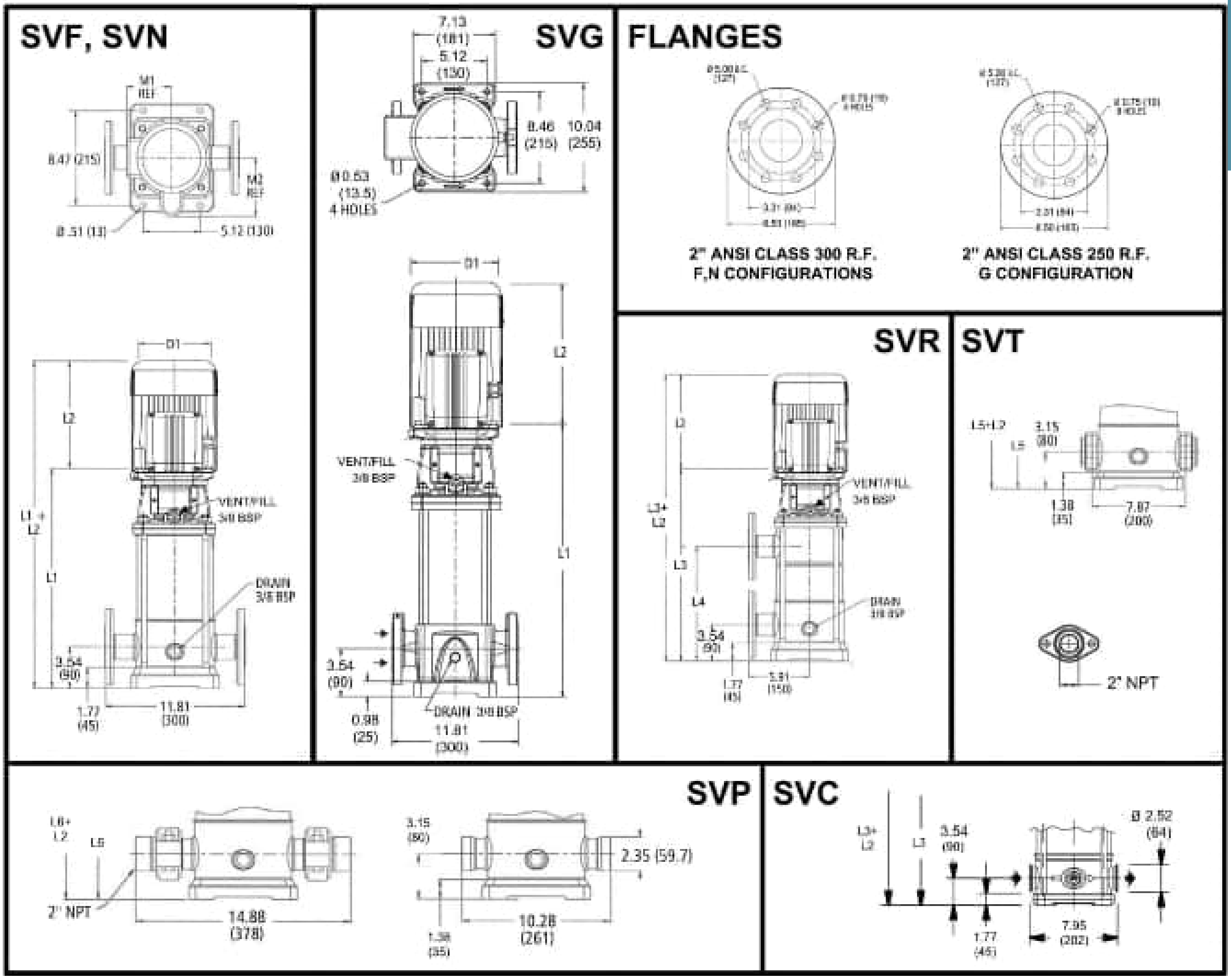
MIN SYSTEM CURVE

OPERATING RANGE

| | | | |
|---|---|---|---|
| Customer | | Date | 20.10.2022 |
| Contact | | Project | |
| Phone number | | Project no. | |
| Email | | | |

## 15SV5GJ4F60

### Drawing



### Dimensions inch

| | | | | | | |
|---|---|---|---|---|---|---|
| D1 max | $10^{1}/_{4}$ | NEMA Frame | 215TC | | | Weight |
| D2 | $9^{1}/_{16}$ | | | | | 198 lb |
| L1 | $24^{15}/_{16}$ | | | | | |
| L2 | $15^{1}/_{4}$ | | | | | |
| L3 | $24^{15}/_{16}$ | | | | | |
| L4 | $13^{3}/_{4}$ | | | | | |
| L5 | $24^{9}/_{16}$ | | | | | |
| L6 | $24^{9}/_{16}$ | | | | | |
| M.Ref | $9^{3}/_{16}$ | | | | | |

Plug Type Duplex Basket Strainer

# Model 50

Pipeline Strainer

Cast Construction

Permanent Media

- Sizes 5", 6", 8"
- Iron, bronze, carbon steel or stainless steel
- Flanged

## Features

- Continuous flow, no shutdown for basket cleaning
- Rugged tapered plug design
- Lift jack prevents galling of the plug
- Quick open cover—no tools needed
- Large capacity baskets
- Threaded drain
- Machined basket seat
- Perforated or mesh 316 stainless steel basket

## Options

- Ductile iron construction
- Basket perforations from 1/32" to 1/2"
- Basket mesh from 20 to 400
- MONEL® baskets
- Vent valves
- Drain valves
- Gauge/vent taps - 1/4" NPT
- Magnetic basket inserts
- Pressure differential gauge and switch connections
- Viton®, PTFE encapsulated or EPDM seals
- Cast iron and stainless steel diverter plug

### Trouble-free design, easy operation

The Eaton Model 50 plug type duplex strainer's design is simple and economical. This high-quality strainer is, in fact, a pressure rated plug valve with integral straining baskets.

To switch the flow from one basket to the other, the operating handle moves through a 90-degree arc. Because of the unique port design in the diverter plug, it is impossible for this operation to stop the flow. The entire switching operation takes fewer than 30 seconds, no tools required. Positioning the plug each time in exactly the right spot happens automatically by integral stops.

Before operating the handle, a specially designed, manual lifting jack built into the strainer, lifts the diverter plug off its seat. After the switching operation, the jack easily reseats the plug, even under high pressures. Because a built-in stop limits the distance the diverter plug rises, it minimizes the possibility of material bypassing the plug while rotated to divert flow. It also prevents debris from building up under the plug and making it difficult to reseat.

### Other features

- A quick, easy to open, swing-away yoke design cover goes back on just as fast as it came off
- Standard NPT drain taps simplify the draining of the basket chamber
- All sizes come with mounting legs for bolting the strainer to the floor for a rock solid installation

MONEL® is a registered trademark of Special Metals Corporation group of Companies.
Viton® is a registered trademark of E. I. du Pont de Nemours and company.

*Powering Business Worldwide*

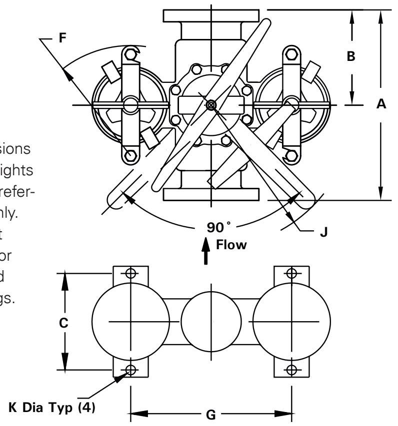
# Model 50 Plug Type Duplex Basket Strainer

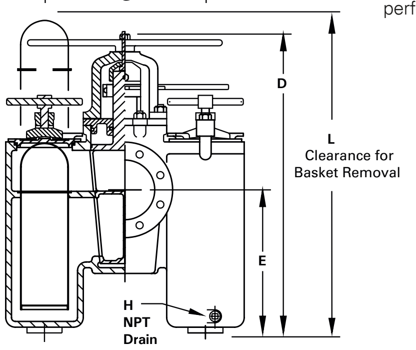
## Selection chart

| Size | Body material | Plug material | End connections | Seals |
|---|---|---|---|---|
| 5", 6", 8" | Iron | Bronze | Flanged 125# | Buna-N® |
| 5", 6", 8" | Bronze | Bronze | Flanged 150# | Buna-N |
| 6", 8" | Carbon steel | Bronze | Flanged 150# | Buna-N |
| 6", 8" | Stainless steel | Stainless steel | Flanged 150# | Viton |

DIN flanges available on 6" only

Dimensions and weights are for reference only. Contact Eaton for certified drawings.





## Rating

| Size | Rating* |
|---|---|
| 5" | 200 psi (13.8 bar) |
| 6" | 200 psi (13.8 bar) |
| 8" | 150 psi (10.3 bar) |

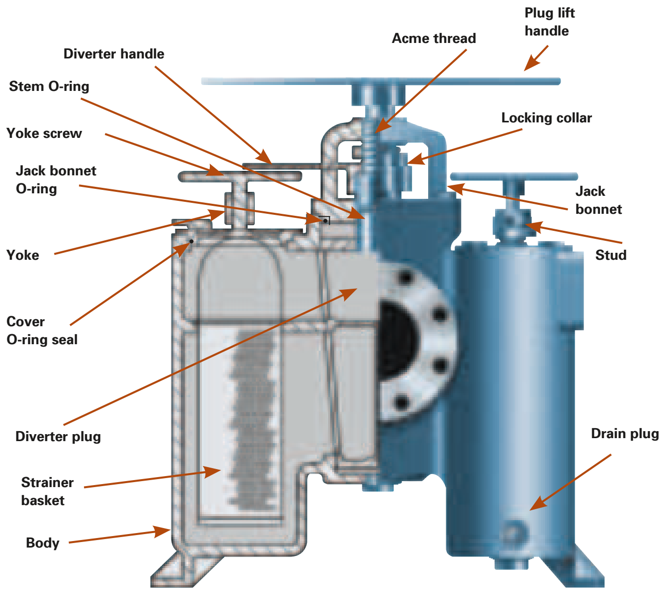
* @ 100 °F (38 °C)

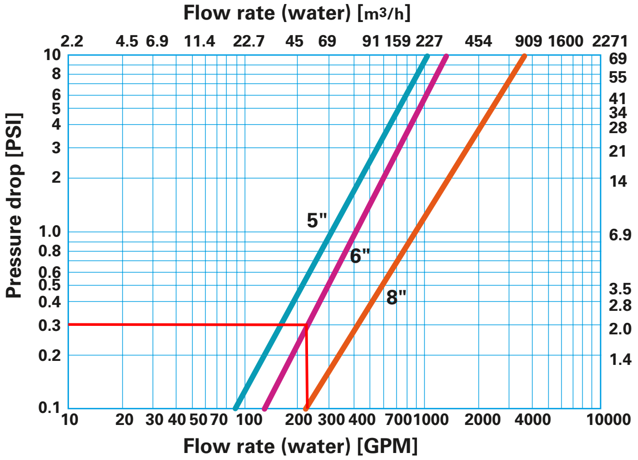
## $C_V$ factors*

| Size | Value |
|---|---|
| 5" | 300 |
| 6" | 420 |
| 8" | 900 |

* For water with clean, perforated basket

Partial cutaway of Model 50 duplex strainer clearly illustrates all major parts—and gives a clear indication of the simplicity of design and ease of maintenance.





## Dimensions (in/mm)

| Pipe size | A | B | C | D | E | F | G | H | J | K | L | Weight (lb / kg) Cast iron | Bronze | Carbon steel | Stainless steel |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 18.38<br>467 | 9.00<br>229 | 9.75<br>248 | 33.25<br>845 | 14.75<br>375 | 10.25<br>260 | 17.19<br>437 | 3/8<br>– | 19.75<br>502 | 0.56<br>14 | 41.00<br>1041 | 403<br>183 | 412<br>187 | –<br>– | –<br>– |
| 6 | 22.00<br>559 | 12.88<br>327 | 12.50<br>318 | 36.25<br>921 | 19.50<br>495 | 11.75<br>298 | 20.75<br>527 | 3/8<br>- | 19.75<br>502 | 0.63<br>16 | 42.00<br>1067 | 500<br>227 | 583<br>264 | 580<br>263 | 615<br>279 |
| 8 | 25.00<br>635 | 14.00<br>356 | 17.00<br>432 | 50.63<br>1286 | 23.06<br>586 | –<br>– | 30.75<br>781 | 1/2<br>– | 28.00<br>711 | 0.94<br>24 | 56.00<br>56 | 1500<br>682 | 1800<br>818 | 1610<br>732 | 1670<br>759 |

North America
44 Apple Street
Tinton Falls, NJ 07724
Toll Free: 800 656-3344
(North America only)
Tel: +1 732 212-4700

Europe/Africa/Middle East
Auf der Heide 2
53947 Nettersheim, Germany
Tel: +49 2486 809-0

Friedensstraße 41
68804 Altlußheim, Germany
Tel: +49 6205 2094-0

An den Nahewiesen 24
55450 Langenlonsheim, Germany
Tel: +49 6704 204-0

China
No. 3, Lane 280,
Linhong Road
Changning District, 200335
Shanghai, P.R. China
Tel: +86 21 5200-0099

Singapore
100G Pasir Panjang Road #07-08
Singapore 118523
Tel: +65 6825-1668

Brazil
Av. Ermano Marchetti, 1435 -
Água Branca, São Paulo - SP,
05038-001, Brésil
Tel: +55 11 3616-8461

**For more information, please email us at *filtration@eaton.com* or visit *www.eaton.com/filtration***

*Powering Business Worldwide*

Job: Newport, NH WWTF Upgrade
J-#: 20828B
CALC. BY: SEV 9/26/2022
CHKD. BY: MAC 10/28/2022
FILE:

## HYDROPNEUMATIC TANK SIZING

Number Pumps 2

| | | | |
|---|---|---|---|
| 1. Continuous Use Demand = | 5 | gpm | Estimate for low-time night flows - estimate min flow of jockey pump |
| Seal Water Demand = | 0 | gpm | See Plant Water System Tab |
| 2. Minimum cycle time = | 10 | minutes | 6 cycles per hour per system |
| | | | 3.0 cycles per hour per pump |
| 3. Minimum Drawdown (available Storage) = | 50 | gallons | |
| 4. Minimum System Pressure = | 70 | psi | |
| 5. Maximum System Pressure = | 90 | psi | |
| 6. Calc'ed Acceptance Factor = | 0.191 | | Calculated using wessels acceptance chart |
| 7. Total Tank Volume Required = | 262 | gallons | |
| | Wessels Co. | | |
| ASME rated | FXA1000 | | |

Acceptance Factor is based on the cut in and cut out pressures, and is from the Wessels sizing informatio

SINCE 1908
**wessels company**

SUBMITTAL

# FXA-SERIES

## WATER WELL & PRESSURE BOOSTER EXPANSION TANKS

**Models:** FXA-1000 to FXA-15000
**Submittal Sheet No.** C-1006B **Rev.** 2 1/28/2019

Job Name ______________________
Location ______________________
______________________
Engineer ______________________
Contractor ______________________
Sales Rep. ______________________

Submitted By ____________ Date ________
Approved By ____________ Date ________
Order No. ____________ Date ________
Notes ______________________
______________________
______________________

**Description:**

Wessels patented type FXA tanks are ASME replaceable bladder type pre-charged water well & pressure booster expansion tanks for commercial and industrial well and water systems, booster systems, or other potable water applications. They are designed to deliver water under pressure between pump cycles to provide sufficient flow to meet demands. The water is contained in a butyl bladder. All FXA hydro-pneumatic tanks can be installed vertically or horizontally. Products comply with NSF/ANSI Standard 61.

**Construction:**

Shell: Carbon Steel
Heads: Carbon Steel
Exterior: Carbocoat 140 - Harvester Red
Bladder: Heavy Duty Butyl
FDA Approved
NSF 61 Listed
System Connection: Epoxy lined

**Design Parameters:**

Maximum Design Pressure: 125 PSIG*
Temperature Range: -20°F to 240°F

*150, 200 & 250 PSIG available

| Model Number | Part Number | Tank Volume (Gallons) | Tagging Information | Quantity |
|---|---|---|---|---|
| FXA-1000 | 21011000 | 264 | | |
| FXA-1200 | 21011200 | 317 | | |
| FXA-1400 | 21011400 | 370 | | |
| FXA-1600 | 21011600 | 422 | | |
| FXA-2000 | 21012000 | 528 | | |
| FXA-2500 | 21012500 | 660 | | |
| FXA-3000L | 21013000 | 792 | | |
| FXA-3000S | 21013001 | 792 | | |
| FXA-4000 | 21014000 | 1056 | | |
| FXA-5000 | 21015000 | 1320 | | |
| FXA-7500 | 21017500 | 1980 | | |
| FXA-10000 | 21019999 | 2640 | | |
| FXA-15000 | 21500000 | 3963 | | |

**Typical Specification**

Furnish and install, as shown on plans, a ___________ gallon ___________" diameter X ___________" (high) pre-charged steel water well & pressure booster expansion tank with replaceable heavy-duty butyl bladder. The tank shall have NPT epoxy lined system connections and a 0.302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements, a pressure gauge, and bladder integrity monitor. The tank must be constructed in accordance with most recent addendum of Section VIII Division 1 of the ASME Boiler and Pressure Vessel Code. Products comply with NSF/ANSI Standard 61.

Each tank shall be Wessels model number FXA-__________ or approved equal.

E-mail

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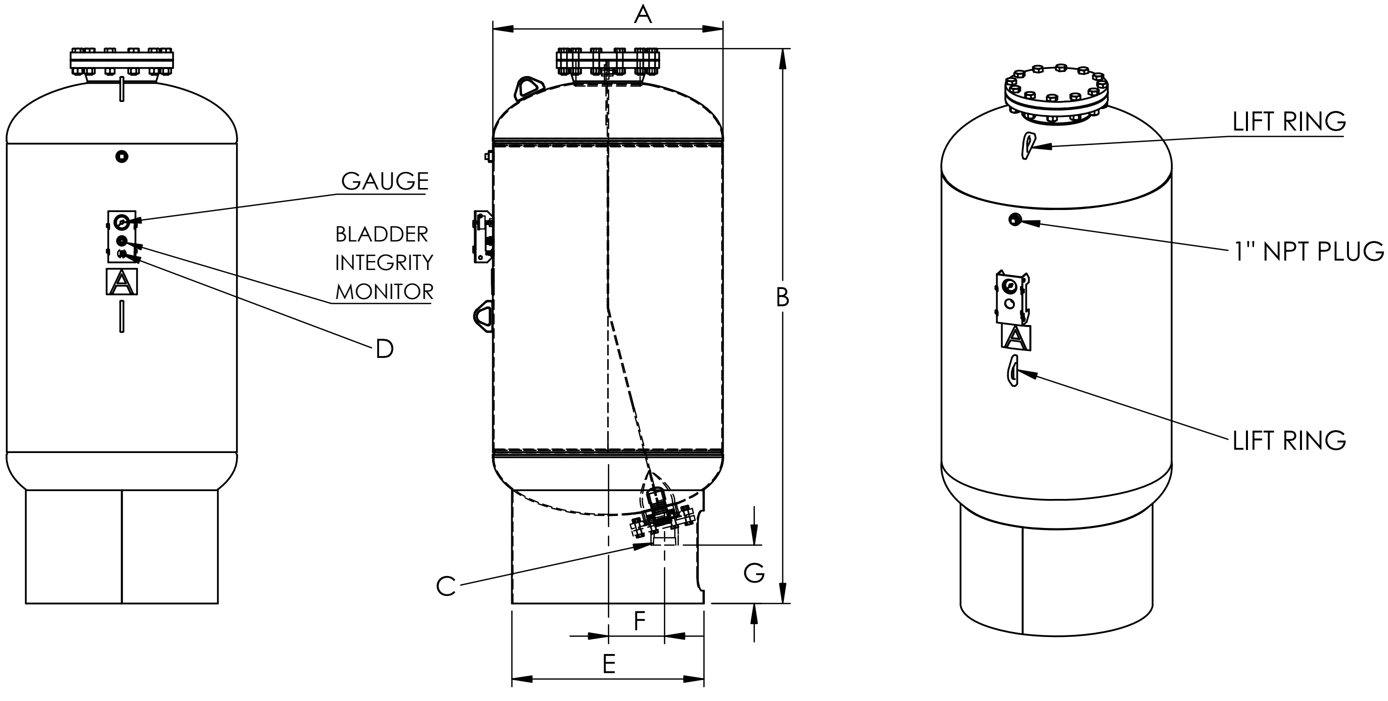
**wessels company**

SUBMITTAL

# FXA-SERIES

## WATER WELL & PRESSURE BOOSTER EXPANSION TANKS

**Models:** FXA-1000 to FXA-15000
**Submittal Sheet No.** C-1006B **Rev.** 2 1/28/2019



FXA-1000 TO FXA-15000

## Dimensions & Weights:

| Model Number | Dimensions in Inches | | | | | | | Approx. Shipping Weight (lbs) |
|---|---|---|---|---|---|---|---|---|
| | A | B | System Connection C | Charging Valve D | E | F | G | |
| FXA-1000 | 36 | 87 | 3 | 0.302- 32NC | 30 | 8 | 9 1/8 | 735 |
| FXA-1200 | | 98 1/2 | | | | | | 745 |
| FXA-1400 | | 110 1/2 | | | | | 8 7/8 | 900 |
| FXA-1600 | 48 | 84 | | | 42 | 9 | 9 1/8 | 1210 |
| FXA-2000 | | 96 | | | | | | 1305 |
| FXA-2500 | | 110 | 4 | | | | 8 7/8 | 1430 |
| FXA-3000L | | 133 | | | | | 9 | 1575 |
| FXA-3000S | 60 | 93 | | | 54 | 10 | 9 3/4 | 2169 |
| FXA-4000 | | 115 | | | | | 9 7/16 | 2638 |
| FXA-5000 | | 138 | | | | | 9 7/8 | 3246 |
| FXA-7500 | 72 | 140 | | | 60 | 11 | 8 | 4080 |
| FXA-10000 | | 172 | | | | | | 4920 |
| FXA-15000 | | 243 | | | | | | 6000 |

**Notes:**

- Tanks are factory pre-charged at 40 psig and field adjustable.
- California code-sight glass is available upon request.
- Tanks installed horizontally must have the system connection below the horizontal centerline of the tank.
- Mounting clips are available upon request.
- U.S. Patent No. 8,633,825 B2

# Appendix C
# Building Design Memoranda

WRIGHT-PIERCE
Engineering a Better Environment

230 Commerce Way Suite 302
Portsmouth, NH 03801
www.wright-pierce.com

| | |
|---|---|
| CLIENT | Newport, NH |
| PROJECT | WWTF Upgrade |
| PROJECT NO. | 20828B |
| DESIGNED BY | SEV |
| DATE | 7/31/2022 |
| CHECKED BY | MAC/JRM |
| DATE | 11/1/2022 |

Purpose:
To identify the following: Summary of nomenclature for buildings/structures and spaces, space classifications and NEMA ratings, and references to applicable sections of NFPA 820

These names, classifications, abbreviations and terminology shall be used where work is performed as a part of this project.

Reference: NFPA 820, 2020 Edition.

| LEGEND | |
|---|---|
| *Italics* | Existing structures/buildings and spaces |
| Bold | New structures/buildings and spaces |
| ~~Strikethrough~~ | Buildings or spaces that are to be eliminated or changed |

| Building / Level | Space Name | Classification | NEMA Rating | NFPA 820 Reference | Notes |
|---|---|---|---|---|---|
| *Control Building* | *Screen Room* | *Class 1/Division 1* | *7* | *5.2.2,2a or b* | *2* |
| | Control Room | Unclassified | *1/12* | 4.2.2,16 | 6 |
| | Pump Room | Unclassified | 4X | 4.2.2,15 a | - |
| | *Shop and Lunchroom* | *Unclassified* | *1/12* | *N/A* | *1* |
| | ~~Blower Room~~ | ~~Unclassified~~ | ~~1/12~~ | ~~N/A~~ | ~~1~~ |
| | Aeration Blower Room | Unclassified | 1/12 | N/A | 1 |
| | ~~Dechlorination Room~~ | ~~Unclassified~~ | ~~1/12~~ | ~~N/A~~ | ~~1~~ |
| | Chemical Room | Unclassified | 4X | N/A | 1 |
| | *Boiler Room* | *Unclassified* | *1/12* | *N/A* | *1* |
| | *Stair A* | *Unclassified* | *1* | *N/A* | *1* |
| | *Stair B* | *Unclassified* | *1* | *N/A* | *1* |
| | *Corridor* | *Unclassified* | *1* | *N/A* | *1* |
| | *Foyer* | *Unclassified* | *1* | *N/A* | *1* |
| | ~~Generator Room~~ | ~~Unclassified~~ | ~~12~~ | ~~N/A~~ | - |
| | Electrical Room | Unclassified | 1/12 | N/A | 1 |
| | *Garage* | *Unclassified* | *1/12* | *N/A* | - |
| | ~~Chemical System~~ | ~~Unclassified~~ | ~~4X~~ | ~~N/A~~ | - |
| | *Records* | *Unclassified* | *1* | *N/A* | - |
| | *Storage Room A* | *Unclassified* | *1/12* | *N/A* | - |
| | *Storage Room B* | *Unclassified* | *1/12* | *N/A* | - |
| | *Storage Room C* | *Unclassified* | *1/12* | *N/A* | - |
| | *Parts* | *Unclassified* | *1* | *N/A* | *1* |
| | *Maintenance Room* | *Unclassified* | *1/12* | *N/A* | - |
| | *Toilet* | *Unclassified* | *1* | *N/A* | *1* |
| | *Office & Laboratory* | *Unclassified* | *1* | *N/A* | *1* |
| Process Building | Dewatering Room | Unclassified | 4X | Table 6.2.2, 12a | 4,10 |
| | Container Bay | Unclassified | 4X | Table 6.2.2, 13a | 4,10 |
| | Sludge Pump Room | Unclassified | 4X | Table 6.2.2,9b | 6,10 |
| | Grit Pump Room | Unclassified | 4X | Table 6.2.2, 2 | 4 |
| | Stairwell | Unclassified | 1 | N/A | 1 |
| | Mechanical Room | Unclassified | 1/12 | N/A | 1 |
| | Electrical Room | Unclassified | 1/12 | N/A | 1 |
| | Restroom | Unclassified | 1 | N/A | 1 |
| | Grit Removal System (Exterior) | Class 1/Division 2 | 7 | Table 5.2.2,5c | 6 |
| | Flow Diversion Outlet Box (Exterior) | Class 1/Division 2 | 7 | Table 5.2.2,1c | 6,13,16 |
| | Envelope above exterior channels and boxes | Class 1/Division 2 | 7 | Table 5.2.2,1c | 6,13,16 |
| | Odor Control Unit (Exterior) | Unclassified | 4X | See Note 17 | 3 |
| | Control Room | Unclassified | 1/12 | - | 1 |
| *Tertiary Building* | *Filter Room* | *Unclassified* | *4X* | *Table 5.2.2, 22* | *7* |
| | *Chemical Storage Area* | *Unclassified* | *4X* | *Table 5.2.2, 22* | *7* |
| | *Electrical Room* | *Unclassified* | *1/12* | *N/A* | *1* |
| | *Mezzanine* | *Unclassified* | *4x* | *Table 5.2.2, 22* | *7* |
| | Lagoon Effluent EQ Pump Station Wet Well | Unclassified | 4X | Table 5.2.2.21 | 7 |
| Disinfection Building | ~~Chlorine Contact Tanks~~ | - | - | - | - |
| | UV Disinfection Channels | Unclassified | 4X | Table 5.2.2,26 | 7 |
| Site, General | *Lagoons 1&2* | *Class 1/Division 2* | *4X* | *Table 5.2.2, 8* | *7, 13* |
| | *Parshall Flume Structure* | *Unclassified* | *4X* | *Table 5.2,27* | - |
| | Septage Tank (covered) | Class 1/Division 1 | 7 | N/A | 9, 14 |
| | ~~Grit Building~~ | ~~Class 1/Division 1~~ | ~~7~~ | ~~Table 5.2.2,5a~~ | ~~2~~ |
| Tank Complex | Effluent Equalization Tanks (Open to Atm.) | Class 1/Division 2 | 7 | Table 5.2.2, 4c | 6, 7, 16 |
| | Sludge Storage Tanks (Open to Atm.) | Class 1/Division 2 | 7 | Table 6.2.2,10c | 6, 7, 16 |
| | Sequencing Batch Reactors (Open to Atm.) | Class 1/Division 2 | 7 | Table 5.2.2, 8 | 6, 7, 16 |

Notes:

1. NFPA 820 does not establish ventilation criteria for spaces devoted to administrative areas, laboratories and other ancillary spaces (Paragraph 9.1.1.3).
2. Combustible gas detection, hydrant(s) and fire extinguisher(s) are required.
3. Fire extinguisher(s) and a fire detection system TBD (likely not required).
4. A fire alarm system, fire extinguisher(s) and hydrant(s) are required.
5. Combustible gas detection and hydrant(s) are required.
6. Fire extinguisher(s) and hydrant(s) are required.
7. Hydrant(s) is(are) required.
8. Fire extinguisher(s) are required.
9. Combustible gas detection and/or fire extinguisher are not proposed as the enclosed space is a tank and not intended for occupancy.
10. Ventilation equipment will be installed to provide a minimum of 6 air changes per hour (AC/hr.) when the outside temperature is 50°F or above and 3/1.5 AC/hr. when the outside temperature is below 50°F to allow de-rating of the space from Class I, Division 2 to unclassified.
11. Ventilation equipment will be installed to provide 3 AC/hr on occupancy and/or repeat cycle timer.
12. Not used.
13. For Class1/Division2 spaces ,the local control stations can be hermetically sealed NEMA 4X enclosures.
14. NFPA 820 does not establish criteria for septage receiving. This space is treated as a Class 1/Division 1 space.
15. NFPA 820 does not establish criteria for supplemental carbon systems. The Supplemental Carbon system will be based on glycerin and NOT methanol.
16. Envelope is 1.5-ft high from TOC and extends 10-ft in the horizontal direction past the edge of concrete.
17. Did not use Table 4.2.2,18 for classification of odor control. Matched classification of air sources (Dewatering Room and Container Bay).
18. Combustible Gas Detection System required.

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828B | | |
| Subject: | Newport, NH – Civil Preliminary Design Report | | |
| Prepared By: | Jake Shactman, EIT | Date: | 10/25/2022 |
| Reviewed By: | Michael Curry, PE | Date: | 11/2/2022 |
| Revised By: | Jake Shactman, EIT, Michael Curry, PE | Date: | 12/8/2022 |

## Introduction

The Town of Newport, NH owns and operates an aerated lagoon treatment facility, which was upgraded with a tertiary filtration process in 2012. The tertiary filtration system was unable to achieve compliance with the Town's total phosphorus limits and was abandoned after startup. Subsequently, the Town was issued an Administrative Order on Consent (AOC) which required the Town to develop a Facility Plan to achieve compliance with effluent TP limits. A Facility Plan was developed in 2017 in response to the AOC and in 2019, the Town moved forward with the recommended preliminary design.

The proposed improvements included as part of the preliminary design include construction of a new SBR Tank complex, construction of a new Process Building, and supporting site modifications including pavement reconstruction, grading modifications, drainage modifications, and construction of a new gravel access drive for the SBR Tank structure.

## Existing Site Conditions

The WWTF is located on a 15.81 lot at 20 Putnam Road between North Main Street (Route 10) and the Sugar River in Newport, NH. An oxbow of the Sugar River meanders around the site of the WWTF due to channelization of the river during the original construction in 1971. The WWTF currently consists of Lagoons 1 & 2, a chlorine contact tank which has been converted to a UV disinfection structure, Control Building, Filter Building, Grit Building, septic waste holding tank, and abandoned solids settling basin. The main site access is through a gate off of Putnam Road on the southern end of the site. In addition, a gravel access drive off of Route 10 is used for lagoon access and maintenance.

There are two known culverts located on site at Putnam Road and along the gravel lagoon access road that convey water within the oxbow. Stormwater drainage at the WWTF portion of the site is limited to two catch basins and a trench drain in the paved drive east of the Control Building and are assumed to tie into the wastewater effluent outfall based on record drawings. The remaining site drainage flows overland to either the oxbow or Sugar River.

## Wetlands

Wetlands were delineated by Marc Jacobs, Certified Wetland Scientist number 090, in August 2022 and have been included on the Civil drawings. Wetlands were identified in the area of the oxbow but based on their location, are not anticipated to be impacted by the proposed site modifications.

## Flood Elevations

The Federal Emergency Management Agency (FEMA) flood mapping shows the project area is located between Cross Sections AW and AX along the Sugar River (See FEMA FIRMette - Attachment 1) within Special Flood Hazard Area Zone AE. The Base Flood Elevation for each of these cross sections are 778.0 ft and 779.7 ft. The 100-Year flood elevation (BFE) and 500-Year flood elevation for the project site has been identified as a maximum 778.5 ft and 781.0 ft elevation, respectively, based on the Effective FEMA Flood Mapping and Flood Insurance Study (FIS) effective date May 23, 2006 (Map Number 33019C0195E) for Sullivan County, NH. The Sugar River Profile derived from the FIS including relevant flood elevation measurements is included in Attachment 2. All elevations provided are in the North American Vertical Datum 1988 (NAVD88).

Based on TR-16 Guides for the Design of Wastewater Treatment Works (Revised 2011 Edition), all critical equipment should be constructed at a minimum elevation of + 3-ft (781.5') from the 100-year flood elevation, and all non-critical equipment should be constructed a minimum elevation of + 2-ft (780.5') from the 100-year flood elevation.

## Client Preferences

The Town has indicated that the existing clearance between the Control Building and the existing settling basins should remain as wide as possible to allow for delivery trucks.  Currently, the space between the structures is approximately 62'.

## Proposed Modifications

- **Roadways/Pavement:** The existing paved areas within the WWTF site are exhibiting signs of significant deterioration.  Based on the existing condition of the pavement, proposed new site piping requirements, and the need for modified grading to accommodate the new structures, drainage modifications, and improved vehicle accessibility, full depth pavement reconstruction is recommended.  For the purposes of the preliminary design, reconstruction extents are limited to within the existing fence line.
- **SBR Tank Complex Access:**  A 10-ft wide gravel access drive is proposed around the Process Building and SBR Tank Complex to provide the Town with vehicle access for operations and maintenance activities of these new structures.
- **Stormwater:** Based on the condition of the existing stormwater collection system around Control Building, a new stormwater system is recommended.  Stormwater east of the Control Building and in the area of the new Tank Complex is proposed to be collected within five catch basins and discharge to a filtration basin on the southeast corner of the site. This will provide stormwater treatment to remove pollutants prior to discharge to the oxbow. Stormwater west of the Control Building is proposed to continue flowing overland to the Sugar River. Drainage swales will be located adjacent to the proposed gravel access drive to prevent erosion of the surface gravel and ponding.
- **Site Grading:** The existing site grading is relatively steep towards the oxbow and river. An emphasis was made to reduce fill within the 100-Year flood plain to minimize any reduction on flood storage. Minor grade changes are proposed to improve drainage throughout the paved drive.
- **Underground Storage Tank (UST):** The existing Control Building heating system utilizes an existing 10,000-gallon double wall fiberglass underground diesel fuel storage tank located south of the Filter Building.  This tank was installed in approximately 2001 and has had fuel line modifications completed as recently as 2021.  The Town has indicated a preference towards propane heating system which would make this UST obsolete. The tank and associated underground piping are proposed for removal as part of a Bid Alternate for the project.

- **Other Site Modifications:** Install new fencing on the easterly portion of the project site. Removal and disposal of existing fence, trees, stumps, vegetation, site piping, and retaining wall as shown on Existing Conditions and Demolition Plan (C-3).

## Permitting Review:

- Local Permits: Confirm local permitting requirements with Town of Newport.
  - Town of Newport Zoning Ordinance 212 "Floodplain Development Ordinance" pertinent requirements include the following:
    - If the lowest floor (including basement) is located below the 100-year flood level, facilities shall be flood-proofed so that below the 100-year flood elevation –
      - The structure is watertight with walls substantially impermeable to the passage of water
      - Have structural components capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy
      - Be certified by a New Hampshire registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards or practice for meeting these provisions
    -
- FEMA Flood Impacts: Impacts are proposed within Special Flood Hazard Area (Zone AE). No impacts are proposed within the Regulatory Floodway; therefore, the proposed project is not anticipated to impact the Base Flood Elevation (BFE). Impacts within the floodplain are regulated through the Town of Newport Floodplain Zoning Ordinance.
- State Environmental Permits:
  - Wetlands – Not anticipated. No proposed wetland impacts.
  - Shoreland – A Shoreland Permit by Notification will be required prior to construction within 250-ft of the Sugar River. The application fee required by the NH Department of Environmental Services (NHDES) is $400 and includes a 5-day review period.
  - Alteration of Terrain Permit – Construction sites with greater than 100,000 SF of contiguous disturbance or 50,000 SF if any portion is within a protected Shoreland (the WWTF is within a protected Shoreland) shall obtain approval from the NHDES AOT Bureau. The contiguous area of disturbance associated with the proposed upgrade less than 50,000 SF, excluding those areas where disturbance is associated with asphalt maintenance activities. The proposed work was discussed and draft site plans were reviewed with the NHDES AOT Bureau in October 2022. NHDES has determined that the proposed project may proceed under a General Permit by Rule.
  - The contractor will be required to subcontract a Certified Tank Remover for the UST removal in compliance with Env-Or 400.
- Federal Permits:
  - Federal Aviation Administration (FAA) - Part 77 Notification of Proposed Construction is required due to proximity with the Parlin Field Airport (2B3).
    - Notification to be filed at least 45 days prior to construction for the purpose of evaluating effects of the proposed construction/alteration on operating procedures and air navigation.
  - FEMA Flood Impacts: National Flood Insurance Program Title 44 CFR Section 60.3(d) is the applicable regulation for floodplain development as the project is located in a SFHA with defined final base flood elevations and regulatory floodway.

        - These regulations are guidance for communities to implement local floodplain requirements and can be found in the Town of Newport Zoning Ordinance: Section 212 – Floodplain Development Ordinance.
        - There are no proposed impacts within the regulatory floodway.
    - Army Corps of Engineers (ACOE): No impacts are proposed within surface waters or jurisdictional wetlands, therefore, ACOE coordination is not anticipated as part of this project.
    - NPDES Construction General Permit: Construction sites of greater than one acre are subject to a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit for construction. The disturbed area will be greater than one acre and so it will be necessary to apply for an NPDES Construction General Permit. This permit is applied for by the General Contractor as part of construction and will be covered in the Construction Costs.
    - NPDES General Permit for Dewatering: Construction dewatering activities in New Hampshire are subject to a General Permit for Dewatering. The depth of excavation will require a Dewatering Permit. This permit is applied for by the General Contractor as part of construction and will be covered in the Construction Costs.

# Attachment 1 – FEMA Flood Mapping

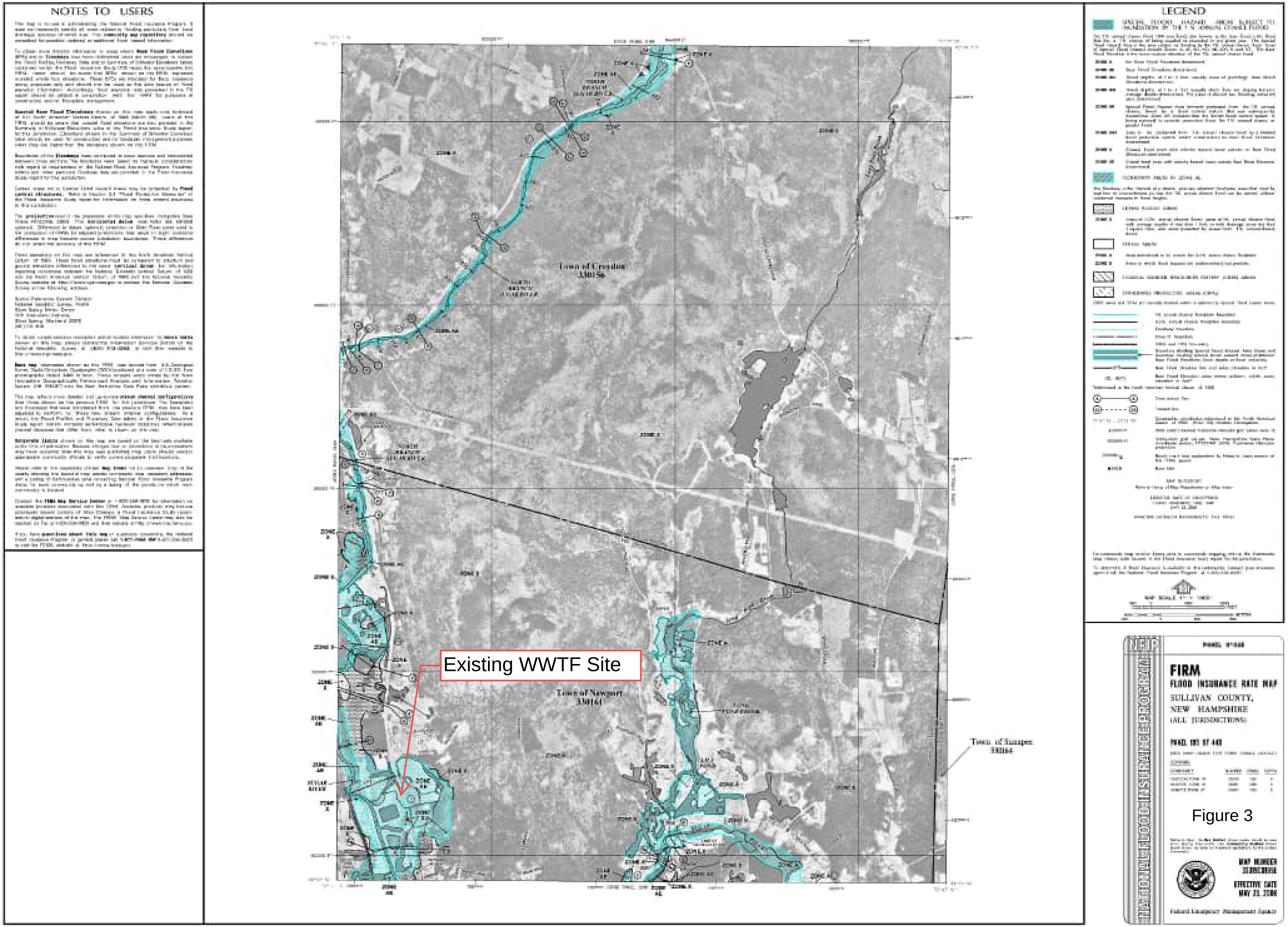

NOTES TO USERS
LEGEND
Town of Croydon
330156
Town of Newport
330161
Town of Sunapee
330164
Existing WWTF Site
NFIP
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
SULLIVAN COUNTY,
NEW HAMPSHIRE
(ALL JURISDICTIONS)
MAP NUMBER
EFFECTIVE DATE
MAY 23, 2006
Federal Emergency Management Agency

Figure 3

# National Flood Hazard Layer FIRMette

72°11'13"W 43°22'49"N

Assuming linear interpolation between Flood Contour Lines:

513/1571 = 0.33

100-Yr Flood Elevation AT WWTF Site

= 778 + 0.33 = Elev. 778.33

Round up to Elev. 778.5'

Feet
0 250 500 1,000 1,500 2,000

1:6,000

72°10'35"W 43°22'23"N

*Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020*

## Legend

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

| | | |
|---|---|---|
| SPECIAL FLOOD HAZARD AREAS | 🟦 | Without Base Flood Elevation (BFE) *Zone A, V, A99* |
| | | With BFE or Depth *Zone AE, AO, AH, VE, AR* |
| | ▨ | Regulatory Floodway |
| OTHER AREAS OF FLOOD HAZARD | 🟧 | 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* |
| | ▨ | Future Conditions 1% Annual Chance Flood Hazard *Zone X* |
| | ▨ | Area with Reduced Flood Risk due to Levee. See Notes. *Zone X* |
| | ▨ | Area with Flood Risk due to Levee *Zone D* |
| OTHER AREAS | NO SCREEN | Area of Minimal Flood Hazard *Zone X* |
| | ▭ | Effective LOMRs |
| | ▭ | Area of Undetermined Flood Hazard *Zone D* |
| GENERAL STRUCTURES | — — — | Channel, Culvert, or Storm Sewer |
| | IIIIIII | Levee, Dike, or Floodwall |
| OTHER FEATURES | B 20.2 17.5 | Cross Sections with 1% Annual Chance Water Surface Elevation |
| | 8 — — — | Coastal Transect |
| | ~~~ 513 ~~~ | Base Flood Elevation Line (BFE) |
| | ——— | Limit of Study |
| | ——— | Jurisdiction Boundary |
| | — - — | Coastal Transect Baseline |
| | — — | Profile Baseline |
| | ——— | Hydrographic Feature |
| MAP PANELS | ☐ | Digital Data Available |
| | ☐ | No Digital Data Available |
| | ☒ | Unmapped |

N

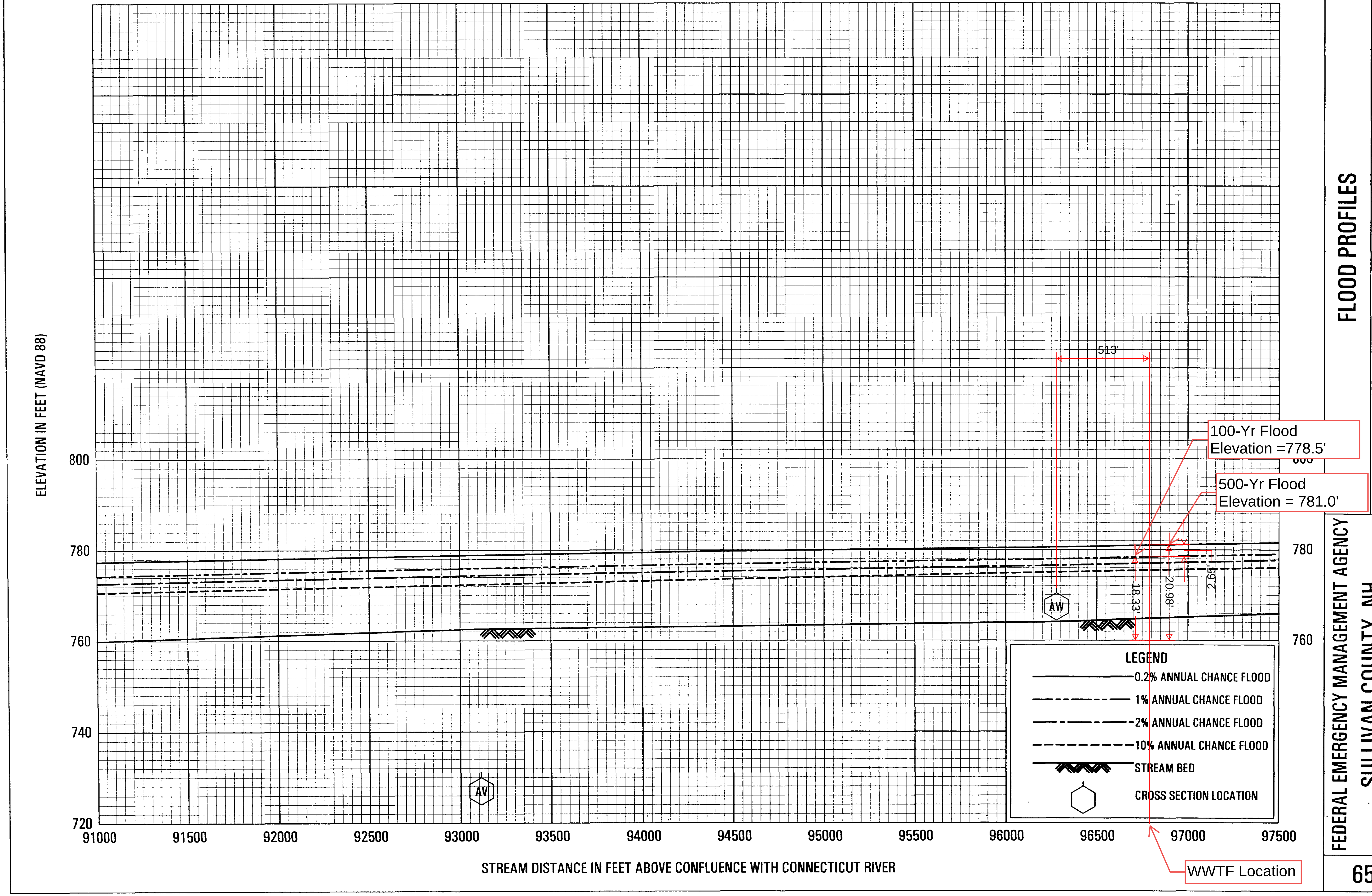
● The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/31/2021 at 12:36 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

# Attachment 2 – FEMA Flood Insurance Study Floodplain Elevations from Sugar River Profile



**FLOOD PROFILES**

SUGAR RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

**SULLIVAN COUNTY, NH**

(ALL JURISDICTIONS)

# Technical Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828B | | |
| Subject: | Architectural Evaluation - Newport, New Hampshire | | |
| Prepared By: | Cathy Michaud | Date: | 10/28/2022 |
| Reviewed By: | Michael Curry, PE | Date: | 12/8/2022 |

## Introduction

The Town of Newport, NH owns and operates an aerated lagoon treatment facility. The facility was initially constructed in the early 1970's and was upgraded with a tertiary filtration process in 2012. The tertiary filtration did not perform as anticipated and was abandoned after startup. The upgrades will consist of a new process building, UV disinfection along with renovations to the existing Control Building. Architectural components of the project are described herein.

## Governing Codes

Currently the governing building code in New Hampshire is the New Hampshire Building Code

- 2018 International Building Code as Amended
- 2018 International Existing Building Code as Amended
- 2018 International Energy Conservation Code as Amended

Many of the buildings/spaces at the Newport Wastewater Treatment Facility are normally unoccupied spaces and designed solely for housing equipment necessary for the treatment of wastewater. Daily workplace activities take place in the office and laboratory area of the Control Building. Any revisions to this area will meet the plumbing and accessibility regulations.

### Existing Building Code Implications

Work in existing buildings is governed by the Existing Building Code. The existing building code classifies work in existing buildings in 6 categories; Repairs, Alteration – Level 1, Alteration – Level 2, Alteration – Level 3, Change of Occupancy and Additions. Following is a summary of how these classifications are defined and basic implications of each classification to the project:

**Repairs:** Fixing or replacing damaged materials. Replacement materials must comply with the building code.

**Alteration – Level 1:** Replacement of existing materials and equipment with new that serves the same purpose. New materials and equipment must comply with the building and energy codes.

**Alteration – Level 2:** Reconfiguration of space (where the Work Area is under 50%), addition/elimination of doors and windows, extension of existing systems or installing additional equipment. Modifications must comply with the building, energy and accessibility codes and cannot worsen means of egress. Other items required include:

- Providing automatic sprinkler systems where required by the building code for new buildings, including in windowless stories greater than 1500 sf.

- Providing guards at openings in work areas.

**Alteration – Level 3:** Where the Work Area is greater than 50%. Work Area is defined as the portion of the building where space is reconfigured. If other sections of the Existing Building Code require reconfiguration of space, this reconfiguration does not count towards the Work Area. Modifications must comply with requirements for Level 2 Alterations plus additional items including:

- Enclosing stairs.
- Enclosing shafts and floor openings.
- Providing the number of exits required per current code.
- Providing doors that swing in the direction of travel for areas with an occupant load over 50.

**Change of Use:** Where the use or occupancy classification of a building is changed modifications must comply with requirements for Level 2 and 3 Alterations. If the new use is required to be accessible, the building must also be made accessible.

Generally, the energy code does not require updating existing buildings to current energy codes. New work and items must meet current energy codes if possible. If a building currently has a vestibule, the vestibule must remain or a new one provided. If any space changes from an unconditioned space to a conditioned space, the envelope of the space must be updated to meet the envelop requirements of the energy code.

Many of the spaces that are above or below the level of exit discharge (i.e. second floors and basements) only have one means of egress via an open stair. To meet current codes for safe egress each level is required to have at least one exit and that exit must be reached within 75 feet. To be classified as a code compliant safe exit, if a level cannot exit directly out to grade, an exit must be a completely enclosed stair with a door directly to the outside. If the exit cannot be reached within 75 feet, two exits are required. If the alterations are classified as a level 2 alteration or less, these deficiencies are not required to be corrected however the egress cannot be made worse. If the alterations are classified as a level 3 or above, these deficiencies need to be corrected.

## Control Building

The Control building was originally constructed in the early 1970's as part of the Camp Dresser and McKee Sewage Treatment Plant project. Originally called the Filter Building this 5,280 SF masonry building contained chemical storage, vacuum filters, office and laboratory space, along with process and mechanical areas. In 1987 Hoyle, Tanner & Associates designed a 1,500 SF addition along with major renovations to the existing building. At this time the once "Filter Building" was now labeled as "Control Building". The building currently houses Office and Laboratory space, along with some process and mechanical equipment spaces. Many areas are no longer utilized as originally constructed including Dechlorination and Chemical Storage areas. A large portion of this building is currently utilized for a workshop and general equipment storage. The primary work areas for the subject project will consist of a new Chemical storage and feed room, the addition of a restroom along with work associated with process, electrical and mechanical modifications. The work for the Control Building will be classified as a Level 2 alteration.

### Observations

Exterior

- Cracks in the exterior will be repointed.
- Exterior control joints are in poor condition with many missing sealants. These joints will be recalked.
- The exterior is in good condition for its age, the brick should be cleaned.
- Exterior hollow metal doors appear to be original and are in fair condition for their age. New hollow metal doors will be installed providing access to the Electrical Room and the Blower room where modifications are being made. The alcove man-door to the new Chemical Room will be removed and replaced with a new 1-hour rated door and hardware.
- The membrane roof was replaced in 2021, however it is reported to be leaking. Any work performed on the roof shall be in accordance with the roof manufactures recommendations and done in a manner to not void the warranty. Obtain manufacture and warranty information. The roof has a very low pitch, with parapet walls and minimal roof drains. Consider adding scuppers or secondary roof drains as a precaution.
- Access to the roof is provided by a roof hatch and ladder. The ladder is not equipped with ladder up safety post making access to the roof more challenging. Provide ladder up safety post.

Interior

- The interior CMU walls are glazed face and appear to be in good condition.
- Chemical Room
  - Where paint on the metal deck ceiling is failing in the chemical room the failed coatings shall be removed. A new fire rated shaftliner ceiling will be added to this room.
  - The concrete floors in the chemical room will be refinished to provide a uniform appearance.
- There is a missing door off an enclosed Stairwell. This door should be replaced for code compliance.
- The Aeration Bower Room has foam panels applied to the walls and ceilings for sound mitigation. The ceiling application appears to have failed. New sound control panels will be provided.
- The fume hood in the laboratory was indicated to not be working properly. A new fume hood is desired for use with the muffle furnace. An “hood” style exhaust was noted to be acceptable by the client.
- The building is equipped with a single locker room. There are no accommodations for separate facilities for Men and Woman as required by code. A second bathroom will be provided.

## Filter Building

The Filter building was constructed in 2012 as designed by AECOM. The building consists of a 2,700 SF pre-engineered metal building. The building is in relatively good condition, with signs of limited corrosion on some equipment and miscellaneous metals components, likely due to the prolonged presence moisture/chemicals without continuous ventilation. The process was abandoned shortly after completion. The building is intended to be repurposed for re-use in a similar manner. There are no major architectural modifications planned in this building. Minor repairs will be considered on an as-needed basis.

## Process Building

The Process Building will be a new building on the existing wastewater treatment plant site. The building will include multiple levels housing sludge pumping and solids handling equipment. The building will be approximately 48 feet by 56 feet. Following is a brief description of each area along with a list of the building materials.

Exterior:

| | |
|---|---|
| Foundation | The foundation consists of concrete frost walls, slabs on grade and concrete foundations around the below grade space. |
| Structure | Load bearing CMU walls with a pitched wood truss roof system. |
| Walls | CMU backup block with insulation, air space with a combination of CMU veneer and metal siding. |
| Doors | Aluminum storefront doors with a baked on finish. |
| | Roll-up doors with a baked on finish. |
| Windows | Aluminum storefront windows with a baked on finish. |
| Louvers | Aluminum with a baked on finish. |
| Roofing | Standing Seam metal roofing. |
| Edge Trim | The fascia, rake trim and soffits will be metal with a baked on finish. |

### Interior Lower Level:

| | |
|---|---|
| Floors | Sealed concrete. |
| Walls | Sealed concrete except where insulation is required on the interior. FRP faced plywood over rigid insulation will installed in these areas. |
| Ceilings | Unfinished concrete |
| Doors | Painted hollow metal doors and frames. |
| Stairs | The stairs will be grated aluminum stairs. |

### Interior Ground Level:

| | |
|---|---|
| Floors | Sealed concrete. |
| Walls | Painted CMU |
| Ceilings | Unfinished concrete |
| Doors | Painted hollow metal doors and frames. |
| Stairs | The stairs will be grated aluminum stairs. |

### Interior Upper Level:

| | |
|---|---|
| Floors | Sealed concrete. |
| Walls | Painted CMU |
| Ceilings | FRP faced plywood panels. |
| Doors | Painted hollow metal doors and frames. |
| Vision Panels | Glazed hollow metal frames. |
| Stairs | The stairs will be grated aluminum stairs. |

## Disinfection Building

The Disinfection Building is a new building that will be located on the existing chlorine contact chamber foundation. The building will be approximately 28' feet by 24 feet. Following is a brief description of each area along with a list of the building materials.

**Exterior:**

| | |
|---|---|
| Foundation | Existing concrete foundation walls, with new floor consisting of concrete, grating, and plating. |
| Structure | Load bearing CMU walls with a pitched wood truss roof system.  Alternative construction methods will be considered in the Final Design for cost effectiveness. |
| Walls | CMU backup block with insulation, and metal siding. |
| Doors | Aluminum storefront doors with a baked on finish. |
| | Roll-up door with a backed on finish. |
| Roofing | Standing Seam metal roofing. |
| Edge Trim | The fascia, rake trim and soffits will be metal with a baked on finish. |

**Interior:**

| | |
|---|---|
| Floors | Grating and Plating |
| Walls | Painted CMU. |
| Ceilings | FRP faced plywood panels. |

## Primary Sedimentation Building

The existing abandoned Primary Sedimentation Building was not evaluated. This structure will be demolished in its entirety and will become the location for a new Process Building.

## Grit Building

The Grit building was not evaluated. This structure will be demolished in its entirety.

# Technical Design Memorandum

Project No.: 20828B

Subject: Newport, NH WWTF Upgrade

Prepared By: Jason Powell, PE

Date: 12/1/2022

## Description of Structures and Associated Scope of Work

*Existing Septage Holding Tanks* (1971 originally Sludge Storage) - Existing reinforced concrete tanks with reinforced concrete top slab. The following modifications are proposed:

- Enlarge existing tank opening to accommodate new submersible septage pump. Install removable aluminum plating over opening.
- Remove a 48" square section of tank fillet to accommodate installation of new submersible septage pump.
- Construct a manual bar rack and spill pad structure adjacent to the septage tank.
- Though not required by OSHA, an aluminum guard may be installed along one or more sides at the Owner's discretion."

*Existing Primary Sedimentation Tanks and Grit Facility* (1971)– Existing partially buried reinforced concrete chain and flygt type. This structure is proposed to be demolished in its entirety for construction of SBR tanks and Process Building.

Existing Grit Building (1987) – Existing partially buried grit structure. This structure is proposed to be demolished in its entirety.

*Existing Control Building* (1971) – No significant structural modifications are proposed. Recommend replacement of expansion joint and sealant. Some incidental guard issues should be addressed for OSHA compliance. Minimal quantities of concrete surface and crack repair are recommended for maintenance.

*Lagoon Splitter Structures* – Minor process modifications are proposed. Existing aluminum grating was not fabricated to the correct size and as a result grating sections can move and nearly fall into the structure. Where necessary, grating fastening is recommended.

*Chlorine Contact Tanks/*Disinfection Building

The existing chlorine contact tanks have been repurposed as a UV Disinfection Structure. The structure currently consists of a partially buried reinforced concrete tank (29' x 51') with a small masonry enclosure (Disinfection Building) over an effluent channel with aluminum grating walking surface. The roof is mono-slope wood joist and metal deck construction. Tanks have steel flap valve pressure relief valves.

> Proposed modifications include demolition of the existing Disinfection Building and construction of a masonry building over 50% of the tank. Walking surfaces will consist of aluminum or galvanized grating mounted to the existing concrete walls. The roof will consist of hot-dip galvanized and painted steel beams and hot dip galvanized metal deck, or a wood truss roof with a metal deck. The remainder of the tank is to be modified to accommodate piping and infilled with flowable fill.

***Filter Building****- Jan 2012* – 63’ x 45’ cast in place concrete foundation with many below grade concrete tanks (flocculation, coagulation, rapid mix, lagoon effluent, spent backwash storage, filter effluent) and frost wall foundation. The 1’-0” thick elevated first floor concrete slab (250 psf live load) supports a large pump room, grated area over effluent channels, aluminum plating and framing supporting disc filters over the filter tank. On the reinforced concrete slab on grade is an electrical room and chemical containment area (alum) with 8” concrete top slab mezzanine (150psf live load). The superstructure is a pre-engineered metal building.

> Proposed modifications include concrete modifications in the existing Filter Basins including demolition of existing tank divider walls and installation of new Filter Basin divider walls.

**Sequencing Batch Reactor and Equalization Tank Complex** - The 58’ square x 24’ deep SBR tank shall be constructed of reinforced concrete. The tank will be designed to resist flotation and internal and external soil and hydrostatic and dynamic forces. The tank will be designed and tested for watertightness and will include reinforced concrete walkways around the top perimeter with edges protected with aluminum guards. Two sets of aluminum stairs will provide access to the top of the tank.

**Process Building**

54’x 58’ Reinforced concrete foundation with at grade and second floor concrete slabs. Superstructure consists of masonry bearing walls and wood truss roof. Substructure equipment includes a below grade pump room and associated stair. First floor equipment is a slab-on-grade with roll-off container guide and plates, an electric room, mechanical room, and grit area. Second floor will support polymer totes and centrifuges with a single overhead monorail which will allow for polymer totes and removal of centrifuge rotating assembly to be lifted onto the second floor.

**Exterior Roll-off Container Pad –** Two 12’x26’ pads will be constructed to accommodate loading/unloading of the sludge roll-off container. Pads will be frost protected shallow foundation type.

**Standby Generator foundation and Transformer Pad**

Frost protected reinforced concrete foundations. An aluminum stair and platform shall be provided as part of the standby generator package.

## Governing Codes

The codes and standards governing the building design include the following:

- 2018 International Building Code
- ASCE 7-16 Minimum Design Loads for Buildings and Other Structures
- ACI 318 - Building Code Requirements for Structural Concrete
- ACI 350 - Code Requirements For Environmental Engineering Concrete Structures
- ACI 350.3/350.3R - Seismic Design of Liquid Containing Concrete Structures
- ACI 530/530.1 - Building Code Requirements and Specifications for Masonry Structures
- Aluminum Association - Specifications for Aluminum Structures
- AISC Manual Of Steel Construction -
- National Design Specification For Wood Construction –
- Ground Snow Loads for New Hampshire, US Army Corps of Engineers

## DESIGN CRITERIA

Risk Category per IBC/ASCE = III

### Geotechnical

100 Year FEMA Flood Elevation = 778.5'
Minimum non-critical new structure elevation : 780.5 (+2 ft above 100 year flood elevation)
Minimum critical new structure elevation : 781.5 (+3 ft above 100 year flood elevation)

Design air freezing index = 1750
Design frost depth = 5'-0"

Jan 2012 AECOM Filter Building Record dwgs show foundation designs are based on allowable bearing pressure of :
Mat @ EL 769.00' = 2250 psf
Mat @ EL 781 and EL 775 = 1500 psf
Wall and Pier footings = 3200 psf

### Building Loads

Floor Live Load: uniform load based on equipment weights and expected usage
Process Equipment Rooms = 300 psf
Electrical Rooms = 250 psf
Office areas = 150 psf

Snow Load: Ground snow load = 85 psf @ EL 1200 -2.1*(1200-800)/100 = 77 psf
Thermal Factor (Ct) = 1.1
Importance Factor (Is) = 1.1
Exposure Factor (Ce) = 1.0 (Assume Exp C, Partially Exposed)

Wind Load:

- Nominal 3 second gust wind speed = 130 mph**Special wind region
  - Confirm with local code enforcement agency
- Surface Roughness C (Open terrain with scattered obstructions having heights generally less than 30 ft) or B (wooded areas)
- Exposure C
- Topographic Factor, Kzt = 1.1 (assumed)

Seismic: Zipcode 03754, 03773
From ATC: Ss = .275, S1 = .072
Soil seismic site class = D (default assumed)
Seismic Design Category C (verify during design)
Seismic Restraint required for electrical and chemical equipment.

### Relevant Specifications:

Bid Form
01150 Measurement & Payment
02156 Excavation Support System
02140 Temporary Construction Dewatering
Division 03 Concrete
Division 05 Metals

06175 Prefabricated Wood Trusses
06600 Fiberglass Reinforced Plastic Fabrications
13084 Seismic Restraint for Non-Structural Components
14320 Hoist Systems
15094 Prefabricated Pipe Supports

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828B | | |
| Subject: | Town of Newport New Hampshire – Mechanical Technical Design Memo | | |
| Prepared By: | Rodney Greene | Date: | 11/3/2022 |
| Reviewed By: | Michael Curry | Date: | 11/3/2022 |
| Revised By: | Rodney Greene | Date: | 11/3/2022 |

## Introduction

The presented scope of work is intended for the preliminary design phase of various upgrades and improvements to the Wastewater Treatment Facility in Newport New Hampshire. This memorandum defines the general scope of work and documents how the HVAC and plumbing systems will be approached to facilitate the modifications to the existing buildings and addition of new buildings.

## Description of Existing Facilities

### Control Building

#### General

Equipment in throughout the building appears to be well maintained and in fair to good condition; piping and ductwork systems appear to be in generally good condition. No operational issues were noted in discussion with the operations staff. The equipment generally functions as necessary to provide heating and ventilation to the spaces served but may not be properly sized as space uses have changed since installation. Most equipment is older and approaching or has exceeded its expected useful life but can continue to be maintained and replaced in kind as necessary. Only areas of this building affected by changes in use or requiring upgrades for code compliance and occupant safety are discussed in more detail below..

#### Boiler Room

- Oil-fired cast-iron boiler; fair condition, approaching the end of its useful life.
- Domestic hot water heater; fair condition, beyond expected useful life (manufactured Jan. 2000).
- Separate indirect domestic water heating tank piped to boiler; good condition.
- Inline circulating pumps; one failed, one fair condition; both beyond expected useful life.
- Expansion tank, piping and other accessories appear to be in generally good condition.
- Ventilation louver has been blanked off limited combustion air available to the boiler.
- Clothes washer, drain piped over floor and discharges to floor drain.

#### Dechlorination Room

This space is no longer used as originally designed and the systems and equipment are not suitable for use.

- Roof mounted exhaust fan ducted to a combination of painted sheet metal duct and aluminum flex duct. Manually controlled by a switch outside the space.
- Intake louver and associated ductwork and grille, motor operated control damper appears to have been removed.
- Loosely fitting EPDM rubber insulation has been added to sections of the hydronic heating piping passing through the space.

- One hydronic unit heater provides heating to the space.
- Hydronic heating pipe passes through the space to an underground conduit to the Grit Building.

### Generator Room

- Intake louver with motor operated damper.
- Exhaust louver with motor operated dampers and ductwork to generator radiator.
- Generator exhaust piping
- Diesel day tank
- Roof mounted exhaust fan

### Pump Room

- An existing roof mounted fan exhausts air from the Pump Room and the Control Room above at a rate of 6 air changes per hour. If operated continuously, this allows for the space to be unclassified by ventilation and no HVAC modifications are required to accommodate the installation of new equipment in this space which is not rated for installation in a Class I, Division 2 space.
- Outside air is introduced to the space through roof mounted intake ventilator ducted to a ceiling grille in the ceiling of the stairwell. Due to life safety travel distance requirements a door is required at the entrance to the Pump Room which will obstruct the flow of air to this space.

### Screen Room

- Two existing roof mounted exhaust fans exhaust air, one from the upper level and one from the lower level. The airflow rate was evaluated and determined to be more than adequate for the health and safety of the occupants.

## Filter Building

### Filter Room

All equipment was installed as part of original build in approximately 2012.

- Gas-fired domestic water heating tank, providing potable hot water to the emergency thermostatic mixing valve, originally serving one interior emergency shower/eyewash unit, an exterior emergency shower, and exterior eyewash, all of which have since been removed. All associated piping which has been exposed shows signs of corrosion. Heater appears to be in good condition.
- Two gas-fired unit heaters provide space heating; fair condition, evident corrosion.
- Direct gas-fired make up air unit; fair condition, some corrosion evident, associated ductwork in good condition.
- Intake air louver/damper assembly; good condition, interlocked with cooling exhaust fans.
- One continuously operating ventilation exhaust fan, good condition.
- Two thermostatically operated cooling exhaust fans, good condition.

### Electrical Room

- Ductless split system air conditioning unit, good condition, aged but limited use, recommend future replacement in kind upon failure.
- Electric unit heater; good condition.

## Governing Codes

- 2018 International Energy Conservation Code
- 2018 International Mechanical Code
- 2018 International Plumbing Code
- ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality
- 2011 NFPA 31 Standard for the Installation of Oil-Burning Equipment
- 2012 NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems
- 2012 NFPA 90B Standard for Warm Air Heating and Air Conditioning Systems
- 2015 NFPA 54 National Fuel Gas Code, amended by Saf-C
- 2020 NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities

## Outdoor Design Conditions

Summer: 88.3°F DB, 70.9°F WB, ASHRAE 0.4%

Winter: -13.7°F DB, ASHRAE Mean Extreme Annual Temperature

## Indoor Design Conditions

| Location | Summer | Winter | Ventilation |
|---|---|---|---|
| *Control Building* | | | |
| *Boiler Room* | *Ambient* | *55°F* | *Not Required* |
| ~~*Dechlorination Room*~~<br>**Chemical Room** | Ambient | 55°F | 1 cfm/sqft Continuous |
| **Bathroom** | 72°F | 55°F | 75 cfm occupied |
| *Aeration Blower Room* | 85°F setpoint; Ambient + 10°F | *55°F* | As required for cooling |
| ~~*Generator Room*~~<br>**Electric Room** | 80°F | 55°F | Not Required |
| *Pump Room* | *Ambient* | *55°F* | *6 ACH continuous* |
| *Filter Building* | | | |
| *Electrical Room* | 80°F | Ambient | Not Required |
| *Filter Room* | Ambient | 55°F | 0.25 cfm/sqft; Occupied: continuous<br>Unoccupied: 5 min. on 55 min off |
| Process Building | | | |
| **Dewatering Room** | Ambient | 55°F | 6 ACH occupied or >50°F ambient;<br>3 ACH unoccupied and <50°F ambient |
| **Container Bay** | Ambient | 55°F | 6 ACH occupied or >50°F ambient; |

| Location | Summer | Winter | Ventilation |
|---|---|---|---|
| | | | 3 ACH unoccupied and <50°F ambient |
| **Sludge Pump Room** | Ambient | 55°F | 6 ACH occupied or >50°F ambient;<br>3 ACH unoccupied and <50°F ambient |
| **Grit Pump Room** | Ambient | 55°F | 6 ACH occupied |
| **Stairwell** | Ambient | 55°F | Not Required |
| **Mechanical Room** | Ambient | 55°F | Not Required |
| **Electrical Room** | 80°F | 55°F | Not Required |
| **Restroom** | Ambient | 70°F | 75 cfm occupied |
| **Control Room** | 72°F | 70°F | 0.06 cfm/sqft + 5 cfm/person |
| Disinfection Building | Ambient | 55°F | 0.25 cfm/sqft; Occupied: continuous<br>Unoccupied: 5 min. on 55 min off |

# Proposed Modifications

## Control Building

### Boiler Room

The owner/operations staff expressed interest in eliminating the fuel oil boiler and associated underground storage tank in favor of a new propane fired boiler and storage tank. The following work is recommended to be included as an add alternate to allow pricing to be obtained and the work completed if project budget allows:

- Demolish existing boiler, pumps, piping, and appurtenances in their entirety.
- Demolish existing fuel oil storage tank and all associated piping and appurtenances.
- Demolish existing domestic water heaters and all associated piping and appurtenances.
- Provide new high efficiency condensing boiler and all associated pumps, accessories, piping, and appurtenances.
- Provide new indirect fired domestic water heater with electric backup coil.
- Provide new washing machine box and associated domestic water, waste, and vent piping. Provide 6” wall cap for dryer vent.
- Replace existing louver blank off panel with new insulated blank off panel.

### Chemical Room

- Demolish existing exhaust fan and all associated ductwork and appurtenances.
- Demolish existing intake grill and associated ductwork back to existing louver to remain.
- Demolish existing hydronic heating piping and appurtenances serving existing Grit Building from floor penetration back to nearest active section of main and cap.
- Replace existing hydronic unit heater and associated appurtenances with new phenolic epoxy coated hydronic unit heater.
- Replace existing hydronic pipe insulation with new preformed EPDM rubber pipe insulation with PVC jacket. Provide epoxy paint coating for piping prior to applying new insulation.

- Provide new utility set type exhaust fan with fiberglass reinforced plastic or PVC housing and electronic commutated motor or variable frequency drive for balancing. Provide CPVC ductwork down though existing roof opening to exhaust inlet in space below.
- Provide new CPVC intake ductwork and motor operated damper connected to existing intake louver.
- Provide new PVC emergency shower/eyewash unit.
- New domestic water to provide tepid water for emergency shower/eyewash unit and cold water to limited area sprinkler system. Existing domestic water heater and tepid water system remain in Filter Building. Route cold water, tepid water, and tepid water recirculation piping below grade from Filter Building to emergency shower / eyewash unit and limited area sprinkler system in Chemical Room. Provide recirculating pump and modify existing tepid water system as necessary to allow for tepid water recirculation. Less cost, less intuitive arrangement with water service in different building; remaining useful life of existing equipment in Filter Building unclear, equipment is aged but has seen little use.
- Provide limited area sprinkler system consisting of 6 heads or fewer, flow switch, and isolation valve with tamper switch.

### Bathroom

- Provide inline exhaust fan above ceiling with associated ductwork connection ceiling exhaust grille to new wall cap.
- Provide hydronic radiant heating panel and associated piping, controls, and appurtenances to supply heat to the space.
- Provide fixtures, piping, and all other associated appurtenances required for one lavatory unit and a single flush tank water closet.
- Provide one floor drain and associated piping and appurtenances.

### Aeration Blower Room

- Provide new intake louver and associated motor operated intake damper.
- Replace existing roof mounted exhaust fan with new roof mounted upblast exhaust fan with electronically commutated motor and thermostatic controls. Fan to be sized to maintain 10°F temperature differential between space and ambient.

### Electrical Room

- Demolish intake louver and associated motor operated damper; coordinate infill of existing wall opening.
- Demolish exhaust louver and associated motor operated dampers and ductwork; coordinate infill of existing wall opening.
- Demolish generator exhaust muffler and piping; cap seal and insulate roof penetration.
- Demolish diesel day tank and all associated fuel transfer piping.
- Demolish roof mounted exhaust fan; cap seal and insulate roof penetration.
- Provide new ductless split system heat pump to provide heating and cooling. Outdoor unit may be either roof or wall mounted.
- Provide electric unit heater for auxiliary heating; unit would operate only when ambient temperature falls too low for heat pump to operate.

### Pump Room

- Demolish existing roof mounted gravity intake ventilator; cap, seal, and insulate existing curb opening.

- Provide new intake louver in the wall of the Control Room above. Provide intake damper at louver with manual locking quadrant operator, manual operator can be replaced with a motorized actuator in the future if required.
- Provide ductwork down through the floor into the pump room below and an additional grille in the Control Room above.

## Tertiary Building

### Electrical Room

- Existing ductless split system air conditioning unit and electric unit heater to remain. Clean and service existing equipment.

### Filter Room

The existing equipment is functional but corroded, has been little used, and will remain functional for an unknown period. To maintain a good environment and conserve energy it is recommended to replace much of the equipment. The following work is recommended to be included as an add alternate to allow pricing to be obtained and the work completed if project budget allows:

- Demolish two gas-fired unit heaters and all associated appurtenances. Cut back gas piping as necessary to allow for installation of new.
- Demolish direct gas-fired makeup air unit and all associated appurtenances. Reuse ductwork if possible, demolish unused.
- Demolish one continuously operating ventilation exhaust fan and replace with new sidewall centrifugal exhaust fan with electronically commutated motor and motor operated damper sized for reduced ventilation airflow rate.
- Intake air louver/damper assembly and two cooling exhaust fans and associated controls to remain.
- Provide two gas fired unit heaters and associated vents, piping, controls, and appurtenances.
- Provide separated combustion, modulating direct vent furnace with mixing box and ductwork to existing intake louver. Provide new motor operated intake damper at louver. Provide duct temperature sensor for discharge air temperature control. Connect to existing supply ductwork.
- Provide new centrifugal sidewall exhaust fan and associated motor operated damper, controls, and appurtenances.
- Base bid to include addition of switch for manual occupancy control of currently continuous exhaust fan and makeup air unit.

## Process Building

### Sludge Pump Room

- Provide new sidewall centrifugal exhaust fan with electronically commutated motor and motor operated damper. Fan sized to provide as 3 air changes per hour at minimum and modulate up as necessary based on a space temperature sensor to remove the heat rejected by the process equipment in the space.
- Provide inline supply fan, intake louver with motor operated damper, hydronic duct heating coil, and associated ductwork to duct mounted supply grilles.
- Provide two hydronic unit heaters and all associated piping and appurtenances.
- Provide one simplex submersible sump pump with integral float control and associated piping and appurtenances.

## Grit Pump Room

- Provide sidewall centrifugal exhaust fan with electronically commutated motor and motor operated damper.
- Provide inline supply fan, intake louver with motor operated damper, hydronic duct heating coil, and associated ductwork to duct mounted supply grilles.
- Provide one hydronic unit heater and all associated piping and appurtenances.
- Provide one floor drain and associated piping and appurtenances.

## Stairwell

- Provide hydronic cabinet unit heater to provide heat to the space.

## Mechanical Room

- Provide water service entrance including backflow preventer, pressure reducing valve, strainer, and water meter. Provide secondary backflow preventer to supply water to non-potable water piping system by others.
- Provide new high-efficiency, direct vent, gas-fired boiler and associated pumps, piping, and accessories. Route polypropylene air intake and vent through exterior wall.
- Provide one hydronic unit heater and all associated piping and appurtenances.
- Provide new 1000-gallon propane storage tank and associated piping and appurtenances to supply gas to gas fired equipment.
- Provide one floor drain and associated piping and appurtenances.

## Electrical Room

- Heating and cooling to be provided by a ductless split heat pump sized to accommodate space requirements and heat rejection from electrical equipment. Outdoor unit to be mounted on wall support brackets and paired with a wall mounted indoor unit.
- Provide electric unit heater for auxiliary heating; unit would operate only when ambient temperature falls too low for heat pump to operate.

## Container Bay

- Provide sidewall centrifugal exhaust fan with electronically commutated motor and motor operated damper.
- Provide inline supply fan, intake louver with motor operated damper, hydronic duct heating coil, and associated ductwork to duct mounted supply grilles.
- Provide two hydronic unit heaters and all associated piping and appurtenances.
- Provide two floor drains and associated piping and appurtenances.

## Control Room

- Provide inline supply fan, intake louver with motor operated damper, and ductwork to ductless split system heat pump indoor unit.
- Provide extended heating range ductless split system heat pump indoor unit connected to outdoor unit mounted on wall support brackets. Provide indoor unit with multifunction casement to allow for additional outdoor air to be supplied directly to the unit.
- Provide ceiling mounted hydronic radiant heating panels and associated piping and controls along exterior walls.

### Bathroom

- Provide inline exhaust fan above ceiling with associated ductwork connection ceiling exhaust grille to new wall cap.
- Provide hydronic radiant heating panel and associated piping, controls, and appurtenances to supply heat to the space.
- Provide fixtures, piping, and all other associated appurtenances required for one lavatory unit and a single flush tank water closet.
- Provide tankless electric domestic water heater to provide hot water to the lavatory.
- Provide one floor drain and associated piping and appurtenances.

### Dewatering Room

- Provide inline supply fan, intake louver with motor operated damper, hydronic duct heating coil, and associated ductwork to duct mounted supply grilles.
- Provide new inline exhaust fan with electronically commutated motor ducted to wall louver with motor operated damper.
- Provide emergency eyewash unit, flow switch and alarm, and associated appurtenances.
- Provide emergency, thermostatically controlled, tankless domestic water heater to supply tepid water to the emergency eyewash unit.
- Provide three hydronic unit heaters and all associated piping and appurtenances.
- Provide three floor drains and associated piping and appurtenances.

### Disinfection Building

- Provide sidewall centrifugal exhaust fan with electronically commutated motor and motor operated damper.
- Provide intake louver and associated motor operated intake damper.
- Provide one 5 kW electric unit heater.

# Basis of Design Memorandum

| | | | |
|---|---|---|---|
| Project No.: | 20828 | | |
| Subject: | Newport, NH – Instrumentation and Controls Preliminary Design Report | | |
| Prepared By: | Paul Denis, PE<br>Quinn Snyder, EI | Date: | 10/27/2022 |
| Reviewed By: | Michael Curry, PE<br>James Papadimitriou, PE (CT, MA, FL) | Date: | 11/2/2022 |
| Revised By: | Paul Denis, PE | Date: | 12/2/2022 |

## Introduction

The Town of Newport, NH owns and operates an aerated lagoon treatment facility, which was upgraded with a tertiary filtration process in 2012. The tertiary filtration system was unable to achieve compliance with the Town's total phosphorus limits and was abandoned after startup. Subsequently, the Town was issued an Administrative Order on Consent (AOC) which required the Town to develop a Facility Plan to achieve compliance with effluent TP limits. A Facility Plan was developed in 2017 in response to the AOC and in 2019, the Town moved forward with the recommended preliminary design.

In 2020, the Town was issued a new NPDES permit with more stringent effluent limits for ammonia nitrogen, metals limits, and total nitrogen monitoring and optimization requirements. Based on the new effluent requirements, the recommendations included in the 2017 Facility Plan and the 2019 Preliminary Design needed to be revised. In 2022, the Town moved forward with an amendment of the Facility Plan Amendment completed by Wright-Pierce to address the new effluent limits.

The following topics will be included as part of the PDR and as described in the PDR Scope of Services.

- Funding and financial coordination
- Flows and loads confirmation
- Evaluation of the following existing and proposed facility components:
    - Influent Pump Station
        - New pumps
        - New piping valving
    - Plant Water System (Bid Alternative)
    - Grit Removal System
    - Sequencing Batch Reactor System
        - Pre-selection to occur as part of Preliminary Design (post-PDR phase)
    - Tertiary Filtration System
        - Existing Filtration Building and tankage to be re-used
    - UV Disinfection System (Bid Alternate)
        - Reuse existing Chlorine Contact Tank structure
    - Septage Receiving System (Bid Alternate)
    - Solids Handling (storage, dewatering, disposal)

  - Lagoon Influent Equalization

## Existing Conditions

The existing process and control system will be replaced in it's entirety and was not evaluated. Refer to Proposed Modifications section for recommendations.

## Governing Codes and Standards

1. Underwriters Laboratory (UL) 508 – Industrial Control Equipment
2. National Fire Protection Standard (NFPA) 820 – Standard for Fire Protection in Wastewater Treatment and Collection Facilities
3. National Electrical Code – NFPA 70

## Client Preferences

1. Bubbler level instrument for influent wet well level monitoring with two floats in each wet well.
2. Have dedicated visual display, not at SCADA, in the control building for influent wet well level, influent flow, and effluent flow trends.
3. Refer to Nomenclature below for light colors and switch nomenclature.
4. SCADA terminals to be located in the Control Building lab and new Process Building Control Room.
5. Sole source considerations:
   a. Enmet for gas detection
   b. iFix for SCADA software to match what the Town utilizes in the water system
   c. LCS Controls for PLC and iFix programming

## Proposed Modifications

### Instruments

The following instruments are proposed to be replaced or installed as part of the design:

1. Influent Wet Well & Pumps
   a. Float Switch – Influent channel prior to grinder
   b. Float Switches (qty 4) – Wet Well
   c. Wet Well Bubbler Level Instrument (w/compressor) – Wet Well (common for both)
   d. Electromagnetic Flow Meter – Influent Pump Discharge
2. Grit Removal System
   a. Electromagnetic Flow Meter – Grit Pump
   b. Float Switch (OEM furnished) – Grit Classifier
3. Sequence Batch Reactor
   a. Float Switches (qty 4 – 2 per tank) (OEM furnished) – SBR Tanks
   b. Submersible Level Element (OEM furnished) – SBR Tanks
   c. Analyzers (DO, ORP, pH) (OEM furnished) – SBR Tanks
4. Effluent Pump Station
   a. Float Switches (qty 2) – Effluent Wet Well
   b. Submersible Level Element – Effluent Wet Well
5. Tertiary Filters
   a. Float Switch – Coagulation Tank
6. Disinfection & Effluent

   a. Analyzers (UVI) (qty 3) (OEM furnished) – UV Disinfection Bank
   b. Float Switch – Plant Water Tank
   c. Ultrasonic Level Element – Plant Water Tank

7. Septage Receiving
   a. Float Switch – Septage Tank
   b. Radar Level Element – Septage Tank
8. Plant Water
   a. Differential Pressure Element – Duplex Strainer
   b. Pressure Element – Pump Discharge
   c. Electromagnetic Flow Meter – Plant Water Pump Discharge
9. Chemical Feed (Ferric)
   a. Float Switches (as required) – Containment
   b. Ultrasonic Level Element (qty 2) – Bulk Tank Level
10. Solids Handling
    a. Pressure Switches (qty 4) (OEM furnished) – Dewatering Feed Pump Suction & Discharge
    b. Electromagnetic Flow Meter – Dewatering Feed Pump Discharge
    c. Ultrasonic Level Element (qty 2) – Sludge Roll-Off Container
    d. Electromagnetic Flow Meter (qty 2) – Waste Sludge Pump Discharge
    e. Float Switches (qty 2) – Sludge Storage Tanks
    f. Radar Level Element (qty 2) – Sludge Storage Tanks
    g. Other instruments as required by manufacturer
11. Lagoon Effluent Tank & Pumps
    a. Float Switch – Lagoon Effluent Tank
    b. Submersible Level Element – Lagoon Effluent Tank
    c. Electromagnetic Flow Meter – Lagoon Equalization Pump Discharge
12. Building & Misc.
    a. LEL Gas Detection Instrument & Notification – Influent Wet Well
    b. Float Switches (as required) – Building Sumps / Flood Switches
    c. Temperature Switches – Building Low/High Temperature

## Controls & SCADA

### Controls General

For this new facility, a complete SCADA system will be implemented. This SCADA system will be standardized to utilize a process control system with three levels of control consisting of Local (locally), with Virtual-Manual and Virtual-Auto at the SCADA system. Local mode is manual control at a Local Control Station (LCS) and bypasses PLC control. This allows the operator to control the equipment manually, even if the control system has faulted or is not available. Virtual-Manual and Virtual-Auto are virtual control modes at the SCADA system. In Virtual-Manual, the operator can manually start/stop the device and set the position of actuators or speed variable speed drives, just as though they were at the equipment LCS. In Virtual-Auto mode, the equipment will be controlled automatically by the control system.

LCSs for equipment will be located adjacent to the equipment and include the following:

- Hand/Off/Auto (HOA) switch
- Speed potentiometer (as required)

- E-Stop switch (as required)

Indicator lights located on SCADA screens, control panels, and LCSs will use the following color legend:

| | |
|---|---|
| Run | Red |
| Stop | Green |
| Warning | Amber |
| Alarm | Red |
| Power | White |

## Standard Control Signals and Hardware Interlocks

Hardwire interlocks needed for equipment or personnel protection will be provided. The hardwire interlocks will be located in the driven equipment control circuit at the VFD or MCC section and will not be able to be bypassed by the PLC or at the LCS. Hardwire interlocks would include signals that could prevent injury to personnel or damage to equipment as noted below. At a minimum standard PLC / SCADA system monitoring and control functions would include the below pieces of equipment. General auto functionality is described in the individual process sections.

### Variable Frequency Drives

- IN REMOTE status
- ESTOP alarm (as required) (hardwire interlock)
- RUN status
- AUTO/MANUAL control with start/stop
- FORWARD/REVERSE control (as required)
- SPEED FEEDBACK
- MANUAL SPEED SETPOINT
- LOAD FEEDBACK (as required) (Load feedback would be amps scaled from 0-100% of FLA)
- VFD FAULT alarm (hardwire interlock)
- MOTOR HIGH TEMP alarm (as required or motors over 10HP) (hardwire interlock)
- HIGH DISCHARGE TEMP alarm (as required) (hardwire interlock)
- HIGH DISCHARGE PRESSURE alarm (as required) (hardwire interlock)
- FAIL alarm
- RUN TIME totalizer

### Motor Starters

- IN AUTO status
- ESTOP alarm (as required) (hardwire interlock)
- RUN status
- AUTO/MANUAL control with start/stop
- OVERLOAD alarm (hardwire interlock)
- MOTOR HIGH TEMP alarm (as required or motors over 10HP) (hardwire interlock)
- HIGH DISCHARGE PRESSURE alarm (as required) (hardwire interlock)
- LOW SUCTION PRESSURE alarm (as required) (hardwire interlock)
- FAIL alarm
- RUN TIME totalizer

### Actuators (open/close & modulating)

- IN AUTO status

- FULL OPEN/CLOSE status
- AUTO/MANUAL control
- MANUAL POSITION SETPOINT (modulating only)
- POSITION FEEDBACK (modulating only)
- FAULT alarm
- FAIL alarm

### Chemical Feed Pumps

- IN AUTO status
- RUN status
- AUTO/MANUAL control with start/stop
- SPEED FEEDBACK
- MANUAL SPEED SETPOINT
- DOSE SETPOINT
- COMMON FAULT alarm
- FAIL alarm
- RUN TIME totalizer

## Supervisory Controls and Data Acquisition (SCADA)

The client would like to implement SCADA as part of this upgrade. The client would has requested to specify LCS to provide the SCADA software programming. LCS is the client's local programmer of choice. LCS recommends that SCADA Access and Permissions will be user based. A meeting during the construction phase of the project will identify different user levels and access. The following computers and SCADA licenses will be provided:

- SCADA-1 Server (Located in the Control Building Lab Room)
- SCADA-2 Server (Located in the Process Building Control Room)

Only the above computers will be provided; computers for email and regular office use will not be provided, unless otherwise noted.

SCADA-1 and SCADA-2 will be redundant and will be located in separate locations for risk mitigation. In the event of a fire, spill, or other miscellaneous incident, it would be less likely for both SCADA computers to be damaged if they were in separate buildings. It is also recommended that the computers to be backed up intermittently. A backup storage device is proposed to be used to intermittently save the PLC programs, SCADA program, and historical data.

### *Alarming*

For remote alarming, a software alarm dialer such a WIN-911 will be used. Alarms will be dialed out using a dedicated analog phone line. The alarm dialing software will be capable of calling different numbers for different alarms (for example, when the pump stations are integrated into the control system, alarms for the pump stations will not dial the same numbers as alarms for the treatment plant). The existing Raco Alarm Dialer in Filter Building will be used as a backup dialer.

### *Network*

The control panels will be connected in a hybrid ring-star network. There will be a ring backbone and star segments off of it. This will allow communication throughout the ring network should one ethernet switch/cable stop functioning. The ring will be between the following panels:

- Control Building Control Panel
- Process Building Control Panel
- UV RIO Control Panel,
- Filter Building Control Panel

The ring network will be fiber optic cable. The remaining control panels will be connected to the closest control panel via a category 6 or fiber optic cable ethernet connection. Fiber will be used if the connection between buildings, and category 6 cable if the connection is within the building.

### Remote Access & Cyber Security

The Town will have remote access into the SCADA system. A “jump server” is recommended for use. The purpose of a “jump server” is to act as an intermediary between the outside world and the control system. The “jump server” would be located in what is called a “DMZ” (Demilitarized Zone). The purpose of a DMZ is to act as a separate network with the IT network or outside world on one side and the control network or OT network on the other. When operators remotely connect to the SCADA System, they would be accessing the DMZ and not the computers on the control network. This is an added level of security recommended by the Department of Homeland Security (DHS), National Institute of Standards and Technology (NIST) and the AWWA. The benefit is there is no direct link of communication between the outside world and the SCADA System. If the “jump server” in the DMZ is compromised (ransomware for example), then it is far less likely for it to affect the computers in the control network. See the network diagram for additional information. It is assumed that the no IT department will be involved.

Wright-Pierce also recommends encrypting remote access data and having all users use unique usernames and passwords. According to the latest Verizon Data Breach Investigations Report (DBIR), over 80% of hacking related breaches involved weak or stolen passwords. Approximately half of the breaches used stolen credentials and half with weak passwords that were brute forced. Using unique and passwords with some complexity would be a step toward mitigating the largest hacking risk without any financial cost.

## Control Panels

New Process Control Panels will be installed in the Control Building, Process Building, and Filter Building. Each Control Panel will have an Ethernet interface for communicating the control network. Operator Interface Terminals (OIT) will also be installed local to equipment to facilitate local SCADA system control of the equipment as noted in the bullets below. The new process control panels include the following:

### Control Building Control Panel (CBCP)

Furnished By: System Integrator

Location: Electrical Room

Rating: NEMA 12

PLC: Modular PLC

OIT/HMI: 10 inch OIT

Enclosure: New

Equipment:

- Mechanical Bar Screen
- Screenings Grinder
- Influent Composite Sampler
- Influent Pumps and Wet Well
- Plant Water Pumps
- Septage Receiving Mixer
- Septage Pump
- Ferric Chloride Feed Pumps and Chemical Storage Tanks
- Aeration Blowers
- Effluent Equalization Pumps

### Filter Building Control Panel (FBCP)

Furnished By: System Integrator

Location: Electrical Room

Rating: NEMA 12

PLC: Remote IO rack – referencing PLC CPU in Control Building

OIT/HMI: 10 inch OIT

Enclosure: Reuse Existing Enclosure

Equipment:

- Rapid Mix Tank Mixer
- Coagulation Tank Mixer
- Flocculation Tank Mixer
- Lagoon Effluent Equalization Pumps and Wet Well

### Process Building Control Panel

Furnished By: System Integrator

Location: Control Room

Rating: NEMA 12

PLC: Remote IO rack – referencing PLC CPU in Control Building

OIT/HMI: 10 inch HMI

Enclosure: New

Equipment:

- Grit Mixer
- Grit Classifier
- Grit Pump
- Sludge Tank Blowers
- Sludge Grinders (future)
- Odor Control Unit (future)

### UV Remote Input/Output Control Panel (UVRIO)

Furnished By: System Integrator

Location: UV Disinfection Building

Rating: NEMA 4X

PLC: None

OIT/HMI: None

Enclosure: New

Equipment:

- Plant Water Tank
- Effluent Sampler
- Effluent Flow

### Sequence Batch Reactors Control Panel (SBRCP)

Furnished By: OEM

Location: Control Room

Rating: NEMA 12

PLC: Modular PLC

OIT/HMI: 10 inch OIT

Enclosure: New

Equipment:

- Motor Operated Valves (Air)
- Motor Operated Gates (Influent)
- Motor Operated Valves (Effluent)
- Floating Mixers
- Decanters
- Waste Sludge Pumps

### Tertiary Disk Filters Control Panel (TDFCP)

Furnished By: OEM

Location: Electrical Room

Rating: NEMA 12

PLC: Micro PLC

OIT/HMI: 6 inch OIT

Enclosure: New

### UV Disinfection Control Panel (UVCP)

Furnished By: OEM

Location: UV Disinfection Building

Rating: NEMA 4X

PLC: Modular PLC

OIT/HMI: OIT

Enclosure: New

### Dewatering Control Panel (DWCP)

Furnished By: OEM

Location: Control Room

Rating: NEMA 12

PLC: Modular PLC

OIT/HMI: OIT

Enclosure: New

Equipment:

- Centrifuge
- Screw Conveyors
- Sludge Grinders
- Dewatering Sludge Feed Pumps
- Polymer Blending Unit

### Control Panel Standards

Control Panel:

1. New control panel NEMA ratings will be rated for the environmental conditions of the space.
2. The assembled control panel shall meet the requirements of UL508A (industrial control panels).
3. Control panels shall have a hinge, three-point latch with lockable handle, door mounted drawing pocket, internal LED light activated by a door switch.
4. PLCs: Refer to control panel list above
5. OITs: Refer to control panel list above.
6. Control Panel Power: 120VAC, 20A circuit

7. UPS: The UPS will provide backup power for the control panel and instruments. The UPS will be sized for a minimum of 15 minutes of power at full load. An Automatic Transfer Relay shall be installed to switch from UPS power to utility power in case of UPS failure.
8. Pushbuttons and Indicator Lights: 30mm industrial grade, water/oil tight, NEMA 4X. Indicator lights shall be LED type.
9. Relays: Socket and base with push to test type.
10. Generic Panel Mounted Devices shall include (list will modify as required):
    a. POWER indictor light (white)
    b. COMMON ALARM indicator light (amber)
    c. RESET pushbutton (reset software and hardware alarms)
    d. Programming Port and Programming Power Receptacle
11. All branch power circuits will have over current protection.
12. Outdoor circuits will have surge protection.
13. All alarms will have adjustable setpoints, time delays, and will be able to be disabled.

## Process Systems

The following section is an overview of the new process systems as they relate to instrumentation and controls portion of the project. A brief description of how the equipment will be run in automatic is also included in each of the sections.

### Grinder and Screenings

The existing grinder and screen run continuously. No additional change is intended.

### Influent Wet Well and Pump Station

The existing two wet wells will be reused. The level of the wet wells will be monitored by a new bubbler instrument, low level floats, and high level floats. The bubbler will be shared by both wet wells, and a high and low level float will be installed in each wet well. The high level floats will notify the operator of a high level, and activate backup control. See the following paragraphs for a description of the backup control.

Three new dry pit submersible pumps (INFP-1,2,3) will be installed in the dry well. The pumps will operate in a Lead / Lag / Standby configuration. The new pumps will be driven from VFDs. Auto control will turn on and off the lead and lag pumps at operator defined pump on and pump off levels. The speed of the pump will be proportional to the level in the wet well between the minimum pump speed and minimum speed level to the maximum pump speed and maximum speed level. Pump flow will be monitored by a new flow meter.

The operator will be able to select a lead backup pump (pump 1, 2, or 3) and a lag backup pump (pump 1, 2, or 3) on the control panel. The lead backup pump will turn on at a preset speed when the high-level float in wet well no.1 is activated and turn off when the low level float in wet well No.1 drops out. The lag backup pump will turn on at a preset speed when the high-level float in wet well no.2 is activated and turn off when the low-level float in wet well no.2 drops out. The high-level floats in the wet well will be separated by about 6” so both pumps don’t turn at the same time.

### Grit System

A new grit mixer (GTMX-1) will be installed in the vortex chamber and be driven by a motor starter. The mixer will run continuously.

A new grit pump (GTP-1) driven by a VFD will pump the grit from the vortex chamber to a new grit classifier (GTC-1). Flow from the grit pump will be monitored by a new magnetic flow meter. When the grit system is operating in automatic, it will operate on a repeat cycle timer (XX minutes on, YY minutes off). Prior to the grit pump and classifier turning on, plant/process water will be used to fluidize the suction line of the grit pump to ensure the suction line remains operational. Then the grit pump and classifier will turn on, after the cycle is over, the classifier will continue to run until for a set period of time to process any grit from the conveyor.

### Sequence Batch Reactors

Wastewater from the grit system will flow in to the SBR influent channel and is then directed to Sequence Batch Reactors No.1 or No. 2. The SBR Influent Channel has two slide gates that direct flow to either SBR No.1 or No.2. Each SBR is monitored for level using a submersible level transducer as well as high-high and low-low level float switches. The DO, ORP, and pH of each SBR is monitored.

Each SBR consists of a Floating Mixer, a Decanter, and a Waste Sludge Pump. The Floating Mixers are driven from non-reversing motor starters. The Decanters direct flow from the Sequence Batch Reactors to the Effluent Equalization Tanks when the butterfly valve is opened. From the Effluent Equalization Tanks, flow is directed to the Effluent Pump Station when the slide gates are opened. The Waste Sludge Pumps are driven from VFDs. They are used to pump sludge from the Sequence Batch Reactors to the Sludge Storage Tanks. The flow from the Waste Sludge Pumps is monitored using magnetic flow meters.

Three Aeration Blowers driven from VFDs provide air to the SBR Tanks. The blowers are located in the Process Building. There are open/close butterfly valves on each aeration line to the SRB Tanks, and amount of air directed to each tank is based on blower speed.

All equipment is controlled by a manufacturer furnished control panel that will be located in the Process Building, and the VFDs for the blowers are networked via an ethernet connection. The manufacturer control panel will control the Sequence Batch Reactors such that while one SBR is filling, the other is in its treatment process. The SBR panel will be integrated into the SCADA system via an ethernet connection.

### Effluent Pump Station

Flow from Sequence Batch Reactors No.1 and No. 2 decant into the Effluent Equalization Tanks.  The Effluent Equalization Tanks are connected to an Effluent wet well situated between the two tanks. The wet well level monitoring is provided by redundant submersible level transducers, high-high, and low-low level switches. The operator will be able to select which submersible level transducer will be the primary instrument. If the primary level instrument fails, the PLC will automatically swap to the backup level instrument. The high-high and low-low level float switches will be used for alarming.

Three Effluent Equalization Pumps (EEQP-1,2,3) convey flow from the Effluent Equalization Wet Well to the Disk Filters. The pumps are driven from VFDs and will operate in a Lead/Lag/Standby configuration. The pumps will empty the wet well at the same time it takes to fill the tank. This will be done using the previous fill time as the pump out time, using the time and the tank volume, a flow setpoint will be calculated. There is an existing 10” magnetic flow meter in the Filter Building that will be used maintain the flow setpoint.

### Tertiary Disk Filters

Flow from the Effluent Pump Station is directed to the existing Rapid Mix Tank. From the Rapid Mix Tank, the flow passes through the existing Coagulation Tank and the existing Flocculation Tank before entering the existing Filter Influent Channel. The Rapid Mix Tank, Coagulation Tank, and Flocculation Tank all have existing mixers that are driven from non-reversing motor starters.

The Filter Influent Channel has two new slide gates that direct flow to the two new Tertiary Disk Filters. From the Tertiary Disk Filters, effluent is directed back to UV Disinfection System. Each Tertiary Disk Filter has a Disk Filter Backwash Pump that is driven from a VFD. The flow from both pumps is monitored using a magnetic flow meter. The flow from the pumps is directed to the influent sewer (SMH-2) at the beginning of the treatment plant.

A manufacturer furnished panel Filter Building will control the Tertiary Disk Filters and the Disk Filter Backwash Pumps.

### UV Disinfection

Flow from the Tertiary Disk Filters is directed to the UV Disinfection Building. Three UV Disinfection Banks use ultraviolet light to disinfect the wastewater effluent without the use of chemicals. Each UV Disinfection Bank is monitored for UV level using manufacturer furnished UVI Analyzers. The level in the UV Banks will also be monitored by a low-low level float switch. From the UV Disinfection Banks, the flow is stored in the Plant Water Tank, which is monitored for level using an ultrasonic level instrument as well as high-high and low-low level float switch. Flow from the Plant Water Tank is used throughout the treatment process, and excess is directed to the Sugar River Outfall. The effluent flow rate is monitored using an ultrasonic flow meter located in a parshall flume in the metering manhole.

One manufacturer furnished control panel will control all three UV Disinfection Banks. Each UV Disinfection Bank will have its own Power Distribution Center. The Control Panel and Power Distribution Center will be located in the UV Building. The UV Banks will run in a Lead/Lag/Standby configuration, and the UV dosing will be flow paced based on the combined flow through the Effluent and Plant Water flow meters.

### Septage Receiving

The existing septage tank and mixer (STMX-1) will be reused. The mixer will be re-powered from a new starter in a new MCC section. The tank level will be monitored with a radar level transmitter and a high level float.

A new submersible septage pump (SEPP-1) will also be installed in the tank and driven by a VFD. The pump will run at a user adjustable speed to during periods of low flow and operate on a repeat cycle timer (XX minutes on, YY minutes off) to slowly meter the septage into the process until a user adjustable off level as been reached.

### Plant Water

A new plant water system will be installed. The system will include a duplex basket strainer, two plant water pumps (PWP-1,2), and a hydropnuematic tank with necessary instrumentation. The basket strainer will have a differential pressure instrument measuring head loss across the strainer and notify the operator when it is prudent to clean. Each plant water pump will be driven from a VFD. Pump discharge flow and pressure will be monitored with new instrumentation.

The plant water system will maintain a user adjustable pressure setpoint. During period of low flow demand, the pumps will cycle on and off between two pressure setpoints and use the hydropnuematic tank as storage during this period to not over cycle the pumps.

### Chemical Feed

A new ferric chemical feed system will be installed. Two new bulk tanks will store the chemicals in a containment area. The level in each tank will be monitored by an ultrasonic level instrument, and the containment area will be monitored for chemical leak with a float switch. The tank fill port will be located in the building. The level transmitter displays for the tank will be located near the fill station. A local and visual alarm will be provided to notify when the tank is about to overflow.

Three peristaltic chemical feed pumps (FEDLP-1,2,3) will distribute the chemical to two different process areas, the centrate manhole and the rapid mix tank. The operator will be able assign the pump to the injection point. When the centrifuge is running, the pump assigned to the centrate will pump at an operator assigned flow rate. Similarly, for the pump assigned to the rapid mix tank will pump at an operator assigned flow rate when any of the effluent equalization pumps (EEQP-1,2,3) are running.

### Solids Handling

Sludge from the waste sludge pumps (WSLP’s) will be stored in two sludge storage tanks. Each sludge storage tank level will be monitored with a radar level transmitter and a high level float. The sludge from the waste sludge pumps will be monitored with a dedicated flow meter waste sludge pump. There will be an interlock to prevent the WSLP’s from pump to the tanks if the tanks are full.

Two new dewatering feed pumps (DSLP-1,2) will pump from the sludge tanks to a new centrifuge (CEN-1). Flow from the pumps to the centrifuge will be monitored by a common flow meter. Polymer from a new polymer blend unit (PBU-1) will be flow paced into the sludge feed flow. Dewatered cake from the centrifuge will be conveyed to a sludge container via two screw conveyors (SC-1, SC-2). Sludge conveyor No.2 (SC-2) will have four ports, two pneumatically controlled slide gates and be reversing. The conveyor will change direction and the slides gates will open and close while the centrifuge is running to evenly distribute the sludge out the four ports into the roll off container. The level at each end of the roll off container will be monitored with two ultrasonic level elements. The centrifuge will be commanded to shut down if the level in the container is at or above an operator defined level or if the level in the sludge storage tank is at or below an operator defined level.

The dewatering system will be controlled by an OEM furnished Dewatering Control Panel (DCP). The DCP will control the dewatering feed pumps, polymer system, sludge conveyors, and centrifuge. Remote access will be provided to the OEM during construction.

### Lagoon Effluent Tank & Pumps

The existing Lagoon Effluent Wet Well and two of the existing submersible pumps will be re-used. The level in the tank will be monitored by a submersible level instrument and high level float switch. Two new submersible Lagoon Equalization Pumps (EEQP-1,2) will be installed in the tank and driven by VFDs. The pumps will operate in a Lead / Standby configuration and pump flow will be monitored by a new flow meter.

The pumps will turn on manually by an operator, run at a user adjustable speed until an operator adjustable off level has been reached.

## Miscellaneous Systems and Equipment

### Automatic Sampler

The existing influent sampler (AS-1) will be reused, and a new effluent sampler (AS-2) will be installed. A flow signal will be sent to the samplers to grab a composite sample. The operator will be able to identify what flow (influent or effluent) signal is to be sent to each sampler.

### Telemetry

The Town owns and operate two remote wastewater pump stations. Neither pump station currently communicates with the plant. Conduit will be installed from the Control Building Control Panel to a location of a future antenna mast location to support future communications from the pump stations to the WWTF and SCADA system.

### Generator

The PLC will monitor the generator and automatic transfer switch status. When transitioning to generator power, the PLC will provide the necessary step loading of process equipment.

### Building Monitoring

The status of the building temperature, flood switches, and eyewash flow switches will be monitored by the PLC; an alarm shall be generated if any of them are actuated.

### Security

The Town has indicated that they are working with a third party contractor to install security cameras across the municipal building. While the cameras/service will be provided by the Town, the engineer shall coordinate conduit and cable requirements to support the Town furnished cameras.

No other security is intended to be included as part of this project.

### Spare Parts

A spare PLC and IO module of every type will be provided. Additional spare parts of miscellaneous control panel equipment will be provided (relays, switches, etc.). A spare bubbler compressor will also be provided.

## Documentation

Record drawings will be provided for the network and control panel drawings. Drawings will include point to point wiring diagrams. Hardcopies of the drawings will be provided in the control panels; additionally, a digital copy will be provided on a USB drive. O&Ms will also be provided with all instrument and equipment information. A digital copy of all PLC, OIT, and SCADA programs will be provided on a USB drive as well.

## Summary of Proposed Design

| System | Recommendations |
|---|---|
| Overall | • Upgraded SCADA with new control system |
| SCADA / Network | • Implement redundant iFix SCADA software<br>• Remote access to SCADA via a jump server<br>• Monitor and control all plant processes through SCADA |

| | |
|---|---|
| | • Alarm dialer software will be used for primary alarm notification. An existing Raco Alarm Dialer will be used for backup alarm dialing |
| Process Equipment | • Sequence Batch Reactors, UV Disinfection, Tertiary Disk Filters, and the Dewatering System will be controlled by OEM Control Panels<br>• All other equipment will be controlled by new Division 13 Control Panels located in the Control, Filter, and Process Buildings |
| Instruments | • Instruments required by the process |
| Security | • Infrastructure for security cameras |
| Telemetry | • Infrastructure for future communication with the pump stations |

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# Technical Design Memorandum

Project No.: 20828B

Subject: Newport WWTF Upgrade Electrical Basis of Design

Prepared By: Adam Robert/ Chris Abell    Date: 10/25/2022

Reviewed By: Michael Curry, PE    Date: 12/8/2022

Revised By: -    Date: Click or tap to enter a date.

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## Introduction

The presented scope of work is intended for the preliminary design phase of upgrades and improvements to the Newport, NH Wastewater Treatment Facility. This memorandum defines the general scope of work and documents how the electrical distribution will be approached to facilitate the upgrades. Existing information and recommendations are based on site visits and record drawings to the facility.

## Description of Existing Facilities

### Control Building

The incoming utility service consists of an (3) 100KVA transformers, mounted overhead on a riser pole providing a 277/480V, 600A, 3 phase, 4 wire service to the facility. The utility service is secondary metered at the riser pole. The site has a 75KW Photovoltaic array fed underground to the facility and connected at the service riser pole after the meter. From this location, power is fed underground to the Control Building Motor Control Center (MCC) / Generator room. Back-up power is provided by a stand-by 400kW diesel generator through a 600A automatic transfer switch located in the Control Building MCC / Generator room. The power is distributed from the Control Building MCC which feeds the Filter Building MCC-1, Grit Building, and the rest of the plant equipment. The Control Building MCC is manufactured by Cutler Hammer, model Unitrol which has reached the end of its useful life. The existing lighting panels in the control building are main lug only panel and does not currently have short circuit protection. In addition, the secondary transformers in the electrical room has a loud audible hum which makes it difficult to hear while within the room and need to be replaced.

### Filter Building

The Filter Building MCC is a General Electric Model Evolution Series E9000 and the electrical equipment was installed in 2012. The light fixtures and electrical equipment noted to be in good condition. There appeared to be abandoned and/or exposed incomplete wiring within the process area of the Filter Building. Any abandoned wire should be either removed or terminated in junction boxes for personnel safety.

### Fire Alarms System

The fire alarm system consists of control panels located in the Control Building and the Filter Building. The Filter Building is an addressable system with a Honeywell MS9600UDLS panel and the Control Building is a zoned control panel model.

## Client Preferences

- Influent Pumps: The Client prefers to have a variable frequency drive with a reduced voltage starter by-pass for added redundancy for the influent pumps. The proposed influent pump upgrades (3 vs 2 pumps) will provide the Town with a dedicated spare pump, thus providing the redundancy from a VFD perspective which the Town is seeking. The approach was selected to reduce costs for the project by not providing additional starting devices and needing to upsize the generator due to accounting for the pumps starting on the reduced voltage starters.
- The Client would prefer pin and sleeve cord connectors at process equipment motors.
- The Client indicated that a walk in generator enclosure is preferred. Budgetary quotes have been obtained and as a cost savings measure, a skin tight enclosure is proposed as part of the preliminary design based on the cost savings ($100-115K).

## Governing Codes

1) National Electrical Code (NEC)

2) Local Electrical Codes

3) NFPA Fire & Safety Codes

## Proposed Modifications

### Control Building

A new 1600A, 277/480V, 3 phase, 4 wire service will be required to serve the proposed upgrades to the facility. For more information on powering the equipment, refer to the single line diagram modification drawing with the Preliminary Design Report. The following will be coordinated in final design:

- A pad mounted transformer and meter pedestal as required by the power company to be provided at the entrance of the site. The height of the transformer pad to be provided above the 100-year flood plain. A work order has been established for coordination with the utility:(WO#: 9438177). The utility company will lease the transformer to the town and the preliminary sizing is 1000 KVA. The existing service and pole mounted transformers are to be removed.
- The existing PV system AC disconnect to be relocated with a new tap cabinet to be installed for connection to the main service.
- The existing photovoltaic (PV) system cement service vault was not installed above the 100 year flood plain. This is not considered a critical piece of equipment and will not be relocated. The solar array disconnect will be relocated to be re-installed three feet above the 100-year flood plain however the splicing within the vault will remain. The disconnect switch can be shut off during a flood event so that a fault does not interfere with the operation of the facility.
- Existing lighting panels and secondary transformers will be replaced and provided with secondary protection.
- The telephone and data communications will be re-routed into the Control Building from the new riser pole at the front of the facility.
- GFCI receptacle will be installed for outlets above the sink in the laboratory.

- The existing screening/grinder control panel will be relocated to the electrical room and the equipment will be re-fed from the new location. Currently, the pin and sleeve connector and the flexible conduit for the grinder and mechanical screen do not meet the requirements of NEMA Class 1, Division 1 areas. These are recommended to be upgraded to devices that are suitable for Class 1, Division 1 areas.

### Lighting and Systems

Lighting system modifications will be made in the new Chemical Room to serve the new space. Existing lighting systems throughout the rest of the building will remain. New emergency battery units and exits signs will be installed where required. The fire alarm system will be extended to monitor the limited area sprinkler system for the new chemical storage as required as well as the new bathroom being installed as part of the upgrade.

### Stand By Generator

A new, exterior 450KW diesel generator with an estimated 2,000 gallon underbelly fuel storage tank will be provided to meet the requirements of TR-16. The generator will be provided with NHDES above storage tank regulations and provided with in a skin tight, sound attenuated Level 2 enclosure. Stairs and platforms for the generator will be provided by the generator manufacturer. Refer to the site plan for proposed location for the project. The height of the concrete pad will be coordinate to be installed above the 100-year flood plain (+3 -ft)

### Site Lighting

- Street poles will be provided to illuminate the road from the gate to the control building.
- The standby generator area will be illuminated by a street pole or installed on the generator enclosure as determined in final design.

## Process Building

A new 600A, 277/480V, 3 phase, 4 wire feeder will be provided from the main switchboard within the Control Building. The following will be provided:

- A new motor control center will be installed to distribute power throughout the building.
- A new secondary transformer rated 120/208V 3 phase, 4 wire and a lighting panel will be installed to power small loads.
- Convenience receptacles and receptacles for process equipment will be installed where required.
- Local control stations with Hand Off Auto selector switches will be installed next to all process equipment.
- A separate VFD control panel for the centrifuge equipment will be provided by the centrifuge manufacturer and installed within the electrical room of the Process Building.
- Provide wiring as required to network control panels.

**Lighting and Systems**

- New LED light fixtures and emergency lighting will be installed throughout the building and outside of each exterior doors. Outdoor light fixtures will be controlled by a photocell.
- A new addressable fire alarm system will be installed throughout the Process Building as required. The fire alarm panel for the Process Building will be networked and connected to the existing fire alarm system. The fire alarm will need to be monitored by a third-party company. The method of communication will be determined in final design as required.

### SBR Tanks

- Pole mounted lights connected to the handrails of the SBR tank will be provided to illuminate the walk ways and stairs.
- Convenience receptacles and receptacles for process equipment will be installed where required.
- Separate Power, Control/Signal, and Intrinsically Safe Pull Boxes will be provided at the tanks. The location will be coordinated in final design to be either installed a minimum 18" away from the tank above grade on the wall or have an alcove installed on the tank dedicated for the installation of the junction boxes so that the junction boxes do not interfere or extrude within the walkways of the tank.

### Tertiary Building

The following modification will be provided at the Tertiary Building:

- The tertiary building will be re-fed from Switchboard SWBD-CB.
- The existing motor control center will be re-used to feed the new process equipment.
- A new power meter will be installed within the motor control center.
- It is anticipated to re-use the existing variable frequency drives and feeder breakers and making modifications to the bucket wiring as required for the new process modifications as shown on the single line diagram.
- Local control stations with Hand Off Auto selector switches will be installed next to all new process equipment
- Provide wiring as required to network the control panels.
- Remove or terminate exposed wiring within junction boxes.

### Grit Building and Disinfection System

- The grit building and disinfection system and structure will be removed in its entirety.

## Sequence Of Operation

The following is a proposed sequence of operation to transfer over the facility to the new service:

- Install the new generator.
- Remove the existing generator and connect the new generator to the existing automatic transfer switch. The contractor will need to provide a temporary generator and a temporary feeder breaker to match the existing service size for connection the oversized generator while the changeover is taking place.

- Install the new switchboard and automatic transfer switch across from the existing motor control center in the Control Building.
- Install the new service and connect to the new switchboard.
- Connect the new generator to the new automatic transfer switch.
- Temporary feed the existing motor control center from the switchboard.
- Install permanent feed of the Tertiary Building from the new switchboard and install the new power meter within the motor control center.  The contractor will need to coordinate with the owner to store flow within the lagoons prior to the temporary shutdown of the building.
- Replace the existing motor control center in two sections as shown on the single line diagram.  The influent pumps source location from either a motor control center or the main switchboard will be coordinated in final design to aide in construction sequencing.
- Install feeder to the new Process Building.

# Appendix D
# Preliminary Design Drawings

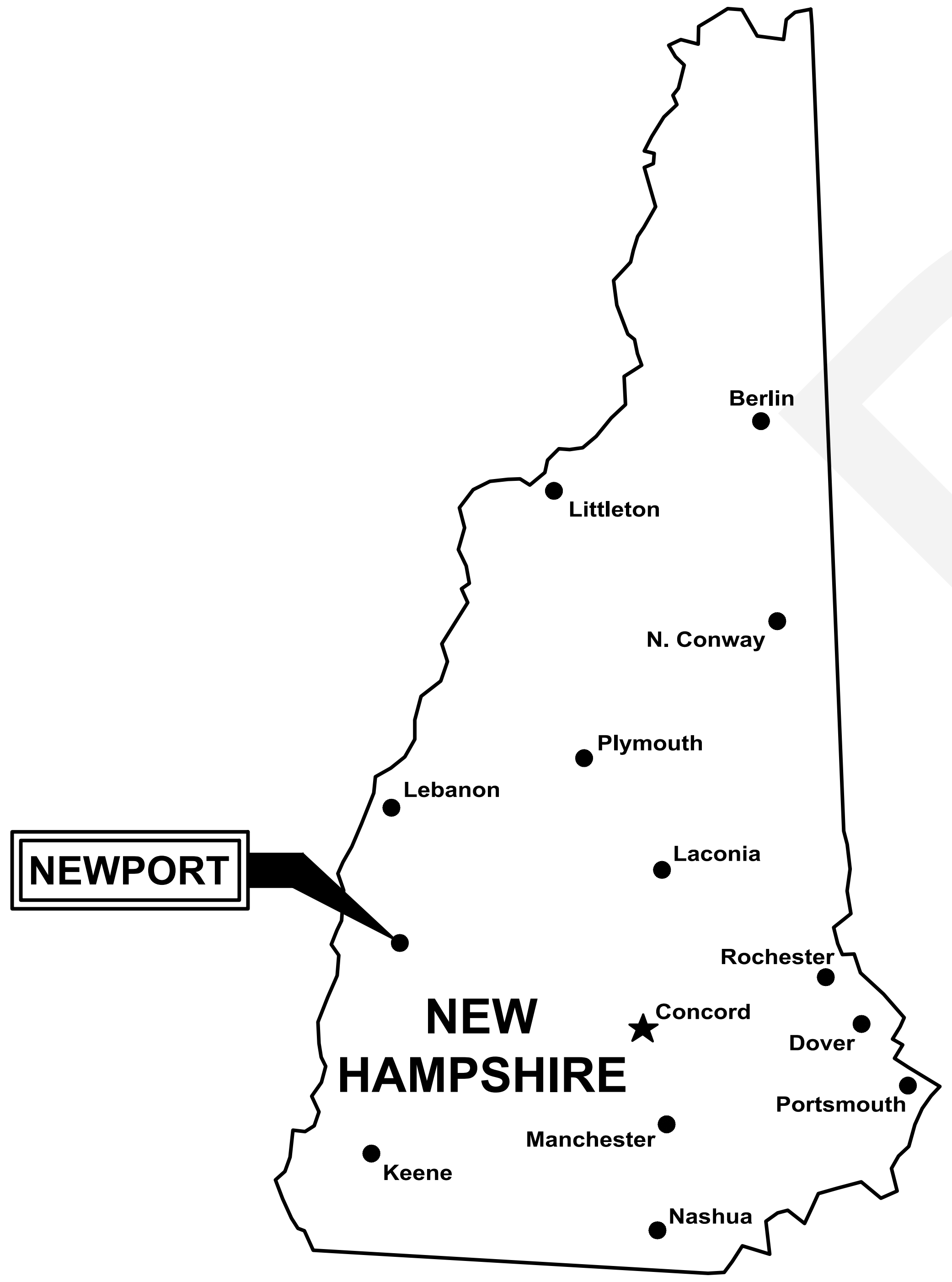
# TOWN OF NEWPORT, NEW HAMPSHIRE

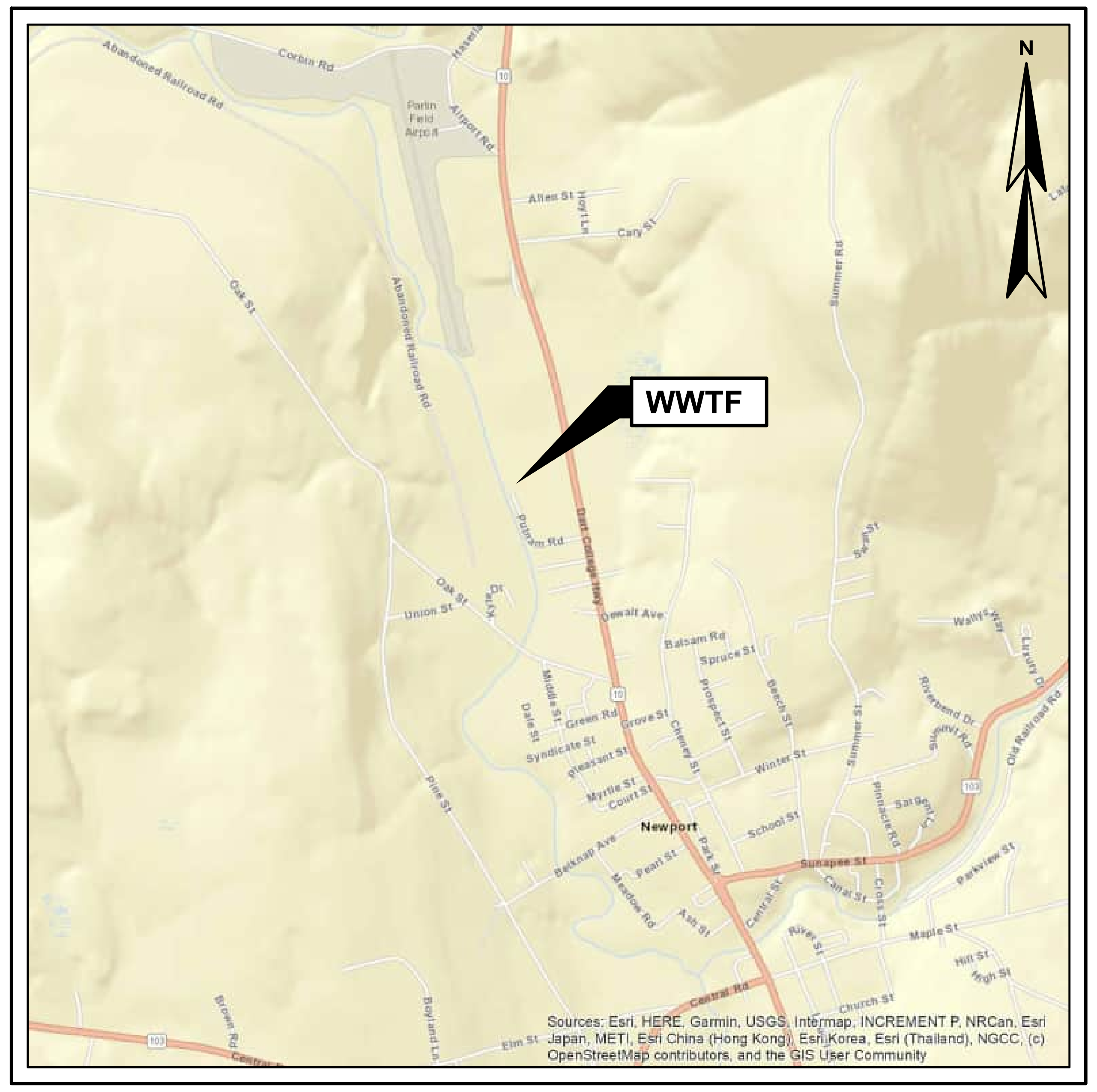
## CONTRACT DRAWINGS FOR

# WASTEWATER TREATMENT FACILITY UPGRADE

DECEMBER 2022

PRELIMINARY DESIGN





**LOCATION PLAN**
SCALE: NTS

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WP PROJECT No. 20828

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| E-2 | ELECTRICAL SITE DEMOLITION AND MODIFICATIONS PLANS I |
| E-3 | SINGE LINE DIAGRAM - MCC - DEMOLITON |
| E-4 | SINGE LINE DIAGRAM - MCC-1 - DEMOLITON |
| E-5 | SINGE LINE DIAGRAM - SWBD-CB - MODIFICATION |
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GRAY TEXT INDICATES DRAWINGS NOT ISSUED WITH THE PRELIMINARY DESIGN REVIEW DRAWING SET.

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DRAWING INDEX

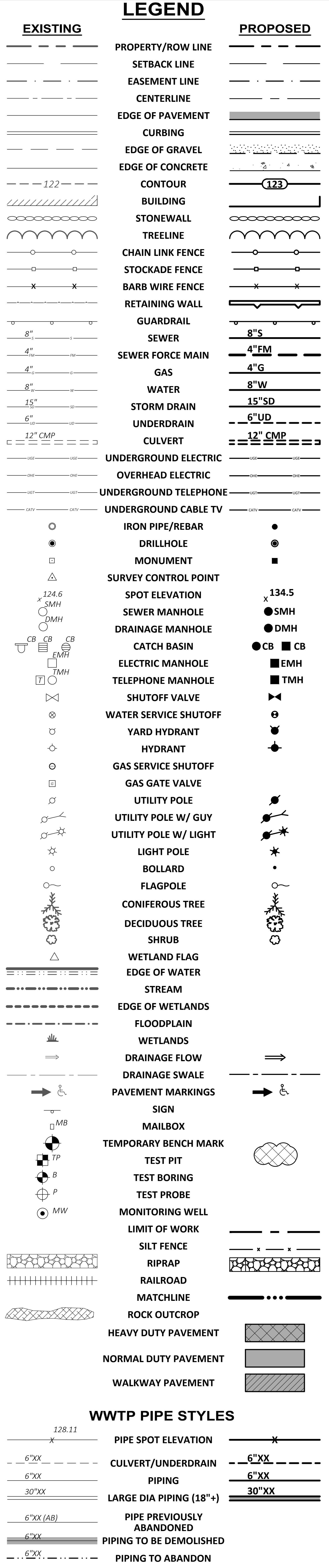
DRAWING
G-2

LAST SAVED BY: RYAN.BEISAW 11/8/2022 8:43 AM

J:\ENG\NH\NEWPORT\20828-WWTF-UPGRADE\DRAWINGS\CIV\20828 C-1 GENERALNOTES.DWG | 20828 C-1 GeneralNotes | 1:2.5849 | ---- | 12/5/2022 10:45:26 AM | RYAN.BEISAW

## CIVIL ABBREVIATIONS

| | |
|---|---|
| & | AND |
| Ø, DIA | DIAMETER |
| #, NO | NUMBER |
| AC | ASBESTOS CEMENT |
| APP'D | APPROVED |
| BR | BRICK |
| BLDG | BUILDING |
| CB | CATCH BASIN |
| CEN | CENTER |
| CFS | CUBIC FEET PER SECOND |
| CI | CAST IRON |
| CIPP | CURED-IN-PLACE-PIPE |
| CL | CENTERLINE |
| CMP | CORRUGATED METAL PIPE |
| CO | CLEANOUT |
| CONC | CONCRETE |
| COR | CORNER |
| CY | CUBIC YARD |
| DEMO | DEMOLITION |
| DMH | DRAIN MANHOLE |
| DI | DUCTILE IRON |
| DR | DRAIN |
| DWG | DRAWING |
| EL | ELEVATION |
| EMH | ELECTRIC MANHOLE |
| FM | FORCE MAIN |
| FT | FEET |
| G | GAS |
| HDPE | HIGH DENSITY POLYETHYLENE |
| HYD | HYDRANT |
| IN | INCH |
| INF | INFLUENT |
| INV | INVERT |
| LBS | POUNDS |
| LF | LINEAR FOOT |
| MAX | MAXIMUM |
| MH | MANHOLE |
| MIN | MINIMUM |
| MW | MONITORING WELL |
| N | NORTH |
| NGVD | NATIONAL GEODETIC VERTICAL DATUM |
| N/A | NOT AVAILABLE/APPLICABLE |
| NTS | NOT TO SCALE |
| OD | OUTSIDE DIAMETER |
| OUT | OUTFALL |
| PC | PERFORATED CLAY |
| PSF | POUNDS PER SQUARE FOOT |
| PSI | POUNDS PER SQUARE INCH |
| PS | PRIMARY SLUDGE |
| PT | POINT OF TANGENCY |
| PVC | POLYVINYL CHLORIDE |
| RCP | REINFORCED CONCRETE PIPE |
| RD | ROOF DRAIN |
| REQ'D | REQUIRED |
| S | SLOPE, SEWER |
| SD | STORM DRAIN |
| SF | SQUARE FEET |
| SMH | SANITARY SEWER MANHOLE |
| SQ | SQUARE |
| STA | STATION |
| T, XFMR | TRANSFORMER |
| TBM | TEMPORARY BENCH MARK |
| THK | THICKNESS |
| TOS | TOP OF STRUCTURE |
| TYP | TYPICAL |
| UD | UNDERDRAIN |
| UG | UNDERGROUND |
| UGE | UNDERGROUND ELECTRIC |
| VC | VITRIFIED CLAY |
| VF | VERTICAL FOOT |
| W/ | WITH |
| W | POTABLE WATER |
| PW | PLANT WATER |
| PRW | PROCESS WATER |
| PD | PROCESS DRAIN |
| LE | LAGOON EFFLUENT |



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PROJECT NO: 20828
DESIGNED: J.SHACTMAN
CAD COORD: A.COUTURE
CAD: R.BEISAW
CHECKED: J.SHACTMAN
DATE:
APPROVED: J.PREBLE
DATE:
SUBMISSION: PRELIMINARY DESIGN

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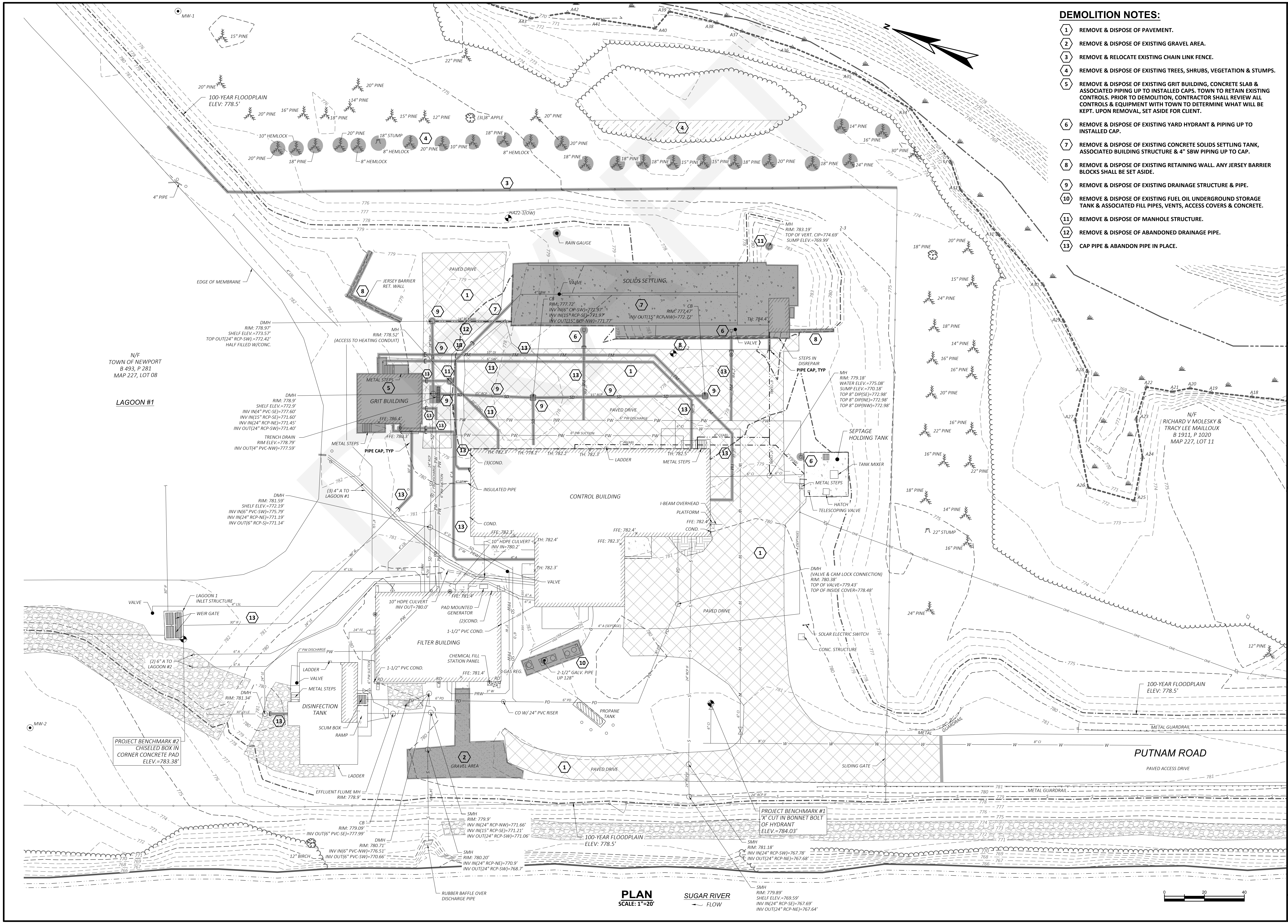
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

GENERAL NOTES, LEGEND & ABBRIEVIATIONS

DRAWING
C-1

LAST SAVED BY: RYAN.BEISAW 12/5/2022 9:58 AM

J:\ENG\NH\NEWPORT\20828-WWTF-UPGRADE\DRAWINGS\CIVIL\20828 C-3 EXISTCOND.DWG | 20828 C-3 ExistCond | 1:2.5849 | ---- | 12/5/2022 10:45:37 AM | RYAN.BEISAW



**PLAN**
**SCALE: 1"=20'**

## DEMOLITION NOTES:

1. REMOVE & DISPOSE OF PAVEMENT.
2. REMOVE & DISPOSE OF EXISTING GRAVEL AREA.
3. REMOVE & RELOCATE EXISTING CHAIN LINK FENCE.
4. REMOVE & DISPOSE OF EXISTING TREES, SHRUBS, VEGETATION & STUMPS.
5. REMOVE & DISPOSE OF EXISTING GRIT BUILDING, CONCRETE SLAB & ASSOCIATED PIPING UP TO INSTALLED CAPS. TOWN TO RETAIN EXISTING CONTROLS. PRIOR TO DEMOLITION, CONTRACTOR SHALL REVIEW ALL CONTROLS & EQUIPMENT WITH TOWN TO DETERMINE WHAT WILL BE KEPT. UPON REMOVAL, SET ASIDE FOR CLIENT.
6. REMOVE & DISPOSE OF EXISTING YARD HYDRANT & PIPING UP TO INSTALLED CAP.
7. REMOVE & DISPOSE OF EXISTING CONCRETE SOLIDS SETTLING TANK, ASSOCIATED BUILDING STRUCTURE & 4" SBW PIPING UP TO CAP.
8. REMOVE & DISPOSE OF EXISTING RETAINING WALL. ANY JERSEY BARRIER BLOCKS SHALL BE SET ASIDE.
9. REMOVE & DISPOSE OF EXISTING DRAINAGE STRUCTURE & PIPE.
10. REMOVE & DISPOSE OF EXISTING FUEL OIL UNDERGROUND STORAGE TANK & ASSOCIATED FILL PIPES, VENTS, ACCESS COVERS & CONCRETE.
11. REMOVE & DISPOSE OF MANHOLE STRUCTURE.
12. REMOVE & DISPOSE OF ABANDONED DRAINAGE PIPE.
13. CAP PIPE & ABANDON PIPE IN PLACE.

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PROJECT NO: 20828
DESIGNED: J.SHACTMAN
CAD COORD: A.COUTURE
CAD: R.BEISAW
CHECKED: J.SHACTMAN
DATE:
APPROVED: J.PREBLE
DATE:
SUBMISSION: PRELIMINARY DESIGN

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# TOWN OF NEWPORT, NEW HAMPSHIRE WASTEWATER TREATMENT FACILITY UPGRADE

EXISTING CONDITIONS & DEMOLITION PLAN

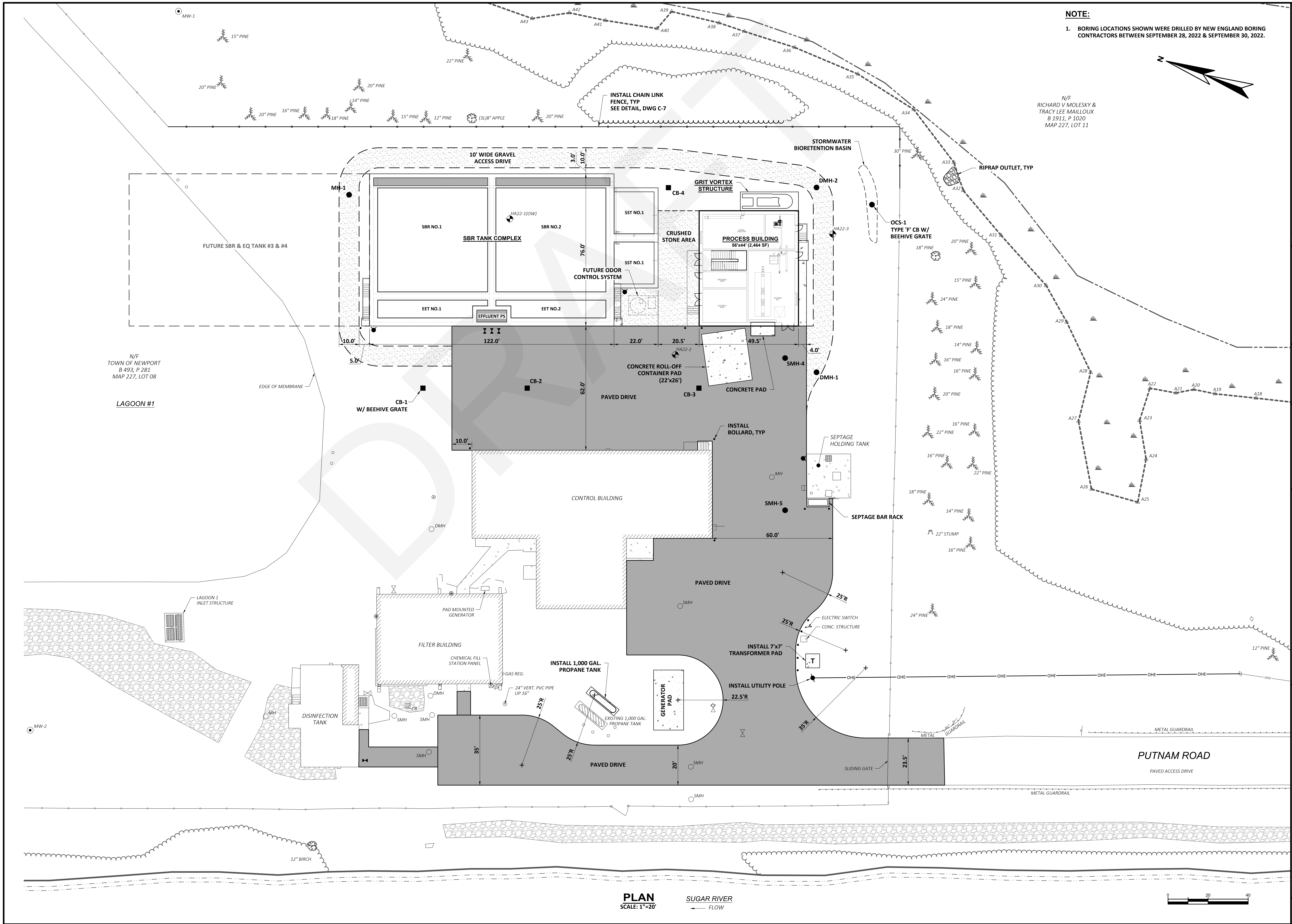
DRAWING
C-3

LAST SAVED BY: RYAN.BEISAW 12/5/2022 10:43 AM

J:\ENG\NH\NEWPORT\20828-WWTF-UPGRADE\DRAWINGS\CIV\20828 C-4 SITELAYOUTPLAN.DWG | 20828 C-4 SiteLayoutPlan | 1:2.5849 | ---- | 12/5/2022 10:45:48 AM | RYAN.BEISAW

**NOTE:**

1. BORING LOCATIONS SHOWN WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS BETWEEN SEPTEMBER 28, 2022 & SEPTEMBER 30, 2022.



**PLAN**
SCALE: 1"=20'

*SUGAR RIVER*
*FLOW*

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PROJECT NO: 20828
DESIGNED: J.SHACTMAN
CAD COORD: A.COUTURE
CAD: R.BEISAW
CHECKED: J.SHACTMAN
DATE:
APPROVED: J.PREBLE
DATE:
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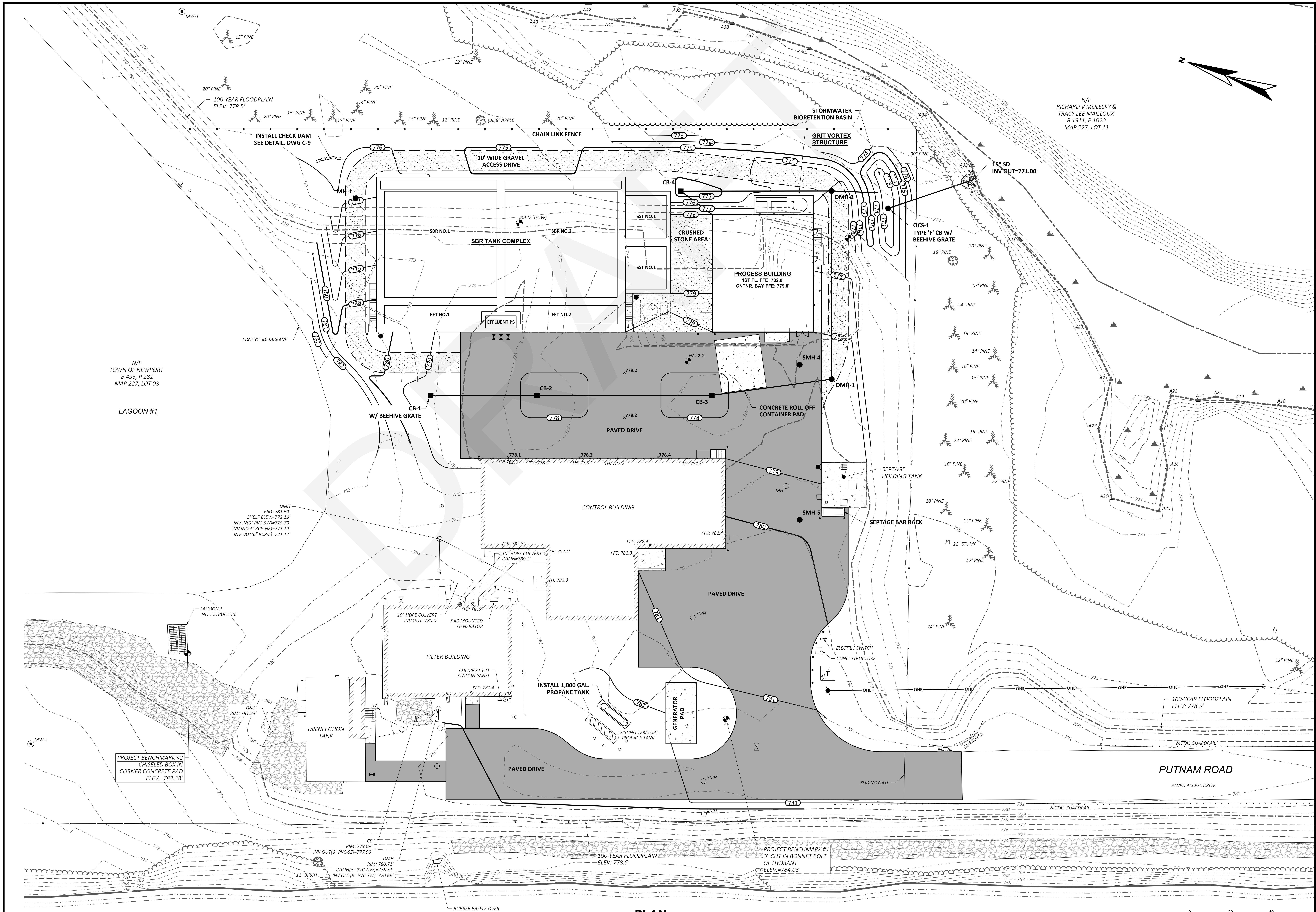
**TOWN OF NEWPORT, NEW HAMPSHIRE**
**WASTEWATER TREATMENT FACILITY**
**UPGRADE**

SITE LAYOUT PLAN

DRAWING
**C-4**

LAST SAVED BY: RYAN.BEISAW 12/5/2022 10:43 AM

J:\ENG\NH\NEWPORT\20828-WWTF-UPGRADE\DRAWINGS\CIV\20828 C-5 SITEGRADINGDRAINAGEPLAN.DWG | 20828 C-5 SiteGradingDrainagePlan | 1:2.5849 | ---- | 12/5/2022 10:46:04 AM | RYAN.BEISAW



**PLAN**
**SCALE: 1"=20'**

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PROJECT NO: 20828
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CAD COORD: A.COUTURE
CAD: R.BEISAW
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DATE:
APPROVED: J.PREBLE
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SUBMISSION: PRELIMINARY DESIGN

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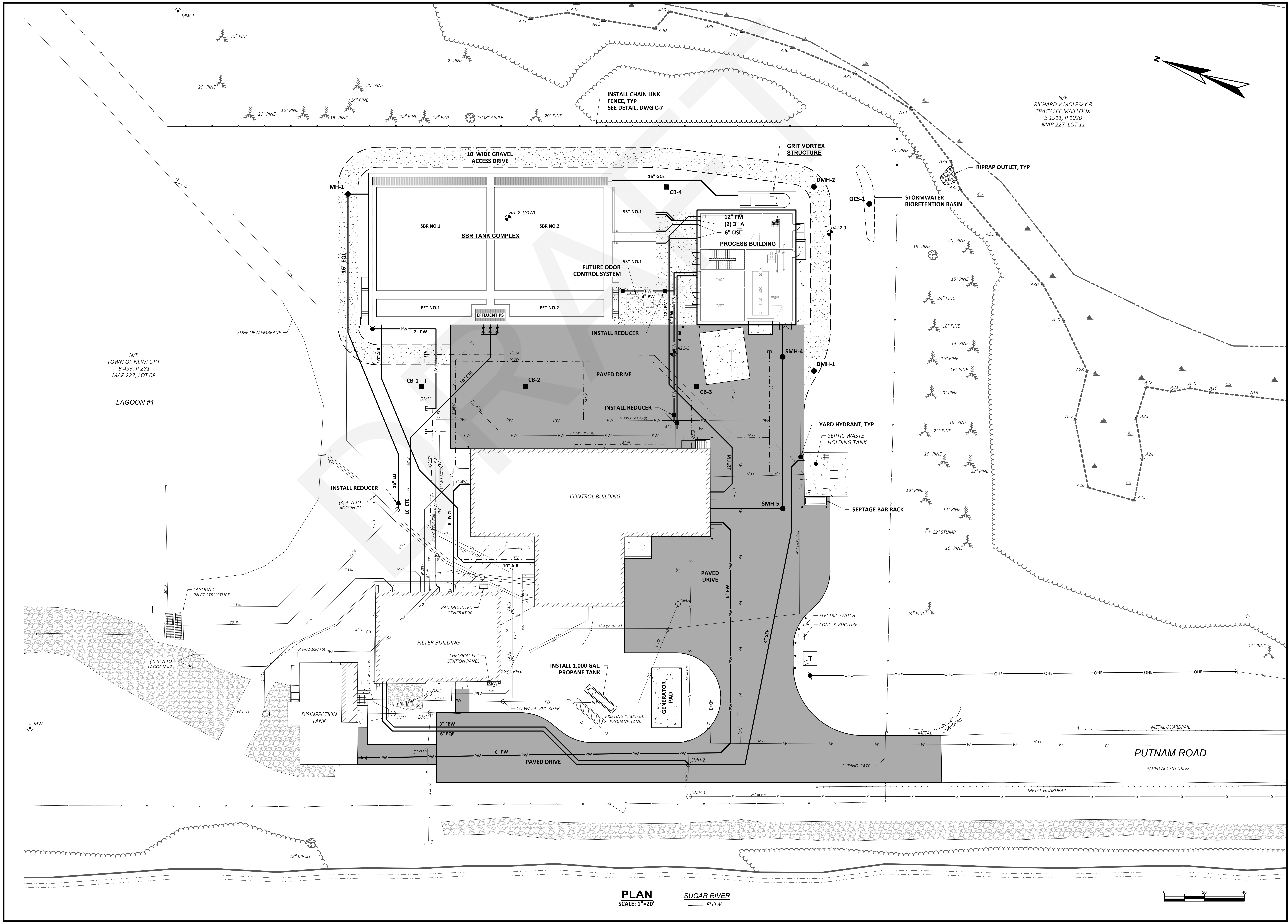
**TOWN OF NEWPORT, NEW HAMPSHIRE**
**WASTEWATER TREATMENT FACILITY**
**UPGRADE**

**SITE GRADING & DRAINAGE PLAN**

DRAWING
**C-5**



## PLAN
SCALE: 1"=20'

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PROJECT NO: 20828
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CAD COORD: A.COUTURE
CAD: R.BEISAW
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APPROVED: J.PREBLE
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# TOWN OF NEWPORT, NEW HAMPSHIRE WASTEWATER TREATMENT FACILITY UPGRADE

## SITE PIPING PLAN

DRAWING
C-6

**FIRST FLOOR DEMOLITION PLAN**

SCALE: 1/4" = 1'-0"

## DEMOLITION NOTES:

1. REMOVE VISION PANEL FOR CMU INFILL
2. REMOVE EXISTING DOOR FOR INSTALLATION OF NEW HOLLOW METAL DOOR.
3. REMOVE DOOR AND ADJACENT MASONRY WALL FOR INSTALLTION OF NEW DOUBLE HOLLOW METAL DOOR.
4. REMOVE LOUVER AND ADJACENT MASONRY WALL FOR INSTALLTION OF NEW DOUBLE HOLLOW METAL DOOR.
5. REMOVE EXISTING LOUVER FOR MASONRY INFILL.
6. REMOVE WINDOWS FOR MASONRY INFILL.

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NH
WASTE WATER TREATMENT FACILITY
UPGRADE

CONTROL BUILDING
DEMOLITION FLOOR PLANS

DRAWING
A-3

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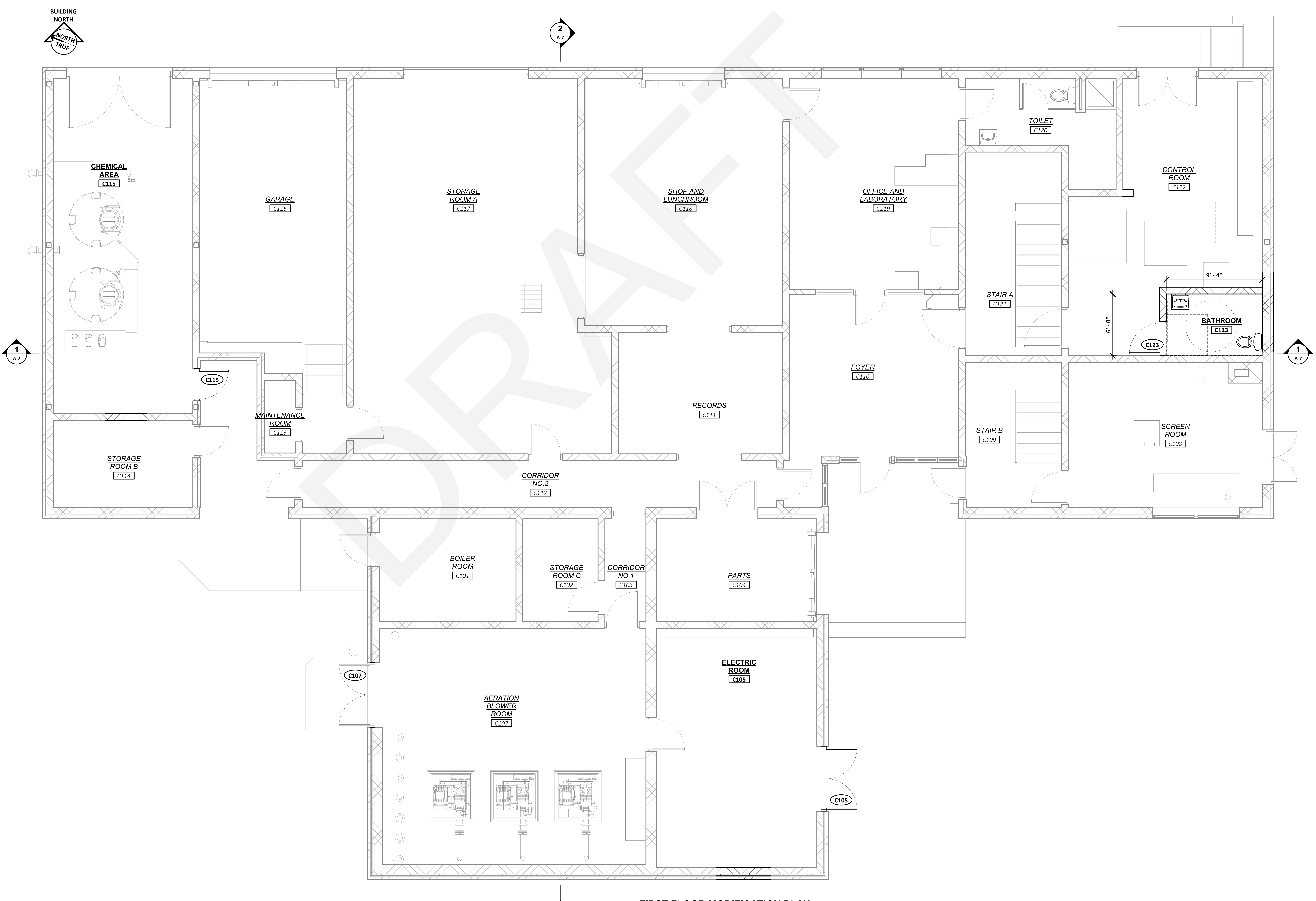

**FIRST FLOOR MODIFICATION PLAN**

SCALE: 1/4" = 1'-0"

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-ControlBldg.rvt

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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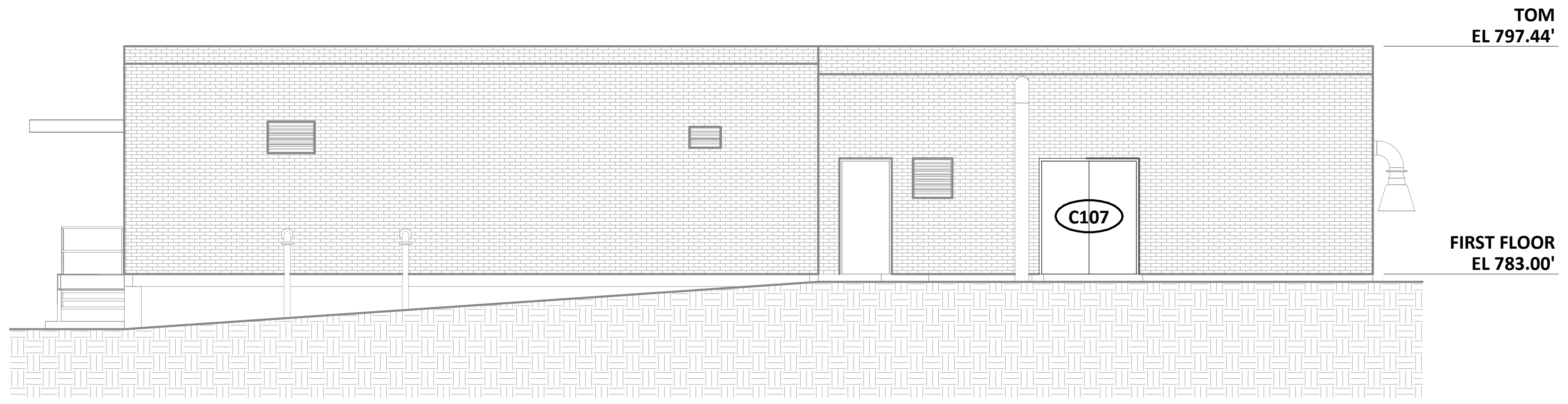
TOWN OF NEWPORT, NH
WASTE WATER TREATMENT FACILITY
UPGRADE

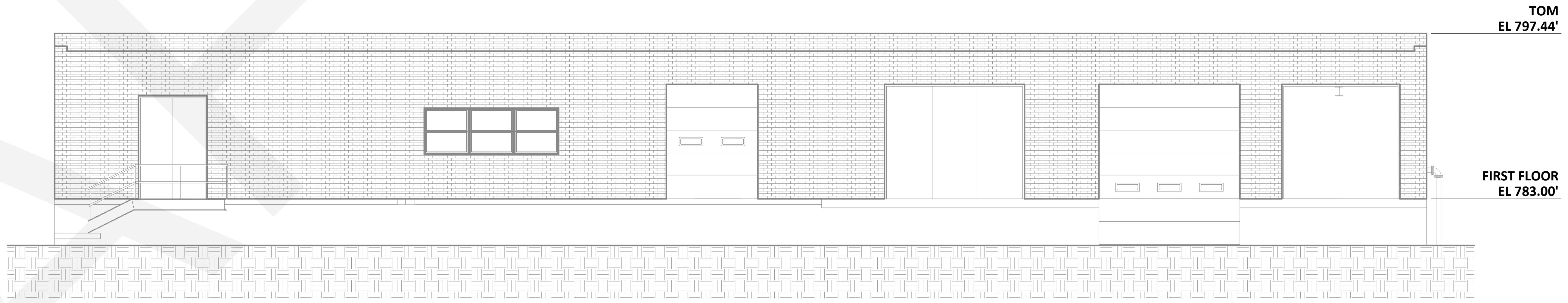
CONTROL BUILDING
MODIFICATION FLOOR PLANS

DRAWING
A-4



## NORTH ELEVATION

SCALE: 1/8" = 1'-0"

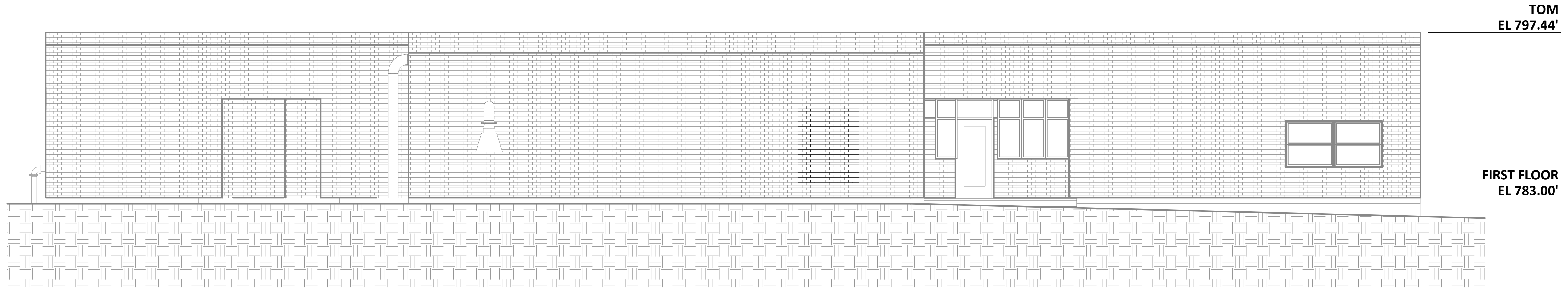


## EAST ELEVATION

SCALE: 1/8" = 1'-0"

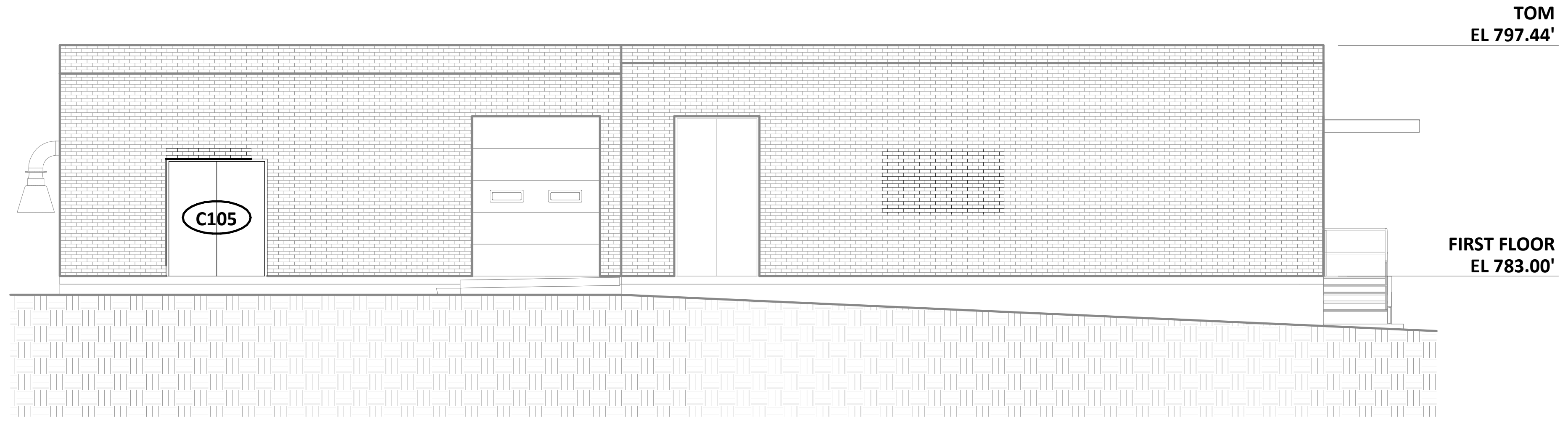
## MODIFICATION NOTES:

1. REMOVE EXISTING JOINT SEALANT AT CONTROL JOINTS AND INSTALL NEW SEALANT.
2. REPOINT ____ SF OF MASONRY JOINTS TO BE FIELD LOCATED.
3. REPAIR MORTAR JOINTS WHERE INDICATED.



## WEST ELEVATION

SCALE: 1/8" = 1'-0"



## SOUTH ELEVATION

SCALE: 1/8" = 1'-0"

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
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DATE:
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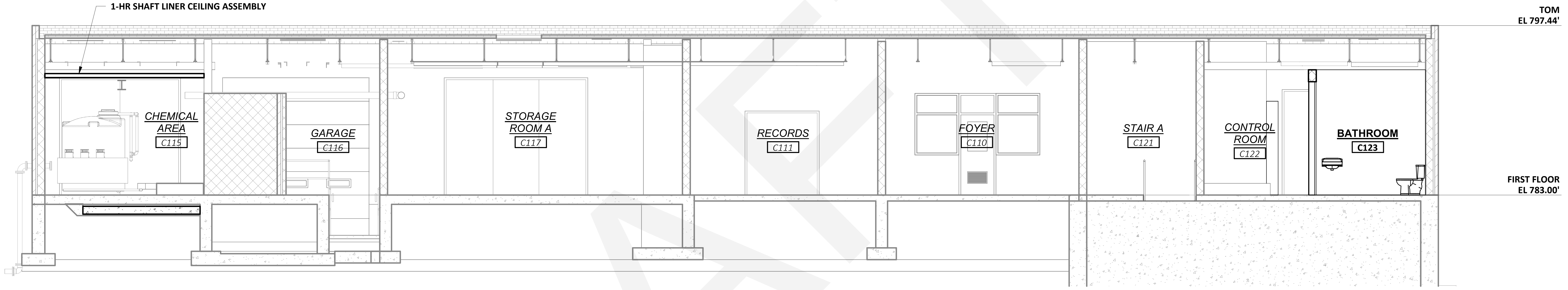
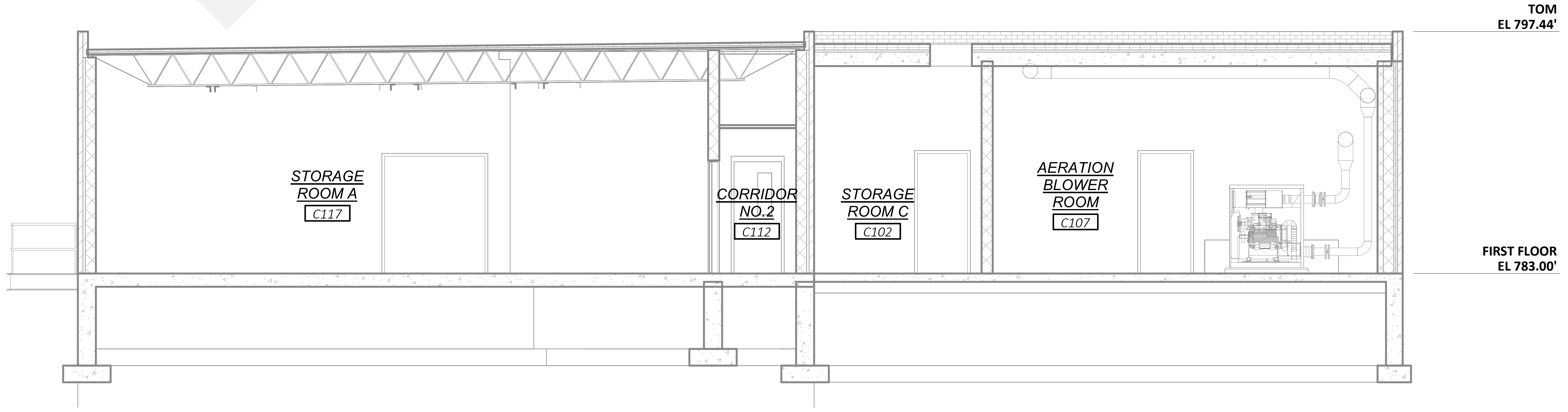
TOWN OF NEWPORT, NH
WASTE WATER TREATMENT FACILITY
UPGRADE

CONTROL BUILDING
EXTERIOR ELEVATIONS

DRAWING
A-6



1 A-4 **SECTION**
SCALE: 3/16" = 1'-0"



2 A-4 **SECTION**
SCALE: 3/16" = 1'-0"

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
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DATE:
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DATE:
SUBMISSION: PRELIMINARY DESIGN

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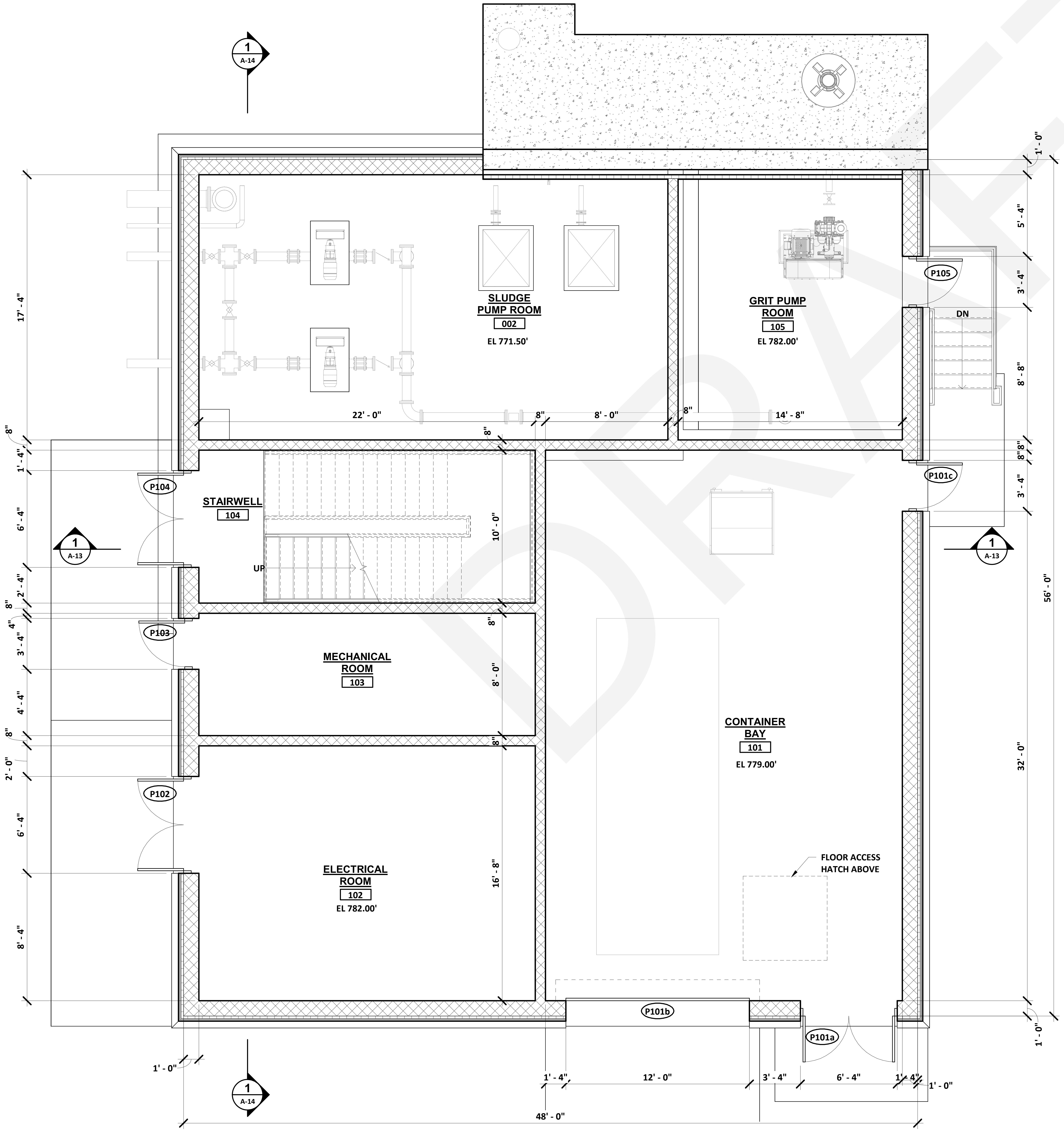
TOWN OF NEWPORT, NH
WASTE WATER TREATMENT FACILITY
UPGRADE

CONTROL BUILDING
PLANS AND SECTIONS III

DRAWING
A-7

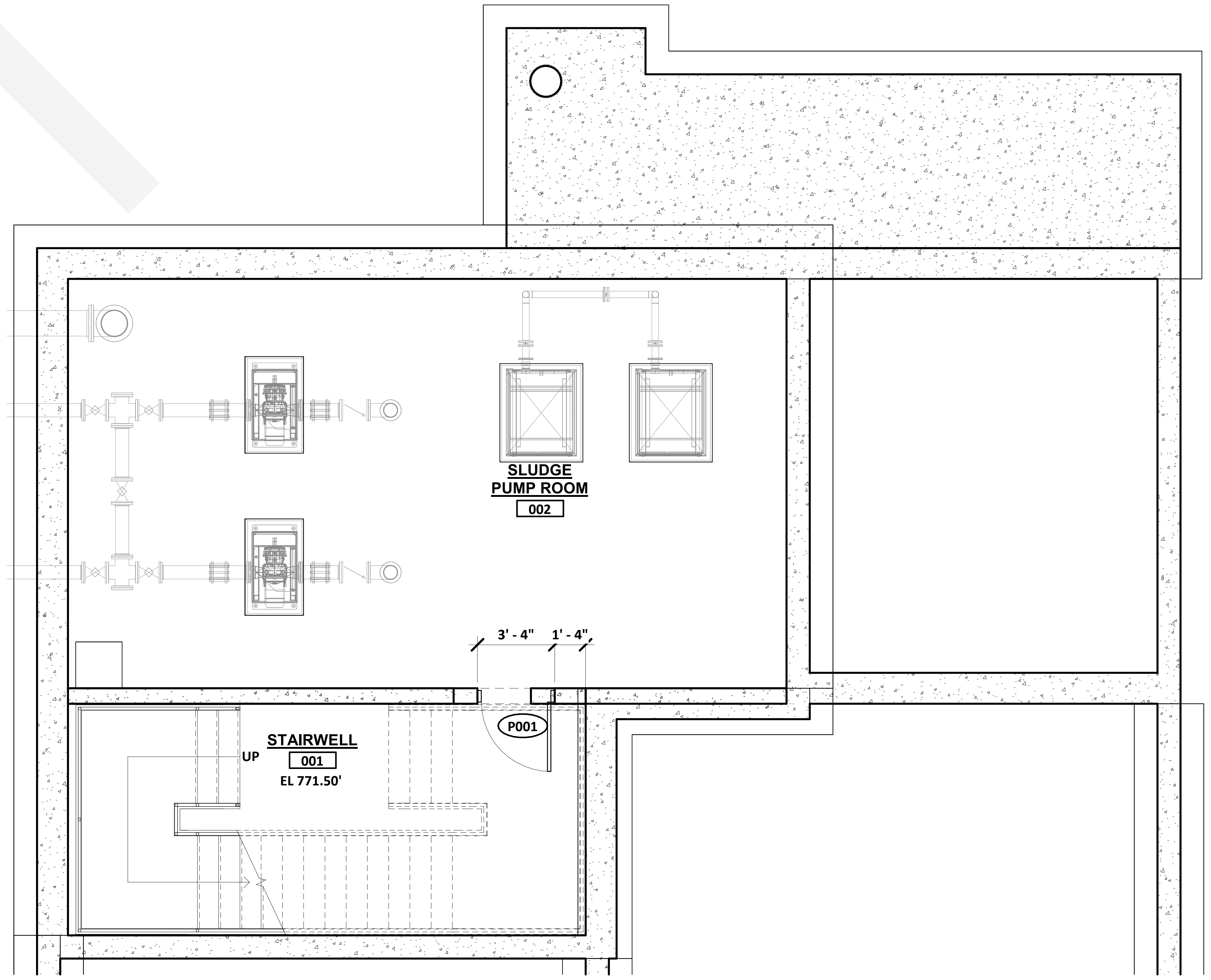
12/9/2022 8:46:31 AM

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



## FIRST FLOOR

SCALE: 1/4" = 1'-0"



## SLUDGE PUMP ROOM

SCALE: 1/4" = 1'-0"

BUILDING NORTH
TRUE NORTH

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PROJECT NO: 20828
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CAD COORD: A.COUTURE
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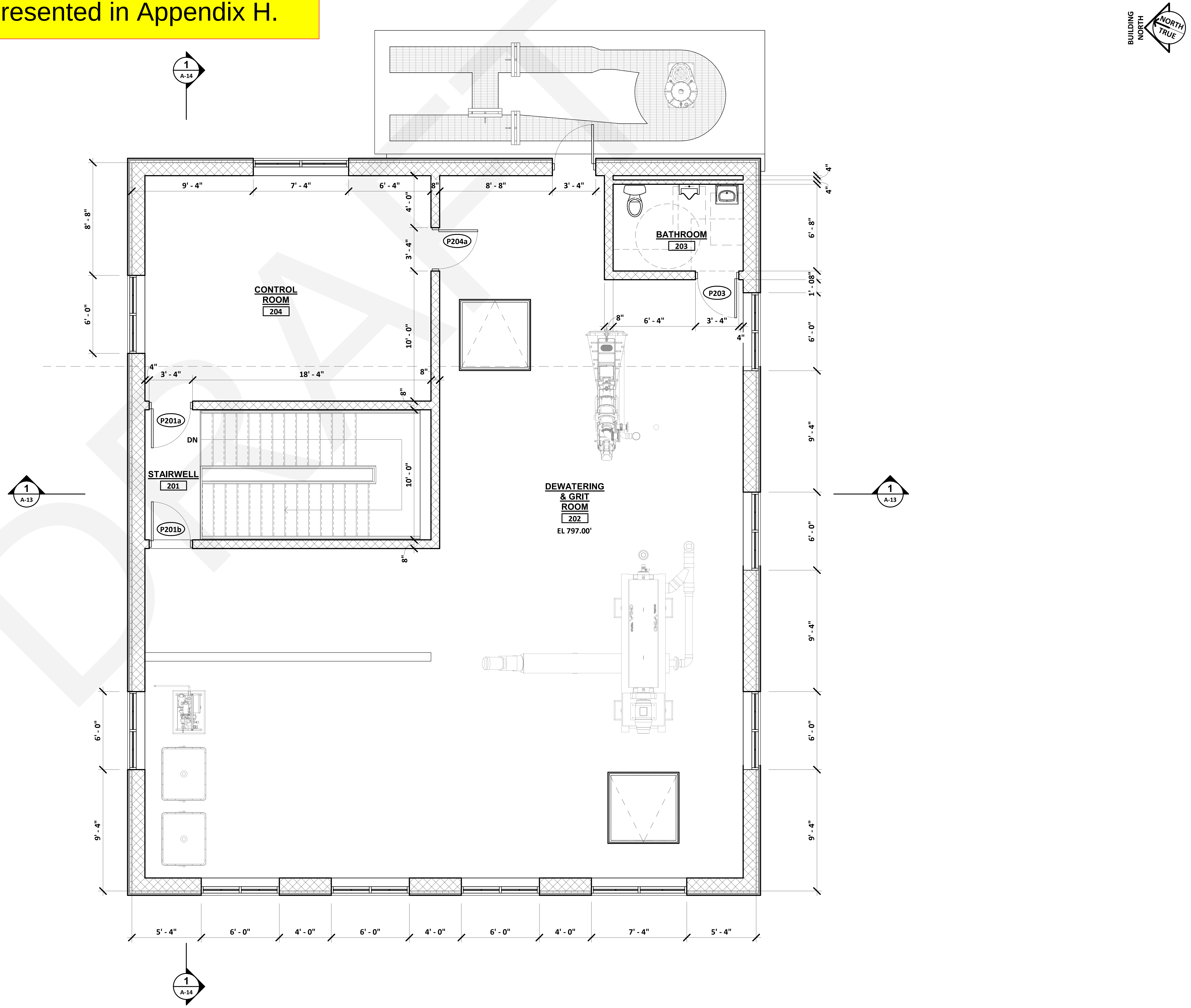
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
FLOOR PLANS I

DRAWING
A-10

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-ProcessBldg.rvt

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



**SECOND FLOOR**

SCALE: 1/4" = 1'-0"

| NO | REVISIONS | DATE | APP'D |
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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
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DATE:
SUBMISSION: PRELIMINARY DESIGN

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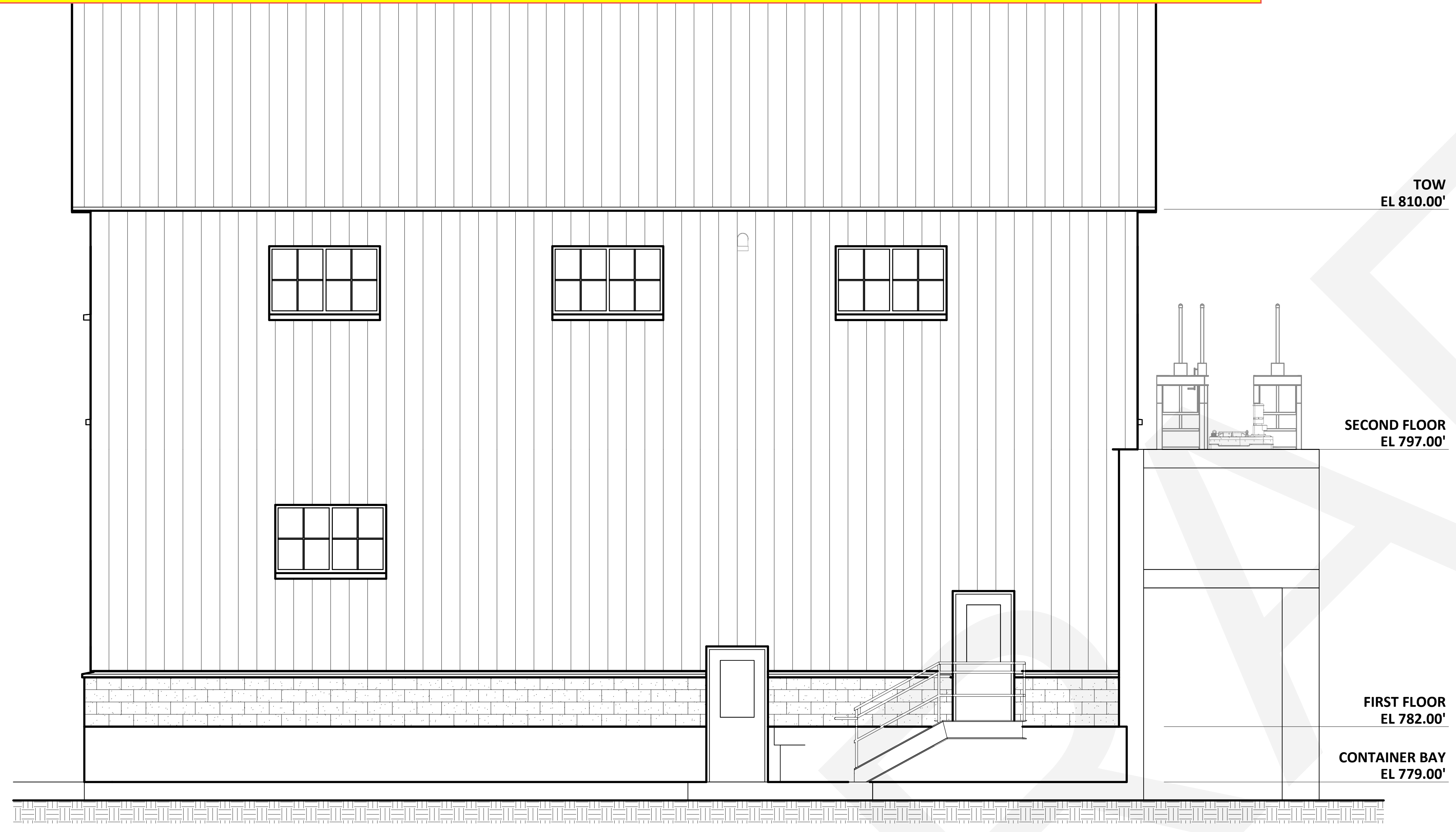
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

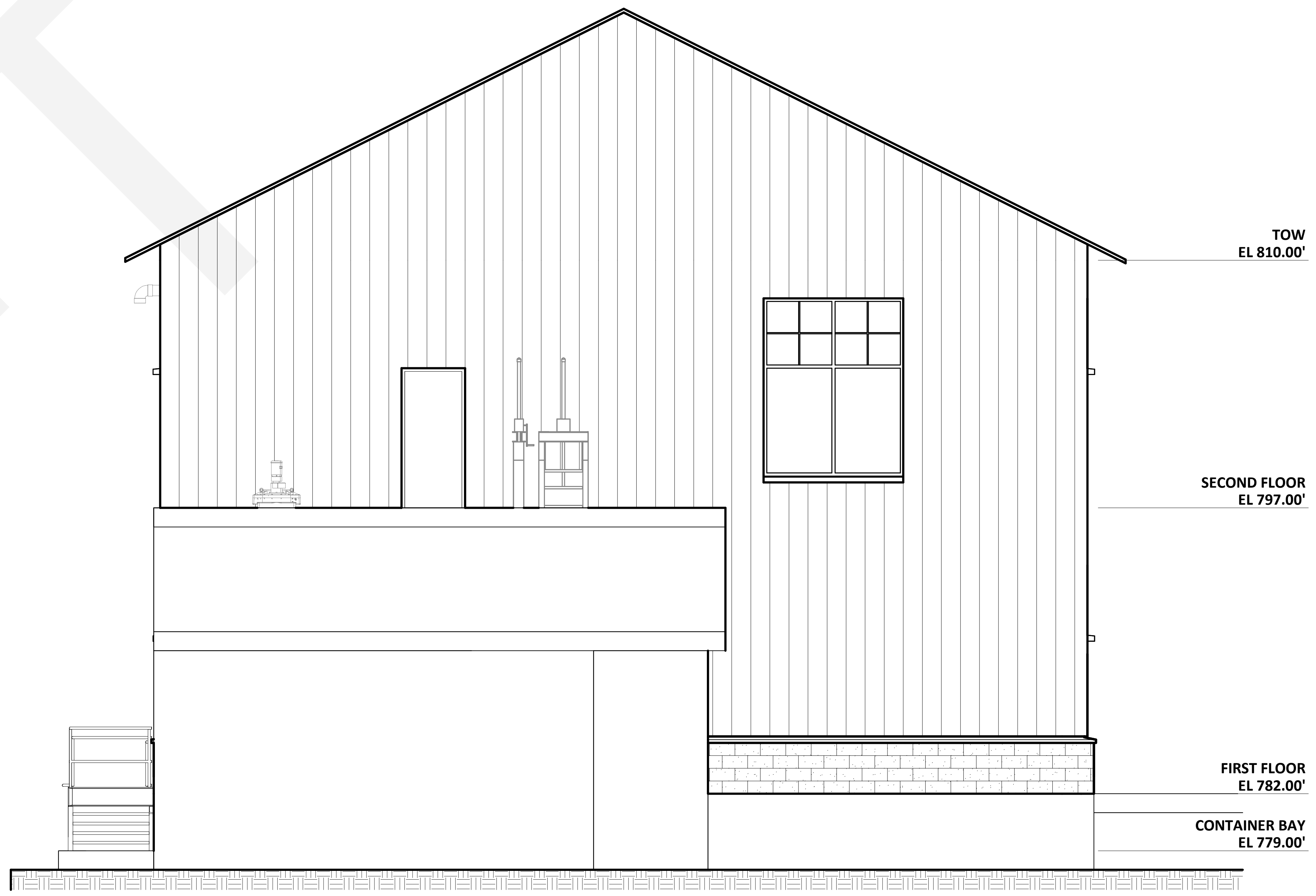
PROCESS BUILDING
FLOOR PLANS II

DRAWING
A-11

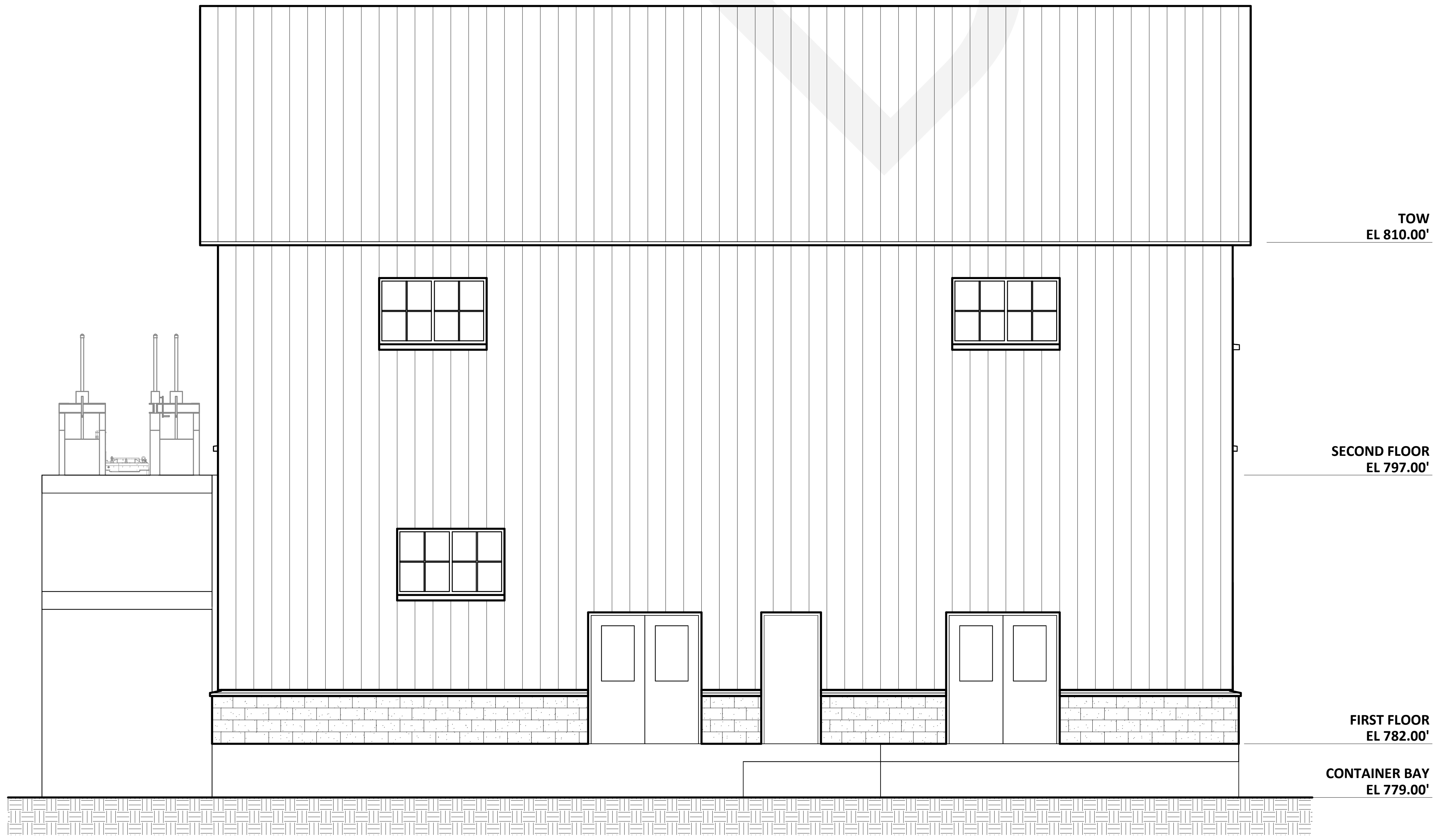
Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



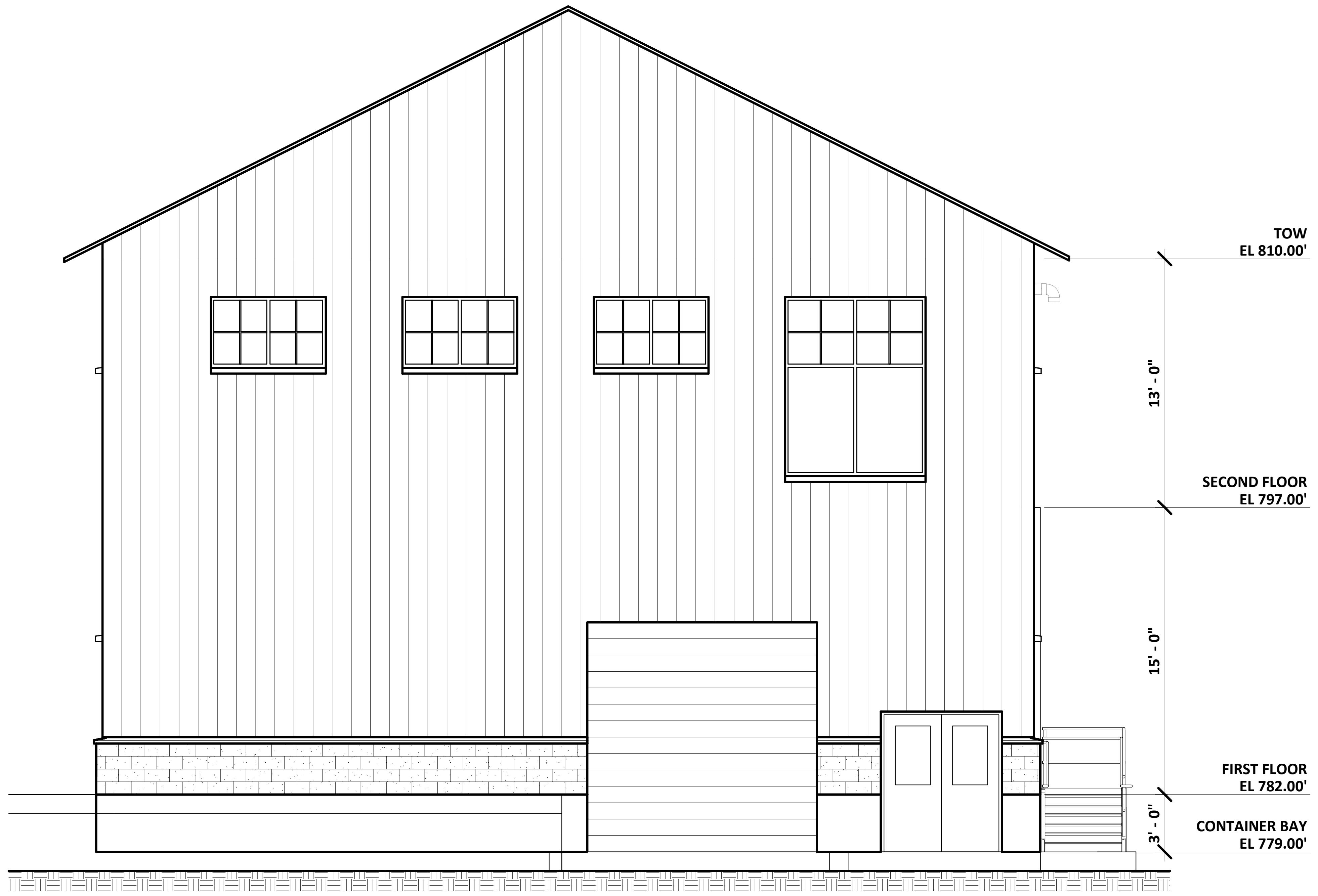
**SOUTH ELEVATION**
SCALE: 3/16" = 1'-0"



**EAST ELEVATION**
SCALE: 3/16" = 1'-0"



**NORTH ELEVATION**
SCALE: 3/16" = 1'-0"



**WEST ELEVATION**
SCALE: 3/16" = 1'-0"

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

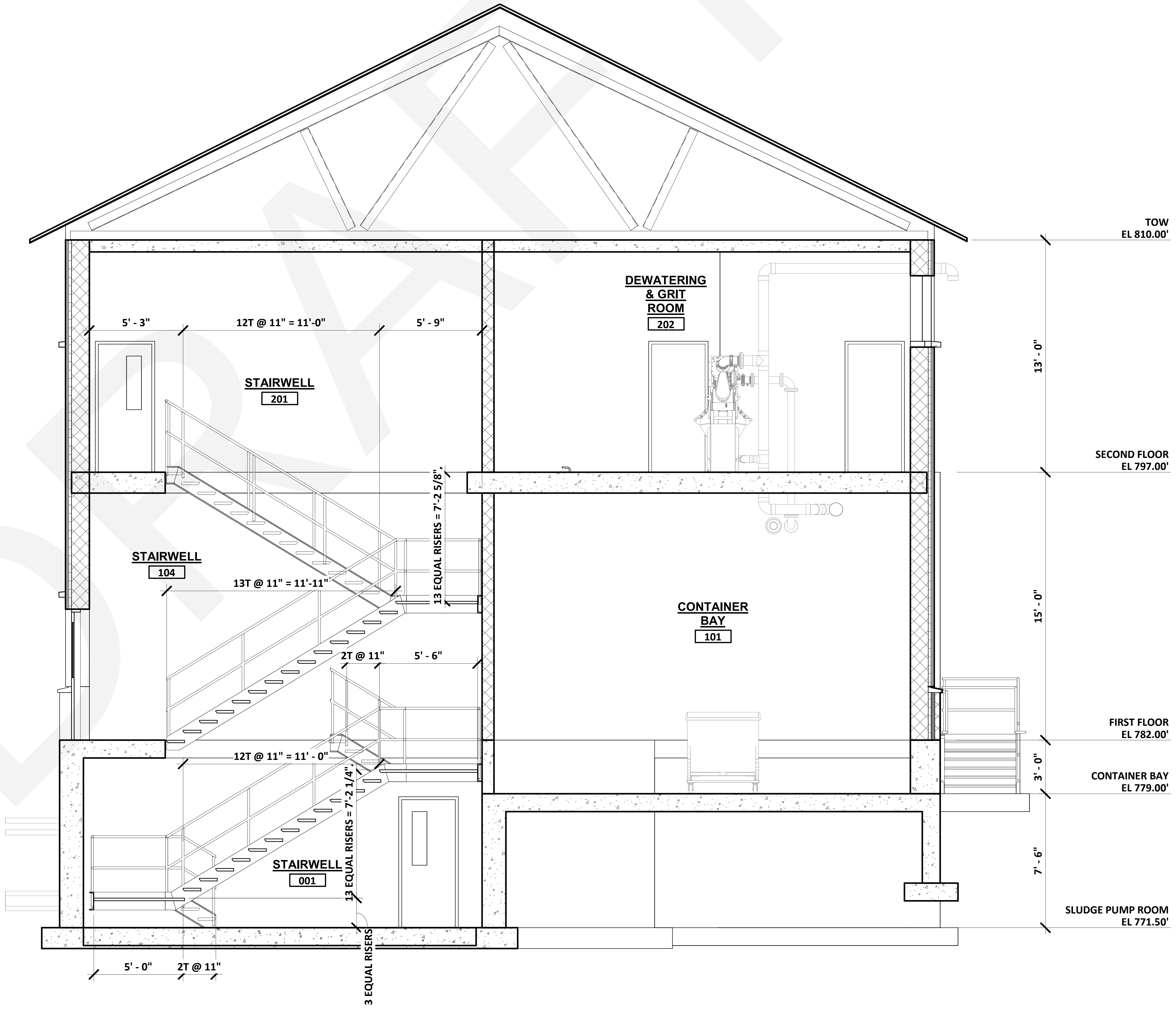
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
EXTERIOR ELEVATIONS

DRAWING
A-12

12/9/2022 8:46:52 AM

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



**1 SECTION**
A-10
SCALE: 1/4" = 1'-0"

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PROJECT NO: 20828
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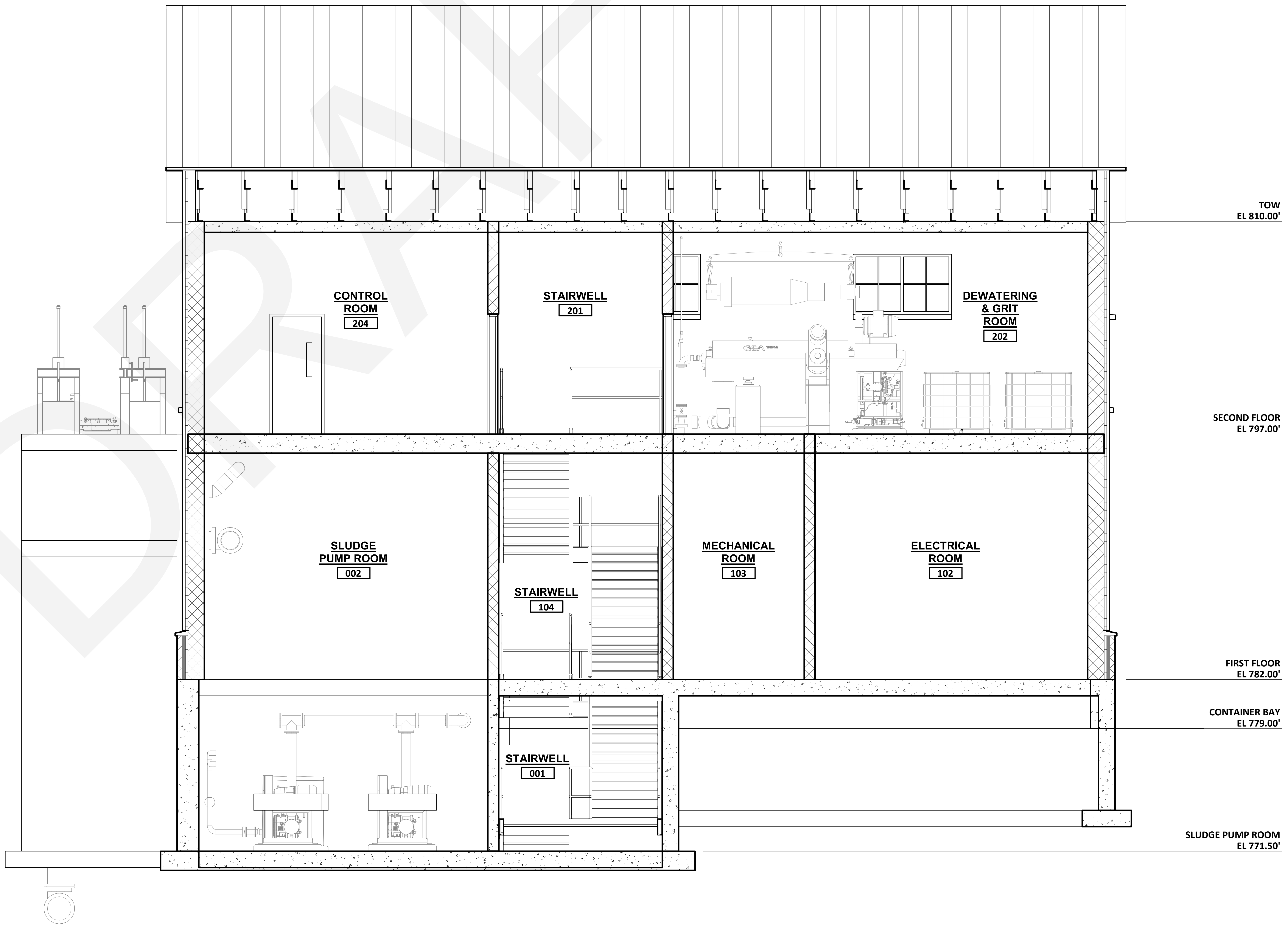
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS I

DRAWING
A-13

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-ProcessBldg.rvt

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



1 A-10 **SECTION**
SCALE: 1/4" = 1'-0"

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Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-ProcessBldg.rvt

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
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CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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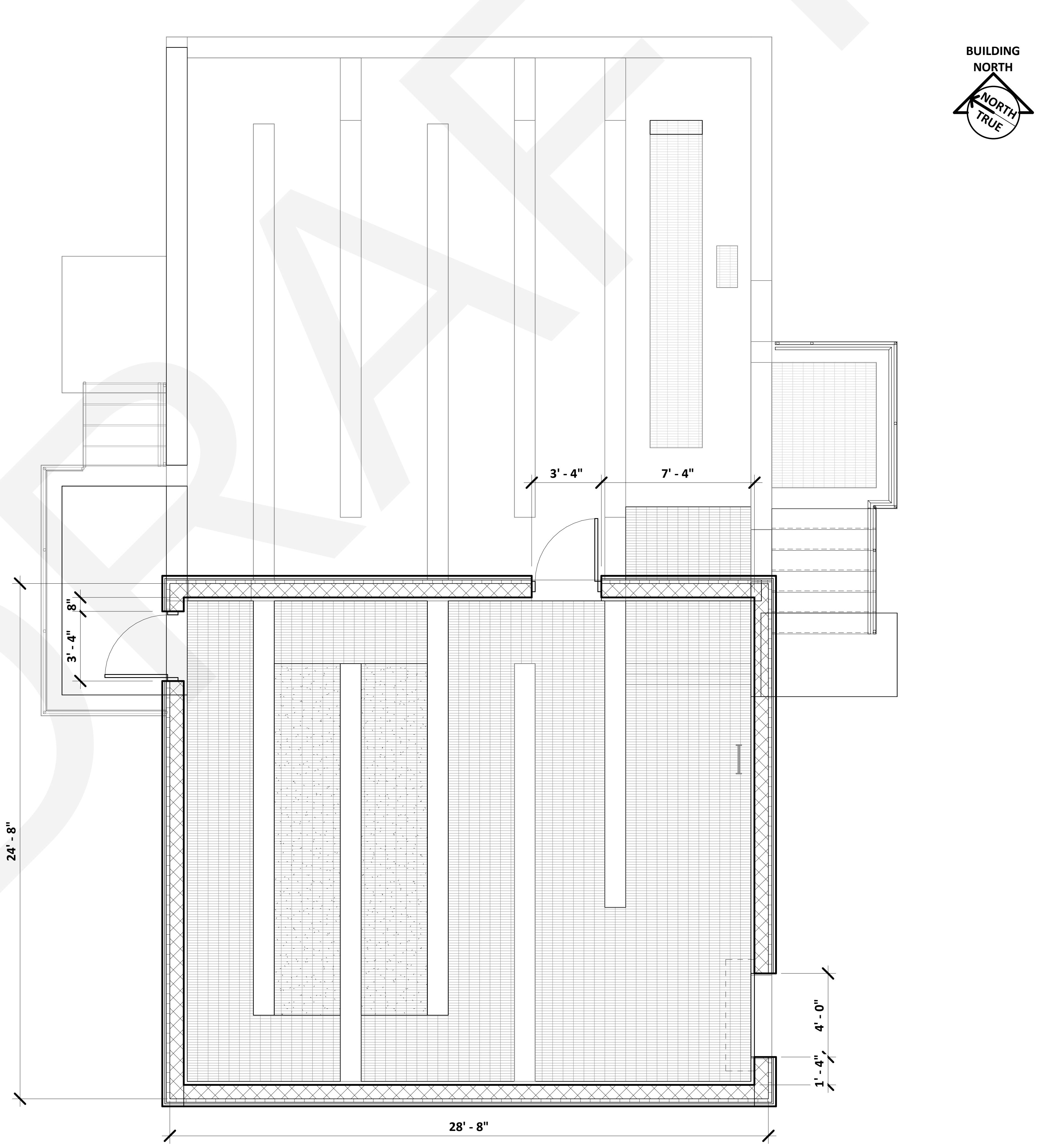
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS II

DRAWING
A-14



**FIRST FLOOR**
SCALE: 1/4" = 1'-0"

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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603.430.3728 | www.wright-pierce.com
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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DISINFECTION BUILDING
FLOOR PLANS

DRAWING
A-19

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Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-DisinfectionBldg.rvt

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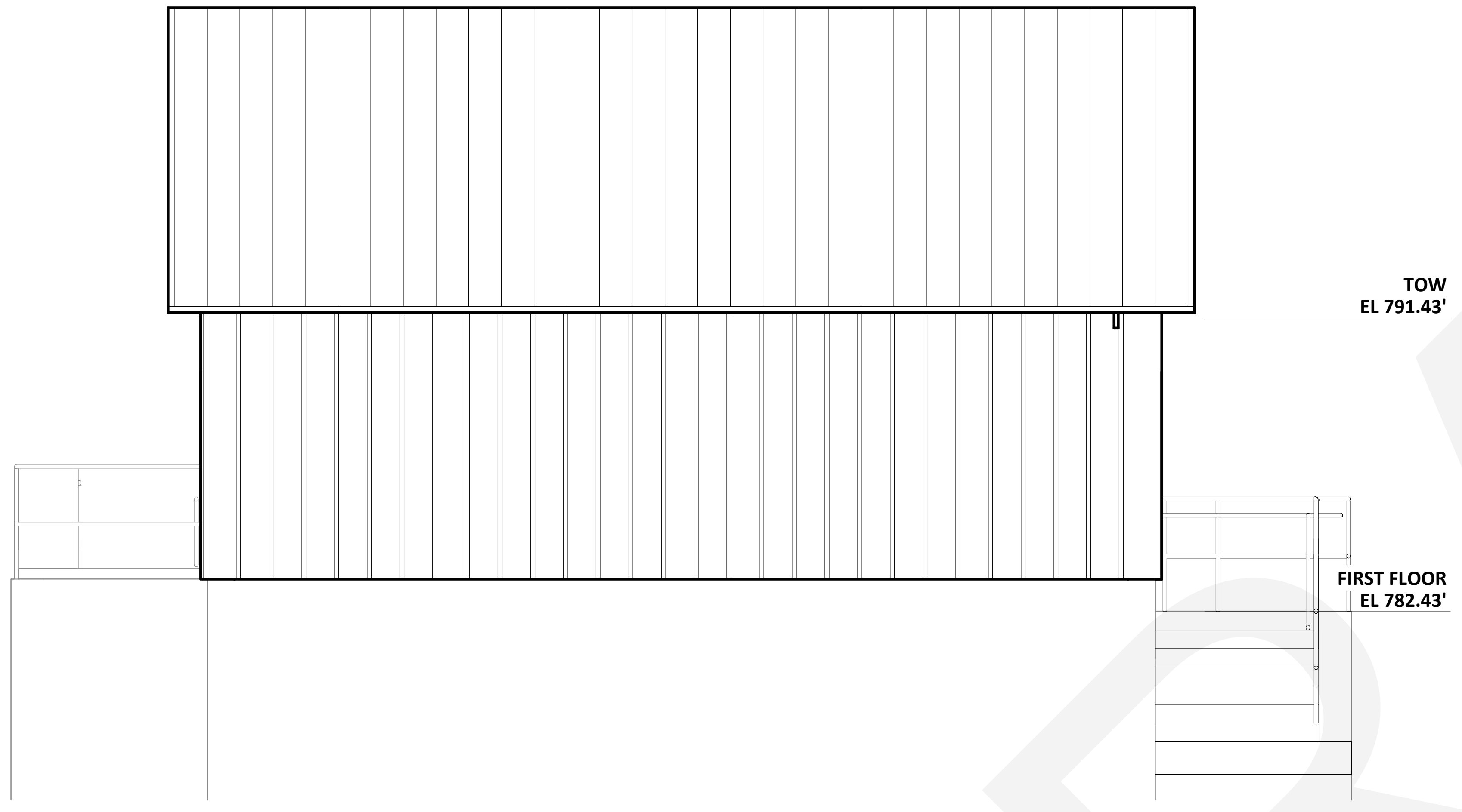
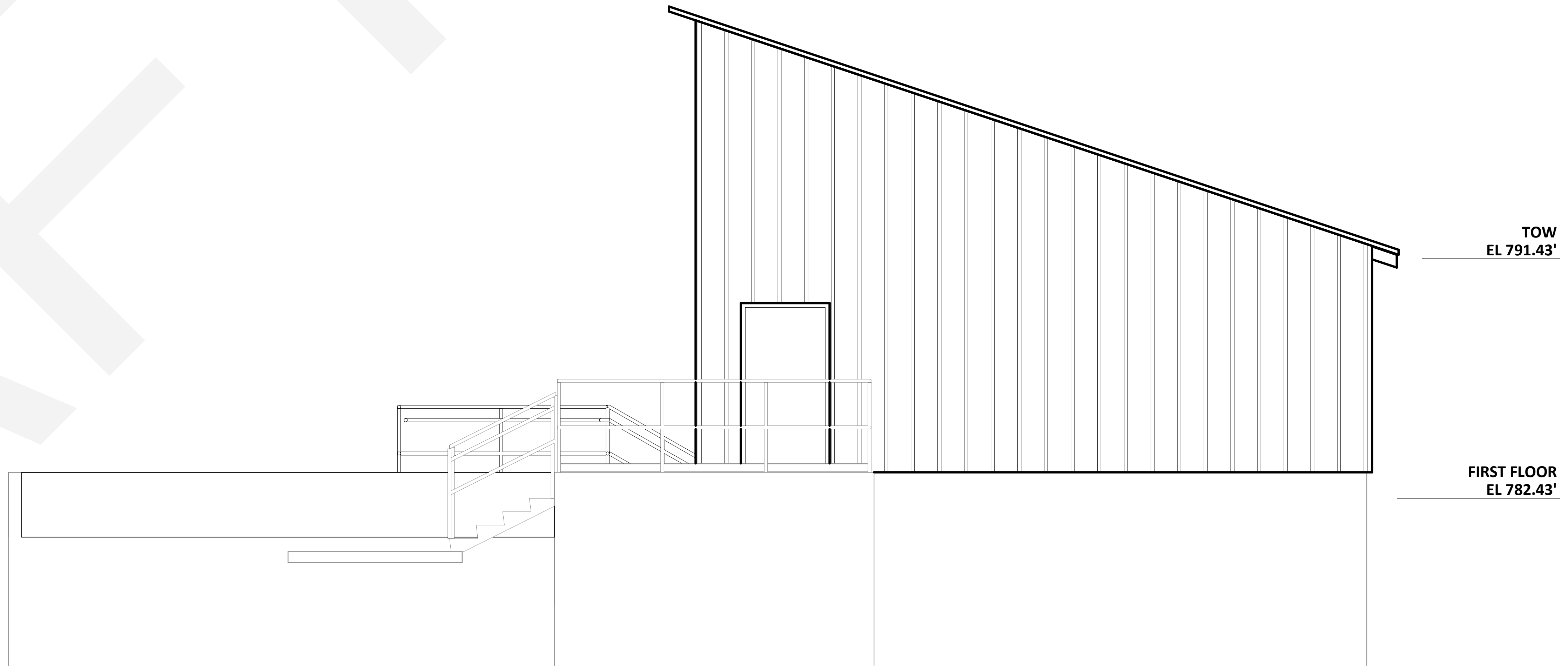


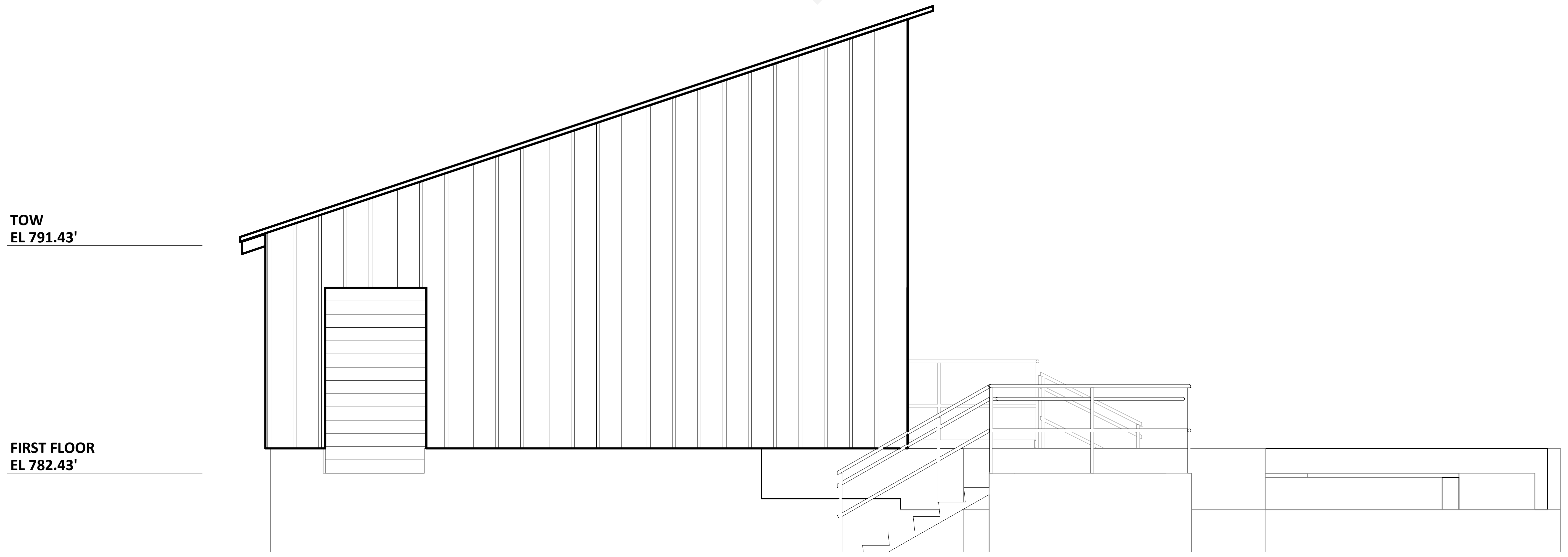
**SOUTH ELEVATION**

SCALE: 1/4" = 1'-0"



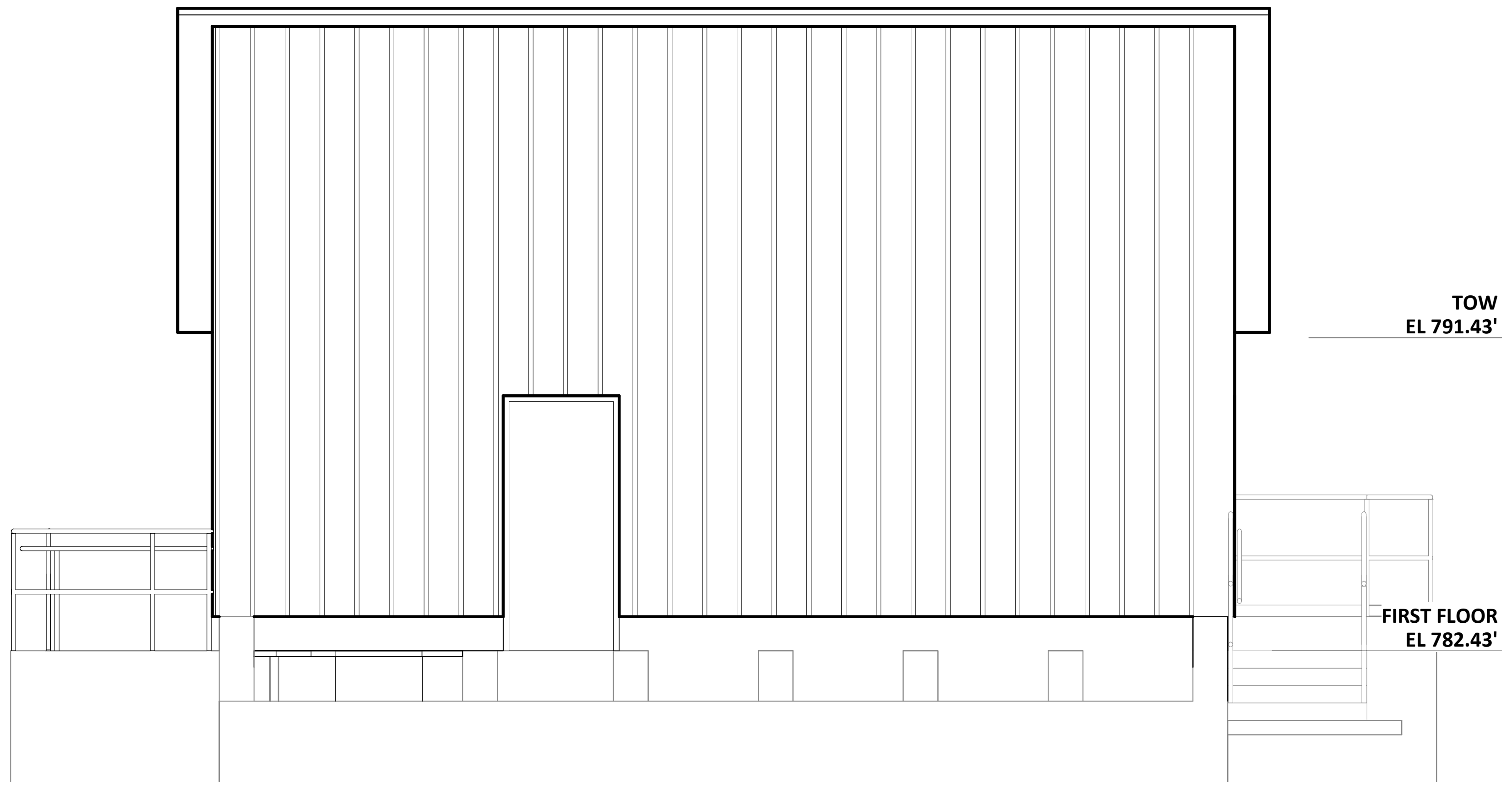
**WEST ELEVATION**

SCALE: 1/4" = 1'-0"



**EAST ELEVATION**

SCALE: 1/4" = 1'-0"



**NORTH ELEVATION**

SCALE: 1/4" = 1'-0"

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PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
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DATE:
APPROVED:
DATE:
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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DISINFECTION BUILDING
EXTERIOR ELEVATIONS

DRAWING
A-20

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-DisinfectionBldg.rvt

12/5/2022 11:55:15 AM

# STRUCTURAL NOTES

## GENERAL NOTES:

1. EXISTING DIMENSIONS AND/OR ELEVATIONS TAKEN FROM THE FOLLOWING RECORD DRAWINGS:
    1.1 "TOWN OF NEWPORT, NEW HAMPSHIRE SEWAGE WORKS IMPROVEMENTS" BY CAMP, DRESSER AND MCKEE DATED MAY, 1971.
    1.2 "TOWN OF NEWPORT NEW HAMPSHIRE WASTEWATER TREATMENT FACILITY " BY HOYLE, TANNER AND ASSOCIATES, INC DATED MARCH, 1987.
2. GENERAL CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES
3. * INDICATES THAT THE GENERAL CONTRACTOR SHALL COORDINATE EXACT DIMENSION AND/OR ELEVATION BASED ON EQUIPMENT SUPPLIED. ALL CHANGES SHALL BE REVIEWED WITH NO EXCEPTIONS TAKEN BY THE ENGINEER.
4. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.
5. ALL STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS, SHOP DRAWINGS (REVIEWED WITH NO EXCEPTIONS TAKEN) AND SPECIFICATIONS. SEE ARCHITECTURAL, PROCESS, MECHANICAL AND ELECTRICAL DRAWINGS FOR DOVETAIL SLOTS, PIPES, PIPE SLEEVES, CONDUITS, GATE FRAMES OR OTHER ITEMS TO BE EMBEDDED OR PASSED THROUGH THE CONCRETE.
6. THE CONTRACTOR SHALL COORDINATE PREPARED OPENING SIZES AND LOCATIONS WITH THE VARIOUS CONSTRUCTION TRADES AND EQUIPMENT MANUFACTURERS. MANY SLEEVE SIZES AND PREPARED OPENING SIZES ARE LARGER THAN THE NOMINAL DIMENSION IN ORDER TO ACCOMMODATE THE EQUIPMENT.
7. THE DETAILS, STRUCTURAL NOTES, ABBREVIATIONS AND LEGEND SHOWN ON DRAWINGS S-1 AND S-[*INSERT*] THROUGH S-[*INSERT*] SHOULD BE USED WHOLLY OR IN PART WHERE THEY APPLY EXCEPT WHERE MODIFIED BY THE DETAILED DRAWINGS OR SPECIFICATIONS.

## CONCRETE DEMOLITION NOTES:

1. REFERENCE SPECIFICATION - 02050.
2. GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF ALL CONCRETE, EQUIPMENT AND MATERIALS INDICATED TO BE DEMOLISHED UNLESS OTHERWISE INDICATED. SOME MATERIALS MAY BE REINSTALLED OR SALVAGED FOR FUTURE USE BY THE OWNER.
3. DETAILS AND SECTIONS SHOWN FOR REMOVING OR MODIFYING CONCRETE ARE BASED ON EXISTING REFERENCED DRAWINGS. IF CONDITIONS DIFFER FROM THOSE AS SHOWN ON THE REFERENCED DRAWINGS, GENERAL CONTRACTOR SHALL NOTIFY ENGINEER PRIOR TO BEGINNING THE DEMOLITION WORK.
4. USE OF HEAVY DUTY PNEUMATIC HAMMERS ARE NOT PERMITTED TO REMOVE THE EXISTING CONCRETE. UNLESS OTHERWISE PERMITTED, LINE DRILLING OR SAW CUTTING WILL BE REQUIRED FOR CUTTING EXISTING CONCRETE. GENERAL CONTRACTOR SHALL USE CAUTION TO AVOID DAMAGING EXISTING CONCRETE STRUCTURES TO REMAIN.
5. GENERAL CONTRACTOR SHALL REPAIR ANY DAMAGE TO EXISTING STRUCTURES AS A RESULT OF CONTRACTOR ACTIVITIES AT NO ADDITIONAL COST TO THE OWNER.
6. GENERAL CONTRACTOR SHALL THOROUGHLY CLEAN EXISTING CONCRETE TO BE MODIFIED PRIOR TO STARTING WORK.
7. ALL WALL AND/OR FLOOR PENETRATIONS REMAINING AFTER THE REMOVAL OF PIPING, CONDUIT, HATCHES AND OTHER EMBEDDED ITEMS ARE TO BE INFILLED WITH REINFORCED CONCRETE AND FINISHED FLUSH TO MATCH EXISTING SURFACES. (UNLESS OTHERWISE INDICATED ON THE DRAWINGS).
8. ALL CUT REINFORCING STEEL THAT WILL REMAIN EXPOSED AFTER REMOVING CONCRETE SHALL BE COATED AS FOLLOWS (UNLESS OTHERWISE INDICATED ON THE DRAWINGS):
    8.1 DRY SPACES - COAT WITH 4 MILS OF PRIMER AND 4 MILS OF EPOXY PAINT
    8.2 WET SPACES - COAT WITH CEMENTITIOUS OVERLAY.
9. GENERAL CONTRACTOR SHALL COORDINATE THE INDICATED DEMOLITION WITH THE ASSOCIATED PROPOSED NEW WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
10. WHEN REMOVING PORTIONS OF EXISTING CONCRETE OR CONCRETE FILL, ALL OVERCUT CONCRETE SHALL BE PATCHED WITH REPAIR MATERIAL FLUSH WITH REMAINING CONCRETE.

## CAST-IN-PLACE REINFORCED CONCRETE NOTES:

1. REFERENCE SPECIFICATIONS - 03300, 03305, 03346
2. REINFORCED CONCRETE WAS DESIGNED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE FOLLOWING:
    2.1 ACI 318 - BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE AND COMMENTARY
    2.2 ACI 350 - CODE REQUIREMENTS FOR ENVIRONMENTAL CONCRETE STRUCTURES AND COMMENTARY
    2.3 ACI 350.3 - SEISMIC DESIGN GUIDE FOR LIQUID-CONTAINING CONCRETE STRUCTURES AND COMMENTARY
3. MINIMUM CONCRETE COMPRESSIVE STRENGTH AT 28 DAYS:
    STRUCTURAL CONCRETE - f'c = 4,500 PSI
    CONCRETE FILL, ELECTRICAL CONDUIT ENCASEMENTS, PIPE ENCASEMENTS - f'c = 3,000 PSI
4. REINFORCING STEEL SHALL BE NEW BILLET STEEL CONFORMING TO ASTM SPECIFICATION A615 GRADE 60 DEFORMED BARS. FABRICATION SHALL BE IN ACCORDANCE WITH THE CRSI CODE OF STANDARD PRACTICE.
5. REINFORCING STEEL SHALL HAVE THE FOLLOWING CLEAR CONCRETE COVER UNLESS OTHERWISE NOTED:
    5.1 CONCRETE CAST AGAINST EARTH: 3 INCHES
    5.2 CONCRETE WITH EMBEDDED 6" WATERSTOPS PERPENDICULAR TO THE REINFORCING STEEL: 3 INCHES
    5.3 ALL OTHER CONCRETE SURFACES: 2 INCHES
6. SPLICED BARS SHALL HAVE THE FOLLOWING MINIMUM SPLICE LENGTHS REGARDLESS OF LOCATION (UNLESS OTHERWISE INDICATED ON THE DRAWINGS):
    #4 - 1'-8"    #5 - 2'-0"    #6 - 2'-5"    #7 - 3'-6"
    #8 - 4'-0"    #9 - 4'-6"    #10 - 5'-0"    #11 - 5'-6"
7. EMBEDDED HOOKED DOWEL BAR SPLICERS SHALL HAVE THE FOLLOWING MINIMUM DIMENSIONS:
    #4 - 7" EMBEDMENT WITH 9" HOOK
    #5 - 8" EMBEDMENT WITH 10" HOOK
    #6 - 10" EMBEDMENT WITH 12" HOOK
    #7 - 11" EMBEDMENT WITH 12" HOOK
8. CONSTRUCTION JOINTS SHALL NOT BE PLACED AT LOCATIONS OTHER THAN SHOWN ON THE DRAWINGS UNLESS REVIEWED WITH NO EXCEPTIONS TAKEN BY THE ENGINEER. CONTROL JOINTS SHALL BE PLACED AT ALL INDICATED LOCATIONS.
9. SIZE AND LOCATION OF EQUIPMENT PADS AND ANCHOR BOLTS SHALL BE AS REQUIRED BY THE EQUIPMENT MANUFACTURER. (UNLESS OTHERWISE INDICATED ON THE DRAWINGS)
10. PROVIDE CHAMFERS AT ALL EXPOSED CORNERS AND EDGES, EXCEPT THOSE DIRECTLY BELOW MASONRY OR WOOD WALLS.
11. 90 DEGREE BENDS IN REINFORCING BARS SHALL EXTEND 12 BAR DIAMETERS BUT NOT LESS THAN 12" BEYOND BEND UNLESS OTHERWISE NOTED.
12. PROVIDE ADDITIONAL REINFORCING STEEL AT SLAB AND WALL OPENINGS AS INDICATED ON THE TYPICAL STRUCTURAL DETAILS.
13. PROVIDE A MINIMUM 4" THICK REINFORCED CONCRETE PAD BELOW ALL EQUIPMENT, PIPE SUPPORTS, STANCHIONS, CONTROL PANELS, TANKS, ETC. UNLESS OTHERWISE NOTED.
14. APPLY EPOXY BONDING AGENT TO ALL EXISTING CONCRETE BEFORE BONDING NEW CONCRETE TO IT. EXISTING SURFACES SHALL BE CLEANED AND ROUGHENED PRIOR TO PLACING CONCRETE.
15. ALL WASTEWATER PIPING (EXCLUDING BUILDING DRAINS/SEWER) AND PRESSURIZED PIPING INSTALLED BELOW SLABS SHALL BE ENCASED IN CONCRETE.
16. INDEPENDENT TESTING LABORATORY WILL PERFORM SLUMP AND AIR CONTENT TESTS FOR ALL CONCRETE TRUCKS AND PREPARE AND TEST CONCRETE CYLINDER SAMPLES.
17. PVC WATERSTOPS AND FORM TIES WITH WATERSTOP WASHERS SHALL BE INSTALLED IN ALL LIQUID RETAINING WALLS AND WALLS OF BELOW GRADE SPACES.

## FOUNDATION NOTES:

1. PRIOR TO BACKFILLING, DAMPPROOFING OR APPLICATION OF CONCRETE COATINGS, ALL TANKS AND OTHER LIQUID CONTAINING STRUCTURES SHALL BE LEAK TESTED.
2. BACKFILLING OF THE FROST WALLS SHALL NOT COMMENCE UNTIL THE FOLLOWING CONDITIONS ARE MET:
    2.1 THE CONCRETE WALLS HAVE BEEN IN PLACE FOR A MINIMUM OF 7 DAYS.
    2.2 THE CONCRETE WALLS HAVE ATTAINED A COMPRESSIVE STRENGTH OF 3,300 PSI.
3. BACKFILLING OF ALL OTHER FOUNDATION WALLS (TANKS AND BELOW GRADE SPACES) SHALL NOT COMMENCE UNTIL THE FOLLOWING CONDITIONS ARE MET:
    3.1 THE CONCRETE WALLS HAVE BEEN IN PLACE FOR A MINIMUM OF 14 DAYS.
    3.2 THE CONCRETE WALLS HAVE ATTAINED A COMPRESSIVE STRENGTH OF 4,500 PSI
    3.3 THE TOP SLAB HAS BEEN IN PLACE FOR A MINIMUM OF 14 DAYS AND ATTAINED A COMPRESSIVE STRENGTH OF 3,300 PSI
    3.4 LEAK TESTS HAVE BEEN SUCCESSFULLY COMPLETED.
4. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO MAINTAIN A CONTINUOUS DEWATERING SYSTEM TO INSURE AGAINST FLOTATION OF EACH NEW STRUCTURE UNTIL CONSTRUCTION OF THE CONCRETE FOUNDATION AND BACKFILLING FOR EACH STRUCTURE IS COMPLETED.
5. FOUNDATION DESIGN, SUBGRADE AND FILL DETAILS ARE BASED ON A MAXIMUM NET ALLOWABLE SOIL BEARING CAPACITY OF *[INSERT]* PSF.
6. EXISTING SUBGRADE CONDITIONS CONSIST OF [*NOTE TO ENGINEER: PROVIDE A BRIEF DESCRIPTION OF SOIL STRATA*]. IF UNSUITABLE MATERIAL IS ENCOUNTERED AS DETERMINED BY THE ENGINEER, REMOVE AN ADDITIONAL 18 INCHES BELOW THE SUBGRADE LEVEL AND REPLACE WITH COMPACTED SELECT FILL.
7. ALL CONCRETE STRUCTURES SHALL BE COVERED, INSULATED AND HEATED AS REQUIRED TO PREVENT FROST PENETRATION BENEATH THE STRUCTURES UNTIL SUBSTANTIAL COMPLETION OR UNTIL STRUCTURES ARE COMPLETED AND BACKFILLED.
8. THE BOTTOM OF ALL EXTERIOR FOOTINGS SHALL BE BELOW THE FROST DEPTH (AS MEASURED FROM FINISH GRADE) UNLESS OTHERWISE INDICATED ON THE DRAWINGS.
9. BACKFILL BOTH SIDES OF FROST WALLS AT THE SAME TIME TO PREVENT AN UNBALANCED LOAD ON THE WALLS.
10. SEE ARCHITECTURAL DRAWINGS FOR LIMITS OF FOUNDATION INSULATION, VAPOR BARRIERS AND DAMPROOFING.
11. GENERAL CONTRACTOR SHALL PROVIDE SUPPORT BELOW EXISTING STRUCTURES WHEN EXCAVATION FOR NEW WORK MAY UNDERMINE OR CAUSES INSTABILITY OF THE EXISTING STRUCTURES.

## WOOD TRUSS NOTES:

1. REFERENCE SPECIFICATION - 06175
2. ALL WOOD TRUSSES SHALL BE DESIGNED IN ACCORDANCE WITH THE LATEST EDITION OF THE FOLLOWING PUBLICATIONS:
    2.1 "NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION" INCLUDING "DESIGN VALUES FOR WOOD CONSTRUCTION", BY THE AMERICAN WOOD COUNCIL.
    2.2 "NATIONAL DESIGN STANDARD FOR METAL PLATE CONNECTED WOOD TRUSS CONSTRUCTION" ANSI/TPI 1-2014 BY THE TRUSS PLATE INSTITUTE.
3. STRUCTURAL LUMBER USED IN THE MANUFACTURE OF WOOD TRUSSES SHALL BE SELECTED BY THE TRUSS DESIGN ENGINEER.
4. TOP AND BOTTOM CHORDS SHALL BE 2X6 MINIMUM SIZE AND INTERIOR WEBS SHALL BE 2X4 MINIMUM SIZE. TRUSS MEMBER SIZES SHALL BE INCREASED ABOVE THE MINIMUMS AS NECESSARY TO SUPPORT DESIGN LOADS. OUTSIDE DIMENSIONS OF TRUSSES SHALL BE AS INDICATED ON THE DRAWINGS, INTERIOR CONFIGURATIONS SHOWN ON THE DRAWINGS ARE ASSUMED AND SHALL BE AS REQUIRED BY THE TRUSS ENGINEER TO SUPPORT DESIGN LOADS AND AVOID INTERFERENCES.
5. THE PERMANENT LATERAL BRACING SYSTEM AS INDICATED ON THE CONTRACT DRAWINGS INCLUDES WOOD BRACING (LATERAL, DIAGONAL, AND WEB) AND PLYWOOD ROOF SHEATHING. CONTRACTOR SHALL PROVIDE TEMPORARY BRACING AS REQUIRED TO LATERALLY SUPPORT THE TRUSSES DURING CONSTRUCTION.
6. ATTACH ROOF TRUSSES TO TOP PLATES AT EACH END OF THE TRUSSES WITH HURRICANE ANCHORS AS INDICATED BELOW. ALL EQUIVALENTS SHALL HAVE EQUAL REACTION CAPACITY TO THOSE SPECIFIED. ATTACH CONNECTOR TO TRUSS AND TOP PLATES IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

| STRUCTURE | TRUSS | USP | SIMPSON STRONG-TIE | MATERIAL |
|---|---|---|---|---|
| PROCESS BUILDING | T1 | RT15 | H1 | HDG (SS) |

## PIPE SUPPORT NOTES:

1. THE FOLLOWING RESTRICTIONS FOR SUPPORTING PIPES FROM NEW AND EXISTING STRUCTURES IN THE TABLE BELOW SHALL APPLY TO ALL PIPE SUPPORTS:

| AREA | EXISTING STRUCTURES | NEW STRUCTURES |
|---|---|---|
| FLOOR SYSTEMS | | |
| REINFORCED CONCRETE SLAB: | | |
| ELEVATED SLAB | NO | YES |
| MAT SLAB/ BASE SLAB | YES | YES |
| CONCRETE SLAB W/ METAL DECK | NO | NO |
| SLAB-ON-GRADE | YES | YES |
| WOOD FRAMED | NO | NO |
| ROOF SYSTEMS | | |
| WOOD TRUSS | NO | NO |
| PRECAST CONCRETE PLANK | NO | NO |
| REINFORCED CONCRETE SLAB | NO | YES |
| STEEL JOISTS | NO | NO |
| STEEL FRAME | NO | YES |
| METAL DECK | NO | NO |
| OTHER SYSTEMS | | |
| METAL AND CONCRETE STAIRS | NO | NO |
| CONCRETE WALLS | YES | YES |

NOTE: "NO" INDICATES THAT PIPES MAY NOT BE SUPPORTED FROM THE INDICATED STRUCTURE AND "YES" INDICATES THAT PIPES MAY BE SUPPORTED FROM THE INDICATED STRUCTURE. THE RESTRICTIONS APPLY TO BEARING THE PIPE SUPPORT ABOVE, HANGING BELOW, OR HANGING THE PIPE FROM THE SIDE OF THE INDICATED STRUCTURAL ELEMENT. ALL PIPE SUPPORTS SUPPORTED FROM STRUCTURES SHALL BE SUBJECTED TO REVIEW WITH NO EXCEPTIONS TAKEN BY THE ENGINEER.

## LEAKAGE TEST NOTES:

1. REFERENCE SPECIFICATION - 03305
2. LEAKAGE TESTS SHALL BE PERFORMED PRIOR TO BACKFILLING, DAMPPROOFING, APPLICATION OF CONCRETE COATINGS OR INSTALLATION OF CONCRETE FILL. THE LEAKAGE TESTS SHALL NOT COMMENCE UNTIL THE FOLLOWING CONDITIONS ARE MET AS INDICATED FOR EACH STRUCTURE:
    2.1 THE CONCRETE WALLS HAVE BEEN IN PLACE FOR A MINIMUM OF 28 DAYS,
    2.2 THE CONCRETE WALLS HAVE ATTAINED A COMPRESSIVE STRENGTH OF 4,000 PSI,
    2.3 THE TOP SLAB MUST BE IN PLACE FOR A MINIMUM OF 7 DAYS AND ATTAIN A COMPRESSIVE STRENGTH OF 3,300 PSI.
3. LEAKAGE TESTS SHALL BE PERFORMED FOR ALL LIQUID CONTAINING STRUCTURES WITH CONDITIONS AS LISTED BELOW:
    SBR TANK 1
    SBR TANK 2
    EQUALIZATION TANK 1
    EQUALIZATION TANK 2
    SLUDGE STORAGE TANK 1
    SLUDGE STORAGE TANK 2
4. EVERY TANK SHALL BE TESTED INDIVIDUALLY (ONE AT A TIME) UNLESS OTHERWISE NOTED.
5. CLOSE ALL OPENINGS, VALVES AND GATES TO THE STRUCTURE.
6. FILL EACH TANK WITH POTABLE WATER OR WATER THAT MEETS ASTM C1602/C1602M FURNISHED BY THE CONTRACTOR TO THE MAXIMUM WATER ELEVATION AS INDICATED ON THE STRUCTURAL DRAWINGS.
7. TANK SHALL BE KEPT FULL FOR AT LEAST 72 HOURS DURING PART 1 OF THE TEST- QUALITATIVE CRITERIA - PRIOR TO COMMENCEMENT OF PART 2 - QUANTITATIVE CRITERIA.
8. THE TEST PERIOD FOR PART 2 OF THE TEST SHALL BE PER ACI 350.1-10. LOSS OF TANK VOLUME SHALL NOT EXCEED 0.05% PER DAY. CHEMICAL CONTAINMENTS SHALL HAVE NO MEASURABLE LOSS OF VOLUME.
9. ALL VISIBLE LEAKS AND DAMP AREAS SHALL BE REPAIRED AND ELIMINATED BY A METHOD PROPOSED BY THE CONTRACTOR AND REVIEWED FOR INFORMATION ONLY BY AN ENGINEER.
10. SUBSEQUENT TO THE REPAIRS AND ELIMINATION OF ALL VISIBLE LEAKS AND DAMP AREAS, TANKS SHALL BE REFILLED AS PREVIOUSLY DESCRIBED.
11. ALL LIQUID CONTAINING STRUCTURES SHALL BE RETESTED SUBSEQUENT TO REPAIRS.
12. ADDITIONAL TESTS AND REPAIRS SHALL BE PERFORMED UNTIL SUCH TIME AS THE STRUCTURES CAN DEMONSTRATE COMPLIANCE WITH TESTING REQUIREMENTS.

## MASONRY NOTES:

1. REFERENCE SPECIFICATION - 04200
2. MINIMUM COMPRESSIVE STRENGTH OF GROUTED CMU WALLS: F'm = 1500 PSI (INSPECTED)
3. MORTAR SHALL CONFORM TO ASTM C270 TYPE S WITH 28 DAY COMPRESSIVE STRENGTH OF 1800 PSI.
4. CMU BLOCK SHALL CONFORM TO ASTM C90 (NORMAL WEIGHT) WITH A MINIMUM COMPRESSIVE STRENGTH OF 2000 PSI.
5. GROUT SHALL CONFORM TO ASTM C476 FINE GROUT WITH MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 2000 PSI.
6. REINFORCING STEEL SHALL BE NEW BILLET STEEL CONFORMING TO ASTM SPECIFICATION A615 GRADE 60 DEFORMED BARS. FABRICATION SHALL BE IN ACCORDANCE WITH THE CRSI CODE OF STANDARD PRACTICE.
7. GROUT CMU CELLS SOLID AT THE FOLLOWING LOCATIONS:
    7.1 EXPANSION AND EPOXY ANCHORS
    7.2 CELLS WITH REINFORCING STEEL BARS
    7.3 CELLS BELOW LINTELS AND BEAMS BEARING ON CMU. THE LIMITS OF GROUTED CELLS SHALL BE AS INDICATED ON THE DRAWINGS
8. INDEPENDENT TESTING LABORATORY WILL PERFORM TESTS ON MASONRY PRISM, MORTAR CUBE AND GROUT CUBE SAMPLES AS SPECIFIED. MASON SHALL PREPARE SAMPLES FOR TESTING.

## METAL DECK NOTES:

1. REFERENCE SPECIFICATION 05310.
2. STEEL DECK SHALL CONFORM TO THE REQUIREMENTS OF ANSI/SDI RD-2010 STANDARD FOR STEEL ROOF DECK.
3. METAL DECK SHEETS SHALL BE PROVIDED IN THE LONGEST LENGTHS POSSIBLE BUT NO LESS THAN THREE (3) SPANS.
4. METAL DECK MATERIALS SHALL BE AS INDICATED ON THE DRAWINGS
5. STEEL DECK FINISH SHALL BE GALVANIZED [COATED] .
6. DECK SHALL BE EITHER WELDED OR SCREWED TO ALL SUPPORTING ROOF STEEL TO ACCOMMODATE DIAPHRAGM ACTION AS INDICATED BELOW:
    6.1 WELDED CONNECTIONS:
        6.1.1 AT END AND INTERIOR TRANSVERSE SUPPORTS (BEARING SUPPORTS PERPENDICULAR TO DECK SPAN) BY 5/8-INCH DIAMETER PLUG WELDS AT THE BOTTOM OF EVERY SECOND RIB AT EACH SUPPORT AND AT A SPACING NOT TO EXCEED 12 INCHES WITH ONE WELD ALWAYS OCCURRING AT THE SIDE LAPS (36/4 PATTERN).
        6.1.2 AT INTERIOR AND EXTERIOR LONGITUDINAL SUPPORTS (SUPPORTS PARALLEL TO DECK SPAN) BY 5/8" INCH DIAMETER PLUG WELDS AT A SPACING NOT TO EXCEED 18 INCHES.
        6.1.3 WELDS TO SUPPORTING MEMBERS AT SIDE LAPS AND END LAPS SHALL GO THROUGH BOTH SHEETS.
        6.1.4 THE DECK SHEETS SHALL BE CONNECTED ALONG THEIR SIDE LAPS BY 1 1/2" FILLET WELDS OR #10 TEK SCREWS. THE NUMBER OF SIDE LAP FASTENERS SHALL BE NO LESS THAN 4 FASTENERS PER DECK SPAN. SIDE LAP ONE FLUTE.
    6.2 SCREWED CONNECTIONS:
        6.2.1 AT END AND INTERIOR TRANSVERSE SUPPORTS (BEARING SUPPORTS PERPENDICULAR TO DECK SPAN) BY #12 TEK SCREWS AT THE BOTTOM OF EVERY SECOND RIB AT EACH SUPPORT AND AT A SPACING NOT TO EXCEED 12" WITH ONE SCREW ALWAYS OCCURRING AT THE SIDE LAPS (36/4 PATTERN).
        6.2.2 AT INTERIOR AND EXTERIOR LONGITUDINAL SUPPORTS (SUPPORTS PARALLEL TO DECK SPAN) BY #12 TEK SCREWS AT 12" ON CENTER
        6.2.3 THE DECK SHEETS SHALL BE CONNECTED ALONG THEIR SIDE LAPS BY #10 TEK SCREWS. THE NUMBER OF SIDE LAP FASTENERS SHALL BE NO LESS THAN 4 FASTENERS PER DECK SPAN. SIDE LAP ONE FLUTE.
7. OPENINGS IN DECK - ALL OPENINGS IN THE METAL DECK SHALL BE FIELD CUT. THE GENERAL CONTRACTOR SHALL COORDINATE THE WORK OF THE TRADES INVOLVED TO ENSURE PROPER PROVISION FOR THE SUPPORT AND ATTACHMENT OF DECK AROUND OPENINGS. OPENINGS SHALL BE REINFORCED AS FOLLOWS:
    7.1 OPENINGS LESS THAN 6" IN DIAMETER OR LARGEST SIDE LENGTH AND NO GREATER THAN 2 WEBS REMOVED, ADDITIONAL REINFORCING NOT REQUIRED.
    7.2 OPENINGS GREATER THAN OR EQUAL TO 6" AND LESS THAN OR EQUAL TO 12" PROVIDE REINFORCING PLATE. SIZE OF PLATE SHALL BE A MINIMUM 12" GREATER THAN THE OPENING ON ALL SIDES SUCH THAT THE PLATE SPANS ACROSS A MINIMUM 3 FLUTES.
    7.3 OPENINGS GREATER THAN 12 INCHES PROVIDE FRAMING AS INDICATED ON THE CONTRACT DRAWINGS. IF ADDITIONAL FRAMING IS NOT INDICATED ON THE CONTRACT DRAWINGS, PROVIDE THE MINIMUM FRAMING INDICATED BELOW:
        7.3.1 SPAN OF FRAMING MEMBER LESS THAN 3'-0" C8X11.5
        7.3.2 SPAN OF FRAMING MEMBER GREATER THAN OR EQUAL TO 3'-0" AND LESS THAN 6'-0" C10X20
        7.3.3 MAIN FRAMING SHALL BE INSTALLED PERPENDICULAR TO THE DECK SPAN SUCH THAT THE DECK BEARS ON THE TOP FLANGE. SECONDARY FRAMING INSTALLED PARALLEL WITH THE DECK SPAN WITH ADDITIONAL FRAMING WELDED TO THE TOP FLANGE TO PROVIDE POSITIVE BEARING AS REQUIRED.

## WOOD FRAMING NOTES:

1. REFERENCE SPECIFICATION - 06100
2. ALL WOOD FRAMING WAS DESIGNED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE "NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION" INCLUDING "DESIGN VALUES FOR WOOD CONSTRUCTION", BY THE AMERICAN WOOD COUNCIL.
3. TOP PLATES BETWEEN TOP OF MASONRY AND TRUSSES SHALL BE SOUTHERN YELLOW PINE No 2 OR EQUAL USED AT 19% MAXIMUM MOISTURE CONTENT. THE BOTTOM TOP PLATE IN CONTACT WITH THE MASONRY WALL SHALL BE PRESSURE TREATED.
4. ALL OTHER FRAMING SHALL BE SPRUCE-PINE-FIR (SPF) No. 2 OR EQUAL USED AT 19% MAXIMUM MOISTURE CONTENT.
5. NAILING SCHEDULE:

| | |
|---|---|
| TOP PLATE TO STUD | 2-16d (DIRECT) |
| STUD TO SILL PLATE | 4-12d (TOE NAIL) |
| STUD TO STUD (ELSEWHERE) | 16d @ 24" OC (DIRECT) |
| STUD TO STUD (@ WALL CORNERS) | 16d @ 16" OC (DIRECT) |
| HEADER TO STUD | 4-8d (TOE NAIL) |
| DOUBLE TOP PLATES | 12d @ 16" OC (2 ROWS) (DIRECT) |
| DOUBLE TOP PLATES (END JOINT) | 8-16d DIRECT EACH SIDE OF JOINT (2 ROWS @ 3" OC) |
| DOUBLE TOP PLATES (CORNERS & INTERSECTION) | 4-16d (TOENAIL) |
| BLOCKING TO TOP PLATE | 12d @ 6" (TOE NAIL) |
| FLOOR JOIST TO TOP PLATE | 3-8d (TOENAIL) |
| RIM JOIST TO TOP PLATE | 12d @ 6" OC (TOENAIL) |
| GABLE END WALL BRACING | 3-16d EACH END |
| TRUSS OUTRIGGERS TO TRUSS | 2-16d (DIRECT) |
| TRUSS OUTRIGGERS TO GABLE END WALL | 2-12d (TOENAIL) |
| BRACING TO TRUSSES | 2-12d EACH TRUSS |
| BLOCKING TO TRUSSES | 2-8d (TOENAIL) OR 2-16d (DIRECT) |
| EACH END COLLAR TIE TO RAFTER | 3-10d |
| ROOF RAFTER TO RIDGE | 2-16d (DIRECT OR TOENAIL) |
| ROOF RAFTER TO PLATE | 3-10d (TOENAIL) |
| FURRING/STRAPPING TO BOTTOM OF TRUSS | 2-NO. 8 x 2 1/2" LONG SCREWS EACH TRUSS |
| BUILT UP HEADER | 16d @ 16" OC (2 ROWS) (DIRECT) |
| RIM JOIST TO JOIST | 3-16d (END NAIL) |
| ROOF PLYWOOD @ DIAPHRAGM BOUNDARY | [8d @ 4"] OC |
| ROOF PLYWOOD @ ALL OTHER EDGES | [8d @ 6"] OC |
| ROOF PLYWOOD @ INTERIOR SUPPORTS | [8d @ 12"] OC |
| SHEAR WALL PLYWOOD @ ALL EDGES | [8d @ 6"] OC |

    ALL OTHER NAILING SHALL BE IN ACCORDANCE WITH REFERENCED BUILDING CODE.
    ALL FASTENERS SHALL BE THE BRIGHT COMMON TYPE.
6. WOOD TO STEEL, WOOD TO WOOD, WOOD TO MASONRY AND WOOD TO CONCRETE BOLTED CONNECTORS SHALL BE AS FOLLOWS (UNLESS OTHERWISE NOTED):
    6.1 WOOD TO STEEL: ASTM A307 OR ASTM F3125 GRADE A325N BOLTS (CONCEALED); TYPE 316 STAINLESS OR HOT-DIPPED GALVANIZED ASTM F3125 GRADE A325N BOLTS (EXPOSED)
    6.2 WOOD TO WOOD: ASTM A307 OR ASTM F3125 GRADE A325N BOLTS (CONCEALED); TYPE 316 STAINLESS STEEL OR HOT-DIPPED GALVANIZED F3125 GRADE A325N BOLTS (EXPOSED)
    6.3 WOOD TO MASONRY: TYPE 316 STAINLESS STEEL OR HOT-DIPPED GALVANIZED EPOXY OR EXPANSION ANCHORS
    6.4 WOOD TOP PLATES TO CMU BOND BEAMS: 3/4"Ø ANCHOR RODS @ 2'-0" OC [3/4"Ø SS EPOXY ANCHORS @ 2'-0" OC]. USE FLAT WASHERS BETWEEN HEAD OF BOLT AND WOOD.
7. USE FLAT WASHERS BETWEEN NUT AND WOOD. BOLT HOLES IN WOOD SHALL BE 1/32" LARGER THAN BOLT. WOOD NAILERS SHALL BE FASTENED TO STEEL BEAMS WITH 1/2"Ø BOLTS STAGGERED AT 2'-0" UNLESS OTHERWISE NOTED.
8. WOOD IN CONTACT WITH CONCRETE OR MASONRY, EXPOSED TO THE EXTERIOR, OR INDICATED ON THE DRAWINGS TO BE PRESSURE TREATED SHALL BE TREATED WITH WATERBORNE PRESERVATIVES IN ACCORDANCE WITH AWPA STANDARD U1 TO THE REQUIREMENTS OF CATEGORY 2 (UC2).
9. PLYWOOD SHEATHING SHALL BE AS FOLLOWS:
    9.1 ROOF: 5/8" APA RATED STRUCTURAL I SHEATHING, 40/20 SPAN RATING, EXPOSURE 1 (BLOCK ALL PLYWOOD EDGES WITH FULL DEPTH 2X BLOCKING).
    9.2 WALLS: 1/2" APA RATED STRUCTURAL I SHEATHING, 32/16 SPAN RATING, EXPOSURE 1 (BLOCK ALL PLYWOOD EDGES WITH FULL DEPTH 2X BLOCKING).

## METALS NOTES:

1. REFERENCE SPECIFICATION - 05500
2. STRUCTURAL STEEL AND STEEL LINTELS SHALL CONFORM TO THE FOLLOWING:
    2.1 WIDE FLANGE BEAM ("W" SHAPES), STANDARD BEAMS ("S" SHAPES) - ASTM A992
    2.2 CHANNELS AND ANGLES - ASTM A36
    2.3 PLATES - ASTM A572
3. UNLESS OTHERWISE INDICATED, ALL METAL FABRICATIONS SHALL BE STRUCTURAL STEEL.
4. ANCHOR RODS SHALL CONFORM TO ASTM F1554 GRADE 55. [36]
5. STEEL BOLTS SHALL CONFORM TO ASTM F3125 GRADE 325 UNLESS OTHERWISE NOTED.
6. ALUMINUM SHAPES SHALL CONFORM TO ASTM B308 ALLOY 6061-T6 UNLESS OTHERWISE NOTED.
7. STAINLESS STEEL FASTENERS SHALL CONFORM TO ASTM F593 AND ASTM F594 (TYPE 316).
8. EPOXY AND EXPANSION ANCHORS SHALL BE TYPE 316 STAINLESS STEEL. EMBEDMENT DEPTH OF THESE ANCHORS SHALL BE NOT LESS THAN 6 INCHES UNLESS OTHERWISE NOTED.
9. NEOPRENE BEARING PADS SHALL BE HIGH GRADE WITH DUROMETER HARDNESS OF SHORE A SOFT (35-45).
10. ALL STRUCTURAL STEEL, HIGH STRENGTH BOLTS AND ANCHOR RODS SHALL BE HOT-DIPPED GALVANIZED AND/OR PAINTED AS SPECIFIED. GALVANIZE STEEL PRIOR TO ASSEMBLY IF POSSIBLE AND AFTER ALL WELDING.
11. ALL SURFACES OF UNCOATED STEEL (EXCEPT REINFORCING STEEL) AND ALUMINUM SHAPES AND FASTENERS THAT ARE IN CONTACT WITH OR EMBEDDED IN CONCRETE, GROUT, OR MASONRY SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT).
12. ALL SURFACES OF DISSIMILAR METALS IN CONTACT SHALL BE COATED WITH EPOXY PAINT (MIN 5 MIL DFT).

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

TYPICAL STRUCTURAL NOTES I

DRAWING
S-1

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SS-NotesandDetails.rvt

**STRUCTURAL DESIGN CRITERIA:**

**GEOTECHNICAL:**

DESIGN GROUNDWATER ELEVATION: [1 FOOT BELOW FINISH GRADE]
DESIGN FLOOD ELEVATION: EL 778.00'
LATERAL EARTH PRESSURES (BELOW GRADE STRUCTURES):
- ABOVE GROUNDWATER = 65 PSF/FT (UNIFORM VARYING)
- BELOW GROUNDWATER = 95 PSF/FT (UNIFORM VARYING)
- SURCHARGE = 75 PSF/FT (BASED ON 300 PSF UNIFORM LOAD)
- SEISMIC = 0.100($S_s$)($F_a$)($Y_t$)($H^2$)(INVERTED UNIFORMLY VARYING)

LATERAL HYDROSTATIC PRESSURES:
- STATIC = 65 PSF/FT (UNIFORM VARYING)
- SEISMIC (IN ACCORDANCE WITH ACI 350.3)
  - Z = 0.15 (ZONE 2A)
  - S = 2.0
  - I = 1.0

ALLOWABLE SUBGRADE BEARING PRESSURE = *[INSERT]* PSF
MINIMUM FROST DEPTH = 5' - 0"

**LIVE LOADS:**

REF:
ASCE 7-16 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
2018 INTERNATIONAL BUILDING CODE
NEW HAMPSHIRE STATE BUILDING CODE
GROUND SNOW LOADS FOR NEW HAMPSHIRE -
US ARMY CORPS OF ENGINEERS

RISK CATEGORY III

**WIND LOADS**

BASIC WIND SPEED (V):
Vult = 130 MPH
Vasd = 109 MPH
IMPORTANCE FACTOR ($I_w$) = 1.15
EXPOSURE CATEGORY C
INTERNAL PRESSURE COEFFICIENT ($GC_{pi}$) = ±0.18

**SNOW LOADS**

GROUND SNOW LOAD ($P_g$) = 85 PSF
IMPORTANCE FACTOR ($I_s$) = 1.1
EXPOSURE FACTOR ($C_e$) = 1.0
THERMAL FACTOR ($C_t$) = 1.1
EXPOSURE CATEGORY C
SLOPE FACTOR ($C_s$) = 1.0

**SEISMIC LOADS**

EQUIVALENT LATERAL FORCE ANALYSIS
IMPORTANCE FACTOR ($I_e$) = 1.25
SITE CLASSIFICATION D
SEISMIC DESIGN CATEGORY C
0.2s SPECTRAL RESPONSE ACCELERATION ($S_s$) = 0.275
1.0s SPECTRAL RESPONSE ACCELERATION ($S_1$) = 0.072
RESPONSE MODIFICATION COEFFICIENT ($R_w$):
MASONRY SHEAR WALLS (INTERMEDIATE) Rw = 3.5

**ICE LOADS**

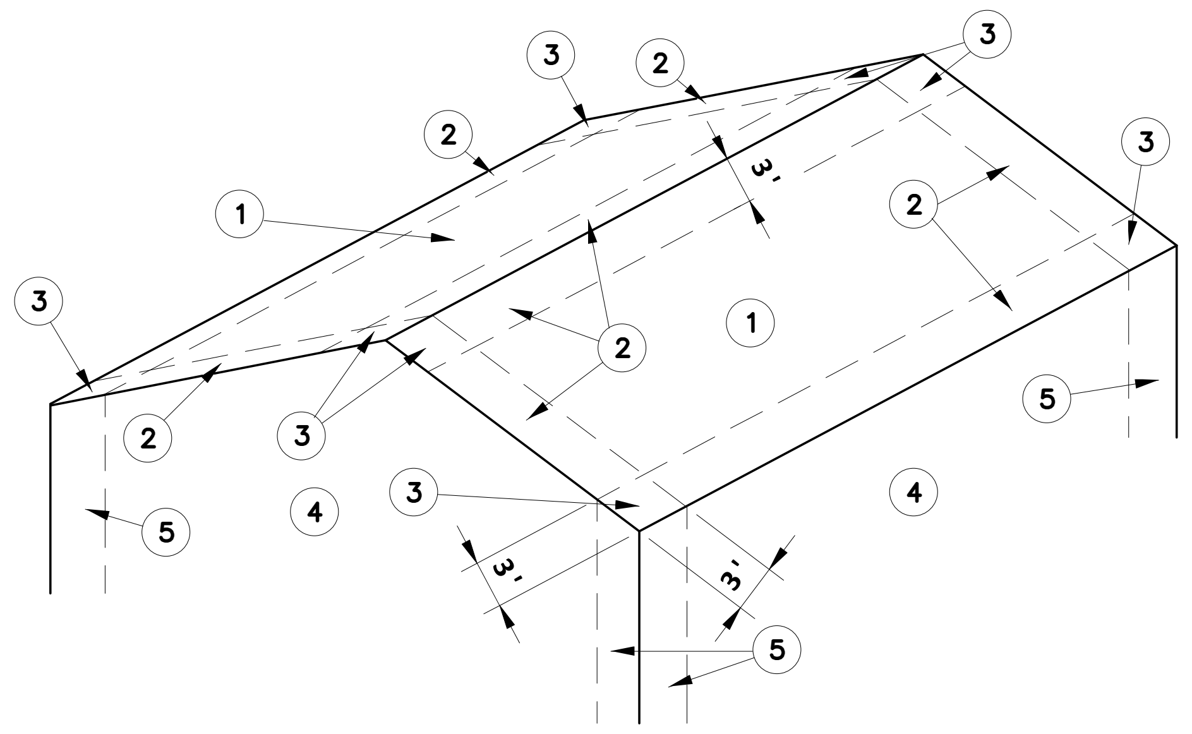
EQUIVALENT RADIAL ICE THICKNESS (t) = 1 INCH
3 SECOND WIND GUST SPEED ($V_c$) = 50 MPH
TOPOGRAPHIC FACTOR ($K_{ze}$) = 1.1
ICE IMPORTANCE FACTOR ($I_i$) = 1.25
WIND IMPORTANCE FACTOR ($I_w$) = 1.00

**FLOOR LIVE LOADS**

AS INDICATED ON THE DRAWINGS

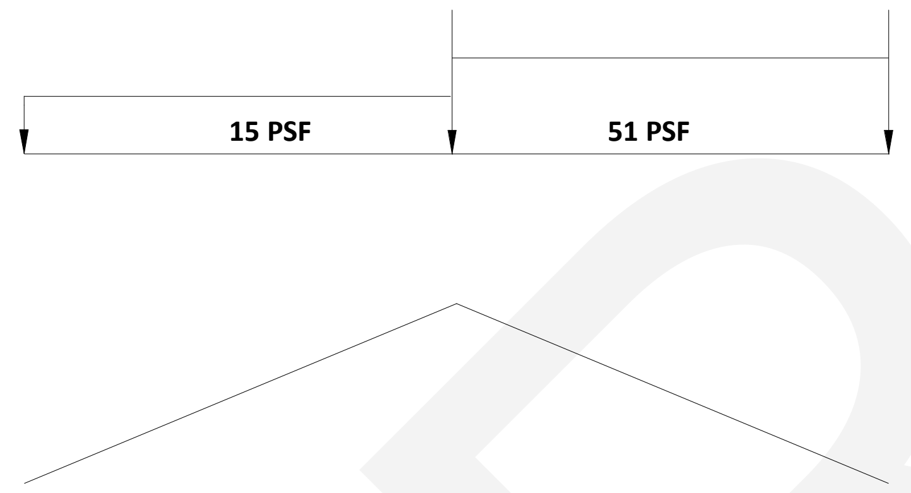
**ROOF LIVE LOADS**

AS INDICATED ON THE DRAWINGS



## COMPONENTS AND CLADDING PRESSURE DIAGRAM

SCALE: NTS



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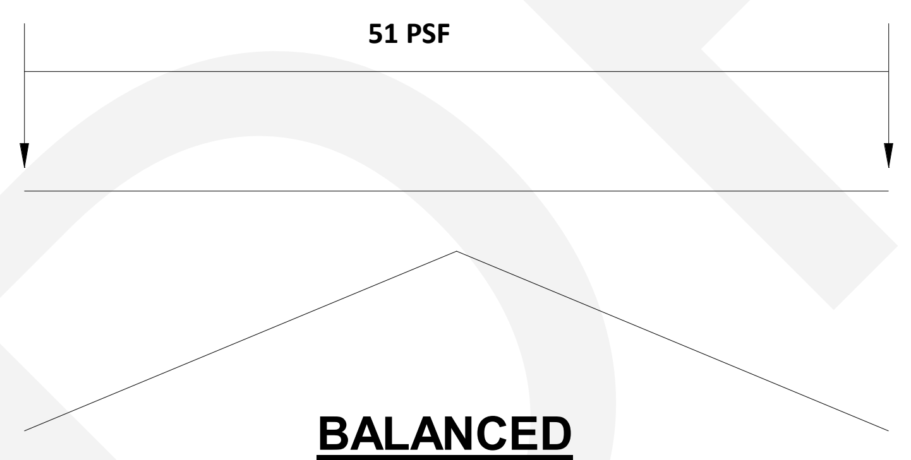


BALANCED

## SNOW LOADS DIAGRAM

SCALE: NTS

### COMPONENT AND CLADDING WIND PRESSURES (PSF)

(LOAD INCLUDES 0.6 LOAD FACTOR FOR WIND)

| | ZONE 1 | ZONE 2 | ZONE 3 | ZONE 4 | ZONE 5 |
|---|---|---|---|---|---|
| CASE 1 | XX | XX | XX | XX | XX |
| CASE 2 | XX | XX | XX | XX | XX |

PLUS AND MINUS SIGNS SIGNIFY PRESSURES ACTING TOWARD AND AWAY FROM THE PROJECTED SURFACES, RESPECTIVELY.

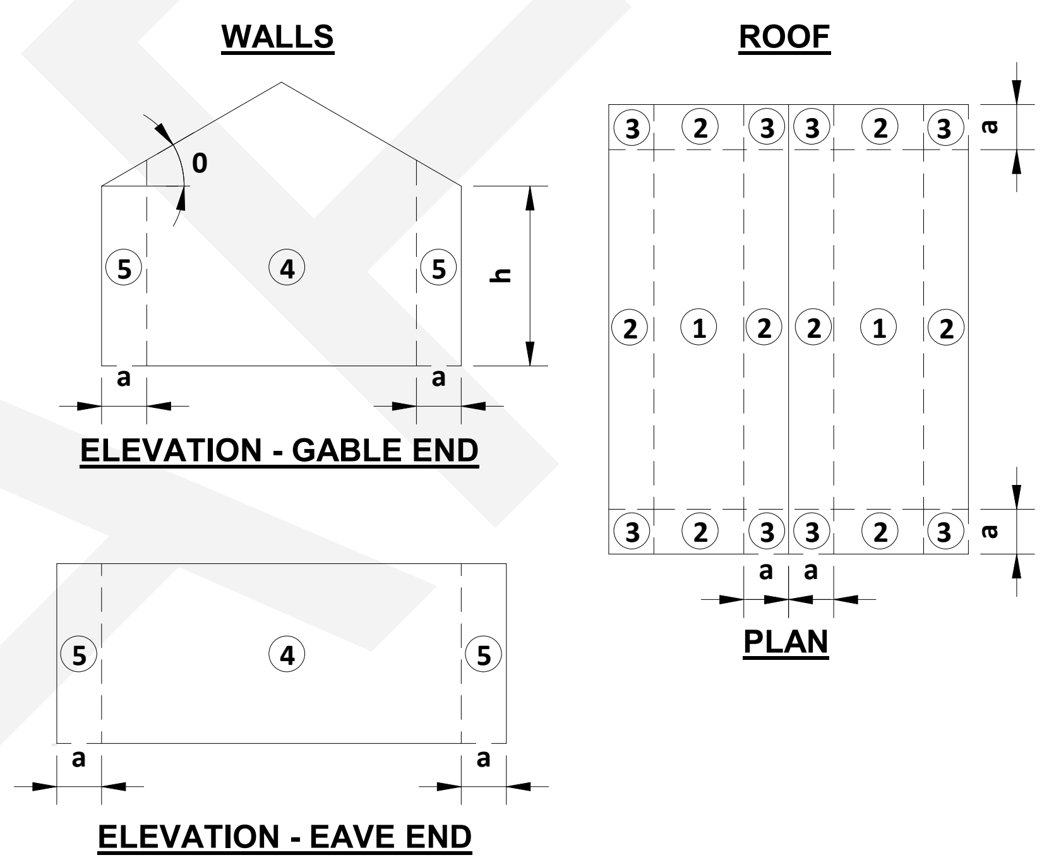
### COMPONENT AND CLADDING WIND PRESSURES (PSF)

(LOAD INCLUDES 0.6 LOAD FACTOR FOR WIND)

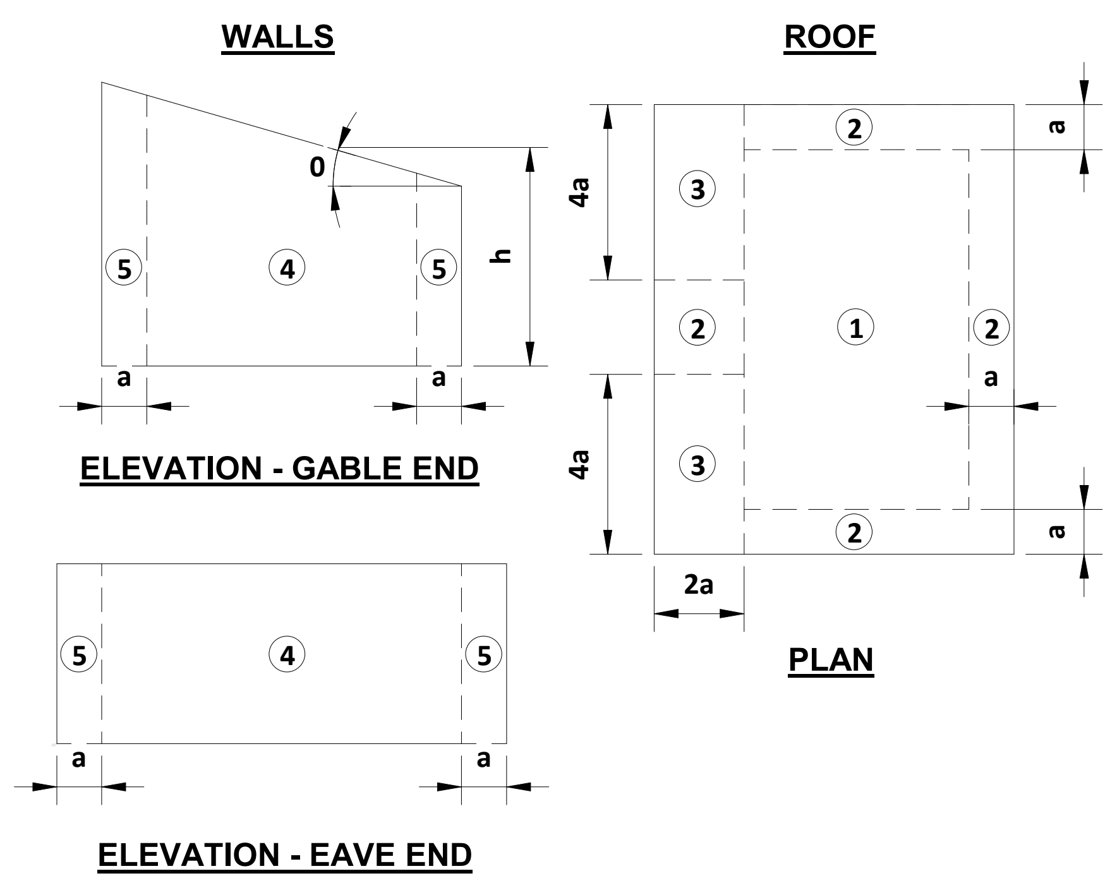
| | ZONE 1 | ZONE 2 | ZONE 3 | ZONE 4 | ZONE 5 |
|---|---|---|---|---|---|
| CASE 1 | XX | XX | XX | XX | XX |
| CASE 2 | XX | XX | XX | XX | XX |

PLUS AND MINUS SIGNS SIGNIFY PRESSURES ACTING TOWARD AND AWAY FROM THE PROJECTED SURFACES, RESPECTIVELY.

GABLE ROOFS 7°<θ≤45°



MONOSLOPE ROOFS 10°<θ≤30°



## COMPONENTS AND CLADDING PRESSURE TABLE COMPLETE

SCALE: NTS

## LEGEND

### PLAN

- EXISTING STRUCTURE
- EXISTING STRUCTURE TO BE DEMOLISHED
- STRUCTURE
- GUARD
- CONCRETE CURB
- GRATING
- HIDDEN OBJECT
- FLOOR PLATE
- METAL DECK
- CONSTRUCTION JOINT
- CONTROL JOINT
- OPENING

### SECTION

- EXISTING CAST-IN-PLACE CONCRETE
- CAST-IN-PLACE CONCRETE
- STRUCTURAL STEEL
- STRUCTURAL ALUMINUM
- CONCRETE MASONRY
- PRECAST CONCRETE
- CONCRETE FILL/ SAND
- FINISH GRADE
- FILL OR STONE
- GRATING
- LUMBER
- RIGID INSULATION

### TEXT

| | |
|---|---|
| *CONCRETE WALL* | EXISTING STRUCTURE |
| CONCRETE WALL | PROPOSED WORK |
| *1"* | DIMENSION OF EXISTING STRUCTURE |
| 1" | DIMENSION OF PROPOSED STRUCTURE |

### SYMBOLS

| | |
|---|---|
| ▲ | CONCRETE EQUIPMENT PAD |
| ◔ , ⬡ | PIPE |
| PRV ⬡ | PRESSURE RELIEF VALVE |
| FD ▢ | FLOOR DRAIN |
| RD ○ | ROOF DRAIN |
| ◑ # | LIFT HOOK (# = CAPACITY IN TONS) |
| Ⓐ | CONCRETE FILL ELEVATIONS |
| △ A | CONCRETE FOOTING TYPE |
| ⬡ # | CONCRETE PILASTER TYPE |
| ▢ # | STRUCTURAL STEEL PIPE SUPPORT FRAME TYPE |
| Ⓐ | PIPE GUIDE TYPE |
| ▽ EL 12.83' | LIQUID ELEVATION |

## ABBREVIATIONS

| | |
|---|---|
| ALUMINUM | ALUM, AL |
| AND | & |
| ANGLE | ∠ |
| ARCHITECTURAL | ARCH |
| AT | @ |
| BEAM | BM |
| BOTTOM | BOT, B/ |
| CROSS BRACING | CB |
| CENTER | CTR |
| CENTERLINE | CL |
| CLEAR | CLR |
| COLUMN | COL |
| CONCRETE | CONC |
| CONCRETE MASONRY UNIT | CMU |
| CONTINUOUS | CONT |
| CONTROL JOINT | CJ |
| CONTROL JOINT (TYPE 1) | CJ (1) |
| CONTROL JOINT (TYPE 2) | CJ (2) |
| CONSTRUCTION JOINT | CNJ |
| DETAIL | DET |
| DIAMETER | DIA, ∅ |
| DOWEL BAR SPLICERS | DBS |
| DOWEL | DWL |
| EACH END | EE |
| EACH FACE | EF |
| EACH WAY | EW |
| ELECTRICAL | ELEC |
| ELEVATION | ELEV, EL |
| EQUAL | EQ |
| EXPANSION JOINT | EJ |
| EXPANSION | EXP |
| EXTERIOR | EXT |
| FEET | FT |
| FLOOR DRAIN | FD |
| FIBERGLASS REINFORCED PLASTIC | FRP |
| GALVANIZED | GALV |
| GAUGE | GA |
| GRATING | GRTG |
| HIGH | H |
| HIGH POINT | HP |
| HIGH STRENGTH | HS |
| HORIZONTAL | HOR |
| HOT DIPPED GALVANIZED | HDG |
| INSIDE DIAMETER | ID |
| INSIDE FACE | IF |
| INSULATION | INSUL |
| JOINT | JT |
| LOW POINT | LP |
| MANUFACTURER | MFR |
| MATCHING | MATCH |
| MAXIMUM | MAX |
| MECHANICAL | MECH |
| MINIMUM | MIN |
| MODULAR OPENING | MO |
| MOUNTED | MTD |
| NOT TO SCALE | NTS |
| NUMBER | NO |
| ON CENTER | OC |
| OPENING | OPNG |
| OUTSIDE DIAMETER | OD |
| OUTSIDE FACE | OF |
| PERIMETER | PERIM |
| PLATE | PL |
| POUND | # |
| POUNDS PER SQUARE FOOT | PSF |
| POUNDS PER SQUARE INCH | PSI |
| PRESSURE RELIEF VALVE | PRV |
| PROCESS | PROC |
| PROJECTION | PROJ |
| REINFORCING | REINF |
| REQUIRED | REQ'D |
| RISER | R |
| ROUGH OPENING | RO |
| SCHEDULE | SCH |
| SECTION | SECT |
| SHEET | SHT |
| SIMILAR | SIM |
| SLOPE | SL |
| SPACE(ING) | SP |
| SPECIFICATION | SPEC |
| SQUARE | SQ |
| SYMMETRICAL | SYM |
| STANDARD | STD |
| STRUCTURAL | STRUCT |
| STAINLESS STEEL | SS |
| STEEL | STL |
| THICKNESS | THK |
| TOP | T, T/ |
| TOP & BOTTOM | T & B |
| TOP OF CONCRETE | T/ CONC, TOC |
| TOP OF PLATE | T/ PL |
| TOP OF STEEL | T/ STL |
| TREAD | TR |
| TYPICAL | TYP |
| UNLESS OTHERWISE NOTED | UON |
| WELDED WIRE FABRIC | WWF |
| WIDE | W |
| WITH | W/ |
| WITHOUT | W/O |
| WOOD | WD |

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

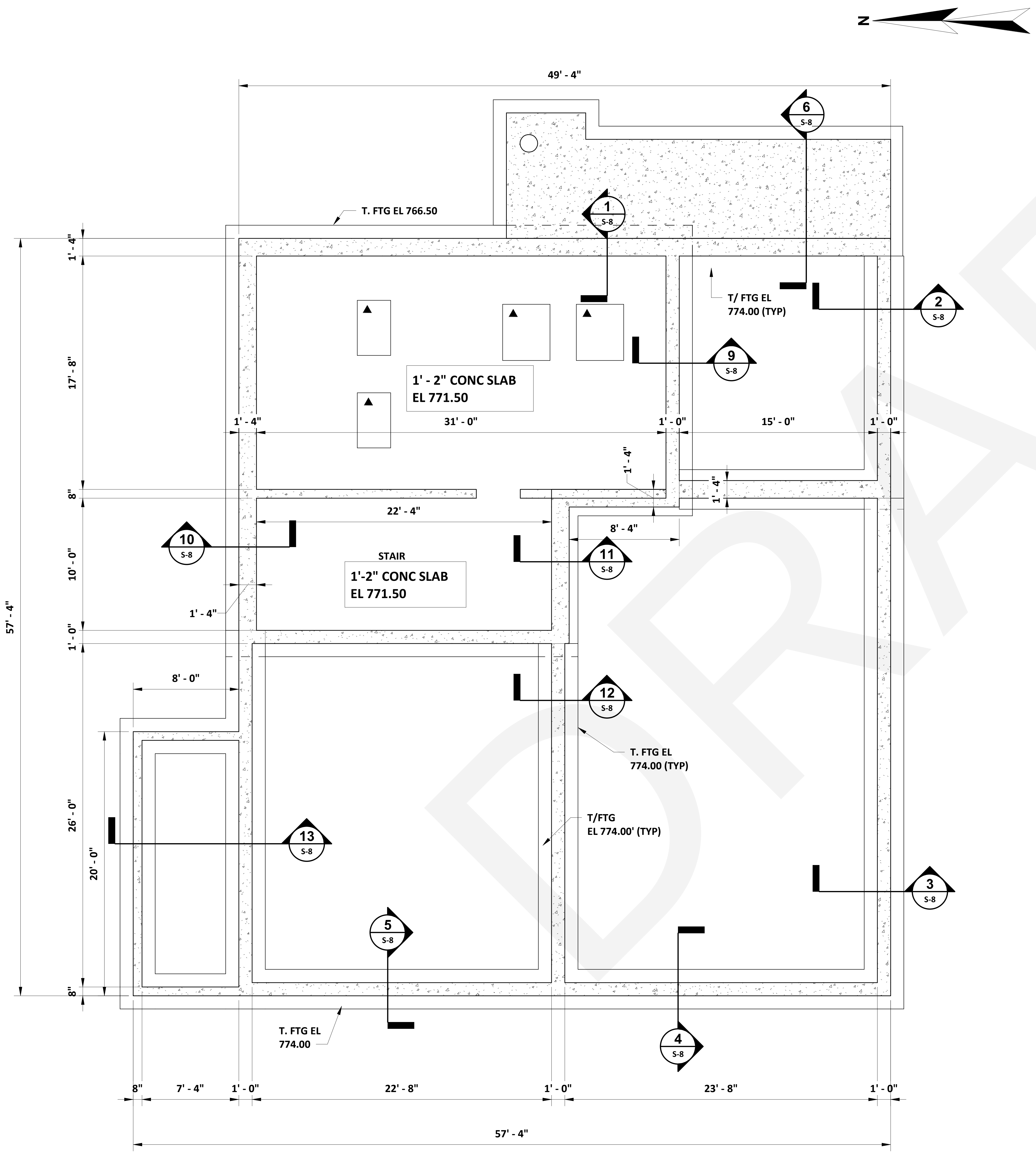
WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

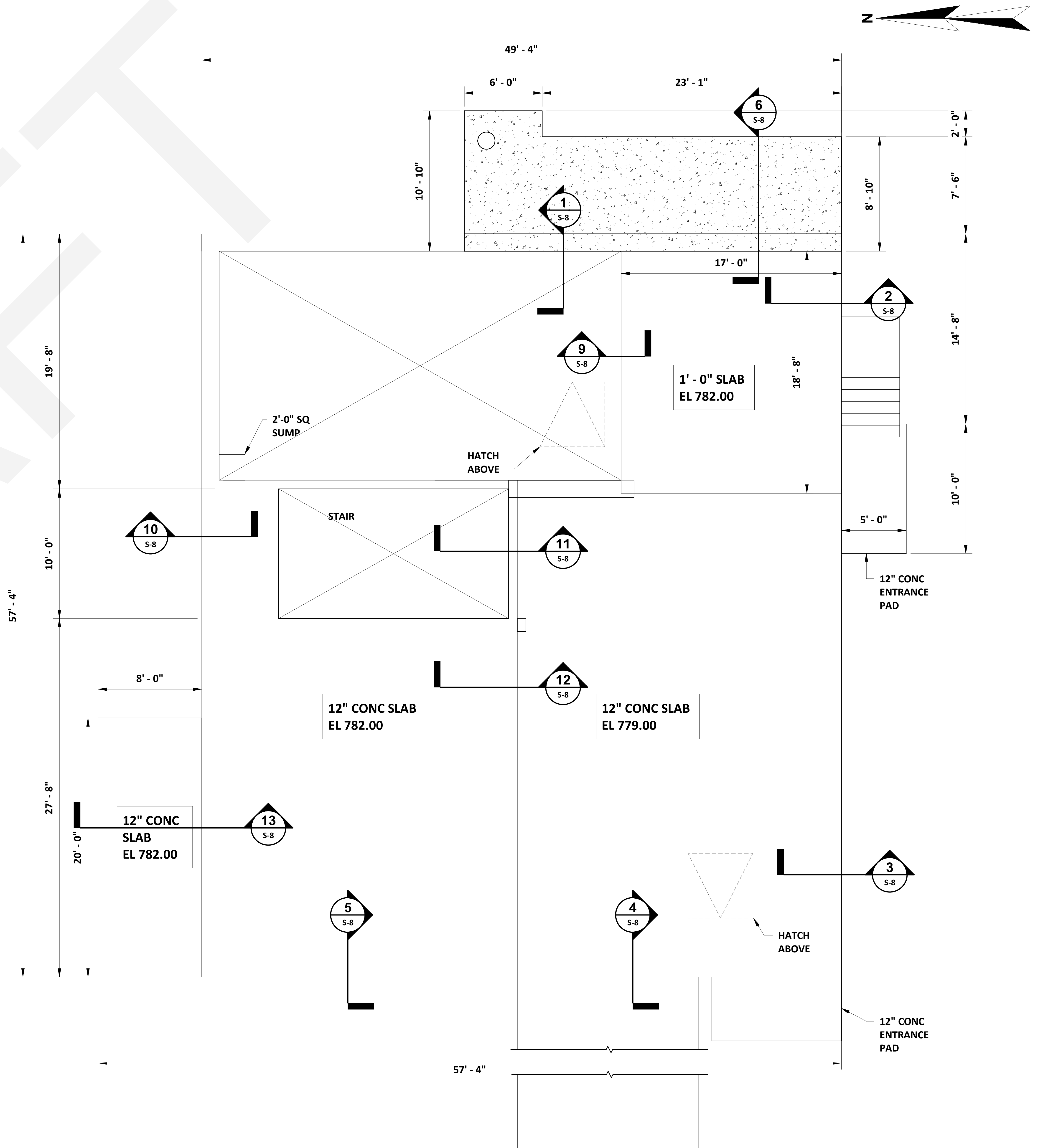
TYPICAL STRUCTURAL NOTES II

DRAWING
S-2

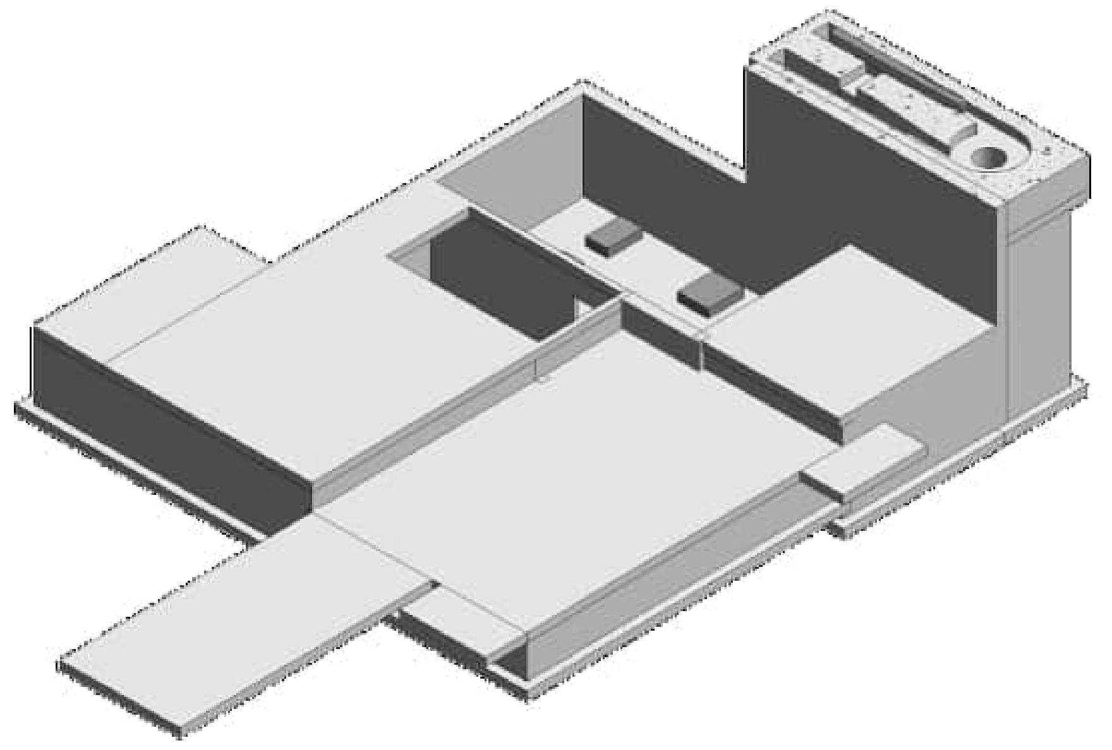
12/5/2022 11:39:06 AM



## FOUNDATION PLAN
SCALE: 3/16" = 1'-0"



## FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"



## ISOMETRIC
SCALE:

NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS

NOTES:
1. DESIGN TOP SLAB LIVE LOAD = 250 PSF
   ALUM HATCH LIVE LOAD = 300 PSF
2. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | APP'D | DATE |
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DESIGNED: J.POWELL
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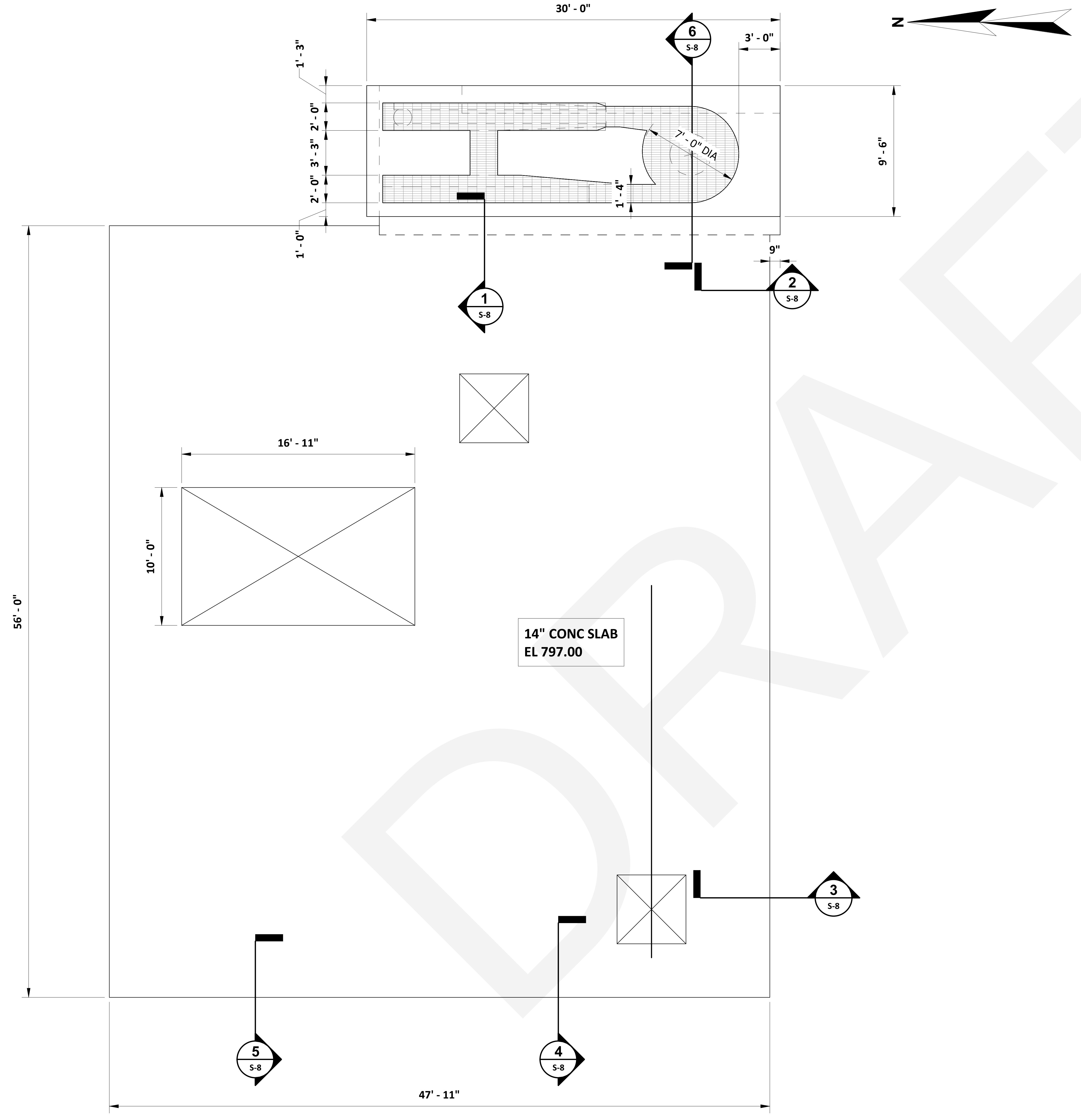
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
FOUNDATION AND TOP PLANS

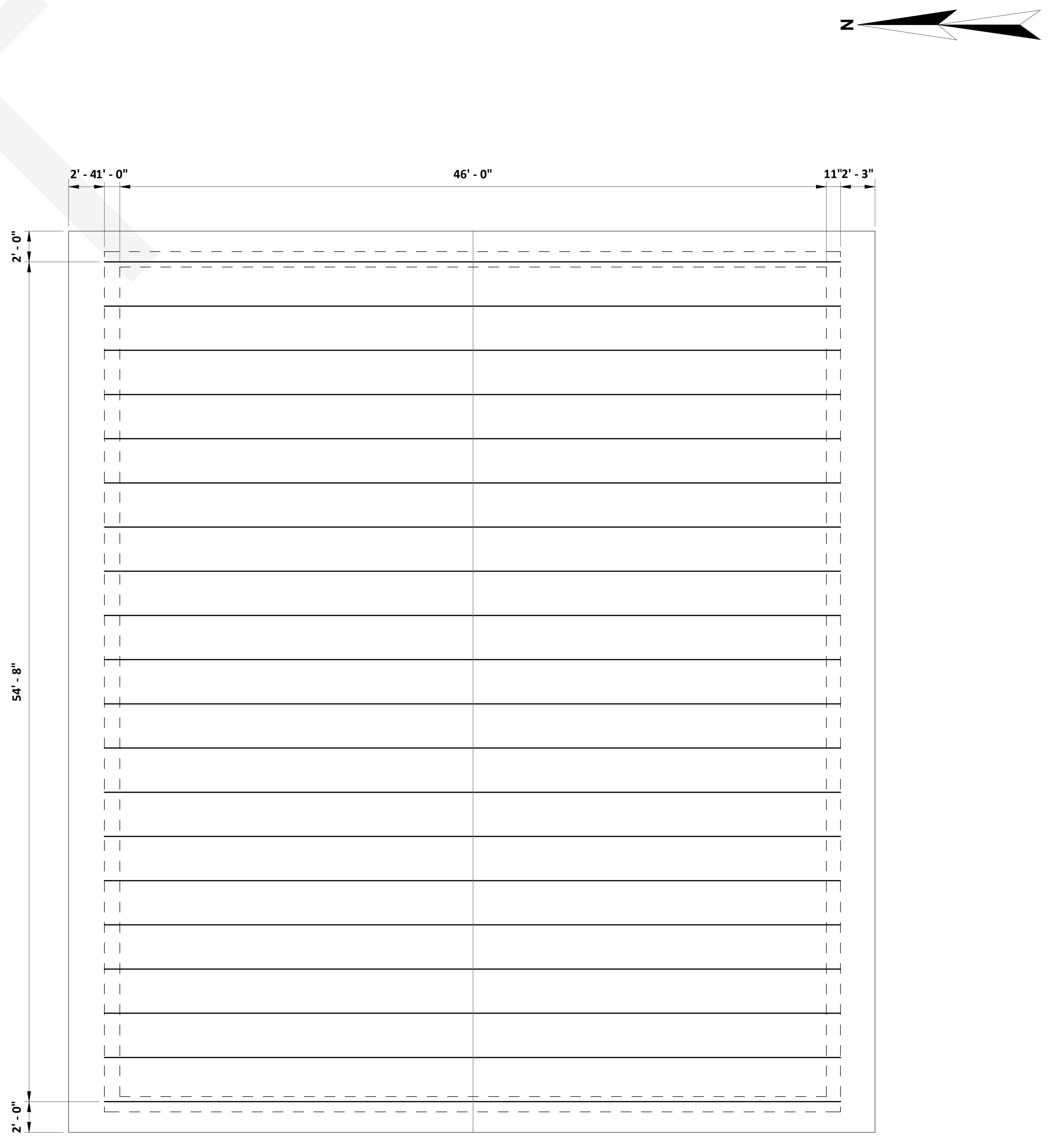
DRAWING
S-6

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-ProcessBldg.rvt



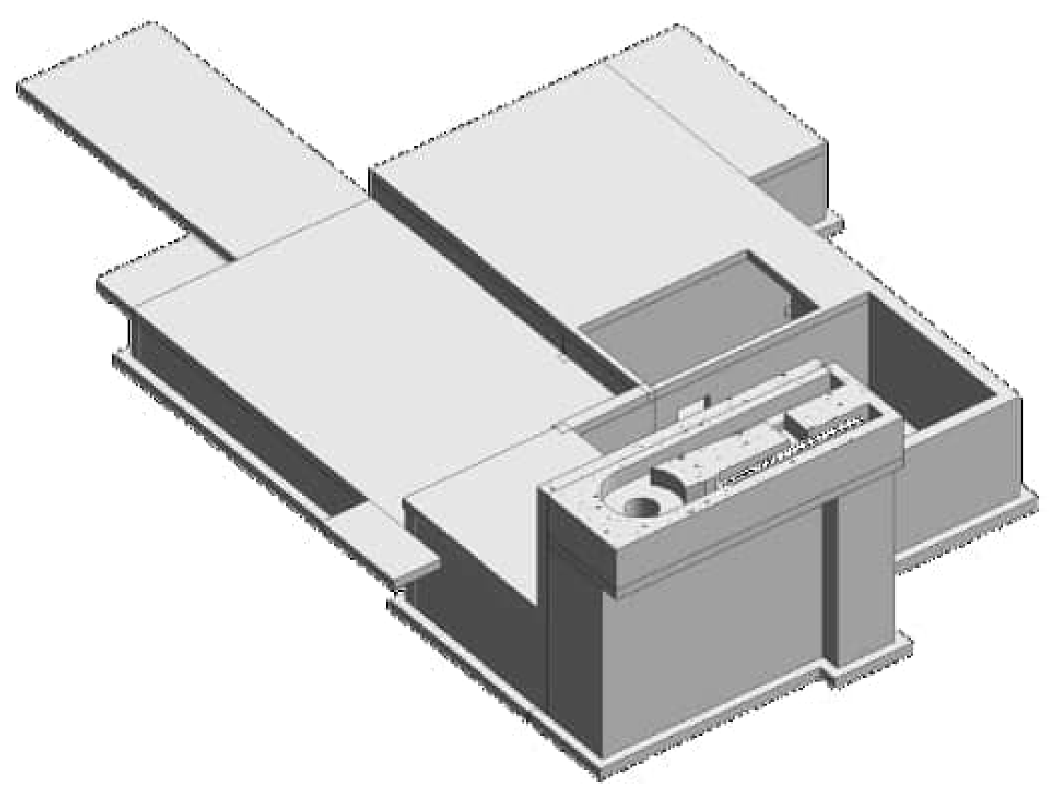
**SECOND FLOOR PLAN**

SCALE: 3/16" = 1'-0"



**ROOF FRAMING PLAN**

SCALE: 3/16" = 1'-0"



NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS

**ISOMETRIC**

SCALE:

**NOTEs**

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | DATE | APP'D |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
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| 5 | | | |

PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
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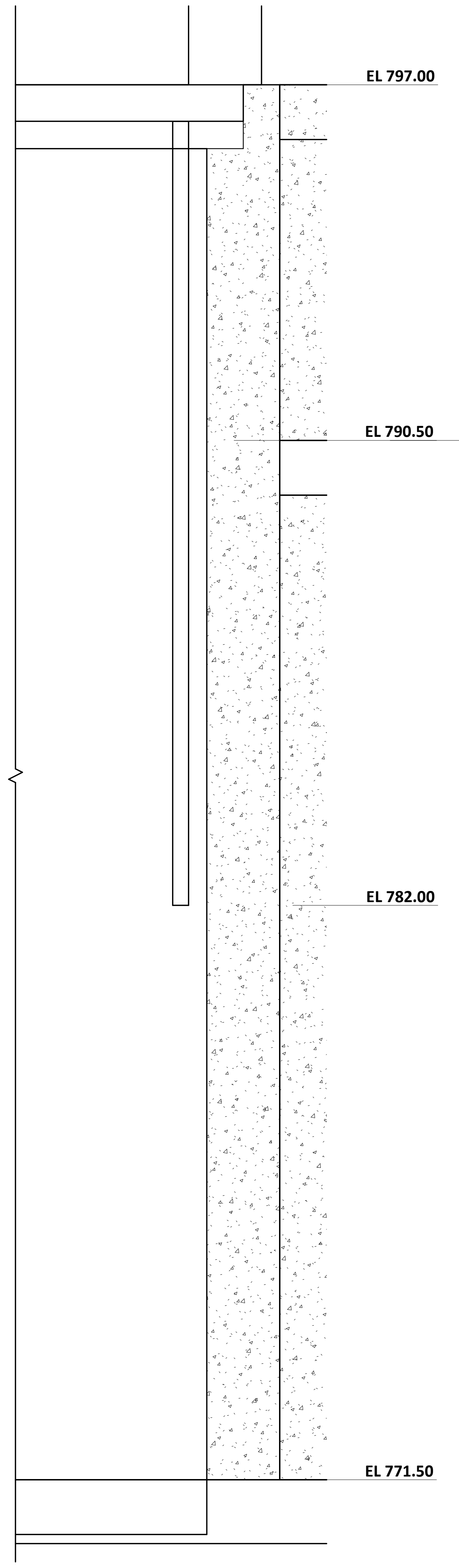
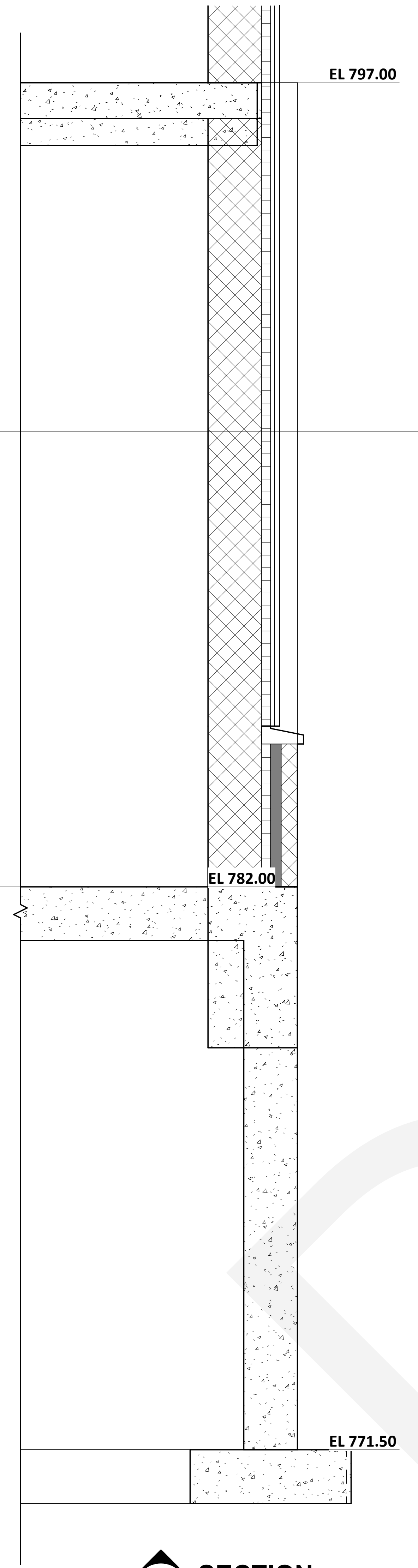
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECOND FLOOR AND ROOF PLANS

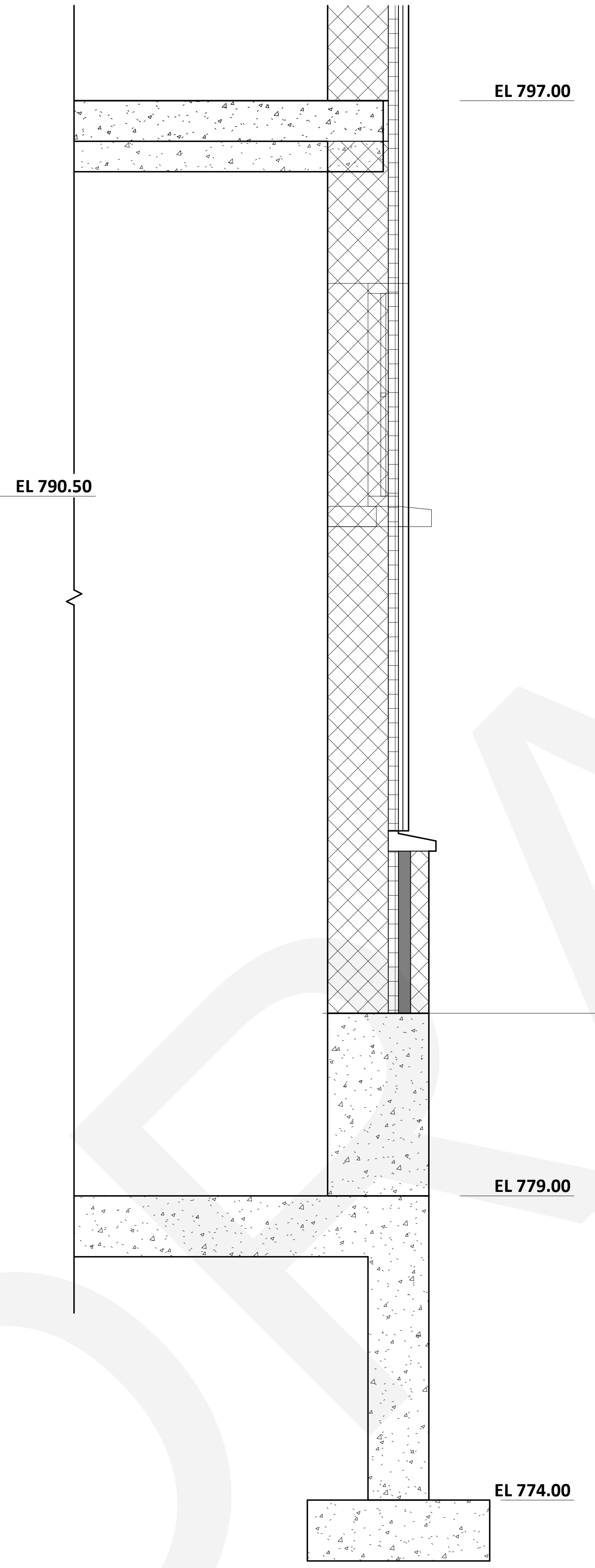
DRAWING
S-7



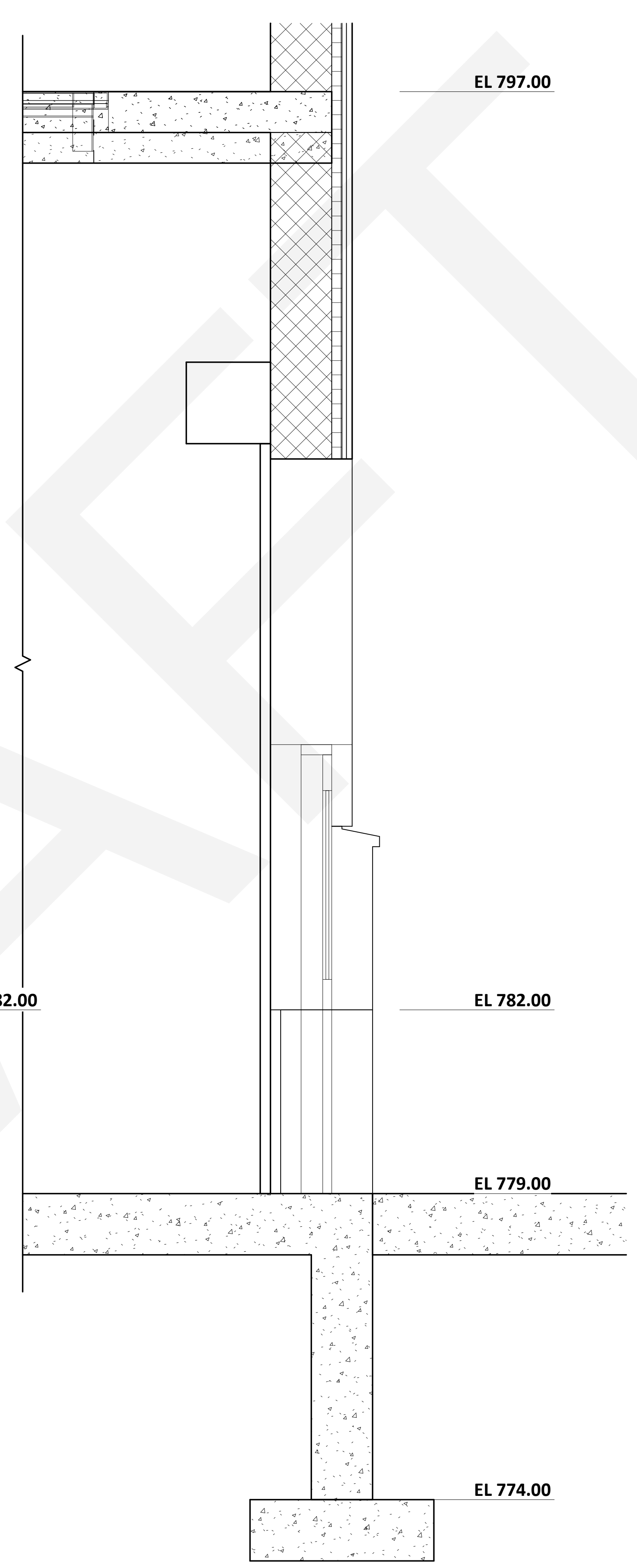
**1** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



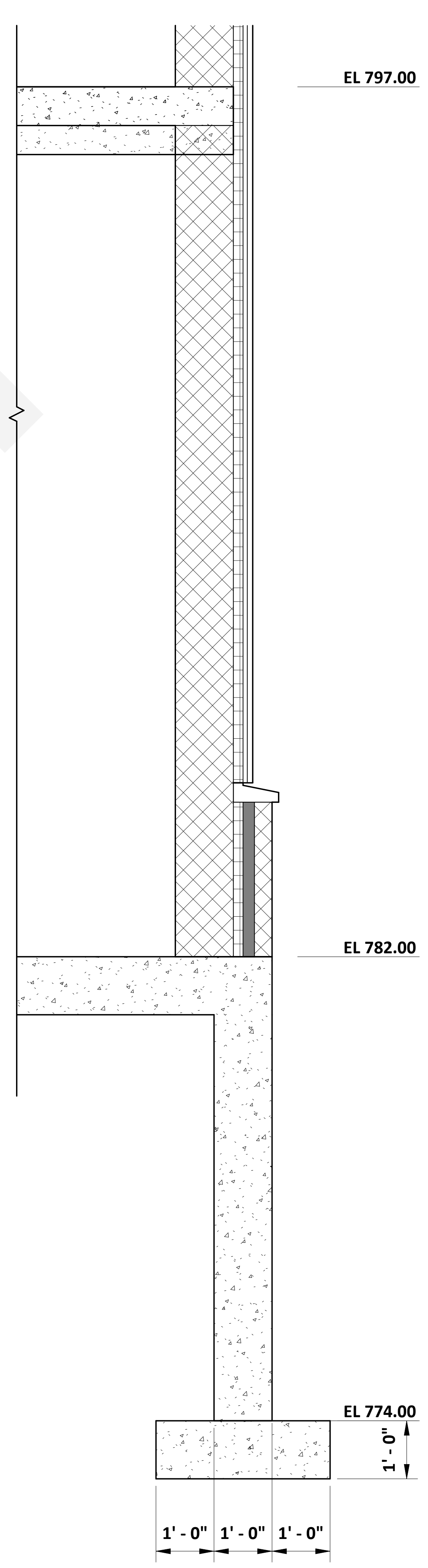
**2** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



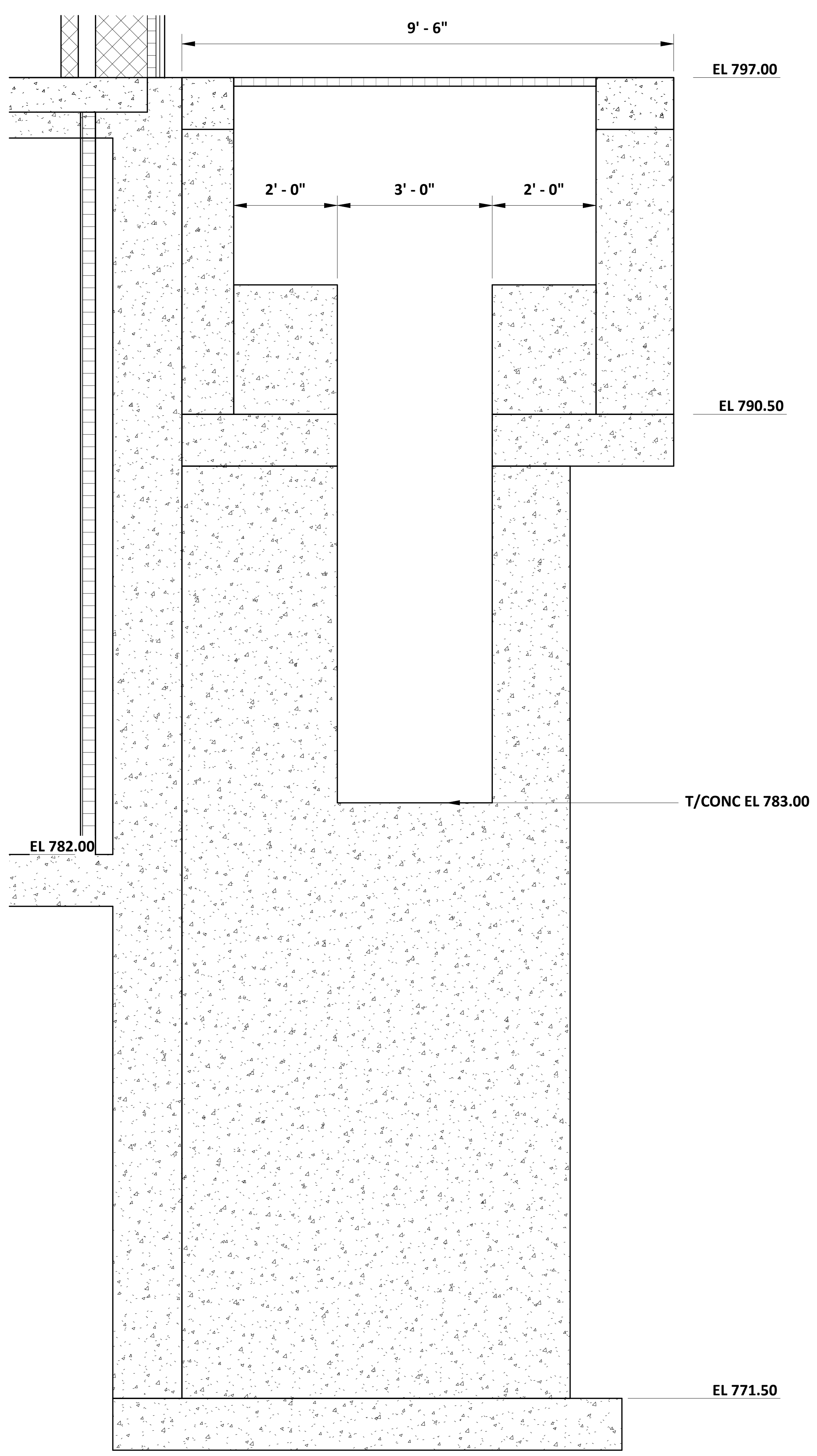
**3** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



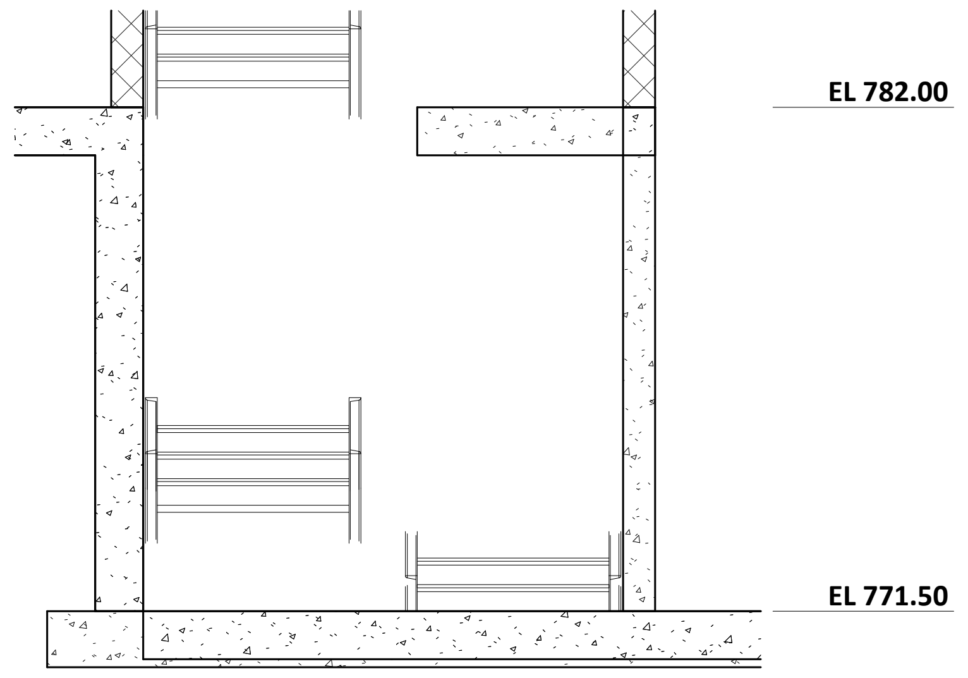
**4** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



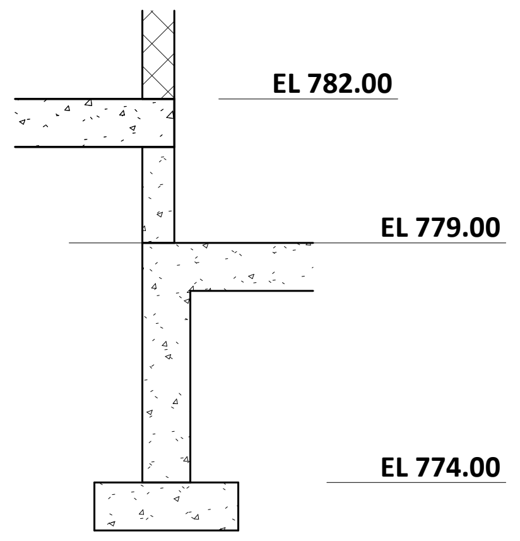
**5** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



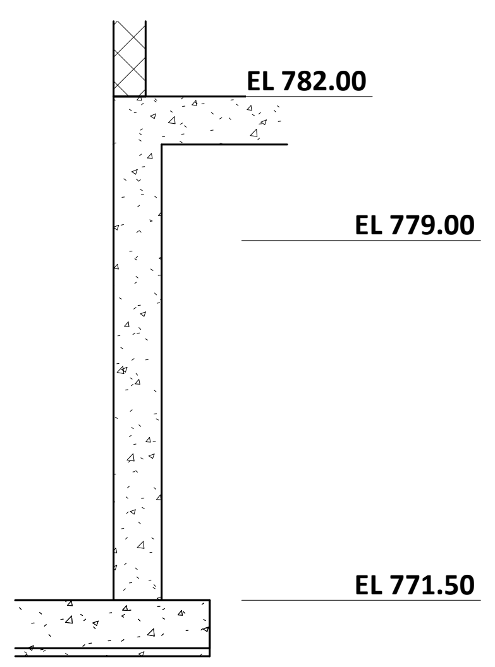
**6** **SECTION**
S-6 SCALE: 1/2" = 1'-0"



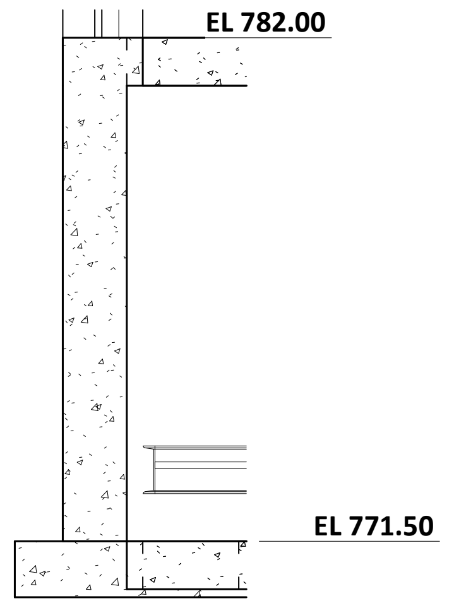
**7** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



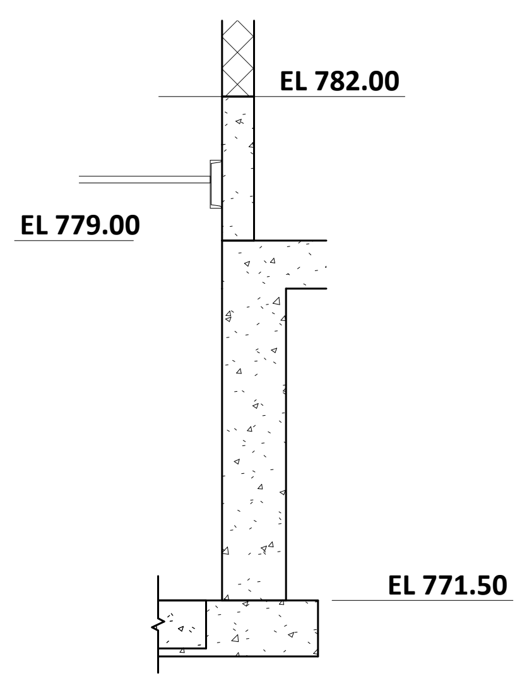
**8** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



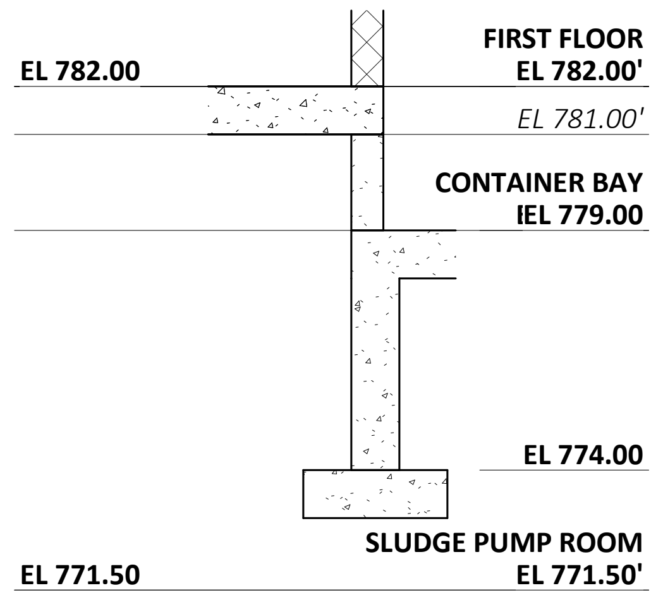
**9** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



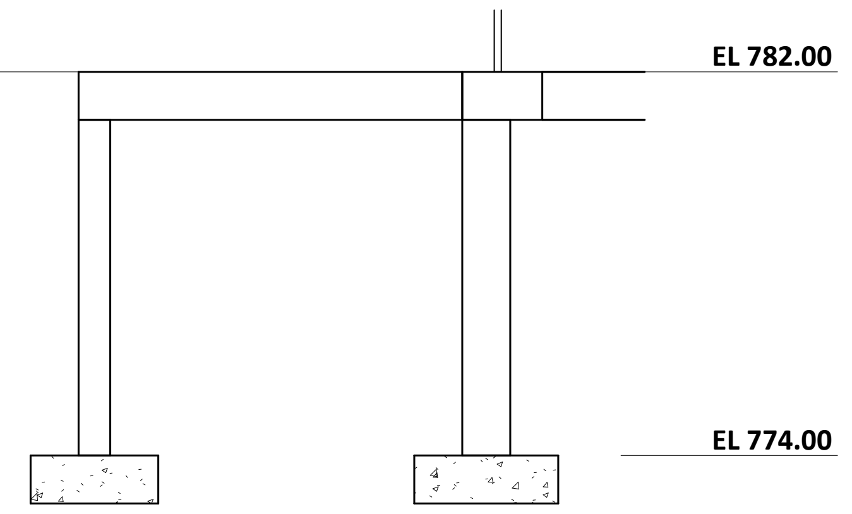
**10** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



**11** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



**12** **SECTION**
S-6 SCALE: 1/4" = 1'-0"



**13** **SECTION**
S-6 SCALE: 1/4" = 1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | DATE | APP'D |
|---|---|---|---|
| 1 | | | |
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| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
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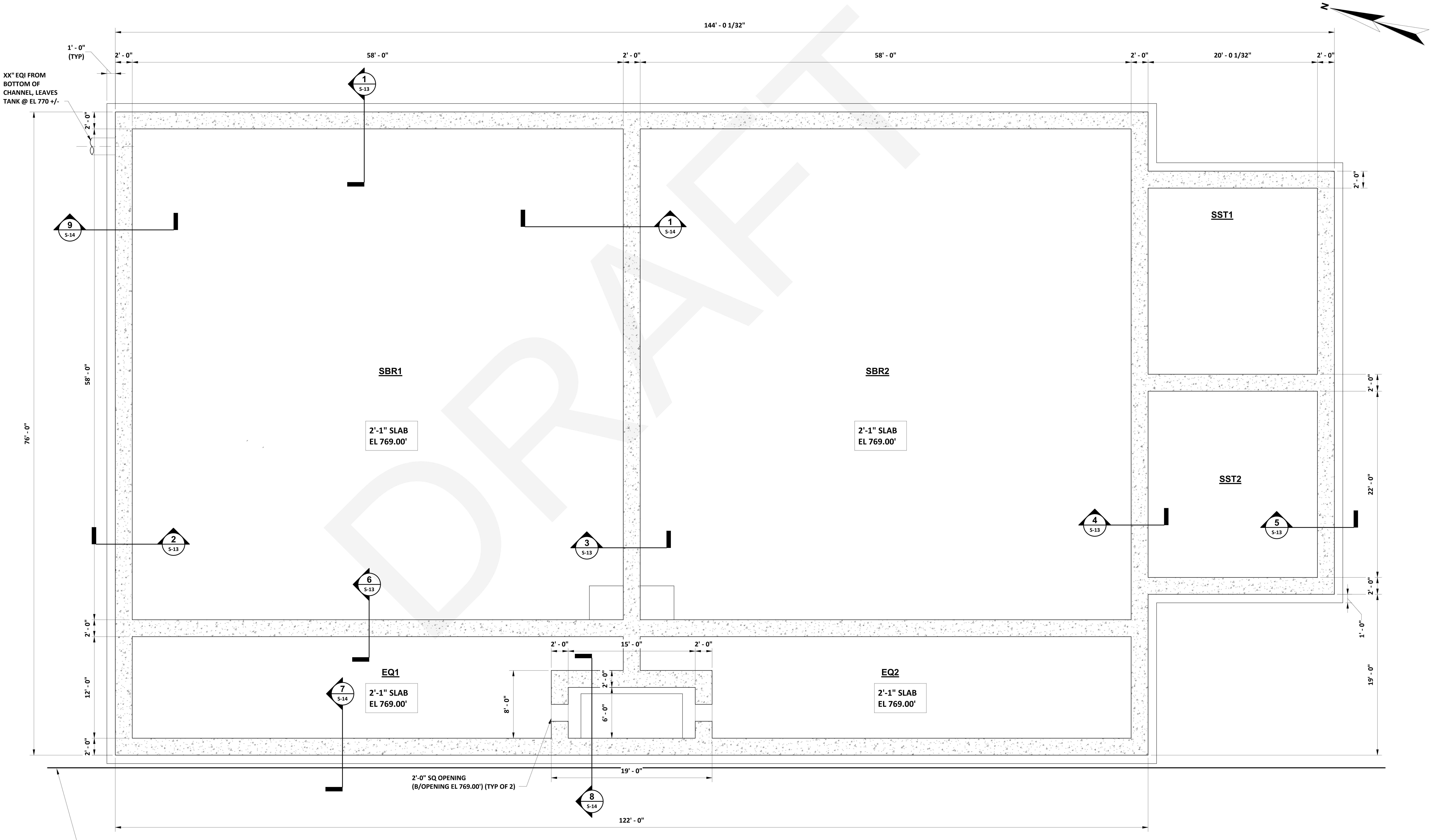
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS

DRAWING
S-8



XX" EQI FROM
BOTTOM OF
CHANNEL, LEAVES
TANK @ EL 770 +/-

2'-0" SQ OPENING
(B/OPENING EL 769.00') (TYP OF 2)

INSTALL EXCAVATION SUPPORT AS
REQUIRED TO PREVENT MOVEMENT
OR UNDERMINING OF ADJACENT
STRUCTURES OR UTILITIES

FOUNDATION PLAN
SCALE: 3/16" = 1'-0"

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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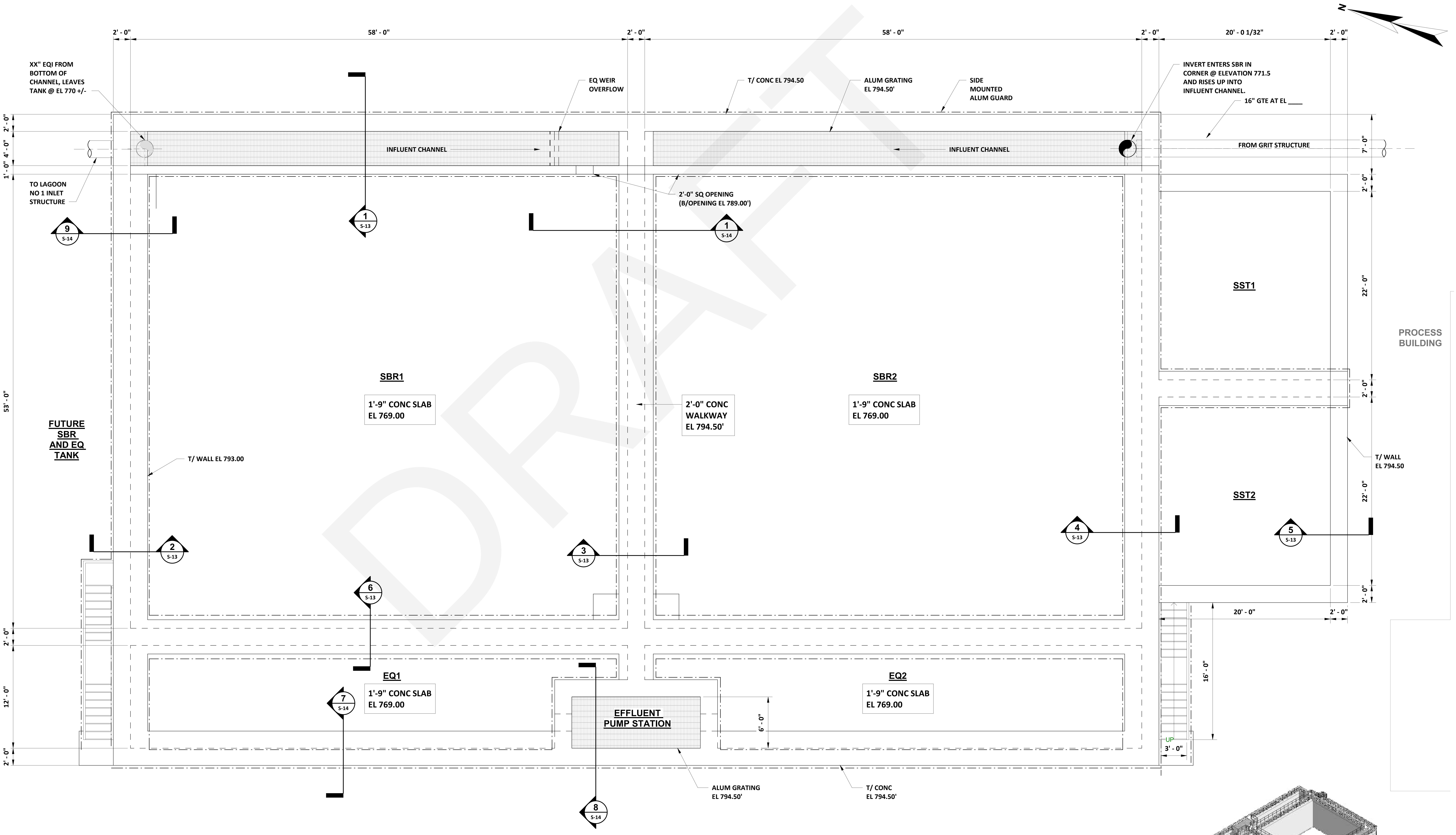
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SBR TANK COMPLEX
BASE PLAN

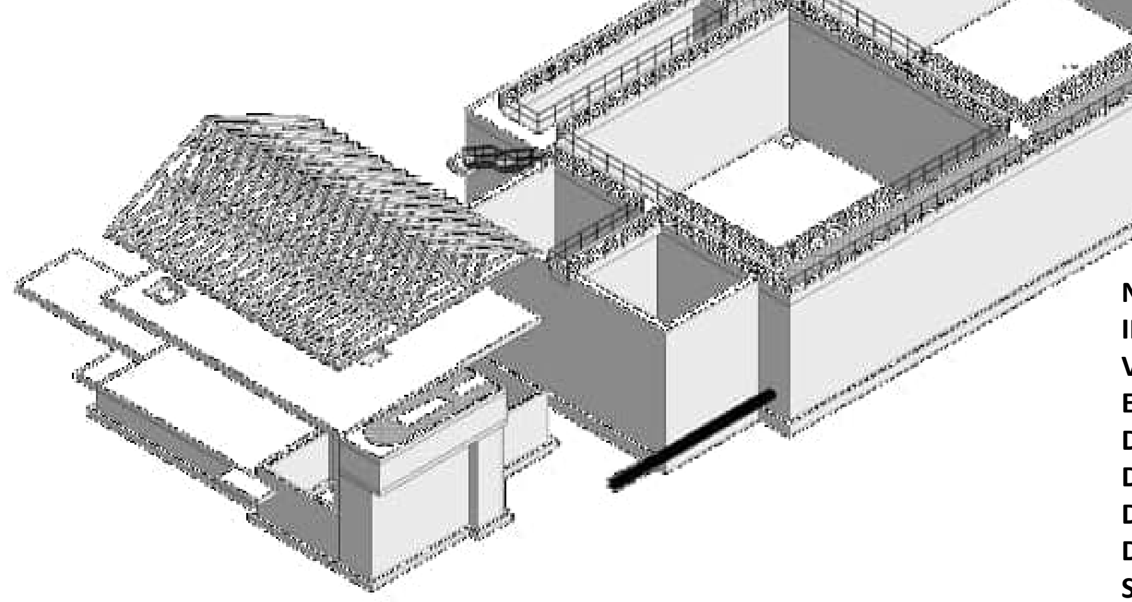
DRAWING
S-11

12/5/2022 11:47:09 AM



## TOP PLAN

SCALE: 3/16" = 1'-0"



NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS

**NOTES:**

1. DESIGN CONC WALKWAY LIVE LOAD = 100 PSF
2. DESIGN ALUM GRATING LIVE LOAD = 100 PSF
3. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | DATE | APP'D |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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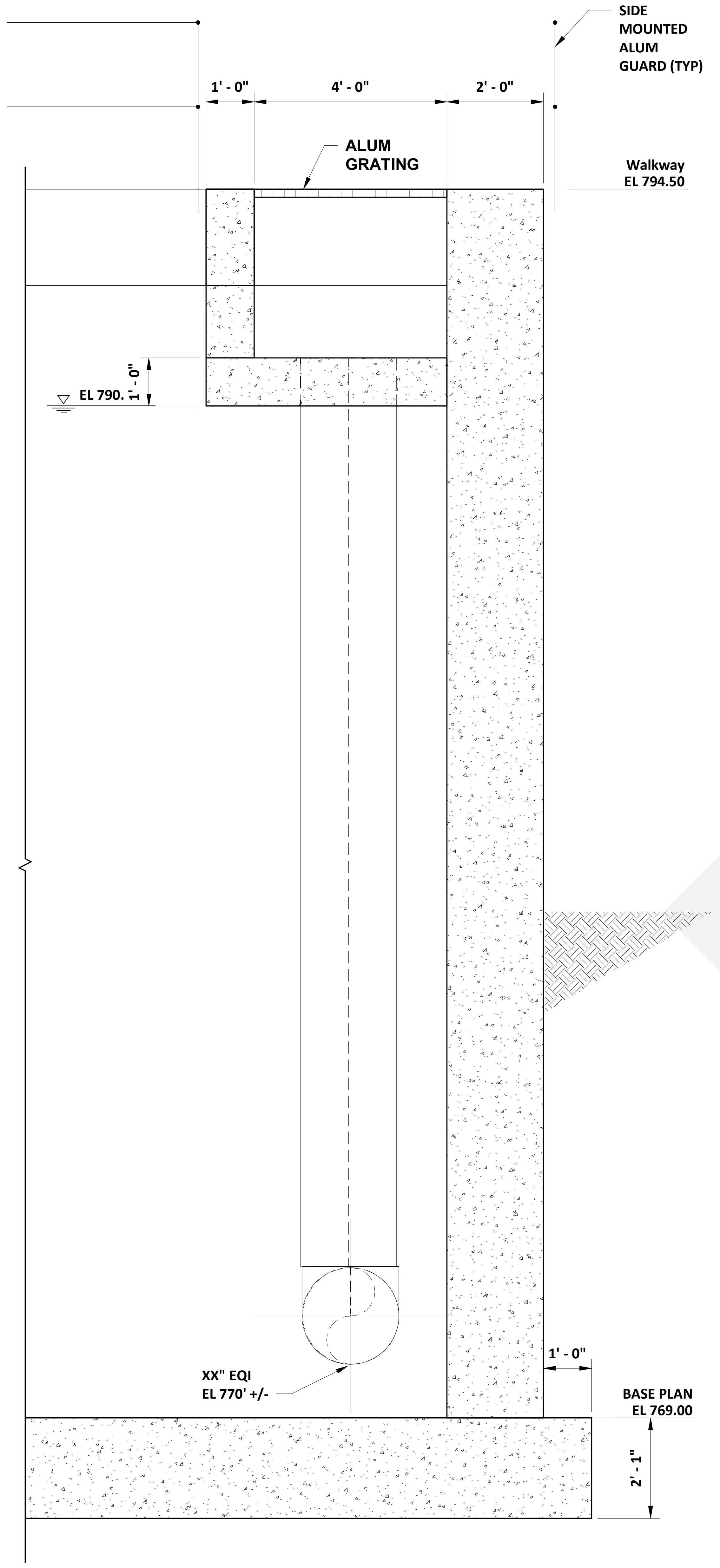
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

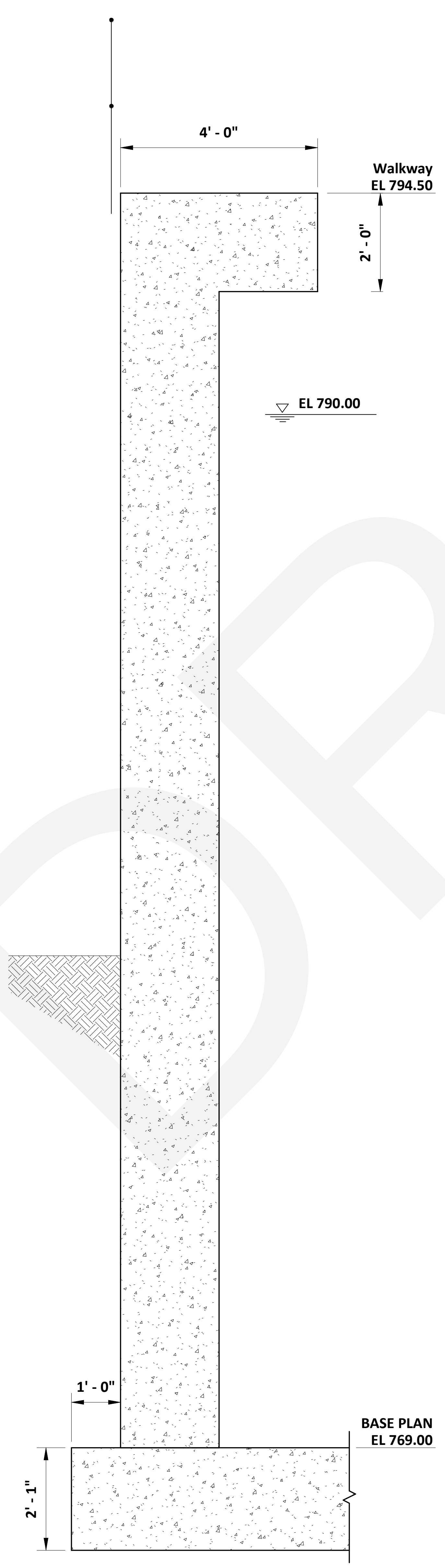
SBR TANK COMPLEX
TOP PLAN

DRAWING
S-12

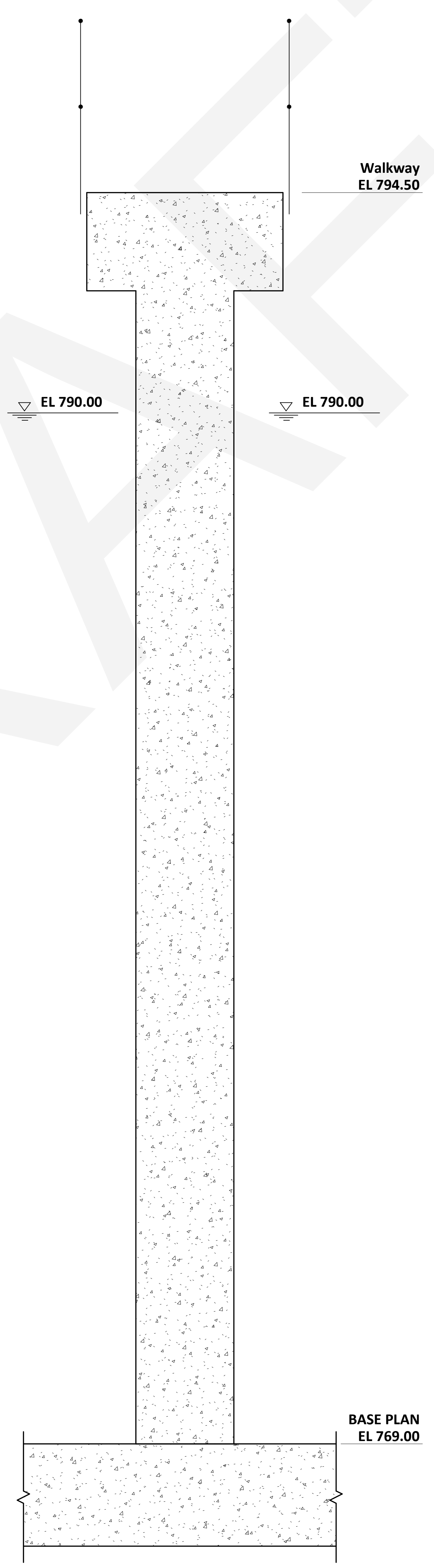
Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-SBRTankComplex.rvt



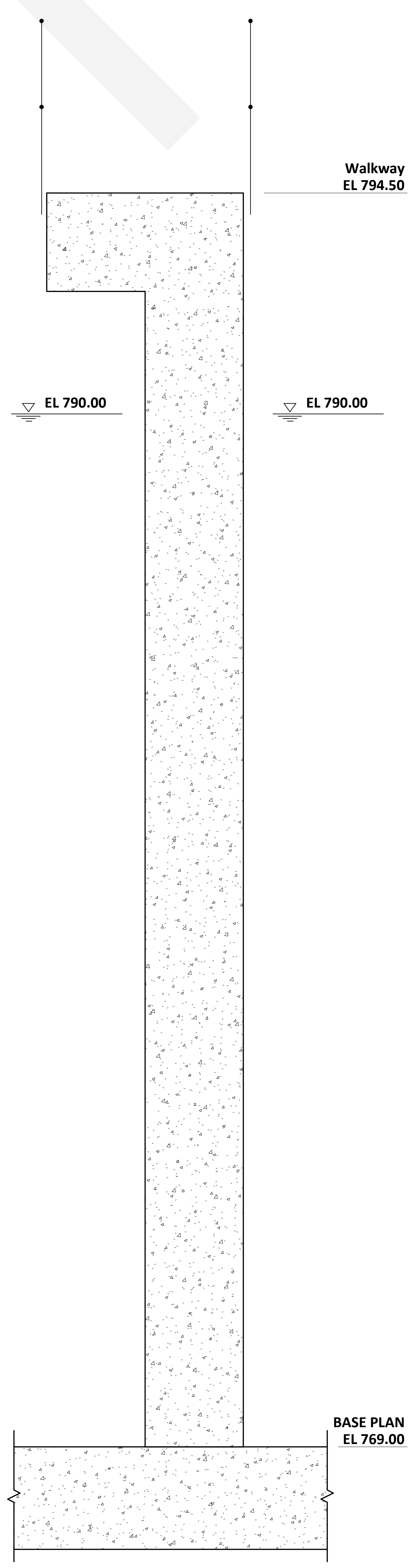
**1 SECTION**
S-11 SCALE: 1/2" = 1'-0"



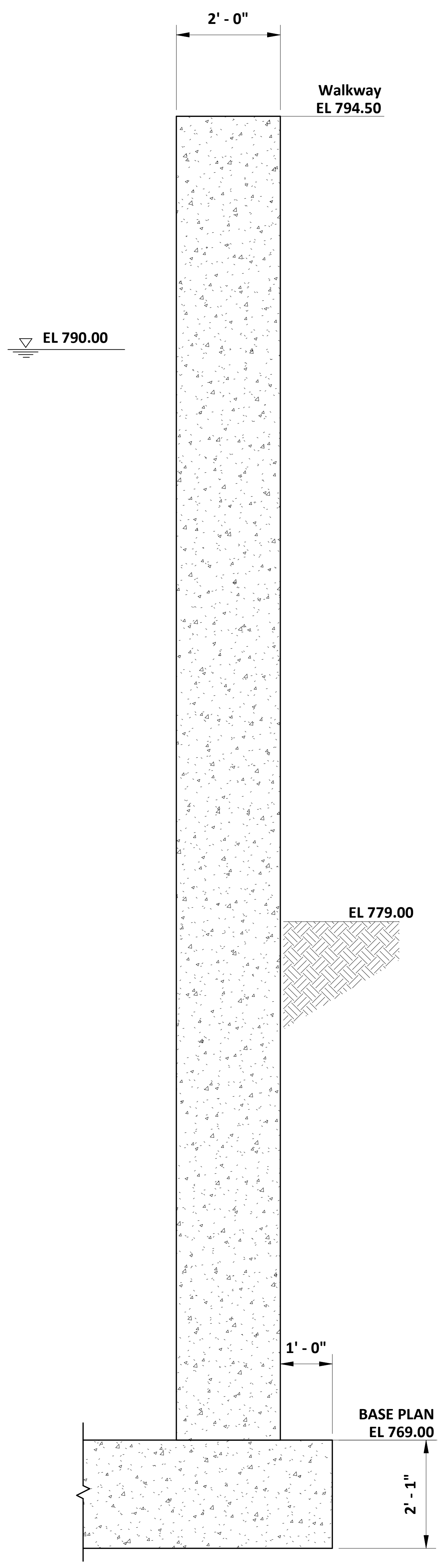
**2 SECTION**
S-11 SCALE: 1/2" = 1'-0"



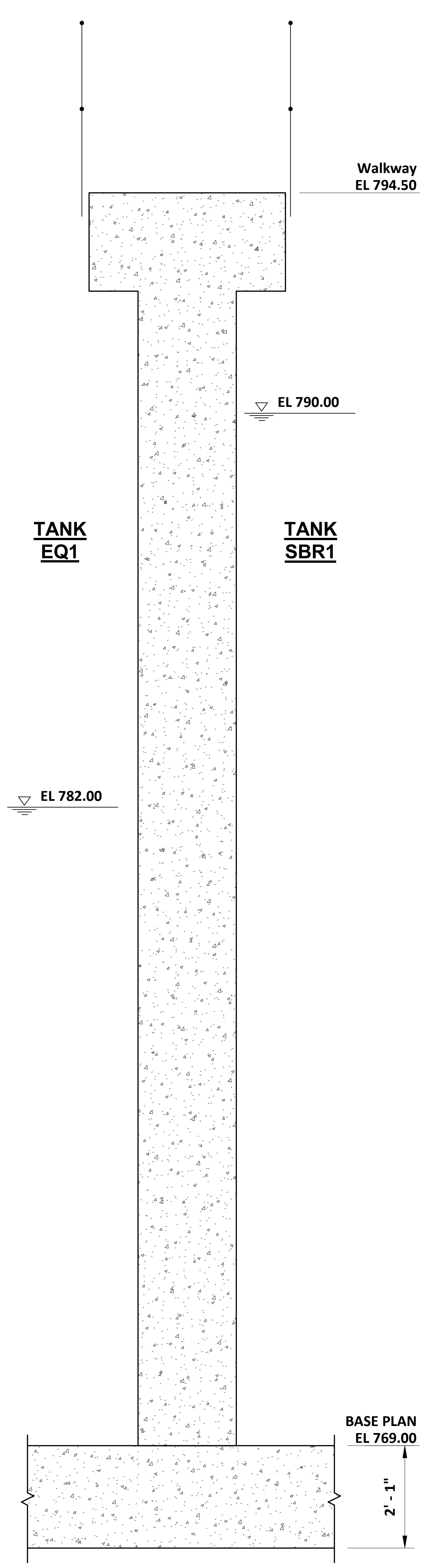
**3 SECTION**
S-11 SCALE: 1/2" = 1'-0"



**4 SECTION**
S-11 SCALE: 1/2" = 1'-0"



**5 SECTION**
S-11 SCALE: 1/2" = 1'-0"



**6 SECTION**
S-11 SCALE: 1/2" = 1'-0"

NOTES:

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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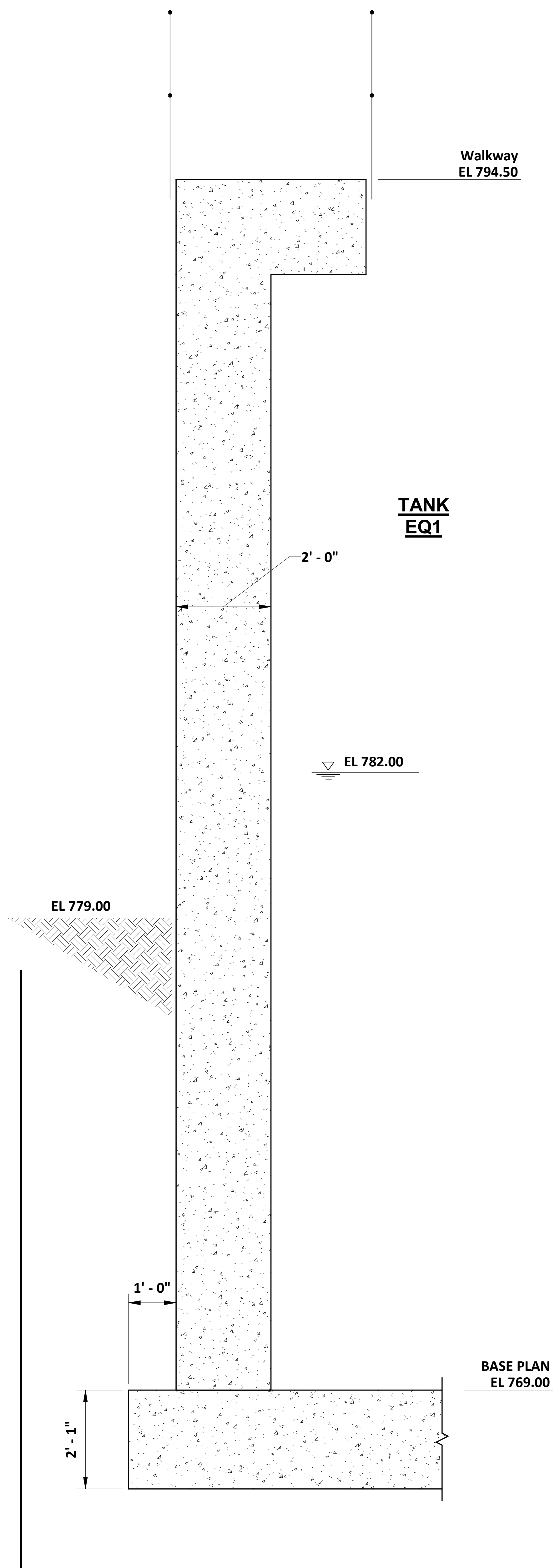
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

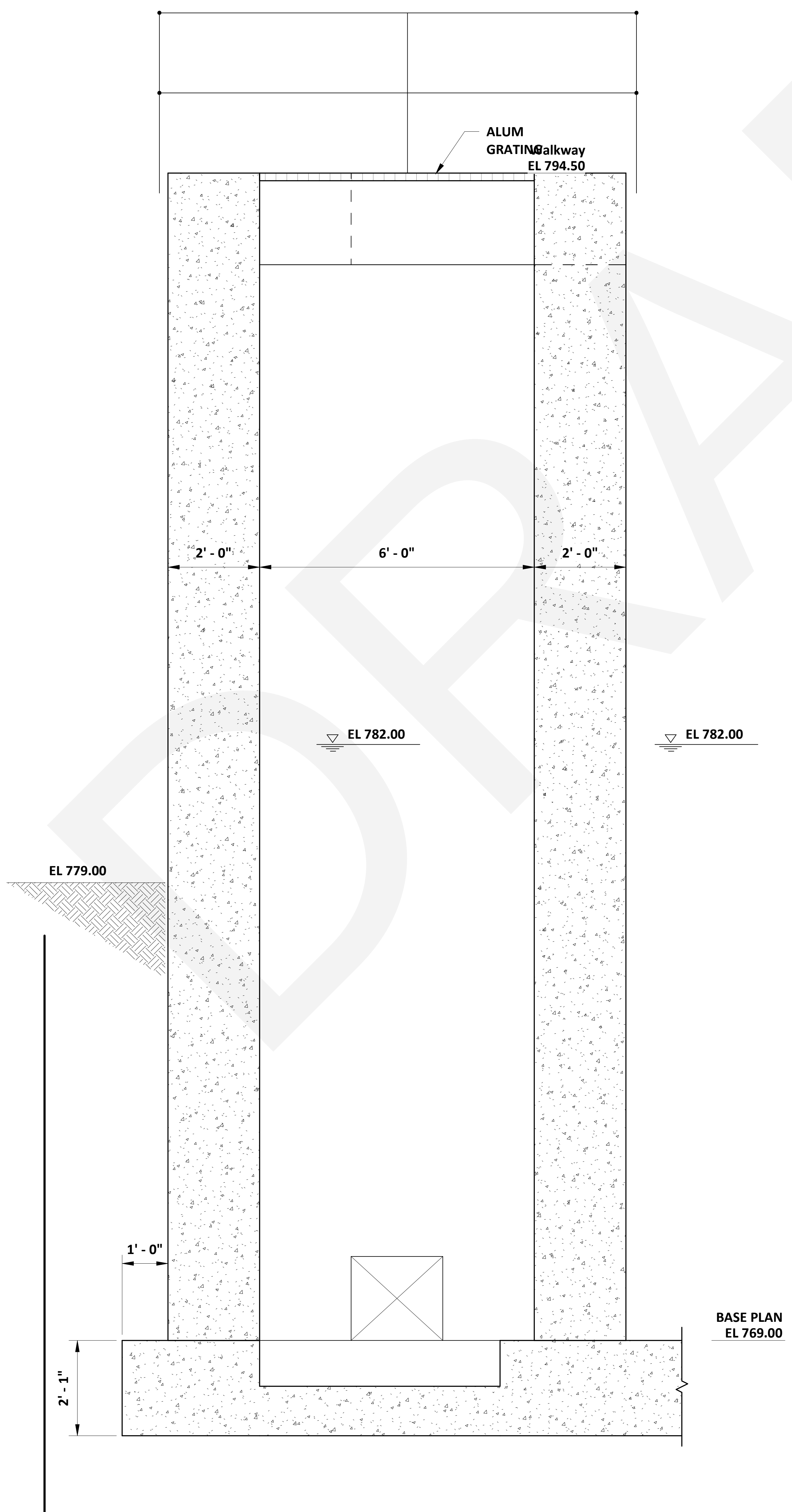
SBR TANK COMPLEX
SECTIONS I

DRAWING
S-13



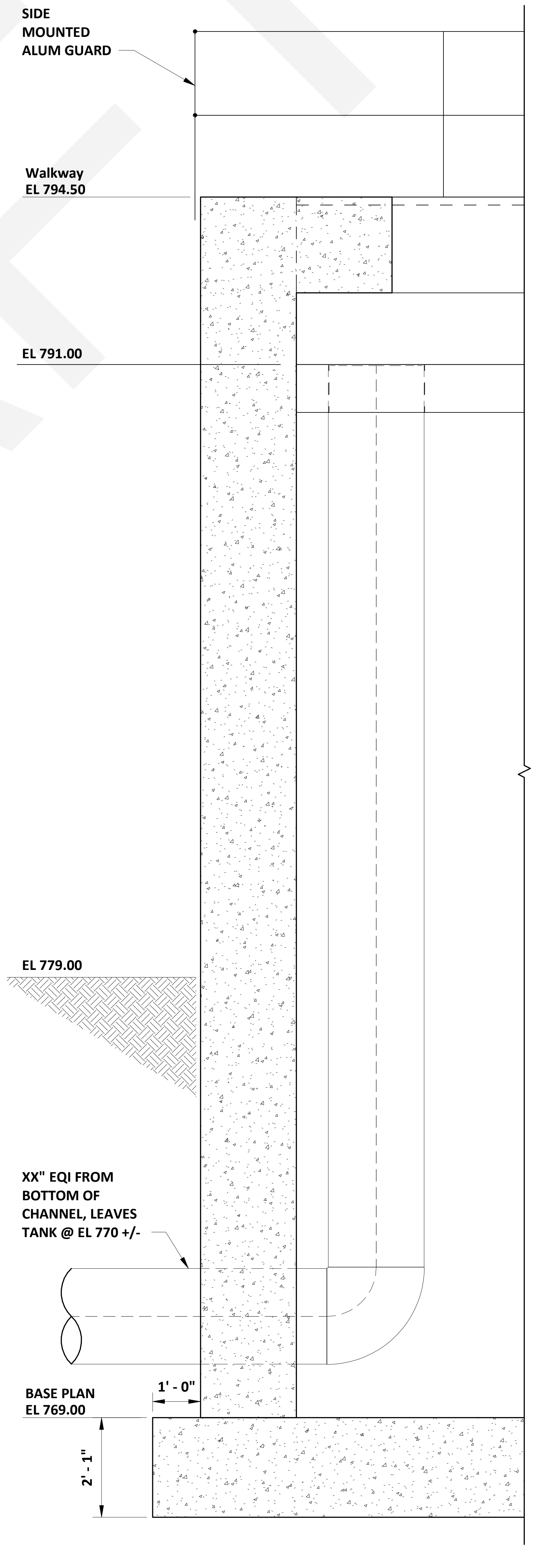
7 **SECTION**
S-11 SCALE: 1/2" = 1'-0"

INSTALL EXCAVATION SUPPORT AS REQUIRED TO PREVENT MOVEMENT OR UNDERMINING OF ADJACENT STRUCTURES OR UTILITIES

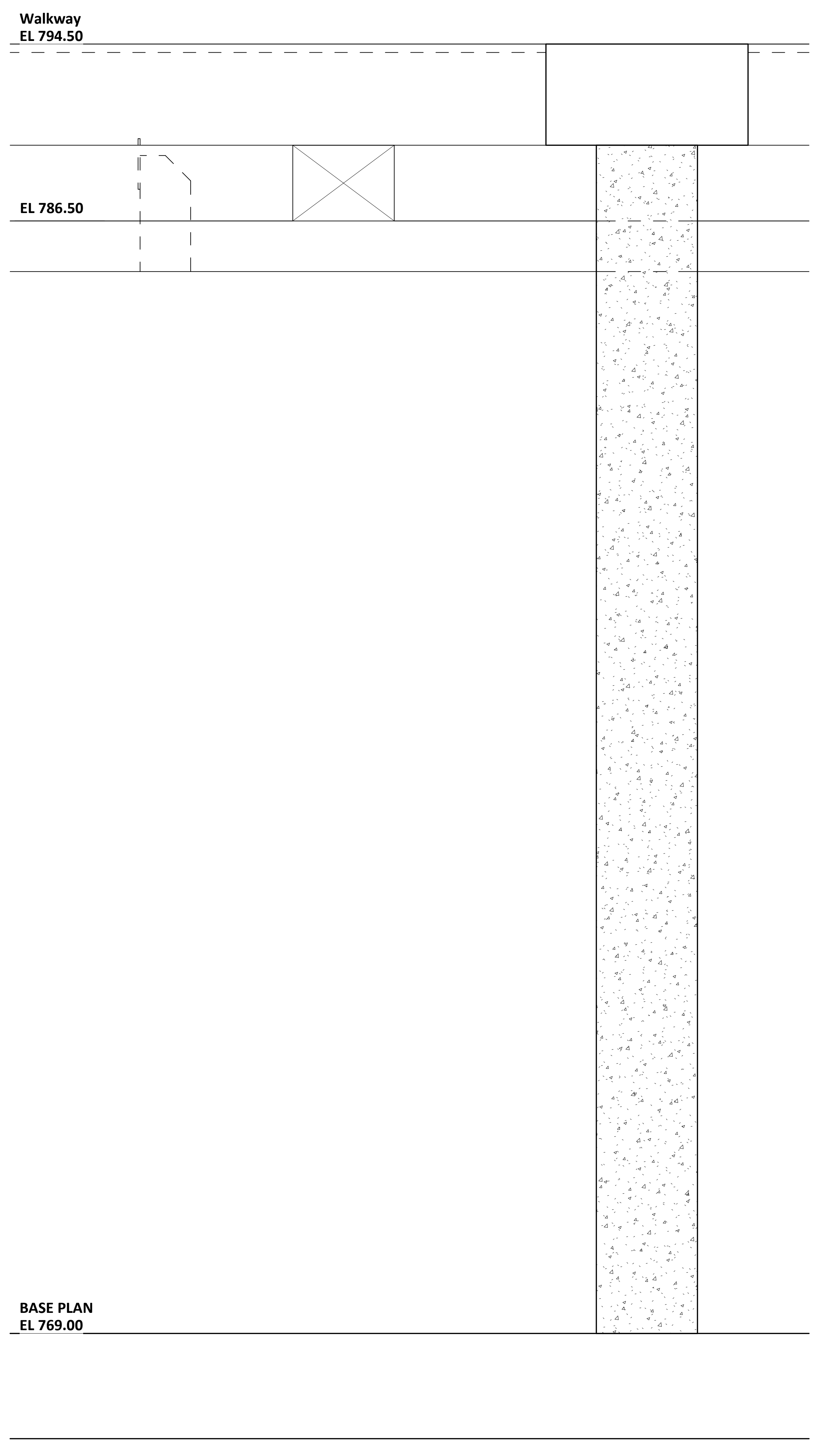


8 **SECTION**
S-11 SCALE: 1/2" = 1'-0"

INSTALL EXCAVATION SUPPORT AS REQUIRED TO PREVENT MOVEMENT OR UNDERMINING OF ADJACENT STRUCTURES OR UTILITIES



9 **SECTION**
S-11 SCALE: 1/2" = 1'-0"



1 **SECTION**
S-11 SCALE: 1/2" = 1'-0"

**NOTES:**

1. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
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PROJECT NO: 20828
DESIGNED: J.POWELL
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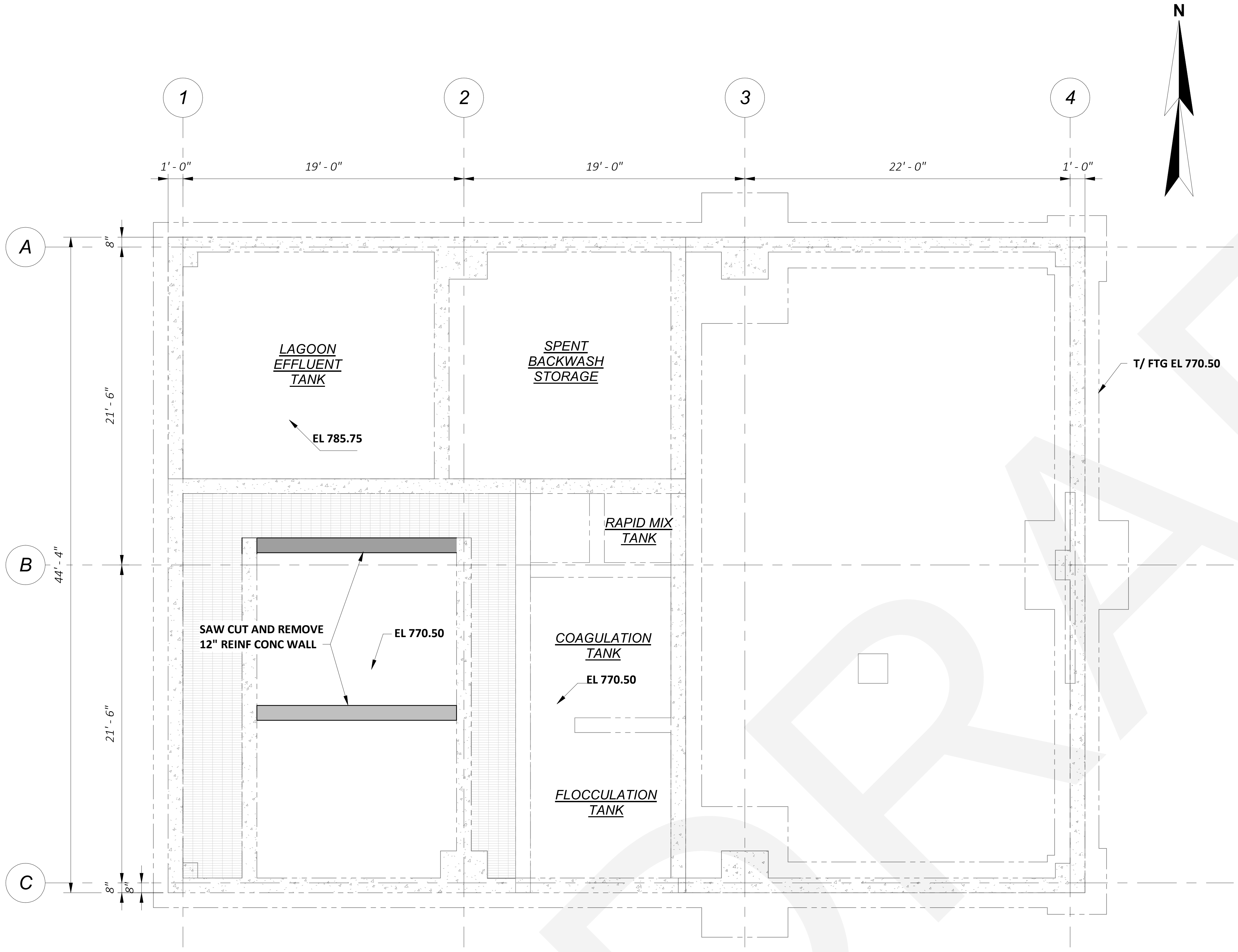
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

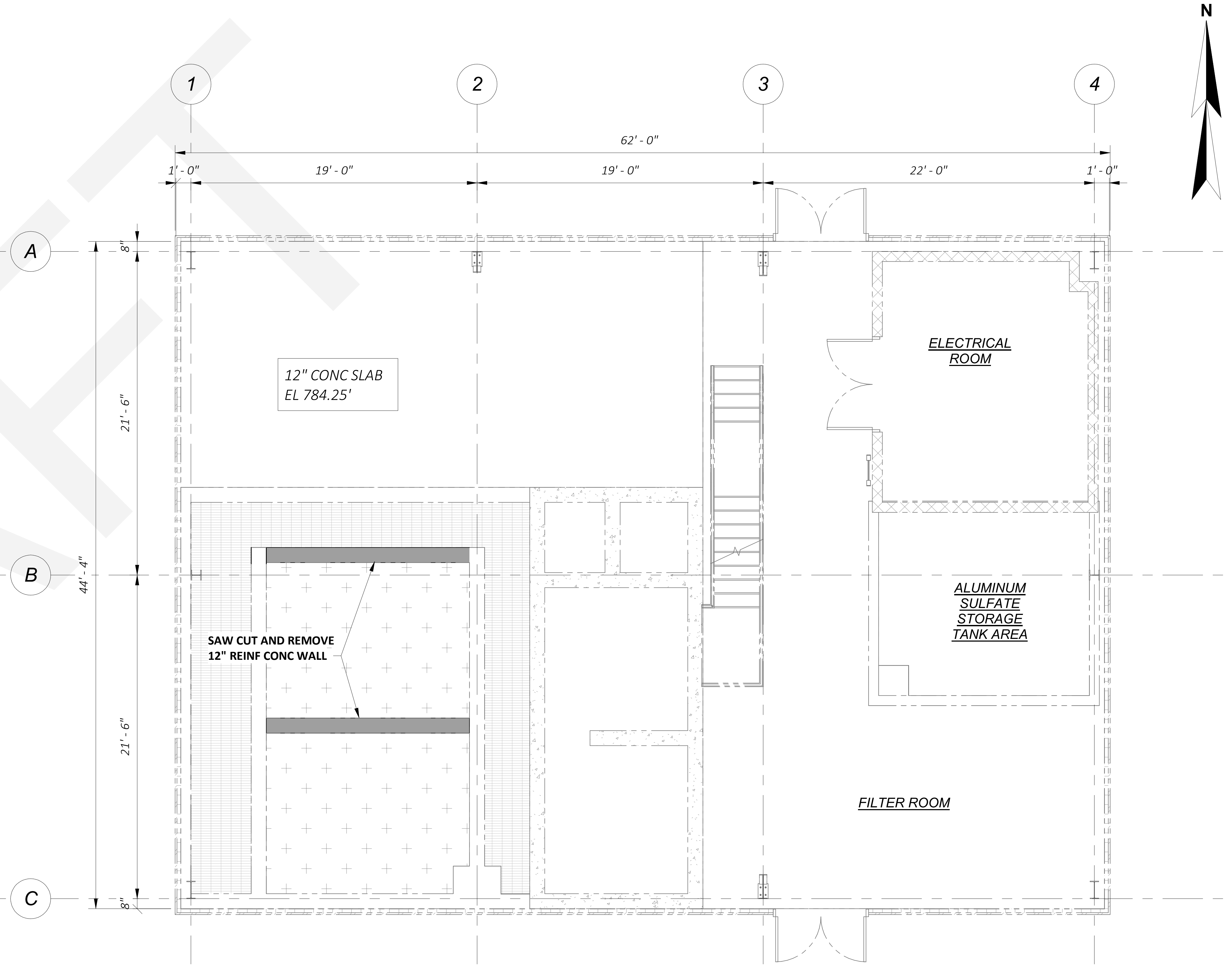
SBR TANK COMPLEX
SECTIONS II

DRAWING
S-14



## BASE PLAN DEMOLITION

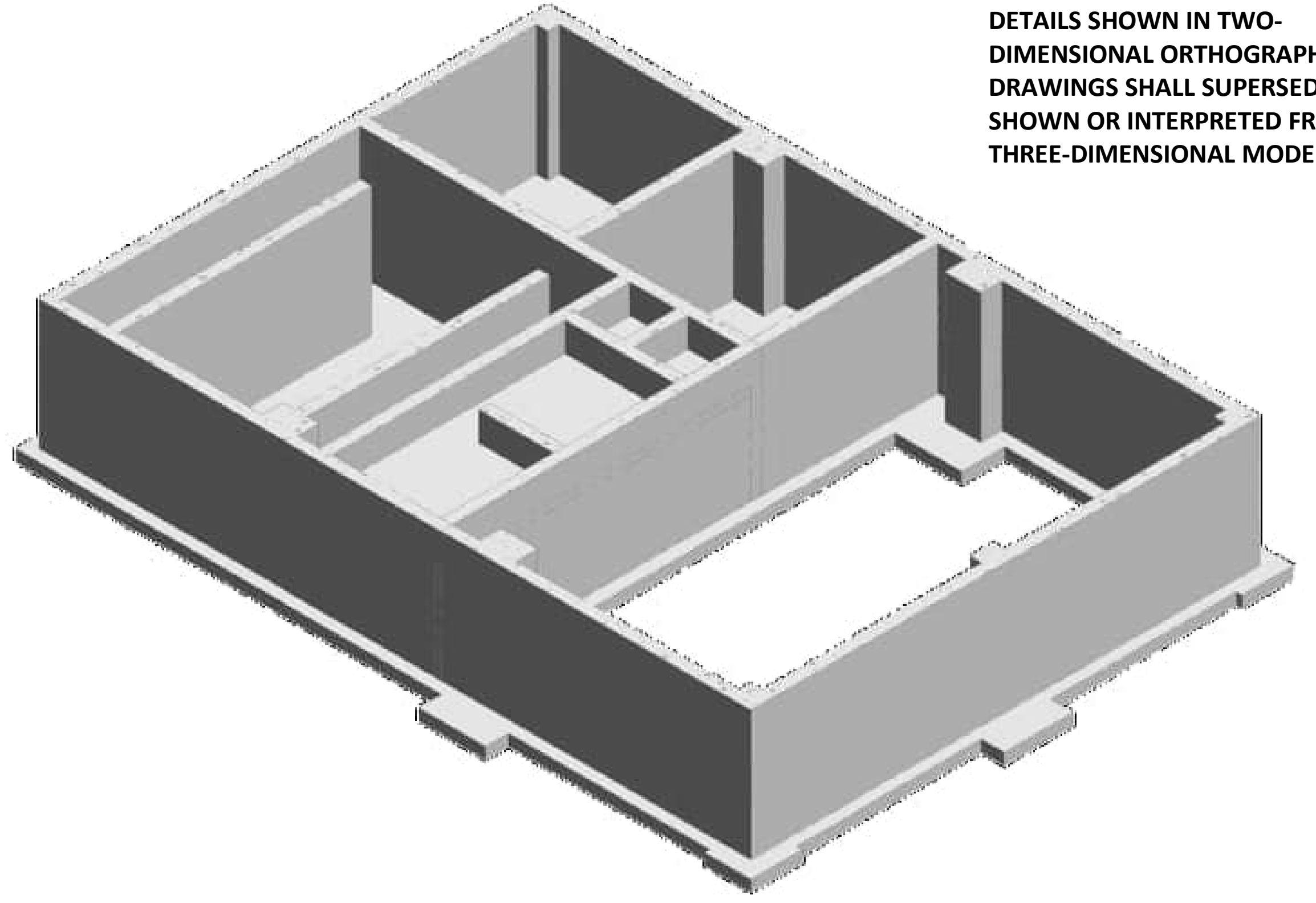
SCALE: 3/16" = 1'-0"



## TOP PLAN DEMOLITION

SCALE: 3/16" = 1'-0"

NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS



## ISOMETRIC

SCALE:

**NOTES:**

1. CONCRETE SURFACE REPAIR WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED AS BID ITEM 2 IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 200 SF).
2. CONCRETE CRACK REPAIRS WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED AS BID ITEM 3 IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 25 LF).
3. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | DATE | APP'D |
|---|---|---|---|
| 1 | | | |
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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

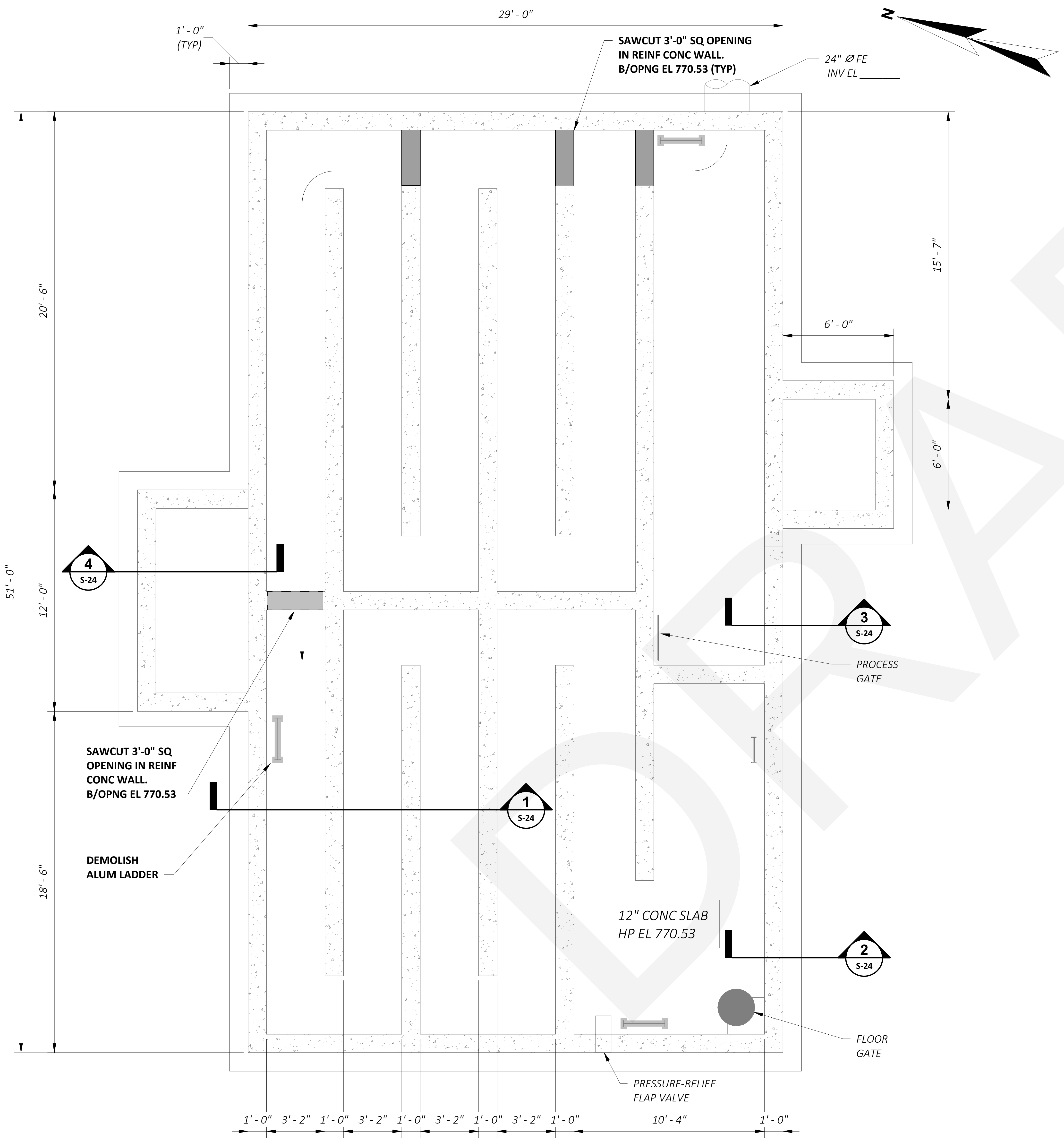
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

FILTER BUILDING
BASE PLAN AND TOP PLAN DEMOLITION

DRAWING
S-15

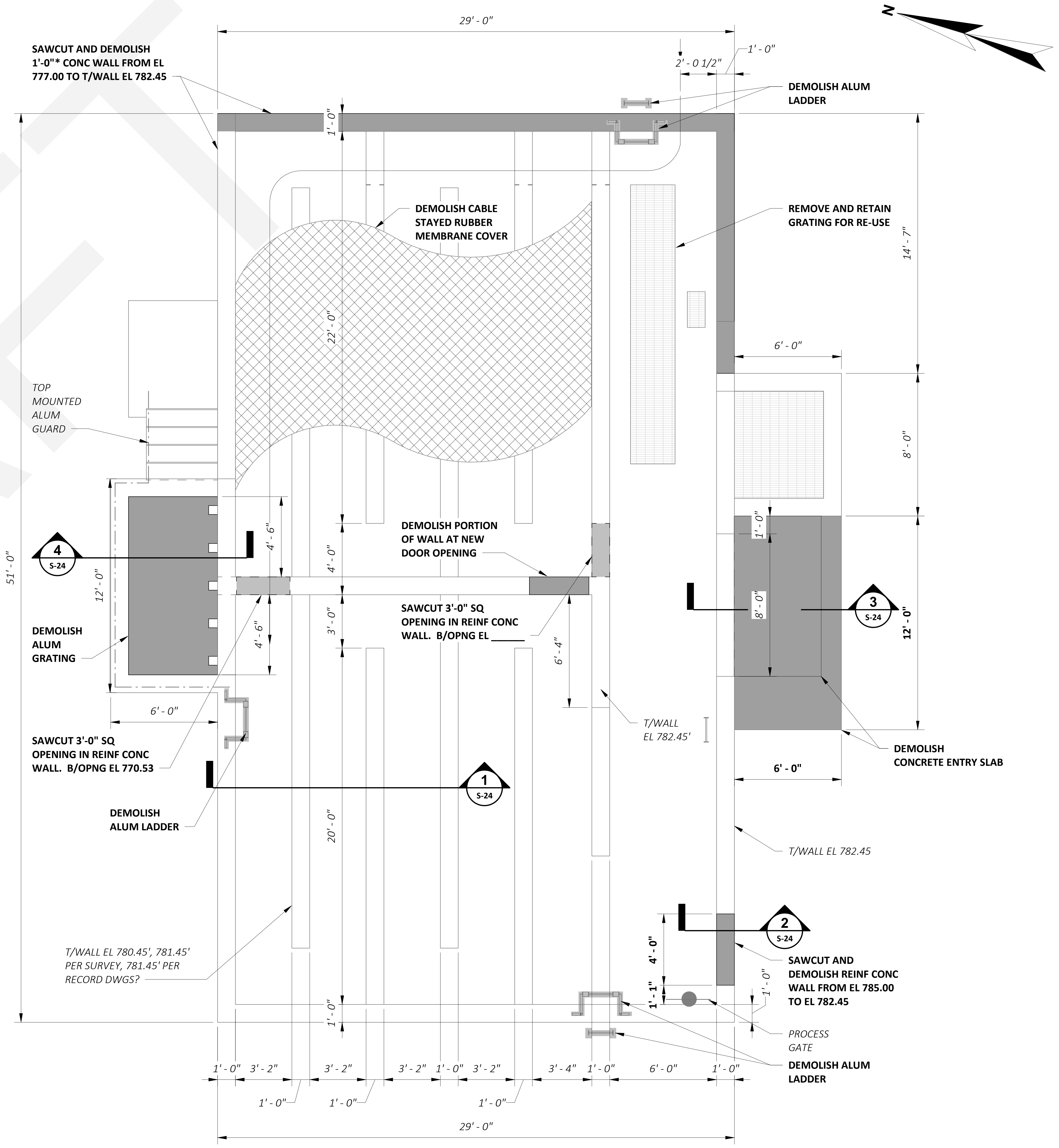
12/2/2022 8:37:30 AM

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-Disinfection.rvt



## BASE PLAN DEMOLITION

SCALE: 1/4" = 1'-0"



## TOP PLAN DEMOLITION

SCALE: 1/4" = 1'-0"

**NOTES:**

1. CONCRETE SURFACE REPAIR WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED AS BID ITEM 2 IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 200 SF).
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3. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
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PROJECT NO: 20828
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SUBMISSION: PRELIMINARY DESIGN

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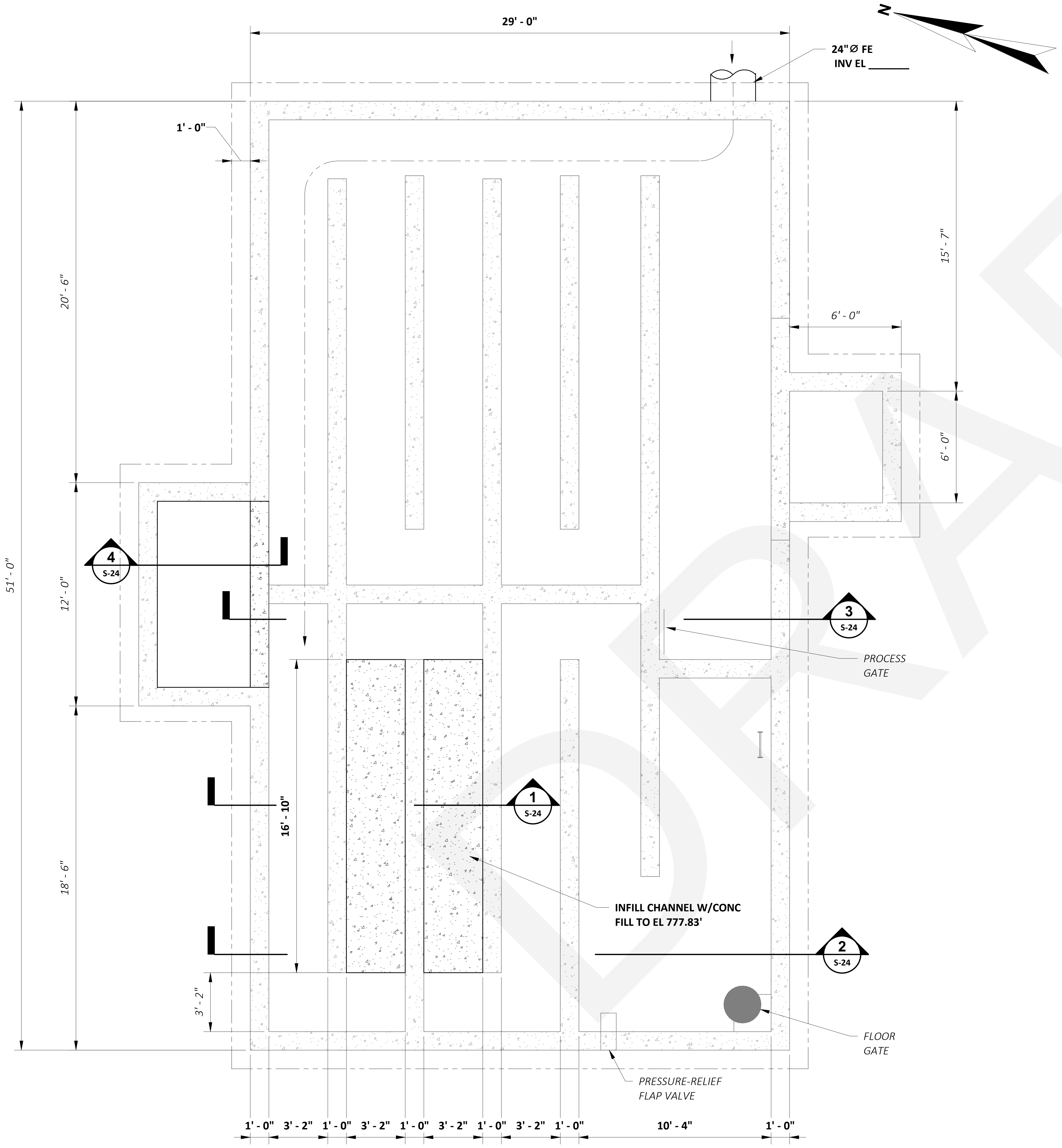
**TOWN OF NEWPORT, NEW HAMPSHIRE**
**WASTEWATER TREATMENT FACILITY**
**UPGRADE**

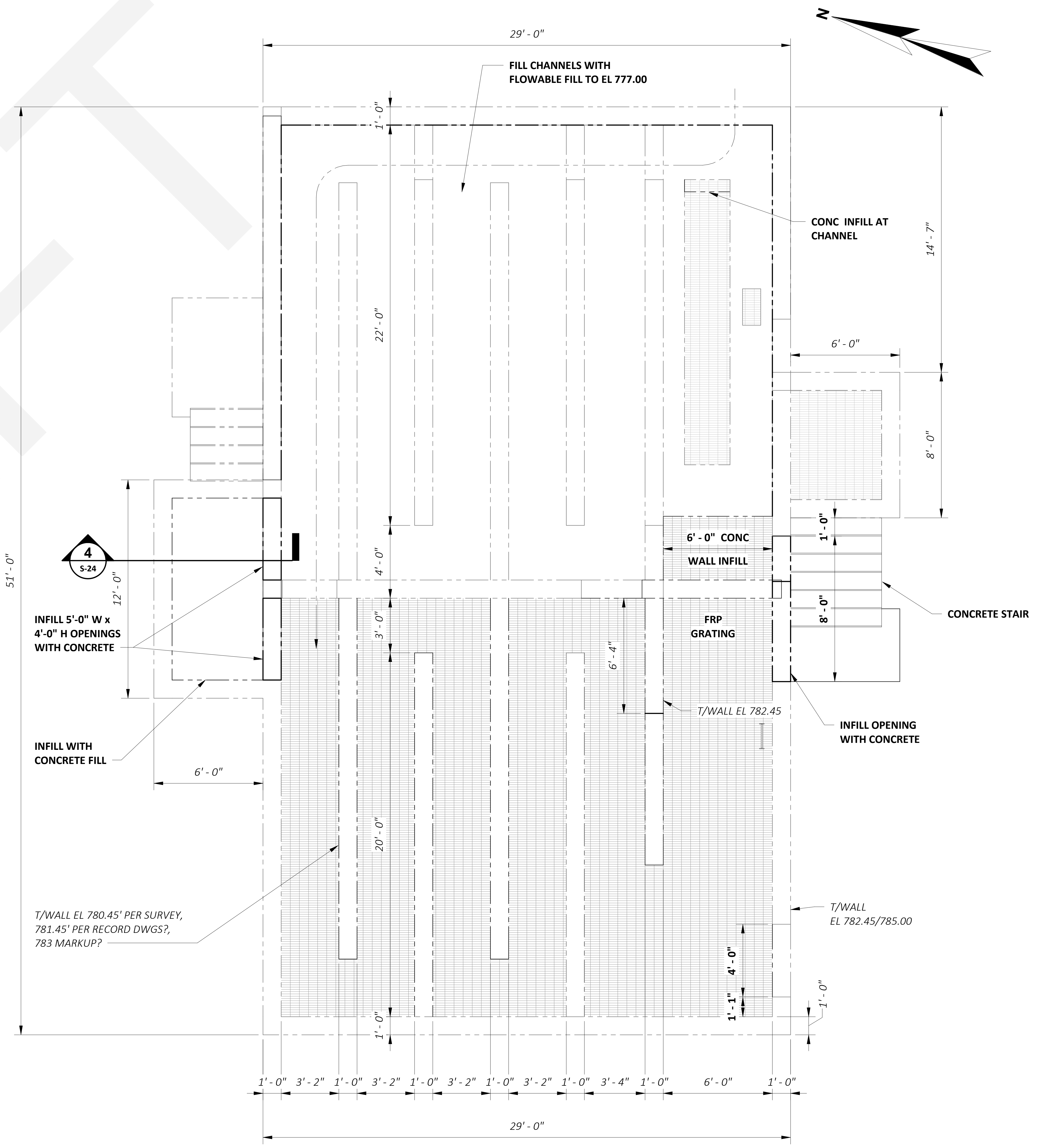
DISINFECTION BUILDING
BASE PLAN AND TOP PLAN DEMOLITION

DRAWING
**S-21**



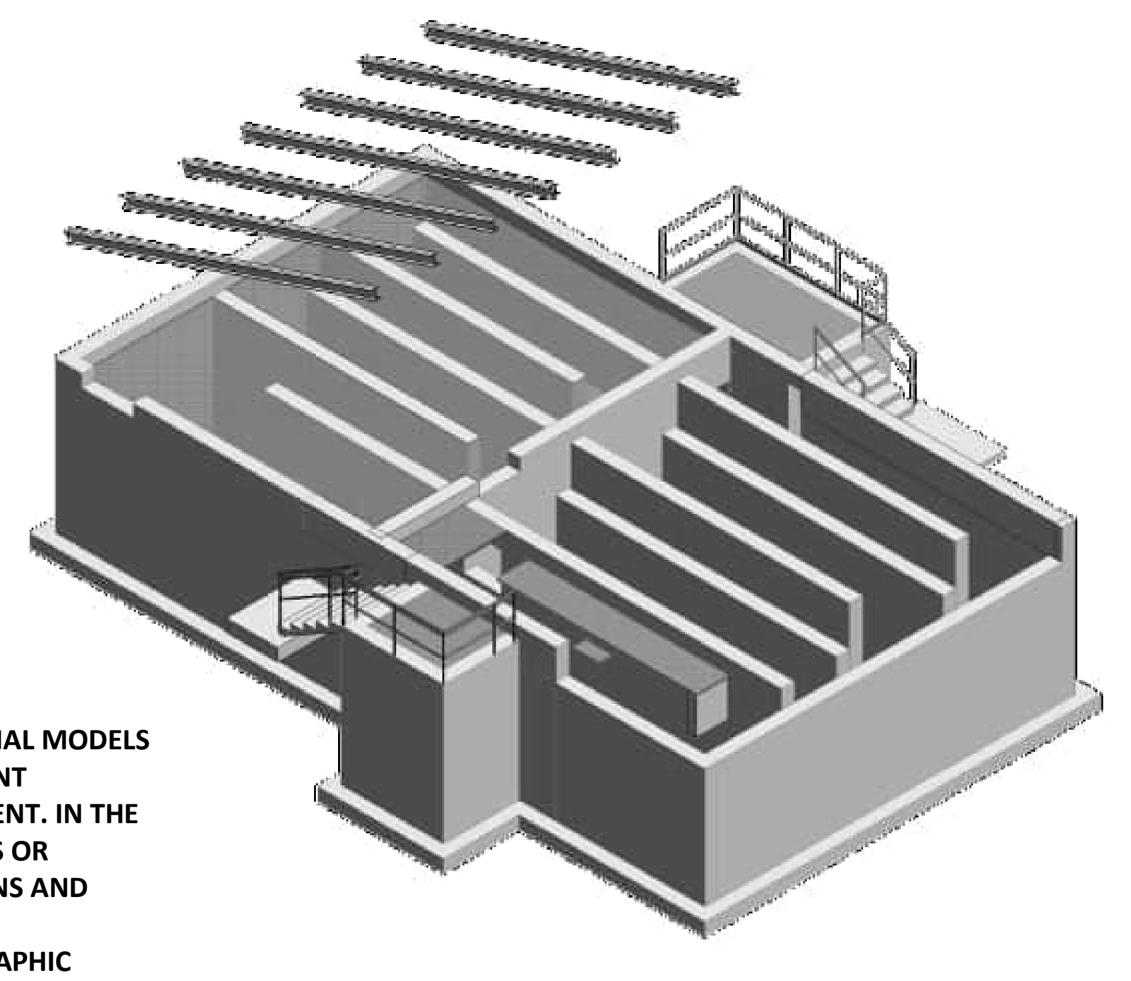
## BASE PLAN MODIFICATIONS

SCALE: 1/4" = 1'-0"



## TOP PLAN MODIFICATIONS

SCALE: 1/4" = 1'-0"



NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS

## ISOMETRIC

SCALE:

**NOTES:**

1. DESIGN FRP LIVE LOAD = 100 PSF
2. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

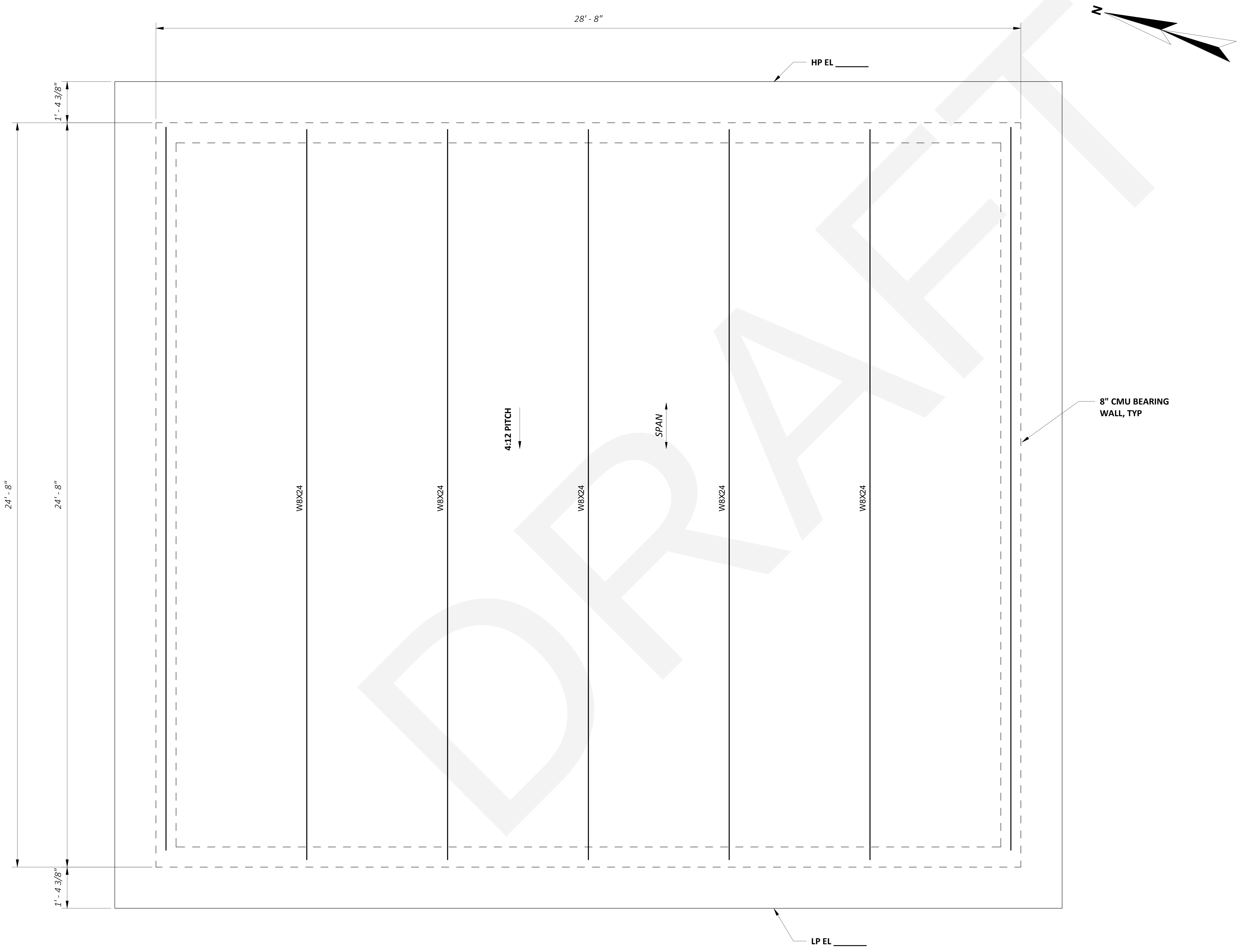
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DISINFECTION BUILDING
BASE PLAN AND TOP PLAN MODIFICATIONS

DRAWING
S-22

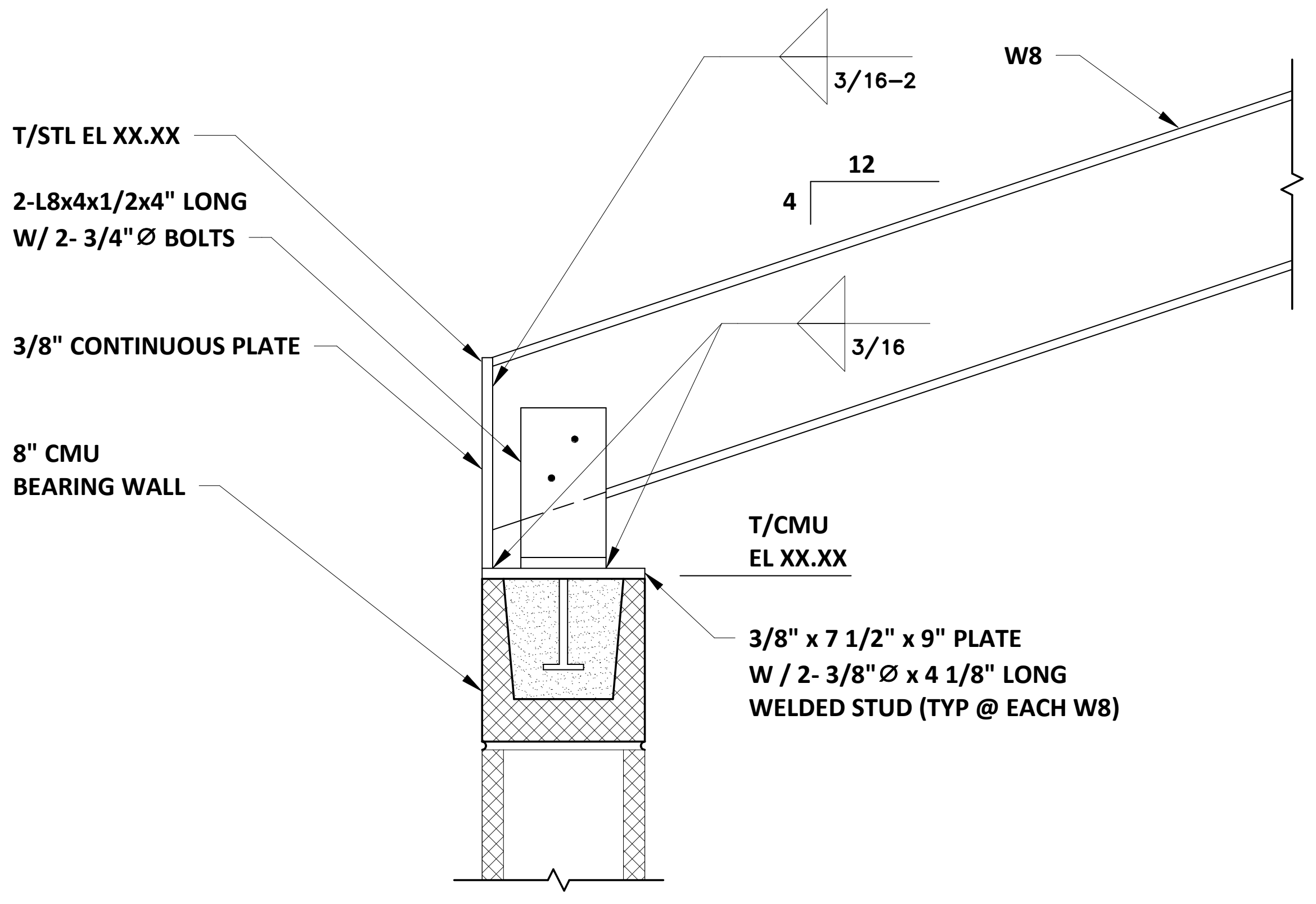
Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-Disinfection.rvt

12/2/2022 8:37:40 AM



## ROOF FRAMING PLAN

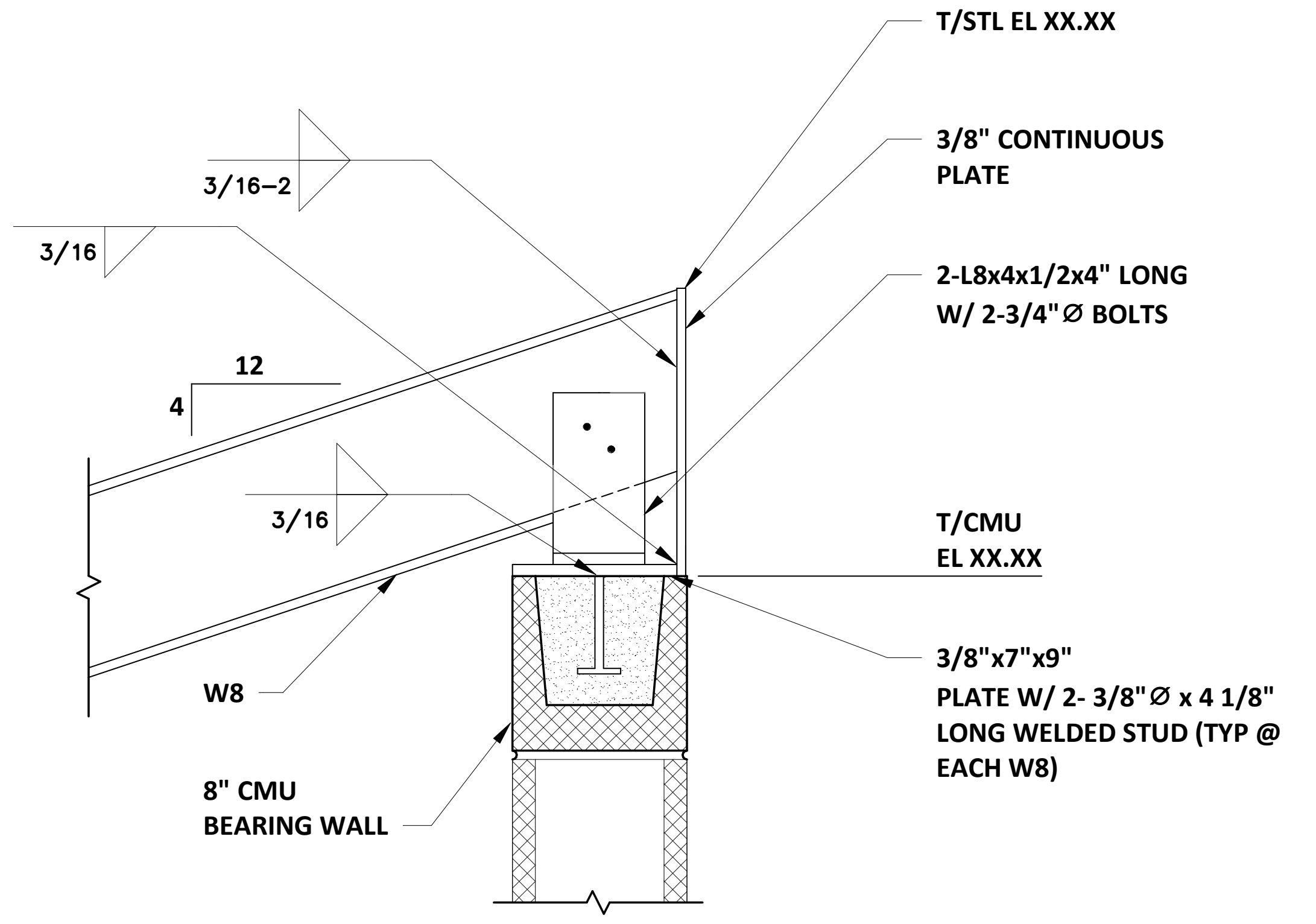
SCALE: 1/2" = 1'-0"



## A DETAIL

S-23

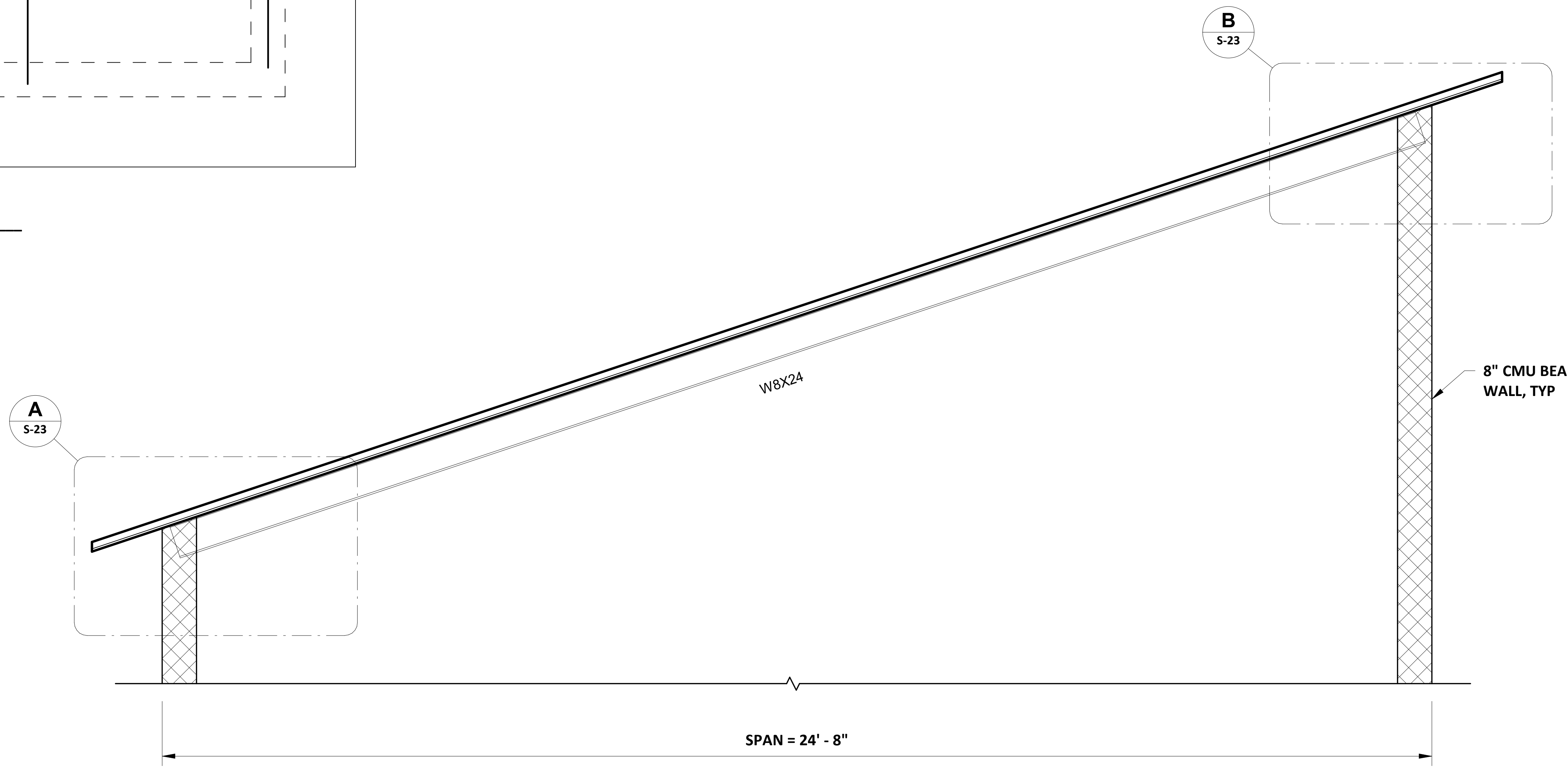
SCALE: 1 1/2" = 1'-0"



## B DETAIL

S-23

SCALE: 1 1/2" = 1'-0"



## ROOF SECTION

SCALE: 1/2" = 1'-0"

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DISINFECTION BUILDING
ROOF FRAMING PLAN

DRAWING
S-23

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-Disinfection.rvt

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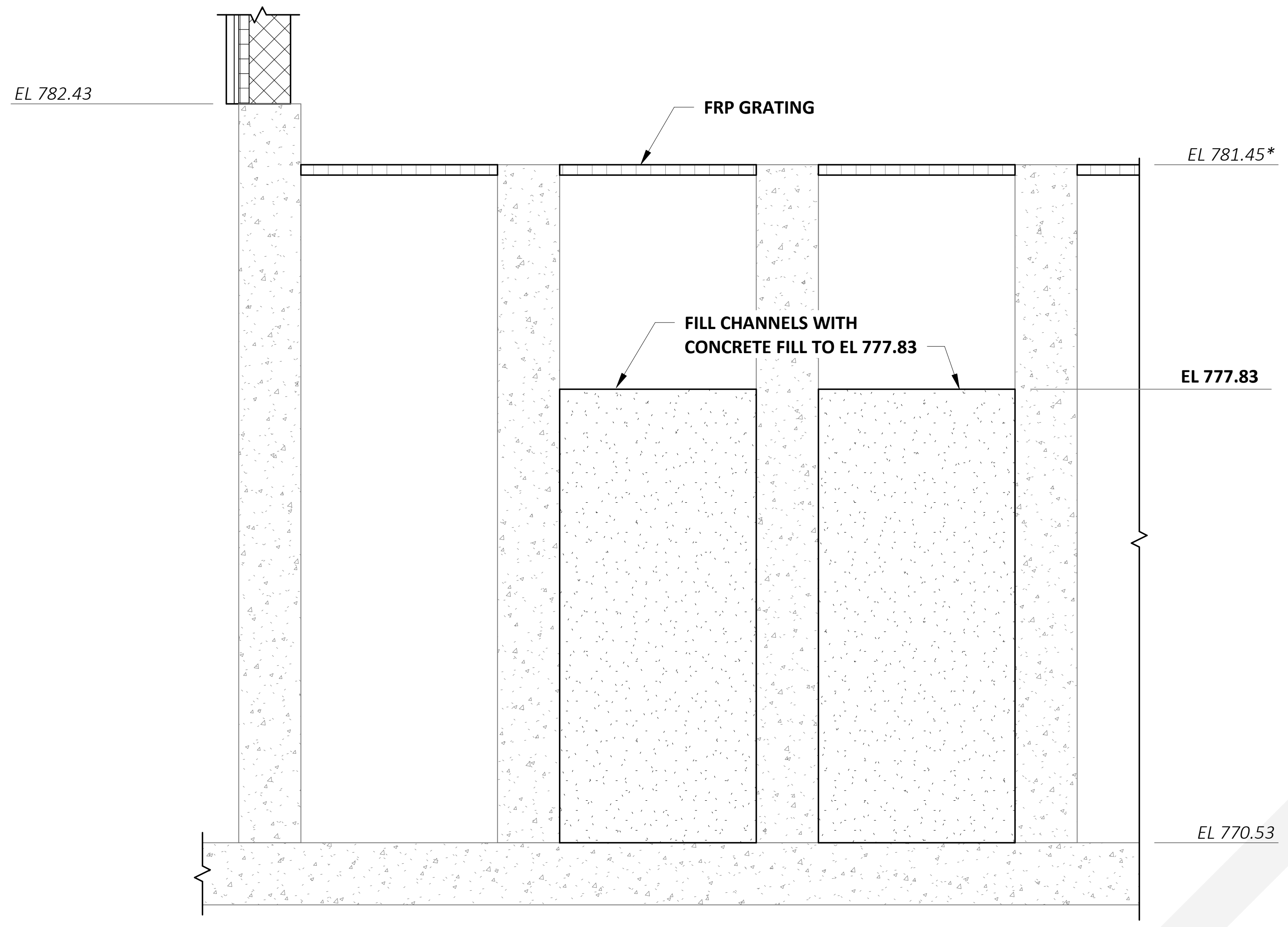
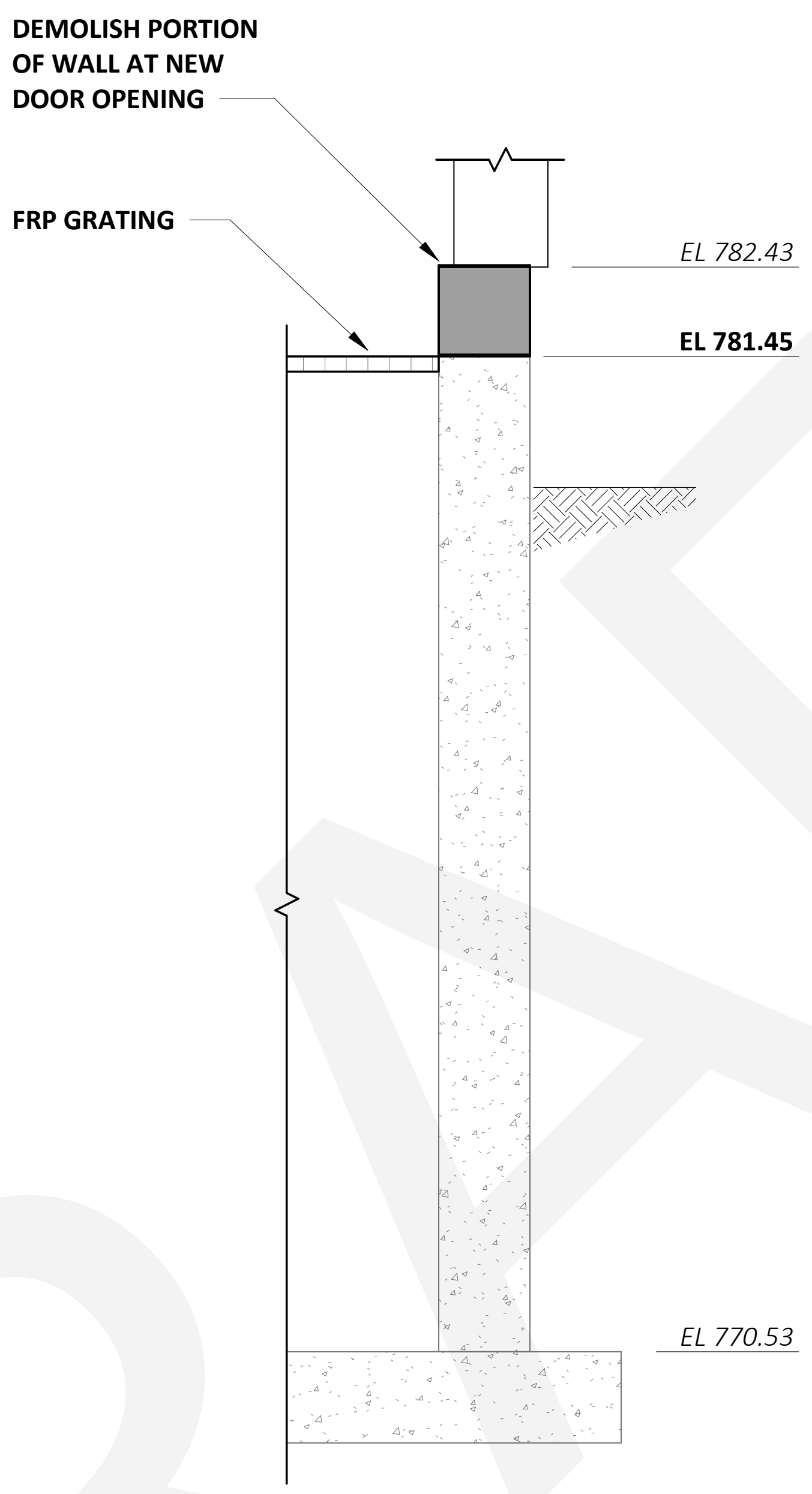
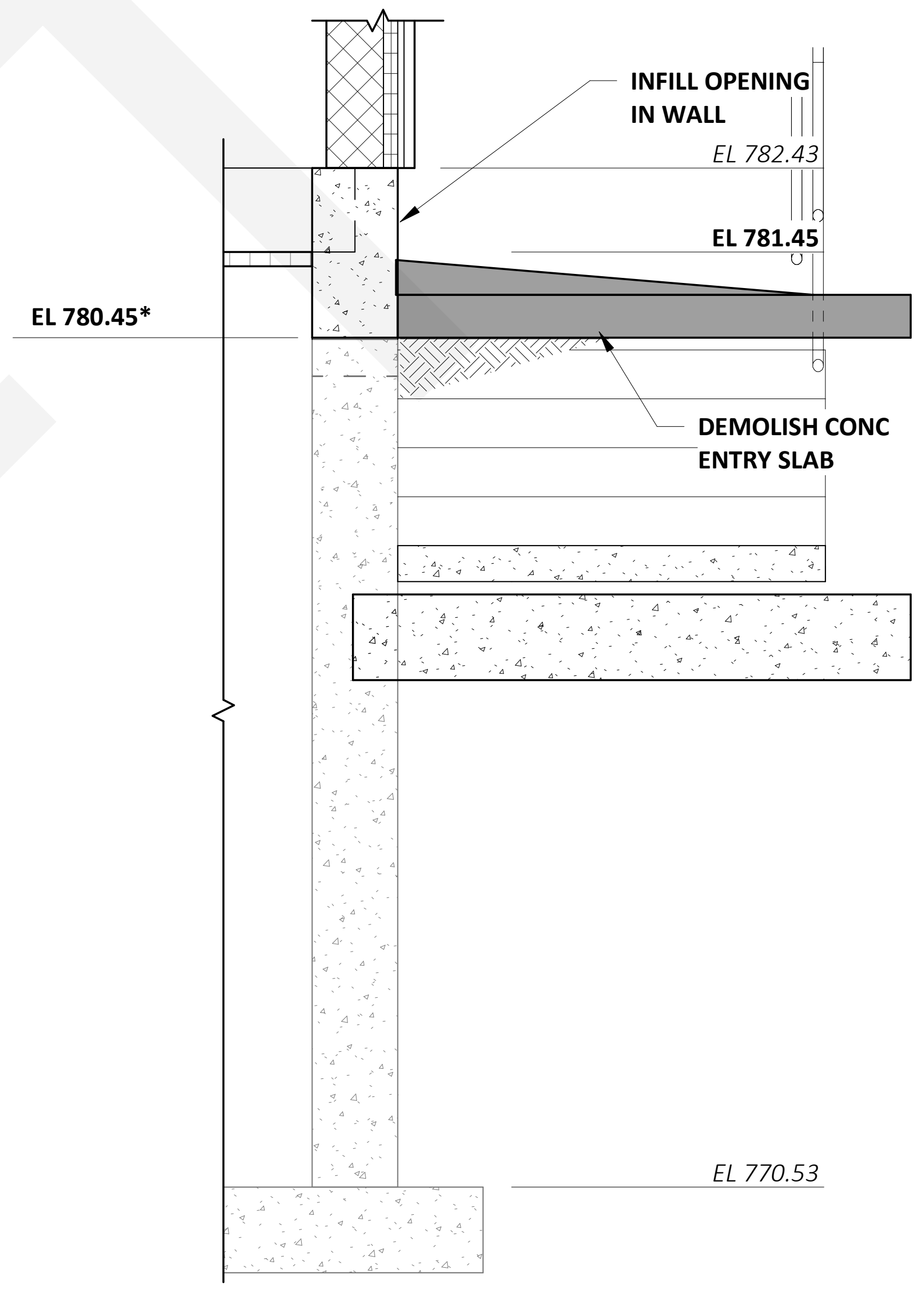


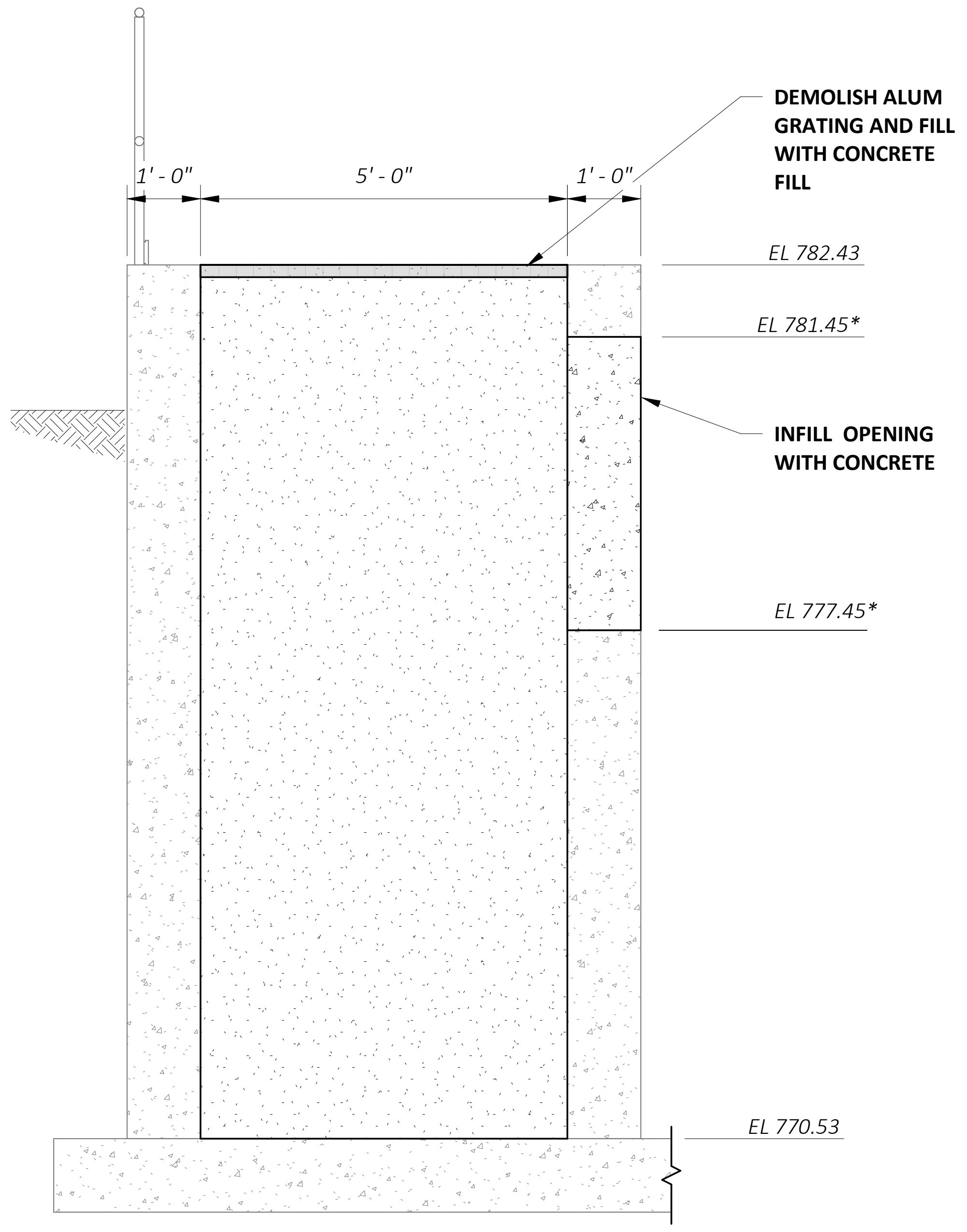
1 SECTION
S-21
SCALE: 1/2" = 1'-0"



2 SECTION
S-21
SCALE: 1/2" = 1'-0"



3 SECTION
S-21
SCALE: 1/2" = 1'-0"



4 SECTION
S-21
SCALE: 1/2" = 1'-0"

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

DISIFECTION BUILDING - SECTIONS

DRAWING
S-24

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-Disinfection.rvt

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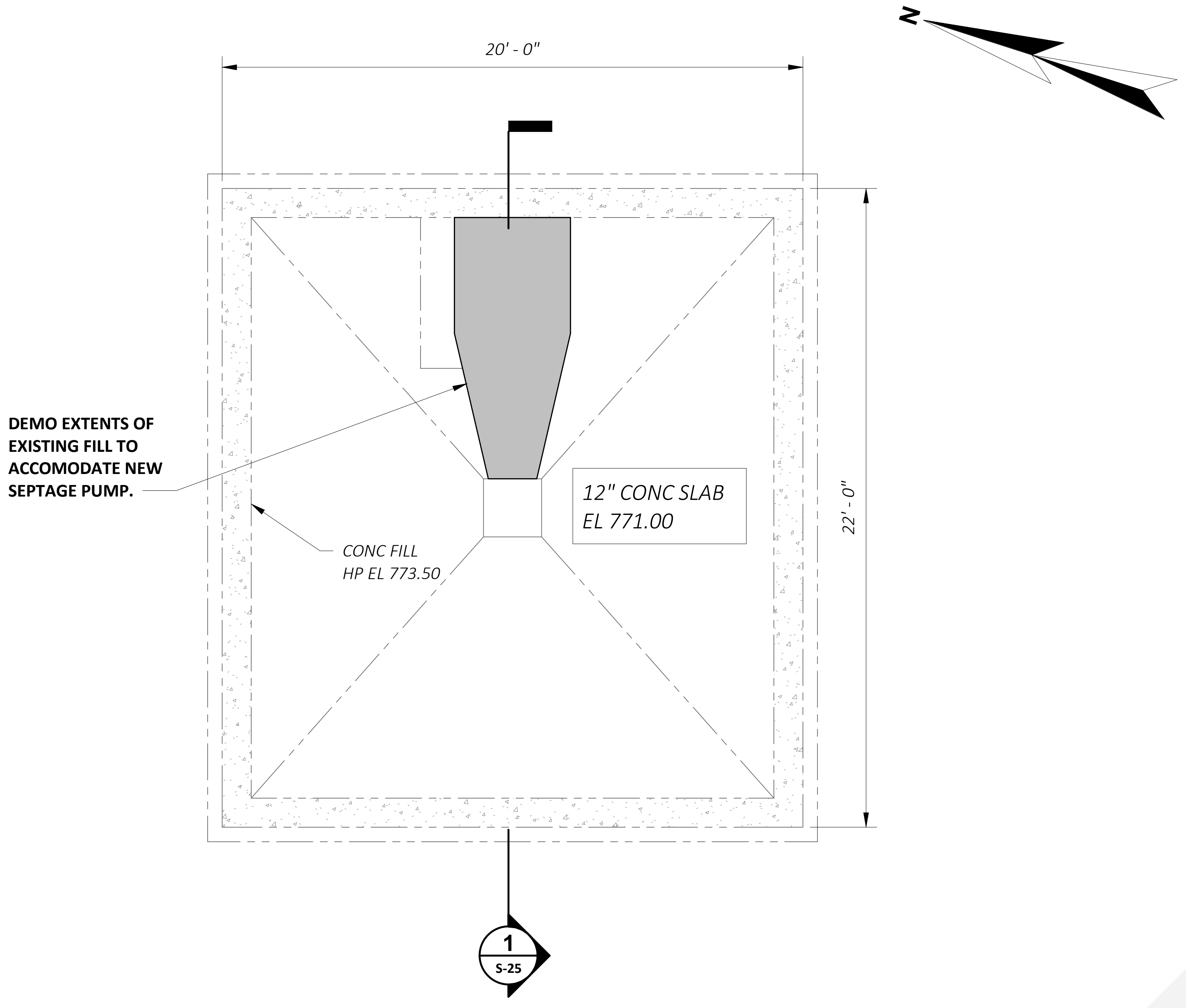
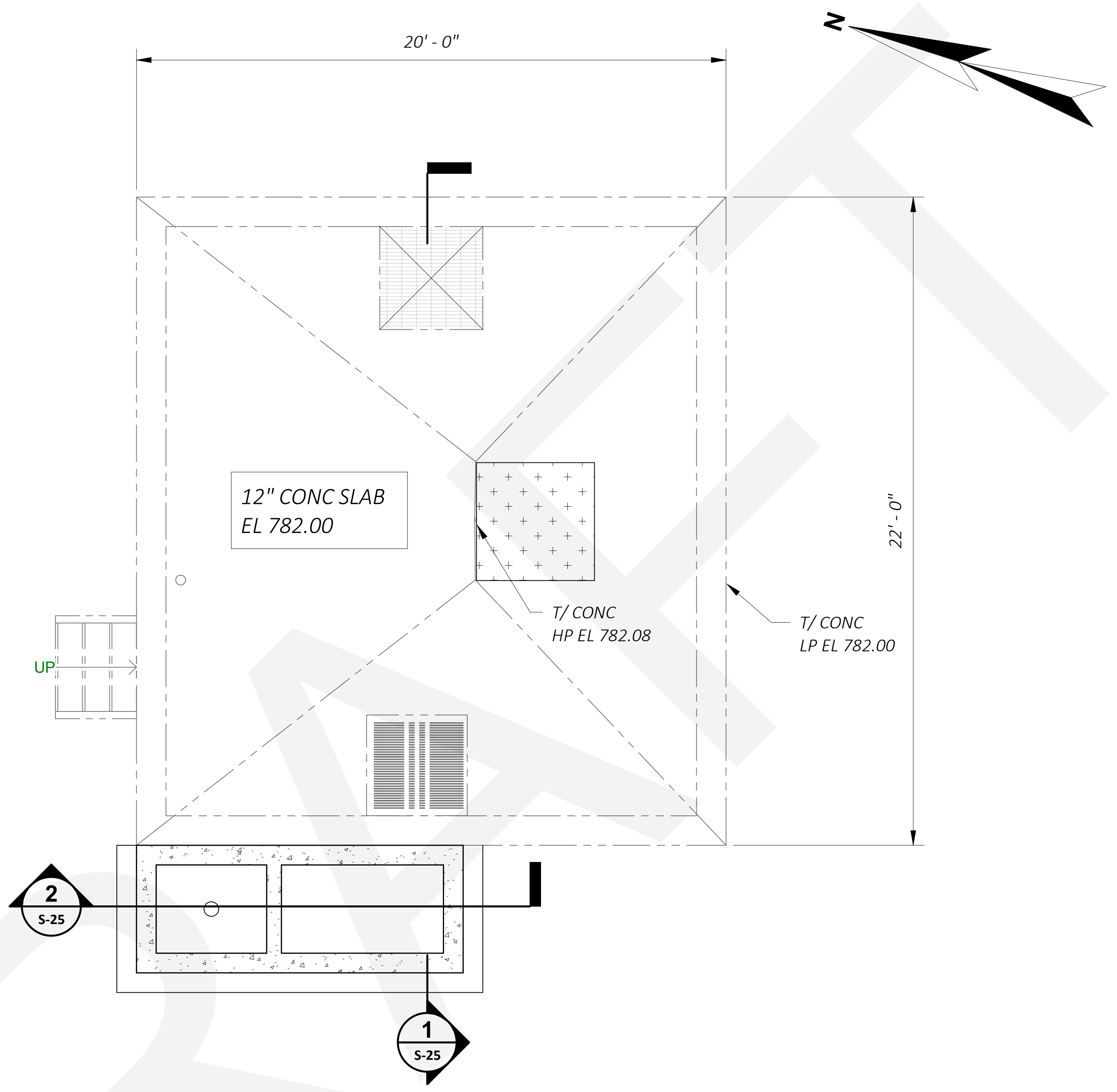


## FOUNDATION PLAN

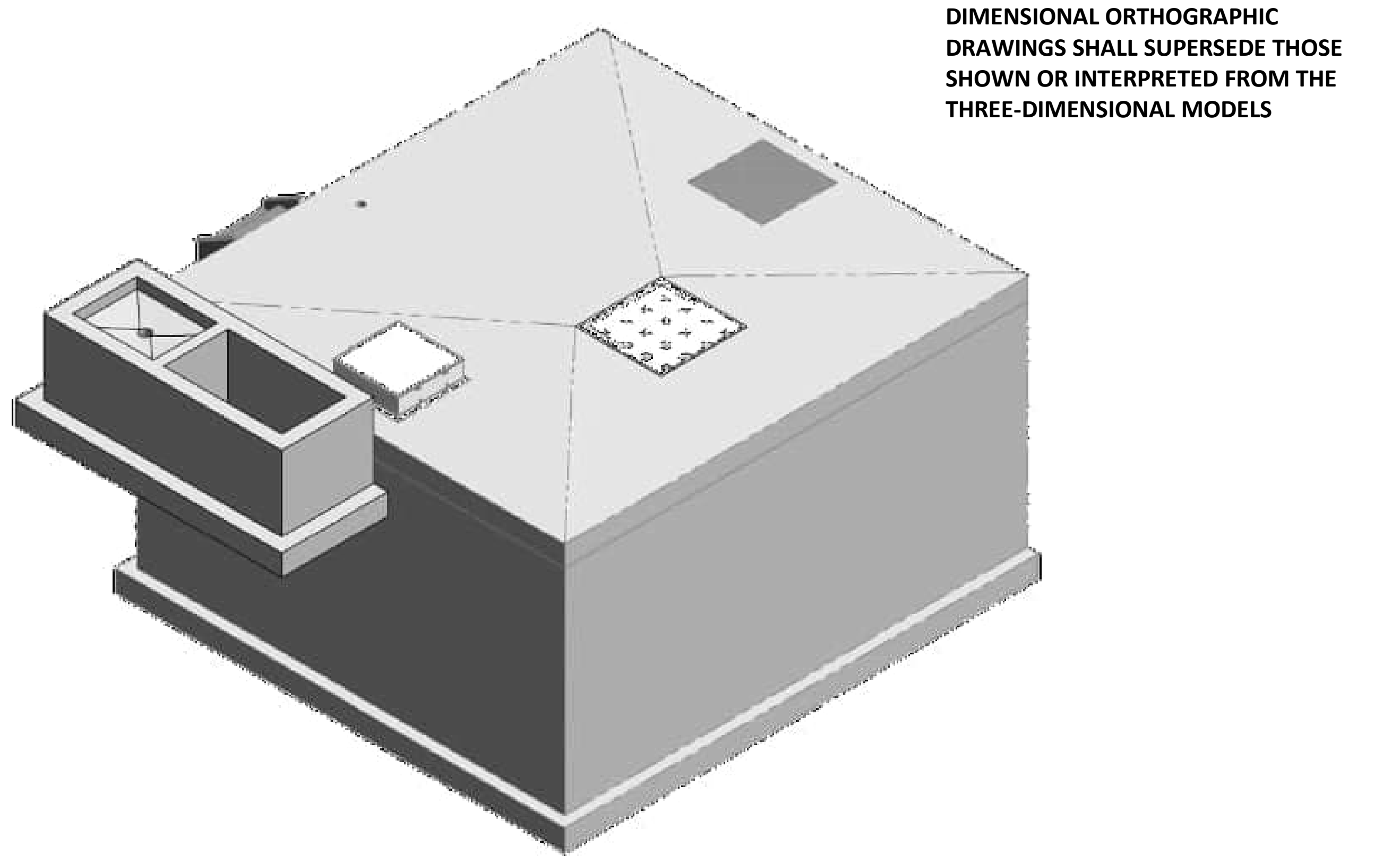
SCALE: 1/4" = 1'-0"



## TOP PLAN

SCALE: 1/4" = 1'-0"

NOTE: THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS



## ISOMETRIC

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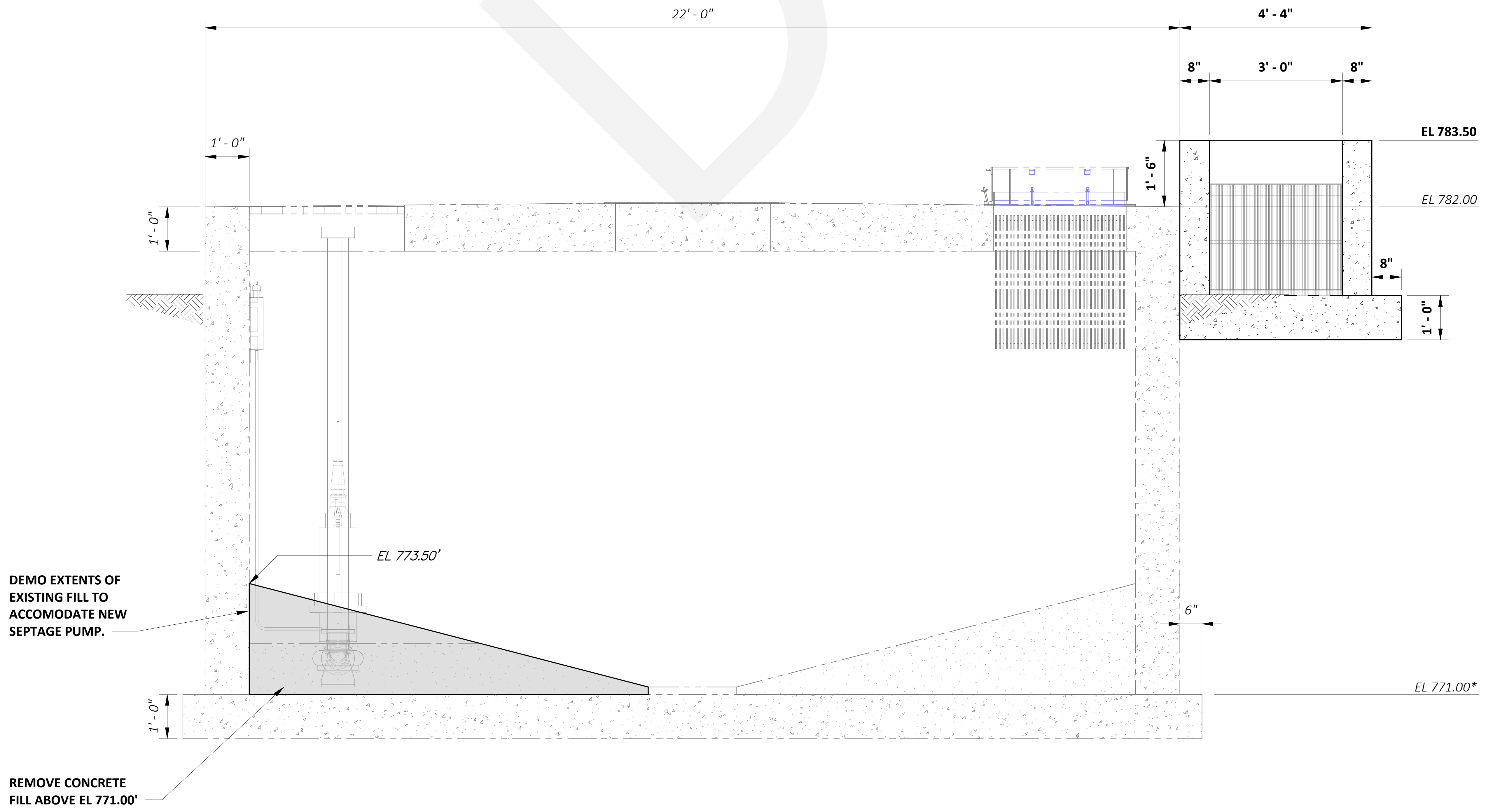
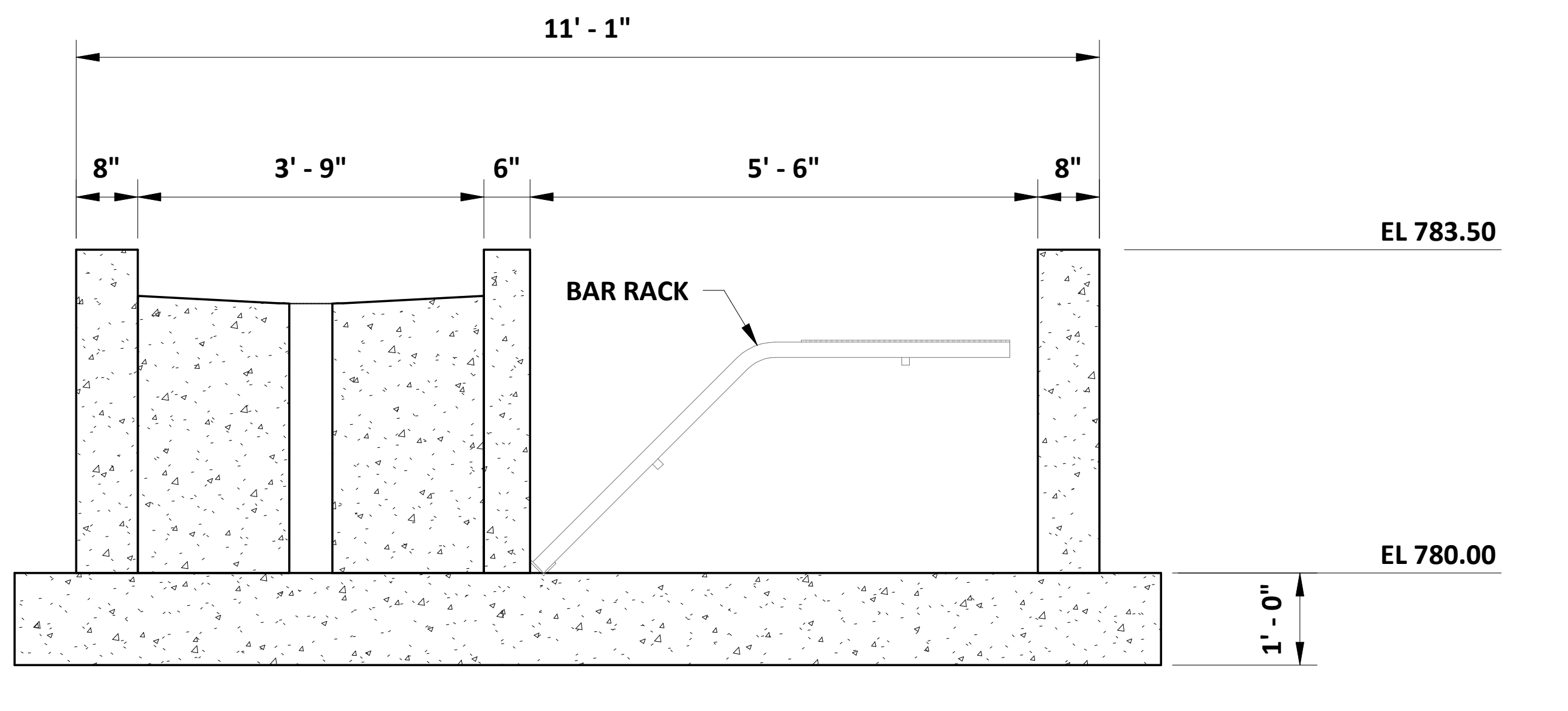


## 1 S-25 SECTION

SCALE: 1/2" = 1'-0"



## 2 S-25 SECTION

SCALE: 1/2" = 1'-0"

NOTES:

1. CONCRETE SURFACE REPAIR WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED AS BID ITEM 2 IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 200 SF).
2. CONCRETE CRACK REPAIRS WILL BE REQUIRED AT LOCATIONS INDICATED ON THE DRAWINGS AND OTHER AREAS IDENTIFIED BY THE ENGINEER DURING CONSTRUCTION. THESE REPAIRS WILL BE COVERED AS BID ITEM 3 IN THE BID FORM AND IN SPECIFICATION SECTION 01150 "MEASUREMENT AND PAYMENT" (APPROX 25 LF).
3. FOR GENERAL STRUCTURAL NOTES, SEE DRAWING S-1. FOR TYPICAL STRUCTURAL DETAILS, SEE DRAWINGS S-XX THROUGH S-XX.

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-SM-SeptageHoldingTank.rvt

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PROJECT NO: 20828
DESIGNED: J.POWELL
CAD COORD: A.COUTURE
CAD: T.SCALIA
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SEPTAGE HOLDING TANK
PLANS AND SECTIONS

DRAWING
S-25

## PROCESS GENERAL NOTES

1. ALL EQUIPMENT AND PIPING LAYOUT DIMENSIONS SHALL BE FIELD VERIFIED AND COORDINATED WITH EQUIPMENT SUPPLIED, AND/OR EXISTING CONDITIONS. SOME INFORMATION ASSOCIATED WITH EXISTING STRUCTURES, PIPING AND EQUIPMENT LOCATIONS, ELEVATIONS AND SIZES, WERE TAKEN FROM THE RECORD DRAWINGS FOR THE TOWN OF NEWPORT NEW HAMPSHIRE SEWAGE TREATMENT PLANT, CONTRACT NO. 1, DATED 1971 (CDM), AS-BUILT DRAWINGS FOR THE WASTEWATER TREATMENT FACILITY EPA PROJECT NO. C-330169-04 DATED 1987 (HOYLER, TANNER & ASSOCIATES, INC.), AND THE BIDDING PROJECT CONTRACT DRAWINGS FOR THE PHOSPHOROUS REMOVAL UPGRADE CWSRF PROJECT NUMBER CS-330169-10 DATED 2012 (AECOM). CONTRACTOR TO NOTE THAT RECORD DRAWINGS WERE NOT DEVELOPED FOR THE 2012 UPGRADE AND THAT BIDDING DOCUMENTS WERE USED FOR REFERENCE. CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AS REQUIRED PRIOR TO BEGINNING CONSTRUCTION OF NEW FACILITIES, EQUIPMENT OR PIPING THAT MAY BE AFFECTED. IN SOME SPECIFIC INSTANCES, WHERE SPECIAL ATTENTION MAY BE REQUIRED BY THE CONTRACTOR, SOME DIMENSIONS, ELEVATIONS, ETC. HAVE BEEN NOTED WITH AN " * ". THIS DOES NOT HOWEVER, LIMIT THE CONTRACTOR'S RESPONSIBILITY TO VERIFY AND COORDINATE ALL NECESSARY INFORMATION FOR CONSTRUCTION.

2. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DIMENSIONS, LAYOUT OR ELEVATION CHANGES REQUIRED TO SUIT THE SPECIFIC EQUIPMENT BEING PROVIDED UNDER THIS CONTRACT. WHEN SUCH EQUIPMENT REQUIRES PADS, PIERS, CURBING, ETC., THAT DIFFERS FROM THAT SHOWN ON THE CONSTRUCTION DRAWINGS, THE CONTRACTOR SHALL COORDINATE THE STEEL REINFORCING SHOP DRAWINGS ACCORDINGLY.

3. ALL BURIED CONNECTIONS TO STRUCTURES SHALL HAVE SLEEVE TYPE FLEXIBLE CONNECTIONS APPROXIMATELY 4-FEET FROM THE STRUCTURES. ALL SLEEVE TYPE COUPLINGS ON PRESSURE LINES SHALL BE RESTRAINED (SOLID SLEEVE TYPE). REFER TO SPECIFICATION SECTION 15088.

4. ALL PIPING INSTALLED BELOW SLABS-ON-GROUND SHALL BE ENCASED IN CONCRETE (EXCLUDING DRAINS/SEWERS UNDER NON-STRUCTURAL SLABS-ON-GROUND AND PVC PIPING), UNLESS OTHERWISE NOTED. PROCESS DRAWINGS DO NOT SHOW CONCRETE ENCASEMENT FOR CLARITY. SEE STRUCTURAL DRAWINGS FOR DETAILS.

5. PROVIDE CAST OR DUCTILE IRON WALL PIPE CASTINGS OR GALVANIZED STEEL PIPE SLEEVES FOR ALL PIPE PENETRATIONS MADE THROUGH CONCRETE WALLS AND SLABS, UNLESS OTHERWISE NOTED ON THE DRAWINGS. ALL WALL SLEEVES AND WALL PIPE CASTINGS SHALL HAVE SEALING/ANCHORING COLLARS. SEE PROCESS, MECHANICAL, PLUMBING AND STRUCTURAL DRAWINGS FOR LOCATIONS OF PENETRATIONS. NOTE THAT NOT ALL PIPE PENETRATIONS ARE SHOWN ON THE STRUCTURAL DRAWINGS. NEW PENETRATIONS THROUGH EXISTING STRUCTURE WALLS AND SLABS SHALL BE BY CORING MACHINE AND LINK TYPE COMPRESSION SEALS, UNLESS OTHERWISE INDICATED. OPENINGS TO BE COMPATIBLE WITH REQUIRED PIPING AND STANDARD LINK TYPE COMPRESSION SEAL SIZES. FOR ADDITIONAL INFORMATION, REFER TO SPECIFICATION SECTION 15092.

6. FOR PIPING MATERIAL, SEE THE PIPE SCHEDULE IN SPECIFICATION SECTION 15050.

7. WHERE 90-DEGREE BENDS ARE USED ON SLUDGE, GRIT, SEPTAGE AND SCUM LINES THEY SHALL BE LONG RADIUS TYPE, EXCEPT WHERE DIMENSIONAL CONSTRAINTS NECESSITATE THE USE OF STANDARD BENDS. THESE EXCEPTIONS SHALL BE SUBJECT TO ENGINEER'S REVIEW AND ACCEPTANCE.

8. ALL LIQUID TYPE FLOW ELEMENTS SHALL BE LOCATED A MINIMUM OF TEN PIPE DIAMETERS DOWNSTREAM AND FIVE DIAMETERS UPSTREAM OF ANY HYDRAULIC DISTURBANCE, EXCEPT IN SITUATIONS WHERE DIMENSIONAL CONSTRAINTS PRECLUDE THESE SEPARATION DISTANCES. IN THESE CASES, THE ENGINEER WILL REVIEW THE LAYOUT AND PROVIDE REVISED MINIMUM SEPARATION DISTANCES.

9. ALL AIR TYPE FLOW ELEMENTS SHALL BE FIELD LOCATED "IN PLANE" (ALIGNED WITH PIPE) WHERE POSSIBLE, UNLESS OTHERWISE INDICATED ON THE DRAWINGS. THE MINIMUM UPSTREAM AND DOWNSTREAM PIPE DIAMETERS SHALL BE AS REQUIRED BY THE METER MANUFACTURER. FOR THOSE EXCEPTIONS WHERE DIMENSIONAL CONSTRAINTS PRECLUDE THESE SEPARATION DISTANCES, THE CONTRACTOR SHALL PROVIDE STRAIGHTENING VANES WHERE REQUIRED BY THE METER MANUFACTURER AND/OR WHERE SHOWN ON THE DRAWINGS, AT NO ADDITIONAL COST TO THE OWNER.

10. ALL BLIND FLANGES ON SCUM, SLUDGE, SEPTAGE AND SUPERNATANT LINES SHALL HAVE A 1-1/2-INCH BALL VALVE AND AN ATTACHMENT FOR FLUSHING WITH PLANT WATER, UNLESS OTHERWISE NOTED. GRIT LINES AND SOME SEPTAGE, SCUM, AND SLUDGE LINES SHALL BE HARD PIPED WITH PLANT WATER FOR FLUSHING, WHERE INDICATED ON THE DRAWINGS. REFER TO SPECIFICATION SECTION 15200.

11. PROVIDE DRIP PANS, WITH CENTRAL COLLECTION POINT AND DRAIN TO FLOOR, FOR ELECTRICAL AND INSTRUMENTATION EQUIPMENT LOCATED BENEATH LIQUID CARRYING PIPES.

12. ALL PROCESS AND PLANT WATER HOSE BIBBS SHALL BE PROVIDED WITH A HOSE RACK AND HOSE, ALONG WITH A SIGN INDICATING "NOT SUITABLE FOR DRINKING". FOR ADDITIONAL HOSE BIBB AND HOSE RACK INFORMATION, SEE SPECIFICATION SECTION 15200 AND DRAWINGS.

13. INSTALL CORPORATION COCKS ON ALL BUILDING AND STRUCTURE INTERIOR PIPING HIGH POINTS TO PREVENT AIR BINDING. CONTRACTOR IS RESPONSIBLE FOR DETERMINING EXACT NUMBER AND LOCATIONS OF THESE CORPORATION COCKS BASED UPON INFORMATION DEPICTED ON DRAWINGS AND ACTUAL FIELD ROUTING OF PIPING. REVIEW LOCATIONS WITH ENGINEER BEFORE INSTALLATION. THESE MANUAL AIR RELEASES SHALL INCLUDE A 1/2-INCH BRASS CORPORATION COCK WITH 1/2-INCH COPPER TUBING ADEQUATELY SUPPORTED, EXTENDING TO A LOCAL AREA DRAIN. ROUTING OF TUBING AND SELECTED DRAIN TO BE REVIEWED WITH, AND ACCEPTED BY, ENGINEER.

14. PIPES 3-INCH IN DIAMETER AND UNDER SHALL HAVE UNIONS INSTALLED ADJACENT TO EQUIPMENT AND TANKS, UNLESS OTHERWISE NOTED ON DRAWINGS. FLANGES ARE ACCEPTABLE ON 3-INCH DIAMETER PIPING.

15. ALL PIPES SHALL BE ADEQUATELY RESTRAINED AND SUPPORTED IN ACCORDANCE WITH SPECIFICATION SECTION 15094.

16. AFTER INSTALLATION, ALL PIPELINES SHALL BE PRESSURE TESTED FOR TIGHTNESS IN ACCORDANCE WITH SPECIFICATION SECTIONS 15050 AND 02755. ALL LEAKS SHALL BE CORRECTED AND RETESTED UNTIL PRESSURE TEST IS SATISFACTORILY COMPLETED.

17. ALL PIPING SHALL BE CLEANED, TO THE SATISFACTION OF THE ENGINEER, BEFORE TESTING.

18. PROVIDE 4-INCH HIGH (MIN.) REINFORCED CONCRETE PAD UNDER ALL EQUIPMENT, CONTROL PANELS, PIPE AND EQUIPMENT SUPPORTS, TANKS, ETC. UNLESS OTHERWISE INDICATED.

19. REFER TO SPECIFICATION SECTION 01070 AND PR-2 FOR A LISTING OF COMMONLY USED ABBREVIATIONS.

20. ALL PLANT WATER AND PROCESS WATER PIPING IN THE DEWATERING ROOM AND ROLL-OFF CONTAINER ROOM, ARE TO BE INSULATED AND PROVIDED WITH A PVC JACKET, IN ADDITION TO OTHER PIPING INSULATION CALLED FOR IN SPECIFICATION SECTION 15180.

21. ALL REDUCERS SHALL BE CONCENTRIC TYPE UNLESS DESIGNATED AS ECCENTRIC (ECC) ON THE DRAWINGS. ECCENTRIC REDUCERS SHALL BE INSTALLED WITH FLAT SIDE UP.

22. FLEXIBLE CONNECTIONS ON AIR LINES ARE TO BE PROVIDED WHERE SHOWN ON THE DRAWINGS; AND AS REQUIRED FOR EXPANSION/CONTRACTION, AS REQUIRED BY THE MANUFACTURER.

23. ALL PENETRATIONS BETWEEN CLASS 1, DIVISION 1 AREAS AND UNCLASSIFIED AREAS SHALL BE GAS TIGHT.

24. WHERE NEW PIPING IS TO BE CONNECTED TO EXISTING PIPING, THE CONTRACTOR SHALL FURNISH, AND INSTALL ADAPTERS, FITTINGS AND ADDITIONAL PIPE AS REQUIRED TO COMPLETE THE INSTALLATION. THE USE OF UNI-FLANGES WILL NOT BE ALLOWED UNLESS INDICATED ON THE DRAWINGS.

25. ALL STAINLESS STEEL FASTENERS FOR PIPING, EQUIPMENT, SUPPORTS, ETC., SHALL BE HAND TIGHTENED IN ORDER TO LIMIT THE POTENTIAL FOR GALLING.

26. CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. THE EXCEPTION IS WHEN SCANNED IMAGES ARE UTILIZED FROM THE PREVIOUS CONSTRUCTION PROJECTS NOTED IN GENERAL NOTE NO. 1, ABOVE. WHEN REVIEWING DRAWINGS NOTED AS "SCANNED" UNDER DRAWING TITLE, THE CONTRACTOR SHALL IGNORE ANY REFERENCE TO PREVIOUS CONTRACT WORK. SCANNED IMAGES ARE NOT TO SCALE; HOWEVER, AN APPROXIMATE SCALE MAY BE GIVEN FOR CONVENIENCE.

27. THE CONTRACT DOCUMENTS INCLUDE A NUMBER OF BID ALTERNATES. REFER TO SPECIFICATION SECTION 01100.

28. VORTEX BREAKER SHALL BE PROVIDED FOR ALL NEW PIPES WHICH ARE 18-INCH DIAMETER OR LARGER, WHERE FLOW EXITS STRUCTURES IN A VERTICAL (DOWNWARD) DIRECTION AND/OR WHERE SHOWN ON THE DRAWINGS. REFER TO STRUCTURAL DRAWINGS FOR DETAILS. MATERIALS OF CONSTRUCTION SHALL BE ALUMINUM UNLESS OTHERWISE INDICATED ON THE DRAWINGS.

29. PRESSURE SAFETY/RELIEF VALVES UTILIZED IN CONCRETE STRUCTURES TO AVOID FLOATATION ARE SPECIFIED IN SPECIFICATION SECTION 03300, UNLESS OTHERWISE INDICATED.

30. CONTRACTOR SHALL COORDINATE INSTRUMENTATION MOUNTING DETAILS WITH THE INSTRUMENTATION SUPPLIER AND THE ELECTRICAL CONTRACTOR. REFER TO DETAILS ON THE INSTRUMENTATION DRAWINGS, AND/OR EQUIPMENT MANUFACTURER MOUNT DETAILS AND REQUIREMENTS.

31. ALL FIXED WEIRS MUST BE LEVELED TO WITHIN 0.005-FEET OF THE ELEVATIONS INDICATED ON THE DRAWINGS. CONTRACTOR SHALL SURVEY THE WEIRS TO CONFIRM LEVEL TOLERANCES ALONG THE ENTIRE WEIR LENGTH AT INTERVALS NO GREATER THAN 5-FEET. CONTRACTOR SHALL CONFIRM THE LEVEL TOLERANCE BY FILLING THE STRUCTURE WITH WATER TO THE LEVEL OF THE WEIR. WEIRS WHICH DO NOT MEET TOLERANCE SHALL BE ADJUSTED AT NO ADDITIONAL COST TO THE OWNER.

32. ALL CHECK VALVES SHALL BE SWING TYPE CHECK VALVES UNLESS SPECIFICALLY CALLED OUT ON THE DRAWINGS.

33. PHOTO TAGS, AS SHOWN ON THE PLAN, INDICATE THE LOCATION AND DIRECTION FROM WHICH THE PHOTO WAS TAKEN.

34. ALL LUBRICATION FITTINGS SHALL BE BROUGHT TO LOCATIONS THAT ARE READILY ACCESSIBLE TO OPERATORS. REFER TO SPECIFICATION SECTION 11000 FOR ADDITIONAL REQUIREMENTS.

35. DO NOT SCALE DISTANCES OR DIMENSIONS FROM THE DRAWINGS. WRITTEN DIMENSIONS SHALL PREVAIL. REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER.

## PROCESS GENERAL NOTES (CONTINUED)

36. THREE-DIMENSIONAL MODELS INTENDED TO SUPPLEMENT VISUALIZING DESIGN INTENT. IN THE EVENT OF DISCREPANCIES OR DIFFERENCES, DIMENSIONS AND DETAILS SHOWN IN THE TWO-DIMENSIONAL ORTHOGRAPHIC DRAWINGS SHALL SUPERSEDE THOSE SHOWN OR INTERPRETED FROM THE THREE-DIMENSIONAL MODELS/PERSPECTIVES PROVIDED.

37. IT IS IMPORTANT TO NOTE THAT THESE MODELS HAVE BEEN DEVELOPED USING A 3D PIPING PACKAGE. IN ORDER TO PRESERVE THE 2D DESIGN MODEL, IN MANY INSTANCES THE SYMBOLS DEPICTING VALVES AND EQUIPMENT DO NOT NECESSARILY PORTRAY THE ACTUAL EQUIPMENT SPECIFIED IN THE SPECIFICATIONS. MOST NOTABLY, FOR INSTANCES, WOULD BE THE VALVE OPERATORS AND THE DESIRED ORIENTATION. THE SPECIFICATIONS WILL PREVAIL AND THE VALVES SHOWN WITHIN THE DRAWING SET SHOULD BE CONSIDERED PURELY SYMBOLIC.

## GENERAL DEMOLITION NOTES

1. REFER TO INDIVIDUAL DRAWINGS FOR SPECIFIC DEMOLITION NOTES.

2. ———— INDICATES EXISTING PIPING/EQUIPMENT TO REMAIN FOR RE-USE.
   ════ INDICATES EXISTING PIPING/EQUIPMENT TO BE DEMOLISHED.
   -/-/-/-/- INDICATES EXISTING PIPING/EQUIPMENT TO BE RELOCATED.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL AND DISPOSAL OF ALL DEMOLISHED PIPING, EQUIPMENT AND MATERIALS. THE OWNER RESERVES THE RIGHT TO RETAIN PIPING, EQUIPMENT AND/OR MATERIALS ON SITE FOR THEIR USE AS SPECIFIED IN SPECIFICATION SECTION 02050. SUCH MATERIAL TO BE RETAINED SHALL BE PLACED IN AN ON-SITE STORAGE AREA, REVIEWED/COORDINATED WITH, AND ACCEPTABLE TO THE OWNER AND ENGINEER. RETAINED EQUIPMENT SHALL BE REMOVED IN SUCH A WAY AS NECESSARY TO MAINTAIN ITS FUNCTIONAL AND PHYSICAL INTEGRITY.

4. THE CONTRACTOR SHALL KEEP A RECORD OF DEMOLITION AND LOCATION OF UTILITIES FOUND AS PART OF THE PROJECT RECORD DOCUMENTS, AS SPECIFIED IN SPECIFICATION SECTION 01720.

5. REFER TO THE DEMOLITION SPECIFICATION SECTION 02050, SUMMARY OF WORK SPECIFICATION SECTION 01010, AND SITE DEMOLITION DRAWING C-__ FOR ADDITIONAL INFORMATION REGARDING DEMOLITION REQUIREMENTS AND CONSTRUCTION SEQUENCING.

6. REFER TO DRAWING C-___ FOR ADDITIONAL INFORMATION REGARDING EXISTING UTILITIES. THE SIZES, LOCATIONS, AND MATERIALS OF CONSTRUCTION INDICATED ARE FROM THE BEST AVAILABLE INFORMATION AND MAY NOT BE COMPLETE OR ACCURATE. ALL SIZES, LOCATIONS, AND MATERIALS OF CONSTRUCTION SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD AS REQUIRED. ALL EXISTING UTILITIES THAT ARE TO REMAIN, AND ARE DAMAGED BY THE CONTRACTORS ACTIVITIES, SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

7. SEVERING THE EXISTING UTILITIES FOR ABANDONMENT, OR REMOVAL OF A SEGMENT FROM SERVICE, SHALL BE PERFORMED IN SUCH A MANNER AS TO ALLOW THE REMAINING ACTIVE SEGMENT TO CONTINUE IN ITS INTENDED SERVICE. CAP ACTIVE SEGMENTS WITH APPROPRIATE FITTING, JOINT RESTRAINT, ETC. TO ENSURE THEIR INTEGRITY. THE METHOD OF CAPPING SHALL BE REVIEWED WITH, AND ACCEPTABLE TO, THE ENGINEER.

8. ALL PIPING, EQUIPMENT AND MATERIALS TO BE DEMOLISHED AND/OR REMOVED FROM SERVICE MUST BE COORDINATED WITH THE OWNER AND ENGINEER BEFOREHAND.

9. THE CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO ENSURE THAT ALL FLOWS, FLOW METERING AND LEVEL CONTROLS ARE MAINTAINED DURING CONSTRUCTION. GRAVITY, PUMPED BYPASSES OR OTHER MEANS OF FLOW MAINTENANCE SHALL BE REVIEWED WITH, AND ACCEPTABLE TO, THE ENGINEER. THE CONTRACTOR SHALL COORDINATE ANY TEMPORARY STOPPAGES WITH THE OWNER AND ENGINEER. CONTRACTOR SHALL VERIFY WITH OWNER/ENGINEER ALL VALVES, GATES, EQUIPMENT, ETC., ARE FUNCTIONAL PRIOR TO ASSUMING UTILIZATION FOR FLOW ISOLATION.

10. WHERE PIPING OR CONDUIT THAT IS TO BE REMOVED PASSES THROUGH THE WALL OF THE STRUCTURE, IT SHALL BE CUT OFF AS NEAR TO THE WALL AS PRACTICAL AND PROPERLY SEALED ON EACH SIDE OF THE WALL, OR AS SHOWN ON THE DRAWINGS. SEAL METHOD SHALL BE SUBJECT TO REVIEW AND ACCEPTANCE OF THE ENGINEER.

11. ALL WALL AND/OR FLOOR PENETRATIONS REMAINING AFTER THE REMOVAL OF PIPING OR CONDUIT ARE TO BE PATCHED AND FINISHED FLUSH TO MATCH EXISTING SURFACES.

12. REMOVE ALL PUMP AND EQUIPMENT PADS NOT BEING RE-USED AND FINISH FLUSH TO FLOOR LEVEL.

13. REMOVE ALL WALL BRACKETS, PIPE HANGERS AND PIPE SUPPORTS NOT BEING RE-USED. PATCH BOLT HOLES TO MATCH THE EXISTING SURFACE.

14. ALL WALL AND FLOOR SURFACES DAMAGED OR DISTURBED AS A RESULT OF DEMOLITION BY THE CONTRACTOR OR ITS SUB-CONTRACTORS, SHALL BE PATCHED AND PAINTED PER SPECIFICATION SECTION 09900.

15. WHERE PIPING AND/OR EQUIPMENT THAT IS NOTED AS ABANDONED INTERFERES WITH THE CONTRACTOR'S CONSTRUCTION ACTIVITIES, CONTRACTOR SHALL REMOVE AND DISPOSE OF AS NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

16. ALL ANCHOR BOLTS TO BE REMOVED SHALL BE CUT/MELTED TO A MINIMUM OF 3/4-INCH BELOW EXISTING CONCRETE OR MASONRY SURFACES AND PATCHED/FILLED FLUSH TO SURFACE WITH NON-SHRINK GROUT.

## GENERAL CHEMICAL SCHEMATIC NOTES

1. REFER TO PROCESS GENERAL NOTES ON THIS DRAWING FOR ADDITIONAL REQUIREMENTS.

2. CONTRACTOR SHALL FIELD LOCATE/ROUTE ALL PIPING, EQUIPMENT AND APPURTENANCES AS REQUIRED TO ENSURE A FULLY FUNCTIONAL AND INTEGRATED CHEMICAL FEED SYSTEM AS SPECIFIED. CONTRACTOR MUST REVIEW THE PROPOSED CHEMICAL FEED SYSTEM LAYOUT WITH THE ENGINEER AND OWNER IN THE FIELD PRIOR TO INSTALLATION.

3. CONTRACTOR SHALL COORDINATE TUBING SIZES AS REQUIRED FOR CONNECTIONS TO PUMPS AND ANALYZERS. PROVIDE REDUCERS, FITTINGS AND OTHER APPURTENANCES AS REQUIRED, AT NO ADDITIONAL COST TO THE OWNER.

4. PROVIDE PUMP SUCTION AND DISCHARGE PULSATION DAMPENERS WHERE REQUIRED BY THE EQUIPMENT MANUFACTURER, AND WHEN SPECIFIED OR SHOWN ON THE DRAWINGS.

5. CHEMICAL FEED PIPING SHALL BE INSTALLED IN SUCH A WAY AS TO ALLOW EQUIPMENT ACCESS AND SPACE FOR MAINTENANCE. PROVIDE PIPE GUARDS TO PROTECT PIPING FROM PHYSICAL DAMAGE WHERE, IN THE OPINION OF THE ENGINEER, THE POTENTIAL FOR DAMAGE EXISTS. PROTECTION SYSTEM SHALL BE CORROSION RESISTANT.

6. THE SYSTEM SCHEMATICS DO NOT SHOW ALL UNIONS. HOWEVER, CONTRACTOR IS RESPONSIBLE FOR PROVIDING SUFFICIENT UNIONS TO PERMIT THE REMOVAL OF EQUIPMENT, VALVES AND OTHER SYSTEM APPURTENANCES FOR MAINTENANCE.

7. FIELD LOCATE CALIBRATION COLUMN SUCH THAT TOP OF COLUMN ELEVATION IS NO HIGHER THAN LIQUID LEVEL IN THE STORAGE TANKS WHEN HALF FULL.

8. ALL BURIED CHEMICAL PIPING SHALL BE DOUBLE CONTAINMENT PIPE. SEE SPECIFICATION SECTION 15050.

9. REFER TO INSTRUMENTATION DRAWING I-1 FOR INSTRUMENTATION ABBREVIATIONS, LEGEND AND NOTES AND OTHER ADDITIONAL REQUIREMENTS.

10. PROVIDE CHEMICAL NAME PLATE IDENTIFICATION ON ALL FILL LINES AS SPECIFIED AND AS SHOWN ON THE DRAWINGS.

11. PROVIDE BACK PRESSURE VALVES AT DISCHARGE LOCATIONS WHERE NECESSARY TO POSITIVELY STOP CHEMICAL FLOW WHEN PUMPS STOP.

## GENERAL CHEMICAL PLAN/SECTION NOTES:

1. NOT ALL PIPES, VALVES AND FITTINGS AND CHEMICAL SYSTEM APPURTENANCES ARE SHOWN FOR CLARITY. SHOWN ARE THE GENERAL EQUIPMENT AND TANKAGE LOCATIONS. CONTRACTOR SHALL FIELD LOCATE/ROUTE ALL PIPING, EQUIPMENT AND APPURTENANCES AS REQUIRED TO ENSURE A FULLY FUNCTIONAL AND INTEGRATED CHEMICAL FEED SYSTEM AS SPECIFIED. CONTRACTOR MUST REVIEW THE PROPOSED CHEMICAL FEED SYSTEM LAYOUT WITH THE ENGINEER AND OWNER IN THE FIELD PRIOR TO INSTALLATION. FOR ADDITIONAL INFORMATION, REFER TO THE CHEMICAL SYSTEM SCHEMATICS AND SPECIFICATIONS.

2. THE DISCHARGE OF EACH PUMP SHALL BE PROVIDED WITH AN FRP UNITSTRUT SUPPORT TO FACILITATE SUPPORT AND/OR MOUNTING OF THE PRESSURE RELIEF VALVE, BALL VALVES, QUICK DISCONNECT CAMLOCK AND CAP, PULSATION DAMPENERS AND OTHER APPURTENANCES AS INDICATED ON THE DRAWINGS. CONFIGURATION SHALL BE REVIEWED WITH THE ENGINEER IN THE FIELD, PRIOR TO BEGINNING INSTALLATION.

3. CONTRACTOR TO PROVIDE DRAIN FROM THE CHEMICAL PUMPS DISCHARGE PIPING AND SLOPE CONTINUOUSLY TO FLOOR DRAIN OR SUMP. REFER TO CHEMICAL FEED SCHEMATIC.

4. ALL CHEMICAL TANKS SHALL BE RESTRAINED TO PREVENT OVERTURNING. REFER TO SPECIFICATION SECTION [11236/XXXX] AND STRUCTURAL DRAWINGS.

5. TANK PAD SHALL BE CONSTRUCTED IN SUCH A WAY AS TO PROVIDE A MINIMUM OF 4-INCHES OF THICKNESS ABOVE ADJACENT CONCRETE FILL AT THE OUTLET POINT OF THE TANK. REFER TO STRUCTURAL DRAWINGS.

6. CONTRACTOR SHALL INSTALL THE VENT FROM THE CHEMICAL SYSTEM THROUGH ROOF WALL OR AS INDICATED ON THE DRAWINGS.

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

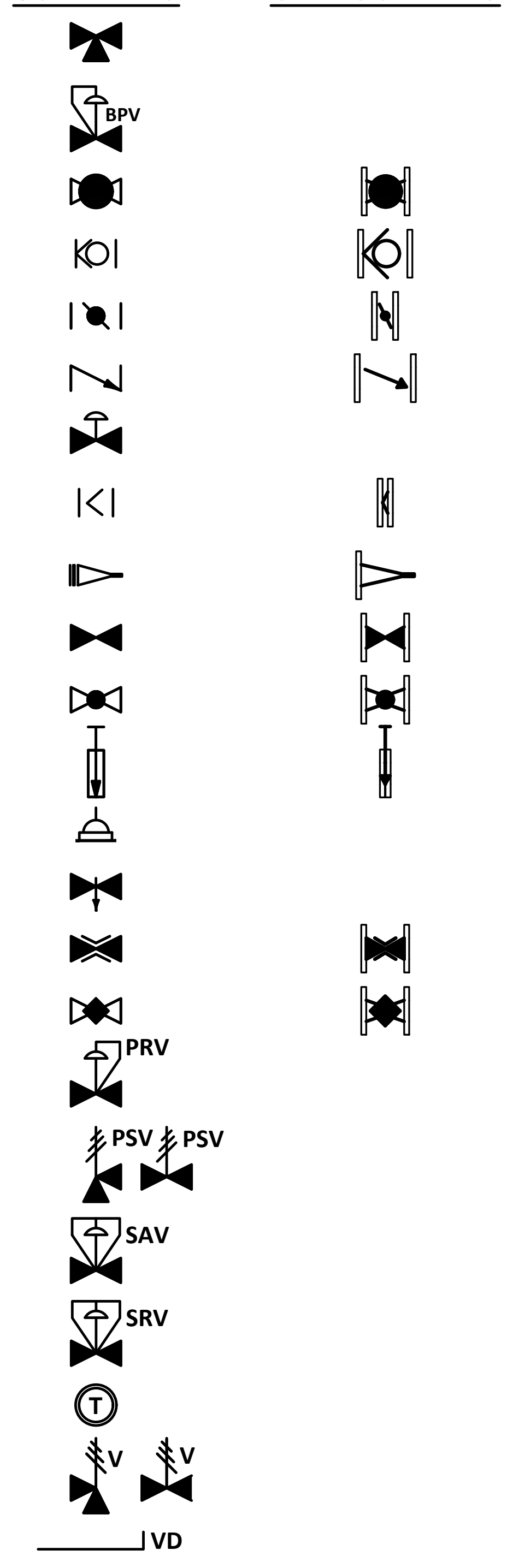
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS GENERAL NOTES

DRAWING
PR-1

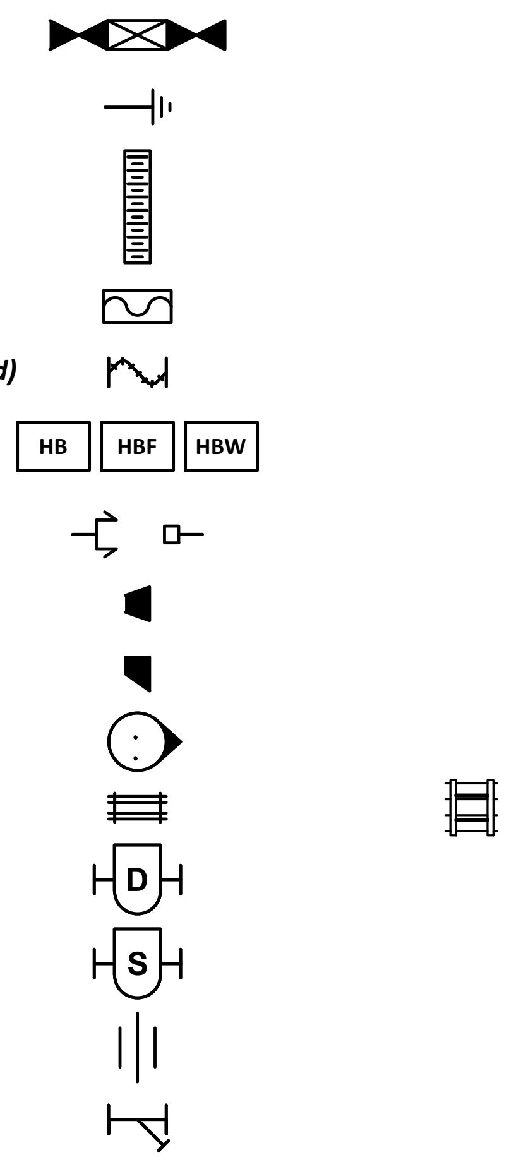
## VALVES

**SCHEMATIC** **ORTHOGRAPHIC**



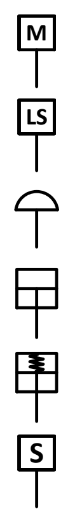
- 3-WAY VALVE
- BACKPRESSURE VALVE (BPV)
- BALL VALVE (BV)
- BALL CHECK VALVE (BCV)
- BUTTERFLY VALVE (BFV)
- CHECK VALVE (CKV)
- DIAPHRAGM VALVE (DFV)
- DOUBLE DISC CHECK VALVE (DDCV)
- DUCK-BILL TYPE CHECK VALVE (DCKV)
- GATE VALVE (GV)
- GLOBE VALVE (GBV)
- KNIFE GATE VALVE (KV)
- MUD VALVE (MDV)
- NEEDLE VALVE (NV)
- PINCH VALVE (PCHV)
- PLUG VALVE (PV)
- PRESSURE REDUCING VALVE (PRV)
- PRESSURE SAFETY (RELIEF) VALVE (PSV)
- SURGE ANTICIPATION VALVE (SAV)
- SURGE RELIEF VALVE (SRV)
- TELESCOPING VALVE (TELV)
- VACUUM RELIEF VALVE (VRV)
- VOLUME DAMPER (VD)

## FITTINGS/APPURTENANCES



- BACKFLOW PREVENTER (RPZ)
- BARBED FITTING
- CALIBRATION COLUMN
- DIAPHRAGM SEAL
- EXPANSION JOINT *(air or liquid)*
- HOSE BIBB (HB, HBF, OR HBW)
- QUICK DISCONNECT
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- ROTAMETER
- SLEEVE COUPLING
- STRAINER (DUPLEX)
- STRAINER (SIMPLEX)
- UNION
- WYE STRAINER

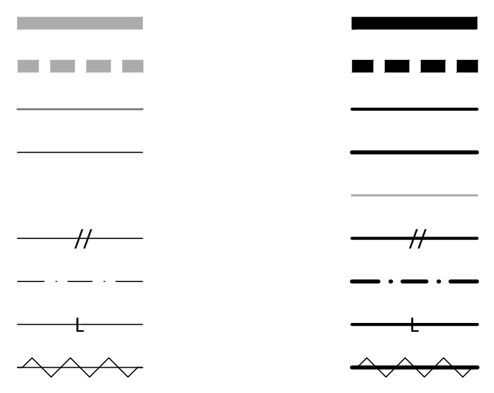
## ACTUATORS



- CONTROL ACTUATOR
- LIMIT SWITCH
- PNEUMATIC DIAPHRAGM ACTUATOR
- PNEUMATIC/HYDRAULIC CYLINDER
- PNEUMATIC/HYDRAULIC CYLINDER (spring return)
- SOLENOID ACTUATOR

## LINETYPES

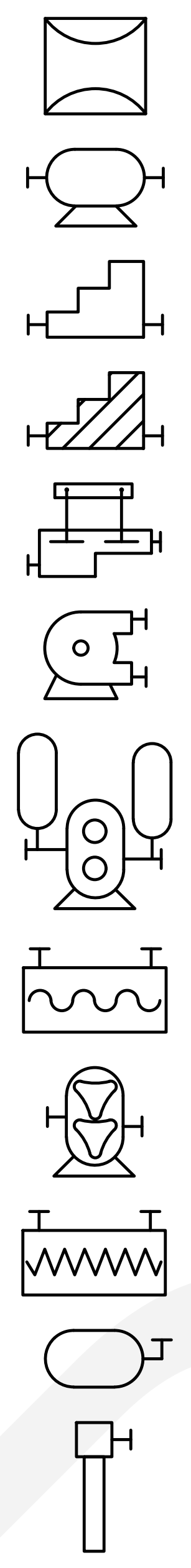
**EXISTING** **NEW**



- MAIN PROCESS FLOW PATH
- STORAGE/BYPASS FLOW
- STRUCTURES
- EQUIPMENT/PIPING
- FUTURE EQUIPMENT/PIPING
- AIR - COMPRESSED
- AIR - LOW PRESSURE
- HYDRAULIC
- HEAT TRACE/INSUL/JACKETING

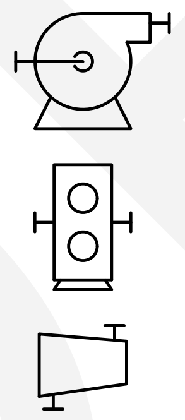
## EQUIPMENT

### SCHEMATIC PUMPS



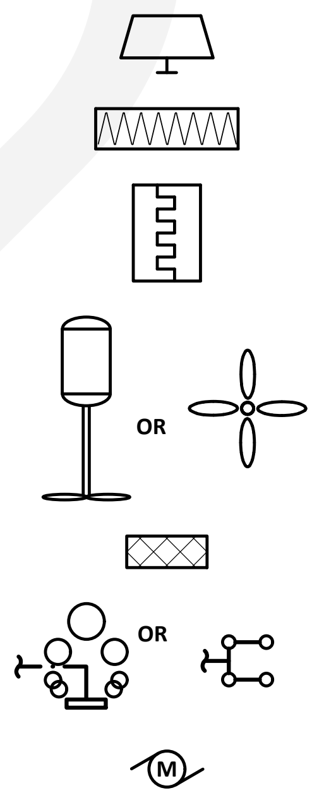
- AIR DIAPHRAGM PUMP
- CENTRIFUGAL PUMP
- CHEMICAL METERING PUMP
- CHEMICAL TRANSFER PUMP
- DOUBLE DISK PUMP
- HOSE PUMP
- PLUNGER PUMP
- PROGRESSIVE CAVITY PUMP
- ROTARY LOBE PUMP
- SCREW PUMP
- SUBMERSIBLE PUMP
- VERTICAL TURBINE PUMP

### SCHEMATIC BLOWERS



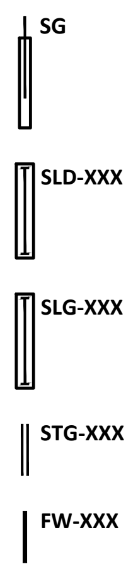
- BLOWER - CENTRIFUGAL
- BLOWER - POSITIVE DISPLACEMENT
- COMPRESSOR

### SCHEMATIC MISCELLANEOUS



- AIR INTAKE FILTER
- CONVEYOR - SCREW
- GRINDER
- MIXER
- MIXER - INLINE STATIC
- MIXING - COMPRESSED AIR
- MOTOR

### SCHEMATIC GATES

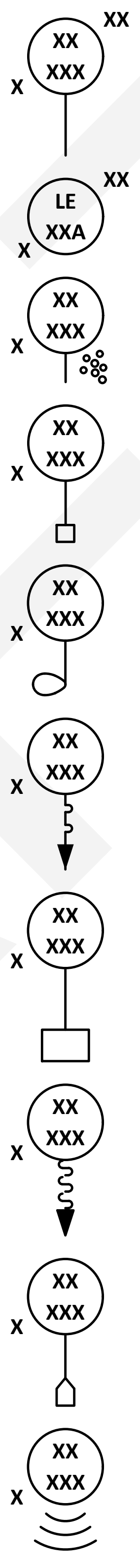


- SHEAR GATE
- SLIDE GATE
- SLUICE GATE
- STOP GATE
- WEIR *(straight, compound, or "v-notch weir)*

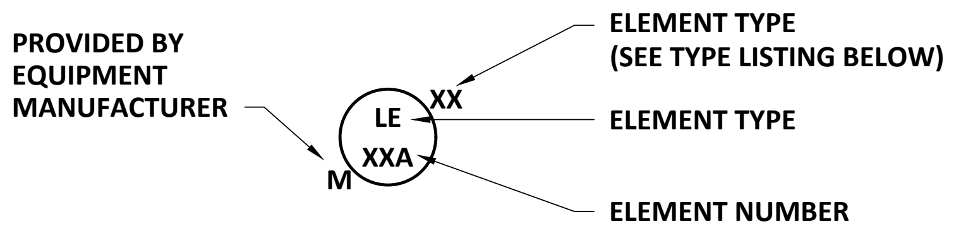
## FIELD INSTRUMENTS

FOR ADDITIONAL INFORMATION REFER TO INSTRUMENTATION DWG I-1

### INSTRUMENTS



- FIELD PIPE MOUNTED DEVICE
- FIELD MOUNTED DEVICE
- BUBBLE LIQUID ELEMENT
- CAPACITANCE OR ADMITTANCE TYPE PROBE
- FLOAT SWITCH
- GUIDED WAVE RADAR
- PADDLE OR LEVER TYPE PROBE
- RADAR LEVEL TRANSDUCER
- SUBMERSIBLE PRESSURE TRANSDUCER
- ULTRASONIC LEVEL TRANSDUCER

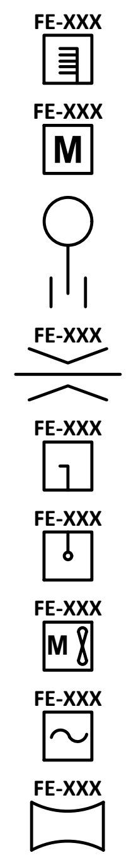


## TYPICAL INSTRUMENTATION SYMBOL DESCRIPTION

**TYPE LIST IDENTIFICATION**

| | |
|---|---|
| DO | DISSOLVED OXYGEN PROBE |
| NH3 | AMMONIA PROBE |
| NO2 | NITRITE PROBE |
| NO3 | NITRATE PROBE |
| P | PHOSPHORUS PROBE |
| PC | PULL CHORD |
| PH | pH |
| TSS | TOTAL SUSPENDED SOLIDS PROBE |

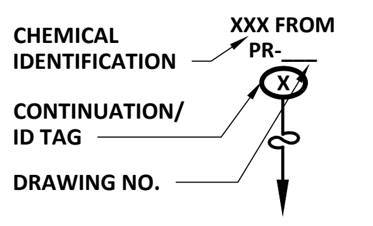
### SCHEMATIC FLOW METER



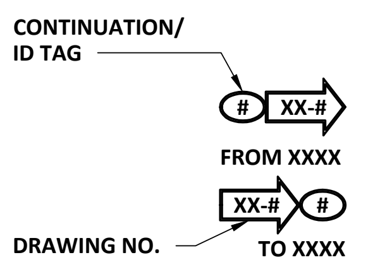
- AVERAGING PITOT FLOW METER
- MAGNETIC FLOW METER
- ORIFICE PLATE
- PARSHALL FLUME
- PITOT FLOW METER
- THERMAL MASS FLOW METER
- TURBINE FLOW METER
- ULTRASONIC FLOW METER
- VENTURI FLOW METER

## FLOW/CONTINUATION SYMBOLS

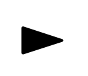
CHEMICAL INJECTION



TO/FROM IN-CONTRACT PIPE OR PROCESS



FLOW ARROW



TO/FROM OUT-OF-CONTRACT PIPE OR PROCESS

## PROCESS ABBREVIATIONS - GENERAL

| | |
|---|---|
| AE | ANALYZING ELEMENT |
| AL | ALUMINUM |
| ALT | ALTERNATE |
| BF | BLIND FLANGE |
| BLDG | BUILDING |
| BOT | BOTTOM |
| CAR | CARRIER PIPE |
| CI | CAST IRON |
| CIP | CLEAN-IN-PLACE |
| CO | CLEANOUT |
| CON | CONTAINMENT PIPE |
| CONC | CONCRETE |
| CONT | CONTINUED |
| CPL | COUPLING |
| DET | DETAIL |
| DI | DUCTILE IRON |
| DIA (Ø) | DIAMETER |
| DIM | DIMENSION |
| DMH | DRAIN MANHOLE |
| DN | DOWN |
| DWG | DRAWING |
| ECC | ECCENTRIC |
| EL (ELEV) | ELEVATION |
| ELL | ELBOW |
| EQUIP | EQUIPMENT |
| EXIST (EX) | EXISTING |
| EXP | EXPANSION |
| FC | FLUSHING CONNECTION |
| FD | FLOOR DRAIN |
| FE | FLOW ELEMENT |
| FFE | FINISHED FLOOR ELEVATION |
| FLG | FLANGE |
| FLR | FLOOR |
| FOT | FLAT ON TOP |
| FP | FIRE PROTECTION |
| FPHB | FROST PROOF HOSE BIBB |
| FRP | FIBERGLASS REINFORCED PLASTIC |
| FS | FLOW SWITCH |
| FW | FIXED WEIR (WW) |
| GA | GAUGE |
| GAC | GRANULAR ACTIVATED CARBON |
| GAL | GALLON |
| GALV | GALVANIZED |
| GR | GREASE |
| HB | HOSE BIBB |
| HBF | HOSE BIBB FLUSHING |
| HBW | HOSE BIBB WASHDOWN |
| HDPE | HIGH DENSITY POLYETHYLENE |
| HP | HIGH POINT |
| HYD | HYDRANT |
| ID | INSIDE DIAMETER |
| INL | INLET |
| INV | INVERT |
| JT | JOINT |
| LE | LEVEL ELEMENT |
| LR | LONG RADIUS |
| MAX | MAXIMUM |
| MECH | MECHANICAL |
| MFG | MANUFACTURER |
| MH | MANHOLE |
| MIN | MINIMUM |
| MJ | MECHANICAL JOINT |
| MTD | MOUNTED |
| NIC | NOT IN CONTRACT |
| NO | NUMBER |
| NPT | NATIONAL PIPE THREAD |
| NTS | NOT TO SCALE |
| NV | NEEDLE VALVE |
| OC | ON CENTER |
| OD | OUTSIDE DIAMETER |
| OCD | ODOR CONTROL DUCT |
| OH | OVERHEAD |
| OUT | OUTLET |
| PAC | POWDER ACTIVATED CARBON |
| PCCP | PRESTRESSED CONCRETE CYLINDER PIPE |
| PE | POLYETHYLENE OR PRESSURE ELEMENT |
| PP | POLYPROPYLENE |
| PS | PRESSURE SWITCH |
| PVC | POLYVINYL CHLORIDE |
| RCP | REINFORCED CONCRETE PIPE |
| RED | REDUCER |
| RES | RESIDUALS |
| REQ'D | REQUIRED |
| RD | ROOF DRAIN/ROOF DRAINAGE PIPING |
| SAM | SAMPLE LINE |
| SCH | SCHEDULE |
| SECT | SECTION |
| SHT | SHEET |
| SMH | SANITARY SEWER MANHOLE |
| SP | SUMP PUMP |
| SPD | SUMP PUMP DISCHARGE |
| SQ | SQUARE |
| SS | STAINLESS STEEL |
| STD | STANDARD |
| STL | STEEL |
| THK | THICKNESS |
| TK | TANK |
| TYP | TYPICAL |
| UV | ULTRAVIOLET |
| VERT | VERTICAL |
| WSE | WATER SURFACE ELEVATION |
| XP | EXPLOSION PROOF |
| YH | YARD HYDRANT |

## PROCESS ABBREVIATIONS - FLUID

| | |
|---|---|
| A | AIR (LOW PRESSURE) |
| AC | AIR (COMPRESSED) |
| AI | AIR (INSTRUMENT/PNEUMATIC) |
| ALUM | ALUMINUM SULFATE |
| AM | AMMONIA SOLUTION |
| ATE | AERATION TANK EFFLUENT |
| ATI | AERATION TANK INFLUENT |
| BIS | SODIUM BISULFITE |
| BSL | BLENDED SLUDGE |
| BW | BACKWASH |
| CEN | CENTRATE |
| DCT | DECANT |
| DEF | DEFOAMER |
| DPOL | DILUTED POLYMER |
| DR | DRAIN |
| DSL | DEWATERING SLUDGE |
| EFF | EFFLUENT (FINAL) |
| EFW | EFFLUENT FLUSHING WATER |
| EQE | EQUALIZATION EFFLUENT |
| EQI | EQUALIZATION INFLUENT |
| ETE | EQUALIZATION TANK EFFLUENT |
| FE | FILTERED EFFLUENT |
| FECL | FERRIC CHLORIDE |
| FES | FINAL EFFLUENT SAMPLE |
| FIL | FILTRATE |
| FM | FORCE MAIN |
| FSW | FOAM SPRAY WATER |
| FTW | FILTER TO WASTE |
| FW | FINISH WATER (W) |
| G | GAS |
| GCE | GRIT CHAMBER EFFLUENT |
| GCES | GRIT CHAMBER EFFLUENT SAMPLE |
| GT | GRIT |
| HW | HOT WATER |
| HYP | SODIUM HYPOCHLORITE |
| INF | INFLUENT |
| ISS | INFLUENT SEWAGE SAMPLE |
| JW | JACKET WATER |
| LSL | LAGOON SLUDGE |
| LT | LAGOON TRANSFER |
| NG | NATURAL GAS |
| OFL | OVERFLOW |
| PACL | POLY-ALUMINUM CHLORIDE |
| PHOS | PHOSPHATE |
| POL | POLYMER (NEAT) |
| PRW | PROCESS WATER (NON-POTABLE WATER) |
| PTE | PRELIMINARY TREATMENT EFFLUENT |
| PW | PLANT WATER |
| REC | RECYCLE |
| S | SEWER |
| SA | SODIUM ALUMINATE |
| SAN | SANITARY WASTE |
| SBRE | SEQUENCE BATCH REACTOR EFFLUENT |
| SBRI | SEQUENCE BATCH REACTOR INFLUENT |
| SBW | SPENT BACKWASH |
| SC | SCUM |
| SCD | SCUM DECANT |
| SCS | SCUM SAMPLE |
| SD | STORM DRAIN |
| SEP | SEPTAGE |
| SL | SLUDGE |
| SPD | SUMP PUMP DISCHARGE |
| SW | SEAL WATER |
| TBW | TERTIARY BACKWASH |
| TE | TERTIARY EFFLUENT |
| TI | TERTIARY INFLUENT |
| TSL | TERTIARY SLUDGE |
| TW | TEMPERED WATER |
| UD | UNDERDRAIN |
| V | VENT |
| W | WATER - POTABLE |
| WSL | WASTE SLUDGE |
| WSS | WASTE SLUDGE SAMPLE |

## PROCESS ABBREVIATIONS - ACTUATING CONTROL VALVES

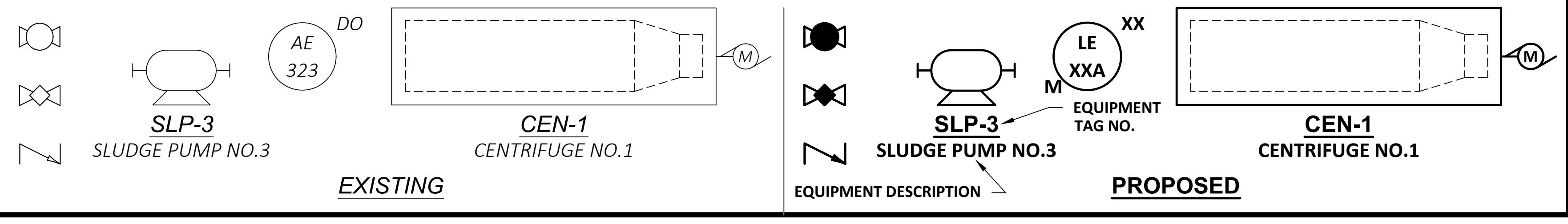
| | |
|---|---|
| ACV | ANALYSIS CONTROL VALVE |
| FCV | FLOW CONTROL VALVE |
| LCV | LEVEL CONTROL VALVE |
| MOG | MOTOR OPERATED GATE |
| MOV | MOTOR OPERATED VALVE |
| PCV | PRESSURE CONTROL VALVE |
| TCV | TEMPERATURE CONTROL VALVE |
| SV | SOLENOID VALVE |

## PROCESS ABBREVIATIONS - EQUIPMENT/STRUCTURES/TANKAGE

| | |
|---|---|
| ***T | *** CHEMICAL TANK |
| AS-X | AUTOMATIC SAMPLER NO.__ |
| ATB-# | AERATION TANK BLOWER NO.__ |
| BP-# | BOOSTER PUMP NO.__ |
| BWP-# | BACKWASH PUMP NO.__ |
| CA-# | COMPRESSOR-AIR (HIGH PRESSURE) NO.__ |
| CEN-# | CENTRIFUGE NO.__ |
| CENP-# | CENTRATE PUMP NO.__ |
| CG-# | COMPRESSOR-GAS (HIGH PRESSURE) NO.__ |
| COM-# | COAGULATION TANK MIXER NO.__ |
| DBA-# | DIFFUSED BUBBLE AERATION (LOWRY-TYPE, TANK) NO.__ |
| DEC-# | DECANTER NO.__ |
| DPMX-# | DILUTE POLYMER MIXER NO.__ |
| DPOLP-# | DILUTE POLYMER PUMP NO.__ |
| DPOLT-# | DILUTE POLYMER TANK NO.__ |
| DSLG-# | DEWATERING SLUDGE GRINDER NO.__ |
| DSLP-# | DEWATERING SLUDGE PUMP NO.__ |
| EEQP-# | EFFLUENT EQUALIZATION PUMP NO.__ |
| FECLP-# | FERRIC CHLORIDE PUMP NO.__ |
| FIL-# | FILTER NO.__ |
| FILP-# | FILTRATE PUMP NO.__ |
| FLM-# | FLOC MIXER NO.__ |
| FSWP-# | FOAM SPRAY WATER NO.__ |
| GSC-# | GRIT SCREW CONVEYOR NO.__ |
| GTB-# | GRIT TANK BLOWER NO.__ |
| GTC-# | GRIT CLASSIFIER NO.__ |
| GTCY-# | GRIT CYCLONE NO.__ |
| GTMX-# | GRIT MIXER (VORTEX UNIT) NO.__ |
| GTP-# | GRIT PUMP NO.__ |
| GTR-# | GRAVITY THICKENER MECHANISM/DRIVE NO.__ |
| GTW-# | GRIT WASHER NO.__ |
| HYDT-# | HYDROPNEUMATIC TANK NO.__ |
| HYPP-# | SODIUM HYPOCHLORITE PUMP NO.__ |
| HYPT-# | SODIUM HYPOCHLORITE TANK NO.__ |
| IEQP-# | INFLUENT EQUALIZATION PUMP NO.__ |
| INFG-# | INFLUENT GRINDER NO.__ |
| INFP-# | INFLUENT PUMP NO.__ |
| LB-# | LAGOON BLOWER NO.__ |
| LEP-# | LAGOON EQUALIZATION PUMP NO.__ |
| LSP-# | LAGOON SLUDGE PUMP NO.__ |
| OCF-# | ODOR CONTROL FAN NO.__ |
| OCRP-# | ODOR CONTROL RECIRCULATION PUMP NO.__ |
| OCS-# | ODOR CONTROL SYSTEM NO.__ |
| PACLP-# | POLYALUMINUM CHLORIDE PUMP NO.__ |
| PACP-# | POWDERED ACTIVATED CARBON PUMP NO.__ |
| PBU-# | POLYMER BLENDING UNIT NO.__ |
| POLP-# | POLYMER (NEAT) PUMP NO.__ |
| POLT-# | POLYMER (NEAT) TANK NO.__ |
| PSLG-# | PRIMARY SLUDGE GRINDER NO.__ |
| PSP-# | PUMP STATION NO.__ |
| PTMX-# | POLYMER TOTE MIXER NO.__ |
| PTP-# | PROCESS TRANSFER PUMP NO.__ |
| PWP-# | PLANT WATER PUMP NO.__ |
| RMM-# | RAPID MIX TANK MIXER |
| SAP-# | SODIUM ALUMINATE PUMP NO.__ |
| SBR-# | SEQUENCE BATCH REACTOR NO.__ |
| SC-# | SCREW CONVEYOR (NON-SLUDGE) NO.__ |
| SCFP-# | SCUM FINAL PUMP NO.__ |
| SCR-# | MECHANICAL SCREEN NO.__ |
| SCSP-# | SCUM SECONDARY PUMP NO.__ |
| SEPB-# | SEPTAGE TANK BLOWER NO.__ |
| SEPP-# | SEPTAGE PUMP NO.__ |
| SLBC-# | SLUDGE BELT CONVEYOR NO.__ |
| SLC-# | SLUDGE COLLECTOR NO.__ |
| SLG-# | SLUDGE GRINDER NO.__ |
| SLP-# | SLUDGE PUMP NO.__ |
| SLSC-# | SLUDGE SCREW CONVEYOR NO.__ |
| SLTB-# | SLUDGE TANK BLOWER NO.__ |
| SMX-# | STATIC MIXER (IN-LINE) NO.__ |
| SRU-# | SEPTAGE RECEIVING UNIT NO.__ |
| STMX-# | SEPTAGE MIXER NO.__ |
| TDF-# | TERTIARY DISC FILTER NO.__ |
| TR-# | TURBINE NO.__ |
| TSLP-# | TERTIARY SLUDGE PUMP NO.__ |
| UV-# | ULTRAVIOLET LIGHT DISINFECTION NO.__ |
| WSLG-# | WASTE SLUDGE GRINDER NO.__ |
| WSLP-# | WASTE SLUDGE PUMP NO.__ |
| YWP-# | YARD WASTE PUMP NO.__ |

## EXISTING VS. PROPOSED IDENTIFICATION

AS IDENTIFIED IN THE PROCESS GENERAL NOTES, CONTRACTOR TO NOTE THAT ALL EXISTING INFORMATION ON THE DRAWINGS IS SHOWN WITH A LIGHTER LINE WEIGHT AND INDICATED WITH A SLANTED TYPE TEXT. EXISTING VALVES DO NOT HAVE A FILL ASSOCIATED WITH THEM. REFER TO EXAMPLES IN THIS BOX.



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REVISIONS

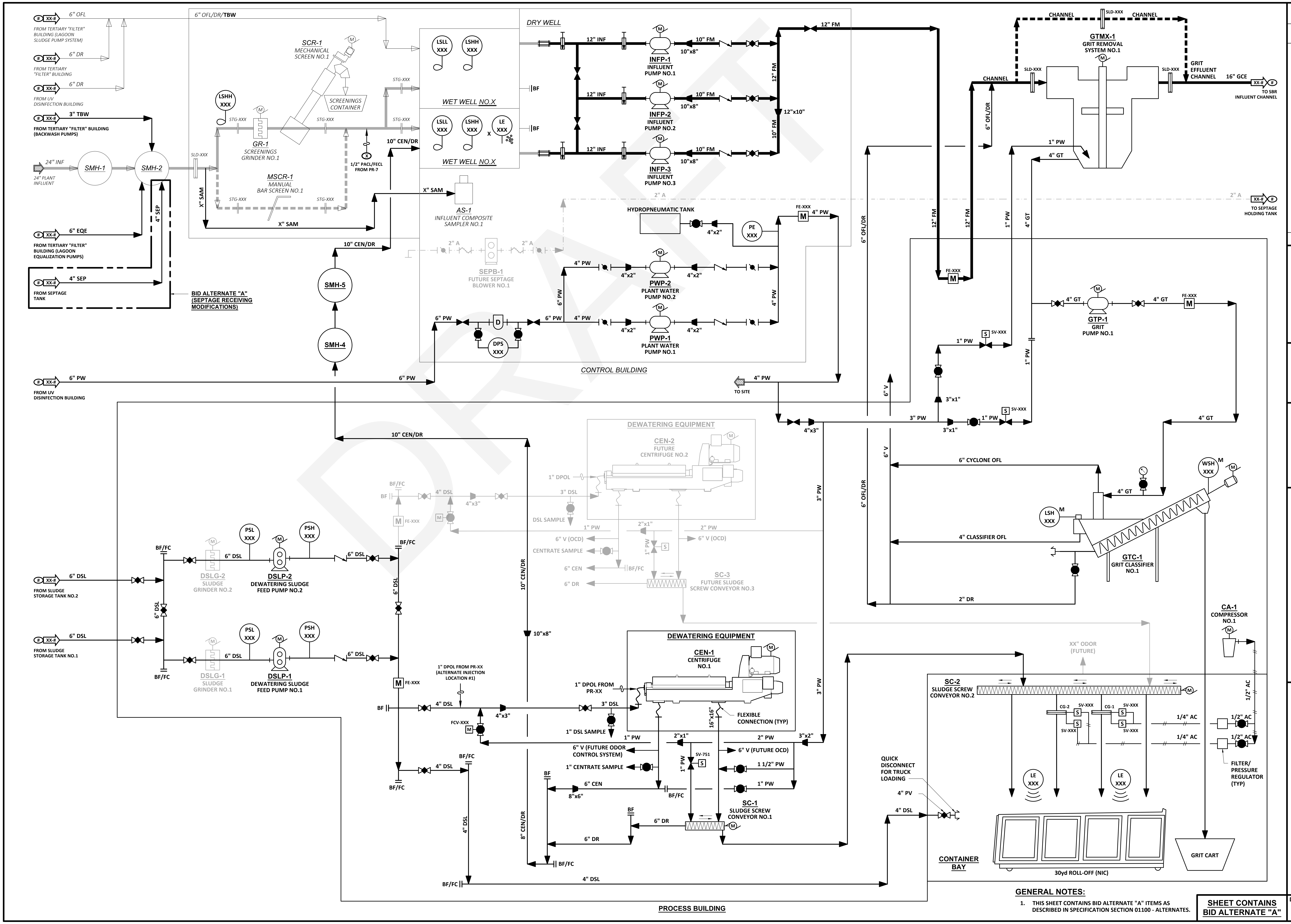
PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS LEGEND AND ABBREVIATIONS

DRAWING
PR-2



## GENERAL NOTES:

1. THIS SHEET CONTAINS BID ALTERNATE "A" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100 - ALTERNATES.

**SHEET CONTAINS BID ALTERNATE "A"**

| NO | REVISIONS | DATE | APP'D |
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PROJECT NO: 20828
DESIGNED: A.COUTURE
CAD COORD: A.COUTURE
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CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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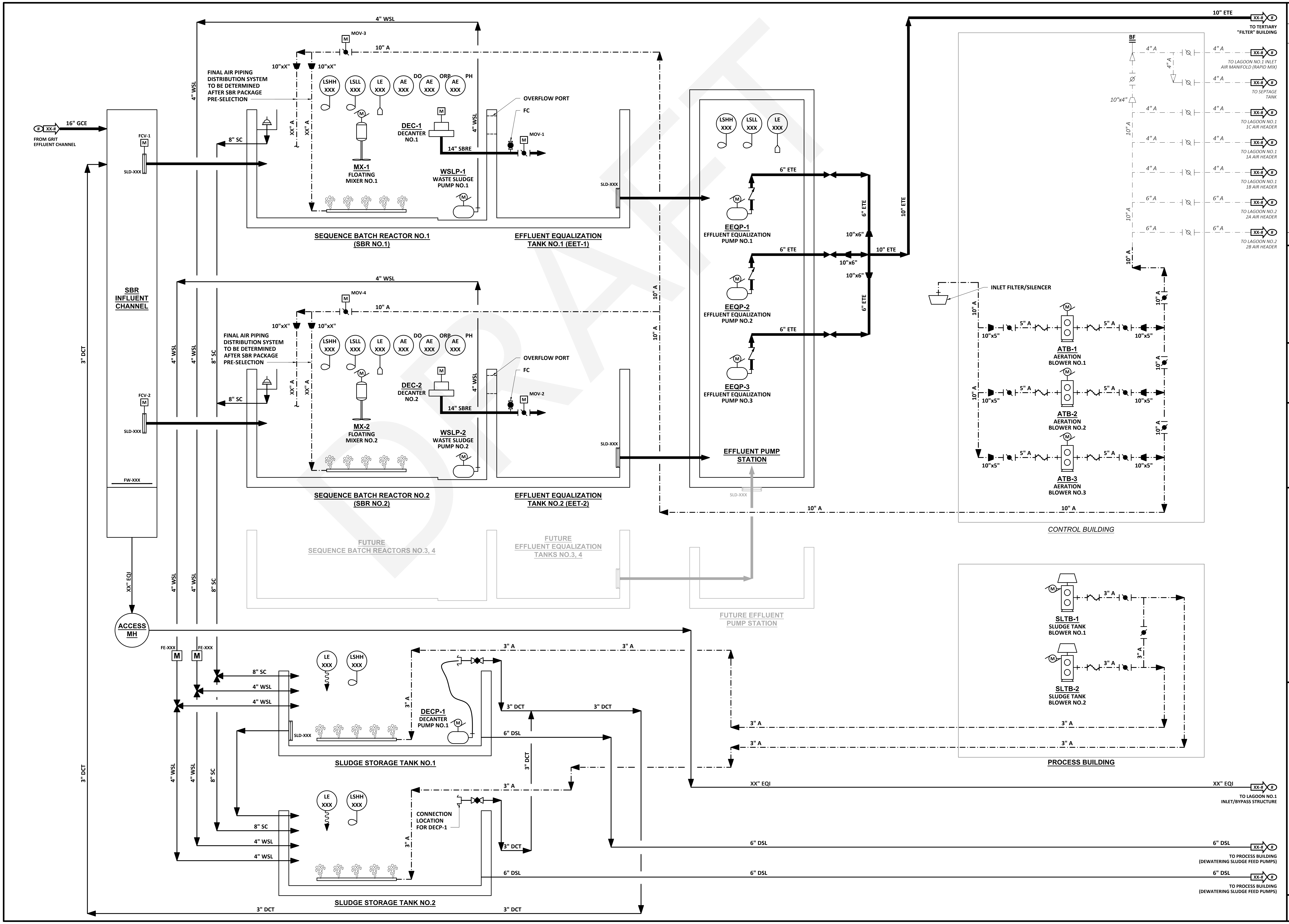
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS FLOW SCHEMATIC I

DRAWING
PR-3



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PROJECT NO.: 20828
DESIGNED: A.COUTURE
CAD COORD: A.COUTURE
CAD:
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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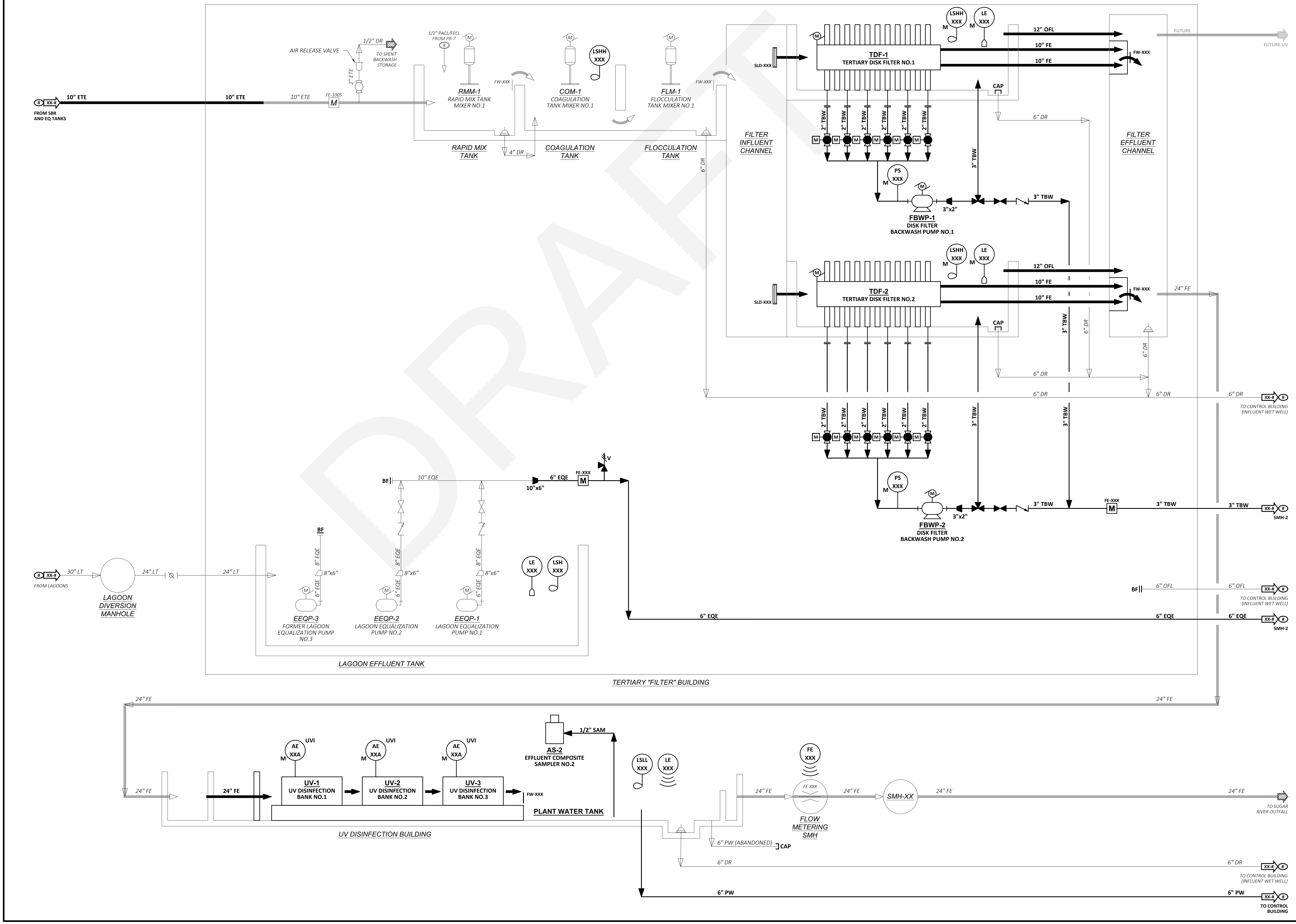
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS FLOW SCHEMATIC II

DRAWING
PR-4



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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

**WRIGHT-PIERCE**
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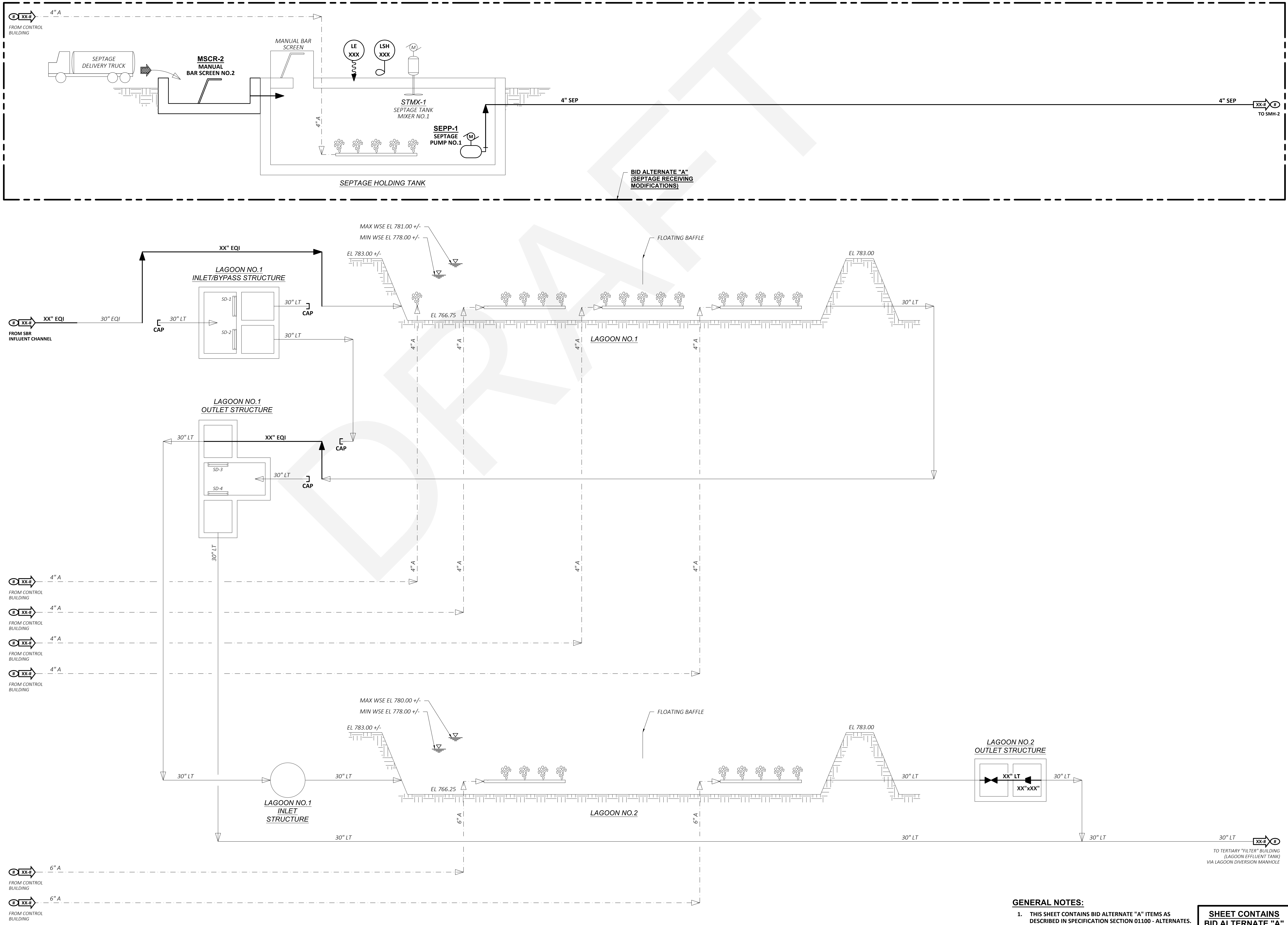
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

# TOWN OF NEWPORT, NEW HAMPSHIRE WASTEWATER TREATMENT FACILITY UPGRADE

## PROCESS FLOW SCHEMATIC III

DRAWING
**PR-5**



**GENERAL NOTES:**

1. THIS SHEET CONTAINS BID ALTERNATE "A" ITEMS AS DESCRIBED IN SPECIFICATION SECTION 01100 - ALTERNATES.

**SHEET CONTAINS BID ALTERNATE "A"**

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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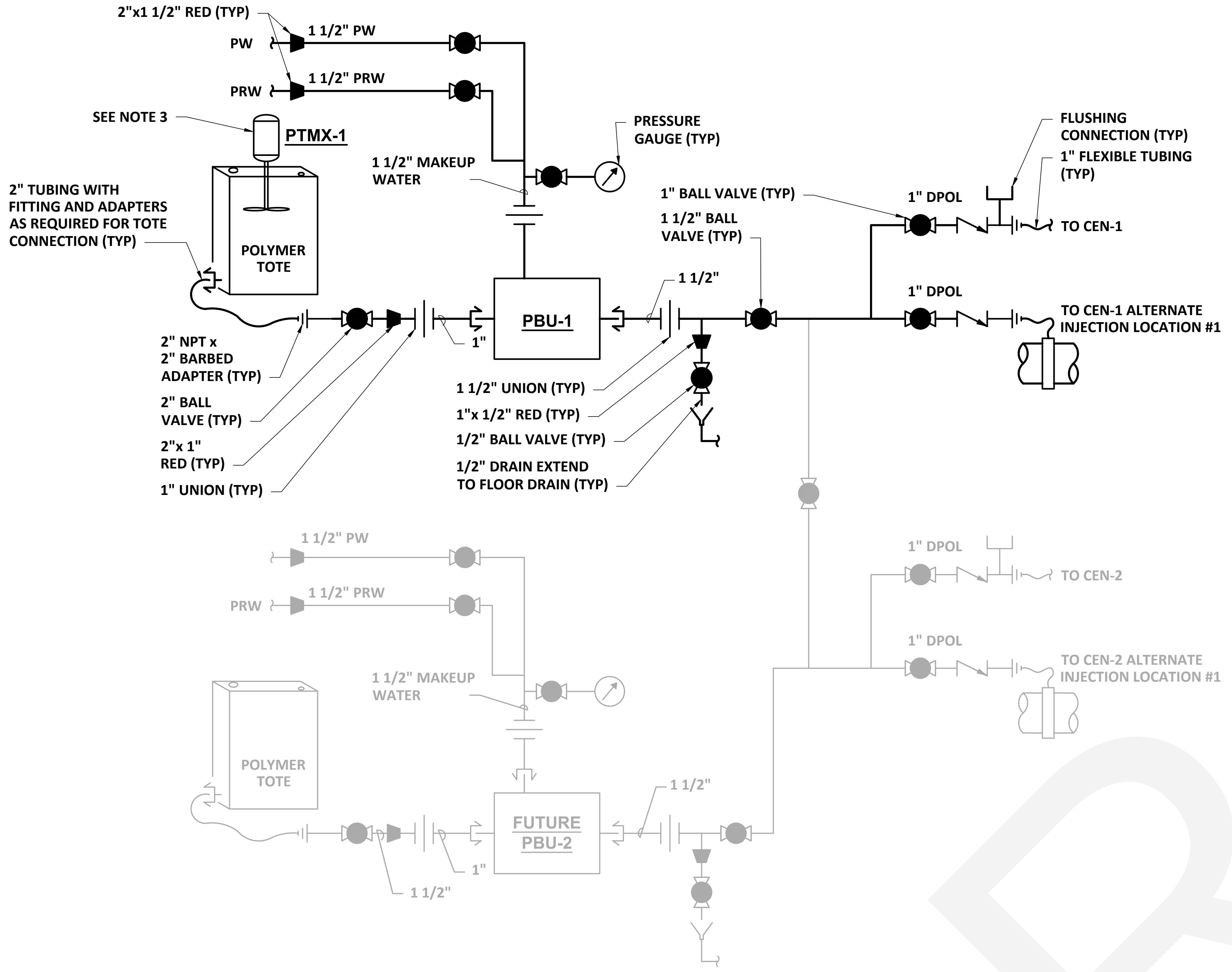
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

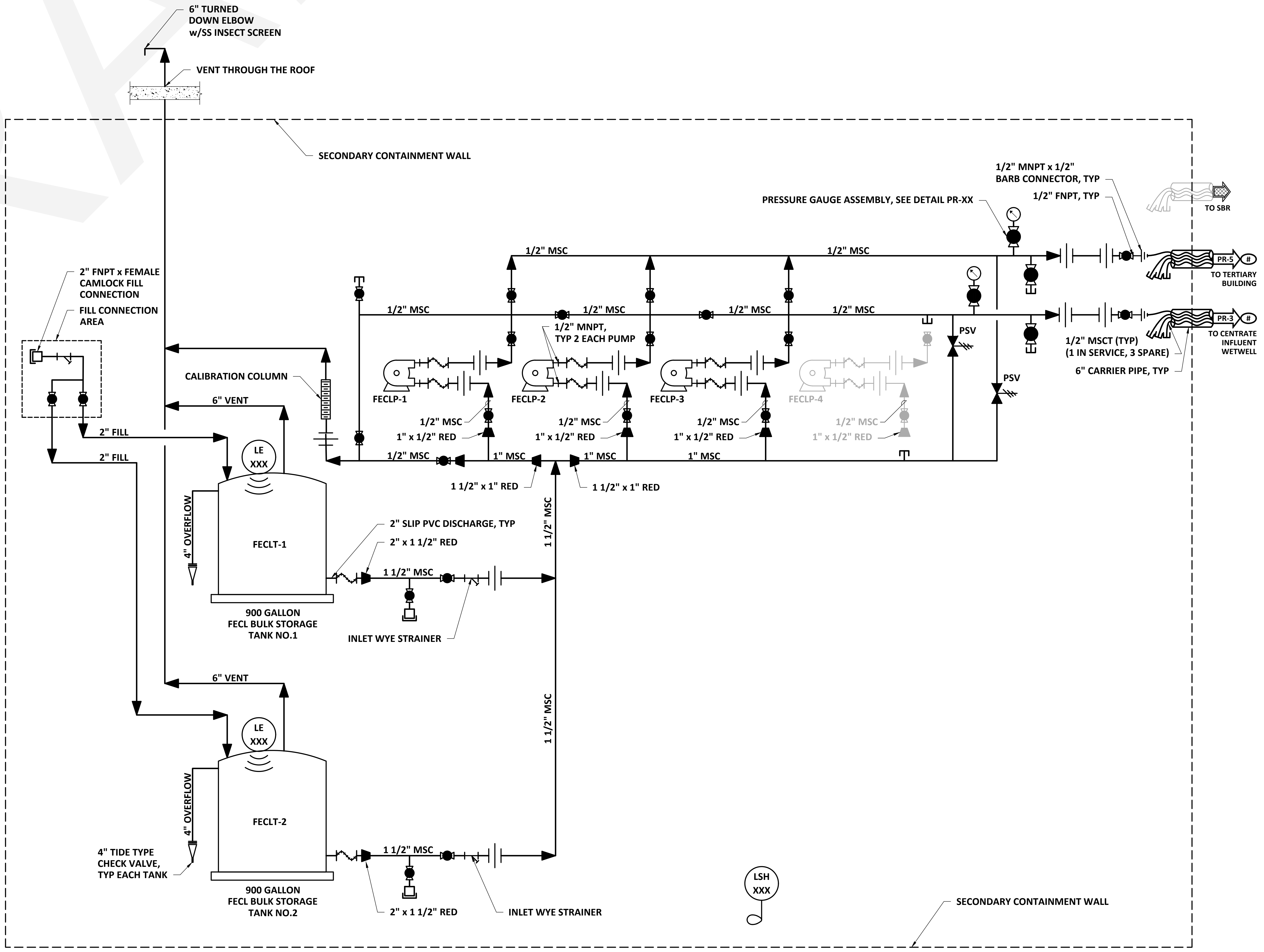
PROCESS FLOW SCHEMATIC IV

DRAWING
PR-6



NOTES:
1. REFER TO SPECIFICATION SECTIONS 11232A FOR POLYMER BLENDING ASSEMBLIES.
2. POLYMER ASSEMBLY, VALVES AND EQUIPMENT TO BE FURNISHED BY POLYMER SYSTEM SUPPLIER. CONTRACTOR TO FURNISH INTERCONNECTING PIPING, VALVES, ETC. AS REQUIRED. CONTRACTOR TO VERIFY TUBING SIZE, FITTINGS, AND ADAPTERS AS NECESSARY PER POLYMER TOTE MANUFACTURER.
3. REFER TO SPECIFICATION 11220A FOR POLYMER TOTE MIXER.
4. 1 1/2" DPOL PIPING SHALL BE FLANGED AT LOCATIONS SPECIFIED ON PR-19.
5. LOCATE BALL VALVE AS CLOSE TO BARBED ADAPTER AS POSSIBLE.

## DEWATERING POLYMER SYSTEM SCHEMATIC



NOTES:
1. ALL BALL VALVES SHOWN ARE TRUE UNION BALL VALVES.

## FERRIC CHLORIDE SYSTEM SCHEMATIC

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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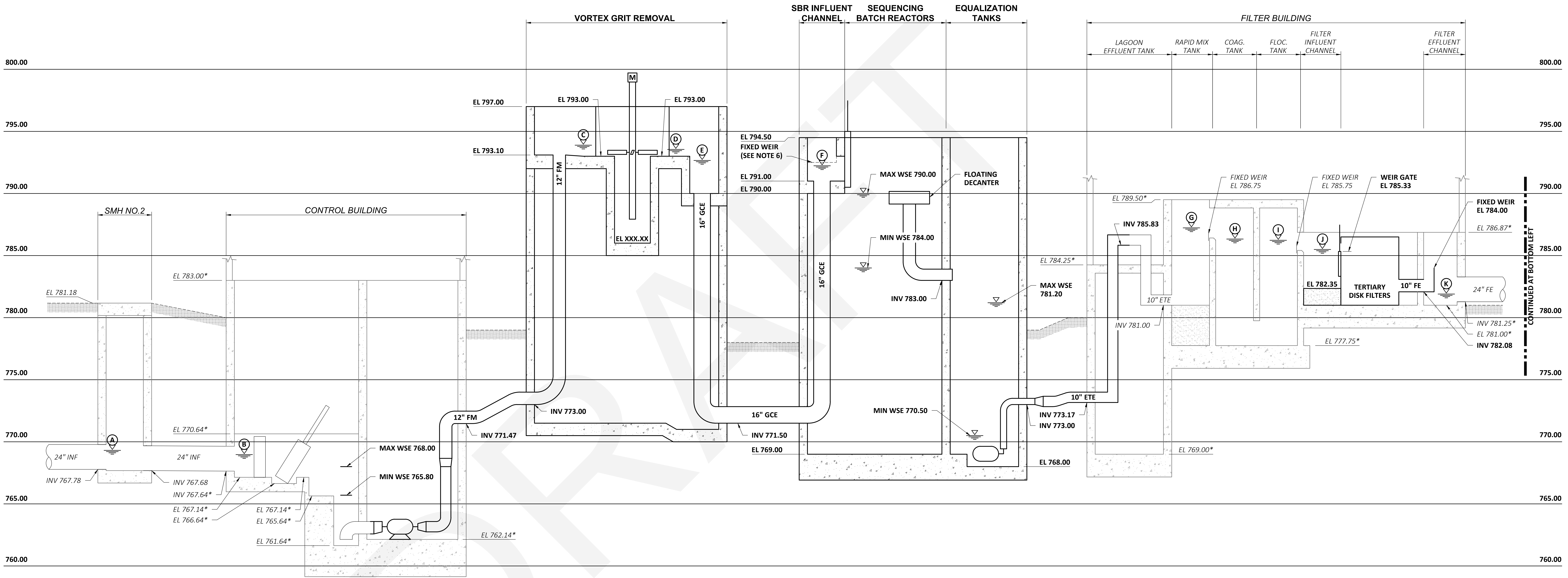
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

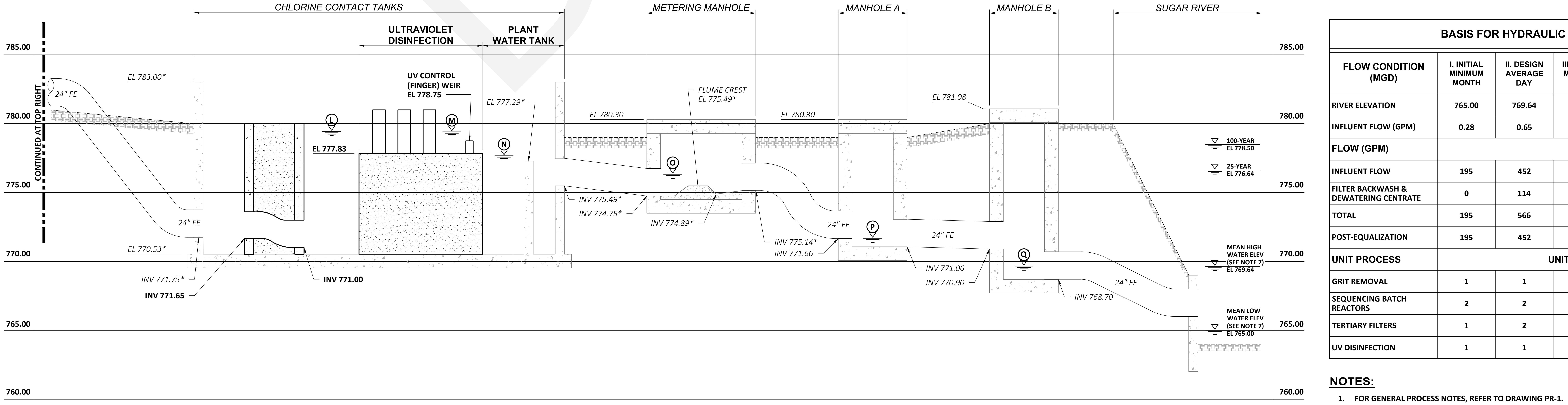
PROCESS SCHEMATIC - CHEMICAL FEED SYSTEMS I

DRAWING
PR-7



## HYDRAULIC PROFILE

SCALE: HORIZONTAL: NTS - VERTICAL 1/4"=1'-0"



## HYDRAULIC PROFILE

SCALE: HORIZONTAL: NTS - VERTICAL 1/4"=1'-0"

### HYDRAULIC PROFILE WATER SURFACE ELEVATIONS

| FLOW CONDITION | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I - INITIAL MINIMUM MONTH | 768.17 | 766.89 | 793.53 | 793.19 | 791.58 | 791.58 | 786.97 | 786.07 | 785.97 | 785.41 | 781.83 | 778.97 | 778.97 | 777.41 | 775.76 | 771.33 | 768.93 |
| II - DESIGN AVERAGE DAY | 768.50 | 767.36 | 793.68 | 793.33 | 791.81 | 791.76 | 787.07 | 786.17 | 786.07 | 785.42 | 781.85 | 779.14 | 779.13 | 777.51 | 775.97 | 771.45 | 769.64 |
| III - DESIGN MAXIMUM MONTH | 768.72 | 768.03 | 793.78 | 793.43 | 792.00 | 791.89 | 787.16 | 786.26 | 786.16 | 785.46 | 781.88 | 779.30 | 779.29 | 777.60 | 776.17 | 771.57 | 769.65 |
| IV - DESIGN PEAK DAY | 769.31 | 768.97 | 793.89 | 793.55 | 792.66 | 792.23 | 787.23 | 786.33 | 786.23 | 785.49 | 781.90 | 779.44 | 779.41 | 777.67 | 776.33 | 771.68 | 769.66 |
| V - DESIGN PEAK HOUR (100-YR) | 769.60 | 769.26 | 794.62 | 794.62 | 794.61 | 792.79 | 787.23 | 786.33 | 786.23 | 785.58 | 781.90 | 779.44 | 779.41 | 778.73 | 778.71 | 778.53 | 778.52 |

### BASIS FOR HYDRAULIC PROFILE

| FLOW CONDITION (MGD) | I. INITIAL MINIMUM MONTH | II. DESIGN AVERAGE DAY | III. DESIGN MAXIMUM MONTH | IV. DESIGN PEAK DAY | V. DESIGN PEAK HOUR |
|---|---|---|---|---|---|
| RIVER ELEVATION | 765.00 | 769.64 | 769.64 | 769.64 | 778.50 |
| INFLUENT FLOW (GPM) | 0.28 | 0.65 | 1.10 | 2.28 | 4.96 |
| FLOW (GPM) | | | | | |
| INFLUENT FLOW | 195 | 452 | 765 | 1,585 | 3,447 |
| FILTER BACKWASH & DEWATERING CENTRATE | 0 | 114 | 114 | 204 | 204 |
| TOTAL | 195 | 566 | 879 | 1,789 | 3,651 |
| POST-EQUALIZATION | 195 | 452 | 765 | 1,043 | 1,043 |
| UNIT PROCESS | UNITS ON-LINE | | | | |
| GRIT REMOVAL | 1 | 1 | 1 | 1 | 1 |
| SEQUENCING BATCH REACTORS | 2 | 2 | 2 | 2 | 2 |
| TERTIARY FILTERS | 1 | 2 | 2 | 2 | 1 |
| UV DISINFECTION | 1 | 1 | 1 | 1 | 1 |

## NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWING PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. ELEVATIONS SHOWN REFER TO THE NATIONAL GEODETIC VERTICAL DATUM OF NAVD 1988.
3. SHADING IS REPRESENTATIVE OF SCENARIO IV. DESIGN PEAK HOUR HYDRAULIC GRADE LINE.
4. CONTRACTOR TO NOTE, ELEVATIONS HAVE BEEN UPDATED TO REFLECT FIELD VERIFIED/SURVEYED CONDITIONS. AN "*" HAS BEEN USED IN CASES WHERE NO UPDATED SURVEY OR FIELD VERIFICATION INFORMATION IS AVAILABLE. REFER TO DWG PR-1, GENERAL NOTE 1.
5. HYDRAULIC PROFILES COMPUTED ALONG PATH OF GREATEST HEADLOSS.
6. OVERFLOW WEIR TO XX" EQI YARD PIPING AND LAGOONS FOR INFLUENT EQUALIZATION.
7. MEAN LOW, MEAN HIGH, AND 25-YEAR RIVER WATER ELEVATIONS FROM 1987 HTA WWTF UPGRADE PLANS.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

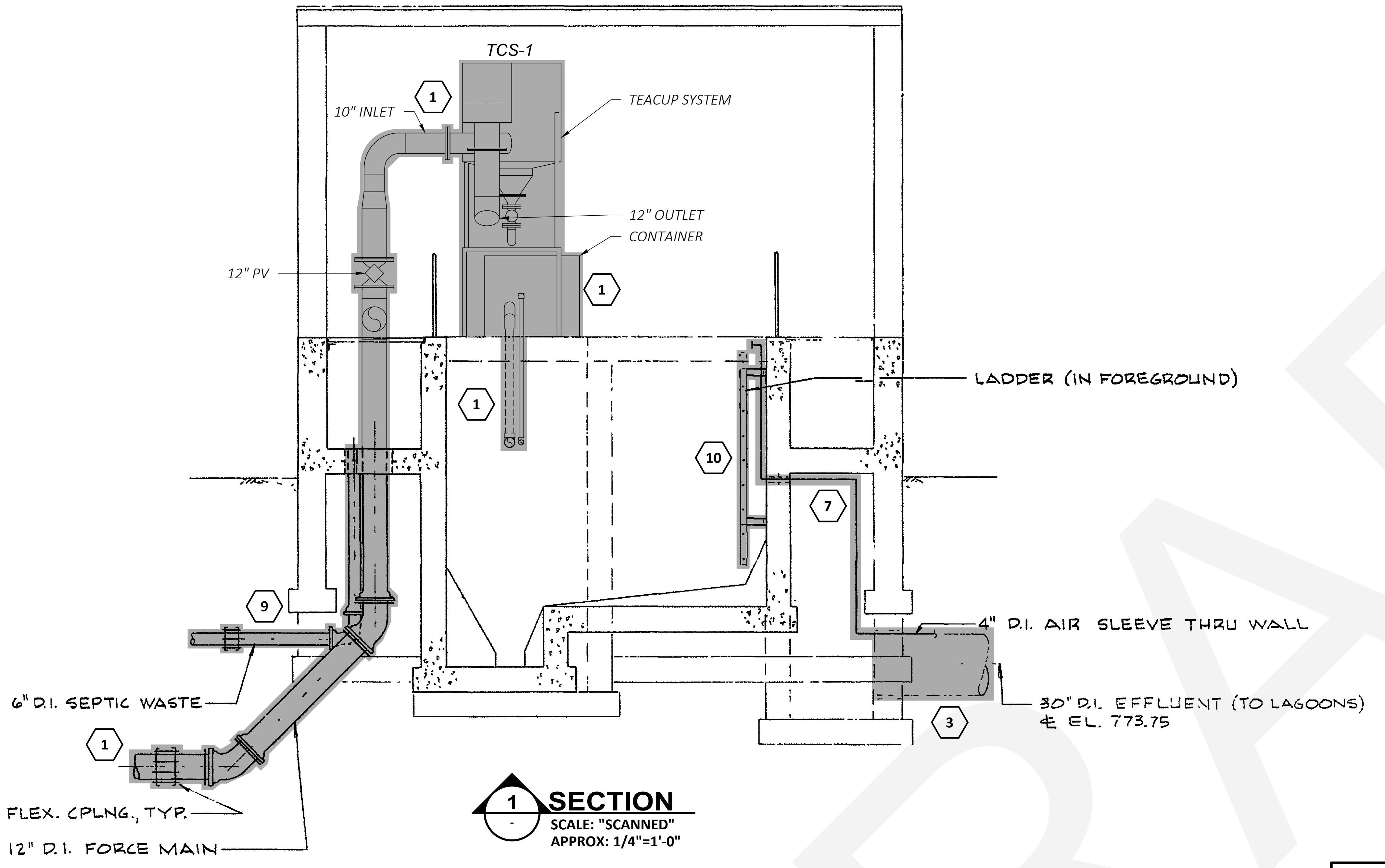
WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

HYDRAULIC PROFILE I

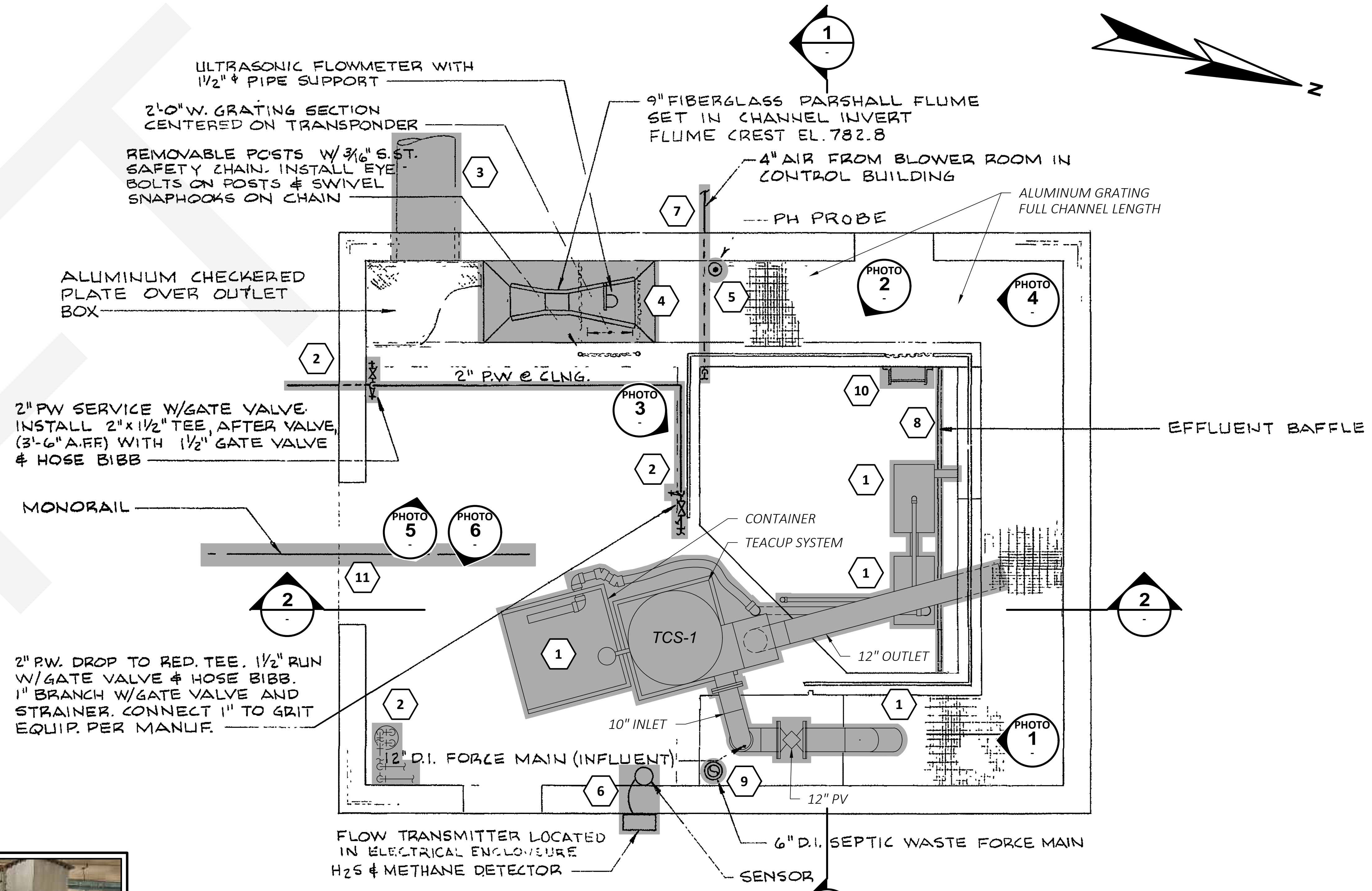
DRAWING
PR-9

LAST SAVED BY: ADAM.COUTURE 9/15/2022 4:12 PM



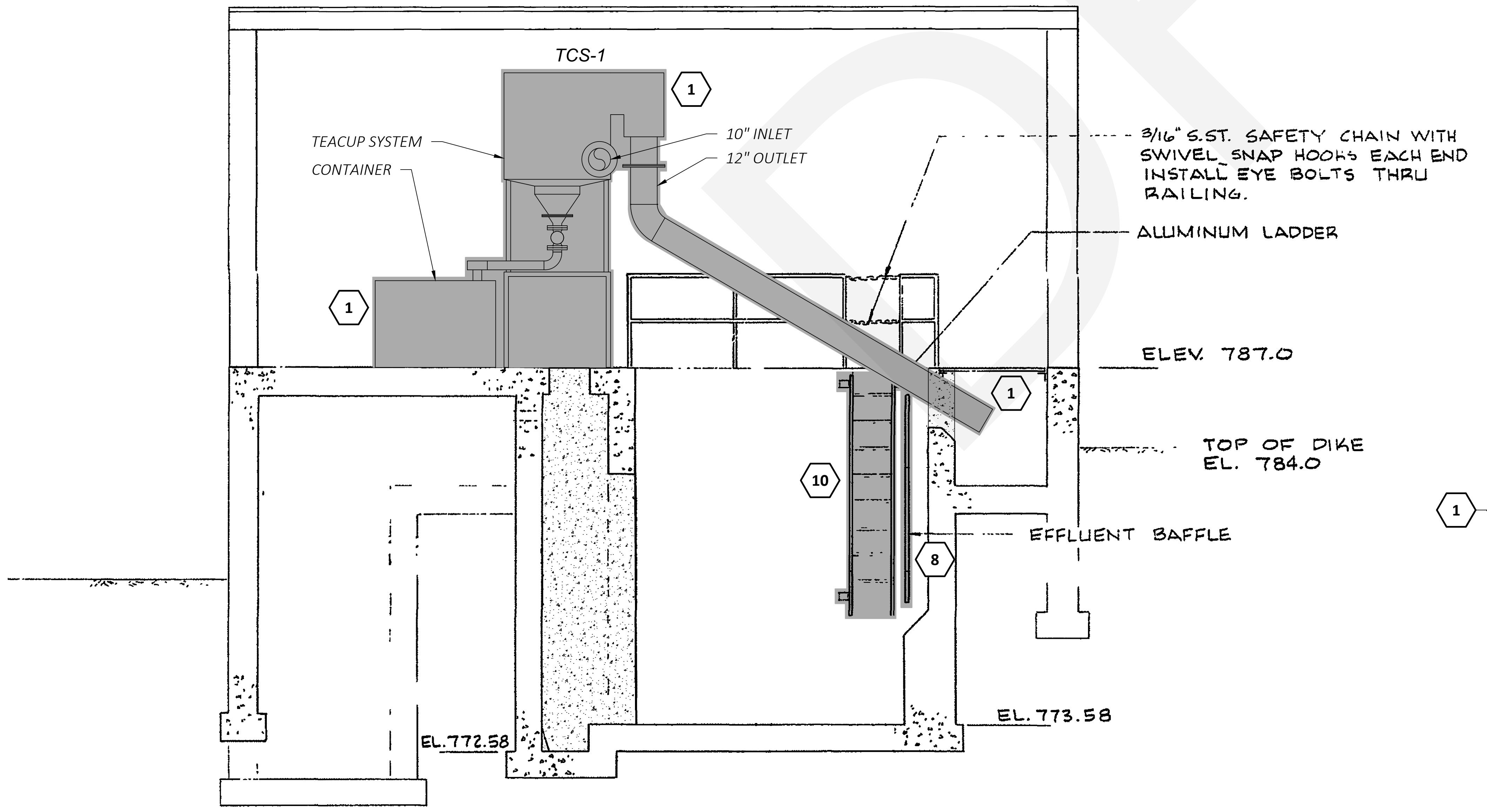
## 1 SECTION

SCALE: "SCANNED"
APPROX: 1/4"=1'-0"



## DEMOLITION PLAN

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")



## 2 SECTION

SCALE: "SCANNED"
APPROX: 1/4"=1'-0"

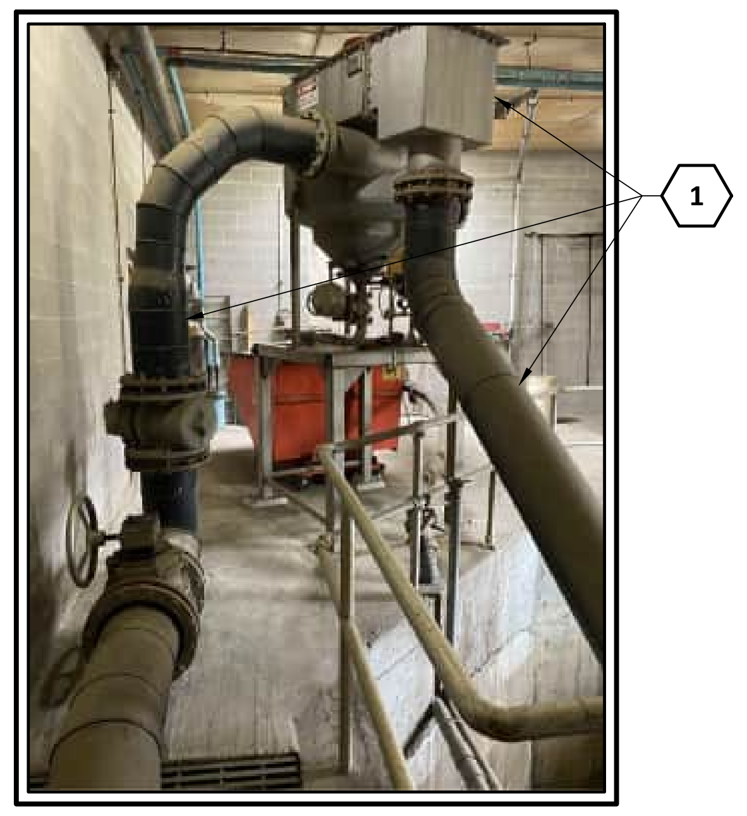


PHOTO 1

PHOTO 2

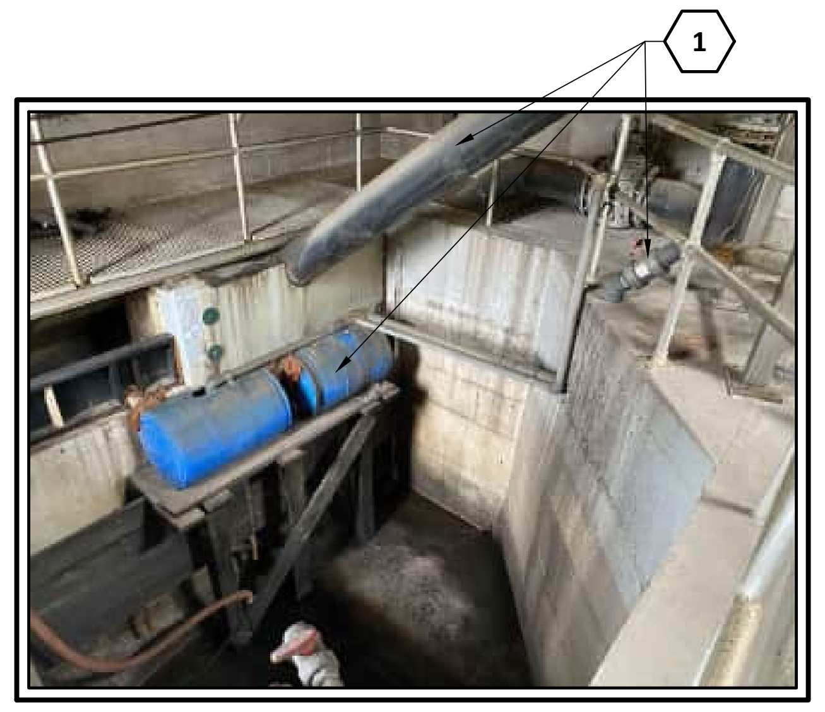


PHOTO 3

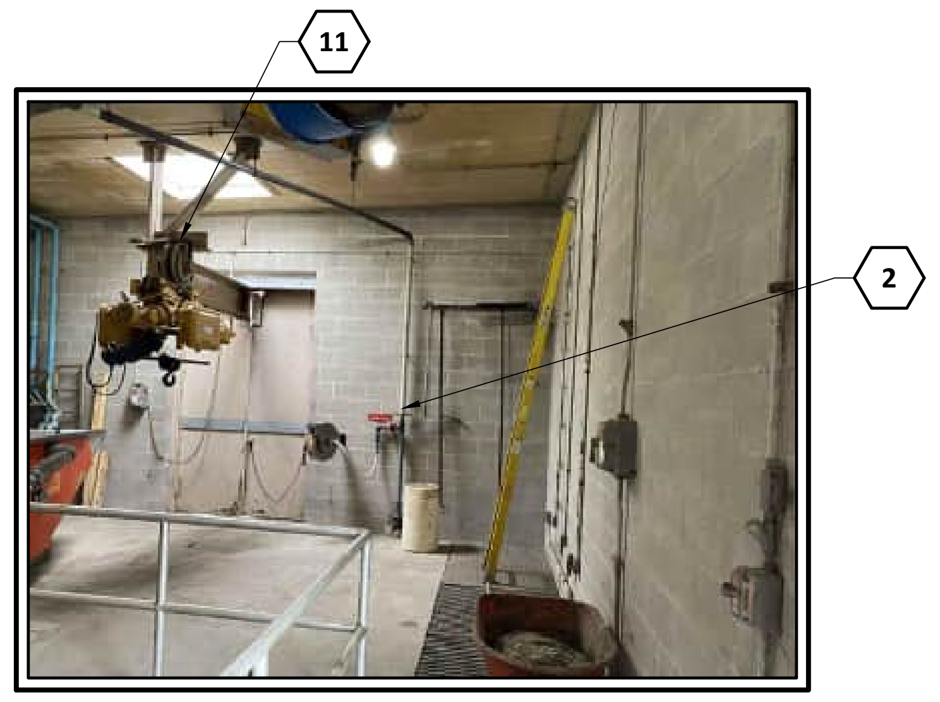


PHOTO 4

PHOTO 5

PHOTO 6

## DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING TEACUP SYSTEM IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: TEACUP SYSTEM MECHANISM, PIPING, VALVES, SUPPORTS, CONTAINER, SCUM BARRELS, ELECTRICAL CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH THE EXISTING PLANT WATER PIPING IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PIPING, VALVES, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING 30" EFFLUENT PIPE IN ITS ENTIRETY.
4. REMOVE/DEMOLISH THE EXISTING FIBERGLASS PARSHALL FLUME IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: FLUME, FLOW METER, CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
5. REMOVE/DEMOLISH THE EXISTING PH PROBE IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PROBE, CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
6. REMOVE/DEMOLISH THE EXISTING FLOW TRANSMITTER IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: FLOW TRANSMITTER, CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
7. REMOVE/DEMOLISH THE EXISTING 4" AIR PIPE IN ITS ENTIRETY.
8. REMOVE/DEMOLISH THE EXISTING BAFFLE IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: BAFFLE, SUPPORTS, HARDWARE, AND ALL OTHER ASSOCIATED APPURTENANCES.
9. REMOVE/DEMOLISH THE EXISTING 6" SEPTIC WASTE PIPE IN ITS ENTIRETY.
10. REMOVE/DEMOLISH THE EXISTING LADDER IN ITS ENTIRETY.
11. REMOVE THE EXISTING MONORAIL AND HOIST IN THEIR ENTIRETY INCLUDING, BUT NOT LIMITED TO: MONORAIL, HOIST, SUPPORTS, CONDUIT AND WIRING, AND ALL OTHER ASSOCIATED APPURTENANCES.

## GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWING PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR CONTROL BUILDING DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-1.
3. CONTRACTOR TO NOTE THAT CHANGES MAY HAVE BEEN MADE SINCE SCANNED RECORD DRAWINGS WERE PREPARED. DRAWINGS MAY NOT REFLECT ACTUAL FIELD CONDITIONS.
4. CONTRACTOR SHALL REVIEW ALL RECORD DRAWINGS ON FILE WITH THE OWNER AND PERFORM SITE INSPECTION TO CONFIRM EXISTING CONDITION AS NECESSARY TO PERFORM DEMOLITION WORK.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
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SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

GRIT BUILDING
DEMOLITION PLAN, SECTIONS, AND PHOTOS

DRAWING
PR-11

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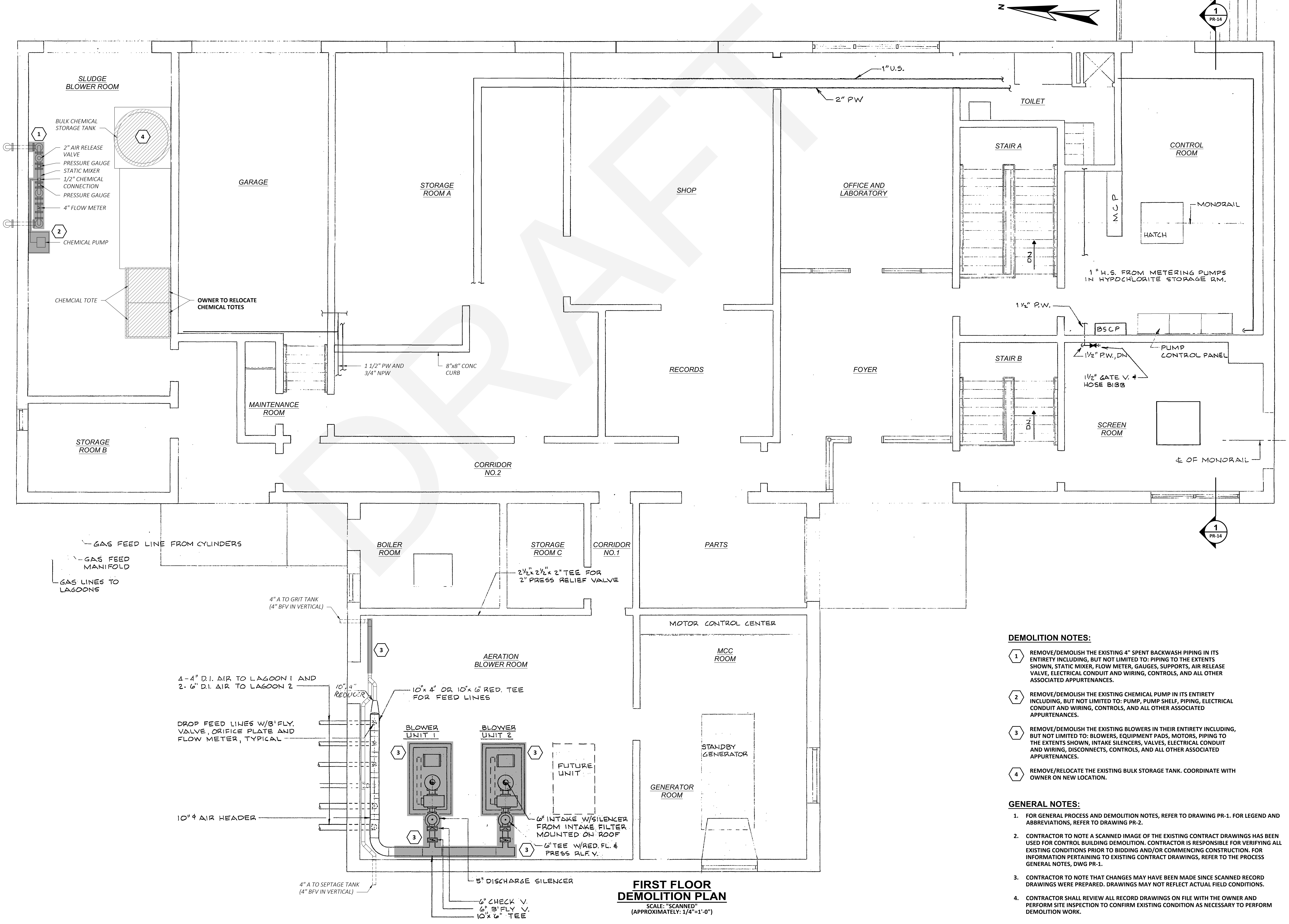

## FIRST FLOOR DEMOLITION PLAN

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")

## DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING 4" SPENT BACKWASH PIPING IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PIPING TO THE EXTENTS SHOWN, STATIC MIXER, FLOW METER, GAUGES, SUPPORTS, AIR RELEASE VALVE, ELECTRICAL CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.

2. REMOVE/DEMOLISH THE EXISTING CHEMICAL PUMP IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PUMP, PUMP SHELF, PIPING, ELECTRICAL CONDUIT AND WIRING, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.

3. REMOVE/DEMOLISH THE EXISTING BLOWERS IN THEIR ENTIRETY INCLUDING, BUT NOT LIMITED TO: BLOWERS, EQUIPMENT PADS, MOTORS, PIPING TO THE EXTENTS SHOWN, INTAKE SILENCERS, VALVES, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.

4. REMOVE/RELOCATE THE EXISTING BULK STORAGE TANK. COORDINATE WITH OWNER ON NEW LOCATION.

## GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWING PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR CONTROL BUILDING DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-1.
3. CONTRACTOR TO NOTE THAT CHANGES MAY HAVE BEEN MADE SINCE SCANNED RECORD DRAWINGS WERE PREPARED. DRAWINGS MAY NOT REFLECT ACTUAL FIELD CONDITIONS.
4. CONTRACTOR SHALL REVIEW ALL RECORD DRAWINGS ON FILE WITH THE OWNER AND PERFORM SITE INSPECTION TO CONFIRM EXISTING CONDITION AS NECESSARY TO PERFORM DEMOLITION WORK.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
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DATE:
APPROVED:
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SUBMISSION: PRELIMINARY DESIGN

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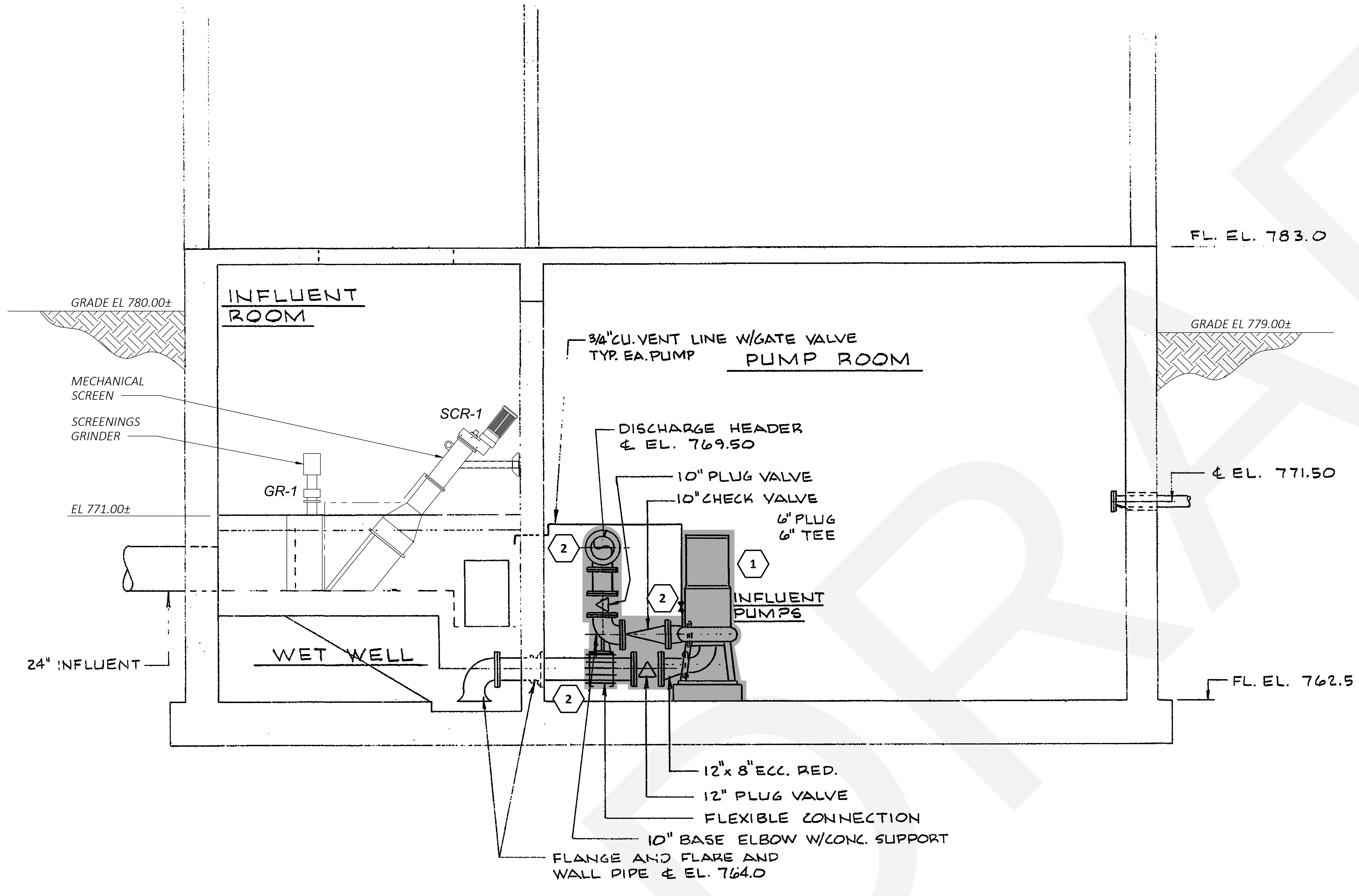
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

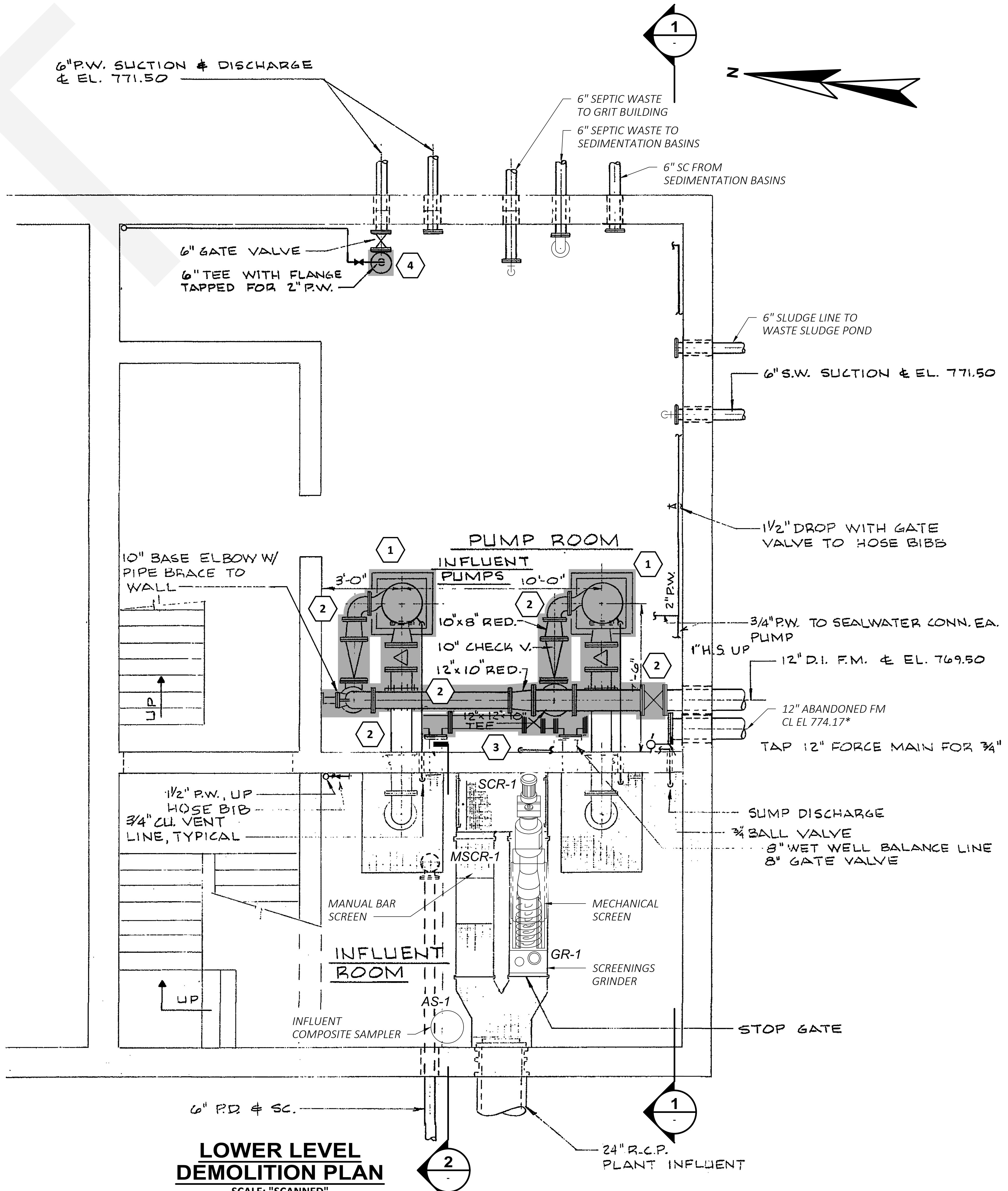
CONTROL BUILDING
FIRST FLOOR DEMOLITION PLAN

DRAWING
PR-13



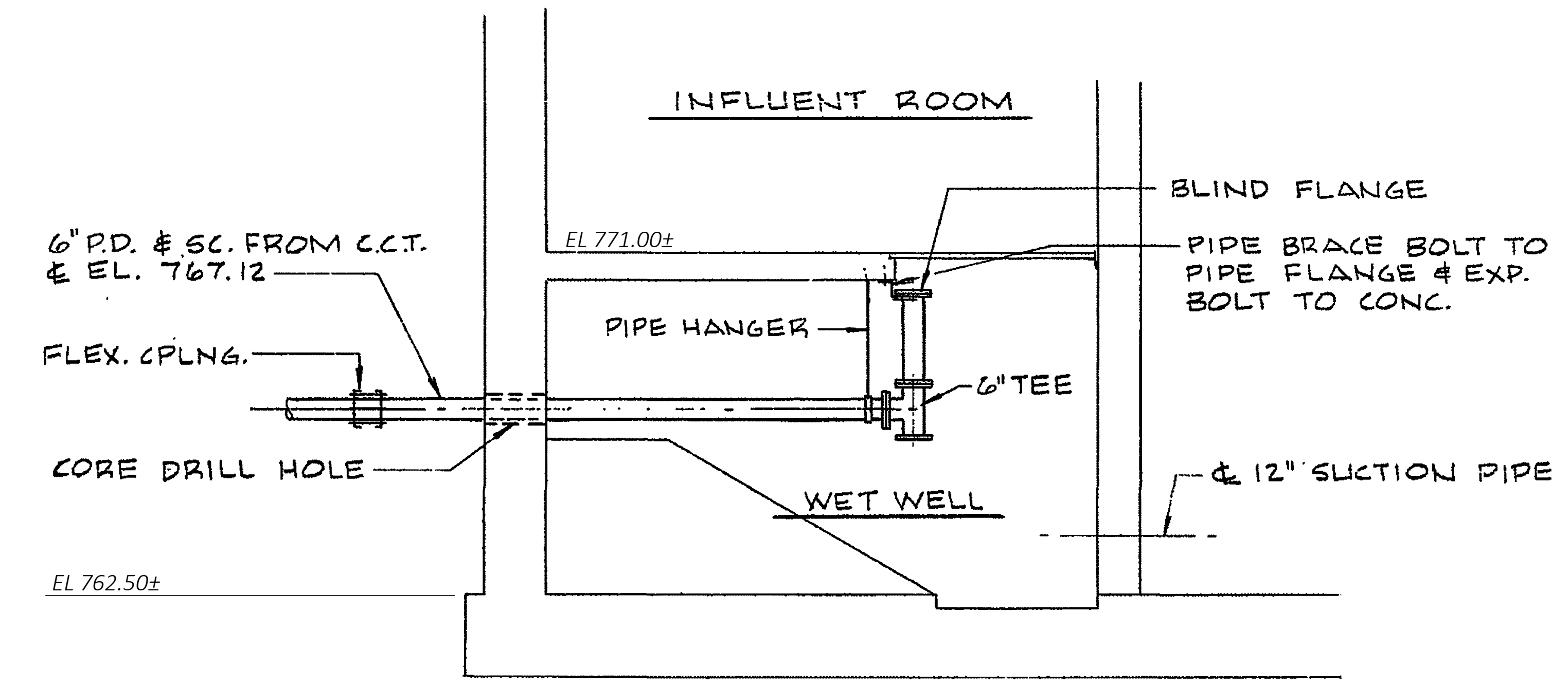
## 1 SECTION

SCALE: "SCANNED"
APPROX: 1/4"=1'-0"
PR-13



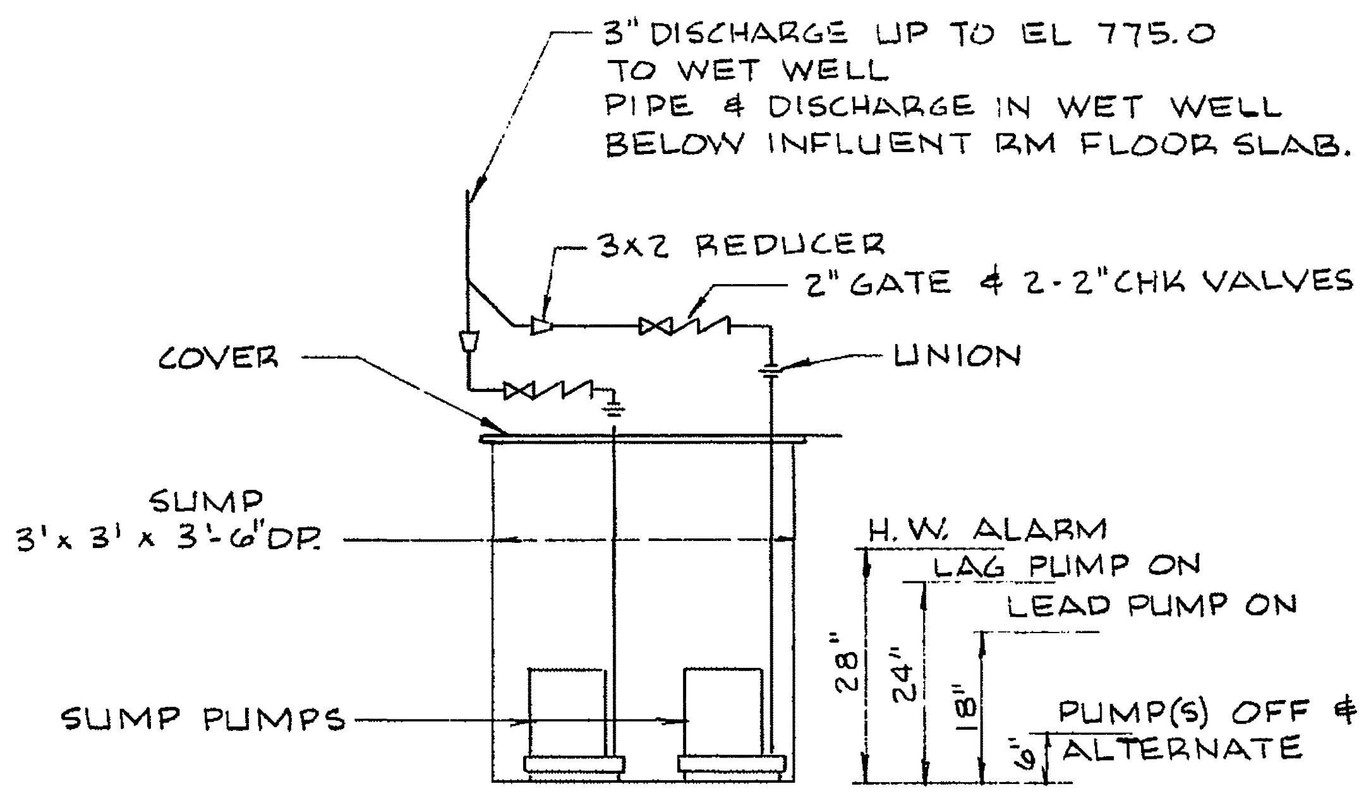
## LOWER LEVEL DEMOLITION PLAN

SCALE: "SCANNED"
(APPROXIMATELY: 1/4"=1'-0")



## 2 SECTION

SCALE: "SCANNED"
APPROX: 1/4"=1'-0"



## DUPLEX SUMP PUMP DETAIL

SCALE: "SCANNED"
(NTS)

## DEMOLITION NOTES:

1. REMOVE/DEMOLISH THE EXISTING INFLUENT PUMPS IN THEIR ENTIRETY INCLUDING, BUT NOT LIMITED TO: PUMPS, EQUIPMENT PADS, MOTORS, ELECTRICAL CONDUIT AND WIRING, DISCONNECTS, CONTROLS, AND ALL OTHER ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH THE EXISTING INFLUENT PUMP PIPING IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PIPING TO THE EXTENTS SHOWN, VALVES, FITTINGS, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING 8" WETWELL BALANCE LINE PIPING IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PIPING TO THE EXTENTS SHOWN, VALVES, FITTINGS, SUPPORTS, AND ALL OTHER ASSOCIATED APPURTENANCES.
4. REMOVE/DEMOLISH THE EXISTING 6" PW 90° BEND AND PW PIPING TO THE EXTENTS SHOWN.

## GENERAL NOTES:

1. FOR GENERAL PROCESS AND DEMOLITION NOTES, REFER TO DRAWING PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. CONTRACTOR TO NOTE A SCANNED IMAGE OF THE EXISTING CONTRACT DRAWINGS HAS BEEN USED FOR CONTROL BUILDING DEMOLITION. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BIDDING AND/OR COMMENCING CONSTRUCTION. FOR INFORMATION PERTAINING TO EXISTING CONTRACT DRAWINGS, REFER TO THE PROCESS GENERAL NOTES, DWG PR-1.
3. CONTRACTOR TO NOTE THAT CHANGES MAY HAVE BEEN MADE SINCE SCANNED RECORD DRAWINGS WERE PREPARED. DRAWINGS MAY NOT REFLECT ACTUAL FIELD CONDITIONS.
4. CONTRACTOR SHALL REVIEW ALL RECORD DRAWINGS ON FILE WITH THE OWNER AND PERFORM SITE INSPECTION TO CONFIRM EXISTING CONDITION AS NECESSARY TO PERFORM DEMOLITION WORK.

| NO | REVISIONS | APP'D | DATE |
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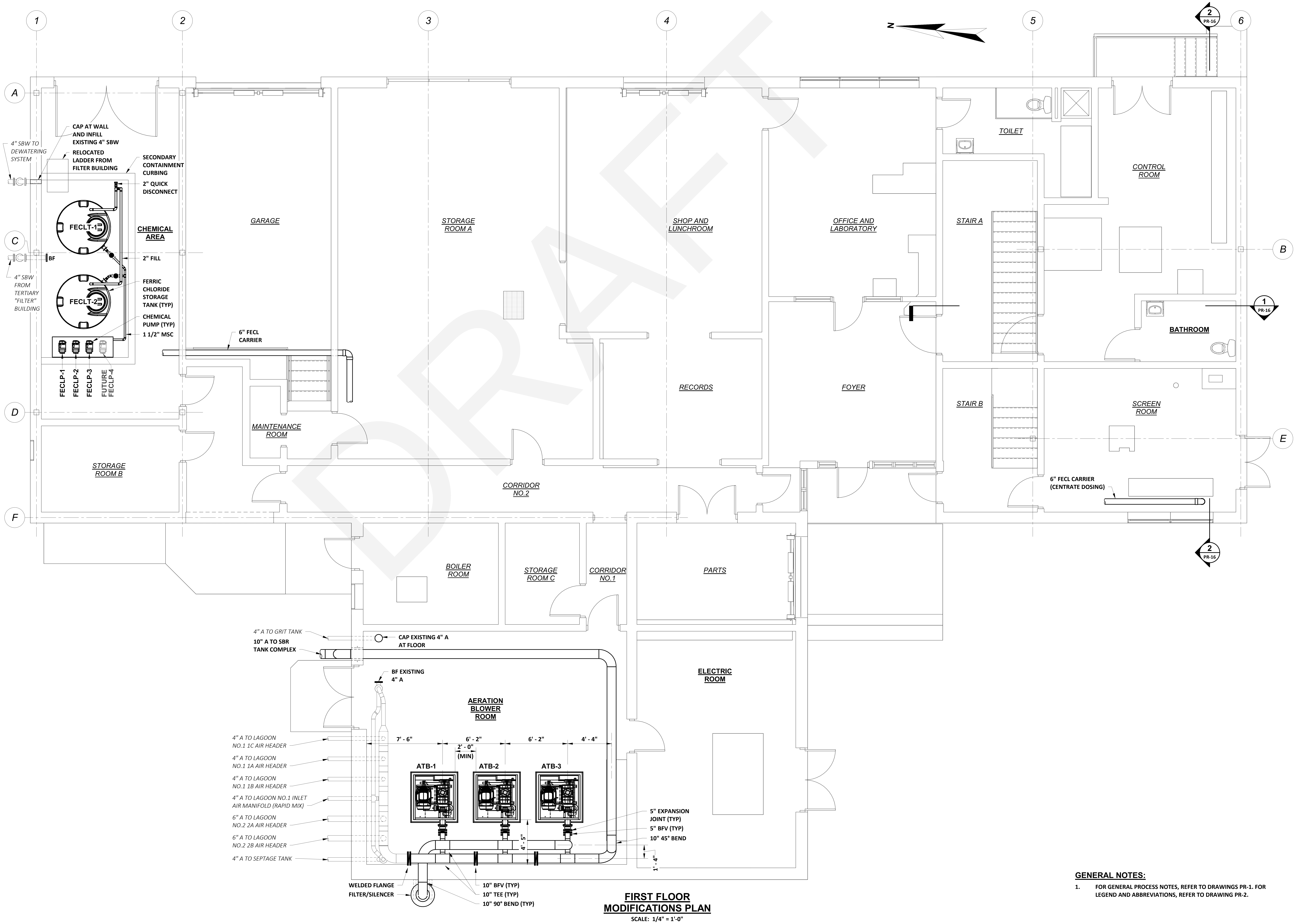
PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

CONTROL BUILDING
LOWER LEVEL DEMOLITION PLAN AND SECTIONS

DRAWING
PR-14



## FIRST FLOOR MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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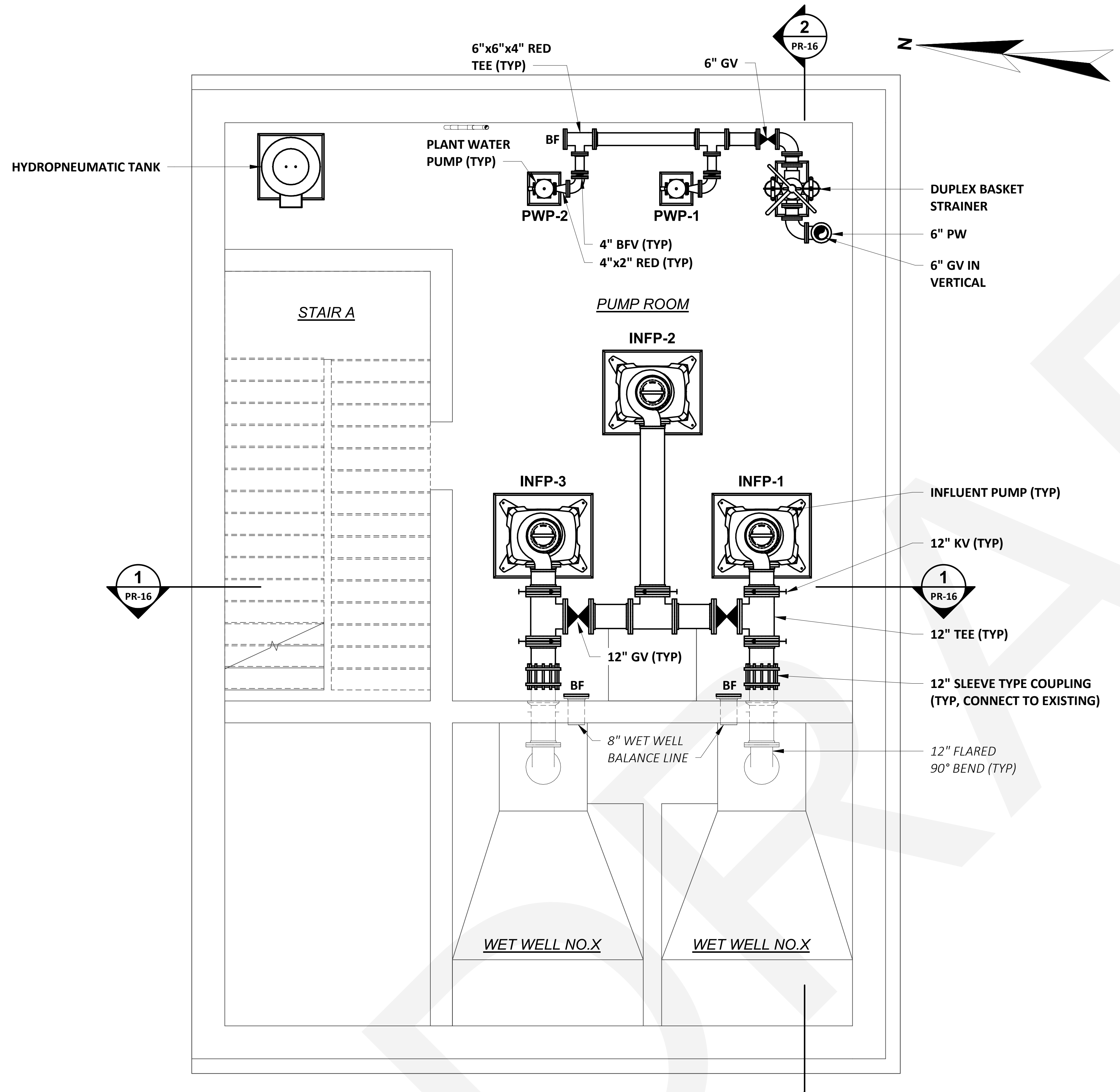
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

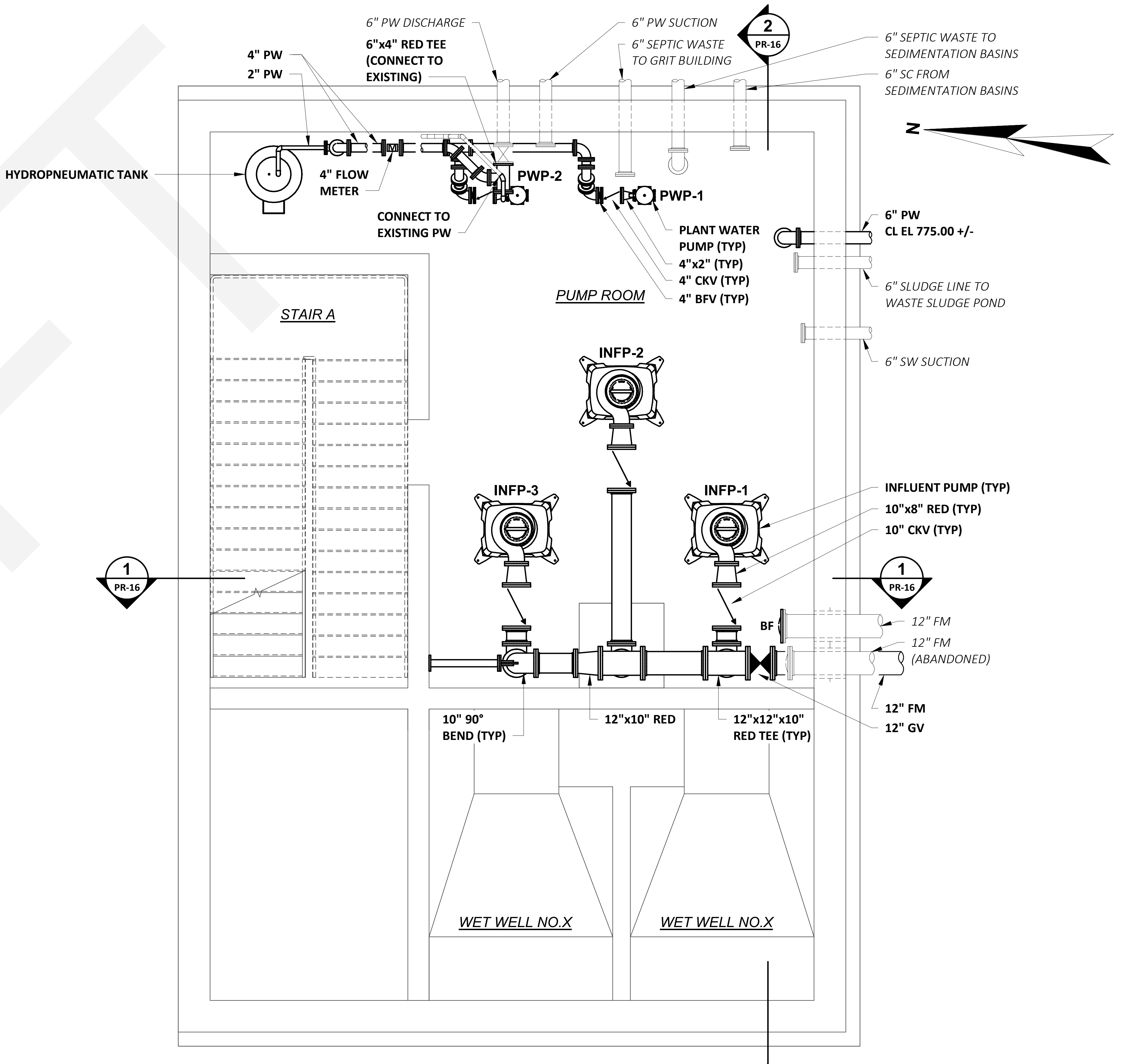
CONTROL BUILDING
FIRST FLOOR MODIFICATIONS PLAN

DRAWING
PR-15



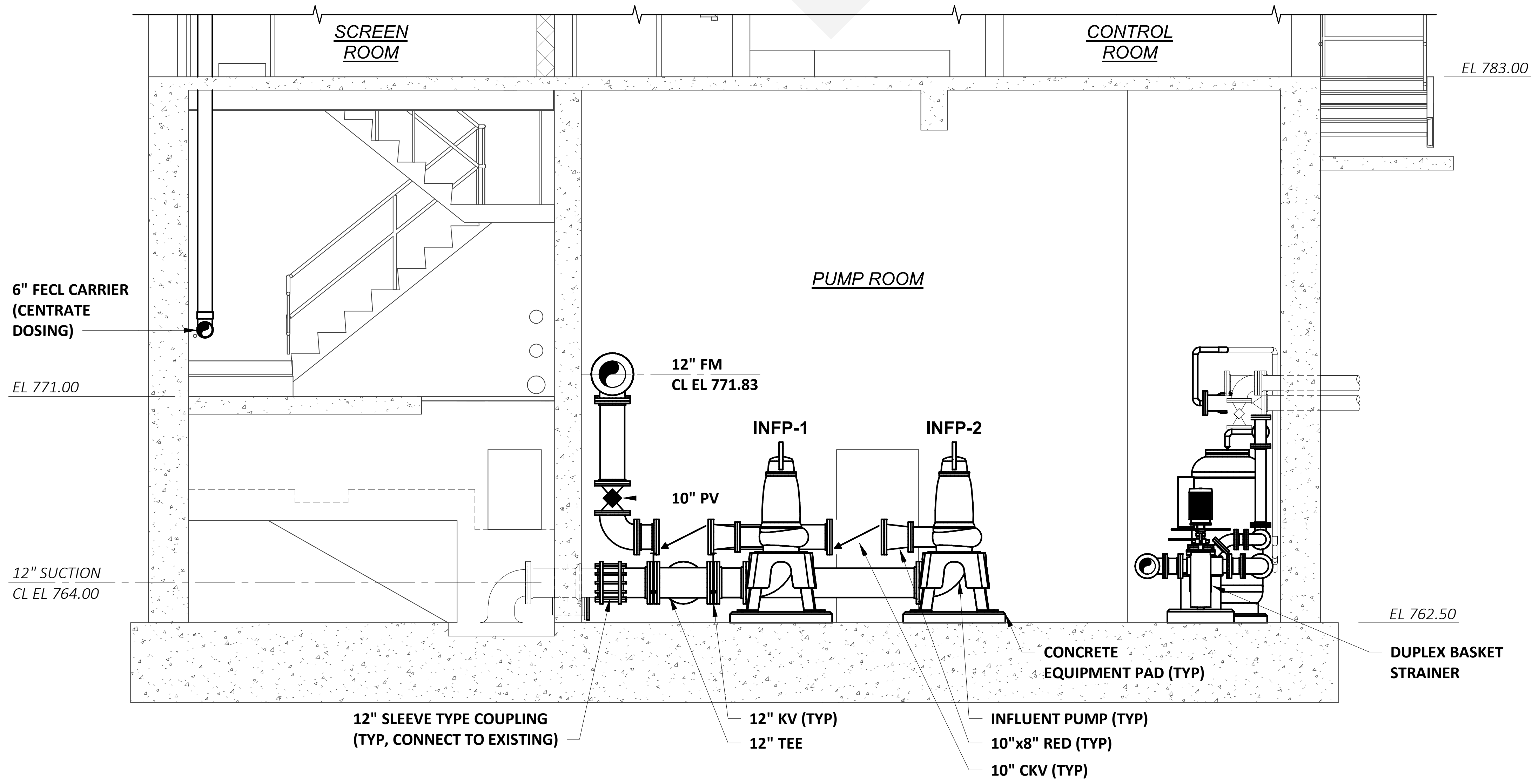
## LOWER LEVEL SUCTION MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"

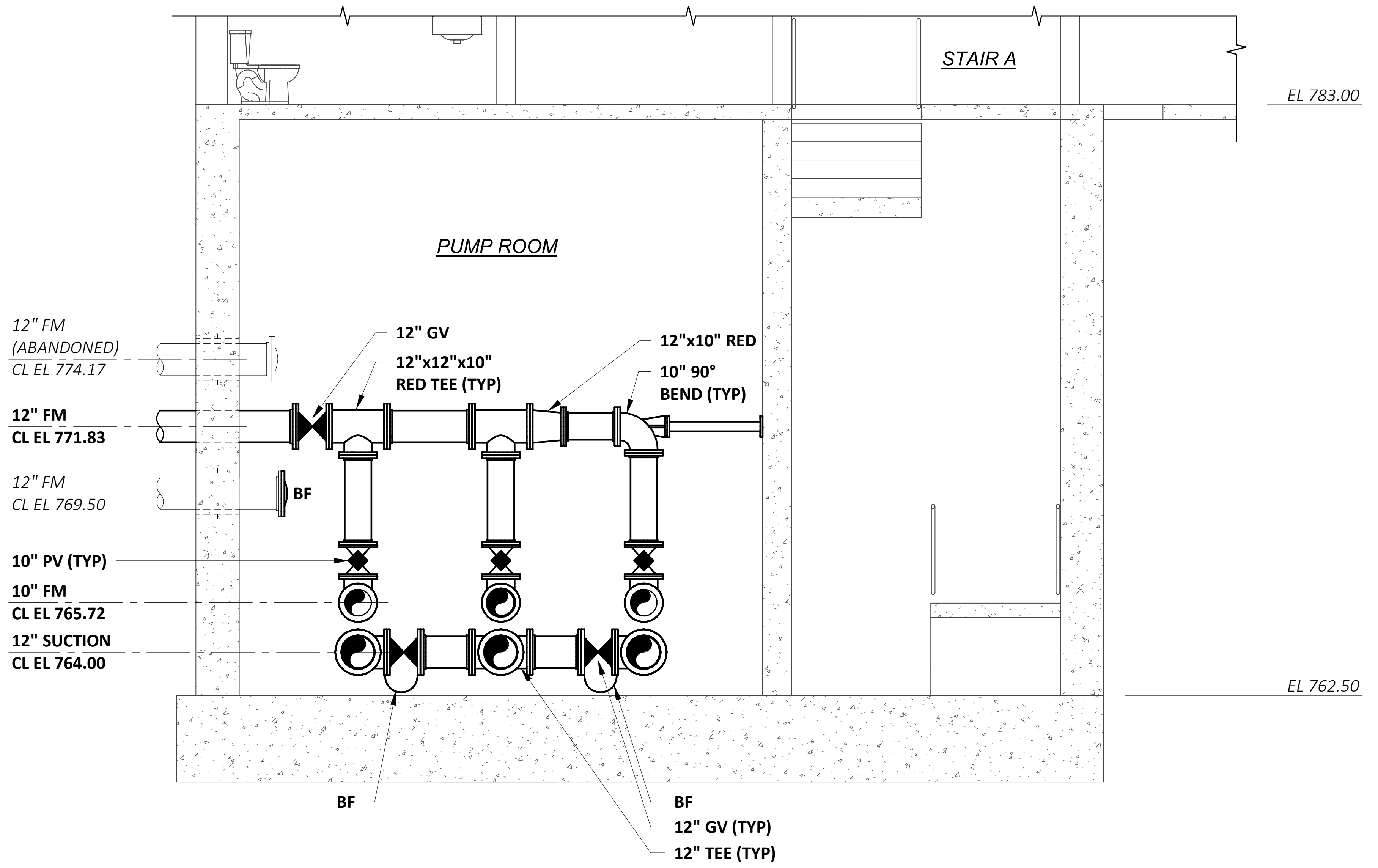


## LOWER LEVEL DISCHARGE MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"



**2** PR-15 **SECTION**
SCALE: 1/4" = 1'-0"



**1** PR-15 **SECTION**
SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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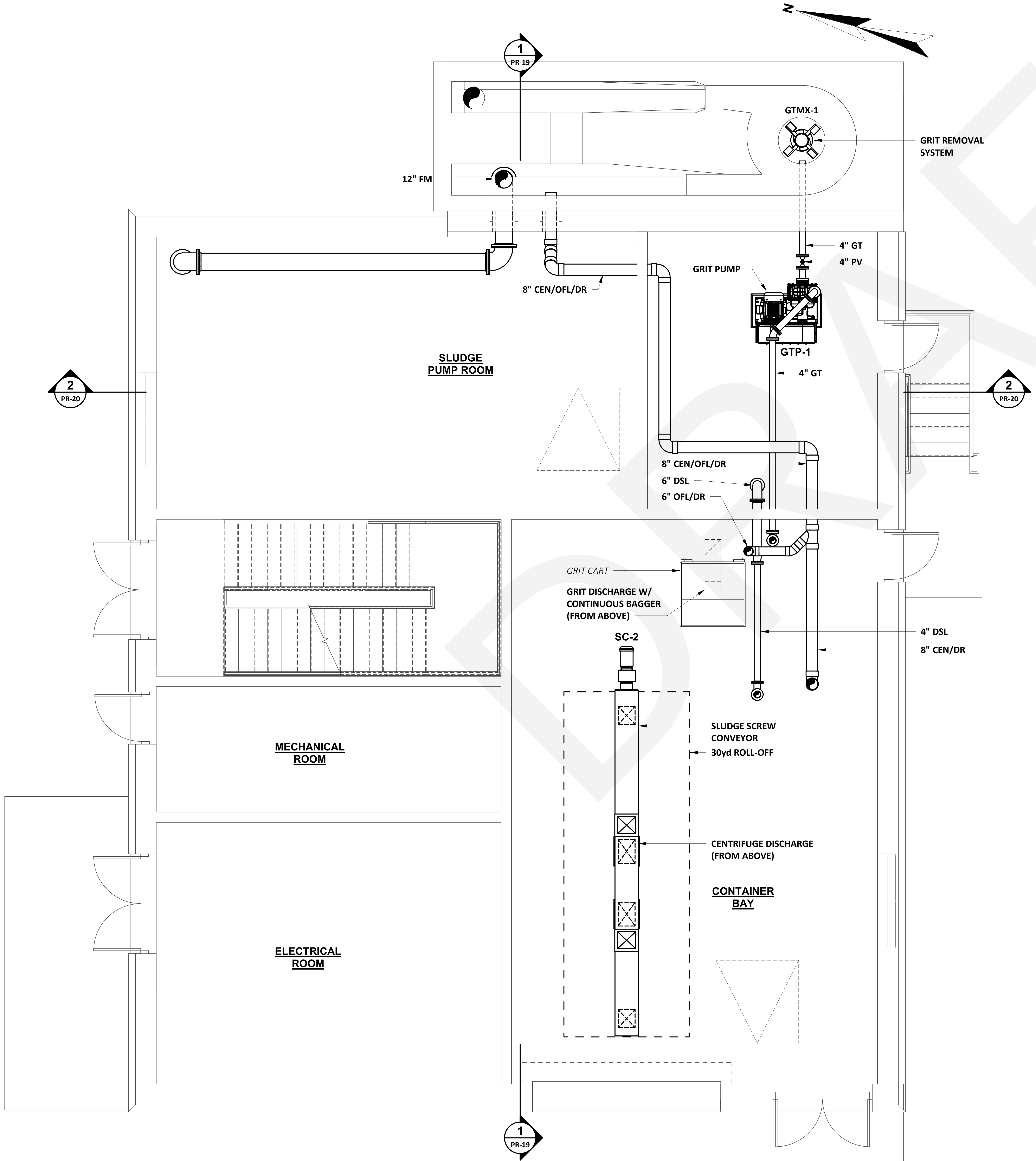
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

CONTROL BUILDING
LOWER LEVEL MODIFICATIONS PLAN AND SECTIONS

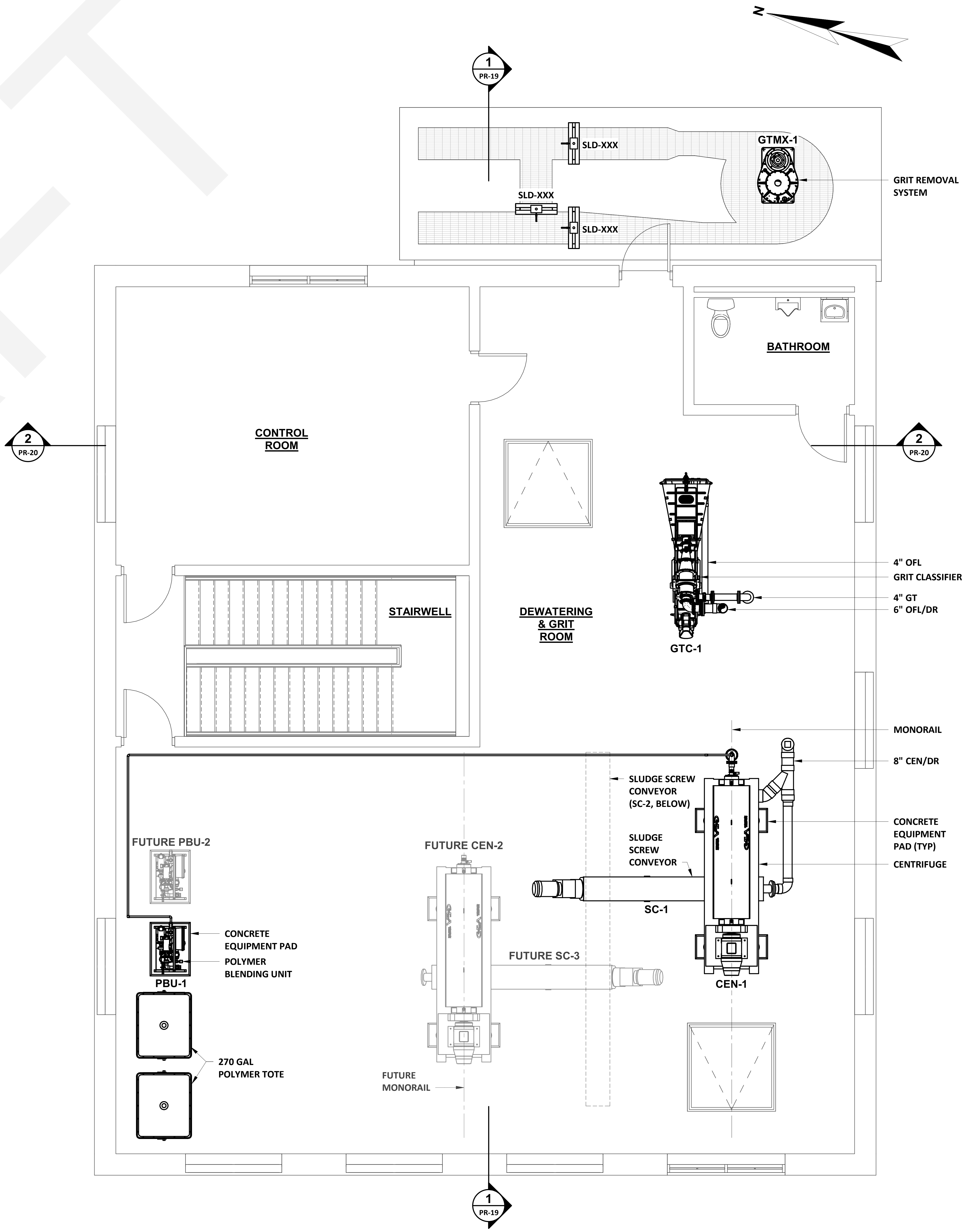
DRAWING
PR-16

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



## FIRST FLOOR PLAN

SCALE: 1/4" = 1'-0"



## SECOND FLOOR PLAN

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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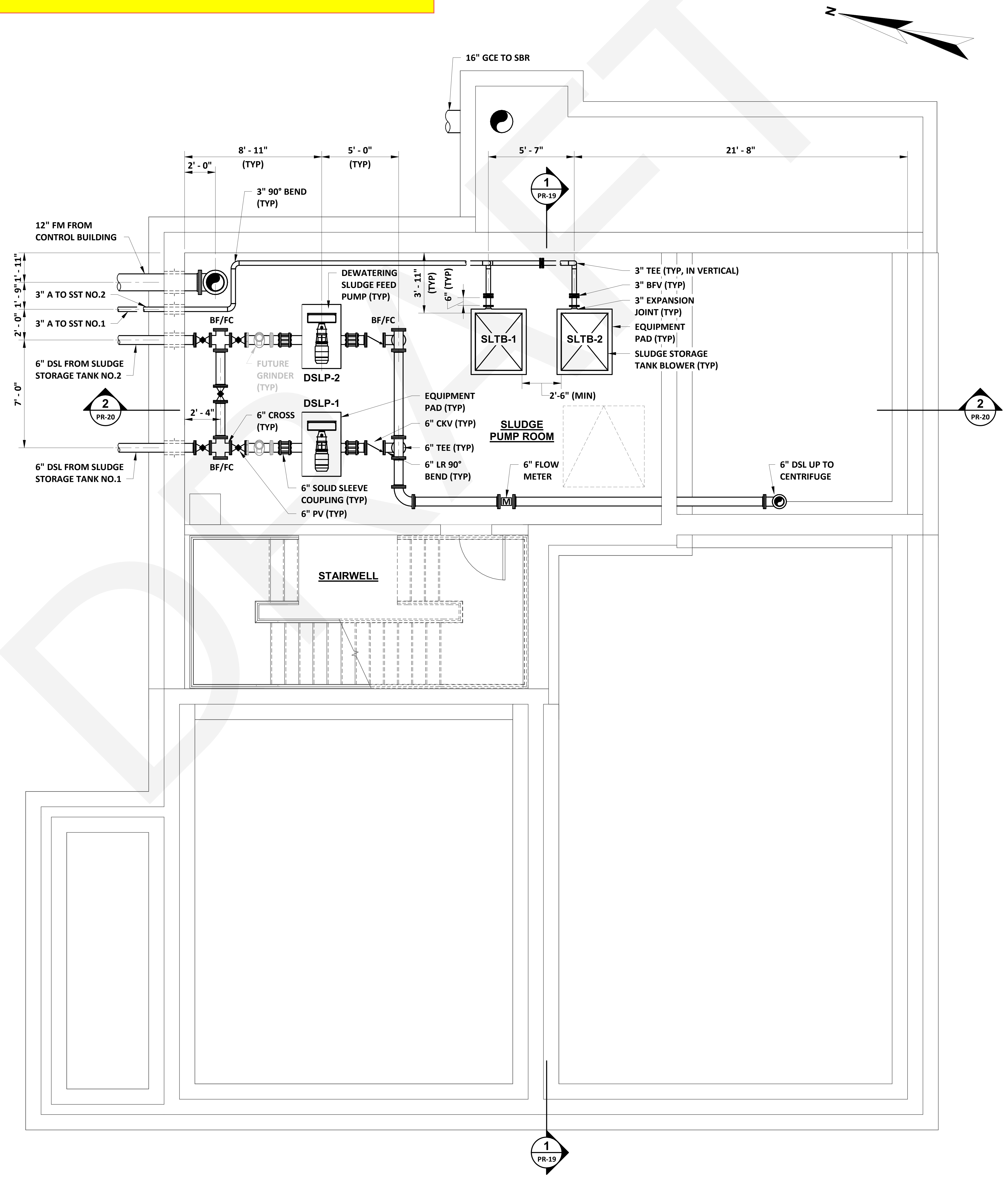
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
FIRST AND SECOND FLOOR PLANS

DRAWING
PR-17

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



**LOWER LEVEL PLAN**

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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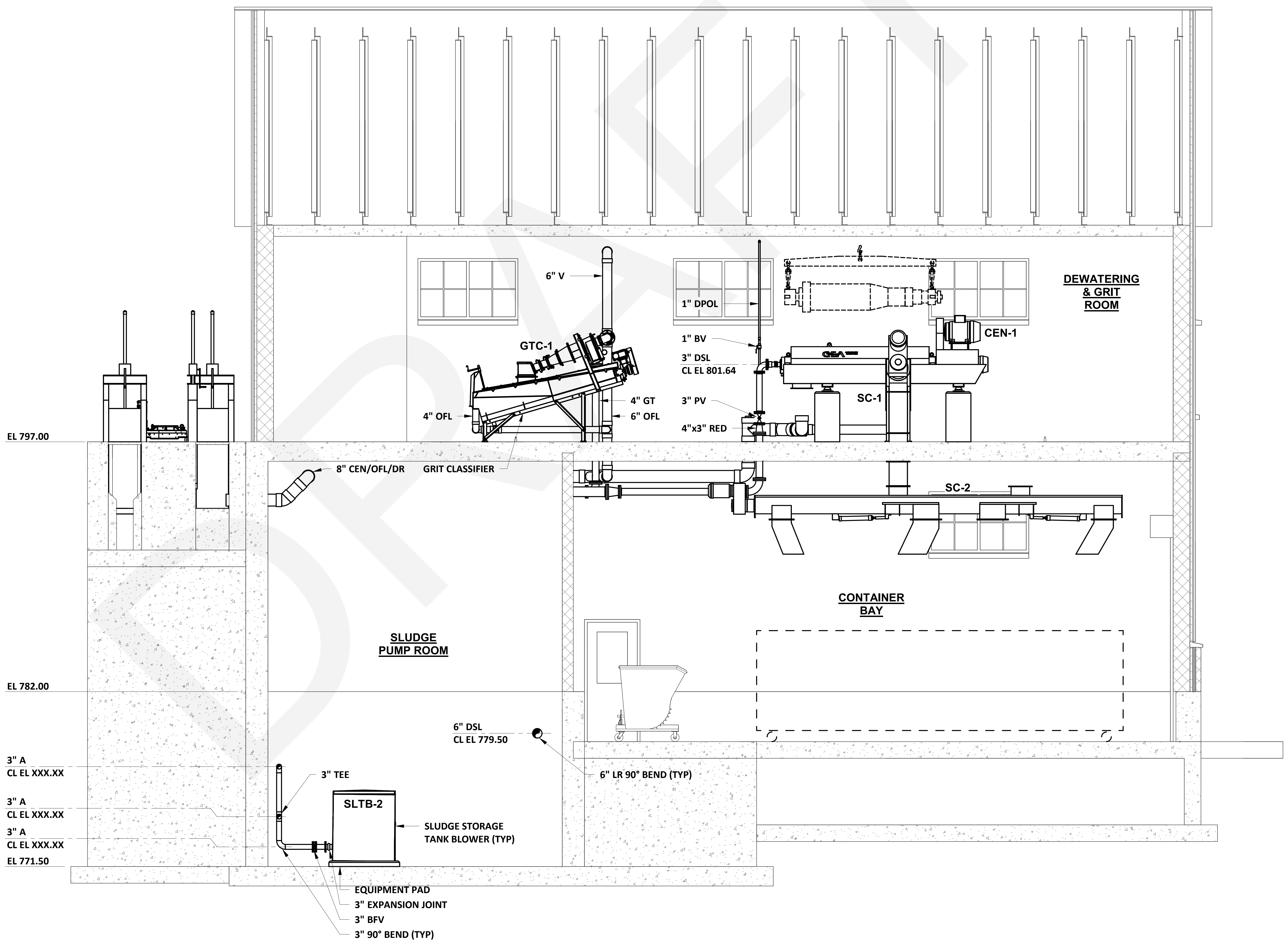
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
LOWER LEVEL PLAN AND SECTIONS

DRAWING
PR-18

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



1 PR-17 **SECTION**
SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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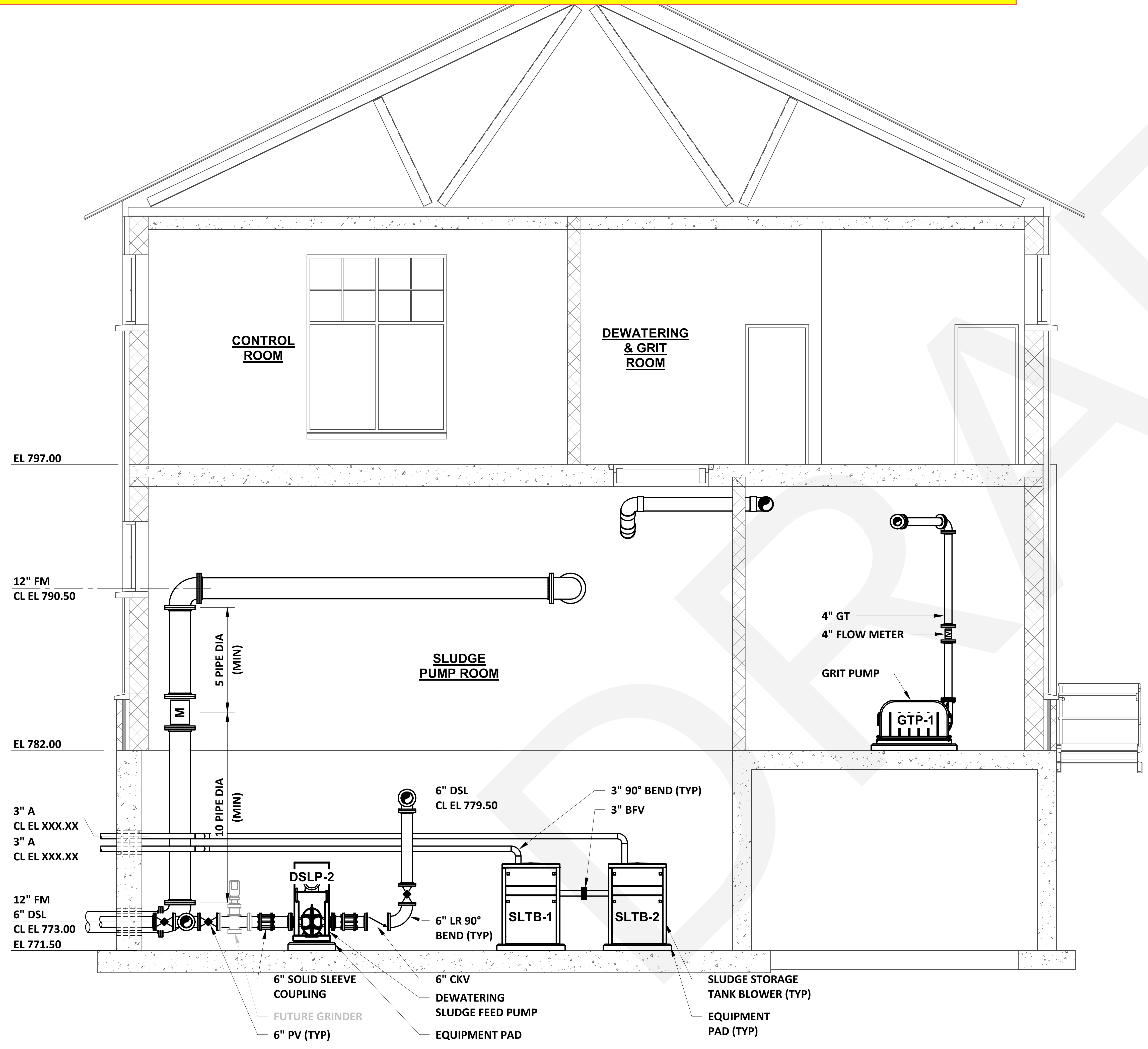
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS I

DRAWING
PR-19

12/8/2022 2:36:43 PM

Note: The Town has elected to move forward with the Alternate Process Building Layout presented in Appendix H.



2 PR-17 **SECTION**
SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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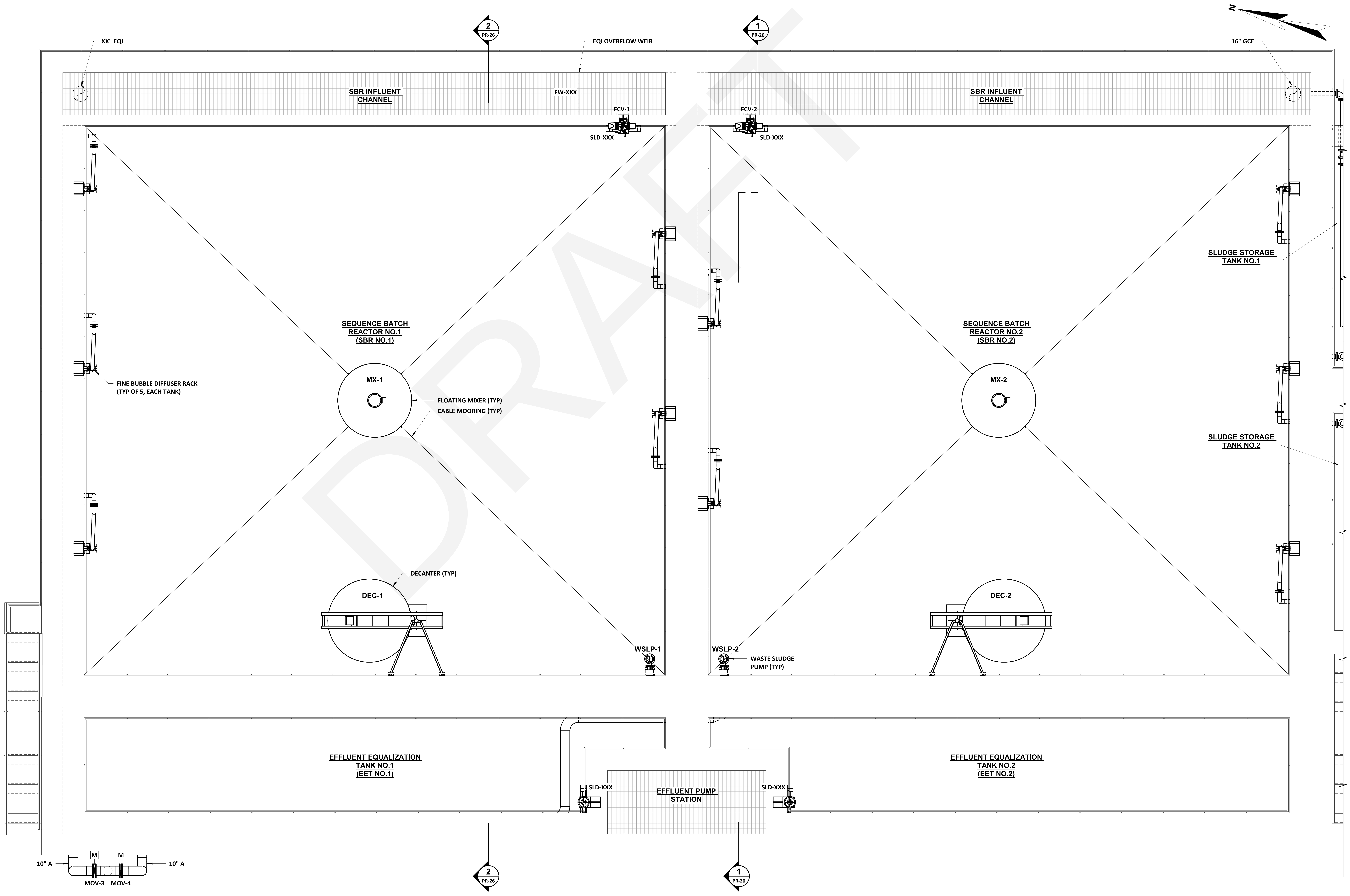
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS II

DRAWING
PR-20

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-PRM-ProcessBldg.rvt

12/8/2022 2:30:21 PM



## SBR AND EQUALIZATION UPPER LEVEL PARTIAL PLAN

SCALE: 1/4" = 1'-0"

### GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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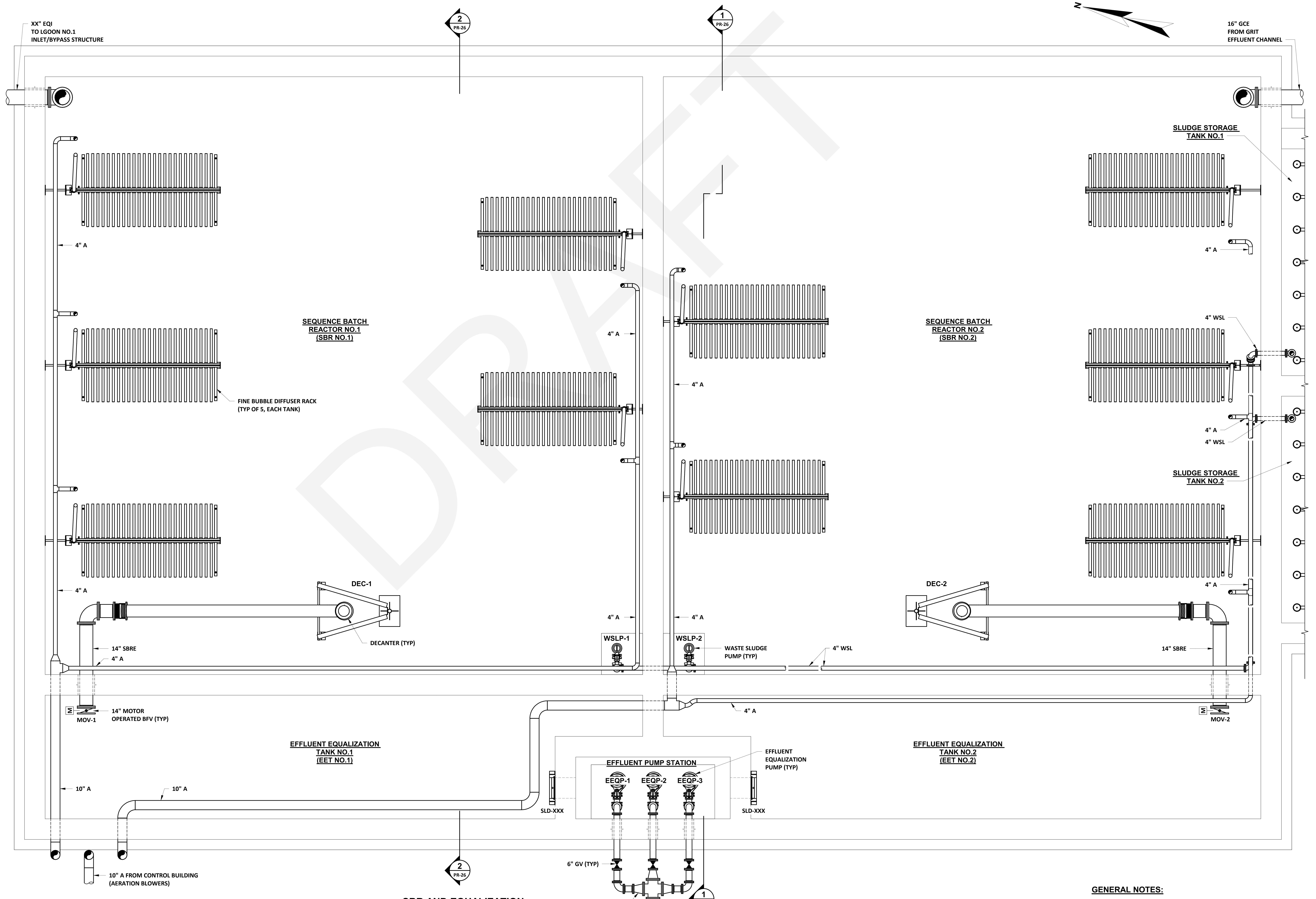
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SBR, EQUALIZATION, AND SLUDGE STORAGE TANK
SBR AND EQUALIZATION
PARTIAL UPPER LEVEL PLAN

DRAWING
PR-23

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-PRM-SBRTankComplex.rvt



## SBR AND EQUALIZATION LOWER LEVEL PARTIAL PLAN

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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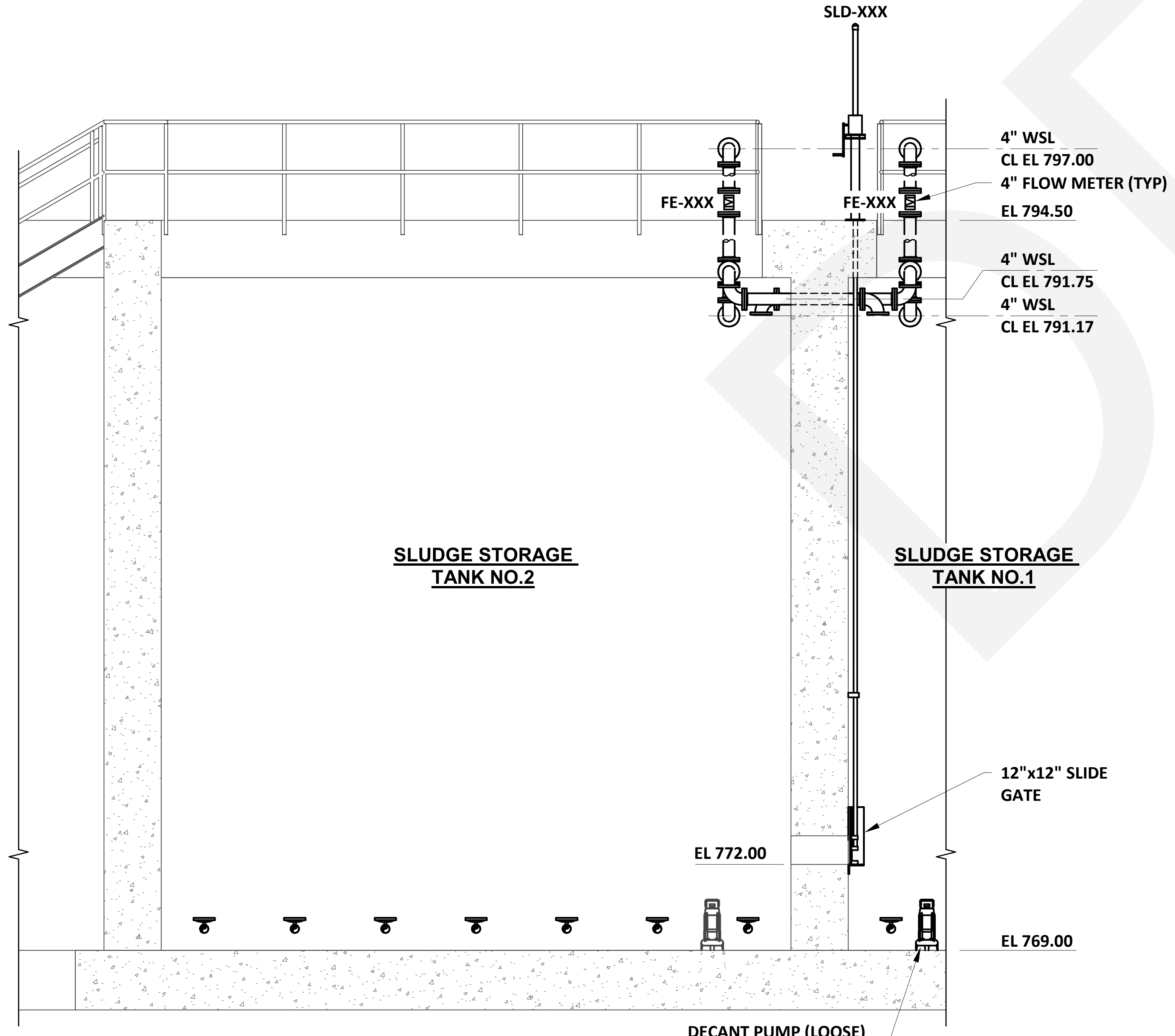
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

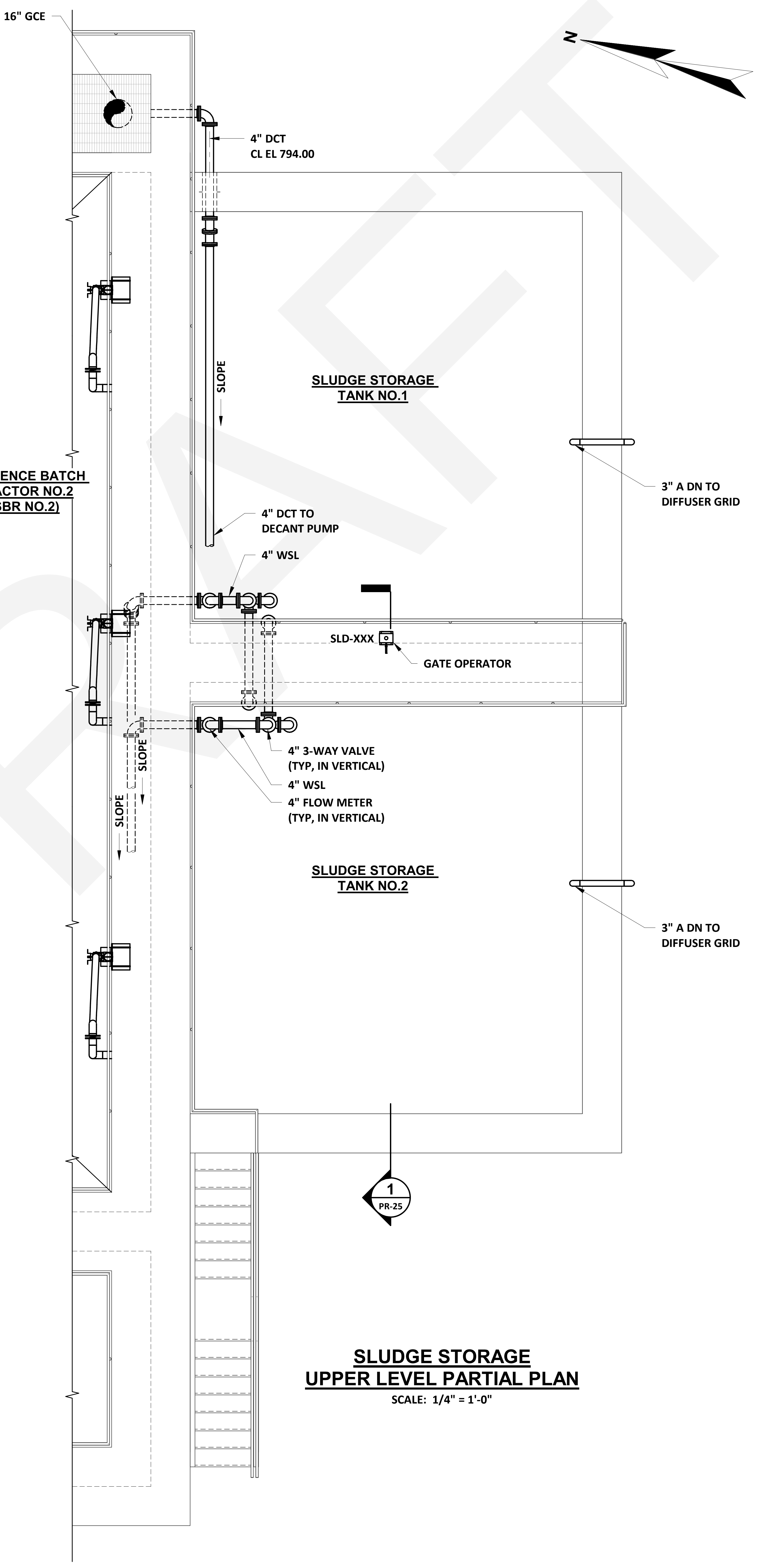
SBR, EQUALIZATION, AND SLUDGE STORAGE TANK
SBR AND EQUALIZATION
PARTIAL LOWER LEVEL PLAN

DRAWING
PR-24

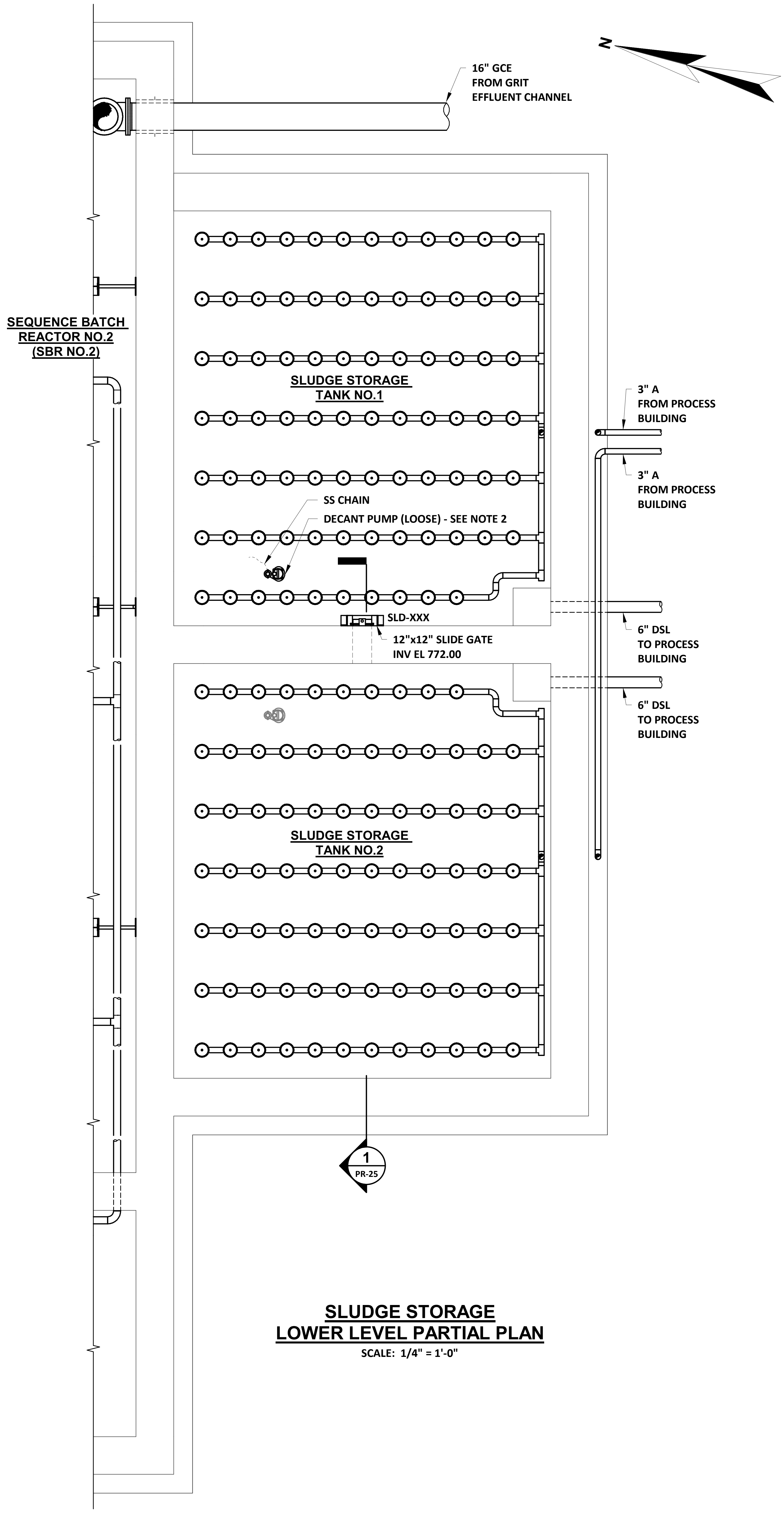


1 PR-25 **SECTION**
SCALE: 1/4" = 1'-0"

**SEQUENCE BATCH REACTOR NO.2 (SBR NO.2)**



## SLUDGE STORAGE UPPER LEVEL PARTIAL PLAN
SCALE: 1/4" = 1'-0"



## SLUDGE STORAGE LOWER LEVEL PARTIAL PLAN
SCALE: 1/4" = 1'-0"

### GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

2. CONTRACTOR TO PROVIDE SUBMERSIBLE DECANT PUMP (_____________, OR EQUAL). PUMP SHALL BE CAPABLE OF 2" SOLIDS HANDLING, CLASS I, DIVISION 2 RATED, AND 115 VOLTS, SINGLE-PHASE. DISCHARGE SHALL BE WEATHER SUCTION HOSE WITH CAMLOCK COUPLING. PROVIDE 25-FT OF 316 STAINLESS STEEL CHAIN AND APPURTENANCES FOR PUMP LIFTING.

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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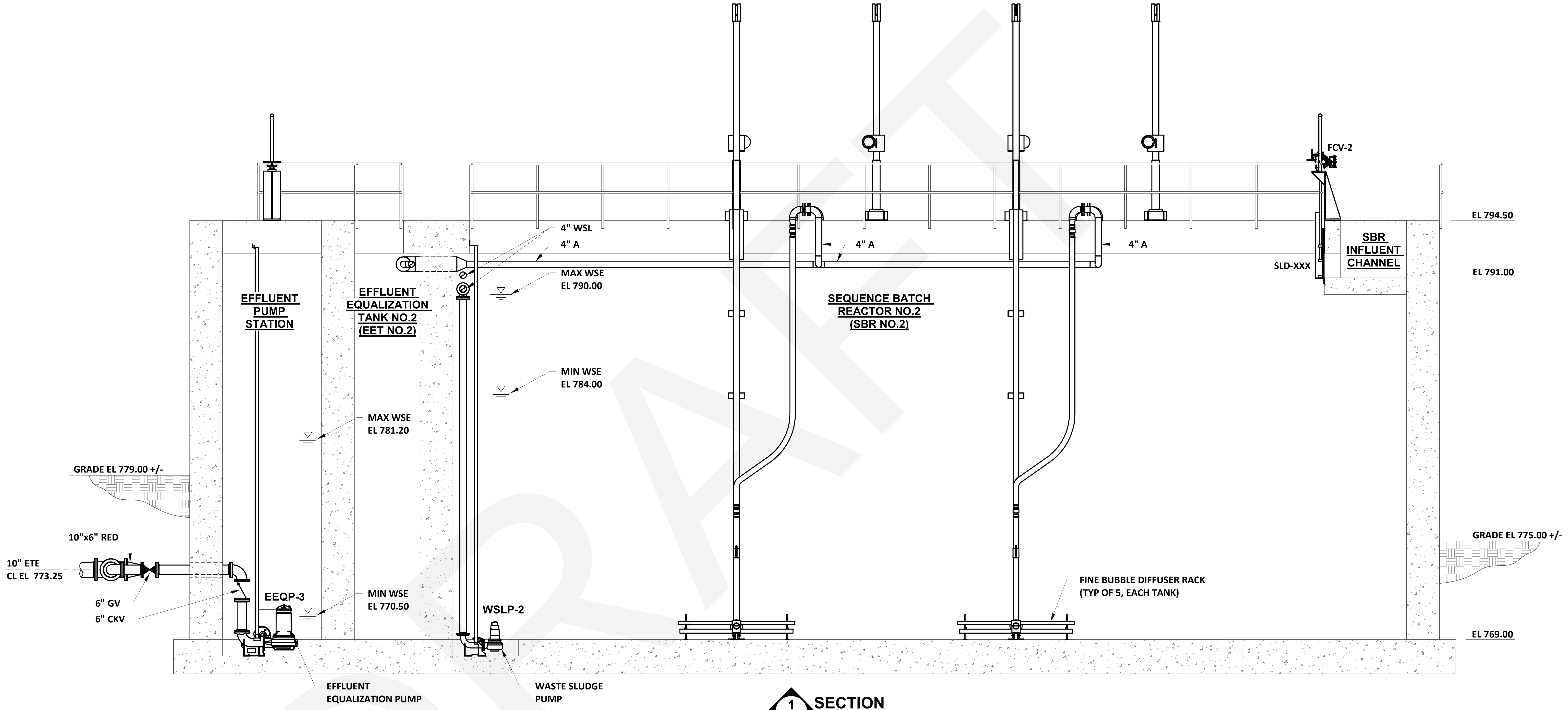
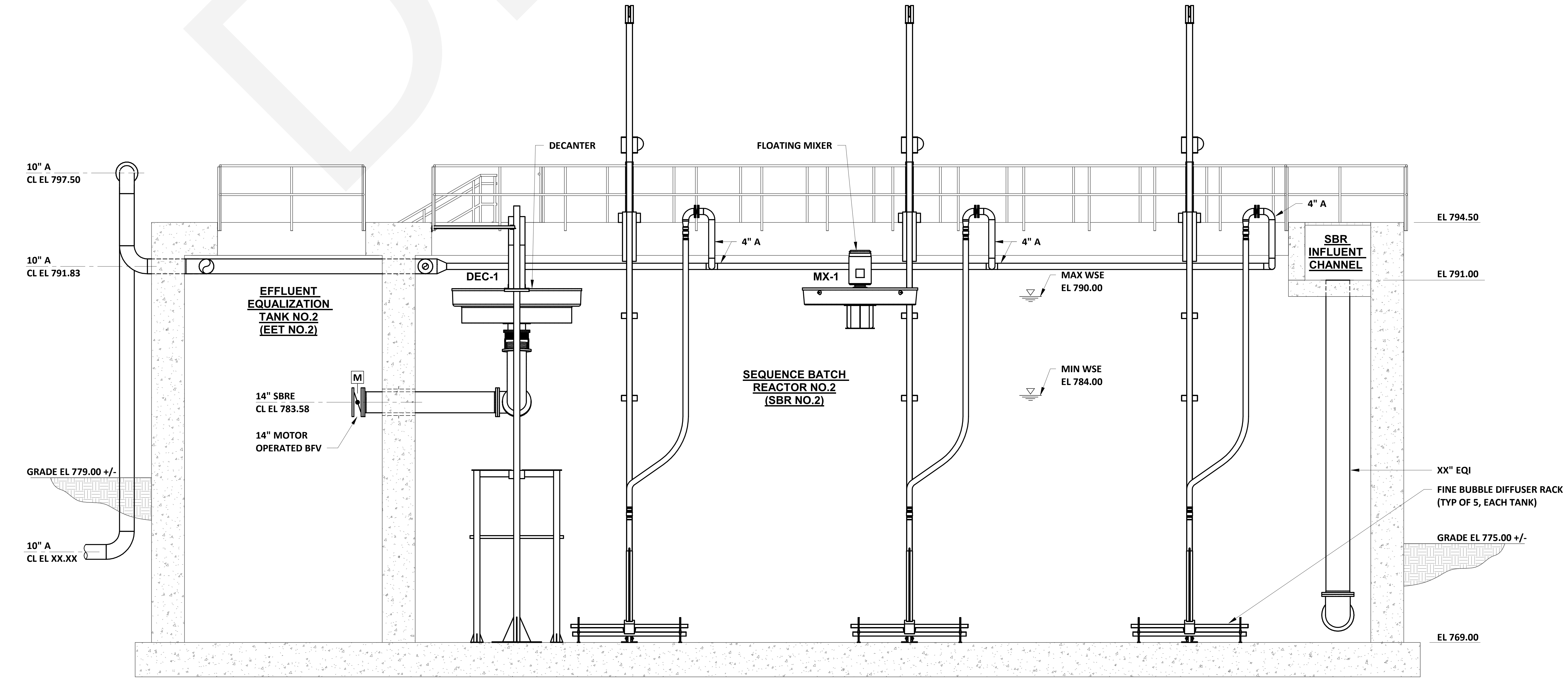
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SBR, EQUALIZATION, AND SLUDGE STORAGE TANK
SLUDGE STORAGE
PARTIAL UPPER AND LOWER LEVEL PLANS

DRAWING
PR-25



1 SECTION
PR-23 SCALE: 1/4" = 1'-0"



2 SECTION
PR-23 SCALE: 1/4" = 1'-0"

## GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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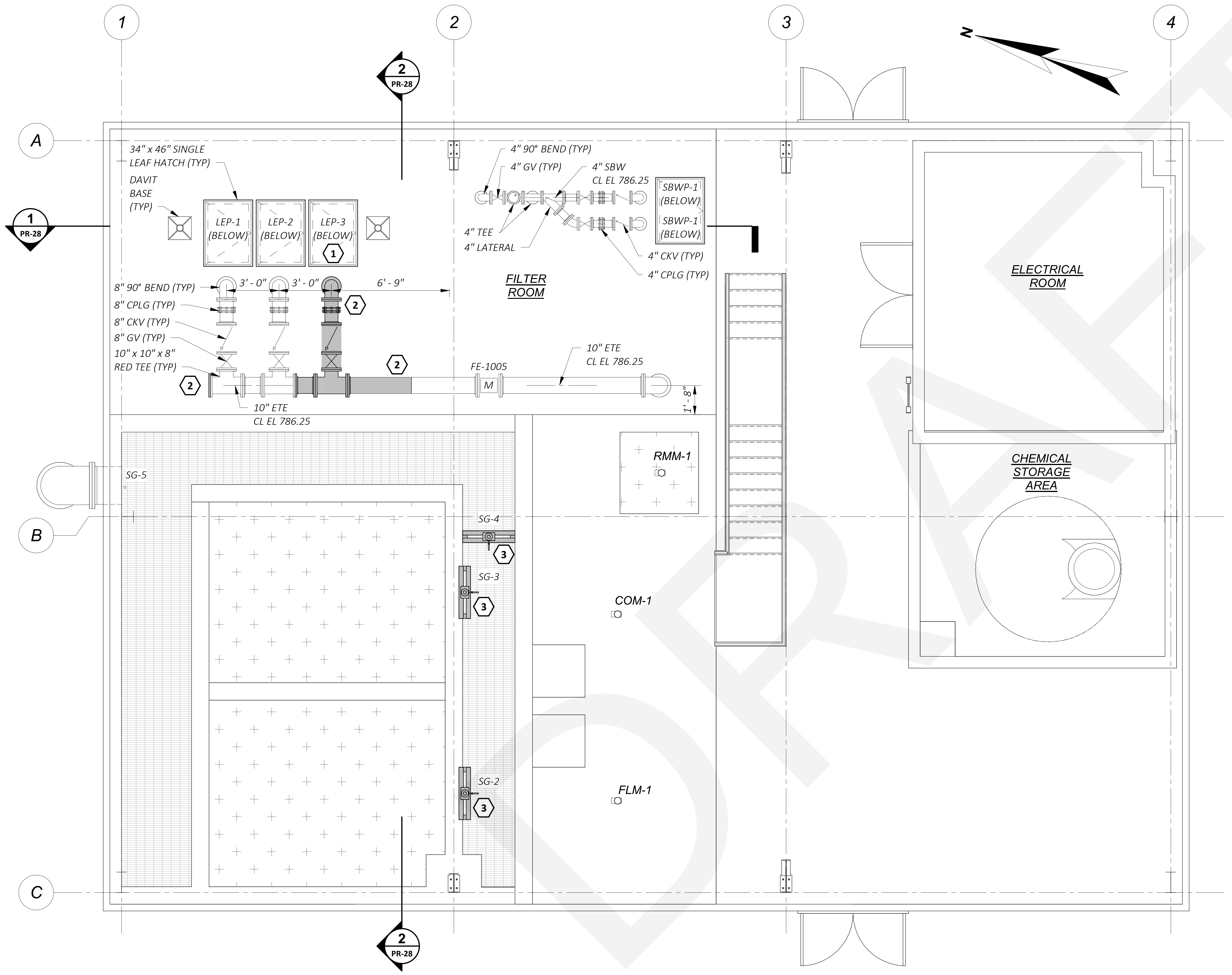
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

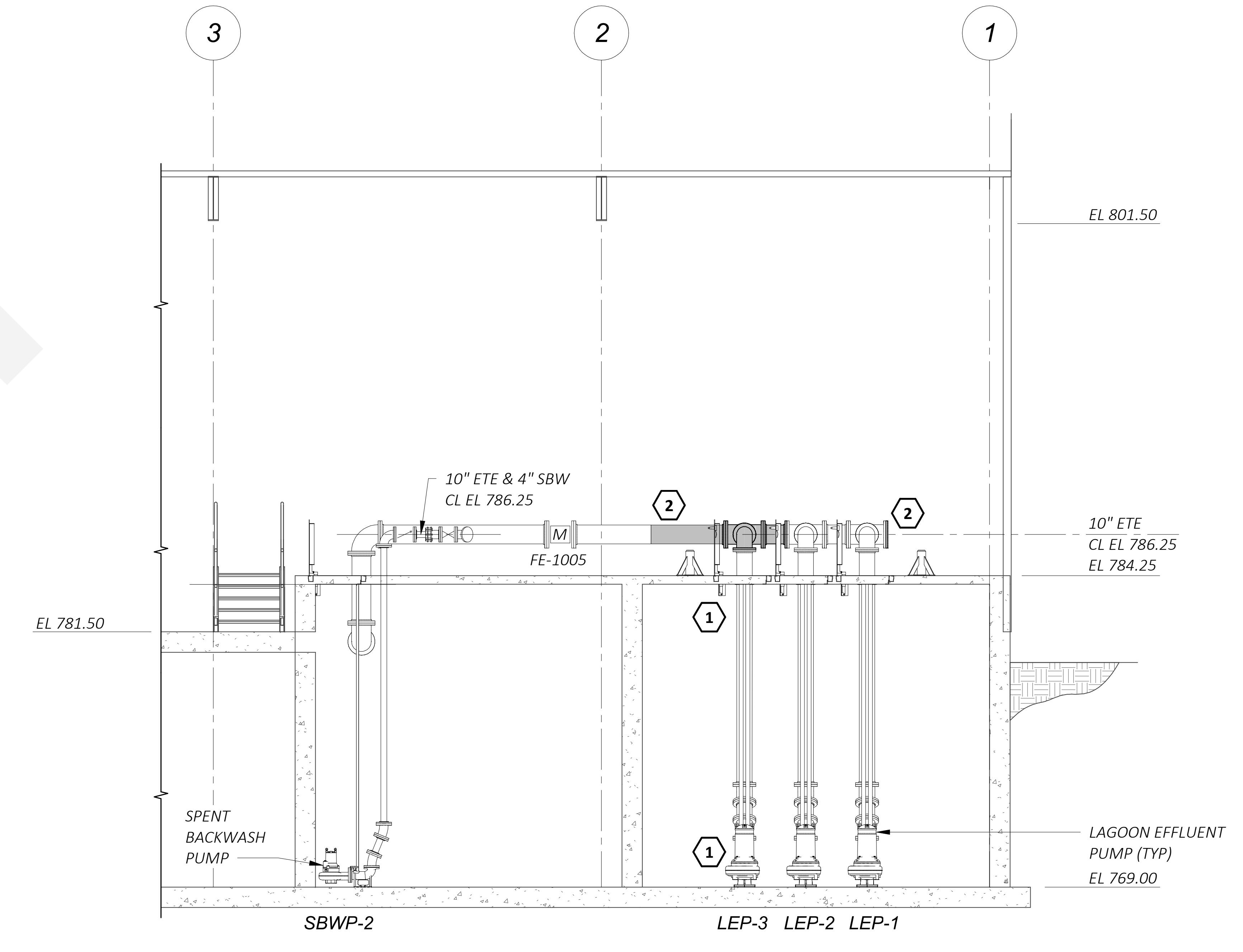
SBR, EQUALIZATION, AND SLUDGE STORAGE TANK
SECTIONS I

DRAWING
PR-26



## DEMOLITION PLAN

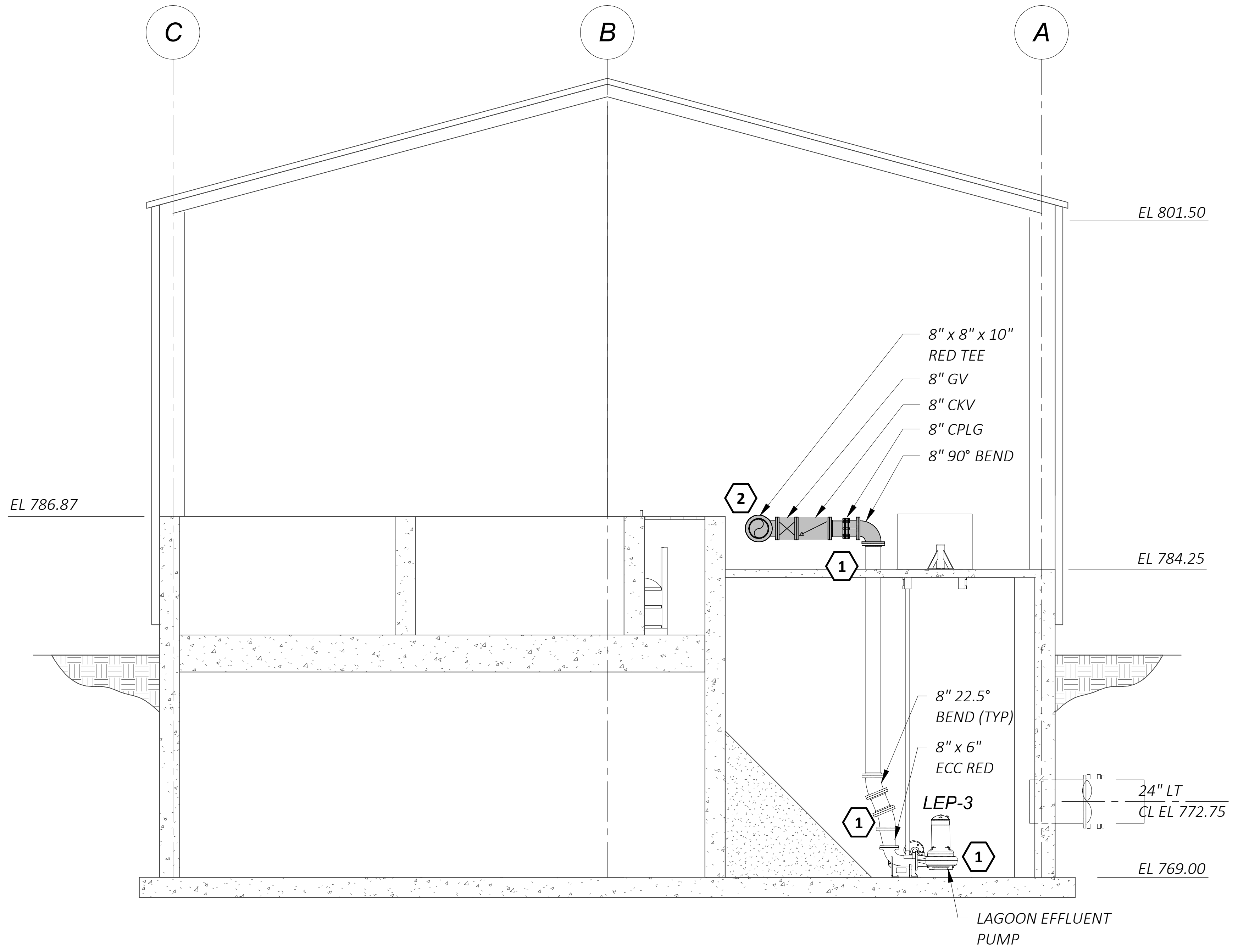
SCALE: 1/4" = 1'-0"



## 1 SECTION

PR-28

SCALE: 3/16" = 1'-0"



## 2 SECTION

PR-28

SCALE: 3/16" = 1'-0"

### DEMOLITION NOTES:

1. ABANDON LEP-3 IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: PUMP, BASE, GUIDE RAILS, PIPING TO THE EXTENTS SHOWN, POWER AND CONTROL WIRING, AND ALL ASSOCIATED APPURTENANCES.
2. REMOVE/DEMOLISH PIPING TO LIMITS SHOWN ON DRAWINGS INCLUDING, BUT NOT LIMITED TO: PIPING, SUPPORTS, VALVES, FITTINGS, COUPLINGS, HARDWARE, AND ALL ASSOCIATED APPURTENANCES.
3. REMOVE/DEMOLISH THE EXISTING SLIDE GATE IN ITS ENTIRETY INCLUDING, BUT NOT LIMITED TO: GATE, FRAME, HARDWARE, AND ALL ASSOCIATED APPURTENANCES.

### GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: Author
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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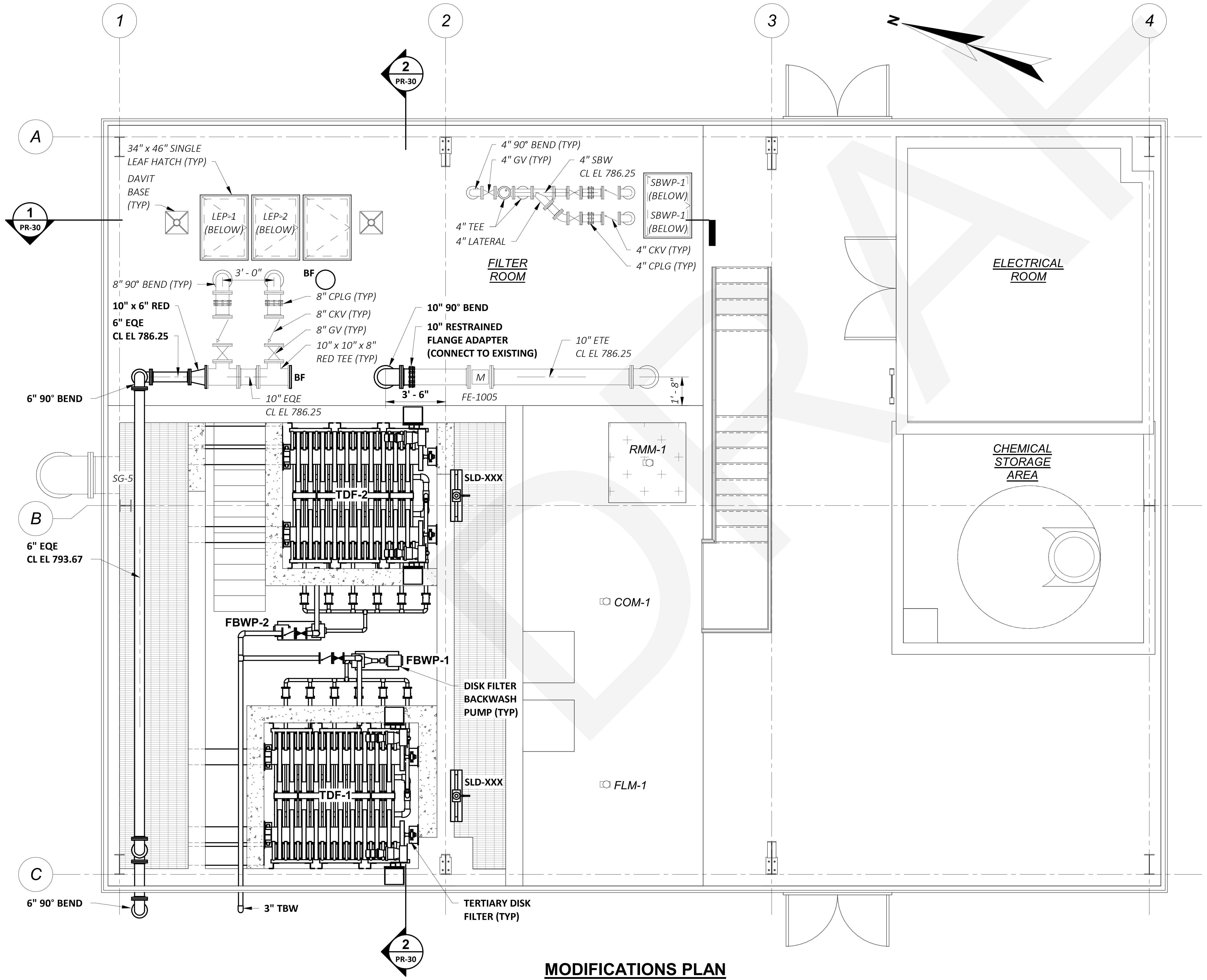
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

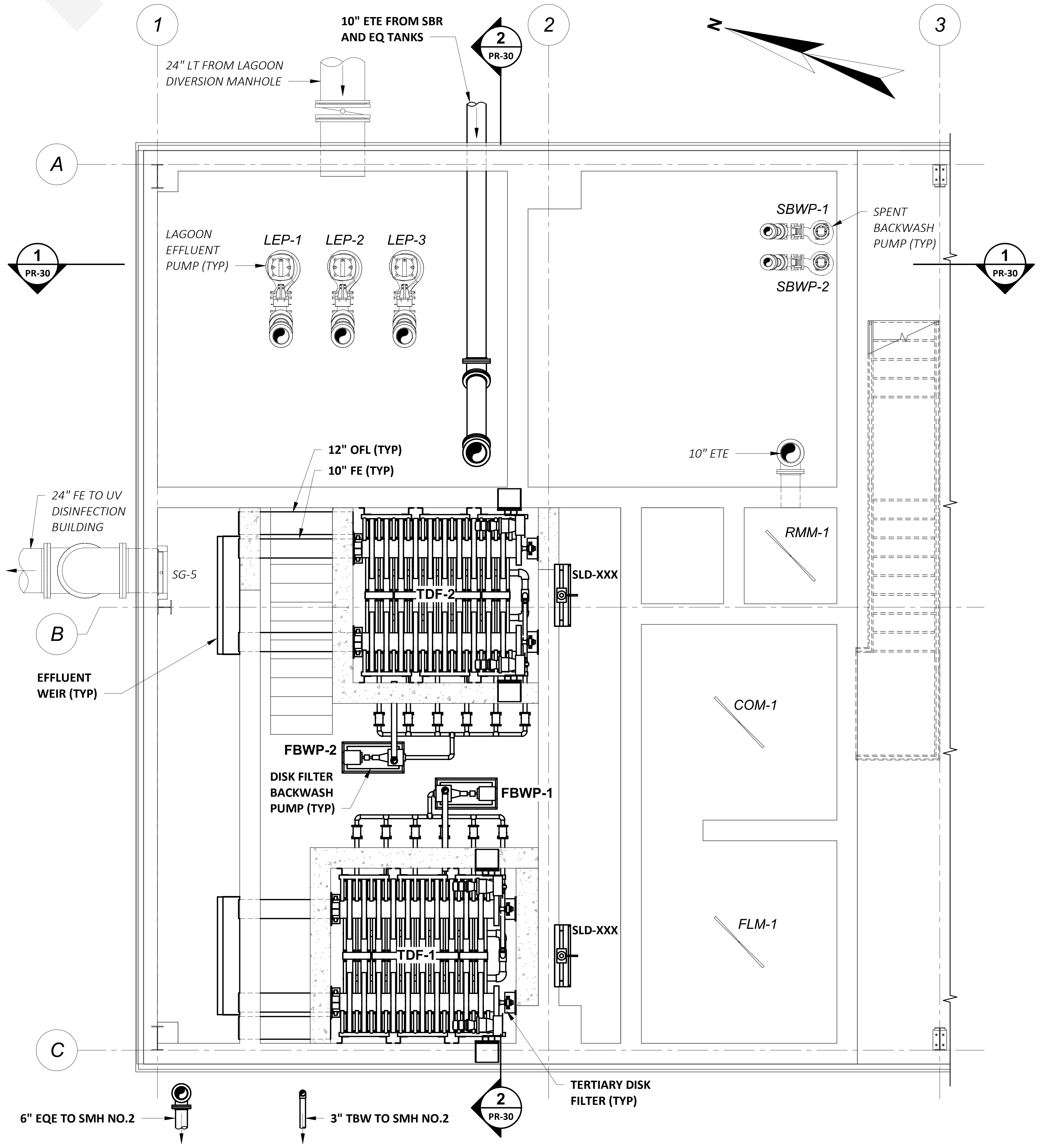
FILTER BUILDING
DEMOLITION PLAN AND SECTION

DRAWING
PR-28



**MODIFICATIONS PLAN**

SCALE: 1/4" = 1'-0"



**PARTIAL MODIFICATIONS PLAN**

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

FILTER BUILDING
MODIFICATION PLANS

DRAWING
PR-29

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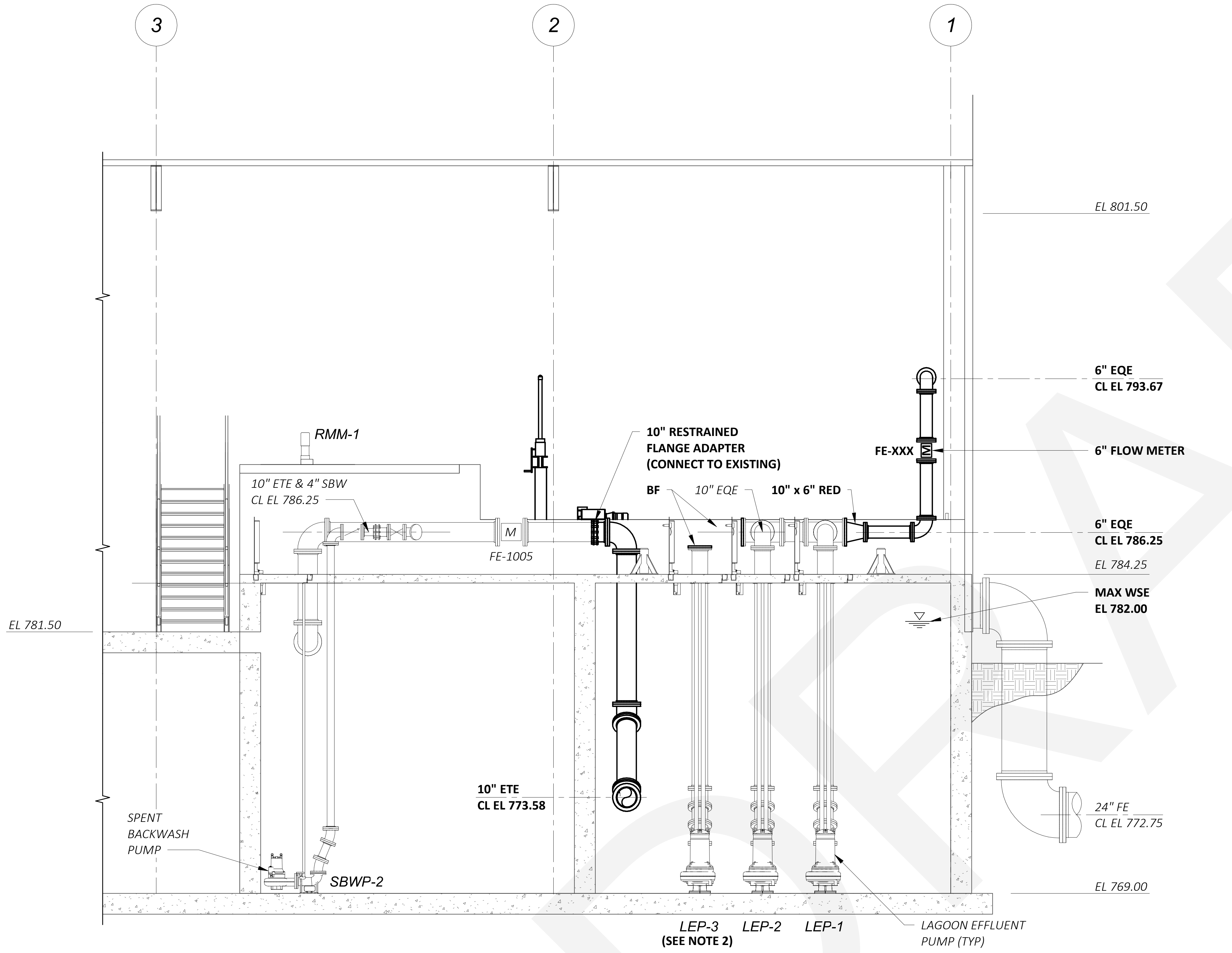
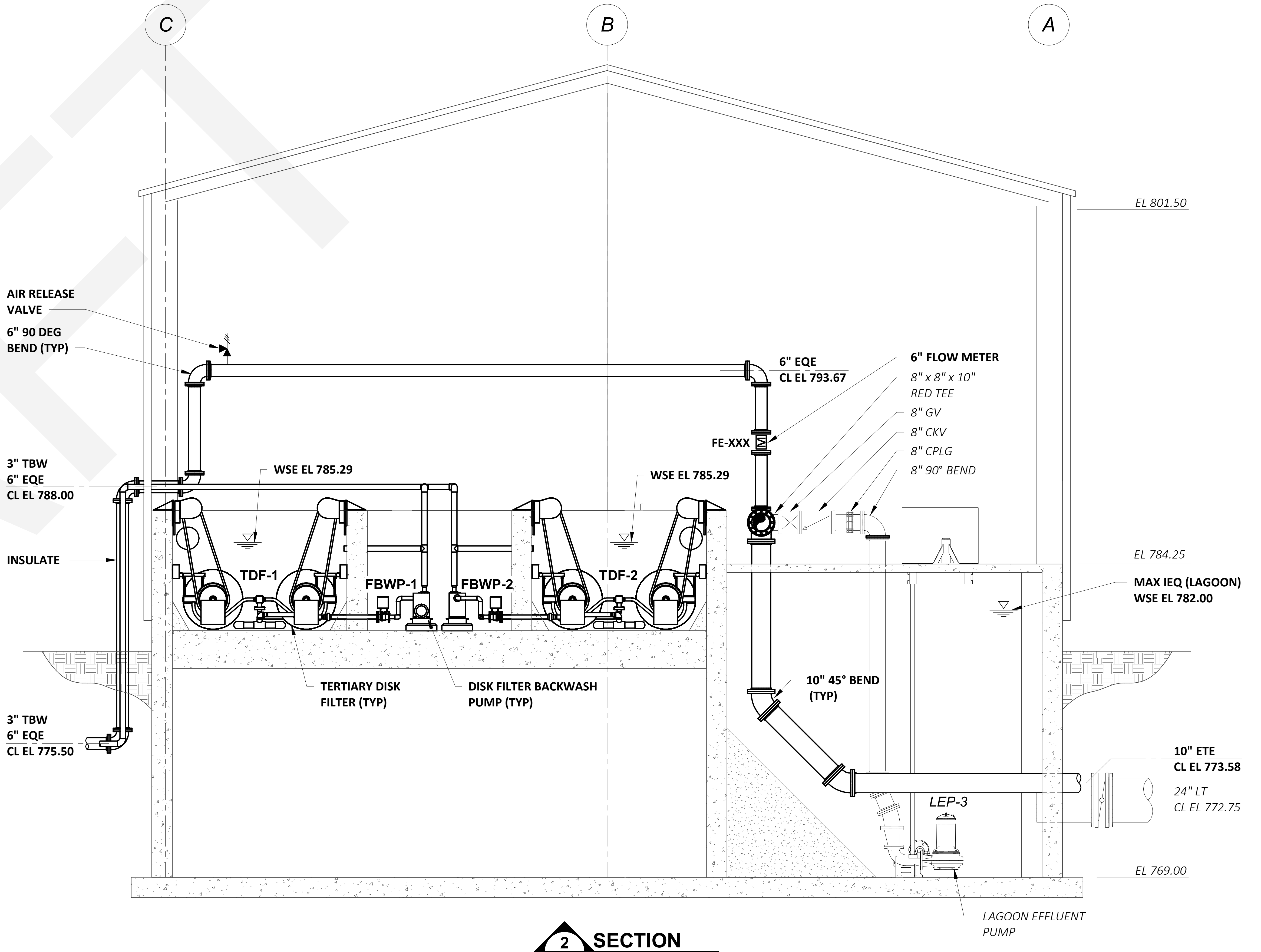


1 **SECTION**
PR-29 SCALE: 1/4" = 1'-0"



2 **SECTION**
PR-29 SCALE: 1/4" = 1'-0"

## GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. LEP-3 ABANDONED FROM OPERATION, BUT PUMP MAY BE USED AS A SPARE FOR LEP-1 AND LEP-2.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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603.430.3728 | www.wright-pierce.com
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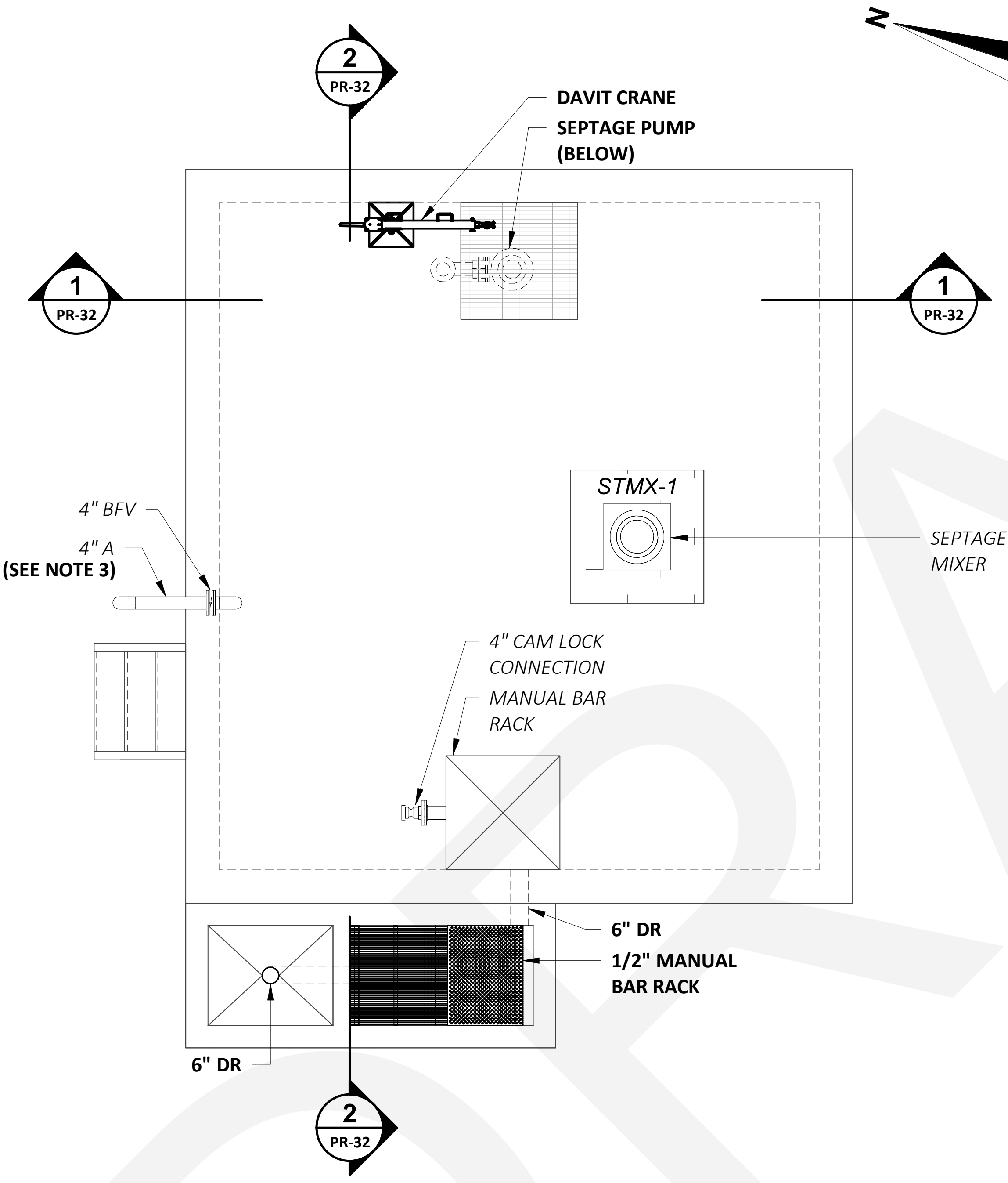
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

FILTER BUILDING
MODIFICATION SECTIONS I

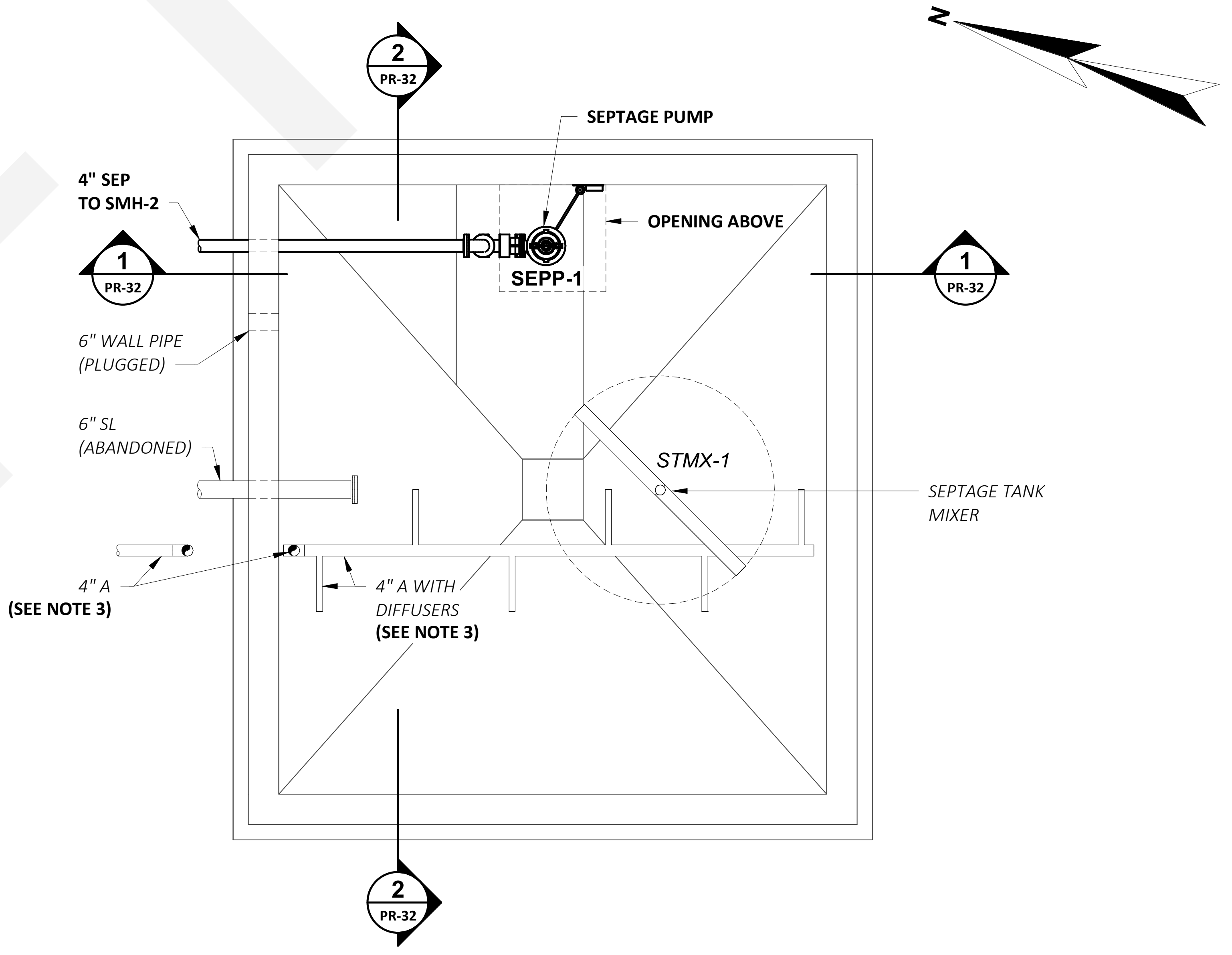
DRAWING
**PR-30**

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-PRM-FilterBldg.rvt



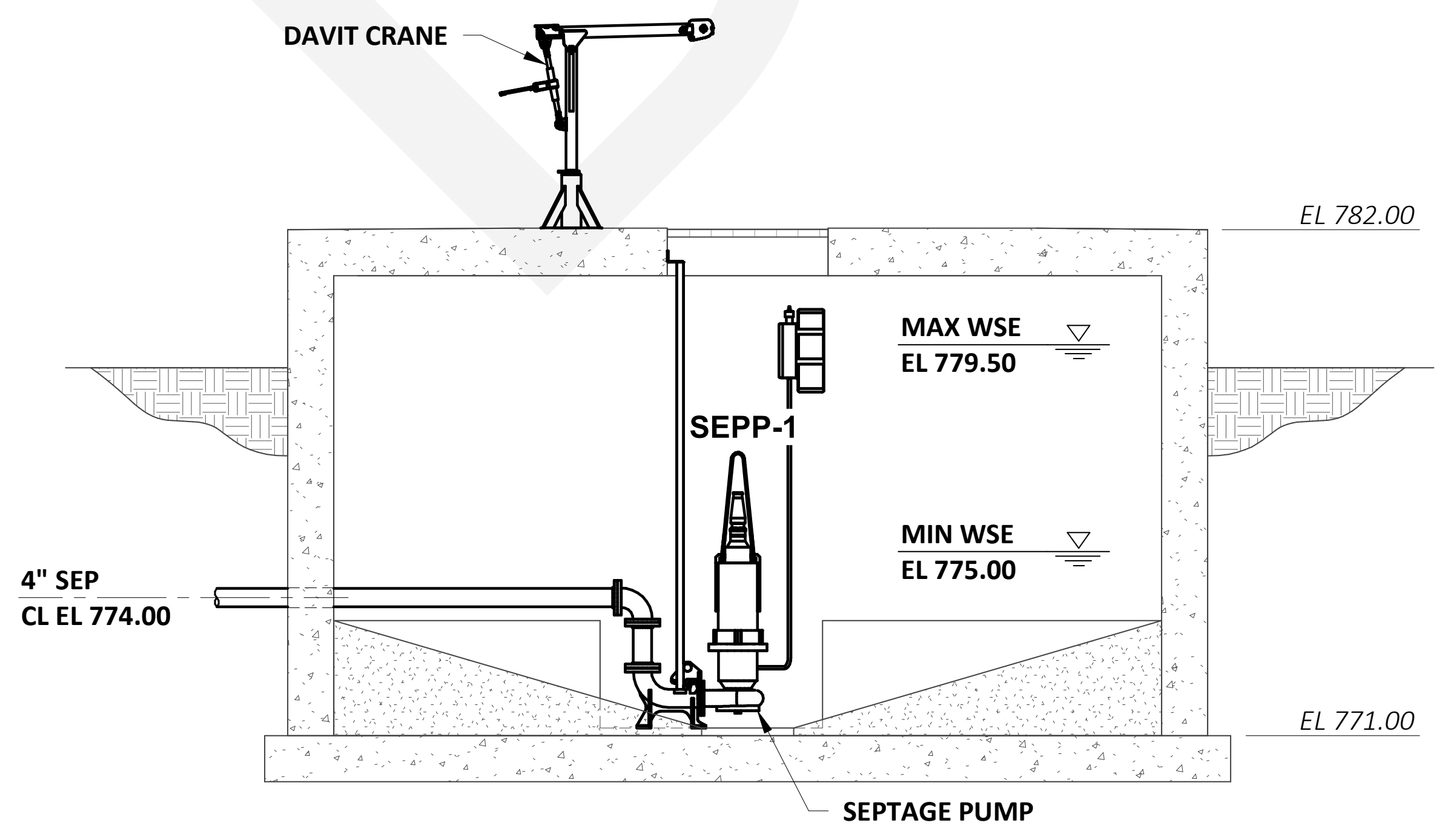
## UPPER LEVEL PLAN

SCALE: 1/4" = 1'-0"



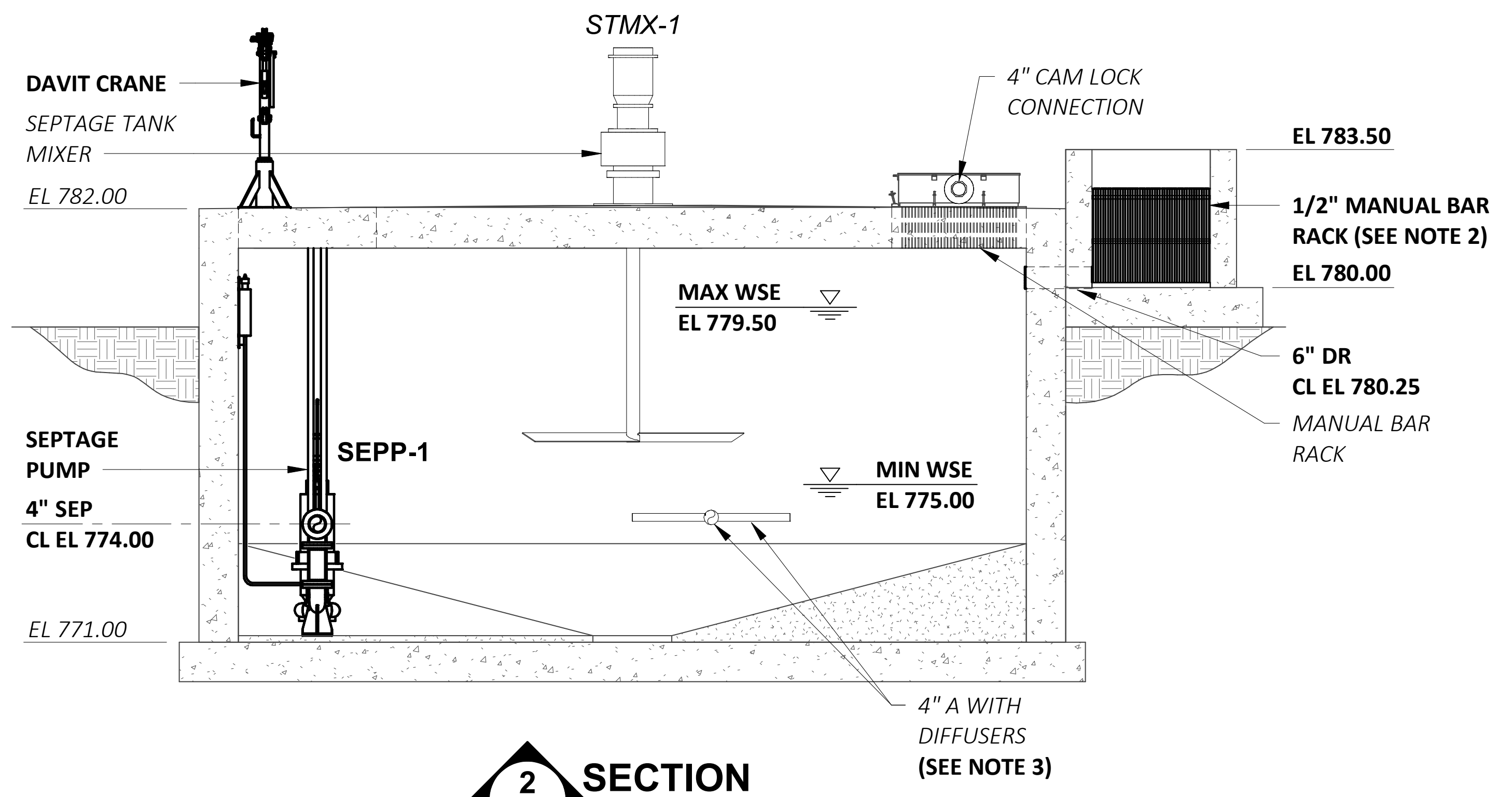
## LOWER LEVEL PLAN

SCALE: 1/4" = 1'-0"



1 PR-32 **SECTION**

SCALE: 1/4" = 1'-0"



2 PR-32 **SECTION**

SCALE: 1/4" = 1'-0"

## GENERAL NOTES:

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.
2. FINAL SEPTAGE BAR RACK SPACING TO BE COORDINATED WITH TOWN AFTER 30% SUBMITTAL.
3. EXISTING AIR PIPING BACK TO CONTROL BUILDING TO REMAIN IN-PLACE, BUT AIR SUPPLY PROCESS AND PIPING USE WILL BE ABANDONED. STMX-1 TO BE UTILIZED FOR SEPTAGE TANK MIXING.

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PROJECT NO: 20828
DESIGNED: M.CURRY
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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SEPTAGE RECEIVING
MODIFICATION PLANS AND SECTIONS

DRAWING
PR-32

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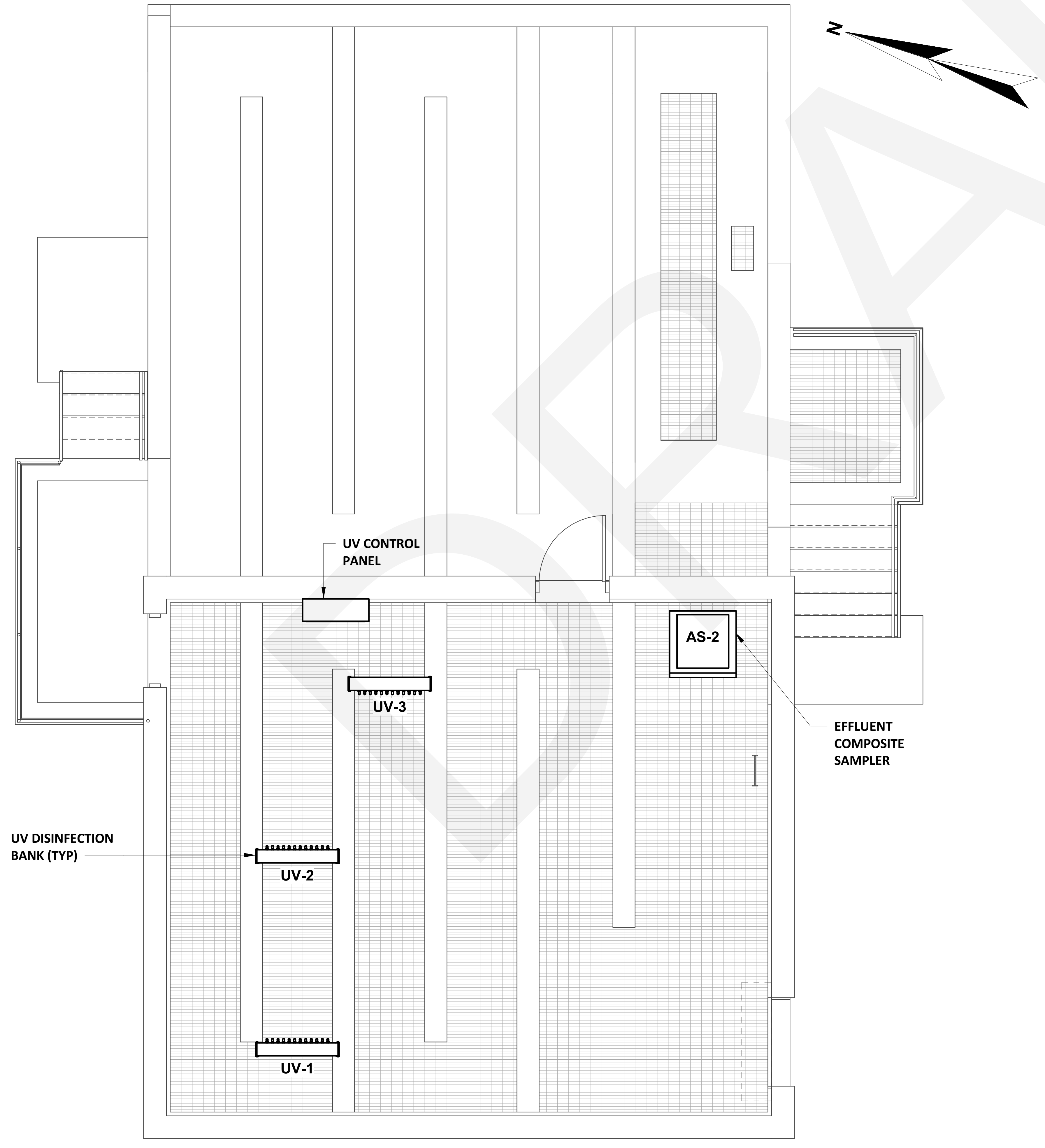
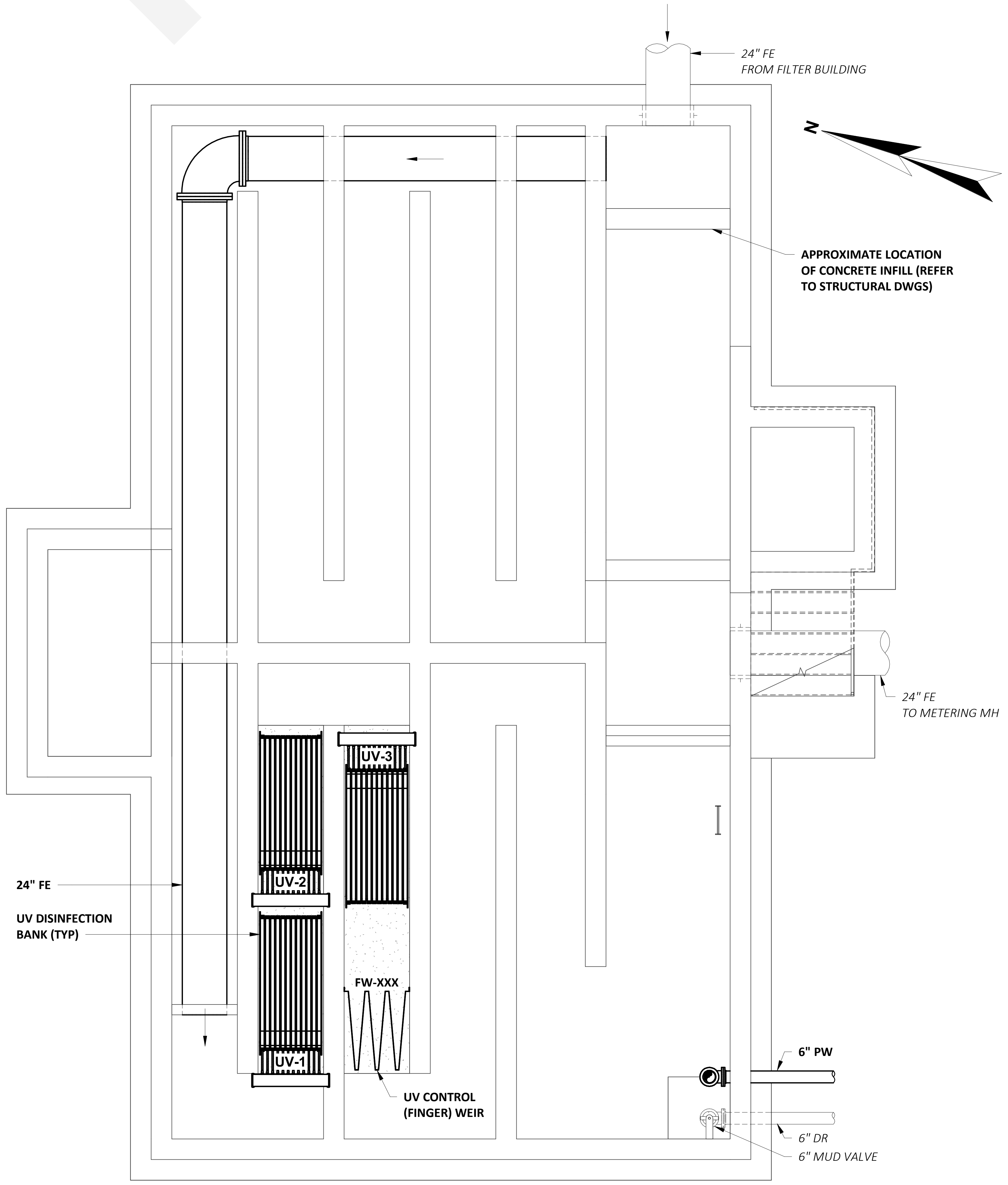


## UPPER LEVEL MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"



## LOWER LEVEL MODIFICATIONS PLAN

SCALE: 1/4" = 1'-0"

**GENERAL NOTES:**

1. FOR GENERAL PROCESS NOTES, REFER TO DRAWINGS PR-1. FOR LEGEND AND ABBREVIATIONS, REFER TO DRAWING PR-2.

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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
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UPGRADE

DISINFECTION BUILDING
MODIFICATION PLANS AND SECTIONS

DRAWING
PR-34

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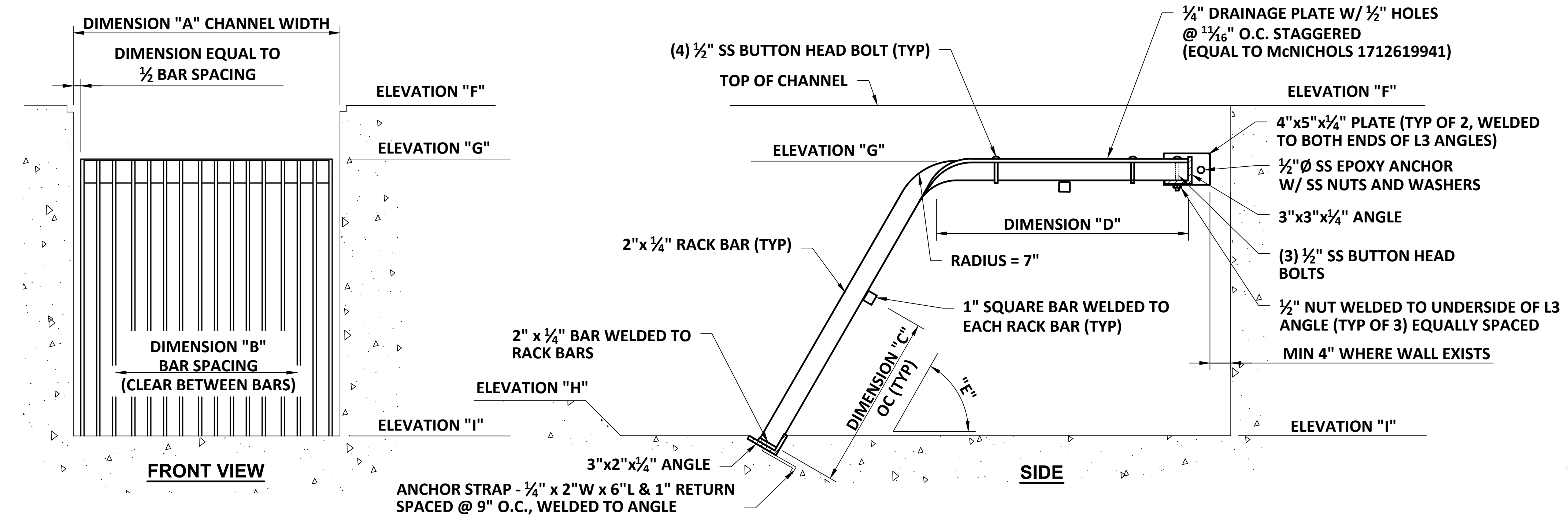
Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-PRM-UVDisinfection.rvt



### BAR RACK SCHEDULE

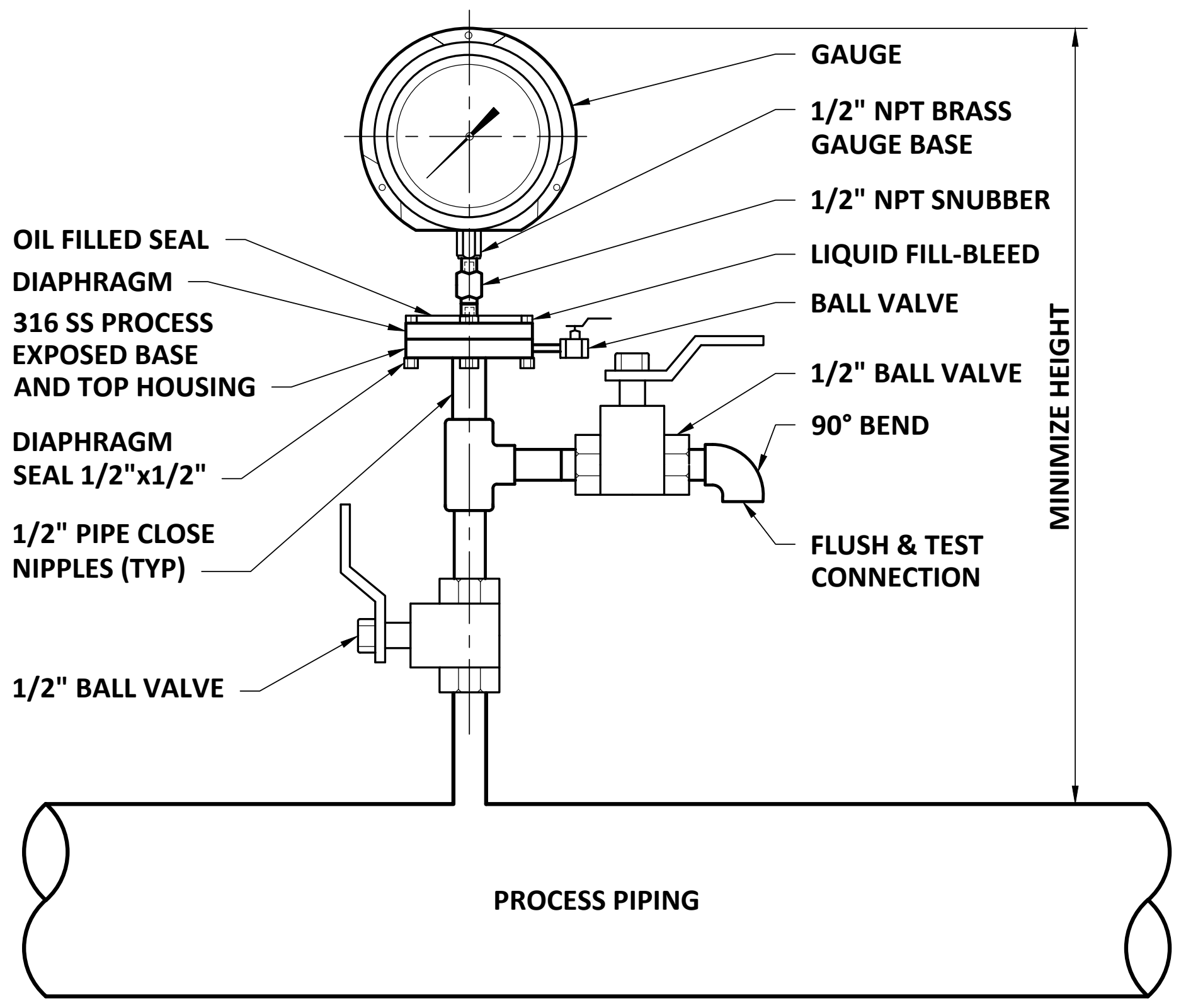
| LOCATION | DIMENSIONS | | | | | ELEVATIONS | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DIM. "A" | DIM. "B" | DIM. "C" | DIM. "D" | ANGLE. "E" | ELEV. "F" | ELEV. "G" | ELEV. "H" | ELEV. "I" |
| SEPTAGE RECEIVING | 3'-0" | 1/2" | 1'-9" | 3'-0" | 45° | 783.50 | 782.50 | 780.50 | 780.00 |
| - | - | - | - | - | - | - | - | - | - |

**NOTES:**

1. MATERIALS OF CONSTRUCTION AND RAKE PER SPECIFICATION SECTION 05500.
2. DESIGN IS INTENDED TO ALLOW RACK TO PIVOT OUT OF CHANNEL.

## BAR RACK DETAILS

SCALE: NTS

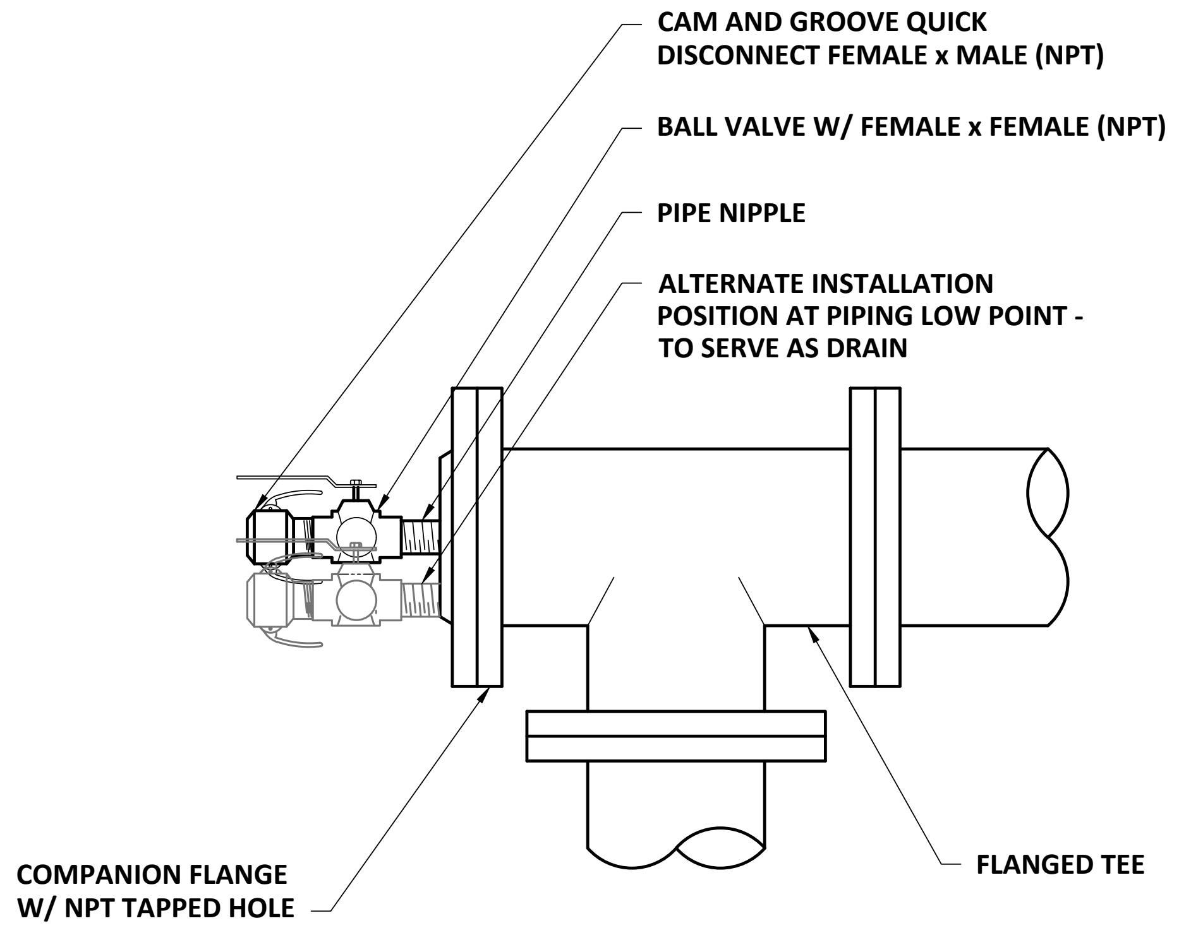


## GAUGE ASSEMBLY

SCALE: NTS

**NOTE:**

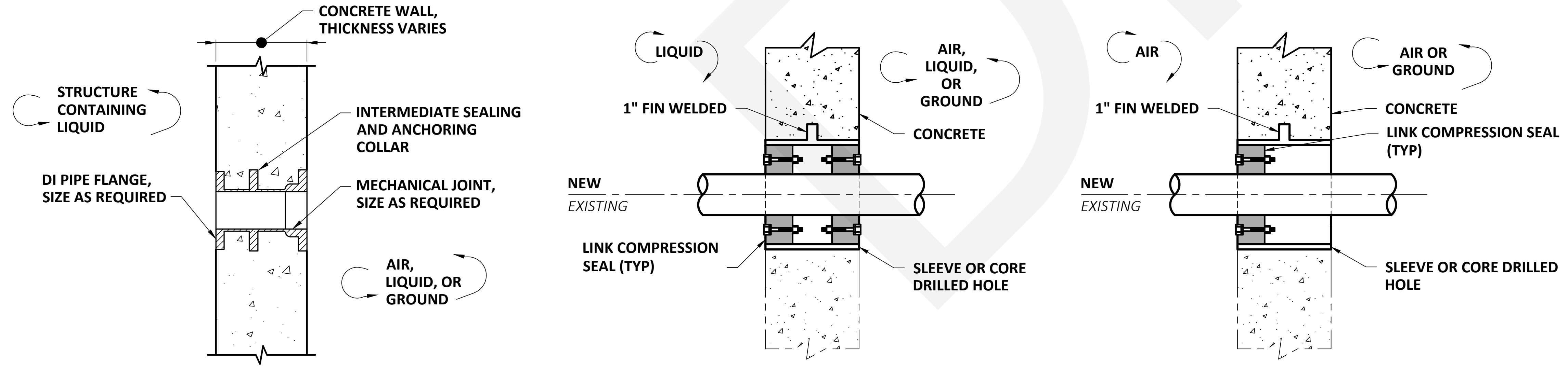
PROVIDE ONE SUCTION GAUGE ASSEMBLY AND ONE DISCHARGE GAUGE ASSEMBLY PER PROCESS PUMP UNLESS OTHERWISE SPECIFIED. GAUGES SHALL BE PROVIDED IN ACCORDANCE WITH SECTION 11000 AND 11310.



## FLUSHING CONNECTION

SCALE: NTS

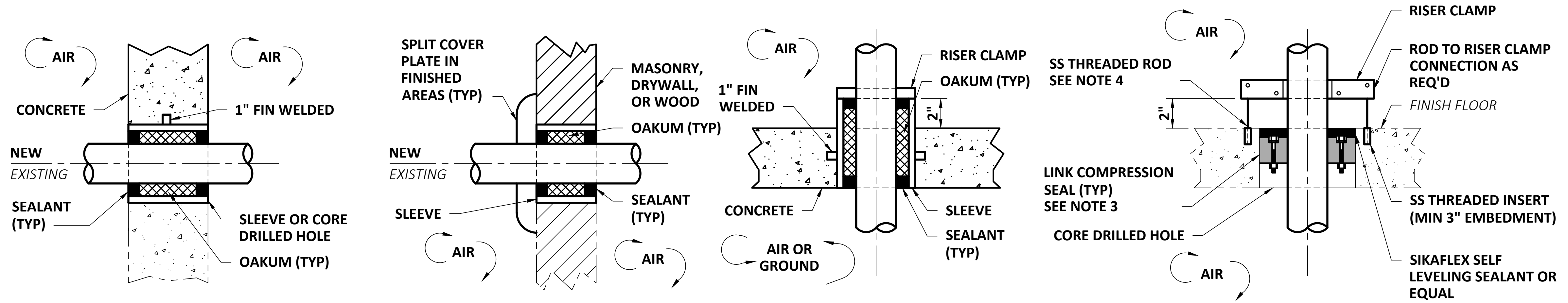
NOTES:
SEE PROCESS DRAWINGS AND SPECIFICATION SECTION 15200.



TANK WALL CASTING

TANK WALL

EXTERIOR WALL



INTERIOR WALL/PARTITION

INTERIOR NON-LOAD BEARING PARTITION

FLOOR (NEW)

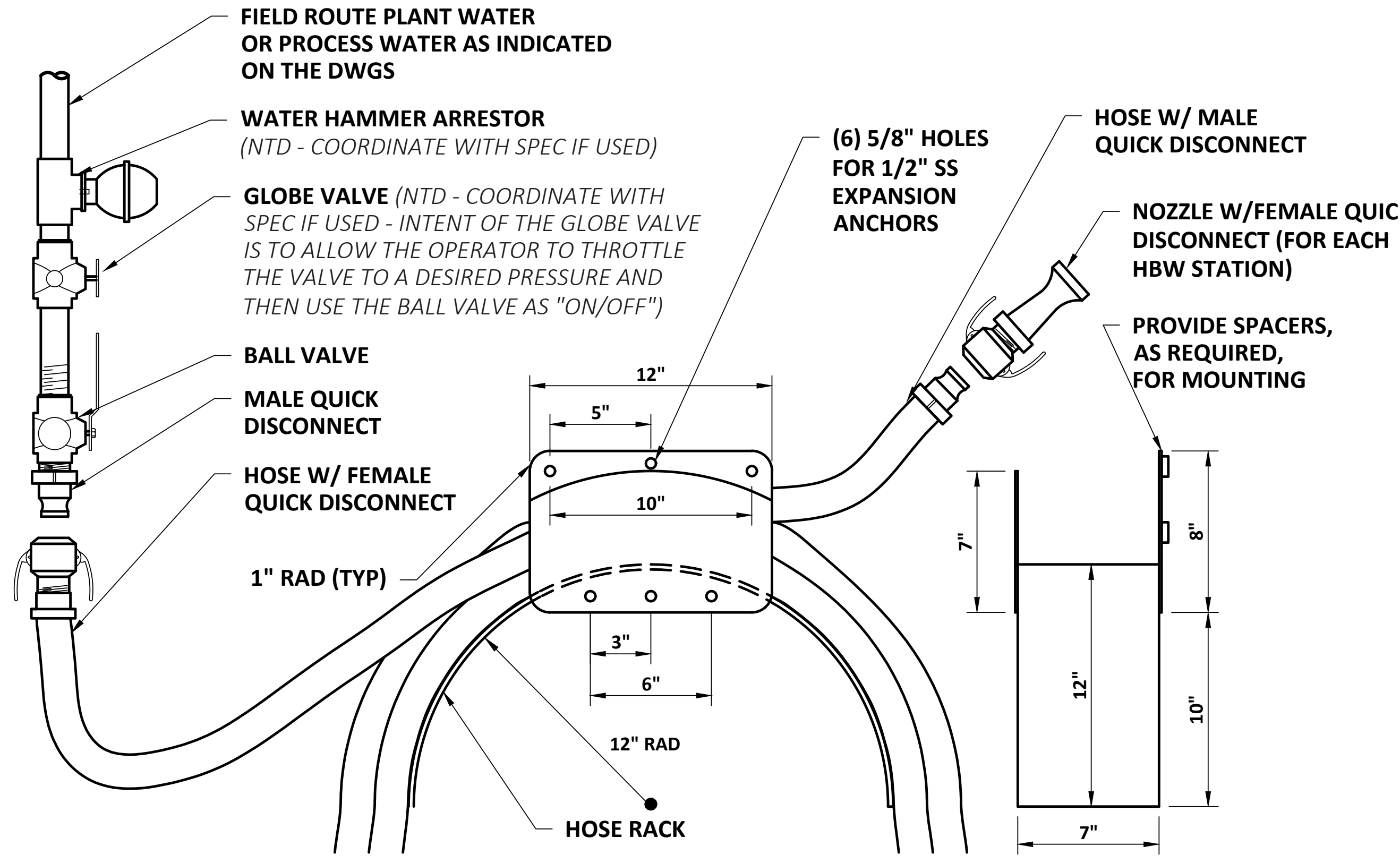
FLOOR (EXISTING WHERE ALLOWED)

## CONSTRUCTION PIPING PENETRATION DETAILS

SCALE: NTS

**NOTES:**

1. REFER TO SPECIFICATION SECTION 15092 FOR REQUIREMENTS AND INFORMATION.
2. WALL CASTING CONNECTION SHOWN IS FLG TO MJ. PROVIDE TYPE OF WALL CASTING AS REQUIRED.
3. SET TOP OF LINK TYPE SEAL APPROXIMATE ½" TO ¼" BELOW FINISH FLOOR.
4. LINK SEAL SHALL NOT BE USED TO SUPPORT PIPE. THREADED ROD SHALL BE SIZED AS REQUIRED TO SUPPORT PIPE BOTH VERTICALLY AND HORIZONTALLY.



## WASHDOWN (HBW) / FLUSHING (HBF) HOSE BIBB STATIONS

SCALE: NTS

**NOTES:**

1. DETAIL IS FOR NON-POTABLE WATER APPLICATIONS IN ACCORDANCE WITH SPECIFICATION SECTION 15200. FOR POTABLE WATER HOSE BIBB AND APPURTENANCES, REFER TO SPECIFICATION SECTION 15401.
2. COORDINATE LOCATIONS WITH ENGINEER AND OWNER.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED:
CAD COORD: A.COUTURE
CAD: A.COUTURE
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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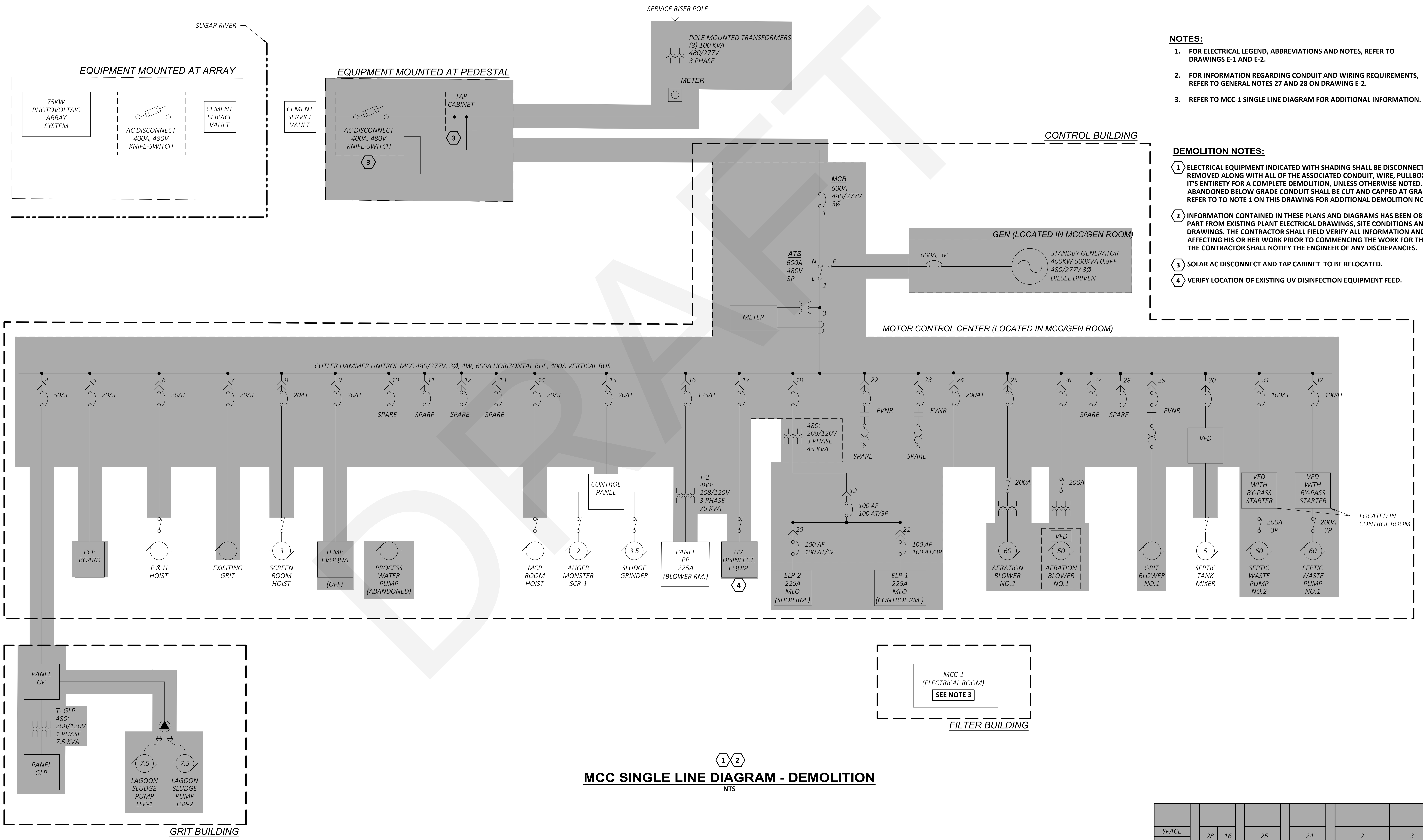
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

MISCELLANEOUS DETAILS I

DRAWING
PR-35



①②

## MCC SINGLE LINE DIAGRAM - DEMOLITION

NTS

## NOTES:

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES, REFER TO DRAWINGS E-1 AND E-2.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 27 AND 28 ON DRAWING E-2.
3. REFER TO MCC-1 SINGLE LINE DIAGRAM FOR ADDITIONAL INFORMATION.

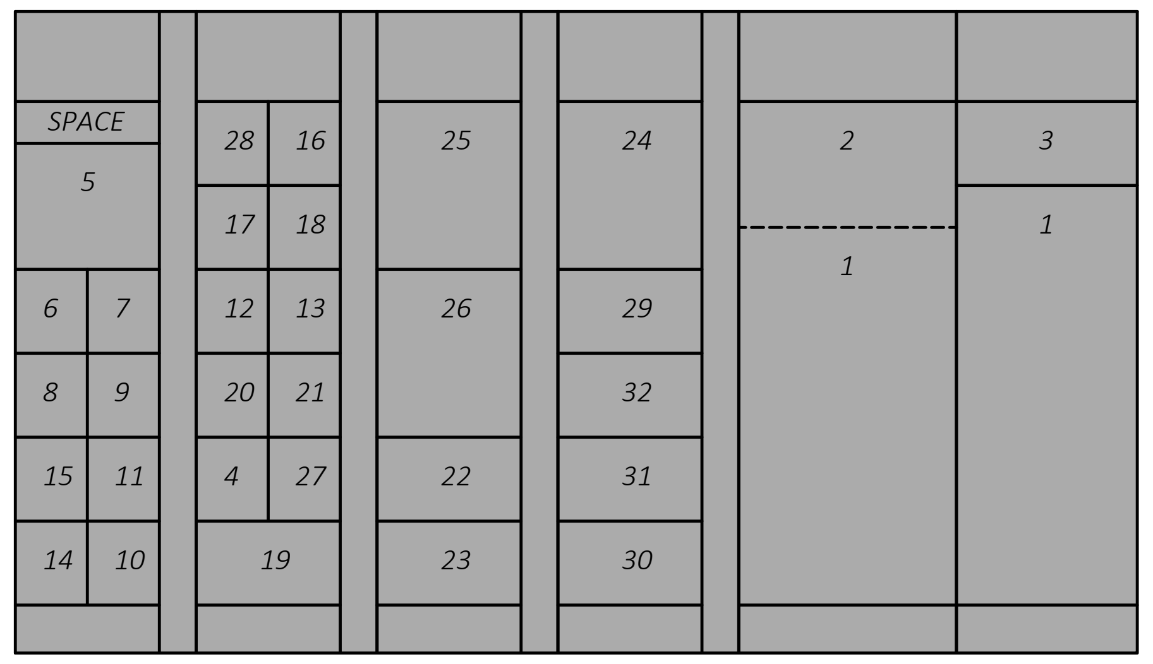
## DEMOLITION NOTES:

① ELECTRICAL EQUIPMENT INDICATED WITH SHADING SHALL BE DISCONNECTED AND REMOVED ALONG WITH ALL OF THE ASSOCIATED CONDUIT, WIRE, PULLBOXES, ETC. IN IT'S ENTIRETY FOR A COMPLETE DEMOLITION, UNLESS OTHERWISE NOTED. ALL ABANDONED BELOW GRADE CONDUIT SHALL BE CUT AND CAPPED AT GRADE LEVEL. REFER TO TO NOTE 1 ON THIS DRAWING FOR ADDITIONAL DEMOLITION NOTES.

② INFORMATION CONTAINED IN THESE PLANS AND DIAGRAMS HAS BEEN OBTAINED IN PART FROM EXISTING PLANT ELECTRICAL DRAWINGS, SITE CONDITIONS AND SHOP DRAWINGS. THE CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND CIRCUITRY AFFECTING HIS OR HER WORK PRIOR TO COMMENCING THE WORK FOR THIS CONTRACT. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

③ SOLAR AC DISCONNECT AND TAP CABINET TO BE RELOCATED.

④ VERIFY LOCATION OF EXISTING UV DISINFECTION EQUIPMENT FEED.



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## MCC ELEVATION

NTS

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PROJECT NO: 20828
DESIGNED: C. ABELL
CAD COORD: A.COUTURE
CAD: A. ROBERT
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SINGLE LINE DIAGRAM
MCC - DEMOLITION

DRAWING
E-3

**NOTES:**

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES, REFER TO DRAWINGS E-1 AND E-2.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 27 AND 28 ON DRAWING E-2.

**DEMOLITION NOTES:**

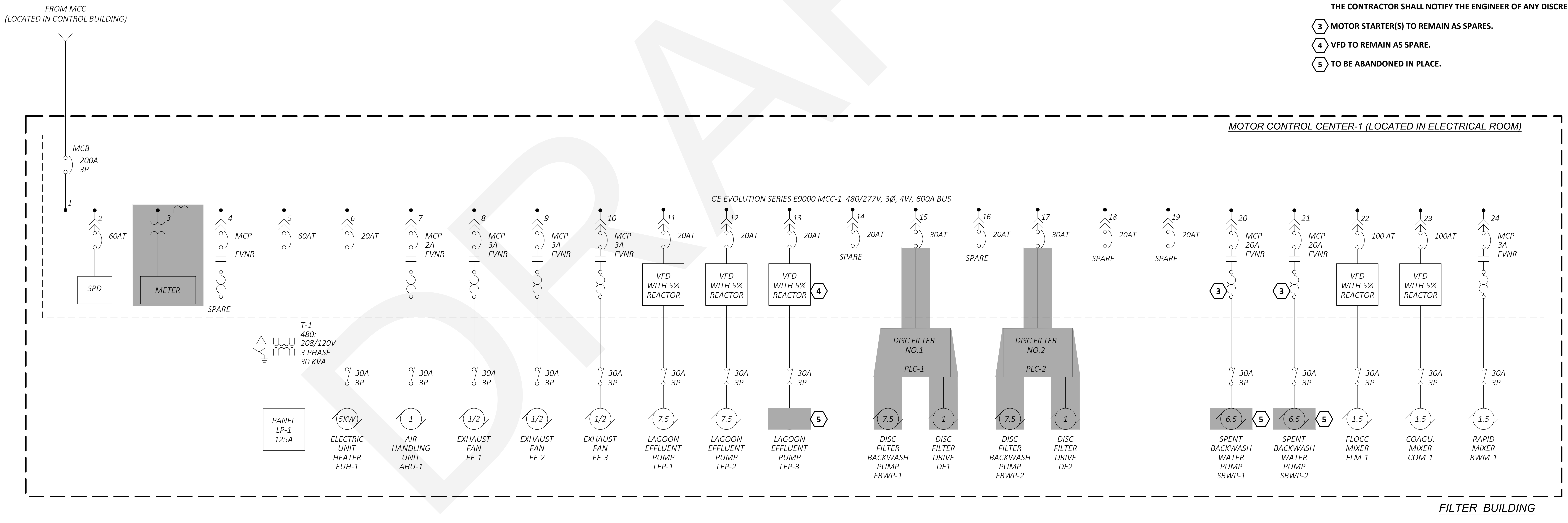
① ELECTRICAL EQUIPMENT INDICATED WITH SHADING SHALL BE DISCONNECTED AND REMOVED ALONG WITH ALL OF THE ASSOCIATED CONDUIT, WIRE, PULLBOXES, ETC. IN IT'S ENTIRETY FOR A COMPLETE DEMOLITION, UNLESS OTHERWISE NOTED. ALL ABANDONED BELOW GRADE CONDUIT SHALL BE CUT AND CAPPED AT GRADE LEVEL. REFER TO TO NOTE 1 ON THIS DRAWING FOR ADDITIONAL DEMOLITION NOTES.

② INFORMATION CONTAINED IN THESE PLANS AND DIAGRAMS HAS BEEN OBTAINED IN PART FROM EXISTING PLANT ELECTRICAL DRAWINGS, SITE CONDITIONS AND SHOP DRAWINGS. THE CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION AND CIRCUITRY AFFECTING HIS OR HER WORK PRIOR TO COMMENCING THE WORK FOR THIS CONTRACT. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

③ MOTOR STARTER(S) TO REMAIN AS SPARES.

④ VFD TO REMAIN AS SPARE.

⑤ TO BE ABANDONED IN PLACE.



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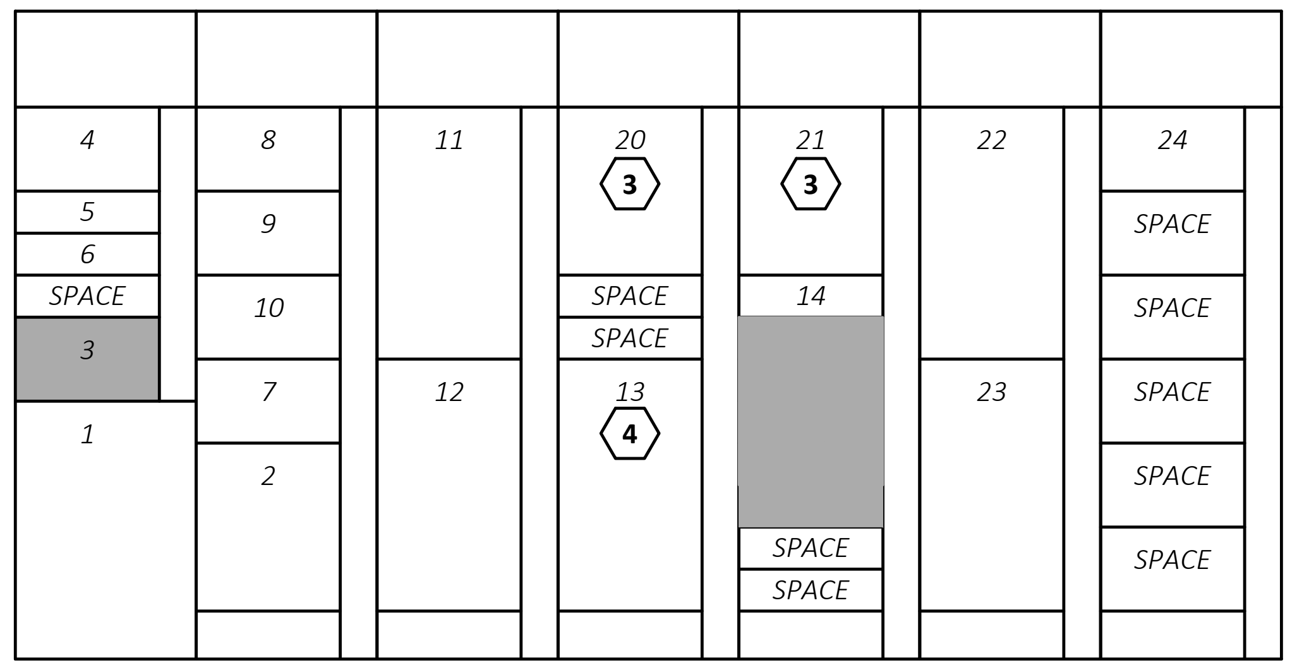
## MCC-1 SINGLE LINE DIAGRAM - DEMOLITION

NTS



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## MCC-1 ELEVATION

NTS

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PROJECT NO: 20828
DESIGNED: C. ABELL
CAD COORD: A.COUTURE
CAD: A. ROBERT
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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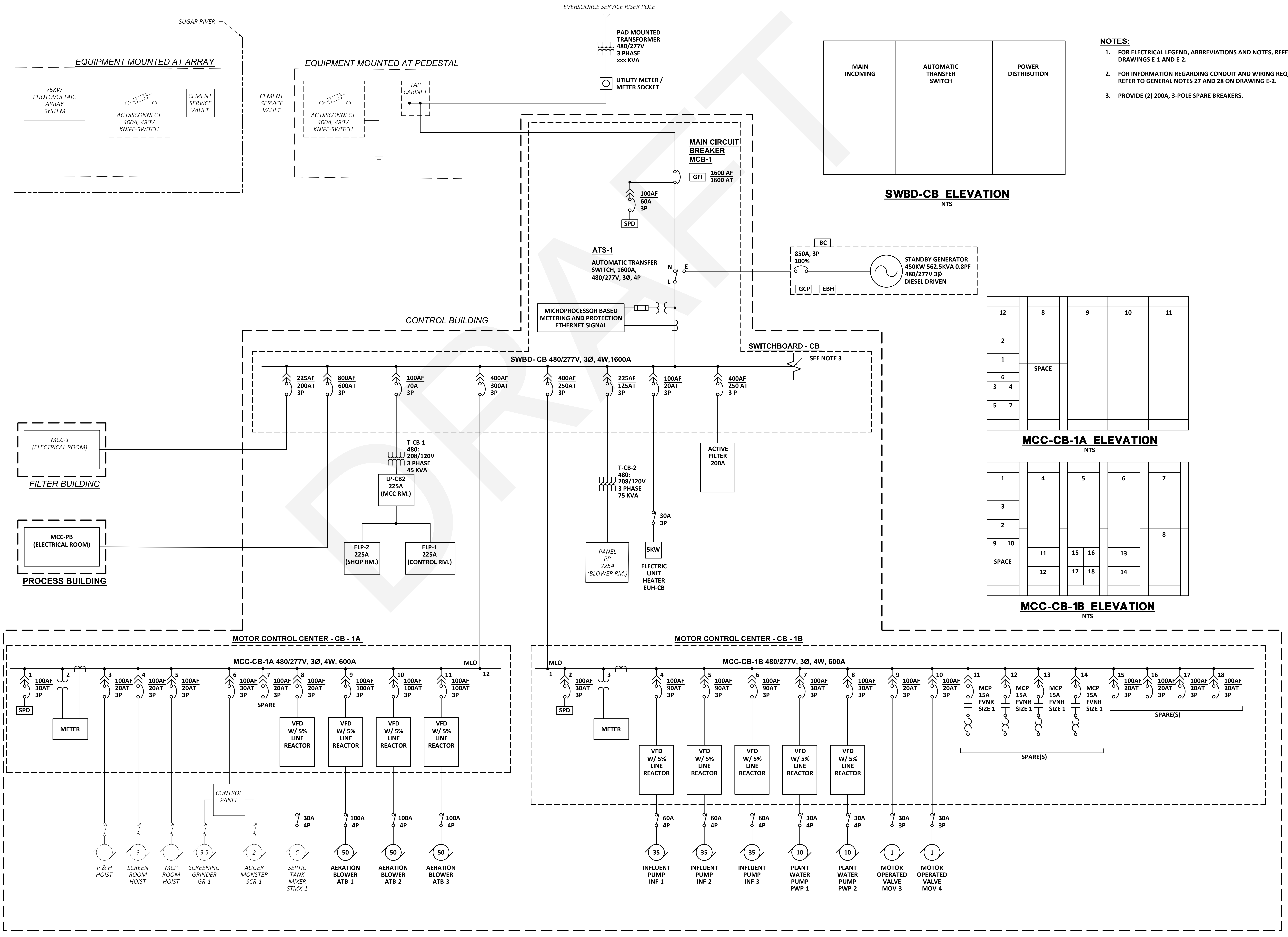
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SINGLE LINE DIAGRAM
MCC-1 - DEMOLITION

DRAWING
E-4



**SWBD-CB ELEVATION**
NTS

**MCC-CB-1A ELEVATION**
NTS

**MCC-CB-1B ELEVATION**
NTS

**SWBD-CB SINGLE LINE DIAGRAM - MODIFICATION**
NTS

**NOTES:**

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES, REFER TO DRAWINGS E-1 AND E-2.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 27 AND 28 ON DRAWING E-2.
3. PROVIDE (2) 200A, 3-POLE SPARE BREAKERS.

| NO | REVISIONS | APP'D | DATE |
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PROJECT NO: 20828
DESIGNED: C. ABELL
CAD COORD: A.COUTURE
CAD: A. ROBERT
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SINGLE LINE DIAGRAM
SWBD-CB- MODIFICATION

DRAWING
E-5

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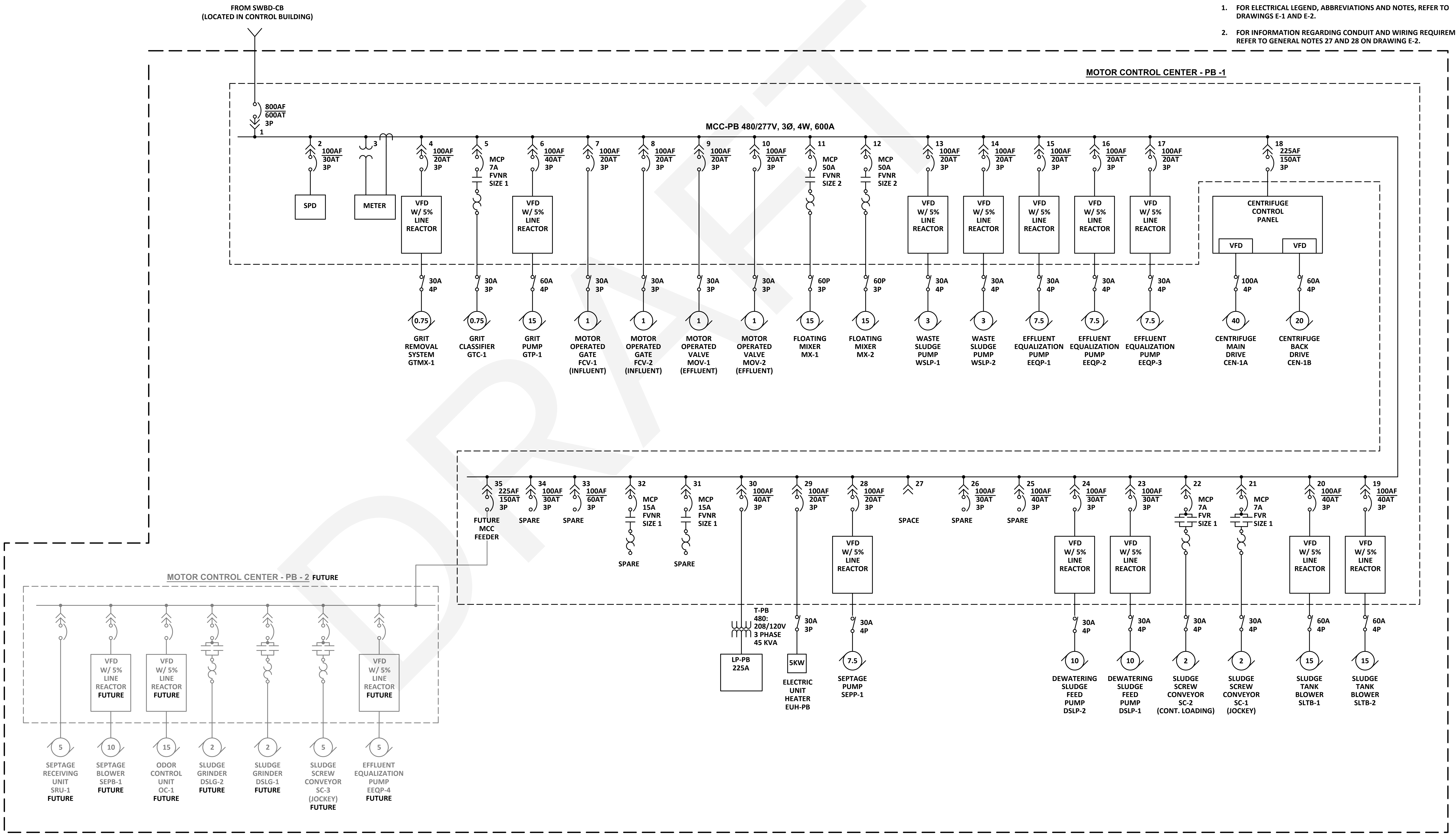
**NOTES:**

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES, REFER TO DRAWINGS E-1 AND E-2.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 27 AND 28 ON DRAWING E-2.



## MCC-PB -1 AND 2 SINGLE LINE DIAGRAM - MODIFICATION

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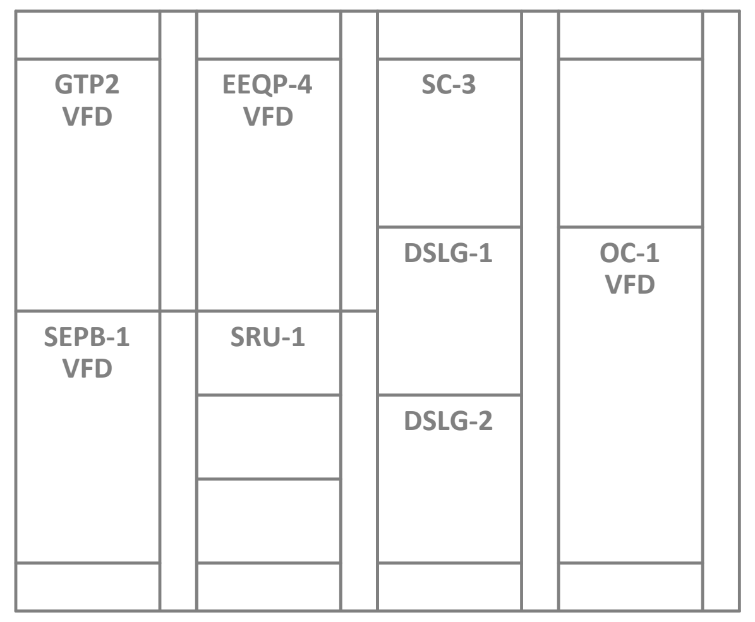

## FUTURE MCC SECTION(S) ELEVATION

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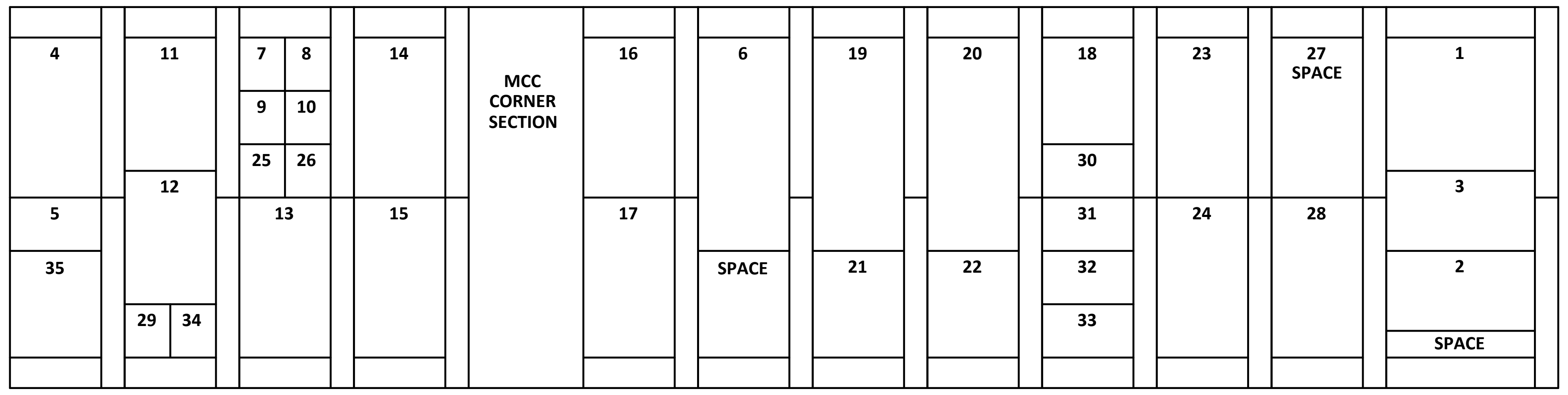

## MCC-PB ELEVATION

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PROJECT NO: 20828
DESIGNED: C. ABELL
CAD COORD: A.COUTURE
CAD: A. ROBERT
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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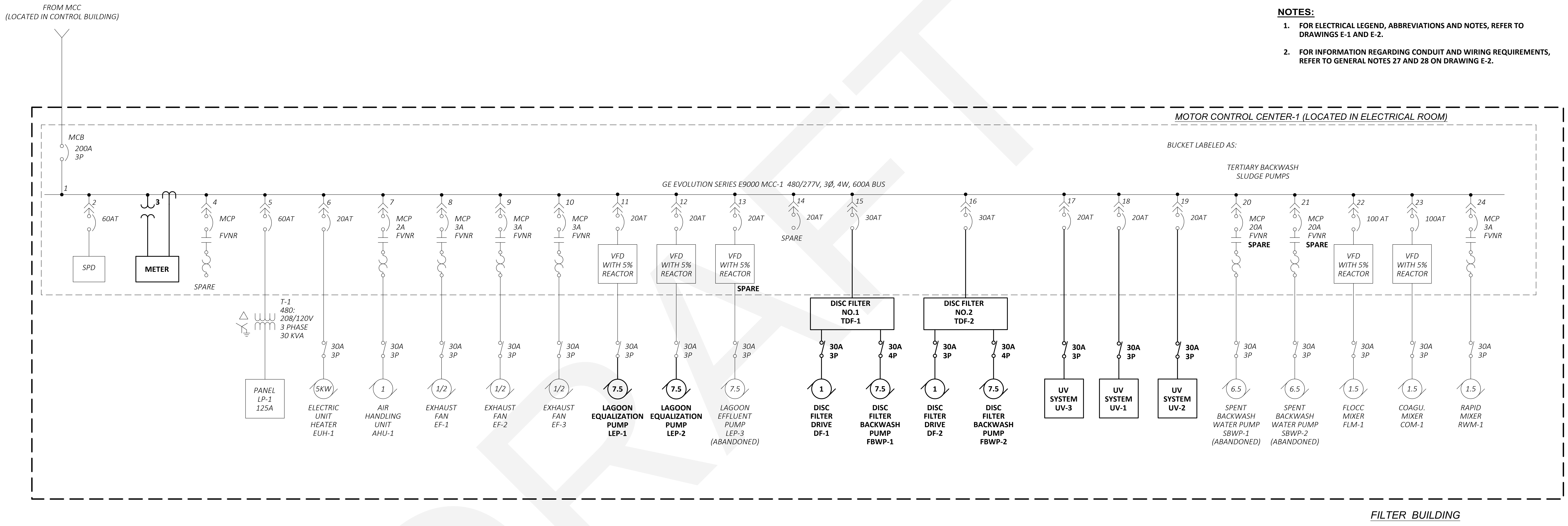
TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SINGLE LINE DIAGRAM
MCC-PB - MODIFICATION

DRAWING
E-6

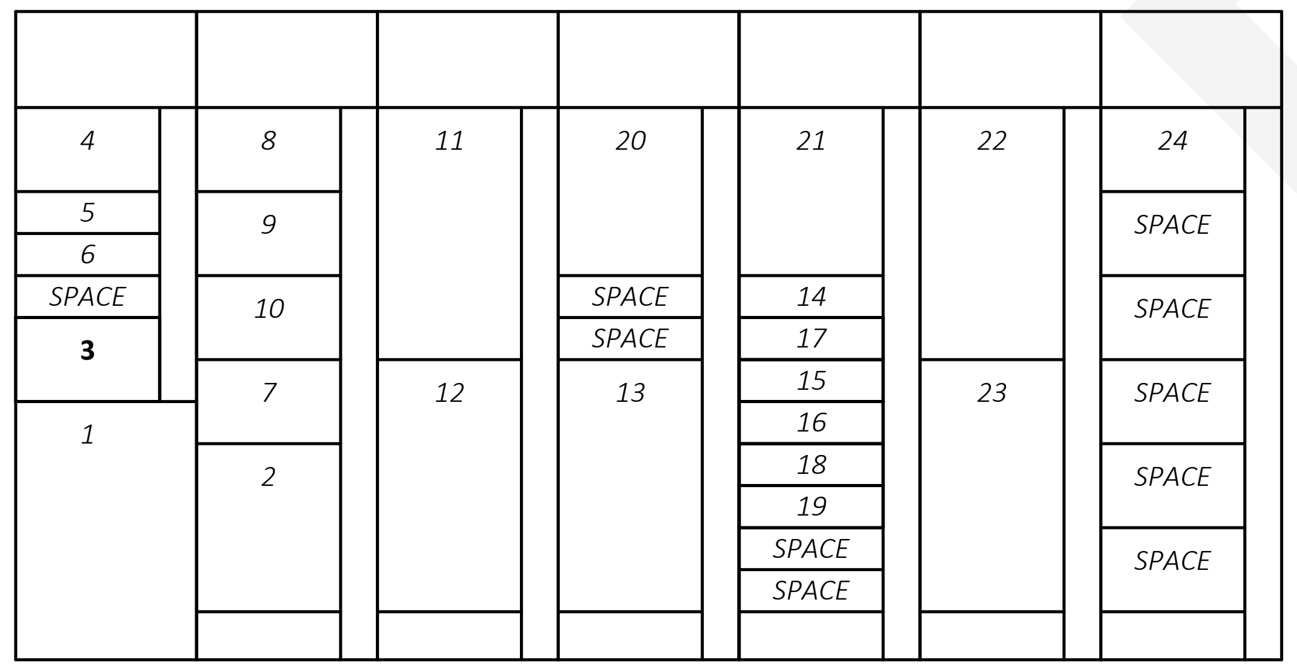
**NOTES:**

1. FOR ELECTRICAL LEGEND, ABBREVIATIONS AND NOTES, REFER TO DRAWINGS E-1 AND E-2.
2. FOR INFORMATION REGARDING CONDUIT AND WIRING REQUIREMENTS, REFER TO GENERAL NOTES 27 AND 28 ON DRAWING E-2.



## MCC-1 SINGLE LINE DIAGRAM - MODIFICATION

NTS



## MCC-1 ELEVATION

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REVISIONS

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PROJECT NO: 20828
DESIGNED: C. ABELL
CAD COORD: A.COUTURE
CAD: A. ROBERT
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT, NEW HAMPSHIRE
WASTEWATER TREATMENT FACILITY
UPGRADE

SINGLE LINE DIAGRAM
MCC-1 - MODIFICATION

DRAWING
E-7

LAST SAVED BY: ADAM.ROBERT 11/7/2022 7:47 AM
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# Appendix E
# Geotechnical Investigation

E-1: Geotechnical Data Report

www.haleyaldrich.com

# GEOTECHNICAL DATA REPORT ON
# WASTEWATER TREATMENT FACILITY UPGRADES
# NEWPORT, NEW HAMPSHIRE

by
Haley & Aldrich, Inc.
Portland, Maine

for
Wright-Pierce
Portsmouth, New Hampshire

File No. 0206093-000
November 2022

HALEY & ALDRICH, INC.
75 Washington Avenue
Suite 1A
Portland, ME 04101
207.482.4600

30 November 2022
File No. 0206093-000

Wright-Pierce
230 Commerce Way, Suite 302
Portsmouth, New Hampshire 03801

Attention: Jeff Mercer, P.E.

Subject: Geotechnical Data Report
Wastewater Treatment Facility Upgrades
Newport, New Hampshire

Ladies and Gentlemen:

This report presents the results of the subsurface investigation conducted for the wastewater treatment facility upgrade in Newport, New Hampshire (see Figure 1, Project Locus). This work has been completed in accordance with our task order dated 16 September 2022 and your subsequent authorization.

## Elevation Datum

Elevations reported herein are in feet and reference the North American Vertical Datum of 1988 (NAVD88).

## Existing Conditions

The project site is located at the existing Wastewater Treatment Facility (WWTF) on Putnam Road in Newport, New Hampshire (Figure 1 – Project Locus). The footprint of the proposed new structures is generally grassy, with an existing solids settling structure located in the center of the area. The Sugar River is located immediately west of the WWTF site.

The area is relatively flat from the existing facility to Putnam Road (located southwest of the facility). The existing ground surface elevation in the area of the proposed upgrades generally ranges from approximately El. 775 to El. 779. The ground surface mounds up locally to El. 783 at the southeast end of the site.

## Proposed Site Development

Based on the Geotechnical Scope Summary document and plans provided by you, it is our understanding that the proposed improvements currently include the following:

- An approximate 10,500 sq. ft SBR tank complex consisting of two sequencing batch reactors, two effluent equalization/post sequencing batch reactor equalization tanks, a grit removal system, a pump station, and two sludge holding tanks including elevated walkways/access stairs. The complex will be supported on a mat foundation with a finished floor elevation at El. 769.
- A 49.3 ft by 57.3 ft, two-story process building to house equipment systems and a control room. The northern portion of the building will have a finished floor at El. 771.5 and the remaining portions of the building will have finished floor at El. 779 and 782.
- A UV building over the existing chlorine contact tank converted to UV channels to protect new UV disinfection equipment.
- An exterior standby generator.
- Installation of various buried piping and duct bank systems.
- Reconstruction/expansion of access road and parking area.

The planned locations of the proposed improvements are shown on Figure 2.

## Site Geology

The project site and vicinity lie within the New England Upland Physiographic Province. According to available publications, surficial geologic units mapped locally at the site consist of alluvial sand deposits transported by post glacial streams. Regionally mapped surficial deposits include alluvial sand and gravel deposits, stratified sand and gravel kame terrace deposits, eskers, glacial outwash, and glacial fluvial deposits. These granular, glacial deposits typically overly fine-grained, glaciolacustrine stratified silt and clay deposits. Glacial till deposits are also regionally, widely mapped at the surface in the vicinity of the site.

Bedrock geology at the site is mapped as Late Devonian Age Bethlehem Gneiss, metamorphic and igneous rocks of the New Hampshire Magma Series. This rock type is described as medium to fine grained gray granite to quartz diorite gneiss commonly with microcline crystals up to 2 in. in length.

## Subsurface Exploration Program

### PREVIOUS SUBSURFACE EXPLORATIONS BY OTHERS

Historic documents provided by Wright-Pierce (W-P) indicate several subsurface investigations were previously conducted at the site by others. Based on our review of this information, the following explorations were performed within the vicinity of the proposed upgrades:

- Eight test borings designated C-1 through C-8 were performed by Carr-Dee Test Boring and Construction Corporation of Medford, Massachusetts in 1966 under the direction of CDM.
- Twenty-two test borings designated B-2 through B-6, B-10, B-11, B-13, B-14, B-16, B-18, B-19, B-22, B-23, B-24, B-29, B-30, B-31, B-33, B-35, B-36, and B-38 were performed by Warren J. Clattenburg of Pittsfield, New Hampshire in 1978.
- Three test borings designated GZ-1 (OW), GZ-101, and GZ-102B were performed by Northeast Diamond Drilling of Union, Maine in 1986 and 1987 under the direction of GZA.
- Two test pits designated TP-10 and TP-11 were performed by St. Pierre, Inc, of Claremont, New Hampshire in 1986 under the direction of GZA.
- Two test borings designated B1 and B2 were performed by Seaboard Geotechnical & Environmental Drilling Services of Springfield, Massachusetts in 2018 under the direction of Stantec.
- The approximate location of historic explorations are shown on Figure 2. The test boring and test pit logs for these explorations are provided in Appendix A for reference.

### 2022 HALEY & ALDRICH SUBSURFACE EXPLORATIONS

During the period 28 to 30 September 2022, a supplemental subsurface investigation consisting of three test borings (HA22-1 (OW), HA22-2, and HA22-3) was undertaken by Haley & Aldrich. The test borings were completed to fill in gaps in the historic data and assess general soil and groundwater conditions at the location of the proposed improvements. Drilling of each test boring was completed by New England Boring Contractors of Derry, New Hampshire. A Haley & Aldrich geologist was on-site to provide full-time technical monitoring of the drilling activities and to document the soil and groundwater conditions encountered in the borings.

Borings were generally advanced through the overburden soils using 4-in. (HW-size) inside diameter (ID) steel casing using cased-washed boring drilling techniques. Geotechnical soil samples were collected at 2 to 10-ft intervals by driving a 1-3/8 in. ID split-spoon sampler with a 140-lb hammer dropped from a height of 30 in., as indicated on the test boring logs. The number of hammer blows required to advance the sampler through each 6-in. interval was recorded and is provided on the logs. The uncorrected SPT N-value (N-uncorrected) is defined as the total number of blows required to advance the sampler through the middle 12 in. of the 24-in. sampling interval. Soil samples were preserved in glass jars. Soil samples are available for review upon request and are at the Haley & Aldrich storage facility in Portland, Maine.

In-situ vane shear tests were conducted within the glaciolacustrine deposits in HA22-2. Vane shear tests were conducted using a 55 mm by 110 mm Geonor rectangular vane attached to a 2-ft long, 12-mm diameter rod extension, attached to a string of 5/8-in. outside diameter (OD) hollow chrome-moly rods. At each in-situ vane shear test location, the vane was pushed (by hand) until the bottom of the vane was approximately 1 ft below the bottom of the borehole. The vane was then rotated at a rate of about 90 degrees per minute using a calibrated torque wrench. Results of the vane shear testing are provided on the test boring logs. Results of the vane shear testing, including raw torque values and calibrated shear strengths, are provided on the individual test boring logs in Appendix B. Due to the relatively "stiff" soil conditions, six field vanes could not be pushed to the full target depth.

One relatively undisturbed sample of glaciolacustrine soil was obtained from test boring HA22-2. The sample was obtained by advancing a 3-in. OD thin-wall Shelby tube into the clay using a piston sampler. A second tube sample was attempted but could not be pushed to the full tube depth.

An open-standpipe observation well was installed in completed boring HA22-1 (OW) to provide information on static groundwater levels at the site. The well is comprised of a 10-ft length of 2-in. ID, slotted PVC well screen and solid PVC riser pipe. The well was screened from a depth of 15 to 25 ft below ground surface (BGS), located primarily in the glaciofluvial deposits. The observation well was protected by a steel locking cap. The observation well installation and groundwater monitoring reports are included in Appendix C.

Logs of the 2022 test borings are provided in Appendix B. "As-drilled" test boring locations are presented on Figure 2 and were determined by Haley & Aldrich in the field by taping distances from existing site features. Ground surface elevations at "as-drilled" test boring locations were estimated based on topographic information provided by W-P.

## Subsurface Conditions

### SOIL CONDITIONS

Subsurface conditions encountered at the site from the recent 2022 borings generally consist of the following geologic units presented in order of increasing depth BGS: man-placed fill, alluvial deposits, upper glaciofluvial deposits, glaciolacustrine deposits, and lower glaciofluvial deposits. To be compliant with seismic code requirements, one boring was extended to a depth of 101 ft BGS and did not encounter bedrock. A general description of each soil unit identified at the site is provided below. Detailed soil descriptions are provided on the Haley & Aldrich test boring logs included in Appendix B.

The conditions encountered in the recent 2022 borings were generally similar to the conditions encountered in the historic borings. However, the historic borings in the vicinity of the SBR tank and process building were terminated at depths of approximately 10 to 20 ft and did not fully penetrate the deposits described below.

Please note that soil descriptions provided on the boring logs and summarized below do not represent field conditions other than at the specific boring locations. The conditions between boring locations may vary from those described herein.

| **Soil Unit** | **Approximate Range in Encountered Thickness (ft)** | **Generalized Description** |
|---|---|---|
| Fill | 4.0 to 8.0 | Loose to dense, gray-brown to brown silty SAND, poorly graded SAND with silt, and/or poorly graded SAND. Encountered in all three borings. |
| Alluvial Deposits | 4.0 to 8.0 | Loose light brown to gray-brown poorly graded SAND, poorly graded SAND with silt, and/or silty SAND with trace organics. Encountered in all three borings. |
| Upper Glaciofluvial Deposits | 11.0 to >18.0 | Very loose to dense gray silty SAND with varying amounts of gravel, well graded SAND with varying amounts of silt and gravel, and/or poorly graded SAND with varying amounts of gravel. Encountered in all three borings. Not fully penetrated in boring HA22-3. |
| Glaciolacustrine Deposits | >2.0 to 85.0 | Very soft to very stiff gray SILT with clay layers and trace sand. Encountered in all three borings. Not fully penetrated in boring HA22-1 (OW). |
| Lower Glaciofluvial Deposits | >2.0 | Medium dense gray well graded SAND. Encountered in boring HA22-2 at a depth of 99 ft BGS (not penetrated). |

### GROUNDWATER CONDITIONS

Groundwater levels were measured in the observation well installed in completed borehole HA22-1 in September, October, and November 2022. Measured groundwater levels varied between 10.3 ft and 11.3 ft BGS (El. 766.2 to El. 767.2; see Appendix C for all data)

Groundwater levels can be expected to fluctuate, subject to seasonal variation, local soil conditions, topography and precipitation. Water levels encountered during construction may differ from those summarized above.

## Laboratory Testing Program

A limited laboratory testing program was undertaken on soil samples collected during the field investigation to assist in soil classification/identification. In general, laboratory testing was performed on disturbed soil samples collected during SPT sampling. All laboratory soil testing was performed by GeoTesting Express of Acton, Massachusetts. Geotechnical laboratory testing was generally performed in accordance with applicable American Society for Testing Materials (ASTM) testing procedures.

The laboratory test program included five grain size analyses (sieve only, no hydrometer), five Atterberg Limit tests, and two corrosion suite tests (electrical resistivity, oxidation-reduction potential, pH, chlorides, sulfates, and sulfides). Note that the sample location and depth for the corrosion suite tests were selected by W-P. A summary of the laboratory test results is provided in the tables below.

| Laboratory Test | ASTM Test Designation | Soil Unit | No. of Tests Completed | Range in Test Results |
|---|---|---|---|---|
| Grain Size | ASTM D6913<br>(Sieve Only) | Fill | 3 | USCS Classification: SP-SM<br>Percent Passing No. 200 Sieve: 11%, 12%, 12% |
| | | Alluvial Deposits | 2 | USCS Classification: SM, SP<br>Percent Passing No. 200 Sieve: 9%, 19% |
| Atterberg Limit | ASTM D4318 | Glaciolacustrine Deposits | 5 | USCS Classification: ML, non-plastic |

| Soil Unit | No of test completed | Chlorides (ASTM D512 Method B) | Electrical Resistivity (ASTM G57) | Oxidation-Reduction Potential (ASTM G200) | pH (ASTM G51) | Sulfates (ASTM D516) | Sulfides (ASTM SM4500) |
|---|---|---|---|---|---|---|---|
| Glaciofluvial | 1 | 13 ppm | 7,128 ohm-cm | 186.5 mV | 5.41 | <10 ppm | 60 ppb |
| Glaciolacustrine | 1 | <10 ppm | 18,595 ohm-cm | 125.1 mV | 6.43 | 10 ppm | 50 ppb |

Laboratory test results are provided in Appendix D.

## Limitations

This report is prepared for the exclusive use of Wright-Pierce relative to the proposed Wastewater Treatment Facility Upgrade to be constructed in Newport, New Hampshire. There are no intended beneficiaries other than Wright-Pierce. Haley & Aldrich shall owe no duty whatsoever to any other person or entity on account of the Agreement or the report. Use of this report by any person or entity other than Wright-Pierce for any purpose whatsoever is expressly forbidden unless such other person or entity obtains written authorization from Wright-Pierce and from Haley & Aldrich. Use of this report by such other person or entity without the written authorization of Wright-Pierce such other person's or entity's sole risk, and shall be without legal exposure or liability to Haley & Aldrich.

Use of this report by any person or entity, including by Wright-Pierce, for a purpose other than relative to the proposed Wastewater Treatment Facility Upgrade in Newport, New Hampshire is expressly prohibited unless such person or entity obtains written authorization from Haley & Aldrich indicating that the report is adequate for such other use. Use of this report by any other person or entity for such other purpose without written authorization by Haley & Aldrich shall be at such person's or entity's sole risk, and shall be without legal exposure or liability to Haley & Aldrich.

This report can be made available to the Contractor, and is to be used solely at the Contractor's risk. The Engineer, Owner and Geotechnical Consultant assume no responsibility concerning the interpretation of the data by the Contractor.

## Closure

Geotechnical design recommendations for the proposed wastewater treatment facility upgrade will be provided under separate cover.

We appreciate the opportunity to provide geotechnical engineering services on this project. Please do not hesitate to call if you have any questions or comments.

Sincerely yours,
HALEY & ALDRICH, INC.

| | |
|---|---|
| Meghan M. Brassard, P.E.<br>Senior Engineer | Erin A. Force, P.E.<br>Project Manager |

Wayne A. Chadbourne, P.E.
Principal

Enclosures:
Figure 1 – Project Locus
Figure 2 – Exploration Location Plan
Appendix A – Historic Test Boring and Test Pit Logs
Appendix B – Recent Test Boring Logs
Appendix C – Groundwater Observation Well Installation and Groundwater Monitoring Reports
Appendix D – Laboratory Test Results

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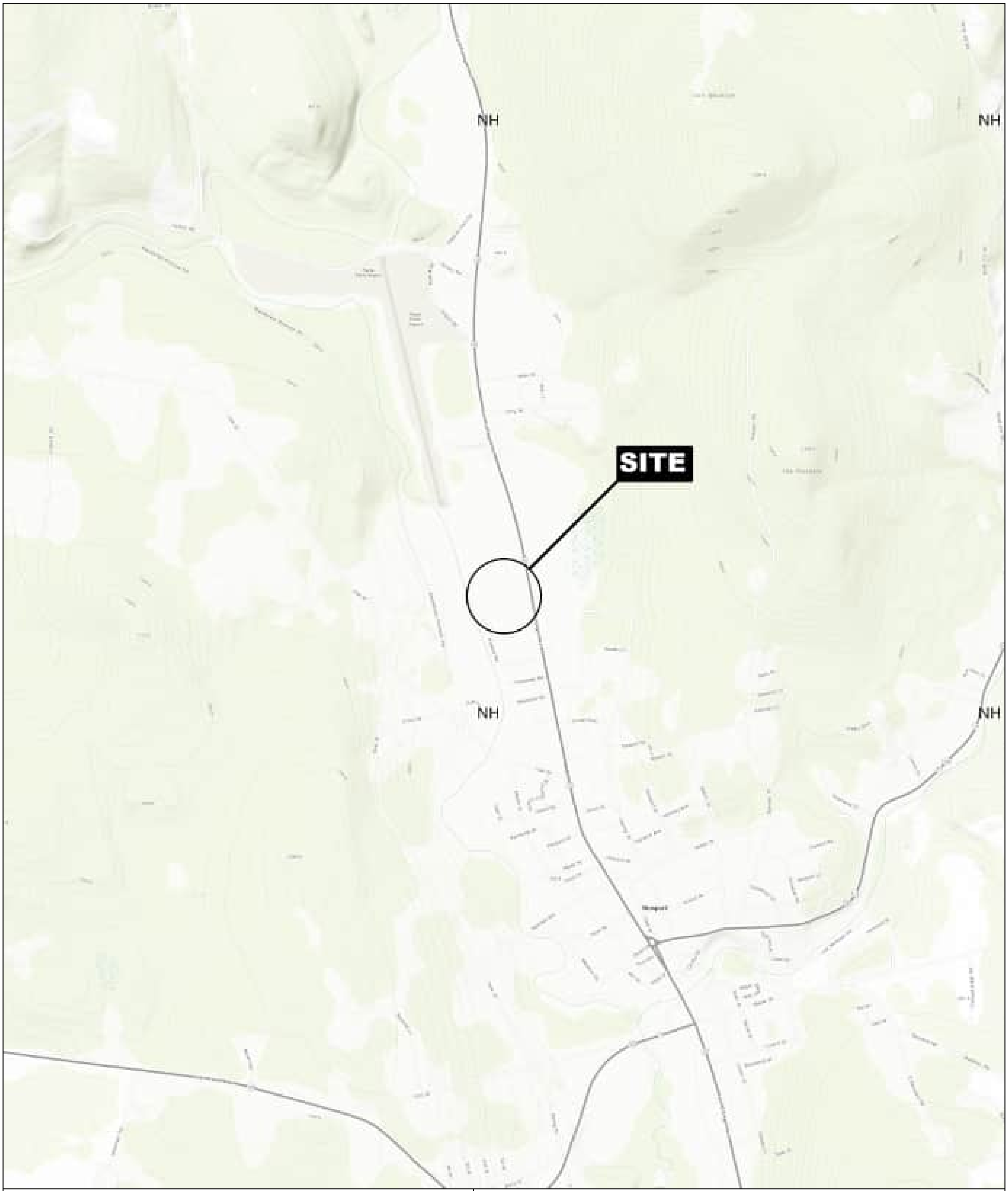
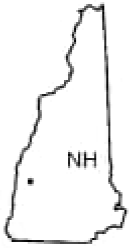
# FIGURES





SITE COORDINATES: 43°22'40"N, 72°10'51"W

MAP SOURCE: USGS

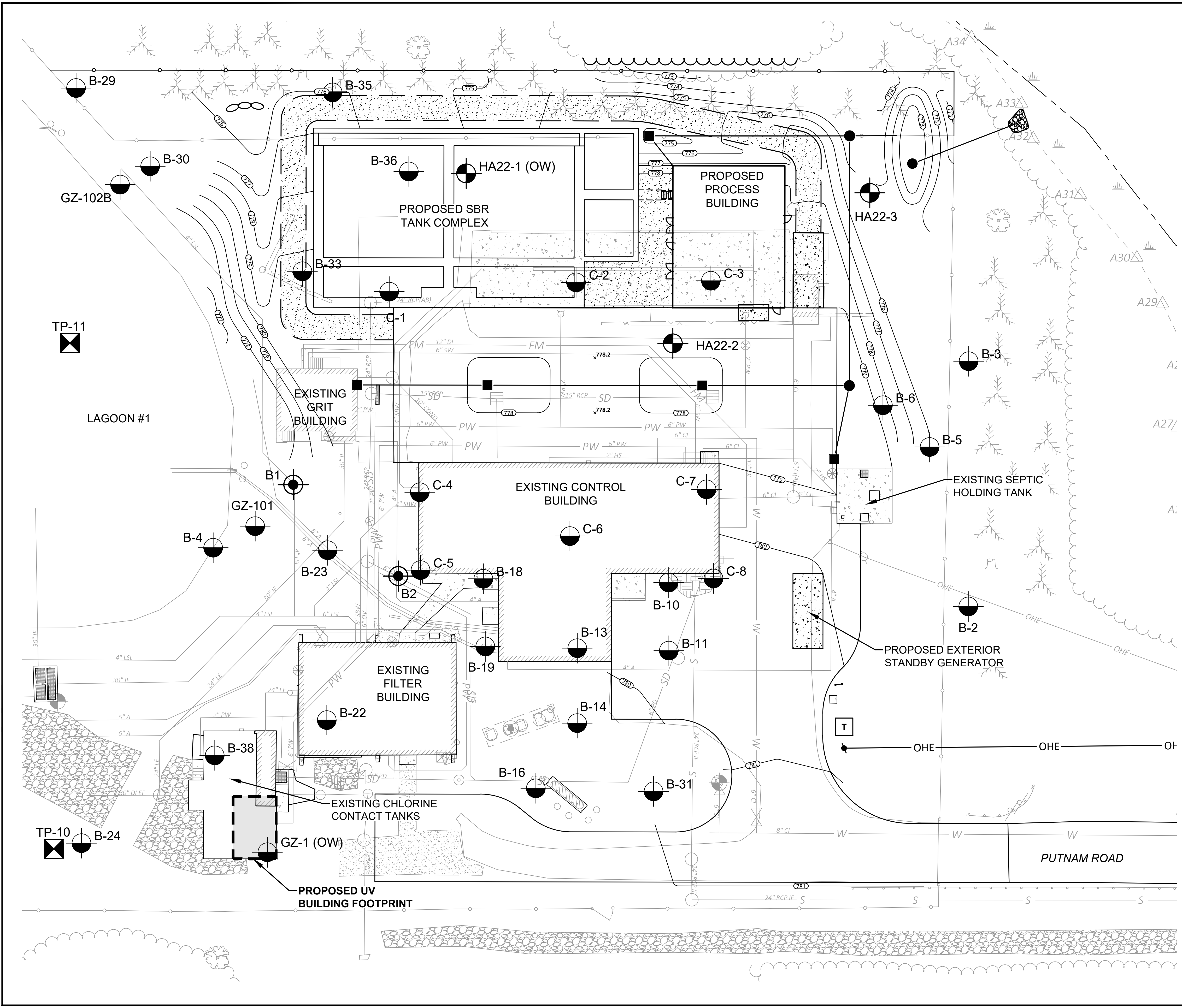
WASTEWATER TREATMENT FACILITY UPGRADES
NEWPORT, NEW HAMPSHIRE

## PROJECT LOCUS

APPROXIMATE SCALE: 1 INCH = 2,000 FEET
NOVEMBER 2022

FIGURE 1

0206093_000_LOCUS HALEYALDRICHMBRASSARD



**LEGEND**

| | |
|---|---|
| HA22-3 | DESIGNATION AND LOCATION OF TEST BORING DRILLED BETWEEN 28 TO 30 SEPTEMBER 2022 BY NEW ENGLAND BORING CONTRACTORS |
| B-3 | DESIGNATION AND LOCATION OF HISTORIC TEST BORING<br>"B" INDICATES BORINGS DRILLED BY WARREN J. CLATTENBURG OF PITTSFIELD, NEW HAMPSHIRE IN 1978<br>"C" INDICATES BORINGS DRILLED BY CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION OF MEDFORD, MASSACHUSETTS IN 1966<br>"GZ" INDICATES BORINGS DRILLED BY NORTHEAST DIAMOND DRILLING OF UNION, MAINE IN 1986 AND 1987 |
| TP-11 | HISTORIC TEST PIT LOCATION EXCAVATED BY ST. PIERRE, INC. OF CLAREMONT, NEW HAMPSHIRE IN 1986 |
| B1 | DESIGNATION AND LOCATION OF HISTORIC TEST BORING DRILLED BY SEABOARD GEOTECHNICAL & ENVIRONMENTAL DRILLING SERVICES OF SPRINGFIELD, MASSACHUSETTS IN 2018 |

**NOTES**

1. BASEMAP CREATED FROM ELECTRONIC CAD FILES RECEIVED ON 6 OCTOBER 2022 FROM WRIGHT-PIERCE.
2. APPROXIMATE HISTORIC LOCATIONS OF 1978, 1966, 1986, AND 1987 BORINGS AND 1986 TEST PITS, FROM PDF DOCUMENT ENTITLED "SITE GEOMETRY AND BORINGS" DATED JUNE 1987 FROM HOYLE TANNER & ASSOCIATES, INC. OF BEDFORD, NEW HAMPSHIRE.
3. APPROXIMATE HISTORIC LOCATIONS B1 & B2 ARE FROM PDF DOCUMENT ENTITLED "SOIL BORING LOCATION PLAN" DATED 1 FEBRUARY 2019 FROM STANTEC OF AUBURN, NEW HAMPSHIRE.

0 40 80
SCALE IN FEET

HALEY ALDRICH

WASTEWATER TREATMENT FACILITY UPGRADES
NEWPORT, NEW HAMPSHIRE

## EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
NOVEMBER 2022

FIGURE 2

Saved by: KPOSTOLOWSKI Printed: 11/30/2022 1:17 PM Sheet: FIG 2
\\HALEYALDRICH.COM\SHARE\CF\PROJECTS\0206093\CAD\0206093_000_0001_EXPO PLAN.DWG

# APPENDIX A

# HISTORIC TEST BORING AND TEST PIT LOGS

37 LINDEN STREET
MEDFORD, MASSACHUSETTS 02155
Telephone EXport 1-4500

To CAMP, DRESSER & McKEE, CONSULTING ENGINEERS, BOSTON, MASS. Date DEC. 27, 1966 Job No. 66427

Location NEWPORT, NEW HAMPSHIRE Scale 1" = 4 f

### BORING #1

Believed to be C-1 on Drawings

GROUND SURFACE ELEV. 775.6

| | | |
|---|---|---|
| | AUGERED TO DEPTH OF 3'6" | |
| 3'6" | LOOSE FINE SAND | 1<br>1<br>2<br>2 |
| 6'0" | FIRM MEDIUM SAND | 3<br>6<br>9 |
| 7'6" | FIRM MEDIUM SAND, SAND, GRAVEL & STONES | 14<br>14<br>8<br>8 |
| 10'0" | | |

WATER LEVEL 6'0"
BELOW GROUND SURFACE

DATE 12-21-66

### BORING #2

Believed to be C-2 on Drawings

GROUND SURFACE ELEV. 775.5

| | | |
|---|---|---|
| | AUGERED TO DEPTH OF 3'6" | |
| 3'6" | LOOSE FINE SAND | 2<br>3<br>3<br>3<br>2<br>3<br>3<br>2 |
| 7'0" | FIRM MEDIUM SAND, GRAVEL & STONES | 8<br>10<br>15<br>15<br>12<br>13 |
| 10'0" | | |

WATER LEVEL 5'6"
BELOW GROUND SURFACE

DATE 12-21-66

### BORING #3

Believed to be C-3 on Drawings

GROUND SURFACE ELEV. 775.3

| | | |
|---|---|---|
| | FIRM FINE SAND | 10<br>5<br>5<br>4 |
| 2'0" | LOOSE FINE SAND | 2<br>4<br>3<br>4 |
| 7'0" | FIRM MEDIUM SAND GRAVEL & STONES | 11<br>17<br>12<br>11 |
| 11'0" | LOOSE FINE SAND | 4<br>3<br>3<br>4<br>3<br>5<br>3<br>2<br>4<br>3 |
| 20'0" | | |

WATER LEVEL 5'8"
BELOW GROUND SURFACE

DATE 12-23-66

UNLESS OTHERWISE SPECIFIED, WATER LEVELS NOTED, WERE OBSERVED AT COMPLETION OF BORINGS, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS. FIGURES IN RIGHT HAND COLUMN INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE 2" O.D. SPLIT TUBE SAMPLER 6 INCHES USING 140 LB. WEIGHT FALLING 30 INCHES ±

SHEET 1 OF 5

# CARR-DEE TEST BORING AND CONSTRUCTION CORPORATION

37 LINDEN STREET MEDFORD, MASSACHUSETTS 02155 Telephone EXport 1-4500

To CAMP, DRESSER & McKEE, CONSULTING ENGINEERS, BOSTON, MASS. Date DEC. 27, 1966 Job No. 66427

Location NEWPORT, NEW HAMPSHIRE Scale 1" = 4 ft

BORING #4

Believed to be C-4 on Drawings

GROUND SURFACE ELEV. 775.3

| | | |
|---|---|---|
| 3'6" | AUGERED TO DEPTH OF 3'6" | |
| 5'6" | LOOSE FINE SAND | 1<br>1<br>2 |
| 8'0" | FIRM MEDIUM SAND, LITTLE GRAVEL | 6<br>4<br>6 |
| 10'0" | HARD COARSE SAND, GRAVEL, STONES | 15<br>22<br>21<br>23 |

WATER LEVEL 6'0"
BELOW GROUND SURFACE

DATE 12-21-66

BORING #5

Believed to be C-5 on Drawings

GROUND SURFACE ELEV. 775.8

| | | |
|---|---|---|
| 3'0" | FINE LOAMY SAND AUGERED TO 3'0" | |
| 5'6" | LOOSE FINE SAND | 3<br>3<br>4<br>2 |
| 7'0" | LOOSE MEDIUM SAND | 1<br>1 |
| 9'6" | FIRM COARSE SAND, GRAVEL & STONES | 12<br>13<br>13<br>14 |

WATER LEVEL 6'0"
BELOW GROUND SURFACE

DATE 12-21-66

UNLESS OTHERWISE SPECIFIED, WATER LEVELS NOTED, WERE OBSERVED AT COMPLETION OF BORINGS, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS. FIGURES IN RIGHT HAND COLUMN INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE TWO-INCH SPLIT SAMPLER

37 LINDEN STREET MEDFORD, MASSACHUSETTS 02155 Telephone EXport 1-4500

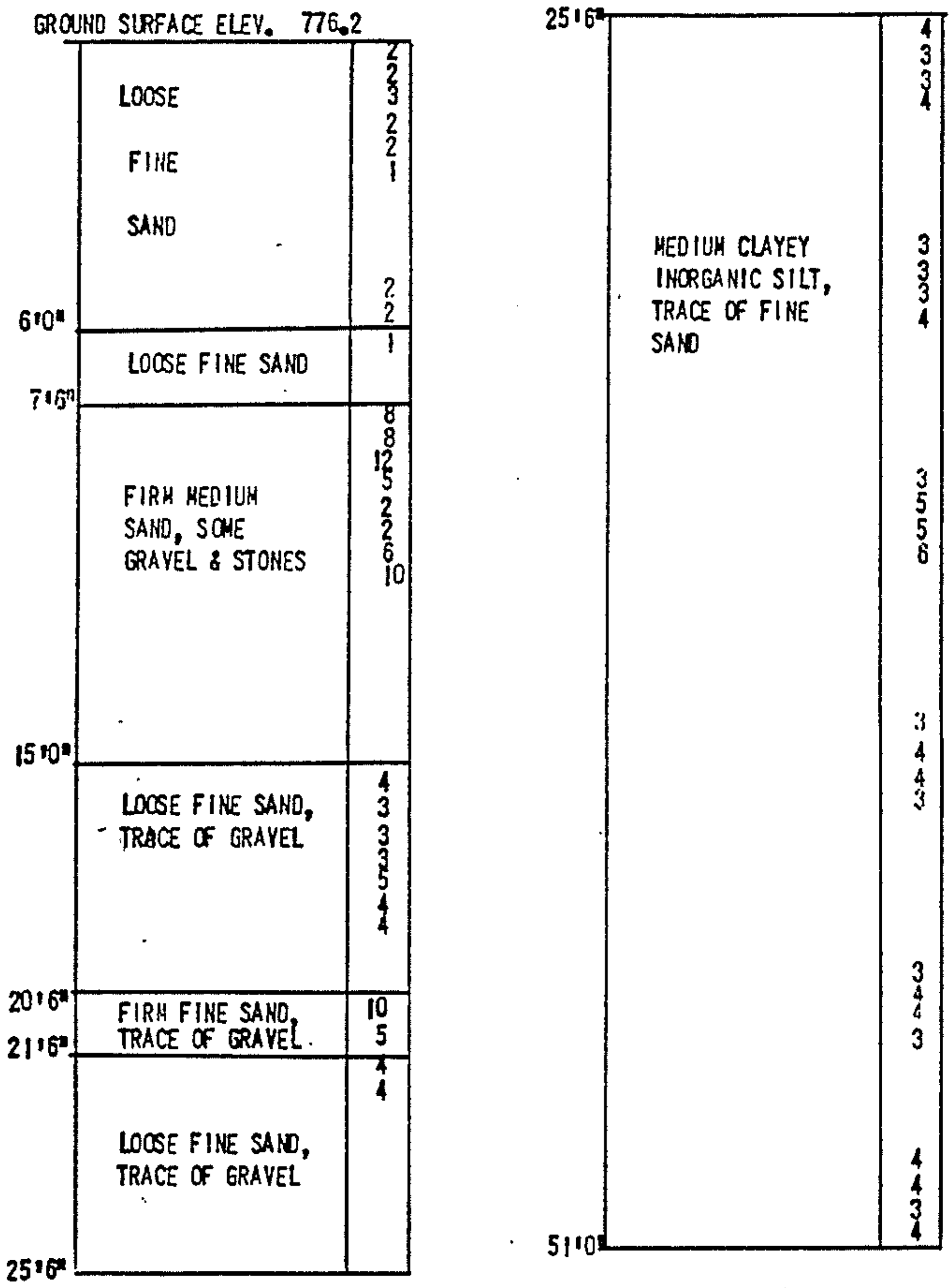
To CAMP, DRESSER & MCKEE, ENGRS., BOSTON, MASS. Date DEC. 27, 1966 Job No. 66427

Location NEWPORT, NEW HAMPSHIRE Scale 1" = 4

BORING #6

Believed to be C-6 on Drawings

GROUND SURFACE ELEV. 776.2



WATER LEVEL 6'6"
BELOW GROUND SURFACE

DATE 12-19,20,21-66

UNLESS OTHERWISE SPECIFIED, WATER LEVELS NOTED, WERE OBSERVED AT COMPLETION OF BORINGS, AND DO NOT NECESSARILY REPRESENT PERMANEN GROUND WATER LEVELS. FIGURES IN RIGHT HAND COLUMN INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE TWO-INCH SPLIT SAMPLER 6 INCHES USING 140 LB. WEIGHT FALLING 30 INCHES ±

SHEET 3 OF 5

37 LINDEN STREET MEDFORD, MASSACHUSETTS 02155 Telephone EXport 1-4500

To CAMP, DRESSER & MCKEE, ENGRS., BOSTON, MASS. Date DEC. 27, 1966 Job No. 66427

Location NEWPORT, NEW HAMPSHIRE Scale 1" = 4

BORING #7 Believed to be C-7 on Drawings

GROUND SURFACE ELEV. 776.4

| | | |
|---|---|---|
| | FIRM FINE LOAMY SAND, VEGETATION | 10<br>5<br>4<br>3 |
| 2'6" | LOOSE FINE TO MEDIUM SAND | 1<br>2<br>1<br>1 |
| 8'6" | FIRM MEDIUM TO COARSE SAND, GRAVEL & STONES | 8<br>7<br>9<br>16<br>8<br>7<br>8<br>8 |
| 14'6" | LOOSE FINE SAND & INORGANIC SILT, TRACE OF CLAY | 2<br>2<br>2<br>3 |
| 20'0" | MEDIUM CLAYEY INORGANIC SILT, TRACE OF FINE SAND | 1<br>3<br>3<br>2<br>2<br>2<br>2<br>2<br>3 |
| 35'6" | | |

WATER LEVEL 7'0"
BELOW GROUND SURFACE

DATE 12-22-66

UNLESS OTHERWISE SPECIFIED, WATER LEVELS NOTED, WERE OBSERVED AT COMPLETION OF BORINGS, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS. FIGURES IN RIGHT HAND COLUMN INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE TWO-INCH SPLIT SAMPLER 6 INCHES USING 140 LB. WEIGHT FALLING 30 INCHES ±

SHEET 4 OF 5

To CAMP, DRESSER & MCKEE, ENGRS., BOSTON, MASS. Date DEC. 27, 1966 Job No. 66427

Location NEWPORT, NEW HAMPSHIRE Scale 1" = 4 ft

BORING #8

Believed to be C-8 on Drawings

GROUND SURFACE ELEV. 776.4

| | | |
|---|---|---|
| | FIRM FINE SAND | 13<br>7<br>4 |
| 1'6" | LOOSE FINE SAND | 4<br>3<br>3<br>2 |
| 3'6" | LOOSE FINE SAND | 3 |
| 8'6" | FIRM COARSE SAND, GRAVEL & STONES | 10<br>9<br>12<br>21 |
| 15'0" | NO SAMPLE-STONE PUSHED AHEAD WITH WASH TOOLS, WATER SHOWED FINE SAND | |
| 18'0" | LOOSE FINE SAND & INORGANIC SILT | 2<br>3<br>3<br>4 |
| 30'6" | | |

WATER LEVEL 6'0"
BELOW GROUND SURFACE

DATE 12-23-66

BORING #9

OMITTED

BORING #10

GROUND SURFACE ELEV. 771.4

| | | |
|---|---|---|
| | LOAMY SAND FILL | |
| 2'0" | LOAMY SAND FILL | |
| 3'0" | ORGANIC SILTY SAND | |
| 3'6" | LOAM & ORGANIC SILT | 1<br>3 |
| 4'6" | WOOD | 5<br>25 |
| 5'6" | HARD MEDIUM SAND, GRACEL & STONES | 30<br>27<br>19<br>15 |
| 8'0" | LOOSE FINE SAND, SOME INORGANIC SILT | 2<br>2<br>2<br>2<br>3<br>3 |
| 12'0" | SOFT INORGANIC SILT, LITTLE FINE SAND | 3<br>2<br>1<br>3<br>2<br>2 |
| 15'0" | | |

WATER LEVEL 3'0"
BELOW GROUND SURFACE

DATE 12-21-66

UNLESS OTHERWISE SPECIFIED, WATER LEVELS NOTED, WERE OBSERVED AT COMPLETION OF BORINGS, AND DO NOT NECESSARILY REPRESENT PERMANENT GROUND WATER LEVELS. FIGURES IN RIGHT HAND COLUMN INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE TWO-INCH SPLIT SAMPLER 6 INCHES USING 140 LB. WEIGHT FALLING 30 INCHES ±

SHEET 5 OF 5

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

# TEST BORING REPORT

Location & Proj. No. Newport N.H. Date June 1979

Boring No. B-2
Ground Elev. 775.7

| | | |
|---|---|---|
| Top Soil | | 0 |
| | | |
| Fine Sand | 12 | 2 |
| | 18 | |
| ↓ | | 4 |
| Fine Sand | | |
| & Silt | 19 | 6 ←$H_2O$ |
| ↓ | 13 | |
| Gravel | 9 | 8 |
| ↓ | 8 | |
| Bott. of Hole | | 10 |
| | | 12 |
| | | 14 |
| | | 16 |
| | | 18 |
| | | 20 |
| | | 22 |
| | | 24 |
| | | 26 |
| | | 28 |
| | | 30 |

Boring No. B-3
Ground Elev. 774.6

| | | |
|---|---|---|
| Top Soil | | 0 |
| | | |
| Fine Sand | 4 | 2 |
| | 7 | |
| | 11 | 4 |
| | | |
| ↓ | | 6 |
| Sandy | 16 | |
| /Gravel | 18 | 8 |
| | 23 | |
| | | 10 |
| | | ←$H_2O$ |
| | 11 | 12 |
| | 21 | |
| | 19 | 14 |
| | | |
| | | 16 |
| | 14 | |
| | 11 | 18 |
| ↓ | 23 | |
| Bott. of Hole | | 20 |
| | | 22 |
| | | 24 |
| | | 26 |
| | | 28 |
| | | 30 |

Boring No. B-5
Ground Elev. 778.0

| | | |
|---|---|---|
| Top Soil | | 0 |
| | | |
| Fine Sand | 5 | 2 |
| | 5 | |
| ↓ | 6 | 4 |
| Sandy | | |
| /Gravel | 15 | 6 |
| | 22 | |
| | 33 | 8 |
| | | |
| | | 10 ←$H_2O$ |
| | 14 | |
| | 14 | 12 |
| | 20 | |
| | | 14 |
| | | |
| | | 16 |
| | 16 | |
| | 22 | 18 |
| ↓ | 19 | |
| Bott. of Hole | | 20 |
| | | 22 |
| | | 24 |
| | | 26 |
| | | 28 |
| | | 30 |

Figures in right hand columh indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.........................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H.

Date June 1978

Boring No. B-6

Ground Elev. 774.8

Boring No.

Elev. con't

Boring No. B-31

Ground Elev. 775.8

|  |  |  |
|---|---|---|
| Top Soil |  | 0 |
|  | 5 |  |
| Fine Sand | 9 | 2 |
|  | 13 |  |
| ↓ |  | 4 |
| Sandy | 12 | kH₂O |
| Gravel | 30 | 6 |
|  | 30 |  |
|  |  | 8 |
|  |  |  |
|  | 27 | 10 |
|  | 25 |  |
|  | 22 | 12 |
|  |  |  |
| ↓ |  | 14 |
| Silty Fine | 8 |  |
| Sand | 8 | 16 |
|  | 7 |  |
|  |  | 18 |
|  |  |  |
|  | 4 | 20 |
|  | 3 |  |
|  | 4 | 22 |
|  | 4 |  |
|  |  | 24 |
|  |  |  |
|  | 4 | 26 |
|  | 5 |  |
|  | 9 | 28 |
|  |  |  |
|  |  | 30 |
|  |  |  |
|  | 6 | 32 |
|  | 7 |  |
|  | 7 | 34 |
|  |  | 38 |

|  |  |  |
|---|---|---|
|  |  |  |
|  | 7 |  |
|  | 11 | 38 |
| ↓ | 12 |  |
| Bott. of Hole |  | 40 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  | 10 |
|  |  |  |
|  |  | 12 |
|  |  |  |
|  |  | 14 |
|  |  |  |
|  |  | 16 |
|  |  |  |
|  |  | 18 |
|  |  |  |
|  |  | 20 |
|  |  |  |
|  |  | 22 |
|  |  |  |
|  |  | 24 |
|  |  |  |
|  |  | 26 |
|  |  |  |
|  |  | 28 |
|  |  |  |
|  |  | 30 |

|  |  |  |
|---|---|---|
| Top Soil |  | 0 |
| Sandy | 12 |  |
| Gravel | 18 | 2 |
|  | 23 |  |
|  |  | 4 |
|  | 54 |  |
|  |  | 6 |
|  |  |  |
|  | 18 | 8 |
| ↓ | 31 | kH₂O |
| Fine Sand | 7 | 10 |
| ↓ |  |  |
|  | 6 | 12 |
| Sandy | 30 |  |
| Gravel | 40 | 14 |
|  |  |  |
|  |  | 16 |
|  | 27 |  |
|  | 19 | 18 |
| ↓ | 14 |  |
| Silty Fine |  | 20 |
| Sand | 3 |  |
|  | 4 | 22 |
|  | 4 |  |
|  | 6 | 24 |
|  |  |  |
|  |  | 26 |
|  | 6 |  |
|  | 5 | 28 |
| ↓ | 6 |  |
| Bott. of Hole |  | 30 |

Figures in right hand columh indicate number of blows required to drive 2" sample spoon one foot,using 140 lb. weight falling 30 inches

..........................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N. H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N. H.

Date June 1978

Boring No. B-4
Ground
Elev. 776.0

Boring No.
Elev. con't

Boring No. B-28
Ground
Elev. 774.0

**Boring No. B-4**

| | | |
|---|---|---|
| Top Soil | | 0 |
| Fine Sand | 4 | |
| | 3 | 2 |
| ↓ | | |
| Sandy | 7 | 4 |
| Gravel | 8 | |
| | 8 | 6 |
| | | |
| | | 8 |
| | 9 | |
| | 10 | 10 |
| | 14 ← $H_2O$ | |
| | | 12 |
| | | |
| | 34 | 14 |
| | 15 | |
| ↓ | 18 | 16 |
| Silty Fine | | |
| Sand | 5 | 18 |
| | 5 | |
| | 3 | 20 |
| | | |
| | | 22 |
| | 4 | |
| | 3 | 24 |
| | 3 | |
| | | 26 |
| | | |
| | | 28 |
| | 3 | |
| | 4 | 30 |
| | 4 | |
| | 5 | 32 |
| | | |
| | | 34 |
| | | |
| | | 36 |

**Elev. con't**

| | | |
|---|---|---|
| | | 0 |
| | 6 | |
| | 8 | 2 38 |
| ↓ | 8 | |
| Bott. of Hole | | 4 40 |
| | | |
| | | 6 |
| | | |
| | | 8 |
| | | |
| | | 10 |
| | | |
| | | 12 |
| | | |
| | | 14 |
| | | |
| | | 16 |
| | | |
| | | 18 |
| | | |
| | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |
| | | |
| | | |
| | | |
| | | |
| | | |

**Boring No. B-28**

| | | |
|---|---|---|
| Top Soil | 1 | 0 |
| | 12 | |
| Fine Sand | 18 | 2 |
| | 7 | |
| ↓ | | 4 |
| Sandy | | |
| Gravel | | 6 |
| | 16 | |
| | 22 ← $H_2O$ | 8 |
| ↓ | 19 | |
| Silty Fine | | 10 |
| Sand | 3 | |
| | 3 | 12 |
| | 4 | |
| | | 14 |
| | | |
| | | 16 |
| | 5 | |
| | 5 | 18 |
| ↓ | 5 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |
| | | |
| | | |
| | | |
| | | |
| | | |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.......................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H. Date May 1978

Boring No. B-10 Boring No. B-19 Boring No.

Ground Elev. 782.1 Ground Elev. 782.0 Elev.

Boring No. B-10, Ground Elev. 782.1

| | | |
|---|---|---|
| Fine Sand | | 0 |
| ↓ | | |
| | | 2 |
| ↓ | | |
| Sandy | 4 | 4 |
| Gravel | 6 | |
| | | 6 |
| | 6 | |
| | 4 | 8 |
| | 4 | |
| ↓ | | 10 |
| Sandy | 25 | |
| Gravel | 30 | 12 |
| ↓ | | |
| | 12 | 14 ← $H_2O$ |
| | 12 | |
| | | 16 |
| ↓ | | |
| Fine Gray | | 18 |
| Sand + Silt | | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |

Boring No. B-19, Ground Elev. 782.0

| | | |
|---|---|---|
| Top Soil | | 0 |
| Fine Sand | | |
| + | | 2 |
| Small Stones | 14 | |
| | 17 | 4 |
| ↓ | | |
| Fine Sand | | 6 |
| | 4 | |
| ↓ | 4 | 8 |
| ↓ | 5 | |
| Crs. Sand | | 10 |
| | | |
| | 6 | 12 ← $H_2O$ |
| ↓ | 6 | |
| Gravel | | 14 |
| | 9 | |
| ↓ | 11 | 16 |
| | | |
| Fine Sand | 15 | 18 |
| | 11 | |
| | | 20 |
| | | |
| | 9 | 22 |
| ↓ | 11 | |
| | | 24 |
| Fine Sand | 6 | |
| + Silt | 8 | 26 |
| | | |
| | 10 | 28 |
| ↓ | 11 | |
| Bott. of Hole | | 30 |

Figures in right hand columh indicate number of blows required to drive 2" sample spoon one foot,using 140 lb. weight falling 30 inches

..........................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

# TEST BORING REPORT

Location & Proj. No. Newport N.H.

Date May 1978

Boring No. B-11
Top of Pavement
Elev. 781.6

| | | |
|---|---|---|
| | | 0 |
| Fine Sand | | |
| | 14 | 2 |
| | 16 | |
| | | 4 |
| Stones | 171 | |
| | 41 | 6 |
| | | |
| | 6 | 8 |
| | 8 | |
| | 8 | 10 |
| | | |
| | 11 | 12 |
| | 10 | ←$H_2O$ |
| Gravel | 29 | |
| | | |
| | | 16 |
| | 22 | |
| | 47 | 18 |
| | 25 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |
| | | |
| | | |
| | | |
| | | |
| | | |

Boring No. B-13
Ground
Elev. 781.5

| | | |
|---|---|---|
| Top Soil | | 0 |
| | | |
| Fine Sand | 8 | 2 |
| | 11 | |
| | | 4 |
| Fine Sand | 49 | |
| & Stones | 53 | 6 |
| | | |
| | | 8 |
| | 16 | |
| | 19 | 10 |
| | | |
| Gravel | 13 | 12 |
| | 24 | ←$H_2O$ |
| | | 14 |
| | | |
| | 20 | 16 |
| | 27 | |
| | | 18 |
| | 31 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |
| | | |
| | | |
| | | |
| | | |
| | | |

Boring No. B-18
Ground
Elev. 781.8

| | | |
|---|---|---|
| Top Soil | | 0 |
| Fine Sand | | |
| wood | | 2 |
| | | |
| Sandy | 20 | 4 |
| Gravel | 61 | |
| | | 6 |
| | | |
| | 7 | 8 |
| | 7 | |
| | | 10 |
| | | |
| | | 12 |
| Muck & Sand | 15 | ←$H_2O$ |
| Gravel | 30 | 14 |
| | | |
| | | 16 |
| Fine Gray | | |
| Sand & Silt | 5 | 18 |
| | 8 | |
| | 5 | 20 |
| Bott. of Hole | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |
| | | |
| | | |
| | | |
| | | |
| | | |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.......................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H. Date June 1978

Boring No. B-22 Boring No. ____ Boring No. ____

Ground
Elev. 781.5 Elev. ____ Elev. ____

| | | |
|---|---|---|
| Top Soil | | 0 |
| Fine Sand | | |
| | 10 | 2 |
| | 12 | |
| | 12 | 4 |
| Gravel | | |
| | 27 | 6 |
| ↓ | 33 | |
| Fine Sand | 11 | 8 |
| | | |
| | | 10 |
| ↓ | 8 | |
| Gravel | 19 | 12 |
| | 24 | ← $H_2O$ 14 |
| | | |
| ↓ | | 16 |
| Crs. Gray | 11 | |
| Sand | 11 | 18 |
| | 13 | |
| ↓ | 18 | 20 |
| Bott. of Hole | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.......................................
Signed

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H.

Date June 1978

Boring No. B-14
Ground Elev. 781.5

| | | |
|---|---|---|
| Top Soil | | 0 |
| | 3 | |
| Fine Sand | 3 | 2 |
| ↓ | 5 | |
| Gravel | | 4 |
| | 19 | |
| | 17 | 6 |
| | 11 | |
| ↓ | | 8 |
| Fine Sand | | |
| | 13 | 10 |
| | 10 | |
| | 10 | 12 |
| ↓ | | |
| Gravel | 17 | 14 $H_2O$ |
| | 15 | |
| ↓ | | 16 |
| Crs. Sand | 6 | |
| | 8 | 18 |
| ↓ | 9 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |

Boring No. B-16
Ground Elev. 781.7

| | | |
|---|---|---|
| Top Soil | | 0 |
| | | |
| Fine Sand | 4 | 2 |
| ↓ | 6 | |
| | 6 | 4 |
| Gravel | | |
| ↓ | 16 | 6 |
| Fine Sand | 8 | |
| | 10 | 8 |
| | | |
| | | 10 |
| | 11 | |
| | 11 | 12 |
| ↓ | 14 | |
| Crs. Sand | | 14 $H_2O$ |
| | 9 | |
| | 9 | 16 |
| | | |
| | 8 | 18 |
| ↓ | 13 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |

Boring No. B-22
Ground Elev. 781.7

| | | |
|---|---|---|
| Top Soil | | 0 |
| Fine Sand | | |
| ↓ | 5 | 2 |
| Gravel | 11 | |
| | 14 | 4 |
| ↓ | | |
| Fine Sand | 11 | 6 |
| | 9 | |
| | 10 | 8 |
| | | |
| | 8 | 10 |
| | 10 | |
| | 14 | 12 |
| ↓ | | |
| Crs. Sand | 7 | 14 $H_2O$ |
| | 7 | |
| | 9 | 16 |
| ↓ | | |
| Fine Sand + | 13 | 18 |
| Silt | 12 | |
| Bott. of Hole | | 20 |
| | | |
| | | 22 |
| | | |
| | | 24 |
| | | |
| | | 26 |
| | | |
| | | 28 |
| | | |
| | | 30 |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

......................................
Signed

Wash Boring | Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N. H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H. Date June 1978

Boring No. B-29
Ground Elev. 774.8

| | | |
|---|---|---|
| 0 | Top Soil | |
| | | |
| 2 | Fine Sand | 9 |
| | | 11 |
| 4 | | 13 |
| | ↓ | |
| 6 | Sandy | 26 |
| | /Gravel | 14 |
| 8 ← $H_2O$ | | 21 |
| | | |
| 10 | | |
| | ↓ | 16 |
| 12 | Silty Fine | 7 |
| | Sand | 4 |
| 14 | | |
| | | |
| 16 | | 3 |
| | | 4 |
| 18 | | 4 |
| | ↓ | 6 |
| 20 | Bott. of Hole | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |
| 30 | | |

Boring No. B-30
Ground Elev. 775.0

| | | |
|---|---|---|
| 0 | Top Soil | |
| | | |
| 2 | Fine Sand | |
| | | |
| 4 | | |
| | | |
| 6 | ↓ | |
| | Sandy | |
| 8 ← $H_2O$ | /Gravel | |
| | | |
| 10 | | |
| | ↓ | |
| 12 | | |
| | Silty Fine | |
| 14 | Sand | |
| | | |
| 16 | | |
| | | |
| 18 | | |
| | ↓ | |
| 20 | Bott. of Hole | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |
| 30 | | |

Boring No. B-37
Ground Elev. 779.1

| | | |
|---|---|---|
| 0 | Fine Sand | |
| | | |
| 2 | | |
| | | |
| 4 | | |
| | | |
| 6 | | |
| | | |
| 8 | | |
| | | |
| 10 | | |
| | ↓ | |
| 12 ← $H_2O$ | Sandy | |
| | /Gravel | |
| 14 | ↓ | |
| | Silty Fine | |
| 16 | Sand | |
| | | |
| 18 | | |
| | ↓ | |
| 20 | Bott. of Hole | |
| 22 | | |
| 24 | | |
| 26 | | |
| 28 | | |
| 30 | | |

Figures in right hand columh indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

........................................

Wash Boring

Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

# TEST BORING REPORT

Location & Proj. No. Newport N.H. Date June 1978

Boring No. B-33
Ground Elev. 779.0

| | | |
|---|---|---|
| 0 | Top Soil | |
| | Gravel | 8 |
| 2 | ↓ | 7 |
| | | 8 |
| 4 | ↓ | |
| | Fine Sand | 13 |
| 6 | ↓ | 12 |
| | | 12 |
| 8 | | |
| | ↓ | |
| 10 | Sandy | 16 |
| | Gravel | 18 ←$H_2O$ |
| 12 | ↓ | 22 |
| | | |
| 14 | | 20 |
| | | 25 |
| 16 | ↓ | 20 |
| | Silty Fine | |
| 18 | Sand | 9 |
| | ↓ | 8 |
| 20 | Bott. of Hole | |

Boring No. B-35
Ground Elev. 775.8

| | | |
|---|---|---|
| 0 | Top Soil | |
| | Fine Sand | |
| 2 | ↓ | 2 |
| | | 4 |
| 4 | | 3 |
| | | |
| 6 | | 3 |
| | ↓ | 7 ←$H_2O$ |
| 8 | Sandy | 15 |
| | Gravel | |
| 10 | ↓ | 20 |
| | | 21 |
| 12 | | 27 |
| | | |
| 14 | ↓ | |
| | Silty Fine | 5 |
| 16 | Sand | 7 |
| | ↓ | 7 |
| 18 | | 7 |
| | ↓ | 9 |
| 20 | Bott. of Hole | |

Boring No. B-24
Ground Elev. 776.3

| | | |
|---|---|---|
| 0 | Top Soil | |
| | Fine Sand | |
| 2 | ↓ | 9 |
| | | 11 |
| 4 | | 7 |
| | ↓ | |
| 6 | Sandy | ←$H_2O$ |
| | Gravel | 13 |
| 8 | ↓ | 18 |
| | | 12 |
| 10 | Bott. of Hole | |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.......................................
Signed

Wash Boring Core Drilling

Warren J. Clattenburg
Box 1, Pittsfield, N.H.
Tel. 435-8486

## TEST BORING REPORT

Location & Proj. No. Newport N.H. Date June 1978

Boring No. B-36 Ground Elev. 778.4
Boring No. B-38 Ground Elev. 775.1
Boring No. Elev. Con't

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Top Soil | | 0 | Top Soil | | 0 | | | |
| Gravel | | | Fine Sand | | | | 6 | |
| | 28 | 2 | | | 2 | | 9 | 38 |
| | 35 | | | | | | 9 | |
| Fine Sand | 6 | 4 | | 19 | 4 | Bott. of Hole | | 40 |
| | | | | 22 | | | | |
| | | 6 | | | 6 | | | |
| | 9 | | | | | | | |
| | 8 | 8 | | 18 | 8 | | | |
| | 8 | | Sandy | 21 | | | | |
| Sandy | | 10 | Gravel | 32 | 10 | | | 10 |
| Gravel | 28 | | | | | | | |
| | 14 | 12 | | | 12 | | | 12 |
| | 11 | | | | | | | |
| | | 14 ←H2O | | 11 | ←H2O 14 | | | 14 |
| Silty Fine | 8 | | | 16 | | | | |
| Sand | 12 | 16 | | 19 | 16 | | | 16 |
| | 11 | | Fine Sand | | | | | |
| | 12 | 18 | | 10 | 18 | | | 18 |
| | 8 | | | 7 | | | | |
| Bott. of Hole | | 20 | Silty Fine | | 20 | | | 20 |
| | | | Sand | 2 | | | | |
| | | 22 | | 3 | 22 | | | 22 |
| | | | | 3 | | | | |
| | | 24 | | 5 | 24 | | | 24 |
| | | | | | | | | |
| | | 26 | | 3 | 26 | | | 26 |
| | | | | 4 | | | | |
| | | 28 | | 4 | 28 | | | 28 |
| | | | | 4 | | | | |
| | | 30 | | | 30 | | | 30 |
| | | | | | | | | |
| | | | | | 32 | | | |
| | | | | 3 | | | | |
| | | | | 7 | 34 | | | |
| | | | | 5 | 36 | | | |

Figures in right hand column indicate number of blows required to drive 2" sample spoon one foot, using 140 lb. weight falling 30 inches

.........................................
Signed

GOLDBERG-ZOINO & ASSOCIATES, INC.
380 HARVEY ROAD, MANCHESTER, NH.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Newport WWTF Lagoons
Newport, New Hampshire

REPORT OF BORING No. GZ-1
SHEET 1 OF 3
FILE No. D-20003
CHKD. BY PJG

BORING Co. Northeast Diamond Drilling
FOREMAN T. Whitman
GZA ENGINEER G. Garfield

BORING LOCATION See Exploration Location Plan
GROUND SURFACE ELEVATION 780 DATUM MSL
DATE START 10/16/86 DATE END 10/17/86

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE:
OTHER:

GROUNDWATER READINGS

| DATE | TIME | WATER AT | CASING AT | STABILIZATION TIME |
|---|---|---|---|---|
| 10/21/86 | 1214 | 14.1 | ow | 6 days |
| 9/9/87 | | 14.0 | ow | 11 months |
| 9/22/87 | | 13.8 | ow | 11 months |

| DEPTH (ft) | CASING (bl/ft) | SAMPLE No. | SAMPLE PEN. (in)/REC. | SAMPLE DEPTH (ft) | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION Burmister CLASSIFICATION | REMARKS | STRATUM DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | 7 | S-1 | 18/18 | 0-1.5 | 2-3-8 | Medium dense, light brown, fine SAND, little Silt. Roots and Surface Organics in top 6" of sampler. | 1. | |
| | 21 | | | | | | | |
| | 34 | | | | | | | |
| | 31 | | | | | | | |
| | 31 | | | | | | | |
| 5 | 41 | S-2 | 18/18 | 5-6.5 | 20-21-30 | Very dense, brown, fine SAND, little (+) Silt, trace coarse Sand, trace Gravel. | | FINE SAND |
| | 194 | | | | | | 2. | |
| | 47 | | | | | | | |
| | 31 | | | | | | | |
| | 29 | | | | | | | |
| 10 | 34 | S-3 | 18/18 | 10-11.5 | 5-6-4 | Loose, brown, fine SAND, little Silt. | | |
| | 31 | | | | | | | 12' |
| | 58 | | | | | | | |
| | 60 | | | | | | | |
| | 64 | | | | | | | |
| 15 | 38 | S-4 | 18/18 | 15-16.5 | 21-36-41 | Very dense, brown fine to coarse SAND and Gravel. | | SAND AND GRAVEL |
| | 42 | | | | | | | |
| | 60 | | | | | | | 18' |
| | 9 | | | | | | | |
| | 8 | | | | | | | |
| 20 | | S-5 | 18/12 | 20-21.5 | 6-4-4 | Medium stiff, grey, SILT & CLAY. | | STRATIFIED SILT & CLAY |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 25 | | S-6 | 18/18 | 25-26.5 | 1-2-3 | Medium stiff, grey, CLAY & SILT. TV=0.15 tsf. | 3. | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| 30 | | S-7 | 18/18 | 30-31.4 | 1-2-4 | Medium stiff, grey, CLAY & SILT with 1/4" Clay seam at 30.7'. | | |
| | | S-7A | | 31.4-31.5 | | S-7A: Grey, fine SAND, some (+) Silt. | | |
| | | | | | | | | |
| | | | | | | | | |
| 35 | | | | | | | | |

| GRANULAR SOILS BLOWS/FT. | GRANULAR SOILS DENSITY | COHESIVE SOILS BLOWS/FT. | COHESIVE SOILS DENSITY |
|---|---|---|---|
| 0-4 | V. LOOSE | < 2 | V. SOFT |
| 4-10 | LOOSE | 2-4 | SOFT |
| 10-30 | M. DENSE | 4-8 | M. STIFF |
| 30-50 | DENSE | 8-15 | STIFF |
| >50 | V. DENSE | 15-30 | V. STIFF |
| | | >30 | HARD |

REMARKS:
1. Topsoil to 0.5 feet below ground surface.
2. Obstruction from 7.0 to 9.0 feet. Boring advanced ahead of casing to remove obstruction. Casing then driven to 10.0 feet.
3. TV indicates results of torvane shear test on split-spoon sample.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. GZ-1

GOLDBERG-ZOINO & ASSOCIATES, INC.
380 HARVEY ROAD, MANCHESTER, NH.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Newport WWTP Lagoons
Newport, New Hampshire

REPORT OF BORING No. GZ-1
SHEET 2 OF 3
FILE No. D-20003
CHKD. BY RJG

BORING Co. Northeast Diamond Drilling
FOREMAN T. Whitman
GZA ENGINEER G. Garfield

BORING LOCATION See Exploration Location Plan
GROUND SURFACE ELEVATION 780 DATUM MLS
DATE START 10/16/86 DATE END 10/17/86

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE:
OTHER:

GROUNDWATER READINGS

| DATE | TIME | WATER AT | CASING AT | STABILIZATION TIME |
|---|---|---|---|---|
| | | | | |
| | | SEE SHEET 1 | | |
| | | | | |

| DEPTH (ft) | CASING (bl/ft) | SAMPLE No. | PEN. (in)/REC | DEPTH (ft.) | BLOWS/6" | SAMPLE DESCRIPTION Burmister CLASSIFICATION | REMARKS | STRATUM DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | S-8 | 18/18 | 35-36.5 | 2-2-3 | Medium stiff, grey CLAY & SILT. | 4. | |
| 40 | | S-9 | 18/18 | 40-46.5 | 1-2-2 | Soft, grey, CLAY & SILT. | 4. | STRATIFIED SILT AND CLAY |
| 45 | | | | | | | | |
| 50 | | S-10 | 18/18 | 50-51.5 | WOH | Very soft, grey CLAY & SILT.<br>TV=0.2 tsf | | |
| 60 | | S-11 | 18/18 | 60-61.5 | 4-5-5 | Stiff, gray, stratified CLAY & SILT. | | |
| 65 | | | | | | | | |

| GRANULAR SOILS BLOWS/FT. | DENSITY | COHESIVE SOILS BLOWS/FT. | DENSITY |
|---|---|---|---|
| 0-4 | V. LOOSE | < 2 | V. SOFT |
| 4-10 | LOOSE | 2-4 | SOFT |
| 10-30 | M. DENSE | 4-8 | M. STIFF |
| 30-50 | DENSE | 8-15 | STIFF |
| >50 | V. DENSE | 15-30 | V. STIFF |
| | | >30 | HARD |

REMARKS:

4. No TV due to sample disturbance induced during spoon removal.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. GZ-1

| | | |
|---|---|---|
| GOLDBERG-ZOINO & ASSOCIATES, INC.<br>380 HARVEY ROAD, MANCHESTER, NH.<br>GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS | PROJECT<br>Newport WWTP Lagoons<br>Newport, New Hampshire | REPORT OF BORING No. GZ-1<br>SHEET 3 OF 3<br>FILE No. D-20003<br>CHKD. BY EJG |

BORING Co. Northeast Diamond Drilling
FOREMAN T. Whitman
GZA ENGINEER G. Garfield
BORING LOCATION See Exploration Location Plan
GROUND SURFACE ELEVATION 780 DATUM MSL
DATE START 10/16/86 DATE END 10/17/86

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE:
OTHER:

| GROUNDWATER READINGS | | | | |
|---|---|---|---|---|
| DATE | TIME | WATER AT | CASING AT | STABILIZATION TIME |
| | | | | |
| | SEE | SHEET | 1 | |

| DEPTH (ft) | CASING (bl/ft) | SAMPLE No. | SAMPLE PEN. (in)/REC | SAMPLE DEPTH (ft.) | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION Burmister CLASSIFICATION | REMARKS | STRATUM DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| | | S-12 | 18/18 | 70-71.5 | 3-WOH-3 | Soft, grey, CLAY & SILT. | 5. | STRATIFIED SILT AND CLAY |
| 75 | | | | | | | | |
| 80 | | | | | | | | |
| | | S-13 | 18/18 | 80-81.5 | WOH/12"-10 | Stiff, grey, Silty CLAY.<br>TV=0.3 tsf | 6.<br>7. | 81.5' |
| | | | | | | Bottom of boring at 81.5'. | | |

| GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|
| BLOWS/FT. | DENSITY | BLOWS/FT. | DENSITY |
| 0-4 | V. LOOSE | < 2 | V. SOFT |
| 4-10 | LOOSE | 2-4 | SOFT |
| 10-30 | M. DENSE | 4-8 | M. STIFF |
| 30-50 | DENSE | 8-15 | STIFF |
| >50 | V. DENSE | 15-30 | V. STIFF |
| | | >30 | HARD |

REMARKS:

5. Top 6" of sample is SILT & CLAY.
6. No refusal encountered.
7. Observation well installed at 15 feet at completion of boring.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. GZ-1

GOLDBERG-ZOINO & ASSOCIATES, INC.
MANCHESTER, NEW HAMPSHIRE
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Newport WWT Lagoons
Newport, New Hampshire

REPORT OF BORING No. GZ-101
SHEET 1 OF 1
FILE No. D-20003
CHKD. BY RJG

BORING Co. Northeast Diamond Drilling
FOREMAN S. Trask
GZA ENGINEER D. Porter

BORING LOCATION See Exploration Location Plan
GROUND SURFACE ELEVATION 780 DATUM MSL
DATE START 6/1/87 DATE END 6/1/87

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE:
OTHER: 2½" H.S.A.

| GROUNDWATER READINGS | | | | |
|---|---|---|---|---|
| DATE | TIME | WATER AT | CASING AT | STABILIZATION TIME |
| | | | | |

| DEPTH (ft) | CASING (bl/ft) | SAMPLE No. | PEN. (in)/REC. | DEPTH (ft) | BLOWS/6" | SAMPLE DESCRIPTION Burmister CLASSIFICATION | REMARKS | STRATUM DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| 5 | | | | | | | | |
| 10 | | | | | | | | |
| | | | | | | | 1. | |
| 15 | | | | | | | | GRAVELLY SAND |
| | | S-1 | 24/14 | 16-18 | 17-26-17-14 | Dense, brown, fine to coarse SAND, some Gravel, little Silt. | | 18' |
| | | S-2 | 24/19 | 18-20 | 6-5-4-4 | Loose, gray, fine SAND and SILT, trace Gravel. | | FINE SAND AND SILT<br>20' |
| 20 | | S-3 | 24/24 | 20-22 | 2-1-2-2 | Soft, gray, SILT and CLAY; stratified with 1/8 to 1" thick fine Sand and Silt comprising approximately 40% of sample. T.V.= 0.15 tsf | | STRATIFIED SILT AND CLAY |
| | | S-4 | 24/24 | 22-24 | 3-2-3-2 | | | 24.0' |
| | | | | | | Bottom of boring at 24.0'. | 2.<br>3.<br>4. | |

| GRANULAR SOILS | | COHESIVE SOILS | |
|---|---|---|---|
| BLOWS/FT. | DENSITY | BLOWS/FT. | DENSITY |
| 0-4 | V. LOOSE | <2 | V. SOFT |
| 4-10 | LOOSE | 2-4 | SOFT |
| 10-30 | M. DENSE | 4-8 | M. STIFF |
| 30-50 | DENSE | 8-15 | STIFF |
| >50 | V. DENSE | 15-30 | V. STIFF |
| | | >30 | HARD |

REMARKS:
1. Drilled boring without sampling to 16 feet.
2. No refusal encountered.
3. Borehole colapsed at 10.5 feet upon removing augers.
4. T.V. indicates torvane shear value.

GZA

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. GZ-101

GOLDBERG-ZOINO & ASSOCIATES, INC.
MANCHESTER, NEW HAMPSHIRE
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Newport WWT Lagoons
Newport, New Hampshire

REPORT OF BORING No. GZ-102B
SHEET 1 OF 1
FILE No. D-20003
CHKD. BY RJG

BORING Co. Northeast Diamond Drilling
FOREMAN S. Trask
GZA ENGINEER D. Porter
BORING LOCATION See Exploration Location Plan
GROUND SURFACE ELEVATION 775.5 DATUM MSL
DATE START 6/2/87 DATE END 6/2/87

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300lb. HAMMER FALLING 24 in.
CASING SIZE: OTHER: 2½" H.S.A.

GROUNDWATER READINGS

| DATE | TIME | WATER AT | CASING AT | STABILIZATION TIME |
|---|---|---|---|---|
| | | | | |
| | | | | |

| DEPTH (ft) | CASING (bl/ft) | SAMPLE No. | SAMPLE PEN. (in)/REC. | SAMPLE DEPTH (ft) | SAMPLE BLOWS/6" | SAMPLE DESCRIPTION Burmister CLASSIFICATION | REMARKS | STRATUM DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| 5 | | | | | | | 1 | |
| 10 | | S-1 | 24/18 | 9.5-11.5 | 2-6-8-6 | Medium dense, gray, fine SAND, little Silt. | | FINE SAND |
| | | S-2 | 24/16 | 11.5-13.5 | 4-3-2-3 | Loose, gray, fine SAND, some Silt. 2" thick seam of SILT and CLAY in tip of spoon. | | |
| | | S-3 | 24/24 | 13.5-15.5 | WOH-WOH-2-3 | Soft, gray, SILT and CLAY. Stratified with ¼ to 1" thick seams of Silt comprising approximately 40% of sample. T.V.=0.075 tsf. | 2 | 13.4'<br>STRATIFIED SILT AND CLAY |
| 15 | | | | | | | 3 | 15.5' |
| | | | | | | Bottom of boring at 15.5'. | 4 | |

| GRANULAR SOILS BLOWS/FT. | GRANULAR SOILS DENSITY | COHESIVE SOILS BLOWS/FT. | COHESIVE SOILS DENSITY |
|---|---|---|---|
| 0-4 | V. LOOSE | < 2 | V. SOFT |
| 4-10 | LOOSE | 2-4 | SOFT |
| 10-30 | M. DENSE | 4-8 | M. STIFF |
| 30-50 | DENSE | 8-15 | STIFF |
| >50 | V. DENSE | 15-30 | V. STIFF |
| | | >30 | HARD |

REMARKS:
1. Drilled boring without sampling to 9.5 feet.
2. WOH indicates weight of hammer.
3. No refusal encountered.
4. T.V. indicates torvane shear value.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. GZ-102B

# TEST PIT FIELD LOG

GOLDBERG · ZOINO & ASSOC., INC
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT .
DESCRIPTION Newport WWT Lagoons
LOCATION Newport, NH

TEST PIT No. TP- 10
FILE No. D-20003
DATE 10/21/86

GZA ENGINEER G. Garfield
WEATHER Sunny

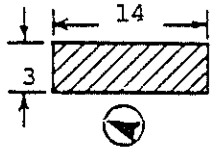
EXCAVATION EQUIPMENT
CONTRACTOR St. Pierre Inc.
OPERATOR F. St.Pierre
MAKE Allis-Chalmers MODEL 918
CAPACITY 1/2 cu.yd. REACH 18 ft

GROUND ELEV. 775.0
TIME STARTED 1200
TIME COMPLETED 1233

| DEPTH | | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDER COUNT QTY. CLASS. | REMARK No. |
|---|---|---|---|---|---|
| 0 | | Light brown, fine to medium SAND, little (-) Silt, trace (+) Gravel. Tree roots to 3.0 feet. | | | |
| 1' | | | E | None | 1 |
| 2' | | | | | |
| 3' | | | | | |
| 4' | | | | | |
| 5' | | | | | |
| 6' | | | | | |
| 7' | | | | | |
| 8' | | | | | 2 |
| 9' | 9.0' | | | | 3 |
| | | Gray, fine to coarse SAND, some (+) Gravel, 5-10% Cobbles. | ▼ | ▼ | |
| 10' | ▽ 10.0 | Bottom of test pit at 10.0 feet. | | | 4 |
| 11' | | | | | |
| 12' | | | | | |
| 13' | | | | | |
| 14' | | | | | |

REMARKS:
1. TP-10 located 78 feet north of test boring GZ-1.
2. Seasonal high water table observed at 8.0 feet.
3. Groundwater encountered at 10.0 feet.
4. TP-10 terminated due to groundwater infiltration.

## TEST PIT PLAN



VOLUME = 15.6 cu.yd

## LEGEND:

### BOULDER COUNT

| SIZE RANGE CLASSIFICATION | LETTER DESIGNATION |
|---|---|
| 6" - 18" | A |
| 18" - 36" | B |
| 36" AND LARGER | C |

### PROPORTIONS USED

| | | |
|---|---|---|
| TRACE | (TR.) | 0 - 10% |
| LITTLE | (LI.) | 10 - 20% |
| SOME | (SO.) | 20 - 35% |
| AND | | 35 - 50% |

### ABBREVIATIONS

F - FINE
M - MEDIUM
C - COARSE
F/M - FINE TO MEDIUM
F/C - FINE TO COARSE
V - VERY
GR - GRAY
BN - BROWN

### EXCAVATION EFFORT

E — EASY
M — MODERATE
D — DIFFICULT

### GROUNDWATER

ELAPSED TIME TO READING ▽ G.W.L

# TEST PIT FIELD LOG

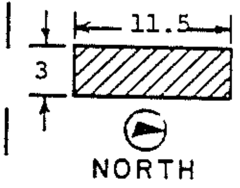
|  |  |  |
|---|---|---|
| GOLDBERG · ZOINO & ASSOC., INC<br>GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS | PROJECT<br>DESCRIPTION Newport WWT Lagoons<br>LOCATION Newport, NH | TEST PIT No. TP-11<br>FILE No. D-20003<br>DATE 10/21/86 |
| GZA ENGINEER G. Garfield<br>WEATHER Sunny | EXCAVATION EQUIPMENT<br>CONTRACTOR St. Pierre Inc.<br>OPERATOR F. St.Pierre<br>MAKE Allis-Chalmers MODEL 918<br>CAPACITY 1/2 cu.yd REACH 18 ft | GROUND ELEV. 775.5<br>TIME STARTED 1234<br>TIME COMPLETED 1300 |

| DEPTH |  | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDER COUNT QTY. CLASS. | REMARK No. |
|---|---|---|---|---|---|
| 0 |  |  |  |  |  |
| 1' |  | Light brown, fine to medium SAND, little Silt, trace (+) Gravel. | E | None | 1,2 |
| 2' |  |  |  |  |  |
| 3' |  |  |  |  |  |
| 4' |  |  |  |  |  |
| 5' |  |  |  |  |  |
| 6' |  |  |  |  |  |
| 7' | 7.0' | Brown, fine to coarse SAND and GRAVEL, 5-10% Cobbles. |  |  | 3 |
| 8' |  |  |  |  |  |
| 9' | ▽ 9.3' |  |  |  | 4,5 |
| 10' |  | Bottom of test pit at 9.3 feet. |  |  |  |
| 11' |  |  |  |  |  |
| 12' |  |  |  |  |  |
| 13' |  |  |  |  |  |
| 14' |  |  |  |  |  |

REMARKS:

1. TP-11 located 200 feet east of TP-10.
2. No topsoil encountered.
3. Seasonal high water table observed at 7.0 feet.
4. Groundwater encountered at 9.0 feet.
5. TP-11 terminated due to groundwater infiltration.

TEST PIT PLAN



VOLUME = 11.9 cu yd.

LEGEND:

BOULDER COUNT

| SIZE RANGE CLASSIFICATION | LETTER DESIGNATION |
|---|---|
| 6"-18" | A |
| 18"-36" | B |
| 36" AND LARGER | C |

PROPORTIONS USED

| | |
|---|---|
| TRACE (TR.) | 0 - 10% |
| LITTLE (LI.) | 10 - 20% |
| SOME (SO.) | 20 - 35% |
| AND | 35 - 50% |

ABBREVIATIONS

F - FINE
M - MEDIUM
C - COARSE
F/M - FINE TO MEDIUM
F/C - FINE TO COARSE
V - VERY
GR - GRAY
BN - BROWN
YE - YELLOW

EXCAVATION EFFORT

E — EASY
M — MODERATE
D — DIFFICULT

GROUNDWATER

ELAPSED TIME TO READING ▽ G.W.L

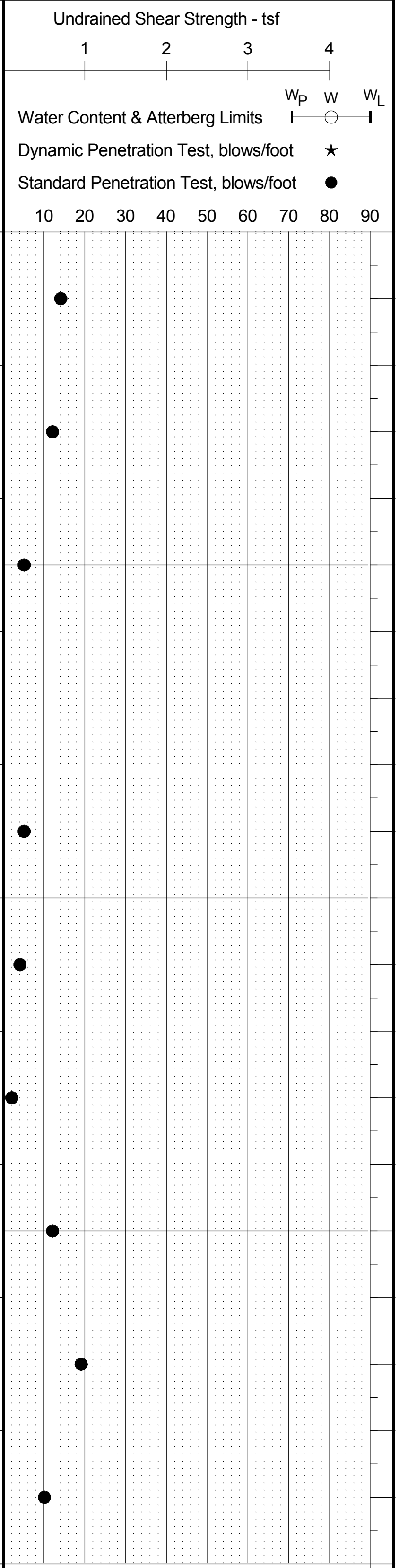
Stantec

# BOREHOLE LOG

# B-1

CLIENT Newport WWTP
LOCATION Newport, NH
EXPLORATION DATE 7/16/2018 to 7/16/2018
WATER LEVEL 13
PROJECT No. 195113316
EXPLORATION No. B-1
DATUM N/A

| DEPTH (ft) | ELEVATION (ft) | MATERIAL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | NUMBER | RECOVERY in. | SPT blows / 6" | SPT N-Value | PID Reading (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Medium dense, light brown fine sand, little gravel, trace silt | | | SS | 1 | 11 | 3<br>7<br>7<br>6 | 14 | |
| | | Medium dense, light brown fine sand and silt, some gravel<br>Rock in shoe. | | | SS | 2 | 3 | 8<br>7<br>5<br>6 | 12 | |
| 5 | | Loose, brown fine sand and silt, some gravel | | | SS | 3 | 13 | 8<br>3<br>2<br>1 | 5 | |
| | | Loose, brown fine sand and silt, some gravel<br>Rock in shoe. | | | SS | 4 | 3 | 3<br>50/1" | R | |
| | | Loose, brown fine to medium sand, trace silt<br>-SAND DEPOSIT- | | | SS | 5 | 17 | 2<br>3<br>2<br>3 | 5 | |
| 10 | | Very loose, brown fine to medium sand, trace silt | | | SS | 6 | 12 | 4<br>2<br>2<br>2 | 4 | |
| | | Very loose, brown fine to coarse sand, trace silt | | ∇ | SS | 7 | 17 | 1<br>1<br>1<br>1 | 2 | |
| 15 | | Medium dense brown coarse sand and gravel, trace fine sand, trace silt | | | SS | 8 | 10 | 2<br>5<br>7<br>8 | 12 | |
| | | Medium dense brown coarse sand and gravel, trace fine sand, trace silt | | | SS | 9 | 12 | 10<br>9<br>10<br>8 | 19 | |
| | | 0"-7": Medium dense brown coarse sand and gravel, trace fine sand, trace silt<br>7-13": Grey fine sand, trace silt | | | SS | 10 | 13 | 4<br>5<br>5<br>4 | 10 | |
| 20 | | | | | | | | | | |



Driller: Seaboard Drilling; Supervisor: Jason Ward
Drill Rig: Truck Mounted Mobile Drill B-53 With 140 lb Autohammer

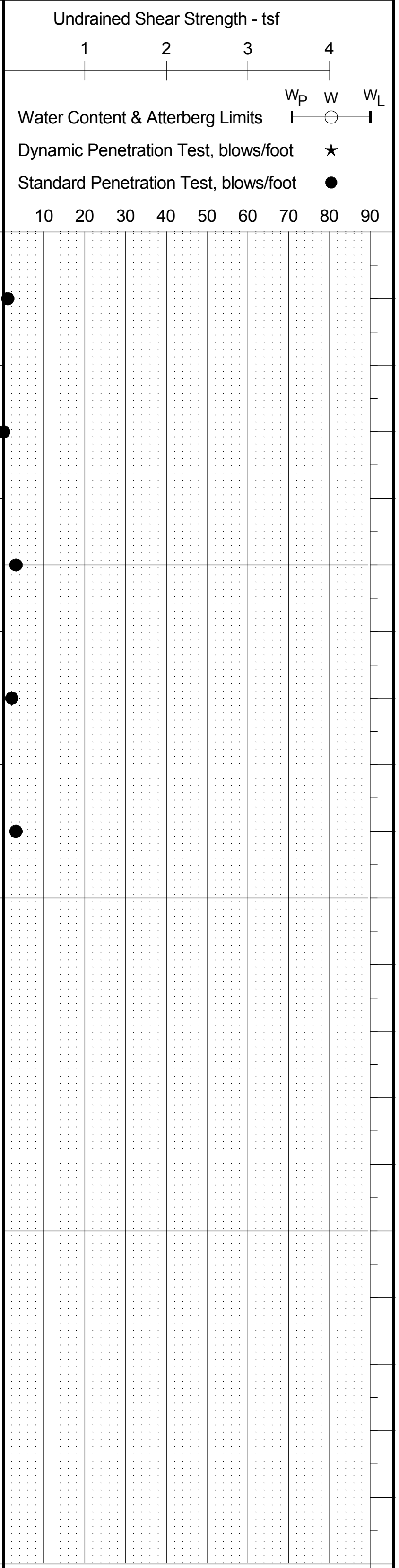
△ Unconfined Compression Test
☐ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

Continued Next Page

# Stantec BOREHOLE LOG **B-1**

CLIENT **Newport WWTP**
PROJECT No. **195113316**
LOCATION **Newport, NH**
EXPLORATION No. **B-1**
EXPLORATION DATE **7/16/2018 to 7/16/2018**
WATER LEVEL **13**
DATUM **N/A**

| DEPTH (ft) | ELEVATION (ft) | MATERIAL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | NUMBER | RECOVERY in. | SPT blows / 6" | SPT N-Value | PID Reading (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Very soft, grey clayey silt with fine sand seams | | | SS | 11 | 15 | 1<br>WH<br>1<br>1 | 1 | |
| | | Very soft, grey silt and clay with fine sand seams | | | SS | 12 | 22 | WH 18"<br>1 | 0 | |
| 25 | | Soft, grey clayey silt with fine sand seams<br>-GLACIOLACUSTRINE DEPOSIT- | | | SS | 13 | 24 | WH<br>1<br>2<br>2 | 3 | |
| | | Soft, grey clayey silt, little sand | | | SS | 14 | 11 | 2<br>1<br>1<br>2 | 2 | |
| | | Soft, grey clayey silt, little sand | | | SS | 15 | 3 | 3<br>2<br>1<br>1 | 3 | |
| 30 | | Boring terminated at 30 feet. No Refusal. | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | | | | | | | | | | |



Driller: Seaboard Drilling; Supervisor: Jason Ward
Drill Rig: Truck Mounted Mobile Drill B-53 With 140 lb Autohammer

△ Unconfined Compression Test
☐ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

# BOREHOLE LOG

## B-2

CLIENT **Newport WWTP**

LOCATION **Newport, NH**

EXPLORATION DATE **7/16/2018 to 7/16/2018**

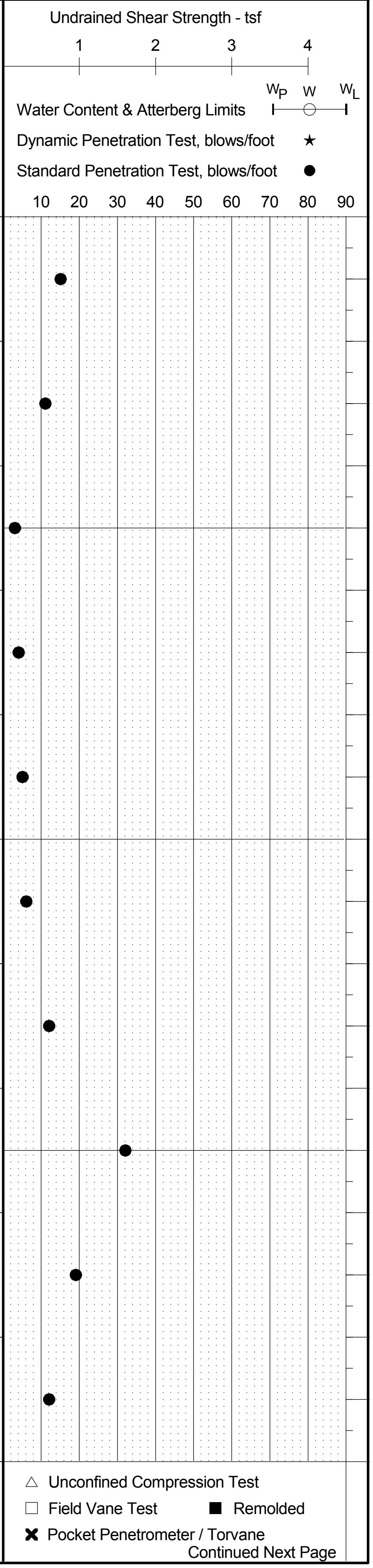
WATER LEVEL **13**

PROJECT No. **195113316**

EXPLORATION No. **B-2**

DATUM **N/A**

| DEPTH (ft) | ELEVATION (ft) | MATERIAL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY in. | SAMPLES SPT blows / 6" | SAMPLES SPT N-Value | PID Reading (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Medium dense, brown fine silt and sand, some gravel | | | SS | 1 | 13 | 3<br>5<br>10<br>10 | 15 | |
| | | Medium dense, brown fine silt and sand, some gravel | | | SS | 2 | 14 | 9<br>6<br>5<br>3 | 11 | |
| 5 | | Very loose, brown fine sand, trace gravel, trace silt | | | SS | 3 | 11 | 3<br>1<br>2<br>2 | 3 | |
| | | Very loose, brown fine sand, trace gravel, trace silt | | | SS | 4 | 9 | 2<br>2<br>2<br>3 | 4 | |
| | | 0"-8": Loose, brown fine sand, trace gravel, trace silt<br>8"-16": Loose, brown fine to medium sand, trace silt | | | SS | 5 | 16 | 2<br>3<br>2<br>2 | 5 | |
| 10 | | Loose, brown fine to medium sand, trace silt<br>-SAND DEPOSIT- | | | SS | 6 | 16 | 3<br>3<br>3<br>2 | 6 | |
| | | 0"-6": Medium dense fine to coarse sand, some silt<br>6"-10": Medium dense brown medium to coarse sand and gravel, some silt | | ▽ | SS | 7 | 14 | 2<br>1<br>11<br>13 | 12 | |
| 15 | | Dense, brown coarse sand and gravel, trace fine sand, trace silt | | | SS | 8 | 12 | 7<br>14<br>18<br>13 | 32 | |
| | | Medium dense, brown coarse sand and gravel, trace fine sand, trace silt | | | SS | 9 | 12 | 4<br>8<br>11<br>8 | 19 | |
| 20 | | Medium dense, brown coarse sand and gravel, trace fine sand, trace silt | | | SS | 10 | 9 | 7<br>5<br>8<br>7 | 12 | |



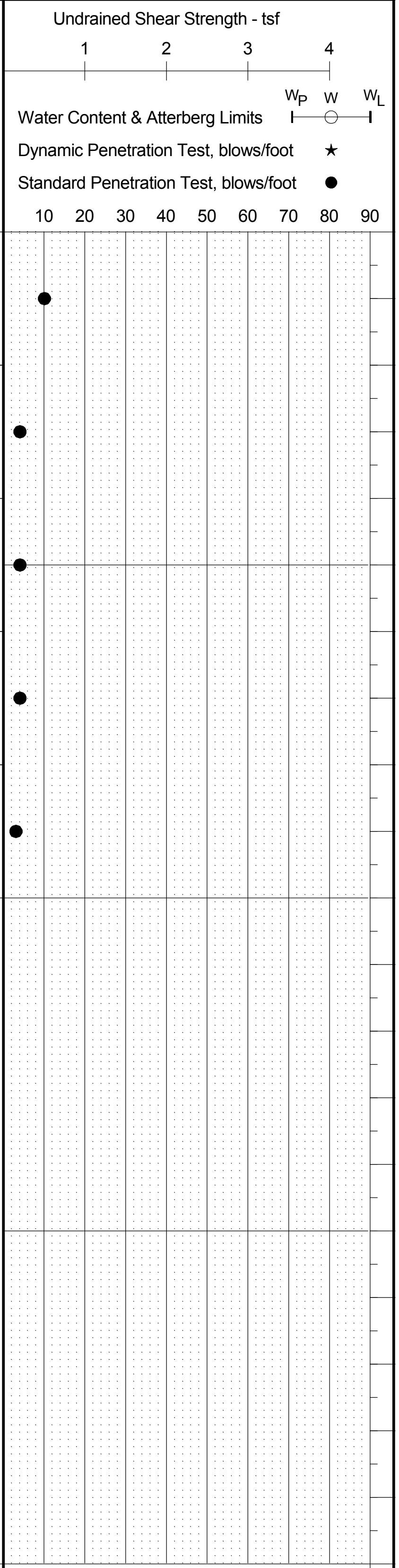
Driller: Seaboard Drilling; Supervisor: Jason Ward
Drill Rig: Truck Mounted Mobile Drill B-53 With 140 lb Autohammer

Continued Next Page

# Stantec BOREHOLE LOG B-2

CLIENT Newport WWTP
PROJECT No. 195113316
LOCATION Newport, NH
EXPLORATION No. B-2
EXPLORATION DATE 7/16/2018 to 7/16/2018
WATER LEVEL 13
DATUM N/A

| DEPTH (ft) | ELEVATION (ft) | MATERIAL DESCRIPTION | STRATA PLOT | WATER LEVEL | SAMPLES TYPE | SAMPLES NUMBER | SAMPLES RECOVERY in. | SAMPLES SPT blows / 6" | SAMPLES SPT N-Value | PID Reading (PPM) |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | | Medium dense, grey fine sand, trace silt, trace gravel | | | SS | 11 | 7 | 6<br>6<br>4<br>2 | 10 | |
| | | Soft, fine gray silt, trace fine sand | | | SS | 12 | 19 | 2<br>2<br>2<br>2 | 4 | |
| 25 | | Soft, grey clayey silt, trace fine sand | | | SS | 13 | 22 | 2<br>2<br>2<br>2 | 4 | |
| | | Soft, grey clayey silt, trace fine sand<br>-GLACIOLACUSTRINE DEPOSIT- | | | SS | 14 | 24 | 2<br>2<br>2<br>2 | 4 | |
| | | Soft, grey clayey silt with silt and clay seams | | | SS | 15 | 24 | 2<br>2<br>1<br>2 | 3 | |
| 30 | | Boring terminated at 30 feet. No Refusal. | | | | | | | | |
| 35 | | | | | | | | | | |
| 40 | | | | | | | | | | |



△ Unconfined Compression Test
☐ Field Vane Test ■ Remolded
✖ Pocket Penetrometer / Torvane

Driller: Seaboard Drilling; Supervisor: Jason Ward
Drill Rig: Truck Mounted Mobile Drill B-53 With 140 lb Autohammer

# APPENDIX B

# RECENT TEST BORING LOGS

HALEY ALDRICH

# TEST BORING REPORT

DRAFT

**Boring No. HA22-1(OW)**

Project WASTEWATER TREATMENT FACILITY UPGRADES, NEWPORT, NH
Client WRIGHT-PIERCE
Contractor NEW ENGLAND BORING CONTRACTORS

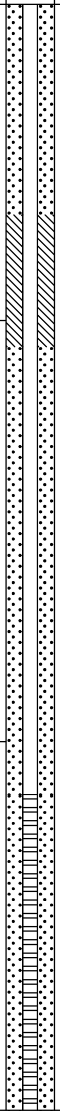
File No. 206093-000
Sheet No. 1 of 2
Start 28 Sep 2022
Finish 28 Sep 2022
Driller W. Hoeckele
H&A Rep. A. Briner

Elevation 777.5
Datum NAVD88
Location See Plan

| | Casing | Sampler | Barrel |
|---|---|---|---|
| Type | HW | S | - |
| Inside Diameter (in.) | 4.0 | 1.375 | - |
| Hammer Weight (lb) | 300 | 140 | - |
| Hammer Fall (in.) | 24 | 30 | - |

Drilling Equipment and Procedures

Rig Make & Model: Mobile B-57 Truck
Bit Type: Roller Bit
Drill Mud: None
Casing: HW Drive
Hoist/Hammer: Winch / Automatic hammer
PID Make & Model: None

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Well Diagram | Stratum Change Elev/Depth (ft) | VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel % Coarse | Gravel % Fine | Sand % Coarse | Sand % Medium | Sand % Fine | % Fines | Field Test Dilatancy | Field Test Toughness | Field Test Plasticity | Field Test Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3<br>3<br>5<br>7 | S1<br>17 | 0.0<br>2.0 | SM |  | | Loose gray-brown silty SAND (SM), no structure, no odor, dry<br>-FILL- | | | | | 85 | 15 | | | | |
| | 10<br>12<br>12<br>10 | S2<br>18 | 2.0<br>4.0 | SP-SM | | | Medium dense gray-brown poorly-graded SAND with silt (SP-SM), no structure, no odor, dry | | 11 | 3 | 9 | 65 | 12 | | | | |
| 5 | 22<br>16<br>16<br>12 | S3<br>22 | 4.0<br>6.0 | SP-SM | | | Dense gray-brown poorly-graded SAND with silt (SP-SM), no structure, no odor, dry | | | | | 90 | 10 | | | | |
| | 3<br>3<br>2<br>3 | S4<br>22 | 6.0<br>8.0 | SP | | 771.5<br>6.0 | Loose light brown and yellow-brown poorly-graded SAND (SP), no structure, no odor, moist, trace organics<br>-ALLUVIAL DEPOSITS- | | | | 6 | 85 | 9 | | | | |
| | 3<br>3<br>4<br>2 | S5<br>9 | 8.0<br>10.0 | SP-SM | | | Loose light brown poorly-graded SAND with silt (SP-SM), no structure, no odor, moist, trace organics | | | | | 90 | 10 | | | | |
| 10 | | | | | | | | | | | | | | | | | |
| 15 | 17<br>16<br>14<br>10 | S6<br>9 | 14.0<br>16.0 | SM | | 763.5<br>14.0 | Medium dense gray silty SAND with gravel (SM), no structure, no odor, wet<br>-GLACIOFLUVIAL DEPOSITS- | | 15 | 5 | 5 | 40 | 35 | | | | |
| 20 | 4<br>2<br>2<br>2 | S7<br>13 | 19.0<br>21.0 | SM | | | Very loose gray silty SAND (SM), no structure, no odor, wet | | | | | 80 | 20 | | | | |

Water Level Data

| Date | Time | Elapsed Time (hr.) | Depth (ft) to: Bottom of Casing | Depth (ft) to: Bottom of Hole | Depth (ft) to: Water |
|---|---|---|---|---|---|
| 09/28/22 | 12:45 | ~1 | NA | 27 | 10.9 |

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
⊞ Riser Pipe
☰ Screen
░ Filter Sand
▒ Cuttings
■ Grout
▵ Concrete
▨ Bentonite Seal

Summary

| | |
|---|---|
| Overburden (ft) | 27.0 |
| Rock Cored (ft) | 0.0 |
| Samples | S8 |

**Boring No. HA22-1(OW)**

**Field Tests:** **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
**Toughness**: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

**Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

HALEY ALDRICH

# TEST BORING REPORT

DRAFT

**Boring No.** **HA22-1(OW)**
File No. 206093-000
Sheet No. 2 of 2

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Well Diagram | Stratum Change Elev/Depth (ft) | **VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION**<br>(Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel<br>% Coarse | Gravel<br>% Fine | Sand<br>% Coarse | Sand<br>% Medium | Sand<br>% Fine | % Fines | Field Test<br>Dilatancy | Field Test<br>Toughness | Field Test<br>Plasticity | Field Test<br>Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | -GLACIOFLUVIAL DEPOSITS- | | | | | | | | | | |
| 25 | 1<br>1<br>2<br>2 | S8<br>20 | 25.0<br>27.0 | ML | | 752.5<br>25.0 | Soft gray SILT (ML), frequent clay layers, no odor, wet<br>-GLACIOLACUSTRINE DEPOSITS- | | | | | | 100 | | | | |
| | | | | | | 750.5<br>27.0 | BOTTOM OF EXPLORATION 27.0 FT<br>Note: Installed observation well in completed borehole. | | | | | | | | | | |

**NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

**Boring No.** **HA22-1(OW)**

H&A-TEST BORING-09-REV-2 PLOG-HA-LIB09-BOS STANDARD ONLY - COPY.GLB H&A PLOG.GDT \\HALEYALDRICH.COM\SHARE\CF\PROJECTS\0206093\GINT\0206093-000-TB.GPJ 28 Nov 22

# TEST BORING REPORT

**Boring No. HA22-2**

Project WASTEWATER TREATMENT FACILITY UPGRADES, NEWPORT, NH
Client WRIGHT-PIERCE
Contractor NEW ENGLAND BORING CONTRACTORS

File No. 206093-000
Sheet No. 1 of 4
Start 28 Sep 2022
Finish 29 Sep 2022
Driller W. Hoeckele
H&A Rep. A. Briner

Elevation 778.0
Datum NAVD88
Location See Plan

| | Casing | Sampler | Barrel |
|---|---|---|---|
| Type | HW | S | - |
| Inside Diameter (in.) | 4.0 | 1.375 | - |
| Hammer Weight (lb) | 300 | 140 | - |
| Hammer Fall (in.) | 24 | 30 | - |

Drilling Equipment and Procedures

Rig Make & Model: Mobile B-57 Truck
Bit Type: Roller Bit
Drill Mud: None
Casing: HW Drive
Hoist/Hammer: Winch / Automatic Hammer
PID Make & Model: None

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel % Coarse | Gravel % Fine | Sand % Coarse | Sand % Medium | Sand % Fine | % Fines | Field Test Dilatancy | Field Test Toughness | Field Test Plasticity | Field Test Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 5<br>9<br>12 | S1<br>14 | 0.5<br>2.0 | SP-SM | | Medium dense brown poorly-graded SAND with silt and gravel (SP-SM), no structure, no odor, dry<br>-FILL- | 14 | 13 | 9 | 25 | 28 | 11 | | | | |
| | 10<br>15<br>12<br>12 | S2<br>19 | 2.0<br>4.0 | SP | | Medium dense brown poorly-graded SAND (SP), no structure, no odor, dry | | 10 | 5 | 5 | 75 | 5 | | | | |
| 5 | 11<br>9<br>3<br>3 | S3<br>17 | 4.0<br>6.0 | SP-SM | | Medium dense brown poorly-graded SAND with silt (SP-SM), no structure, no odor, dry | | 1 | 1 | 5 | 81 | 12 | | | | |
| | 2<br>3<br>3<br>3 | S4<br>15 | 6.0<br>8.0 | SP-SM | | Loose brown poorly-graded SAND with silt (SP-SM), no structure, no odor, moist | 5 | | | | 85 | 10 | | | | |
| | 2<br>3<br>3<br>2 | S5<br>19 | 8.0<br>10.0 | SP-SM | 770.0<br>8.0 | Loose gray-brown and light brown poorly-graded SAND with silt (SP-SM), organic layer (1 in.), no odor, wet, trace roots<br>-ALLUVIAL DEPOSITS- | | | | | 90 | 10 | | | | |
| 10 | | | | | | | | | | | | | | | | |
| 15 | 4<br>4<br>4<br>5 | S6<br>12 | 14.0<br>16.0 | ML | 764.0<br>14.0 | Medium stiff gray SILT with sand (ML), no structure, no odor, wet<br>-GLACIOLACUSTRINE DEPOSITS- | | | | | 15 | 85 | | | | |
| 20 | 2<br>2<br>2<br>2 | S7<br>16 | 19.0<br>21.0 | ML | | Soft gray SILT with sand (ML), no structure, no odor, wet | | | | | 15 | 85 | | | | |

Water Level Data

| Date | Time | Elapsed Time (hr.) | Depth (ft) to: Bottom of Casing | Bottom of Hole | Water |
|---|---|---|---|---|---|
| 09/29/22 | 07:18 | | 19.0 | 29.0 | 10.5 |

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

| | |
|---|---|
| ▯ | Riser Pipe |
| ▤ | Screen |
| ⁘ | Filter Sand |
| ⁖ | Cuttings |
| ■ | Grout |
| △ | Concrete |
| ▨ | Bentonite Seal |

Summary

Overburden (ft) 101.0
Rock Cored (ft) 0.0
Samples S22

**Boring No. HA22-2**

**Field Tests:** **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
**Toughness**: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

**Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | **VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION** (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel % Coarse | Gravel % Fine | Sand % Coarse | Sand % Medium | Sand % Fine | % Fines | Field Test Dilatancy | Field Test Toughness | Field Test Plasticity | Field Test Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | | S8<br>21 | 24.0<br>26.0 | ML | | Stiff gray SILT (ML), no structure, no odor, wet, trace lean clay<br>-GLACIOLACUSTRINE DEPOSITS-<br>55 x 100 mm vane raw torque readings:<br>V1: 25.6'-26.0', 300/110 in. lbs, $S_u$= 1,165/425 psf | | | | | 5 | 95 | | | | |
| 30 | | S9<br>19 | 29.0<br>31.0 | CL | | Stiff gray lean CLAY (CL), with silt layers, no odor, wet<br>V2: 30.1'-30.5', 400/110 in. lbs, $S_u$= 1,550/425 psf<br>Note: Unable to push vane to full test depth at 31.0 ft, vane refusal at 30.5 ft. | | | | | | 100 | | | | |
| 35 | | S10<br>22 | 34.0<br>36.0 | ML | | Stiff gray SILT (ML), with clay layers, no odor, wet, trace sand<br>V3: 34.3'-34.7', 360/80 in. lbs, $S_u$= 1,395/310 psf<br>Note: Unable to push vane to full test depth at 35.0 ft, vane refusal at 34.7 ft. | | | | | 10 | 90 | | | | |
| | | U1<br>0 | 36.0<br>38.0 | | | Note: Attempted tube sample but unable to push to full depth. | | | | | | | | | | |
| 40 | | S11<br>22 | 39.0<br>41.0 | ML | | Stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand<br>V4: 39.2'-39.6', 380/80 in. lbs, $S_u$= 1,475/310 psf<br>Note: Unable to push vane to full test depth at 40.0 ft, vane refusal at 39.6 ft. | | | | | 10 | 90 | | | | |
| 45 | 2<br>2<br>3<br>4 | S12<br>23 | 44.0<br>46.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand | | | | | 10 | 90 | | | | |
| 50 | | S13<br>22 | 49.0<br>51.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand<br>V5: 49.0'-49.4', 230/90 in. lbs, $S_u$= 890/350 psf<br>Note: Unable to push vane to full test depth at 50.0 ft, vane refusal at 49.4 ft. | | | | | 10 | 90 | | | | |
| | | U2<br>24 | 51.0<br>53.0 | | | | | | | | | | | | | |

**NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

# TEST BORING REPORT

**Boring No.** **HA22-2**
File No. 206093-000
Sheet No. 3 of 4

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | **VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION** (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel | | Sand | | | | Field Test | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | Strength |
| 55 | WOH<br>4<br>3<br>4 | S14<br>24 | 54.0<br>56.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand<br>-GLACIOLACUSTRINE DEPOSITS- | | | | | 10 | 90 | | | | |
| 60 | 4<br>2<br>5<br>6 | S15<br>24 | 59.0<br>61.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand<br>Note: Attempt vane shear test at 60 ft, vane refusal at 59.3 ft. | | | | | 10 | 90 | | | | |
| 65 | 2<br>3<br>5<br>5 | S16<br>7 | 64.0<br>66.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand | | | | | 10 | 90 | | | | |
| 70 | 5<br>2<br>3<br>3 | S17<br>24 | 69.0<br>71.0 | ML | | Medium stiff gray SILT (ML), layered silt and clay, no odor, wet, trace sand<br>Note: Attempt vane shear test at 70 ft, vane refusal at 69.3 ft. | | | | | 10 | 90 | | | | |
| 75 | | | | | | | | | | | | | | | | |
| 80 | 9<br>10<br>7<br>8 | S18<br>18 | 79.0<br>81.0 | ML | | Very stiff gray SILT with sand (ML), layered silt and clay, no odor, wet, sand lenses | | | | | 15 | 85 | | | | |

**NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

# TEST BORING REPORT

DRAFT

**Boring No.** **HA22-2**
File No. 206093-000
Sheet No. 4 of 4

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | **VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION** (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel % Coarse | Gravel % Fine | Sand % Coarse | Sand % Medium | Sand % Fine | % Fines | Field Test Dilatancy | Field Test Toughness | Field Test Plasticity | Field Test Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85 | | | | | | -GLACIOLACUSTRINE DEPOSITS- | | | | | | | | | | |
| 90 | 4<br>4<br>7<br>10 | S19<br>0 | 89.0<br>91.0 | | | No recovery | | | | | | | | | | |
| 95 | | | | | | | | | | | | | | | | |
| 100 | 19<br>13<br>15<br>18 | S20<br>14 | 99.0<br>101.0 | SW | 679.0<br>99.0 | Medium dense gray well-graded SAND (SW), no structure, no odor, wet<br>-GLACIOFLUVIAL DEPOSITS- | | 5 | 15 | 20 | 55 | 5 | | | | |
| | | | | | 677.0<br>101.0 | BOTTOM OF EXPLORATION 101.0 FT | | | | | | | | | | |

**NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

**Boring No.** **HA22-2**

HALEY ALDRICH

# TEST BORING REPORT

**Boring No. HA22-3**

| | |
|---|---|
| Project | WASTEWATER TREATMENT FACILITY UPGRADES, NEWPORT, NH |
| Client | WRIGHT-PIERCE |
| Contractor | NEW ENGLAND BORING CONTRACTORS |

| | |
|---|---|
| File No. | 206093-000 |
| Sheet No. | 1 of 2 |
| Start | 30 Sep 2022 |
| Finish | 30 Sep 2022 |
| Driller | W. Hoeckele |
| H&A Rep. | A. Briner |
| Elevation | 777.0 |
| Datum | NAVD88 |
| Location | See Plan |

| | Casing | Sampler | Barrel |
|---|---|---|---|
| Type | HW | S | - |
| Inside Diameter (in.) | 4.0 | 1.375 | - |
| Hammer Weight (lb) | 300 | 140 | - |
| Hammer Fall (in.) | 24 | 30 | - |

**Drilling Equipment and Procedures**

Rig Make & Model: Mobile B-57 Truck
Bit Type: Roller Bit
Drill Mud: None
Casing: HW Drive
Hoist/Hammer: Winch / Automatic Hammer
PID Make & Model: None

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel % Coarse | Gravel % Fine | Sand % Coarse | Sand % Medium | Sand % Fine | % Fines | Field Test Dilatancy | Field Test Toughness | Field Test Plasticity | Field Test Strength |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 9<br>8<br>5<br>7 | S1<br>20 | 0.0<br>2.0 | SM | | Medium dense gray-brown silty SAND (SM), no structure, no odor, dry.<br>-FILL- | | | | | 85 | 15 | | | | |
| | 8<br>5<br>4<br>3 | S2<br>14 | 2.0<br>4.0 | SM | | Loose gray-brown silty SAND (SM), no structure, no odor, dry | | | | | 85 | 15 | | | | |
| 5 | 8<br>4<br>3<br>2 | S3<br>20 | 4.0<br>6.0 | SM | 773.0<br>4.0 | Loose light brown and gray silty SAND (SM), no structure, no odor, dry<br>-ALLUVIAL DEPOSITS- | | | | 5 | 76 | 19 | | | | |
| | 3<br>3<br>3<br>7 | S4<br>18 | 6.0<br>8.0 | SM | | Loose light brown and gray silty SAND (SM), no structure, no odor, wet, trace wood/roots | | | | | 85 | 15 | | | | |
| | 18<br>23<br>18<br>23 | S5<br>12 | 8.0<br>10.0 | SW-SM | 769.0<br>8.0 | Dense gray well-graded SAND with silt and gravel (SW-SM), no structure, no odor, wet<br>-GLACIOFLUVIAL DEPOSITS- | | 25 | 20 | 25 | 20 | 10 | | | | |
| 10 | 10<br>12<br>22<br>21 | S6<br>12 | 10.0<br>12.0 | SW | | Dense gray well-graded SAND with gravel (SW), no structure, no odor, wet | 5 | 15 | 25 | 25 | 25 | 5 | | | | |
| | | | | | | | | | | | | | | | | |
| 15 | 3<br>3<br>5<br>5 | S7<br>10 | 14.0<br>16.0 | SP | | Loose gray poorly-graded SAND (SP), no structure, no odor, wet | | | 5 | 5 | 85 | 5 | | | | |
| | | | | | | | | | | | | | | | | |
| 20 | 6<br>6<br>5<br>9 | S8<br>10 | 19.0<br>21.0 | SP | | Medium dense gray poorly-graded SAND with gravel (SP), no structure, no odor, wet | | 15 | 10 | 35 | 35 | 5 | | | | |

**Water Level Data**

| Date | Time | Elapsed Time (hr.) | Depth (ft) to: Bottom of Casing | Depth (ft) to: Bottom of Hole | Water |
|---|---|---|---|---|---|
| | | NOT OBSERVED | | | |

**Sample ID**

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

**Well Diagram**

| | |
|---|---|
| ☐ | Riser Pipe |
| ☰ | Screen |
| ░ | Filter Sand |
| ▒ | Cuttings |
| ■ | Grout |
| △ | Concrete |
| ▨ | Bentonite Seal |

**Summary**

| | |
|---|---|
| Overburden (ft) | 26.0 |
| Rock Cored (ft) | 0.0 |
| Samples | S9 |

**Boring No. HA22-3**

**Field Tests:**
**Dilatancy**: R - Rapid S - Slow N - None
**Toughness**: L - Low M - Medium H - High
**Plasticity**: N - Nonplastic L - Low M - Medium H - High
**Dry Strength**: N - None L - Low M - Medium H - High V - Very High

**Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

# TEST BORING REPORT

DRAFT

**Boring No.** **HA22-3**
File No. 206093-000
Sheet No. 2 of 2

| Depth (ft) | Sampler Blows per 6 in. | Sample No. & Rec. (in.) | Sample Depth (ft) | USCS Symbol | Stratum Change Elev/Depth (ft) | **VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION** (Density/consistency, color, GROUP NAME & SYMBOL, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION) | Gravel |  | Sand |  |  |  | Field Test |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | % Coarse | % Fine | % Coarse | % Medium | % Fine | % Fines | Dilatancy | Toughness | Plasticity | Strength |
| 25 | 4<br>3<br>5<br>7 | S9<br>11 | 24.0<br>26.0 | SP | 751.0<br>26.0 | Loose gray poorly-graded SAND (SP), no structure, no odor, wet<br>-GLACIOFLUVIAL DEPOSITS- |  | 10 | 10 | 10 | 65 | 5 |  |  |  |  |
|  |  |  |  |  |  | BOTTOM OF EXPLORATION 26.0 FT |  |  |  |  |  |  |  |  |  |  |

**NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.**

**Boring No.** **HA22-3**

# APPENDIX C

# GROUNDWATER OBSERVATION WELL INSTALLATION AND GROUNDWATER MONITORING REPORTS

# GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

**Well No.** HA22-1(OW)

Project WASTEWATER TREATMENT FACILITY UPGRADES
Location NEWPORT, NH
Client WRIGHT-PIERCE
Contractor NEW ENGLAND BORING CONTRACTORS
Driller W. Hoeckele

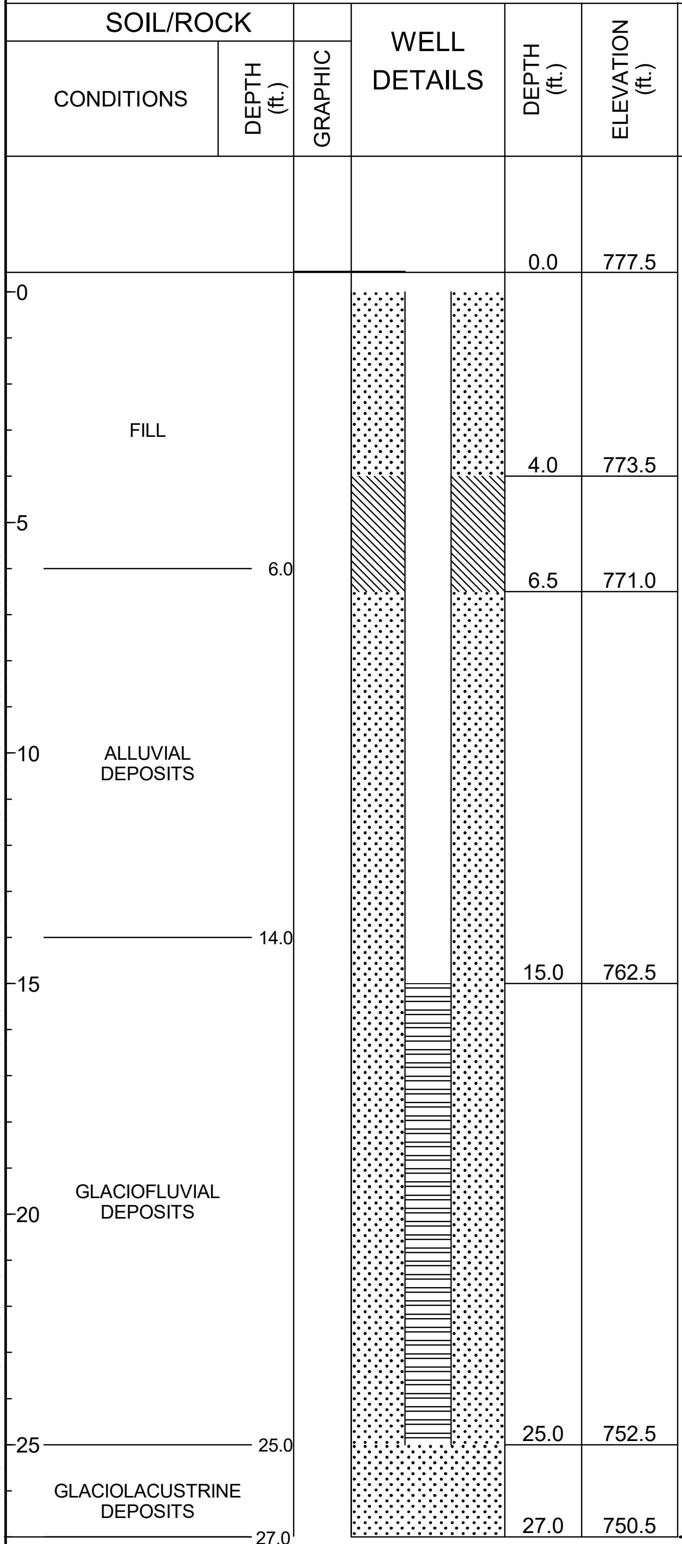
Initial Water Level (depth bgs) 10.9 ft

File No. 206093-000
Date Installed 28 Sep 2022
H&A Rep. A. Briner
Location See Plan

Ground El. 777.5
Datum NAVD88

## Well Diagram

| | |
|---|---|
| ▥ | Riser Pipe |
| ▤ | Screen |
| ░ | Filter Sand |
| ▩ | Cuttings |
| ■ | Grout |
| ∴ | Concrete |
| ▧ | Bentonite Seal |



## WELL CONSTRUCTION DETAILS

Type of protective cover Steel locking cap

Height of Steel Guard Pipe above ground surface 2.5 ft

Height of top of riser above ground surface 2.4 ft

Type of protective casing Steel Guard Pipe

Length 5.0 ft

Inside diameter 3.0 in.

Depth of bottom of Steel Guard Pipe 2.5 ft

Type of riser pipe Schedule 40 PVC

Inside diameter of riser pipe 2.0 in.

Depth of bottom of riser pipe 15.0 ft

| Type of Seals | Top of Seal (ft) | Thickness (ft) |
|---|---|---|
| Bentonite | 4.0 | 2.5 |
| | - | - |
| | - | - |
| | - | - |

Diameter of borehole 4.0 in.

Depth to top of well screen 15.0 ft

Type of screen Machine slotted Sch 40 PVC

Screen gauge or size of openings 0.010 in.

Diameter of screen 2.0 in.

Type of Backfill around Screen Filter Sand

Depth to bottom of well screen 25.0 ft

Bottom of silt trap NA

Depth of bottom of well ft

Depth of bottom of borehole 27.0 ft

COMMENTS:

# GROUNDWATER MONITORING REPORT

**OW/PZ NUMBER**
**HA22-1 (OW)**
**Page** 1 **of** 1

**PROJECT** WASTEWATER TREATMENT FACILITY UPGRADES
**H&A FILE NO.** 206093-000
**LOCATION** NEWPORT, NEW HAMPSHIRE
**PROJECT MGR.** E. FORCE
**CLIENT** WRIGHT-PIERCE
**FIELD REP.** A. BRINER
**CONTRACTOR** NEW ENGLAND BORING CONTRACTORS
**DATE** 28-Sep-22
**ELEVATION OF REFERENCE POINT** 777.5
**REFERENCE POINT:** **Ground Surface** ☑ **PVC** ☐ **Other** ☐

| Date | Time | Elapsed Time (days) | Depth of Water from Reference Point | Elevation of Water | Remarks | Read By |
|---|---|---|---|---|---|---|
| 9/28/2022 | 12:45 | 0 | 10.9 | 766.6 |  | MS |
| 9/30/2022 | 11:35 | 2 | 10.3 | 767.2 |  | AB |
| 10/21/2022 | 10:45 | 23 | 11.3 | 766.2 |  | SM |
| 11/4/2022 | 12:00 | 37 | 11.3 | 766.2 |  | SM |

# APPENDIX D

# LABORATORY TEST RESULTS

| | |
|---|---|
| Client: | Haley & Aldrich, Inc. |
| Project Name: | WW Treatment Facility Upgrades |
| Project Location: | Newport, NH |
| GTX #: | 316247 |
| Test Date: | 10/31/22 |
| Tested By: | nlb |
| Checked By: | bfs |

# Laboratory pH of Soil by ASTM G51

| Boring ID | Sample ID | Depth, ft | Description | Soil Temperature, ° C | Average pH Reading |
|---|---|---|---|---|---|
| HA22-1 | S6 & S7 | 14-21 | Moist, olive gray sand with gravel | 21 | 5.41 |
| HA22-2 | GRAB | 15-17 | Moist, olive gray sand with gravel | 20.4 | 6.43 |

Notes:

GeoTesting
EXPRESS

| | |
|---|---|
| Client: | Haley Aldrich, Inc. |
| Project: | WW Treatment Facility Upgrades |
| Location: | Newport, NH |
| GTX#: | 316247 |
| Test Date: | 11/07/22 |
| Tested By: | ckg |
| Checked By: | ank |

# Laboratory Measurement of Soil Resistivity Using the Wenner Four-Electrode Method by ASTM G57 (Laboratory Measurement)

| Boring ID | Sample ID | Depth, ft. | Sample Description | Electrical Resistivity, ohm-cm | Electrical Conductivity, (ohm-cm)$^{-1}$ |
|---|---|---|---|---|---|
| HA22-1 | S6_S7 | 14-21ft | Moist, olive gray sand with gravel | 7,128 | 1.40E-04 |
| HA22-2 | GRAB | 15-17ft | Moist, olive gray sand with gravel | 18,595 | 5.38E-05 |

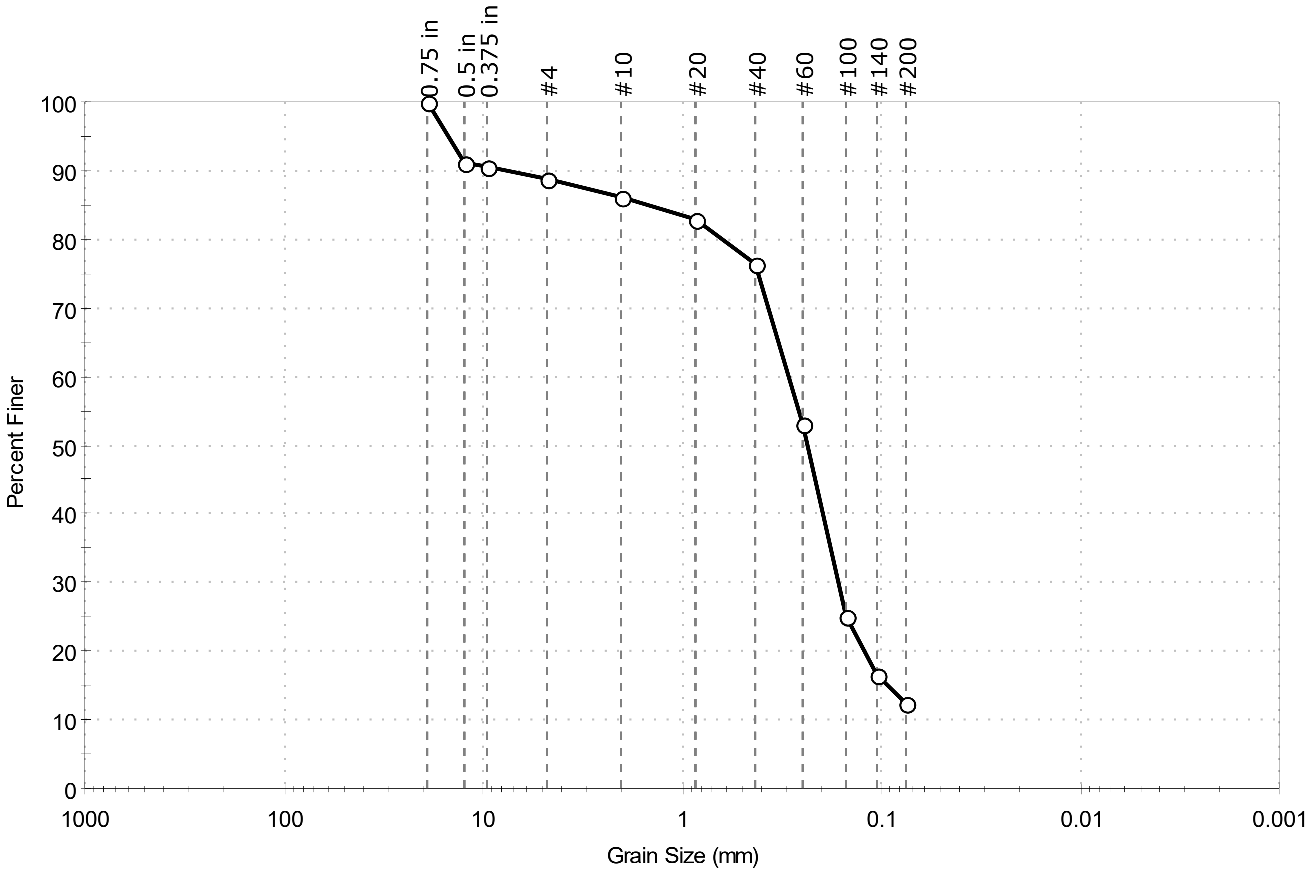
Notes:

Test Equipment: Nilsson Model 400 Soil Resistance Meter, MC Miller Soil Box
Water added to sample to create a thick slurry prior to testing (saturated condition).
Electrical Conductivity is calculated as inverse of Electrical Resistivity (per ASTM G57)
Test conducted in standard laboratory atmosphere: 68-73 F

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Client: | Haley & Aldrich, Inc. |  |  |  |  |
| Project: | WW Treatment Facility Upgrades |  |  |  |  |
| Location: | Newport, NH |  |  | Project No: | GTX-316247 |
| Boring ID: | HA22-1 | Sample Type: | jar | Tested By: | ckg |
| Sample ID: | S2 | Test Date: | 11/03/22 | Checked By: | bfs |
| Depth : | 2-4 ft | Test Id: | 692131 |  |  |

Test Comment: ---
Visual Description: Moist, light olive brown silty sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 11.1 | 76.5 | 12.4 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.75 in | 19.00 | 100 |  |  |
| 0.5 in | 12.50 | 91 |  |  |
| 0.375 in | 9.50 | 91 |  |  |
| #4 | 4.75 | 89 |  |  |
| #10 | 2.00 | 86 |  |  |
| #20 | 0.85 | 83 |  |  |
| #40 | 0.42 | 77 |  |  |
| #60 | 0.25 | 53 |  |  |
| #100 | 0.15 | 25 |  |  |
| #140 | 0.11 | 17 |  |  |
| #200 | 0.075 | 12 |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Coefficients

|  |  |
|---|---|
| $D_{85}$ =1.5043 mm | $D_{30}$ =0.1639 mm |
| $D_{60}$ =0.2926 mm | $D_{15}$ =0.0931 mm |
| $D_{50}$ =0.2365 mm | $D_{10}$ =N/A |
| $C_u$ =N/A | $C_c$ =N/A |

## Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

## Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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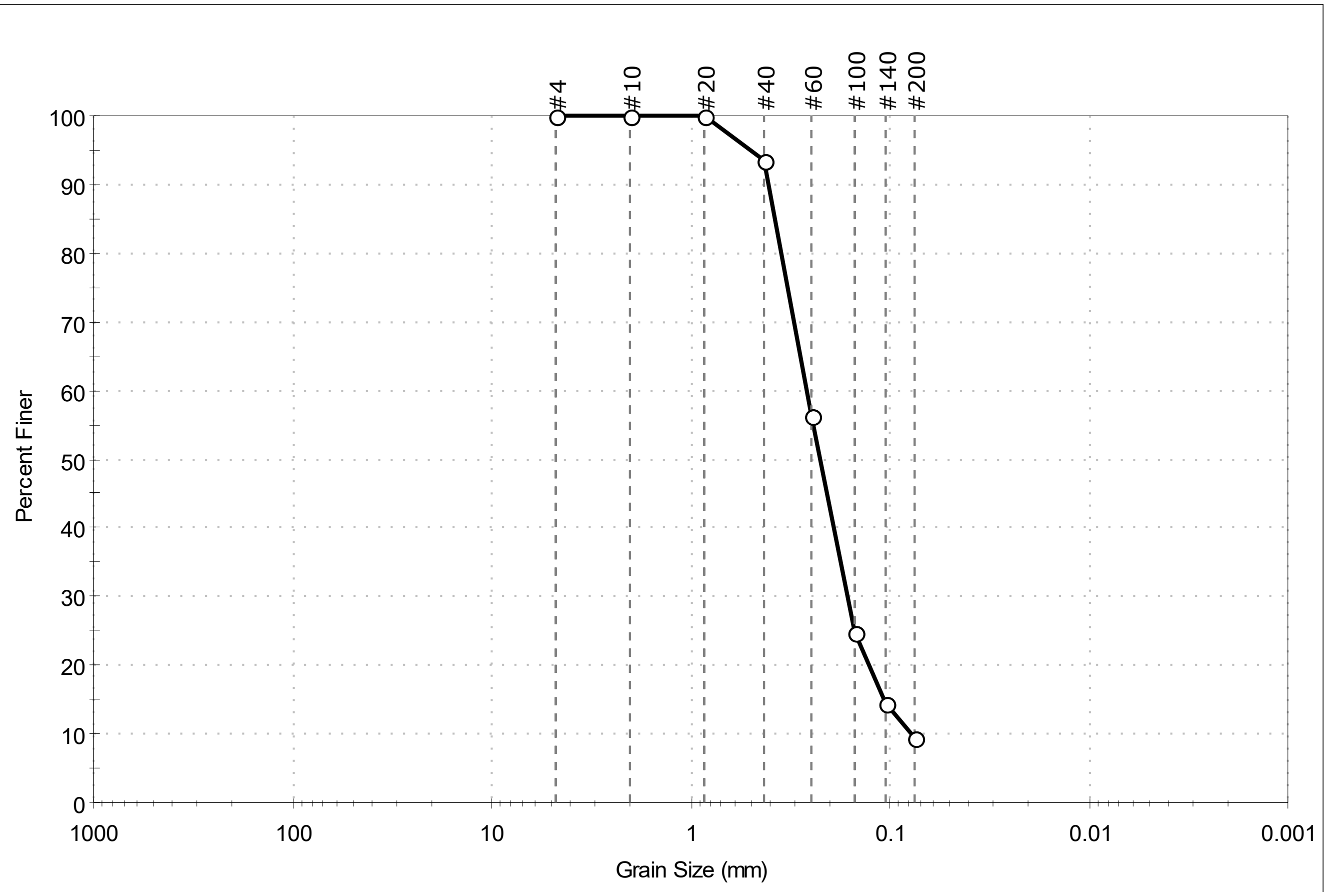
GeoTesting EXPRESS

Client: Haley & Aldrich, Inc.
Project: WW Treatment Facility Upgrades
Location: Newport, NH
Project No: GTX-316247
Boring ID: HA22-1
Sample Type: jar
Tested By: ckg
Sample ID: S4
Test Date: 11/03/22
Checked By: bfs
Depth : 6-8 ft
Test Id: 692132
Test Comment: ---
Visual Description: Moist, light yellowish brown sand with silt
Sample Comment: ---

# Particle Size Analysis - ASTM D6913



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 0.0 | 90.6 | 9.4 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 | | |
| #10 | 2.00 | 100 | | |
| #20 | 0.85 | 100 | | |
| #40 | 0.42 | 94 | | |
| #60 | 0.25 | 56 | | |
| #100 | 0.15 | 25 | | |
| #140 | 0.11 | 14 | | |
| #200 | 0.075 | 9.4 | | |
| | | | | |
| | | | | |

## Coefficients

| | |
|---|---|
| $D_{85}$ =0.3758 mm | $D_{30}$ =0.1630 mm |
| $D_{60}$ =0.2633 mm | $D_{15}$ =0.1083 mm |
| $D_{50}$ =0.2255 mm | $D_{10}$ =0.0781 mm |
| $C_u$ =3.371 | $C_c$ =1.292 |

## Classification

ASTM N/A

AASHTO Fine Sand (A-3 (1))

## Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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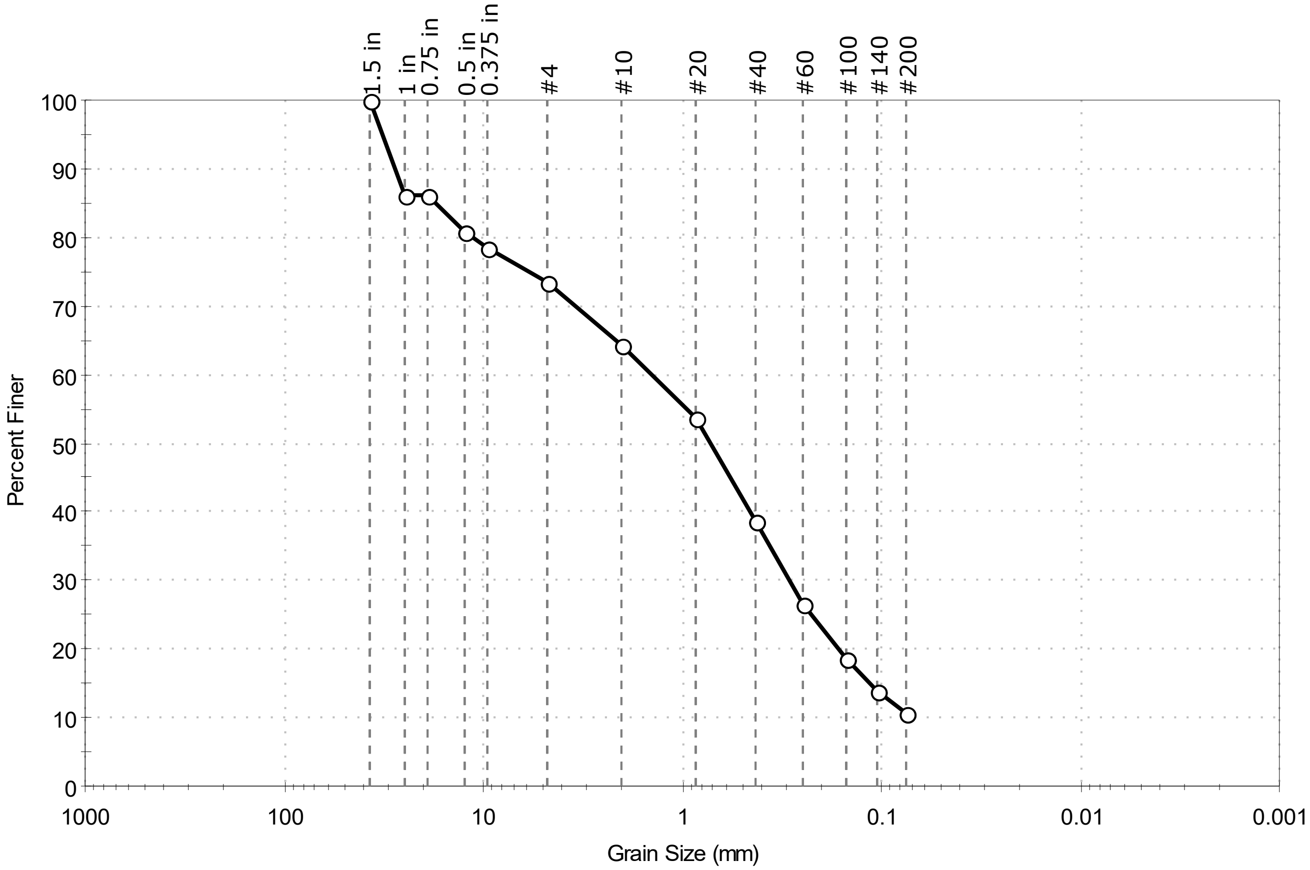
Client: Haley & Aldrich, Inc.
Project: WW Treatment Facility Upgrades
Location: Newport, NH
Project No: GTX-316247
Boring ID: HA22-2
Sample Type: jar
Tested By: ckg
Sample ID: S1
Test Date: 11/03/22
Checked By: bfs
Depth : 0.5-2.0 ft
Test Id: 692133
Test Comment: ---
Visual Description: Moist, light olive brown sand with silt and gravel
Sample Comment: ---

# Particle Size Analysis - ASTM D6913



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 26.5 | 62.9 | 10.6 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 1.5 in | 37.50 | 100 | | |
| 1 in | 25.00 | 86 | | |
| 0.75 in | 19.00 | 86 | | |
| 0.5 in | 12.50 | 81 | | |
| 0.375 in | 9.50 | 78 | | |
| #4 | 4.75 | 73 | | |
| #10 | 2.00 | 64 | | |
| #20 | 0.85 | 54 | | |
| #40 | 0.42 | 39 | | |
| #60 | 0.25 | 27 | | |
| #100 | 0.15 | 19 | | |
| #140 | 0.11 | 14 | | |
| #200 | 0.075 | 11 | | |
| | | | | |
| | | | | |

## Coefficients

$D_{85}$ =17.4056 mm
$D_{30}$ =0.2901 mm
$D_{60}$ =1.4061 mm
$D_{15}$ =0.1144 mm
$D_{50}$ =0.7164 mm
$D_{10}$ =N/A
$C_u$ =N/A
$C_c$ =N/A

## Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

## Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

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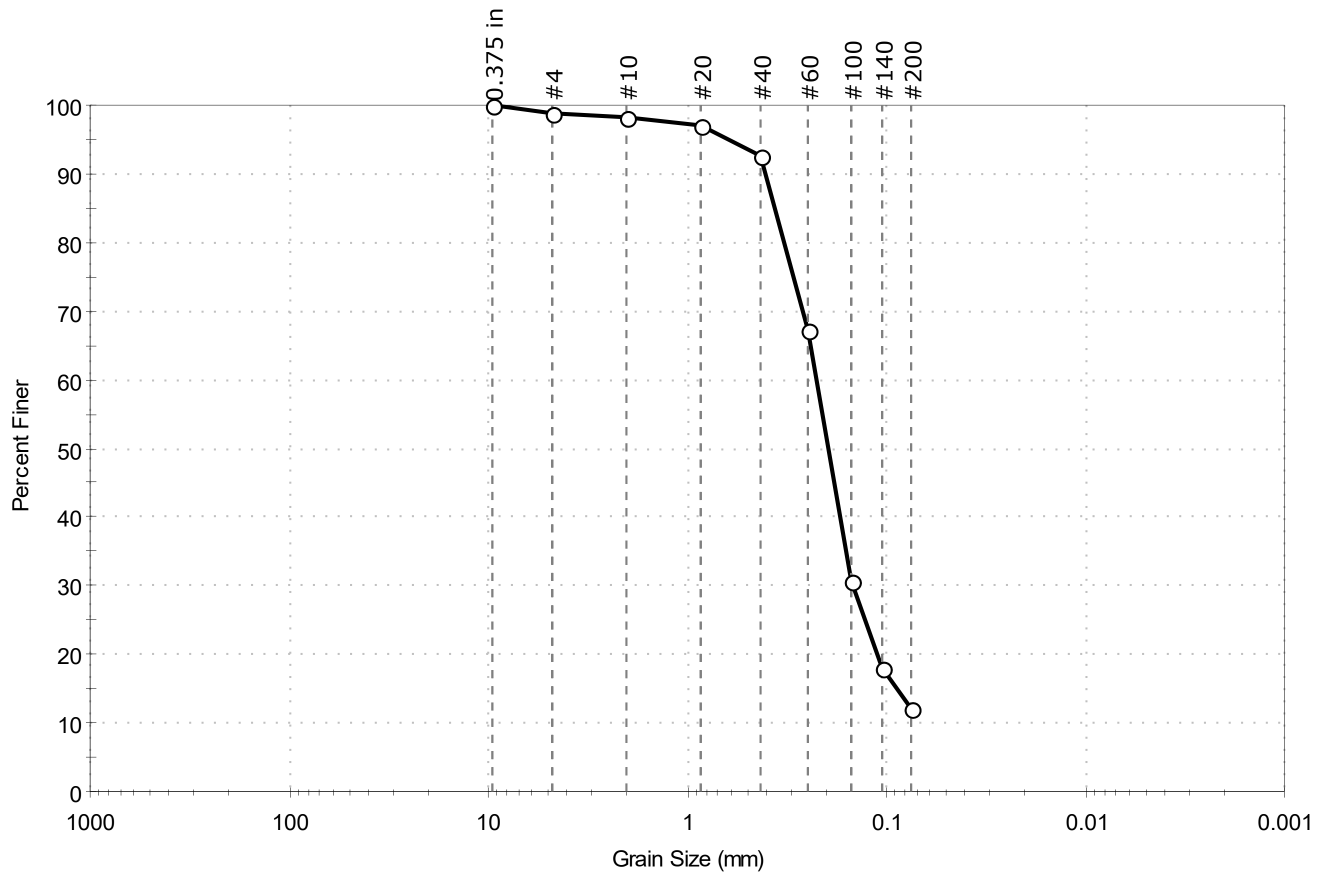
Client: Haley & Aldrich, Inc.
Project: WW Treatment Facility Upgrades
Location: Newport, NH
Project No: GTX-316247

Boring ID: HA22-2
Sample ID: S3
Depth : 4-6 ft
Sample Type: jar
Test Date: 11/03/22
Test Id: 692134
Tested By: ckg
Checked By: bfs

Test Comment: ---
Visual Description: Moist, light olive brown silty sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 1.2 | 86.6 | 12.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.375 in | 9.50 | 100 | | |
| #4 | 4.75 | 99 | | |
| #10 | 2.00 | 98 | | |
| #20 | 0.85 | 97 | | |
| #40 | 0.42 | 93 | | |
| #60 | 0.25 | 67 | | |
| #100 | 0.15 | 31 | | |
| #140 | 0.11 | 18 | | |
| #200 | 0.075 | 12 | | |
| | | | | |
| | | | | |

## Coefficients

$D_{85}$ =0.3621 mm
$D_{30}$ =0.1474 mm
$D_{60}$ =0.2257 mm
$D_{15}$ =0.0887 mm
$D_{50}$ =0.1964 mm
$D_{10}$ =N/A
$C_u$ =N/A
$C_c$ =N/A

## Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

## Sample/Test Description

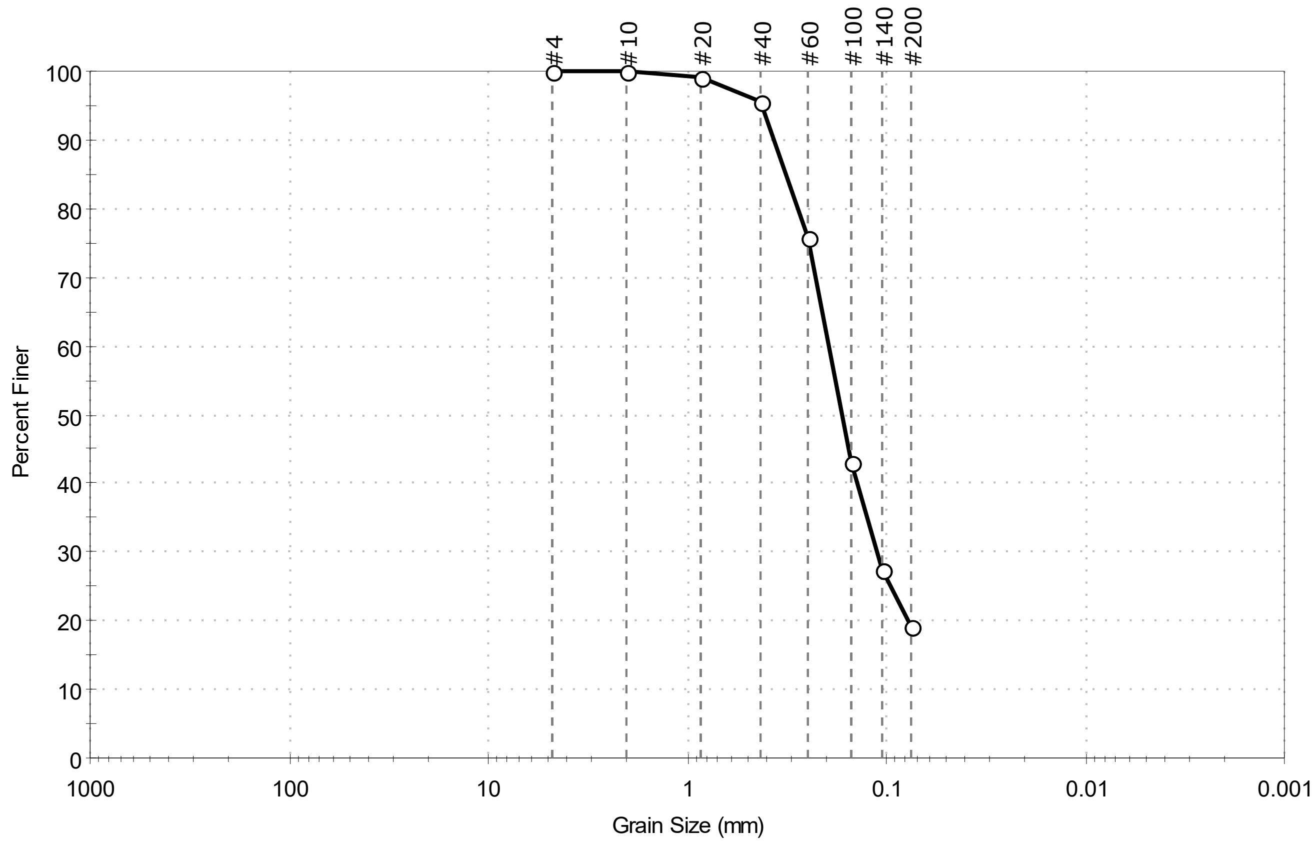
Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Client: | Haley & Aldrich, Inc. |  |  |  |  |
| Project: | WW Treatment Facility Upgrades |  |  |  |  |
| Location: | Newport, NH |  |  | Project No: | GTX-316247 |
| Boring ID: | HA22-3 | Sample Type: | jar | Tested By: | ckg |
| Sample ID: | S3 | Test Date: | 11/03/22 | Checked By: | bfs |
| Depth : | 4-6 ft | Test Id: | 692135 |  |  |

Test Comment: ---
Visual Description: Moist, olive brown silty sand
Sample Comment: ---

# Particle Size Analysis - ASTM D6913



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| — | 0.0 | 80.8 | 19.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| #4 | 4.75 | 100 |  |  |
| #10 | 2.00 | 100 |  |  |
| #20 | 0.85 | 99 |  |  |
| #40 | 0.42 | 95 |  |  |
| #60 | 0.25 | 76 |  |  |
| #100 | 0.15 | 43 |  |  |
| #140 | 0.11 | 27 |  |  |
| #200 | 0.075 | 19 |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

## Coefficients

$D_{85}$ =0.3204 mm
$D_{30}$ =0.1123 mm
$D_{60}$ =0.1954 mm
$D_{15}$ =N/A
$D_{50}$ =0.1672 mm
$D_{10}$ =N/A
$C_u$ =N/A
$C_c$ =N/A

## Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

## Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

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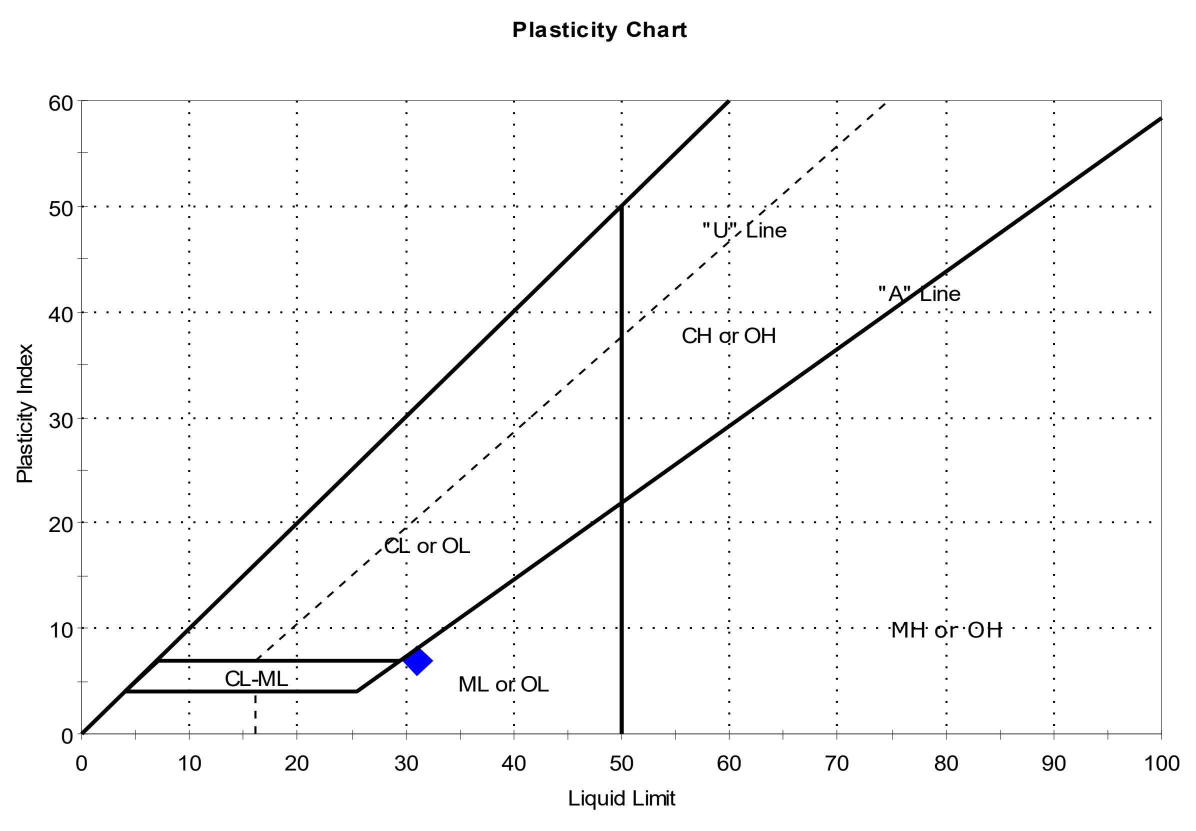
| | | | |
|---|---|---|---|
| Client: | Haley & Aldrich, Inc. | | |
| Project: | WW Treatment Facility Upgrades | | |
| Location: | Newport, NH | Project No: | GTX-316247 |

| | | | | | |
|---|---|---|---|---|---|
| Boring ID: | HA22-1 | Sample Type: | jar | Tested By: | cam |
| Sample ID: | S8 | Test Date: | 11/03/22 | Checked By: | bfs |
| Depth : | 25-27 ft | Test Id: | 692126 | | |

Test Comment: ---
Visual Description: Wet, gray silt
Sample Comment: ---

# Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | S8 | HA22-1 | 25-27 ft | 40 | 31 | 24 | 7 | 2.3 | |

Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Client: | Haley & Aldrich, Inc. |  |  |  |  |
| Project: | WW Treatment Facility Upgrades |  |  |  |  |
| Location: | Newport, NH |  |  | Project No: | GTX-316247 |
| Boring ID: | HA22-2 | Sample Type: | jar | Tested By: | cam |
| Sample ID: | S6 | Test Date: | 11/04/22 | Checked By: | bfs |
| Depth : | 14-16 ft | Test Id: | 693650 |  |  |

Test Comment: ---
Visual Description: Wet, gray silt
Sample Comment: ---

# Atterberg Limits - ASTM D4318

**Sample Determined to be non-plastic**

| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | S6 | HA22-2 | 14-16 ft | 27 | n/a | n/a | n/a | n/a |  |

Dry Strength: MEDIUM
Dilatancy: RAPID
Toughness: n/a
The sample was determined to be Non-Plastic

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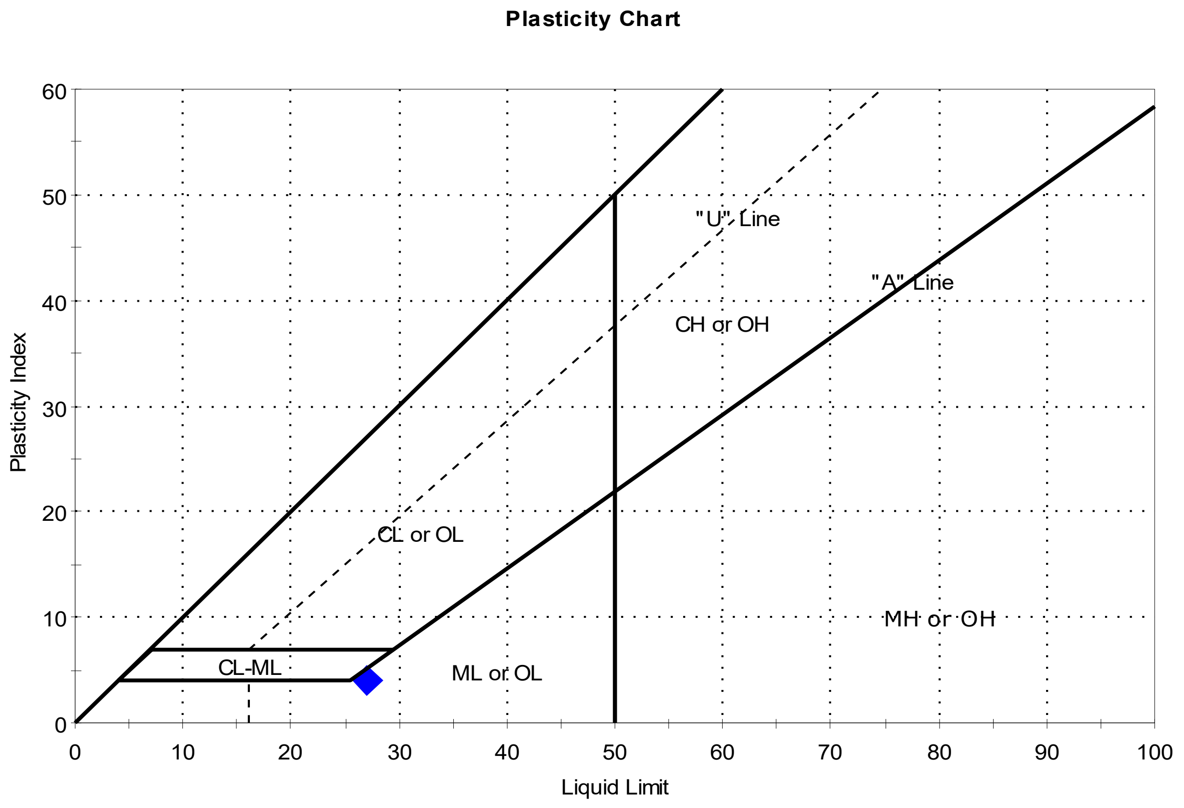
Client: Haley & Aldrich, Inc.
Project: WW Treatment Facility Upgrades
Location: Newport, NH
Project No: GTX-316247

Boring ID: HA22-2
Sample Type: jar
Tested By: cam
Sample ID: S10
Test Date: 11/03/22
Checked By: bfs
Depth : 34-36 ft
Test Id: 692128

Test Comment: ---
Visual Description: Wet, gray silt
Sample Comment: ---

# Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | S10 | HA22-2 | 34-36 ft | 33 | 27 | 23 | 4 | 2.5 | |

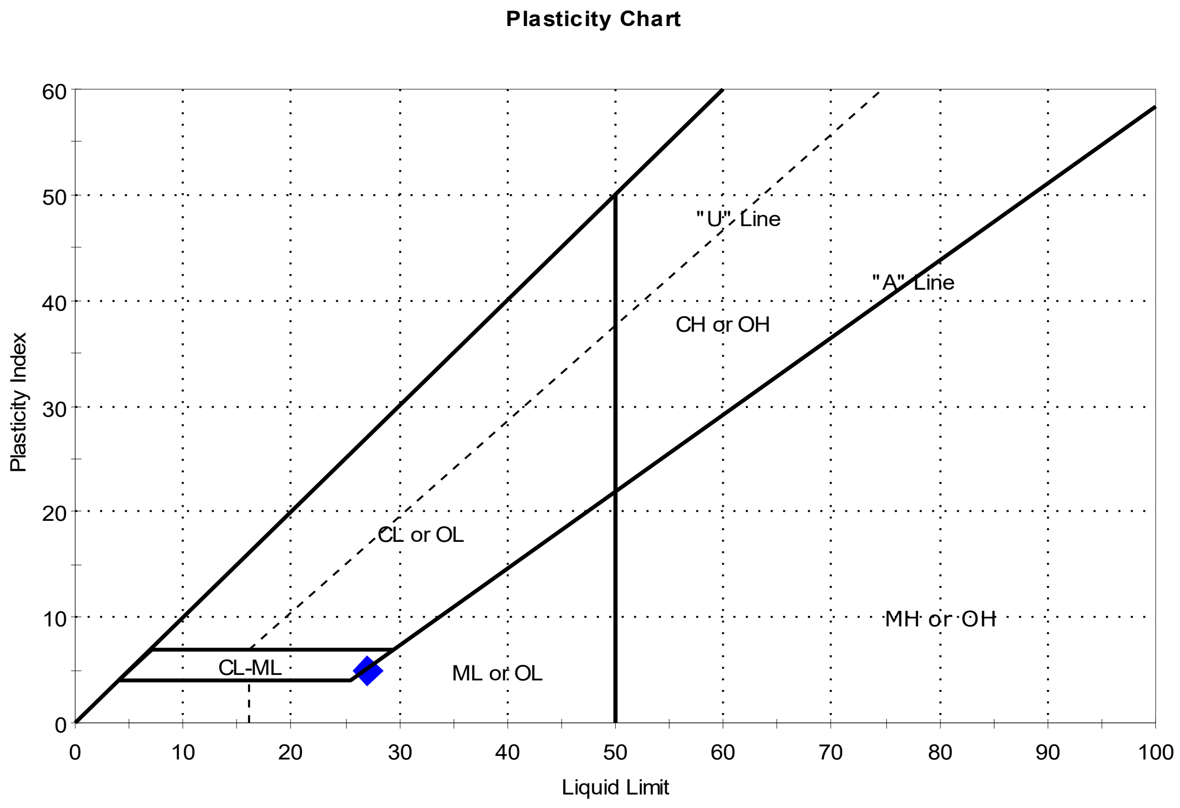
Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

| | | | | | |
|---|---|---|---|---|---|
| Client: | Haley & Aldrich, Inc. | | | | |
| Project: | WW Treatment Facility Upgrades | | | | |
| Location: | Newport, NH | | | Project No: | GTX-316247 |
| Boring ID: | HA22-2 | Sample Type: | jar | Tested By: | cam |
| Sample ID: | S12 | Test Date: | 11/03/22 | Checked By: | bfs |
| Depth : | 44-46 ft | Test Id: | 692129 | | |

Test Comment: ---
Visual Description: Moist, gray silty clay
Sample Comment: ---

# Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | S12 | HA22-2 | 44-46 ft | 35 | 27 | 22 | 5 | 2.5 | |

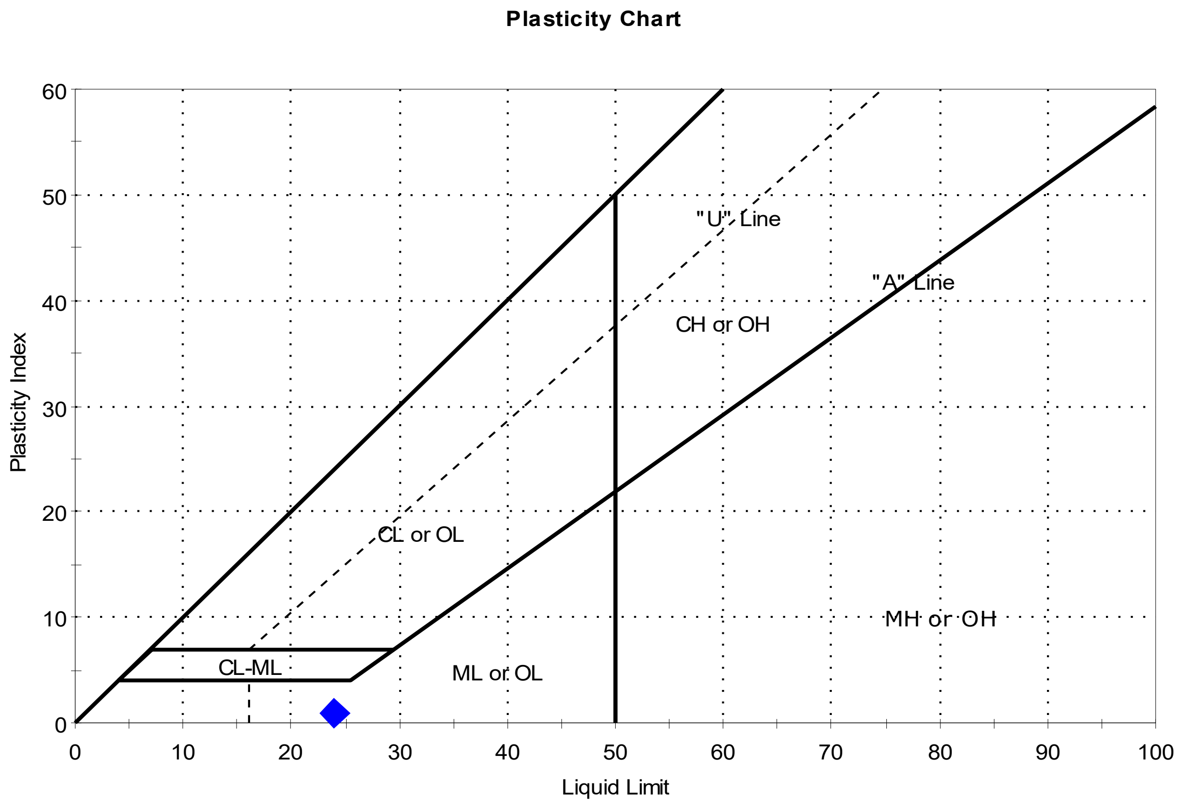
Sample Prepared using the WET method

Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

GeoTesting EXPRESS

Client: Haley & Aldrich, Inc.
Project: WW Treatment Facility Upgrades
Location: Newport, NH
Project No: GTX-316247
Boring ID: HA22-2
Sample Type: jar
Tested By: cam
Sample ID: S15
Test Date: 11/03/22
Checked By: bfs
Depth : 59-61 ft
Test Id: 692130
Test Comment: ---
Visual Description: Wet, gray silt
Sample Comment: ---

# Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring | Depth | Natural Moisture Content,% | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|---|---|---|---|---|---|---|---|---|---|
| ◆ | S15 | HA22-2 | 59-61 ft | 32 | 24 | 23 | 1 | 8.8 | |

Sample Prepared using the WET method

Dry Strength: HIGH
Dilatancy: SLOW
Toughness: LOW

PO Box 572455 / Salt Lake City UT  84157-2455 / USA
TEL +1 801 262 2448 · FAX +1 801 262 9870 · www.TEi-TS.com

GEOTESTING EPXRESS INCORPORATED
125 NAGOG PARK
ACTON  MA  01720-3451
USA

| | |
|---|---|
| Analysis No. | TS-A2210667 |
| Report Date | 09 November 2022 |
| Date Sampled | 27 October 2022 |
| Date Received | 07 November 2022 |
| Where Sampled | Acton, MA  USA |
| Sampled By | Client |

This is to attest that we have examined: Soil: Project: WW Treatment Facility Upgrades; Site Location: - — -; Job Number: GTX-316247

When examined to the applicable requirements of:

| | |
|---|---|
| ASTM D 512-12* | “Standard Test Methods for Chloride Ion in Water” Method B |
| ASTM D 516-16 | “Standard Test Method for Sulfate Ion in Water” |
| Standard Methods-2017 | Part 4000 “Inorganic Nonmetallic Constituents” 4500-$S^{2-}$ Sulfide |
| ASTM G 200-20 | “Standard Test Method for Measurement of Oxidation-Reduction Potential (ORP) of Soil” |

Results:

ASTM D 512 – Chloride Method B

| Sample | | Results | | Detection Limit |
|---|---|---|---|---|
| | | ppm (mg/kg) | %[1] | |
| HA22-1 | | 13. | 0.0013 | 10. |
| S-6, S-7 | 14 — 21’ | | | |
| HA22-2 | | < 10. | < 0.0010 | |
| Grab | 15 — 17’ | | | |

NOTE: [1]Percent by weight after drying and prepared as per the Standard.  *Withdrawn 2021 without Replacement

ASTM D 516 – Sulfates (Soluble)

| Sample | | Results | | Detection Limit |
|---|---|---|---|---|
| | | ppm (mg/kg) | %[1] | |
| HA22-1 | | < 10. | < 0.0010 | 10. |
| S-6, S-7 | 14 — 21’ | | | |
| HA22-2 | | 10. | 0.0010 | |
| Grab | 15 — 17’ | | | |

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

SM 4500-$S^{2-}$ Sulfide (Soluble)

| Sample | | Results | | Detection Limit |
|---|---|---|---|---|
| | | ppb (µg/kg) | %[1] | |
| HA22-1 | | 60. | 0.0000060 | 10. |
| S-6, S-7 | 14 — 21’ | | | |
| HA22-2 | | 50. | 0.0000050 | |
| Grab | 15 — 17’ | | | |

NOTE: [1]Percent by weight after drying and prepared as per the Standard.

ASTM G 200 – Reduction Oxidation Potential (REDOX)

| Sample | | Results | Detection Limit |
|---|---|---|---|
| HA22-1 | | 186.5 @ 19.9 ºC | 0.1mV |
| S-6, S-7 | 14 — 21’ | | |
| HA22-2 | | 125.1 @ 19.9 ºC | |
| Grab | 15 — 17’ | | |

NOTE: Prepared as per the Standard.

END OF ANALYSIS

USEPA Laboratory ID UT00930

Merrill Gee P.E. – Engineer in Charge

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# Appendix F
# Hazardous Materials Survey

November 11, 2022
File No. 100541

Wright-Pierce
Ms. Sarah Viola, EIT
Engineer II
230 Commerce Way #302
Portsmouth, NH 03801

**Re: Hazardous Materials Inspection Report**
**Newport Wastewater Treatment Facility Upgrade Project**
**Newport, New Hampshire**

Dear Ms. Viola,

Nobis Engineering, Inc. (Nobis) prepared this Hazardous Materials Inspection Report to present the results of the hazardous building materials survey (HBMS) conducted at the Control Building, Filter Building, UV Building, Grit Building, and Primary Sedimentation Basins/abandoned Grit Removal Facility buildings at the Newport Wastewater Treatment Facility (WWTF), located in Newport, New Hampshire. Nobis performed the survey to support the proposed renovation/demolition of these structures.

## SCOPE OF WORK

The hazardous materials survey included the identification, quantification, and location of accessible asbestos-containing materials (ACM), lead-based paint (LBP), polychlorinated biphenyls (PCBs), and regulated/universal wastes. Consistent with our executed contract dated September 19, 2022, Nobis completed the following:

- Located and quantified ACM located throughout the building and collected bulk samples of suspect ACM for laboratory for testing.
- Performed a Lead-Based Paint (LBP) survey of the interior and exterior portions of the buildings and building components to located and quantify LBP throughout the buildings using in situ x-ray fluorescence (XRF) testing as required by the Occupational Safety and Health Administration (OSHA) regulations for demolition and worker safety characterization.

- Conducted a survey of universal wastes and other hazardous materials requiring special handling or disposal.
- Performed a limited survey of potential PCB-containing building materials at the Grit Building and Primary Sedimentation Basins/abandoned Grit Removal Facility only (as requested by Wright-Pierce).
- Prepared this HMBS report for your use.

## SURVEY LIMITATIONS

Additional sampling or analysis of air, water, or any other regulated or hazardous materials was beyond the scope of the HMBS. This report is subject to the limitations included in Appendix A. In addition, the following limitations were encountered during the inspection:

- At the direction of Wright-Pierce, Nobis only sampled PCBs at the Grit Building and the Primary Sedimentation Basins/abandoned Grit Removal Facility.
- At the direction of Wright-Pierce, Nobis only sampled roofing materials at the Grit Building and the Primary Sedimentation Basins/abandoned Grit Removal Facility. Wright Pierce should evaluate the other building's roofing materials not included in this survey for asbestos content if renovation/demolition activities are extended to these structures.
- Nobis did not include process chemical storage in the hazardous materials inventory, as these materials are expected to be reused.

## INSPECTION ACTIVITIES

Nobis completed the HBMS on October 4, 2022. Nobis subcontracted Smith and Wessel Associates, Inc. (SWA) to perform the lead inspection and supplement asbestos and PCB sampling activities. Inspection findings are presented in the following sections. Photographs taken during the inspection are included in Appendix B.

### Asbestos Containing Materials (ACM)

Massachusetts asbestos inspectors Alyssa Epstein (AI900791) and Ted Sherry (AI32572) collected 69 samples for laboratory analysis of suspect ACM. Multiple samples were collected from homogeneous areas identified throughout the buildings to identify asbestos content.

Homogeneous areas consist of areas that appear to be similar in material color, texture, and date of installation or application.

Asbestos was detected in the black tar flashing on the roof of the abandoned Grit Removal Facility. Bulk samples that returned positive results for the presence of asbestos are presented on Table 1. Bulk samples that returned negative results for the presence of asbestos are presented on Table 2. Laboratory analytical data for asbestos analysis is included as Appendix C.

Bulk samples were transmitted under a chain-of-custody to EMSL Analytical, Inc., an accredited Massachusetts-certified laboratory located at 5 Constitution Way, Unit-A in Woburn, Massachusetts. Samples were analyzed by polarized light microscopy (PLM) in accordance with the United States Environmental Protection Agency (EPA) *"Method for Determination of Asbestos in Bulk Material"*; EPA/600/R-93/116 (July 1993).

Each set of homogeneous bulk samples was analyzed using the "hit-stop" procedure. Per this procedure, analysis of additional duplicate samples collected from identical materials is not required if asbestos is detected in any one of the samples from the homogeneous group. Sixty-eight bulk samples were analyzed by PLM (one sample was omitted by the hit-stop procedure).

### Lead Based Paint (LBP)

Lead inspector Ted Sherry conducted an OSHA pre-demolition survey of the interior and exterior painted surfaces. Building components were tested for LBP using XRF. Positive LBP screening results are shown on Table 3. The Lead Inspection Report (included as Appendix D) presents specific screening values and locations for each building component tested.

Leaded building components that returned results greater than 1.0 milligram per centimeters squared ($mg/cm^2$) included the interior grey metal door frame in the abandoned Grit Removal Facility; the white metal corrugated ceiling and deck, red and white metal joists, and the brown metal door inside the Control Building, and the beige metal garage door frame on the Control Building exterior.

Lead screening results are used to calculate worker exposure levels for OSHA compliance and to assess lead levels for proper handling and disposal of building materials during demolition. Sampling was conducted in accordance with EPA and United States Department of Housing and Development (HUD) guidance and acceptable practices adopted for inspecting for LBP.

Per EPA[1] and HUD regulations, lead-based paint is present on any surface containing lead equal to or greater than 1.0 mg/cm$^2$; however, the OSHA Lead Construction Standard, Chapter 29, Section 1926.62 of the Code of Federal Regulations (29 CFR 1926.62) deals with worker exposure at any concentration of LBP. Based on current OSHA regulations, any painted surfaces containing lead at levels above 0.0 mg/cm$^2$ that will be disturbed during demolition activities must be handled as LBP.

## PCB Sampling results

Nobis collected six samples of caulk and paint for laboratory analysis of PCBs. Sampling was performed by removing a minimum of 10 grams of suspected PCB-containing media from building components to provide enough material for analytical testing. Con-Test Analytical (Con-Test) in East Longmeadow, Massachusetts analyzed PCB samples by EPA Method 8082 using the Soxhlet extraction method (SW-846 3540C). PCB results are summarized on Table 4 and the PCB analytical laboratory report is included as Appendix E.

PCBs were detected at a concentration of 120 parts per million (ppm) in the grey interior door caulk of the abandoned Grit Removal Facility (PCB-1), 26,000 ppm in the white Sedimentation Basin joint caulk (PCB-2), 30.1 ppm in the abandoned Grit Removal Facility red door paint (PCB-3), and 28.3 ppm in beige door paint of the Grit Building (PCB-6). PCBs were not detected in samples PCB-4 and PCB-5.

In addition, fluorescent light ballasts may contain PCB oils. Nobis did not observe PCB-containing light ballasts during the HM inventory; however, hazardous materials removal contractors should review labels on each fluorescent light ballast during removal to confirm if ballasts contain PCBs. The fluorescent light ballast tally is included in the HM survey results section below.

## Hazardous/Regulated Materials

Nobis surveyed the buildings to locate hazardous and/or regulated materials. Suspect hazardous material locations and quantities are included on Table 5. Installed building components containing hazardous/regulated materials encountered during the survey include fluorescent light tubes, fluorescent light ballasts, exit signs, and emergency lights. Arnold Greenleaf, the contact at the WWTF, indicated that the fluorescent bulbs from the Control Building were

---

[1] United States Environmental Protection Agency, 40 CFR 745.65: Lead; Identification of Dangerous Levels of Lead; Final Rule, dated December 22, 2000 and amended January 5, 2001.

removed and converted to LED bulbs; however, he could not confirm if the fluorescent light ballasts had been removed. Nobis' light ballast tally in Table 5 assumes the ballasts in the Control Building are still present.

Nobis observed one dry-type transformer in the Filter Building, two dry-type transformers in the Control Building, and one 275-gallon aboveground storage tank (AST) outside of abandoned Grit Removal Facility. The quantity and contents of the AST are unknown.

Hazardous materials that may require special handling and disposal should be removed from the building prior to renovation/demolition. Materials handling, transport, and recycling or disposal should be in accordance with applicable Federal, State, and local laws and regulations.

## ABATEMENT/DISPOSAL COST ESTIMATE

Table 6 provides a preliminary cost estimate for abatement and disposal of hazardous and regulated wastes identified during this survey. This estimate includes prevailing wage rate costing and estimates for disposal of hazardous and regulated materials assumed to be in accessible building areas.

Actual abatement and disposal costs may vary. Costing and quantities should be confirmed by the abatement contractor prior to securing funding for the project.

## CONCLUSIONS AND RECOMMENDATIONS

Nobis completed the hazardous materials survey on October 4, 2022, to identify building materials containing ACM, LBP, or PCBs, and other universal wastes and regulated materials requiring proper abatement and disposal prior to demolition and renovation activities.

Tables and photos depict the location of each material sampled. These materials are representative of homogeneous areas identified throughout the survey area. Per the regulations, any material within the homogeneous area must be considered to contain any hazardous materials identified in their representative samples (e.g. LBP was detected on red metal joists in the Control Building; therefore, all red metal joists in the Control Building are assumed coated with LBP, etc.).

## Asbestos Containing Materials

Bulk samples that returned positive results for the presence of asbestos are presented on Table 1. Bulk samples that returned negative results for the presence of asbestos are presented on Table 2. Asbestos was detected in the following materials:

- Black tar flashing on the roof of the abandoned Grit Removal Facility.

ACM requires abatement, special handling, and disposal prior to renovation/demolition activities. Abatement, handling, transport, and disposal of ACM should be conducted in accordance with applicable Federal, State, and local laws and regulations. The disposal contractor should verify hazardous material locations, quantity, and disposal costs before conducting removal activities.

## Lead-Based Paint

Building components returning results greater than 1.0 mg/cm$^2$ are presented in Table 3. XRF screening determined that the following components are coated with LBP:

- Interior grey metal door frame in the abandoned Grit Removal Facility.
- White metal corrugated ceiling and deck, red and white metal joists, and the brown metal door inside the Control Building.
- Beige metal garage door frame on the Control Building exterior.

LBP demolition/renovation is required to be performed by a contractor in compliance with the OSHA Rules for Occupational Health and Environmental Controls for Lead 29 CFR 1926.62, including implementation of a written worker protection program, personal air monitoring, and respiratory protection program. If metal components are to be recycled, lead abatement of the metal components may not be necessary.

Although EPA has established a 1.0 mg/cm2 (0.5% by dry weight) threshold value for dangerous levels of lead, OSHA has not. The OSHA Lead Standard has no set limit for LBP concentrations below which the standards do not apply (i.e. – OSHA considers any paint with detectable lead concentrations to be LBP). If contractors are working with any levels of LBP, they must comply with exposure assessment criteria, worker protection, and other regulatory requirements until air sampling or historical data proves otherwise, regardless of concentration.

LBP abatement may be required prior to working with, dismantling, or otherwise handling materials coated with LBP. Personnel who may impact LBP are responsible for compliance with regulations pertaining to the handling and disposal of materials that contain or are contaminated by lead. A licensed deleading contractor does not have to conduct work where LBP is impacted; however, anyone who will disturb LBP must trained, qualified, and use methods that do not create lead dust, chips, or fumes. Personnel must use appropriate personal protection and properly dispose of or recycle components that are covered by LBP.

### PCBs

PCB analytical results are presented in Table 4. Federal Toxic Substances Control Act (TSCA) regulations establish remediation and disposal requirements for hazardous wastes with total PCB concentrations greater than 50 ppm. Nobis identified PCB concentrations above the hazardous waste threshold in the following materials:

- Grey interior door caulk of the abandoned Grit Removal Facility (120 ppm).
- White Sedimentation Basin joint caulking (26,000 ppm).

Special handling and disposal is required for materials containing PCB concentrations above the TSCA cleanup standard of 1.0 ppm but below the hazardous waste threshold of 50 ppm. Nobis identified PCB concentrations above the TSCA cleanup standard in the following materials:

- Red door paint in the abandoned Grit Removal Facility (30.1 ppm).
- Beige door paint of the Grit Building (28.3 ppm).

In 2013, EPA clarified the meaning of TSCA “Excluded PCB Products” to deemphasize the regulation of commercial products containing low concentrations of PCBs. Excluded products include materials legally installed before October 1, 1984, products legally manufactured and used pursuant to authority granted by EPA, and materials where the resulting PCBs concentration is not the result of diffusion, leaks, or spills of PCBs in concentrations over 50 ppm.

The burden of demonstrating that a regulatory exclusion applies rests with the party seeking that exclusion. Although likely, the disposal contractor should determine if the detected materials containing PCBs are a TSCA Excluded PCB Product as defined in 40 CFR Part 761.3 and are therefore unregulated.

PCB-containing materials to be removed must be properly handled by appropriately trained workers and waste must be disposed of at a facility permitted to accept PCB-containing materials at the concentrations present. These materials should be evaluated by the demolition/disposal contractor and the receiving facility to identify any disposal limitations prior to material removal.

Materials containing hazardous waste levels of PCBs (greater than 50 ppm) are regulated under TSCA and special handling, disposal, and regulatory compliance (such as substrate and surrounding materials testing to delineate PCB cross-contamination) are required. Nobis recommends an additional investigation of the grey interior door caulk of the abandoned Grit Removal Facility and white Sedimentation Basin joint caulking substrates to determine if PCBs have leached from the caulking and to establish the quantity of the substrate also requiring removal.

## Hazardous Materials Inventory

Nobis surveyed the buildings to locate hazardous and/or regulated materials. Suspect hazardous material locations and quantities, are included on Table 5. Hazardous/regulated materials encountered during the survey include:

- Fluorescent light tubes.
- Fluorescent light ballasts.
- Lead Acid Batteries (emergency lights, exit signs).
- 275-gallon AST (contents unknown).

Hazardous materials removal contractors should consult labels on each fluorescent light ballast during removal to confirm if ballasts contain hazardous waste. Fluorescent light ballasts labeled as non-PCB containing may contain diethylhexyl phthalate (DEHP). DEHP was the primary substitute to replace PCBs for small capacitors in fluorescent lighting ballasts and is a toxic substance and a suspected carcinogen. Superfund liability exists for landfilling of DEHP-containing ballasts; therefore, the disposal contractor should avoid disposing of DEHP containing ballasts in the general waste stream. Non-PCB ballasts should be disposed of via metals recycling and incineration.

Hazardous materials that may require special handling and disposal should be removed from the building prior to renovation/demolition activities. Materials handling, transport, and recycling or disposal should be in accordance with applicable Federal, State, and local laws and regulations. The disposal contractor should verify hazardous material locations, quantity, and disposal costs before conducting removal activities.

Thank you for the opportunity to be of service. Should you require additional information, please do not hesitate to contact us.

Sincerely,

**NOBIS ENGINEERING, INC.**

| | |
|---|---|
| Alyssa Epstein | Jeff Brunelle |
| Project Scientist | Senior Project Manager |
| MA Asbestos Inspector/Designer | |

Attachments:

Table 1 – Summary of Positive Asbestos Analytical Results
Table 2 – Summary of Negative Asbestos Analytical Results
Table 3 – Summary of Positive LBP Results
Table 4 – Summary of PCB Analytical Results
Table 5 – Hazardous/Regulated Materials Inventory
Table 5 – Abatement/Disposal Cost Estimate

Appendix A – Limitations
Appendix B – Photographs
Appendix C – Asbestos Analytical Data Reports
Appendix D – Lead Inspection Report
Appendix E – PCB Analytical Data Report

c: File No. 100541.00 (w/attach.)

# Table 1
# Summary of Positive Asbestos Analytical Results
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| Sample ID | Sample Location | Sample Description | Result |
|---|---|---|---|
| 08A | Old Grit Building Roof | Black Tar Flashing at Drip Edge | 15% Chrysotile |
| 08B | Old Grit Building Roof | Black Tar Flashing at Drip Edge | |

**Notes:**

1. Bulk samlpes were analyzed by PLM.
2. Samples were collected on 10/4/22

# Table 2
# Summary of Negative Asbestos Analytical Results
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| Sample ID | Sample Location | Sample Description | Result |
|---|---|---|---|
| 01A | Old Grit Building | Gray Door Caulk Exterior | ND |
| 01B | Old Grit Building | Gray Door Caulk Exterior | ND |
| 02A | Old Grit Building | Gray Door Caulk Interior | ND |
| 02B | Old Grit Building | Gray Door Caulk Interior | ND |
| 03A | Old Grit Building | White Textured Ceiling Paint | ND |
| 03B | Old Grit Building | White Textured Ceiling Paint | ND |
| 03C | Sedimentation Exterior | White Textured Ceiling Paint | ND |
| 04A | Sedimentation Exterior | White Joint Caulk | ND |
| 04B | Old Grit Building Roof | White Joint Caulk | ND |
| 05A | Old Grit Building Roof | Black Tar & Gravel (1/2") | ND |
| 05B | Old Grit Building Roof | Black Tar & Gravel (1/2") | ND |
| 06A | Old Grit Building Roof | Tan Pearlite Filler under 05A (1 1/2") | ND |
| 06B | Old Grit Building Roof | Tan Pearlite Filler under 05B (1 1/2") | ND |
| 07A | Old Grit Building Roof | Black Tar Mop on Concrete under 06A | ND |
| 07B | Old Grit Building Roof | Black Tar Mop on Concrete under 06B | ND |
| 09A | Grit Building | White Interior Door Caulk | ND |
| 09B | Grit Building | White Interior Door Caulk | ND |
| 10A | Grit Building | Black Caulk on Double Door | ND |
| 10B | Grit Building | Black Caulk on Double Door | ND |
| 11A | Grit Building | Black Duct Seam Sealer | ND |
| 11B | Grit Building | Black Duct Seam Sealer | ND |
| 12A | Grit Building | Electrical Shed Roof Shingle | ND |
| 12B | Grit Building | Electrical Shed Roof Shingle | ND |
| 13A | Grit Building Roof | Black Seam Sealer on Blower | ND |
| 13B | Grit Building Roof | Black Seam Sealer on Blower | ND |
| 14A | UV Building | Brown Wood --> Concrete Garage Door Caulk Interior | ND |
| 14B | UV Building | Brown Wood --> Concrete Garage Door Caulk Interior | ND |
| 15A | Filter Building | Gray Vent to Concrete Exterior Caulk | ND |
| 15B | Filter Building | Gray Vent to Concrete Exterior Caulk | ND |
| 16A | Filter Building | Brown Interior Door Caulk | ND |
| 16B | Filter Building | Brown Interior Door Caulk | ND |
| 17A | Filter Building | Red Pipe Sealant | ND |
| 17B | Filter Building | Red Pipe Sealant | ND |
| 18A | Filter Building | Gray Concrete Floor Caulk | ND |
| 18B | Filter Building | Gray Concrete Floor Caulk | ND |
| 19A | Control Building Exterior | Gray Vent to Brick Caulk | ND |
| 19B | Control Building Exterior | Gray Vent to Brick Caulk | ND |
| 20A | Control Building Exterior | Red Brick Joint Caulk | ND |
| 21A | Control Building Exterior | White Brick Joint Caulk | ND |
| 20B | Control Building Exterior | Red Brick Joint Caulk | ND |
| 21B | Control Building Exterior | Gray Brick Joint Caulk | ND |
| 22A | Control Building Exterior | Gray Window Caulk (Concrete to Metal Frame) | ND |
| 22B | Control Building Exterior | Gray Window Caulk (Concrete to Metal Frame) | ND |
| 23A | Control Building Exterior | White Window Caulk (Metal to Frame) | ND |
| 23B | Control Building Exterior | White Window Caulk (Metal to Frame) | ND |
| 24A | Control Building Exterior | Black Window Sill Vapor Barrier | ND |
| 24B | Control Building Exterior | Black Window Sill Vapor Barrier | ND |
| 25A | Control Building Hallway | 2x4 Off-White Ceiling Tile (Older Vintage) | ND |
| 25B | Control Building Hallway | 2x4 Off-White Ceiling Tile (Older Vintage) | ND |

# Table 2
# Summary of Negative Asbestos Analytical Results
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| Sample ID | Sample Location | Sample Description | Result |
|---|---|---|---|
| 26A | Control Building Hallway | 2x4 White Ceiling Tile (Newer) | ND |
| 26B | Control Building Hallway | 2x4 White Ceiling Tile (Newer) | ND |
| 27A | Control Building Shop | CMU Wall Joint Sealant (Gray) | ND |
| 27B | Control Building Shop | CMU Wall Joint Sealant (Gray) | ND |
| 28A | Control Building Storage | White Mudded Drain Pipe Capling | ND |
| 28B | Control Building Shop | White Mudded Drain Pipe Capling | ND |
| 28C | Control Building Shop | White Mudded Drain Pipe Capling | ND |
| 29A | Control Building Lab | White Mudded Fitting 2" Pipe above Drop Ceiling | ND |
| 29B | Control Building Bathroom | White Mudded Fitting 2" Pipe above Drop Ceiling | ND |
| 29C | Control Building Bathroom | White Mudded Fitting 2" Pipe above Drop Ceiling | ND |
| 30A | Control Building Lab | Gray Wall to Frame Window Caulk | ND |
| 30B | Control Building Lab | Gray Wall to Frame Window Caulk | ND |
| 31A | Control Building Lab | White Window Frame Base Wall to Frame Caulk | ND |
| 31B | Control Building Lab | White Window Frame Base Wall to Frame Caulk | ND |
| 32A | Control Building Lab | Black Lab Counter | ND |
| 32B | Control Building Lab | Black Lab Counter | ND |
| 33A | Control Building Generator Room | Yellow Glue Daubs | ND |
| 33B | Control Building Generator Room | Yellow Glue Daubs | ND |

**Notes:**

1. ND = Not Detected.
2. Bulk samples were analyzed by PLM.
3. Homogeneous areas are identified by the letter designator in the sample identification.
4. Samples were collected on 10/4/22

# Table 3
# Summary of Positive LBP Screening Results
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| Description | Location | Max XRF Screening Value (mg/cm$^2$) |
|---|---|---|
| **Abaonded Grit Building** | | |
| Gray metal door frame | Interior | 2.0 |
| **Control Building** | | |
| White metal corrugated ceiling | Chem Feed Room | 1.1 |
| Red metal joist (plenum) | Hallway by workshop | 2.4 |
| Brown metal door system | Hallway by workshop | 2.2 |
| White metal joist | Storage by workshop | 1.9 |
| White metal corrugated deck | Workshop | 1.3 |
| White metal joist | Workshop | 1.7 |
| Beige metal garage door frame | Exterior | 1.8 |

Notes:

1. XRF - x-ray fluorescence

2. Table presents XRF screening results for media that tested positive for lead-based paint (LBP). Refer to Appendix D - Lead Report for a complete listing of media tested.

3. Listed XRF screening values are the highest value recorded for the range of screening values for each media.

# Table 4
# Summary of PCB Analytical Results
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| **Compound** | **TSCA Cleanup Standard** | **TSCA Hazardous Waste Threshold** | **PCB-1** | **PCB-2** | **PCB-3** | **PCB-4** | **PCB-5** | **PCB-6** |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | 10/4/2022 | 10/4/2022 | 10/4/2022 | 10/4/2022 | 10/4/2022 | 10/4/2022 |
| Sample Location | | | Abandoned Grit Removal Facility | Sedimentation Basin | Abandoned Grit Removal Facility | Grit Building | Grit Building | Grit Building |
| Sample Material | | | Grey interior door caulk | White sediment tank joint caulk | Red door paint | Black caulk on double doors | Black duct seam sealer | Beige door paint |
| **PCBs (ppm)** | | | | | | | | |
| PCB 1016 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| PCB 1221 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| PCB 1232 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| PCB 1242 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| PCB 1248 | ~ | ~ | ND (<19) | ND (<1900) | **7.1** | ND (<38) | ND (<3.9) | **6.6** |
| PCB 1254 | ~ | ~ | **120** | **26000** | **18** | ND (<38) | ND (<3.9) | **17** |
| PCB 1260 | ~ | ~ | ND (<19) | ND (<1900) | **5** | ND (<38) | ND (<3.9) | **4.7** |
| PCB 1262 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| PCB 1268 | ~ | ~ | ND (<19) | ND (<1900) | ND (<2.0) | ND (<38) | ND (<3.9) | ND (<2.0) |
| Total PCBs | 1 | 50 | **120** | **26000** | **30.1** | ND (<38) | ND (<3.9) | **28.3** |

Notes:

1. Results are in parts per million (ppm)/milligrams per kilogram (mg/kg).

2. Samples analyzed by Method SW-846 8082A with Soxhlet extraction.

3. Red values exceed the Toxic Substances Control Act (TSCA) cleanup standard (1 ppm total PCBs).

4. Shaded values exceed the TSCA Hazardous Waste Threshold (50 ppm total PCBs).

5. PCB - Polychlorinated Biphenyls

6. "<19" = Not detected above the lab reporting limits (shown in parenthesis).

# Table 5
# Hazardous/Regulated Materials Inventory
# Newport Wastewater Treatment Facility
# Newport, New Hampshire

| **Filter Building** | **Quantity** |
|---|---|
| Fluorescent Light Tubes (4-foot) | 86 EA |
| Fluorescent Light Ballasts | 32 EA |
| Emergency Lights/Exit Signs (Lead-acid Battery) | 9 EA |
| Dry-Type Transformer | 1 EA |
| **Control Building** | |
| Fluorescent Light Ballasts | 65 EA |
| Emergency Lights/Exit Signs (Lead-acid Battery) | 3 EA |
| Dry-Type Transformer | 2 EA |
| **Abandoned Grit Removal Facility** | |
| 275-gallon Aboveground Storage Tank | 1 EA |

# Table 6
# Abatement/Disposal Cost Estimate
## Newport Wastewater Treatment Facility
## Newport, New Hampshire

| Material | Location | Quantity | Units | Price Per Unit | Disposal Cost Estimate |
|---|---|---|---|---|---|
| **Asbestos** | | | | | |
| Black tar flashing at drip edge | Abandoned Grit Building Roof | 50 | SF | $ 18.00 | $ 900.00 |
| | | | | **Subtotal** | **$900** |
| **LBP** | | | | | |
| Lead containing materials special handling and disposal | Abandoned Grit Removal Facility and Control Building | | | | $5,500 |
| | | | | **Subtotal** | **$5,500** |
| **PCBs** | | | | | |
| Substrate Investigation | Abandoned Grit Removal Facility and Sedimentation Basin | | | | **$8,000** |
| TSCA PCB Abatement | | | | | **$25,000** |
| | | | | **Subtotal** | **$33,000** |
| **Regulated Materials/Universal Wastes** | | | | | |
| Fluorescent Light Tubes | Filter Building | 344 | LF | $ 0.10 | $34 |
| Fluorescent Light Ballasts | Filter Building and Control Building | 97 | Each | $ 15.00 | $1,455 |
| Lead-Acid Battery (Emergency light/Exit Sign) | Filter Building and Control Building | 12 | Each | $ 50.00 | $600 |
| | | | | **Subtotal** | **$2,089** |
| | | | | **Grand Total** | **$41,489** |

Notes:

1. Lead disposal costs assume that metal components containing lead can be dismantled and recycled; however, Nobis carried $5500 contingency for removal and disposal of leaded materials that are not metal.

2. The hazardous materials inventory does not include materials located in inaccessible sections of the building.

3. Price per unit rates are prevailing wage rates.

4. Disposal cost for ballast assumes that all ballasts are "No PCB" type ballasts, as PCB containing ballasts were not observed during the survey. If PCB ballasts are encountered during renovation, disposal costs would be $30/ea. Disposal contractor is responsible for confirming PCB content of light ballasts.

5.TSCA level PCB abatement costs are estimated on a range of cost, the highest estimated cost was used to calculate the grand total.

6. Abament estimate of PCBs below TSCA levels (50 ppm) was not included in the estimate. PCBs at any concentration require special handling and disposal at facilities permitted to accept PCB-containing wastes.

# Limitations

# APPENDIX A - ADDITIONAL LIMITATIONS

1) This hazardous materials survey was performed in accordance with generally accepted practices of other consultants undertaking similar work at the same time and in the same geographical area. Nobis attempted to characterize all building materials in the inspection area; however, it is impractical and costly to sample all materials in all areas. Inspection regulations are based on representative sampling. Nobis collected representative samples from suspect asbestos and PCB-containing materials observed throughout the building.

2) The results of this survey are based on our professional judgment and are not scientific certainties. Specifically, Nobis Group (Nobis) does not and cannot represent that the site contains no hazardous materials or other latent conditions beyond those observed during this inspection. No other warranty, express or implied, is made.

3) The observations and conclusions presented in this report were made solely on the basis of conditions described thereon and not on scientific tasks or procedures beyond the scope of described services or the budgetary, time, and work constraints (i.e. restricted demolition/sampling) imposed by the client. The work described in this report was performed in accordance with the terms and conditions described in our agreement, and subsequent discussions in the field with facilities personnel.

4) During the Site inspection, observations were made of the site building. Where access to portions of the site building were unavailable, limited, or unsafe, Nobis renders no opinion as to the presence of asbestos, lead, or other hazardous materials in those portions of the site.

5) No property boundary, site feature or topographic surveys of the site were performed by Nobis.

6) Our services did not include assessments for the presence of pesticides, herbicides, urea-formaldehydes, or radon, nor any air quality monitoring, or any chemical analyses of soil, surface water, groundwater, or any other materials at the site beyond which is included in the report.

7) The purpose of this report was to inspect limited portions of the site building for the presence of suspect asbestos-containing materials, lead based paint, and PCB in bulk products within the context of applicable Occupational Safety and Health Administration (OSHA), USEPA (EPA), and the New Hampshire Department of Environmental Services (NHDES). This report does not in any manner or form constitute a Management Plan or Abatement Design within the context of OSHA, EPA, or New Hampshire regulations. No attempt was made to check the compliance of present or past owners of the site with federal, state or local laws.

APPENDIX B

# Photographs

**Appendix B**
**Hazardous Building Material Inspection Photos**
**Newport Wastewater Treatment Facility**
**Newport, New Hampshire**

| | |
|---|---|
| **Date:** 10/4/22 | **Location:** Abandoned Grit Removal Facility |

**Description:** Black tar flashing at drip edge. Positive result for asbestos.

| | |
|---|---|
| **Date:** 10/4/22 | **Location:** Abandoned Grit Removal Facility |

**Description:** Grey door caulk. Negative result for asbestos.

**Appendix B**
**Hazardous Building Material Inspection Photos**
**Newport Wastewater Treatment Facility**
**Newport, New Hampshire**

**Date:** 10/4/22 | **Location:** Sedimentation Basins

**Description:** White caulk between concrete joints. Negative result for asbestos. PCBs detected at 26,000 ppm.

**Date:** 10/4/22 | **Location:** Abandoned Grit Removal Facility

**Description:** Grey interior door caulk. Negative result for asbestos. PCBs detected at 120 ppm.

## Appendix B
## Hazardous Building Material Inspection Photos
## Newport Wastewater Treatment Facility
## Newport, New Hampshire

**Date:** 10/4/22

**Location:** Abandoned Grit Facility

**Description:** Red door paint. PCBs detected at 30.1 ppm.

**Date:** 10/4/22

**Location:** Grit Building

**Description:** Roofing on Grit Building and attached electrical shed. Negative results for asbestos.

## Appendix B
## Hazardous Building Material Inspection Photos
## Newport Wastewater Treatment Facility
## Newport, New Hampshire

**Date:** 10/4/22

**Location:** Grit Building

**Description:** Beige door paint. PCBs detected at 28.3 pm.

**Date:** 10/4/22

**Location:** UV Building

**Description:** Brown garage door caulk. Negative results for asbestos.

**Appendix B**
**Hazardous Building Material Inspection Photos**
**Newport Wastewater Treatment Facility**
**Newport, New Hampshire**

| | |
|---|---|
| **Date:** 4/10/22 | **Location:** Filter Building |

**Description:** Grey vent caulk. Negative result for asbestos.

| | |
|---|---|
| **Date:** 4/10/22 | **Location:** Filter Buildling |

**Description:** Red pipe sealant. Negative result for asbestos.

## Appendix B
## Hazardous Building Material Inspection Photos
## Newport Wastewater Treatment Facility
## Newport, New Hampshire

| | |
|---|---|
| **Date:** 1/12/22 | **Location:** Filter Building |

**Description:** Dry type transformer.

| | |
|---|---|
| **Date:**10/4/22 | **Location:** Control Building |

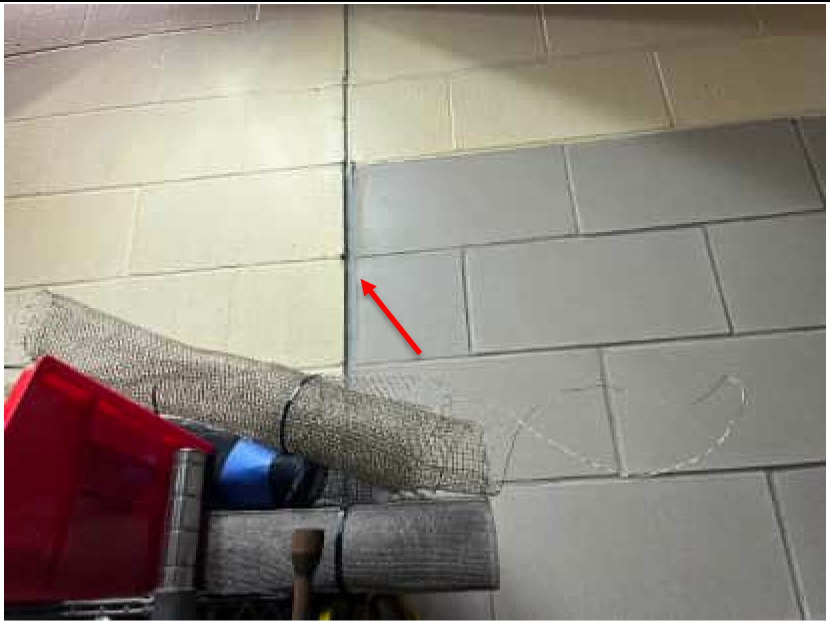
**Description:** Black windowsill vapor barrier and white window caulk. Negative result for asbestos.

## Appendix B
## Hazardous Building Material Inspection Photos
## Newport Wastewater Treatment Facility
## Newport, New Hampshire

**Date:**10/4/22

**Location:** Control Building

**Description:** 2x4 Drop ceiling tile newer and older vintage. Negative result for asbestos.



**Date:**10/4/22

**Location:** Control Building

**Description:** Grey CMU wall joint sealant. Negative result for asbestos.

**Date:**10/4/22

**Location:** Control Building

**Description:** White mudded fittings above drop ceiling. Negative result for asbestos.

**Date:**10/4/22

**Location:** Control Building Generator Room

**Description:** Yellow mastic/glue daubs. Negative result for asbestos.

**Appendix B**
**Hazardous Building Material Inspection Photos**
**Newport Wastewater Treatment Facility**
**Newport, New Hampshire**

| | |
|---|---|
| **Date:**10/4/22 | **Location:** Control Building Generator Room |

**Description:** Dry type transformer.

# Asbestos Lab Report

APPENDIX C

**EMSL Analytical, Inc.**
**5 Constitution Way, Unit A Woburn, MA 01801**
Tel/Fax: (781) 933-8411 / (781) 933-8412
http://www.EMSL.com / bostonlab@emsl.com

**EMSL Order:** 132206917
**Customer ID:** NOBI51
**Customer PO:** 100541
**Project ID:**

**Attention:** Alyssa Epstein
Nobis Engineering, Inc.
585 Middlesex Street
Lowell, MA 01851

**Phone:** (978) 683-0891
**Fax:** (978) 683-0966
**Received Date:** 10/05/2022 9:45 AM
**Analysis Date:** 10/09/2022
**Collected Date:** 10/04/2022

**Project:** Newport WWTP

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 01A<br>*132206917-0001* | Old Grit Building - Gray Door Caulk Exterior | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 01B<br>*132206917-0002* | Old Grit Building - Gray Door Caulk Exterior | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 02A<br>*132206917-0003* | Old Grit Building - Gray Door Caulk Interior | Gray<br>Fibrous<br>Homogeneous | 2% Synthetic | 98% Non-fibrous (Other) | None Detected |
| 02B<br>*132206917-0004* | Old Grit Building - Gray Door Caulk Interior | Gray<br>Fibrous<br>Homogeneous | 2% Synthetic | 98% Non-fibrous (Other) | None Detected |
| 03A<br>*132206917-0005* | Old Grit Building - White Textured Ceiling Paint | Gray/White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 03B<br>*132206917-0006* | Old Grit Building - White Textured Ceiling Paint | Gray/White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 03C<br>*132206917-0007* | Sedimentation Exterior - White Textured Ceiling Paint | Gray/White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 04A<br>*132206917-0008* | Sedimentation Exterior - White Joint Caulk | Gray/White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 04B<br>*132206917-0009* | Old Grit Building Roof - White Joint Caulk | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 05A<br>*132206917-0010* | Old Grit Building Roof - Black Tar & Gravel (1/2") | Black<br>Fibrous<br>Homogeneous | 70% Cellulose | 30% Non-fibrous (Other) | None Detected |
| 05B<br>*132206917-0011* | Old Grit Building Roof - Black Tar & Gravel (1/2") | Black<br>Fibrous<br>Homogeneous | 75% Cellulose | 25% Non-fibrous (Other) | None Detected |
| 06A<br>*132206917-0012* | Old Grit Building Roof - Tan Pearlite Filler under 05A (1 1/2") | Brown<br>Fibrous<br>Homogeneous | 75% Cellulose | 25% Non-fibrous (Other) | None Detected |
| 06B<br>*132206917-0013* | Old Grit Building Roof - Tan Pearlite Filler under 05B (1 1/2") | Brown<br>Fibrous<br>Homogeneous | 75% Cellulose | 25% Non-fibrous (Other) | None Detected |
| 07A<br>*132206917-0014* | Old Grit Building Roof - Black Tar Mop on Concrete under 06A | Black<br>Fibrous<br>Homogeneous | 65% Cellulose | 35% Non-fibrous (Other) | None Detected |
| 07B<br>*132206917-0015* | Old Grit Building Roof - Black Tar Mop on Concrete under 06B | Black<br>Fibrous<br>Homogeneous | 65% Cellulose | 35% Non-fibrous (Other) | None Detected |
| 08A<br>*132206917-0016* | Old Grit Building Roof - Black Tar Flashing at Drip Edge | Black<br>Fibrous<br>Homogeneous | | 85% Non-fibrous (Other) | 15% Chrysotile |

Initial report from: 10/10/2022 08:48:18

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 08B<br>*132206917-0017* | Old Grit Building Roof - Black Tar Flashing at Drip Edge | | | | Positive Stop (Not Analyzed) |
| 09A<br>*132206917-0018* | Grit Building - White Interior Door Caulk | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 09B<br>*132206917-0019* | Grit Building - White Interior Door Caulk | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 10A<br>*132206917-0020* | Grit Building - Black Caulk on Double Door | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 10B<br>*132206917-0021* | Grit Building - Black Caulk on Double Door | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 11A<br>*132206917-0022* | Grit Building - Black Duct Seam Sealer | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 11B<br>*132206917-0023* | Grit Building - Black Duct Seam Sealer | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 12A<br>*132206917-0024* | Grit Building - Electrical Shed Roof Shingle | Gray/Black<br>Fibrous<br>Homogeneous | 8% Glass | 92% Non-fibrous (Other) | None Detected |
| 12B<br>*132206917-0025* | Grit Building - Electrical Shed Roof Shingle | Gray/Black<br>Fibrous<br>Homogeneous | 8% Glass | 92% Non-fibrous (Other) | None Detected |
| 13A<br>*132206917-0026* | Grit Building Roof - Black Seam Sealer on Blower | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 13B<br>*132206917-0027* | Grit Building Roof - Black Seam Sealer on Blower | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 14A<br>*132206917-0028* | UV Building - Brown Wood --> Concrete Garage Door Caulk Interior | Brown<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 14B<br>*132206917-0029* | UV Building - Brown Wood --> Concrete Garage Door Caulk Interior | Brown<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 15A<br>*132206917-0030* | Filter Building - Gray Vent to Concrete Exterior Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 15B<br>*132206917-0031* | Filter Building - Gray Vent to Concrete Exterior Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 16A<br>*132206917-0032* | Filter Building - Brown Interior Door Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 16B<br>*132206917-0033* | Filter Building - Brown Interior Door Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 17A<br>*132206917-0034* | Filter Building - Red Pipe Sealant | Red<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 17B<br>*132206917-0035* | Filter Building - Red Pipe Sealant | Red<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 18A<br>*132206917-0036* | Filter Building - Gray Concrete Floor Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 18B<br>*132206917-0037* | Filter Building - Gray Concrete Floor Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 19A<br>*132206917-0038* | Control Building Exterior - Gray Vent to Brick Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 19B<br>*132206917-0039* | Control Building Exterior - Gray Vent to Brick Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 20A<br>*132206917-0040* | Control Building Exterior - Red Brick Joint Caulk | Red<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 21A<br>*132206917-0041* | Control Building Exterior - White Brick Joint Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 20B<br>*132206917-0042* | Control Building Exterior - Red Brick Joint Caulk | Red<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 21B<br>*132206917-0043* | Control Building Exterior - Gray Brick Joint Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 22A<br>*132206917-0044* | Control Building Exterior - Gray Window Caulk (Concrete to Metal Frame) | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 22B<br>*132206917-0045* | Control Building Exterior - Gray Window Caulk (Concrete to Metal Frame) | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 23A<br>*132206917-0046* | Control Building Exterior - White Window Caulk (Metal to Frame) | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 23B<br>*132206917-0047* | Control Building Exterior - White Window Caulk (Metal to Frame) | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 24A<br>*132206917-0048* | Control Building Exterior - Black Window Sill Vapor Barrier | Brown/Black<br>Fibrous<br>Homogeneous | 65% Cellulose | 35% Non-fibrous (Other) | None Detected |
| 24B<br>*132206917-0049* | Control Building Exterior - Black Window Sill Vapor Barrier | Brown/Black<br>Fibrous<br>Homogeneous | 65% Cellulose | 35% Non-fibrous (Other) | None Detected |
| 25A<br>*132206917-0050* | Control Building Hallway - 2x4 Off-White Ceiling Tile (Older Vintage) | Gray/White<br>Fibrous<br>Homogeneous | 55% Cellulose<br>10% Min. Wool | 35% Non-fibrous (Other) | None Detected |

## Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 25B<br>*132206917-0051* | Control Building Hallway - 2x4 Off-White Ceiling Tile (Older Vintage) | Gray<br>Fibrous<br>Homogeneous | 55% Cellulose<br>10% Min. Wool | 35% Non-fibrous (Other) | None Detected |
| 26A<br>*132206917-0052* | Control Building Hallway - 2x4 White Ceiling Tile (Newer) | Gray/White<br>Fibrous<br>Homogeneous | 55% Cellulose<br>10% Min. Wool | 35% Non-fibrous (Other) | None Detected |
| 26B<br>*132206917-0053* | Control Building Hallway - 2x4 White Ceiling Tile (Newer) | Gray/White<br>Fibrous<br>Homogeneous | 55% Cellulose<br>10% Min. Wool | 35% Non-fibrous (Other) | None Detected |
| 27A<br>*132206917-0054* | Control Building Shop - CMU Wall Joint Sealant (Gray) | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 27B<br>*132206917-0055* | Control Building Shop - CMU Wall Joint Sealant (Gray) | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 28A<br>*132206917-0056* | Control Building Storage - White Mudded Drain Pipe Capling | Gray<br>Fibrous<br>Homogeneous | 18% Cellulose | 82% Non-fibrous (Other) | None Detected |
| 28B<br>*132206917-0057* | Control Building Shop - White Mudded Drain Pipe Capling | Gray<br>Fibrous<br>Homogeneous | 18% Cellulose | 82% Non-fibrous (Other) | None Detected |
| 28C<br>*132206917-0058* | Control Building Shop - White Mudded Drain Pipe Capling | Gray<br>Fibrous<br>Homogeneous | 15% Cellulose | 85% Non-fibrous (Other) | None Detected |
| 29A<br>*132206917-0059* | Control Building Lab - White Mudded Fitting 2" Pipe above Drop Ceiling | Gray/Tan<br>Fibrous<br>Homogeneous | 17% Cellulose<br>7% Min. Wool | 76% Non-fibrous (Other) | None Detected |
| 29B<br>*132206917-0060* | Control Building Bathroom - White Mudded Fitting 2" Pipe above Drop Ceiling | Gray/Tan<br>Fibrous<br>Homogeneous | 6% Cellulose<br>6% Min. Wool | 88% Non-fibrous (Other) | None Detected |
| 29C<br>*132206917-0061* | Control Building Bathroom - White Mudded Fitting 2" Pipe above Drop Ceiling | Gray/Tan<br>Fibrous<br>Homogeneous | 7% Cellulose<br>6% Min. Wool | 87% Non-fibrous (Other) | None Detected |
| 30A<br>*132206917-0062* | Control Building Lab - Gray Wall to Frame Window Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 30B<br>*132206917-0063* | Control Building Lab - Gray Wall to Frame Window Caulk | Gray<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 31A<br>*132206917-0064* | Control Building Lab - White Window Frame Base Wall to Frame Caulk | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 31B<br>*132206917-0065* | Control Building Lab - White Window Frame Base Wall to Frame Caulk | White<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 32A<br>*132206917-0066* | Control Building Lab - Black Lab Counter | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| Sample | Description | Appearance | Non-Asbestos<br>% Fibrous | Non-Asbestos<br>% Non-Fibrous | Asbestos<br>% Type |
|---|---|---|---|---|---|
| 32B<br>*132206917-0067* | Control Building Lab - Black Lab Counter | Black<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 33A<br>*132206917-0068* | Control Building Generator Room - Yellow Glue Daubs | Yellow<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 33B<br>*132206917-0069* | Control Building Generator Room - Yellow Glue Daubs | Yellow<br>Non-Fibrous<br>Homogeneous | | 100% Non-fibrous (Other) | None Detected |

Analyst(s)
*Ramon Buenaventura (68)*

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, ME LB-0039

Initial report from: 10/10/2022 08:48:18

EMSL
EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

# Asbestos Bulk Building Material Chain of Custody

**EMSL Order Number** *(lab use only)*: 132206917

EMSL ANALYTICAL, INC.
5A CONSTITUTION WAY
WOBURN, MA 01801
PHONE: 781-933-8411
FAX: 781-933-8412

**Company Name:** Nobis
**EMSL Customer ID:**
**Street:** 585 Middlesex St
**City:** Lowell
**State or Province:** MA
**Zip/Postal Code:** 01851
**Country:**
**Telephone #:**
**Fax #:**
**Report To (Name):** Alyssa Epstein
**Please Provide Results via:** ☐ Fax ☑ Email
**email Address:** aepstein@nobis-group.com
**Purchase Order Number:** 100541
**Client Project ID:** Newport WWTP
**EMSL Project ID** *(internal use only)*:
**State or Province Collected:**
**CT only** ☐ **Commercial/Taxable** ☐ **Residential/Tax Exempt**
**EMSL-Bill to:** ☑ Same ☐ Different - *If bill to is different note instructions in comment. Third party billing requires written authorization from third party*

**Turnaround Time (TAT) Options Please Check**

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour* ☐ 48 Hour ☑ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

*32 Hour TAT available for select tests only; samples must be submitted by 11:30am.*
*Please call ahead for large projects and/or turnaround times 6 hours or less.*

**PLM - Bulk (reporting limit)**

- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- **Point Count** ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- Point Count w/Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NY ELAP Method 198.1- friable - NY
- ☐ NY ELAP Method 198.6 NOB- non-friable - NY
- ☐ NY ELAP Method 198.8- Vermiculite Surfacing Material
- ☐ OSHA ID-191 Modified
- ☐ EMSL Standard Addition Method

**TEM – Bulk**

- ☐ TEM EPA NOB – EPA 600/R-93/116 Section 2.5.5.1
- ☐ NY ELAP Method 198.4 non-friable - NY
- ☐ Chatfield Protocol (semi-quantitative)
- ☐ TEM % by Mass – EPA 600/R-93/116 Section 2.5.5.2
- ☐ TEM Qualitative via Filtration Prep Technique
- ☐ TEM Qualitative via Drop Mount Prep Technique

**Other tests (please specify)**

- ☐

☑ **Positive Stop – Clearly Identify Homogenous Areas (HA)**
**Date Sampled:** 10/4/22
**Sampler's Name:** Alyssa Epstein
**Sampler's Signature:**

| Sample # | HA # | Sample Location | Material Description |
|---|---|---|---|
| | | | |
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**Client Sample # (s):** 1A - 33B
**Total # of Samples:** 69
**Relinquished by (Client):**
**Date:** 10/5/22
**Time:** 9:40
**Received by (Lab):**
**Date:**
**Time:**
**Comments/Special Instructions:**

SM 945

REC'D EMSL-BOSTON OCT 05 2022

walk in

Page 1 of 5

Controlled Document – COC-01 Asbestos Bulk – R4 – 09/10/2019

EMSL Analytical, Inc.'s (DBA: LA Testing) Laboratory Terms and Conditions are incorporated into this chain of custody by reference in their entirety. Submission of samples to EMSL Analytical Inc. constitutes acceptance and acknowledgment of all terms and conditions.

OrderID: 132206917

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

# Asbestos Bulk Building Material Chain of Custody

**EMSL Order Number** *(lab use only)*: 132206917

EMSL Analytical, Inc.
5A Constitution Way
Woburn, MA 01801
Phone: 781-933-8411
Fax: 781-933-8412

*Additional pages of the Chain of Custody are only necessary if needed for additional sample information*

| Sample # | HA # | Sample Location | Material Description |
|---|---|---|---|
| 1A | | old gmt bldg | grey door caulk exterior |
| 1B | | | " " |
| 2A | | | grey door caulk interior |
| 2B | | | " " |
| 3A | | | white textured ceiling paint |
| 3B | | | " " |
| 3C | | | " " |
| 4A | | sedimentation exterior | white joint caulk |
| 4B | | | " " |
| 5A | | old gmt bldg roof | black tar + gravel (1/2") |
| 5B | | | " " |
| 6A | | | tan pearlite filler under 5A (1/2") |
| 6B | | | " '5B |
| 7A | | | Black tar mop on concrete under 6A |
| 7B | | | " " under 6B |
| 8A | | | Black tar flashing @ drip edge |
| 8B | | | " " |
| 9A | | gmt bldg | white interior door caulk |
| 9B | | | ~~black caulk on double door~~ |
| 10A | | | Black caulk on double door |
| 10B | | | " " |

*Comments/Special Instructions:

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Page 2 of 5 pages

# Asbestos Bulk Building Material Chain of Custody

**EMSL Order Number** *(lab use only)*: 132206917

EMSL Analytical, Inc
5A Constitution Way
Woburn, MA 01801
Phone: 781-933-8411
Fax: 781-933-8412

*Additional pages of the Chain of Custody are only necessary if needed for additional sample information*

| Sample # | HA # | Sample Location | Material Description |
|---|---|---|---|
| 11A | | Grit bldg | Black duct seam sealer |
| 11B | | | " " |
| 12A | | | electrical shed roof shingle |
| 12B | | | " " |
| 13A | | Grit bldg roof | Black seam sealer on blower |
| 13B | | | " " |
| 14A | | UV Bldg | brown wood → concrete garage door caulk interior |
| 14B | | | " " |
| 15A | | Filter bldg | grey vent to concrete exterior caulk |
| 15B | | | " " |
| 16A | | | Brown interior door caulk |
| 16B | | | [illegible] |
| 17A | | | red pipe sealant |
| 17B | | | " " |
| 18A | | | grey concrete floor caulk |
| 18B | | | " " |
| 19A | | control Bldg exterior | grey vent to brick caulk |
| 19B | | | " " |
| 20A | | | red brick joint caulk |
| 21A | | | white brick joint caulk |
| 20B | | | red brick joint caulk |

*Comments/Special Instructions:

REC'D EMSL-BOSTON OCT 05 2022

Page 3 of 5 pages

EMSL
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# Asbestos Bulk Building Material Chain of Custody

**EMSL Order Number** *(lab use only)*:
132206917

EMSL Analytical, Inc.
5a Constitution Way
Woburn, MA 01801
Phone: 781-933-8411
Fax: 781-933-8412

*Additional pages of the Chain of Custody are only necessary if needed for additional sample information*

| Sample # | HA # | Sample Location | Material Description |
|---|---|---|---|
| 21B | | Control Bldg exterior | grey brick joint caulk |
| 22A | | | grey window caulk concrete to metal frame |
| 22B | | | " " |
| 23A | | | white window caulk metal to frame |
| 23B | | | " " |
| 24A | | | Black window sill vapor barrier |
| 24B | | | " " |
| 25A | | control Bldg hallway | offwhite 2x4 ceiling tile older vintage |
| 25B | | | " " |
| 26 A | | | white 2x4 ceiling tile newer |
| 26B | | | " " |
| 27A | | control bldg shop | CMU wall joint sealant grey |
| 27B | | | " " |
| 28A | | Control bldg storage | white mudded drain pipe capling |
| 28B | | Control bldg shop | " " |
| 28 C | | | " " |
| 29A | | control Bldg lab | white mudded fitting 2" pipe above drop ceiling |
| 29B | | control bldg bathroom | " " |
| 29C | | | " " |
| 30A | | Control bldg lab | Grey wall to frame window caulk |
| 3B | | | " " |

*Comments/Special Instructions:

REC'D OCT 05 2022

Page 4 of 5 pages

Controlled Document – COC-01 Asbestos Bulk – R4 – 09/10/2019

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

# Asbestos Bulk Building Material Chain of Custody

**EMSL Order Number** *(lab use only)*: 132206917

EMSL Analytical, Inc.
5A Constitution Way
Woburn, MA 01801
Phone: 781-933-8411
Fax: 781-933-8412

*Additional pages of the Chain of Custody are only necessary if needed for additional sample information*

| Sample # | HA # | Sample Location | Material Description |
|---|---|---|---|
| 31A | | control bldg lab | White window frame base wall to frame caulk |
| 31B | | \| | " " |
| 32A | | \| | Black lab counter |
| 32B | | \| | " " |
| 33A | | Control bldg generator room | yellow glue dabs |
| 33B | | | " " |
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*Comments/Special Instructions:

Page 5 of 5 pages

# Lead Inspection Report

APPENDIX D

The following Table summarizes the LBP test results as conducted by SWA.

| **Summary of LBP Testing** | | | | |
|---|---|---|---|---|
| **Location** | **Substrate** | **Color** | **Component** | **Result (mg/cm2)** |
| **Old Grit Building** | | | | |
| Interior | Concrete | Gray | Floor | <0.1 |
| | Concrete | White | Ceiling | 0.2 |
| | Glaze block | Beige | Wall | <0.1 |
| | Metal | Gray | Door frame | **2.0** |
| | Metal | Beige | Door | <0.1 |
| Exterior | Metal | Brown/red | Door | <0.1 |
| | Metal | Brown | Door frame | 0.7 |
| | Metal | Black | Oil tank | 0.2 |
| **Grit Building** | | | | |
| Exterior | Concrete | Gray | Foundation | <0.1 |
| | Wood | Red | Electric shed | <0.1 |
| | Wood | Red | Electric shed door | <0.1 |
| | Metal | Beige | Door system | <0.1 |
| Interior | Metal | Beige | Door system | <0.1 |
| | Metal | Yellow | Crane system | 0.3 |
| | Metal | Orange | Hopper | <0.1 |
| | Metal | Silver | Valve tank | 0.2 |
| **UV Building** | | | | |
| Exterior | Wood | Red | Upper trim | <0.1 |
| | Wood | Black | Door frame | <0.1 |
| Interior | Wood | Black | Wall stud | <0.1 |
| | Metal | White | Sliding door | <0.1 |
| | Metal | Gray | Frame system | <0.1 |
| **Filter Building** | | | | |
| Exterior | Metal | Gray | Siding | <0.1 |
| | Metal | Brown | Gutters | <0.1 |
| | Metal | Brown | Door | <0.1 |
| Interior | Metal | White | Walls | <0.1 |
| | Metal | Brown | Door system | <0.1 |

**Summary of LBP Testing**

| | | | | |
|---|---|---|---|---|
| | Cinderblock | Blue | Walls | 0.1 |
| | Metal | Blue | Door system | <0.1 |
| | Metal | Green | Structural steel | 0.1 |
| | Metal | Yellow | Ladder | 0.2 |
| | Cinderblock | Green | Walls (elec rm) | 0.1 |
| | Concrete | Gray | Floor (elec rm) | <0.1 |
| **Control Building** | | | | |
| Exterior | Wood | Red | Wall panels | <0.1 |
| | Metal | Beige | Door | <0.1 |
| | Metal | Beige | Garage door frame | **1.8** |
| | Concrete | White | Window frame | <0.1 |
| | Concrete | White | Door frame | <0.1 |
| | Metal | Gray | Door system | <0.1 |
| Chem Feed | Concrete | Gray | Floor | <0.1 |
| | Glaze block | Tan | Wall | 0.4 |
| | Cinderblock | Beige | Wall | <0.1 |
| | Metal | Black | Crane | <0.1 |
| | Metal | White | Corrugated ceiling | **1.1** |
| Garage | Concrete | Yellow | Lower wall | <0.1 |
| | Metal | Gray | Pipe | <0.1 |
| | Metal | Gray | Sliding door | <0.1 |
| | Concrete | Gray | Stairs | <0.1 |
| Hall at work shop | Metal | Red | Joist (plenum) | **2.4** |
| | Cinderblock | Yellow | Wall | <0.1 |
| | Metal | Brown | Door system | **1.2 – 2.2** |
| Storage at work shop | Concrete | Gray | Floor | <0.1 |
| | Wood | Beige | Wall panel | <0.1 |
| | Cinderblock | Yellow | Upper wall | <0.1 |
| | Metal | White | Joist | **1.9** |
| Work shop | Cinderblock | Yellow | Upper wall | <0.1 |
| | Metal | White | Corrugated deck | **1.3** |
| | Metal | White | Joist | **1.7** |
| Motor control room | Cinderblock | Yellow | Wall | <0.1 |

| **Summary of LBP Testing** | | | | |
|---|---|---|---|---|
| | Metal | Brown | Door system | <0.1 |
| Basement | Concrete | Gray | Stairs | <0.1 |
| | Concrete | Yellow/white | Walls | <0.1 |
| Pump room | Concrete | Yellow/white | Walls | <0.1 |
| | Metal | Brown | Door frame | 0.3 |
| | Metal | Yellow | Pumping pipes | 0.2 |

# PCB Laboratory Report

APPENDIX E

con-test®
A Pace Analytical® Laboratory

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

October 13, 2022

Jeff Brunelle
Nobis Engineering
585 Middlesex Street
Lowell, MA 01851

Project Location: Newport, NH
Client Job Number:
Project Number: 100541
Laboratory Work Order Number: 22J0756

Enclosed are results of analyses for samples as received by the laboratory on October 5, 2022. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kerry K. McGee

Kerry K. McGee
Project Manager

# Table of Contents

Nobis Engineering
585 Middlesex Street
Lowell, MA 01851
ATTN: Jeff Brunelle

REPORT DATE: 10/13/2022

PURCHASE ORDER NUMBER: 100541

PROJECT NUMBER: 100541

**ANALYTICAL SUMMARY**

WORK ORDER NUMBER: 22J0756

The results of analyses performed on the following samples submitted to CON-TEST, a Pace Analytical Laboratory, are found in this report.

PROJECT LOCATION: Newport, NH

| FIELD SAMPLE # | LAB ID: | MATRIX | SAMPLE DESCRIPTION | TEST | SUB LAB |
|---|---|---|---|---|---|
| PCB-1 | 22J0756-01 | Caulk | | SW-846 8082A | |
| PCB-2 | 22J0756-02 | Caulk | | SW-846 8082A | |
| PCB-3 | 22J0756-03 | Paint | | SW-846 8082A | |
| PCB-4 | 22J0756-04 | Caulk | | SW-846 8082A | |
| PCB-5 | 22J0756-05 | Caulk | | SW-846 8082A | |
| PCB-6 | 22J0756-06 | Paint | | SW-846 8082A | |

## CASE NARRATIVE SUMMARY

All reported results are within defined laboratory quality control objectives unless listed below or otherwise qualified in this report.

### SW-846 8082A

**Qualifications:**

**DL-03**

Elevated reporting limit due to matrix interference.

**Analyte & Samples(s) Qualified:**

22J0756-04[PCB-4]

**O-27**

Elevated reporting limit due to sample matrix interference. Multiple extract clean-up procedures were performed on this sample, but they did not sufficiently remove the interference to meet the requested reporting limit.

**Analyte & Samples(s) Qualified:**

22J0756-05[PCB-5]

**P-02**

Sample RPD between primary and confirmatory analysis exceeded 40%. Per EPA method 8000, the lower value was reported due to obvious chromatographic interference on the column with the higher result.

**Analyte & Samples(s) Qualified:**

**Aroclor-1248**
22J0756-03[PCB-3], 22J0756-06[PCB-6]

**S-01**

The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences.

**Analyte & Samples(s) Qualified:**

**Decachlorobiphenyl**
22J0756-01[PCB-1], 22J0756-02[PCB-2], 22J0756-04[PCB-4]

**Decachlorobiphenyl [2C]**
22J0756-01[PCB-1], 22J0756-02[PCB-2], 22J0756-04[PCB-4]

**Tetrachloro-m-xylene**
22J0756-01[PCB-1], 22J0756-02[PCB-2], 22J0756-04[PCB-4]

**Tetrachloro-m-xylene [2C]**
22J0756-01[PCB-1], 22J0756-02[PCB-2], 22J0756-04[PCB-4]

The results of analyses reported only relate to samples submitted to Con-Test, a Pace Analytical Laboratory, for testing.
I certify that the analyses listed above, unless specifically listed as subcontracted, if any, were performed under my direction according to the approved methodologies listed in this document, and that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Lisa Worthington

Lisa A. Worthington
Technical Representative

Project Location: Newport, NH | Sample Description: | Work Order: 22J0756

Date Received: 10/5/2022

**Field Sample #: PCB-1** | Sampled: 10/4/2022 09:15

**Sample ID: 22J0756-01**

Sample Matrix: Caulk

### Polychlorinated Biphenyls with 3540 Soxhlet Extraction

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1221 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1232 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1242 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1248 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1254 [2] | 120 | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1260 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1262 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |
| Aroclor-1268 [1] | ND | 19 | mg/Kg | 100 | | SW-846 8082A | 10/6/22 | 10/11/22 15:34 | JEA |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| **Decachlorobiphenyl [1]** | * | 30-150 | S-01 | 10/11/22 15:34 |
| **Decachlorobiphenyl [2]** | * | 30-150 | S-01 | 10/11/22 15:34 |
| **Tetrachloro-m-xylene [1]** | * | 30-150 | S-01 | 10/11/22 15:34 |
| **Tetrachloro-m-xylene [2]** | * | 30-150 | S-01 | 10/11/22 15:34 |

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39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

| | | |
|---|---|---|
| Project Location: Newport, NH | Sample Description: | Work Order: 22J0756 |
| Date Received: 10/5/2022 | | |
| **Field Sample #: PCB-2** | Sampled: 10/4/2022 09:30 | |
| **Sample ID: 22J0756-02** | | |
| Sample Matrix: Caulk | | |

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1221 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1232 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1242 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1248 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1254 [1] | 26000 | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1260 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1262 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |
| Aroclor-1268 [1] | ND | 1900 | mg/Kg | 10000 | | SW-846 8082A | 10/6/22 | 10/12/22 20:30 | SB3 |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| **Decachlorobiphenyl [1]** | * | 30-150 | S-01 | 10/12/22 20:30 |
| **Decachlorobiphenyl [2]** | * | 30-150 | S-01 | 10/12/22 20:30 |
| **Tetrachloro-m-xylene [1]** | * | 30-150 | S-01 | 10/12/22 20:30 |
| **Tetrachloro-m-xylene [2]** | * | 30-150 | S-01 | 10/12/22 20:30 |

Project Location: Newport, NH
Sample Description:
Work Order: 22J0756

Date Received: 10/5/2022

**Field Sample #: PCB-3**
Sampled: 10/4/2022 10:05

**Sample ID: 22J0756-03**

Sample Matrix: Paint

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1221 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1232 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1242 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1248 [1] | 7.1 | 2.0 | mg/Kg | 4 | P-02 | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1254 [2] | 18 | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1260 [1] | 5.0 | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1262 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |
| Aroclor-1268 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 4:54 | JEA |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| Decachlorobiphenyl [1] | 109 | 30-150 | | 10/9/22 4:54 |
| Decachlorobiphenyl [2] | 103 | 30-150 | | 10/9/22 4:54 |
| Tetrachloro-m-xylene [1] | 85.1 | 30-150 | | 10/9/22 4:54 |
| Tetrachloro-m-xylene [2] | 83.2 | 30-150 | | 10/9/22 4:54 |

con-test
A Pace Analytical® Laboratory

39 Spruce Street * East Longmeadow, MA 01028 * FAX 413/525-6405 * TEL. 413/525-2332

Project Location: Newport, NH
Sample Description:
Work Order: 22J0756

Date Received: 10/5/2022

**Field Sample #: PCB-4**
Sampled: 10/4/2022 10:20

**Sample ID: 22J0756-04**

Sample Matrix: Caulk

Sample Flags: DL-03

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1221 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1232 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1242 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1248 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1254 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1260 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1262 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |
| Aroclor-1268 [1] | ND | 38 | mg/Kg | 200 | | SW-846 8082A | 10/6/22 | 10/11/22 16:09 | JEA |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| **Decachlorobiphenyl [1]** | * | 30-150 | S-01 | 10/11/22 16:09 |
| **Decachlorobiphenyl [2]** | * | 30-150 | S-01 | 10/11/22 16:09 |
| **Tetrachloro-m-xylene [1]** | * | 30-150 | S-01 | 10/11/22 16:09 |
| **Tetrachloro-m-xylene [2]** | * | 30-150 | S-01 | 10/11/22 16:09 |

Project Location: Newport, NH　　Sample Description:　　Work Order: 22J0756

Date Received: 10/5/2022

**Field Sample #: PCB-5**　　Sampled: 10/4/2022 10:25

**Sample ID: 22J0756-05**

Sample Matrix: Caulk

Sample Flags: O-27

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1221 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1232 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1242 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1248 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1254 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1260 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1262 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |
| Aroclor-1268 [1] | ND | 3.9 | mg/Kg | 20 | | SW-846 8082A | 10/6/22 | 10/12/22 12:34 | JEA |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| Decachlorobiphenyl [1] | 94.4 | 30-150 | | 10/12/22 12:34 |
| Decachlorobiphenyl [2] | 93.1 | 30-150 | | 10/12/22 12:34 |
| Tetrachloro-m-xylene [1] | 83.2 | 30-150 | | 10/12/22 12:34 |
| Tetrachloro-m-xylene [2] | 81.8 | 30-150 | | 10/12/22 12:34 |

Project Location: Newport, NH Sample Description: Work Order: 22J0756

Date Received: 10/5/2022

**Field Sample #: PCB-6** Sampled: 10/4/2022 10:30

**Sample ID: 22J0756-06**

Sample Matrix: Paint

**Polychlorinated Biphenyls with 3540 Soxhlet Extraction**

| Analyte | Results | RL | Units | Dilution | Flag/Qual | Method | Date Prepared | Date/Time Analyzed | Analyst |
|---|---|---|---|---|---|---|---|---|---|
| Aroclor-1016 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1221 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1232 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1242 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1248 [1] | 6.6 | 2.0 | mg/Kg | 4 | P-02 | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1254 [2] | 17 | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1260 [1] | 4.7 | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1262 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |
| Aroclor-1268 [1] | ND | 2.0 | mg/Kg | 4 | | SW-846 8082A | 10/6/22 | 10/9/22 5:11 | JEA |

| Surrogates | % Recovery | Recovery Limits | Flag/Qual | |
|---|---|---|---|---|
| Decachlorobiphenyl [1] | 108 | 30-150 | | 10/9/22 5:11 |
| Decachlorobiphenyl [2] | 102 | 30-150 | | 10/9/22 5:11 |
| Tetrachloro-m-xylene [1] | 86.6 | 30-150 | | 10/9/22 5:11 |
| Tetrachloro-m-xylene [2] | 84.6 | 30-150 | | 10/9/22 5:11 |

# Sample Extraction Data

**Prep Method: SW-846 3540C** **Analytical Method: SW-846 8082A**

| Lab Number [Field ID] | Batch | Initial [g] | Final [mL] | Date |
|---|---|---|---|---|
| 22J0756-01 [PCB-1] | B319034 | 0.523 | 10.0 | 10/06/22 |
| 22J0756-02 [PCB-2] | B319034 | 0.519 | 10.0 | 10/06/22 |
| 22J0756-04 [PCB-4] | B319034 | 0.527 | 10.0 | 10/06/22 |
| 22J0756-05 [PCB-5] | B319034 | 0.511 | 10.0 | 10/06/22 |

**Prep Method: SW-846 3540C** **Analytical Method: SW-846 8082A**

| Lab Number [Field ID] | Batch | Initial [g] | Final [mL] | Date |
|---|---|---|---|---|
| 22J0756-03 [PCB-3] | B319036 | 0.202 | 10.0 | 10/06/22 |
| 22J0756-06 [PCB-6] | B319036 | 0.205 | 10.0 | 10/06/22 |

## QUALITY CONTROL

### Polychlorinated Biphenyls with 3540 Soxhlet Extraction - Quality Control

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch B319034 - SW-846 3540C** | | | | | | | | | | |
| **Blank (B319034-BLK1)** | | | | Prepared: 10/06/22 Analyzed: 10/10/22 | | | | | | |
| Aroclor-1016 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1016 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1221 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1221 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1232 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1232 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1242 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1242 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1248 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1248 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1254 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1254 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1260 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1260 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1262 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1262 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1268 | ND | 0.19 | mg/Kg | | | | | | | |
| Aroclor-1268 [2C] | ND | 0.19 | mg/Kg | | | | | | | |
| Surrogate: Decachlorobiphenyl | *4.69* | | mg/Kg | 3.79 | | 124 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *3.94* | | mg/Kg | 3.79 | | 104 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *3.54* | | mg/Kg | 3.79 | | 93.3 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *3.57* | | mg/Kg | 3.79 | | 94.1 | 30-150 | | | |
| **LCS (B319034-BS1)** | | | | Prepared: 10/06/22 Analyzed: 10/10/22 | | | | | | |
| Aroclor-1016 | 3.1 | 0.19 | mg/Kg | 3.89 | | 79.2 | 40-140 | | | |
| Aroclor-1016 [2C] | 3.4 | 0.19 | mg/Kg | 3.89 | | 86.3 | 40-140 | | | |
| Aroclor-1260 | 3.1 | 0.19 | mg/Kg | 3.89 | | 80.0 | 40-140 | | | |
| Aroclor-1260 [2C] | 3.1 | 0.19 | mg/Kg | 3.89 | | 78.6 | 40-140 | | | |
| Surrogate: Decachlorobiphenyl | *4.80* | | mg/Kg | 3.89 | | 123 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *4.09* | | mg/Kg | 3.89 | | 105 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *3.67* | | mg/Kg | 3.89 | | 94.3 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *3.68* | | mg/Kg | 3.89 | | 94.7 | 30-150 | | | |
| **LCS Dup (B319034-BSD1)** | | | | Prepared: 10/06/22 Analyzed: 10/10/22 | | | | | | |
| Aroclor-1016 | 2.9 | 0.19 | mg/Kg | 3.80 | | 75.7 | 40-140 | 6.80 | 30 | |
| Aroclor-1016 [2C] | 3.2 | 0.19 | mg/Kg | 3.80 | | 83.0 | 40-140 | 6.27 | 30 | |
| Aroclor-1260 | 2.9 | 0.19 | mg/Kg | 3.80 | | 76.3 | 40-140 | 7.10 | 30 | |
| Aroclor-1260 [2C] | 2.9 | 0.19 | mg/Kg | 3.80 | | 75.8 | 40-140 | 5.82 | 30 | |
| Surrogate: Decachlorobiphenyl | *4.54* | | mg/Kg | 3.80 | | 120 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *3.92* | | mg/Kg | 3.80 | | 103 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *3.50* | | mg/Kg | 3.80 | | 92.1 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *3.56* | | mg/Kg | 3.80 | | 93.8 | 30-150 | | | |

## QUALITY CONTROL

### Polychlorinated Biphenyls with 3540 Soxhlet Extraction - Quality Control

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch B319036 - SW-846 3540C** | | | | | | | | | | |
| **Blank (B319036-BLK1)** | | | | Prepared: 10/06/22 Analyzed: 10/09/22 | | | | | | |
| Aroclor-1016 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1016 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1221 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1221 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1232 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1232 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1242 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1242 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1248 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1248 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1254 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1254 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1260 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1260 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1262 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1262 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1268 | ND | 0.48 | mg/Kg | | | | | | | |
| Aroclor-1268 [2C] | ND | 0.48 | mg/Kg | | | | | | | |
| Surrogate: Decachlorobiphenyl | *10.6* | | mg/Kg | 9.58 | | 111 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *9.96* | | mg/Kg | 9.58 | | 104 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *8.27* | | mg/Kg | 9.58 | | 86.3 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *8.01* | | mg/Kg | 9.58 | | 83.6 | 30-150 | | | |
| **LCS (B319036-BS1)** | | | | Prepared: 10/06/22 Analyzed: 10/09/22 | | | | | | |
| Aroclor-1016 | 2.4 | 0.50 | mg/Kg | 2.50 | | 97.8 | 40-140 | | | |
| Aroclor-1016 [2C] | 2.4 | 0.50 | mg/Kg | 2.50 | | 96.1 | 40-140 | | | |
| Aroclor-1260 | 2.2 | 0.50 | mg/Kg | 2.50 | | 88.0 | 40-140 | | | |
| Aroclor-1260 [2C] | 2.2 | 0.50 | mg/Kg | 2.50 | | 87.9 | 40-140 | | | |
| Surrogate: Decachlorobiphenyl | *11.4* | | mg/Kg | 9.99 | | 114 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *10.7* | | mg/Kg | 9.99 | | 107 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *8.65* | | mg/Kg | 9.99 | | 86.6 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *8.37* | | mg/Kg | 9.99 | | 83.7 | 30-150 | | | |
| **LCS Dup (B319036-BSD1)** | | | | Prepared: 10/06/22 Analyzed: 10/09/22 | | | | | | |
| Aroclor-1016 | 2.5 | 0.50 | mg/Kg | 2.49 | | 102 | 40-140 | 4.14 | 30 | |
| Aroclor-1016 [2C] | 2.4 | 0.50 | mg/Kg | 2.49 | | 97.2 | 40-140 | 0.733 | 30 | |
| Aroclor-1260 | 2.2 | 0.50 | mg/Kg | 2.49 | | 89.1 | 40-140 | 0.956 | 30 | |
| Aroclor-1260 [2C] | 2.2 | 0.50 | mg/Kg | 2.49 | | 87.6 | 40-140 | 0.741 | 30 | |
| Surrogate: Decachlorobiphenyl | *11.3* | | mg/Kg | 9.96 | | 113 | 30-150 | | | |
| Surrogate: Decachlorobiphenyl [2C] | *10.6* | | mg/Kg | 9.96 | | 106 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene | *9.06* | | mg/Kg | 9.96 | | 91.0 | 30-150 | | | |
| Surrogate: Tetrachloro-m-xylene [2C] | *8.74* | | mg/Kg | 9.96 | | 87.8 | 30-150 | | | |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**PCB-1**

| | | | |
|---|---|---|---|
| Lab Sample ID: | 22J0756-01 | Date(s) Analyzed: | 10/11/2022 10/11/2022 |
| Instrument ID (1): | ECD11 | Instrument ID (2): | ECD11 |
| GC Column (1): | ID: (mm) | GC Column (2): | ID: (mm) |

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1254 | 1 | 0.000 | 0.000 | 0.000 | 110 | |
| | 2 | 0.000 | 0.000 | 0.000 | 120 | 8.7 |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**PCB-2**

| | | | | |
|---|---|---|---|---|
| Lab Sample ID: | 22J0756-02 | Date(s) Analyzed: | 10/12/2022 | 10/12/2022 |
| Instrument ID (1): | ECD11 | Instrument ID (2): | ECD11 | |

GC Column (1): ID: (mm) GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1254 | 1 | 0.000 | 0.000 | 0.000 | 26000 | |
| | 2 | 0.000 | 0.000 | 0.000 | 25000 | 3.9 |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**PCB-3**

Lab Sample ID: 22J0756-03

Date(s) Analyzed: 10/09/2022 10/09/2022

Instrument ID (1): ECD10

Instrument ID (2): ECD10

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1248 | 1 | 0.000 | 0.000 | 0.000 | 7.1 | |
| | 2 | 0.000 | 0.000 | 0.000 | 11 | 43.1 |
| Aroclor-1254 | 1 | 0.000 | 0.000 | 0.000 | 18 | |
| | 2 | 0.000 | 0.000 | 0.000 | 18 | 0.0 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 5.0 | |
| | 2 | 0.000 | 0.000 | 0.000 | 4.8 | 4.1 |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**PCB-6**

Lab Sample ID: 22J0756-06

Date(s) Analyzed: 10/09/2022 10/09/2022

Instrument ID (1): ECD10

Instrument ID (2): ECD10

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1248 | 1 | 0.000 | 0.000 | 0.000 | 6.6 | |
| | 2 | 0.000 | 0.000 | 0.000 | 11 | 50.0 |
| Aroclor-1254 | 1 | 0.000 | 0.000 | 0.000 | 16 | |
| | 2 | 0.000 | 0.000 | 0.000 | 17 | 6.1 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 4.7 | |
| | 2 | 0.000 | 0.000 | 0.000 | 4.6 | 2.2 |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**LCS**

Lab Sample ID: B319034-BS1

Date(s) Analyzed: 10/10/2022 10/10/2022

Instrument ID (1): ECD4

Instrument ID (2): ECD4

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1016 | 1 | 0.000 | 0.000 | 0.000 | 3.1 | |
| | 2 | 0.000 | 0.000 | 0.000 | 3.4 | 9.2 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 3.1 | |
| | 2 | 0.000 | 0.000 | 0.000 | 3.1 | 0.0 |

# IDENTIFICATION SUMMARY
# FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**LCS Dup**

Lab Sample ID: B319034-BSD1

Date(s) Analyzed: 10/10/2022 10/10/2022

Instrument ID (1): ECD4

Instrument ID (2): ECD4

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1016 | 1 | 0.000 | 0.000 | 0.000 | 2.9 | |
| | 2 | 0.000 | 0.000 | 0.000 | 3.2 | 9.8 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 2.9 | |
| | 2 | 0.000 | 0.000 | 0.000 | 2.9 | 0.0 |

# IDENTIFICATION SUMMARY
# FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**LCS**

Lab Sample ID: B319036-BS1

Date(s) Analyzed: 10/09/2022 10/09/2022

Instrument ID (1): ECD10

Instrument ID (2): ECD10

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1016 | 1 | 0.000 | 0.000 | 0.000 | 2.4 | |
| | 2 | 0.000 | 0.000 | 0.000 | 2.4 | 0.0 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 2.2 | |
| | 2 | 0.000 | 0.000 | 0.000 | 2.2 | 0.0 |

# IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

*SW-846 8082A*

**LCS Dup**

Lab Sample ID: B319036-BSD1

Date(s) Analyzed: 10/09/2022 10/09/2022

Instrument ID (1): ECD10

Instrument ID (2): ECD10

GC Column (1): ID: (mm)

GC Column (2): ID: (mm)

| ANALYTE | COL | RT | RT WINDOW | | CONCENTRATION | %RPD |
|---|---|---|---|---|---|---|
| | | | FROM | TO | | |
| Aroclor-1016 | 1 | 0.000 | 0.000 | 0.000 | 2.5 | |
| | 2 | 0.000 | 0.000 | 0.000 | 2.4 | 8.0 |
| Aroclor-1260 | 1 | 0.000 | 0.000 | 0.000 | 2.2 | |
| | 2 | 0.000 | 0.000 | 0.000 | 2.2 | 0.0 |

## FLAG/QUALIFIER SUMMARY

| | |
|---|---|
| * | QC result is outside of established limits. |
| † | Wide recovery limits established for difficult compound. |
| ‡ | Wide RPD limits established for difficult compound. |
| # | Data exceeded client recommended or regulatory level |
| ND | Not Detected |
| RL | Reporting Limit is at the level of quantitation (LOQ) |
| DL | Detection Limit is the lower limit of detection determined by the MDL study |
| MCL | Maximum Contaminant Level |

Percent recoveries and relative percent differences (RPDs) are determined by the software using values in the calculation which have not been rounded.

No results have been blank subtracted unless specified in the case narrative section.

| | |
|---|---|
| DL-03 | Elevated reporting limit due to matrix interference. |
| O-27 | Elevated reporting limit due to sample matrix interference. Multiple extract clean-up procedures were performed on this sample, but they did not sufficiently remove the interference to meet the requested reporting limit. |
| P-02 | Sample RPD between primary and confirmatory analysis exceeded 40%. Per EPA method 8000, the lower value was reported due to obvious chromatographic interference on the column with the higher result. |
| S-01 | The surrogate recovery for this sample is not available due to sample dilution below the surrogate reporting limit required from high analyte concentration and/or matrix interferences. |

## CERTIFICATIONS

**Certified Analyses included in this Report**

| Analyte | Certifications |
|---|---|

**No certified Analyses included in this Report**

Con-Test, a Pace Environmental Laboratory, operates under the following certifications and accreditations:

| Code | Description | Number | Expires |
|---|---|---|---|

Pace Analytical®

# CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields

LAB USE ONLY- Affix Workorder/Login Label Here or List Pace Workorder Number or MTJL Log-in Number Here

2250756

**ALL SHADED AREAS are for LAB USE ONLY**

Company: Nobis
Billing Information: AP@nobis-group.com
Address: 585 Middlesex St Lowell
Report To: Jeff Brunelle
Email To: JBrunelle@nobisgroup.com
Copy To: aepstein@nobis-group.com
Site Collection Info/Address: Newport, NH
Customer Project Name/Number: Newport WWTP 100541
State: NH / County/City: Newport
Time Zone Collected: [ ] PT [ ] MT [ ] CT [X] ET
Phone:
Email:
Site/Facility ID #:
Compliance Monitoring? [ ] Yes [ ] No
Collected By (print): AEpstein
Purchase Order #: 100541
Quote #:
DW PWS ID #:
DW Location Code:
Collected By (signature):
Turnaround Date Required:
Immediately Packed on Ice: [ ] Yes [ ] No
Sample Disposal: [ ] Dispose as appropriate [ ] Return [ ] Archive: ______ [ ] Hold: ______
Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [X] 5 Day (Expedite Charges Apply)
Field Filtered (if applicable): [ ] Yes [ ] No
Analysis: ______

Container Preservative Type **

Lab Project Manager:

** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid, (B) ammonium sulfate, (C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other ______

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

| Customer Sample ID | Matrix * | Comp / Grab | Collected (or Composite Start) |  | Composite End |  | Res Cl | # of Ctns | Analyses: PCB soxhlet | Lab Sample # / Comments |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Date | Time | Date | Time |  |  |  |  |
| PCB-1 | OT | G | 10/4/22 | 915 |  |  |  | 1 | X | 1 |
| PCB-2 | \| | \| | \| | 930 |  |  |  | 1 | X | 2 |
| PCB-3 | \| | \| | \| | 1005 |  |  |  | 1 | X | 3 |
| PCB-4 | \| | \| | \| | 1020 |  |  |  | 1 | X | 4 |
| PCB-5 | \| | \| | \| | 1025 |  |  |  | 1 | X | 5 |
| PCB-6 | \| | \| | \| | 1030 |  |  |  | 1 | X | 6 |

Lab Profile/Line:

Lab Sample Receipt Checklist:
Custody Seals Present/Intact Y N [✓ NA]
Custody Signatures Present Y N [✓ NA]
Collector Signature Present [✓ Y] N NA
Bottles Intact [✓ Y] N NA
Correct Bottles [✓ Y] N NA
Sufficient Volume [✓ Y] N NA
Samples Received on Ice [✓ Y] N NA
VOA - Headspace Acceptable Y N [✓ NA]
USDA Regulated Soils Y N [✓ NA]
Samples in Holding Time [✓ Y] N NA
Residual Chlorine Present Y N [✓ NA]
Cl Strips: ______
Sample pH Acceptable Y N [✓ NA]
pH Strips: ______
Sulfide Present Y N [✓ NA]
Lead Acetate Strips: ______

LAB USE ONLY:
Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:

Type of Ice Used: [✓ Wet] Blue Dry None
Packing Material Used:
Radchem sample(s) screened (<500 cpm): Y N NA

SHORT HOLDS PRESENT (<72 hours): Y [✓ N] N/A
Lab Tracking #: 2674541
Samples received via: FEDEX UPS Client Courier [✓ Pace Courier]

Lab Sample Temperature Info:
Temp Blank Received: Y N NA
Therm ID#: ______
Cooler 1 Temp Upon Receipt: ____oC
Cooler 1 Therm Corr. Factor: ____oC
Cooler 1 Corrected Temp: ____oC
Comments: 2.3

| Relinquished by/Company: (Signature) | Date/Time: | Received by/Company: (Signature) | Date/Time: | MTJL LAB USE ONLY |
|---|---|---|---|---|
|  | 10/5/22 1401 |  | 10/5/22 1401 | Table #: |
|  | 10/5/22 1705 | 2.3 | 10/5/22 1705 | Acctnum:<br>Template:<br>Prelogin: |
|  |  |  |  | PM:<br>PB: |

Trip Blank Received: Y N NA
HCL MeOH TSP Other

Non Conformance(s): YES / NO
Page: ______ of: ______

# Appendix G
# Wetlands Delineation

Marc E. Jacobs, *CSS, CWS, PWS, CPESC*
*Professional Wetland / Soil Scientist*
jacobs2wetsoil2004@yahoo.com

Via email to jacob.schactman@wright-pierce.com

November 21, 2022

Mr. Jacob Shactman
Wright-Pierce
230 Commerce Way, Suite 302
Portsmouth, NH 03801

RE: Newport Waste Water Treatment Facility
Putnam Road
Newport, NH
**W-P #20828**

Dear Mr. Shactman,

The following remarks summarize our preliminary observations made during the delineation of jurisdictional wetlands adjacent to the Sugar River at the above-referenced location. A site inspection was conducted on August 31, 2022 to identify and delineate jurisdictional wetlands according to the New Hampshire Department of Environmental Services (NHDES) – Code of Administrative Rules, Section Env-Wt 100 – 900 and the Town of Newport Zoning Ordinance – Article VII – Section 700. The area-of-interest (AOI) involved lands within the yellow polygon as depicted on Figure 1 below.

**FIGURE 1**

General Methodology

Jurisdictional wetlands were identified and wetland-upland boundaries within the AOI were delineated in the field based upon on-the-ground investigations using the technical guidance cited in the certification statement below to evaluate soils, signs of hydrology and vegetation communities. Typical survey flags were then placed at random intervals to mark wetland-upland boundaries in the field. Ordinary high water (OHW) associated with the Sugar River was identified by others.

Each flag bears a unique letter and number to assist in subsequent field location by instrument survey as well as to ascertain exact field position when referencing site plans during any future site visits or during review of this report. The flags are solid color pink and are labeled A1-A87, B1-B51 and C1-C32. Whereas portions of the AOI have been altered, the delineation relied on soils and utilized protocols for altered wetlands as well as best professional judgment and prior experience with similar conditions to ascertain the presence of wetlands and establish the wetland-upland boundary where necessary.[1] Site alterations do not appear to be recent.[2]

General Wetland Descriptions

The Newport Waste Water Treatment facility sits adjacent to, and within the flood plain of, the Sugar River, between the river and Route 10. Flag series 'A' and 'B' generally identify wetlands associated with the historic channel of the Sugar River. The wetlands predominantly possess a substrate of poorly drained hydric soils but very poorly drained mineral hydric soils also exist in some locations.

The wetland-upland boundary appears to be man-made by filling in some locations, especially adjacent to flags A1-A8, A58-A61±, A67-A77±, A80-A87± and B29-B32±. This filling may have created an 'oxbow'. Our preliminary observations suggest that the Sugar River was channelized and straightened along this reach and the fill may have been placed at that time to further encourage the river to flow in the man-made channel while providing access to the facility. Oxbows frequently receive river flow during flooding events but the fill along the 'A' series flags likely precludes flow through, or backflow into, this wetland area. The portion of the oxbow that is identified by the 'B' series flags likely still receives backflow from the river during flooding events. The potential for backflow of the river into either area is dependent upon the severity of the flooding event however. The fill between wetlands 'A' and 'B' bisected the oxbow. We were unable to find a culvert in the fill between wetland areas 'A' and 'B'.

We observed a possible culvert that discharges intermittently into the wetland identified by the 'A' series flags between flags A68-A69. No flow was observed into the area during site investigations and it appears that any flow likely involves storm water runoff although additional investigations would be necessary to confirm this. (The culvert end was covered by automobile tires. A retaining wall consisting of automobile and truck tires exists along the east side of wetland 'A', closest to Route 10, between wetland flags A67-A77±.) We were unable to find a culvert beneath the access road to the waste water treatment facility (although we did observe a nearby stream channel within the wetland area). The lack of a culvert beneath the access road suggests that wetland area 'A' may be acting as a storm water detention basin of sorts. The soil materials beneath the access road in this area may however be coarse textured and pervious and thus encouraging any surface water from wetland area 'A' to seep through the fill and eventually discharge to the river on the west side.

[1] Site alterations within jurisdictional wetlands may be considered violations of N.H. RSA 482-A: if they were undertaken without permits after 1969.

[2] For the purposes of this report, recent (filling, excavation, regrading, stump removal or other land altering activity) is defined as having occurred within the previous year and is an estimate based upon preliminary observations only. Additional investigations would be necessary to confirm the presence, date of placement and extent of any filled wetlands.

Flags C1 through C32 identify wetlands associated with an intermittent stream that originates on the east side of Route 10 and is conveyed on to the subject property between flags C10-C11 by a 36-inch diameter reinforced concrete pipe (RCP) with a stone and mortar headwall. Flags C6-C10 represent a man-made wetland-upland boundary located at the toe-of-fill from a nearby gravel driveway.

There is a small beaver dam adjacent to wetland flag C22. The dam has been abandoned but is still impounding a small area of surface water. The impoundment previously extended into areas of the site that consist of mowed turf grasses that are exposed now that the beaver dam has been abandoned. In this area of the site the delineation is based solely upon the presence of poorly drained hydric soils as per the Newport zoning ordinance and typical protocols for altered wetlands. It is unclear if the area along flags C18-C22± would support poorly drained hydric soils or wetlands if not for the beaver impoundment.

Wetlands along flags C27-C32 also represent altered conditions. A snowmobile trail passes through this area and the area appears to get mowed regularly as part of trail maintenance. The sewage lagoons at this facility are identified as wetlands on some publicly available resources but we did not flag the lagoons as jurisdictional wetlands.

## Vernal Pools

Vernal pools are temporary or seasonal bodies of water that provide essential breeding habitat for certain amphibians and invertebrates as well as important supporting habitat for numerous other species, especially reptiles such as turtles. The potential for wetlands 'A' and 'B' to provide vernal pool habitat according to the NH Code of Administrative Rules – Env-Wt 103.64, Env-Wt 104.15 and Env-Wt 104.44 cannot be conclusively ruled out. The likelihood of these wetlands providing vernal pool habitat, especially significant habitat, are low based upon our preliminary observations and previous experience.[3] However, due to the time of year when our investigations were conducted, additional investigations during a typical spring would be necessary to definitively determine the ability of any wetland area to provide vernal pool habitat.

## Wetland Classification

Dominant wetland areas within the AOI were classified according to the National Wetland Inventory and Cowardin system. The 'A' series flags generally represent the boundary of palustrine emergent (PEM) and palustrine scrub-shrub (PSS) wetlands, which could be described as a 'best fit' considering the altered nature of this area. The 'B' series flags generally represent the boundary of PSS wetlands, although small areas of palustrine forested (PFO) wetlands exist as do areas of PEM, especially near the river. The Sugar River is classified as Riverine, Lower Perennial, Unconsolidated Shore, Seasonally Flooded (R2USC).

## Priority Resource Areas

Priority resource areas (PRA) are jurisdictional areas that also have documented occurrences of protected species or habitat, are bogs, floodplain adjacent to a tier 3 or higher watercourse, designated prime wetland or duly-established 100-foot buffer to a designated prime wetland, sand dune, tidal wetland, tidal water or undeveloped tidal buffer zone. With the possible exception of sensitive plant or animal species, as may be reported by the Natural Heritage Bureau (NHB), our observations suggest and remote sensing indicates that no PRA's are found within the AOI.

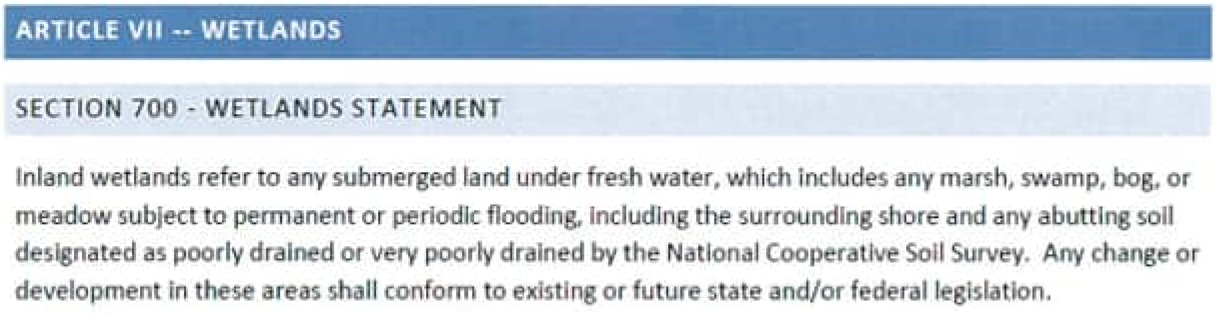
---

[3] For the purposes of this report, significant refers to vernal pools that support a specific abundance of vernal pool amphibian indicator species/criteria such as those identified in 38 Maine Revised Statues Annotated (MRSA) §§480-A to 480-FF and Code of Maine Regulations (CMR) Chapter 335. The state of New Hampshire has no similar criteria.

We have not contacted the NHB for information regarding possible rare, threatened or endangered plant or animal species. An inquiry to the NHB that results in a report which identifies any rare, threatened or endangered species would also involve a PRA. Designation as a PRA has potential ramifications for permitting as well as the need for compensatory mitigation if impacts to jurisdictional areas are proposed. Projects proposing impacts to PRA's are automatically elevated to major project status unless/until the project is designed to the satisfaction of the NHB and NH Fish & Game (NHF&G). If impacts to a PRA cannot be avoided, compensatory mitigation is required regardless of whether other impact thresholds that customarily trigger the need for compensatory mitigation are reached.

Local Zoning

The Town of Newport Zoning Ordinance regarding wetlands has been copied in its entirety and inserted below. The zoning defers to state and federal regulations where development is concerned.



## ARTICLE VII -- WETLANDS

### SECTION 700 - WETLANDS STATEMENT

Inland wetlands refer to any submerged land under fresh water, which includes any marsh, swamp, bog, or meadow subject to permanent or periodic flooding, including the surrounding shore and any abutting soil designated as poorly drained or very poorly drained by the National Cooperative Soil Survey. Any change or development in these areas shall conform to existing or future state and/or federal legislation.

The above is meant as an overview and is tailored to this AOI. You may wish to consult the Town of Newport or our office for additional guidance as may be needed for design and permitting efforts associated with any project that proposes wetland impacts.

Certification Note

The following certification note should be inserted into any drawings that reflect the delineated wetland-upland boundary:

Man-made and natural jurisdictional wetland boundaries were delineated by Marc Jacobs, Certified Wetland Scientist number 090, in August 2022 according to the standards of the US Army Corps of Engineers – 1987 Wetlands Delineation Manual; the 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region; and the Code of Administrative Rules, NH Department of Environmental Services - Wetlands Bureau – Env Wt 100-900. Predominant hydric soils were identified utilizing the Field Indicators for Identifying Hydric Soils in New England, Version 4, June 2020 and the Field Indicators of Hydric Soils in the United States, Version 8, 2016. The status of vegetation as hydrophytic was determined according to the U.S. Army Corps of Engineers - Northcentral and Northeast 2020 Regional Wetland Plant List. Copies of site plans depicting the wetland delineation which have been reviewed by the wetland scientist are individually stamped, signed and dated. This note has been customized for this project.

Please contact the undersigned with any questions regarding the above-referenced information.

Cordially,

MARC
E.
JACOBS
No. 090

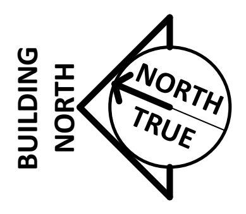
Marc Jacobs, CWS, PWS, CSS, CPESC

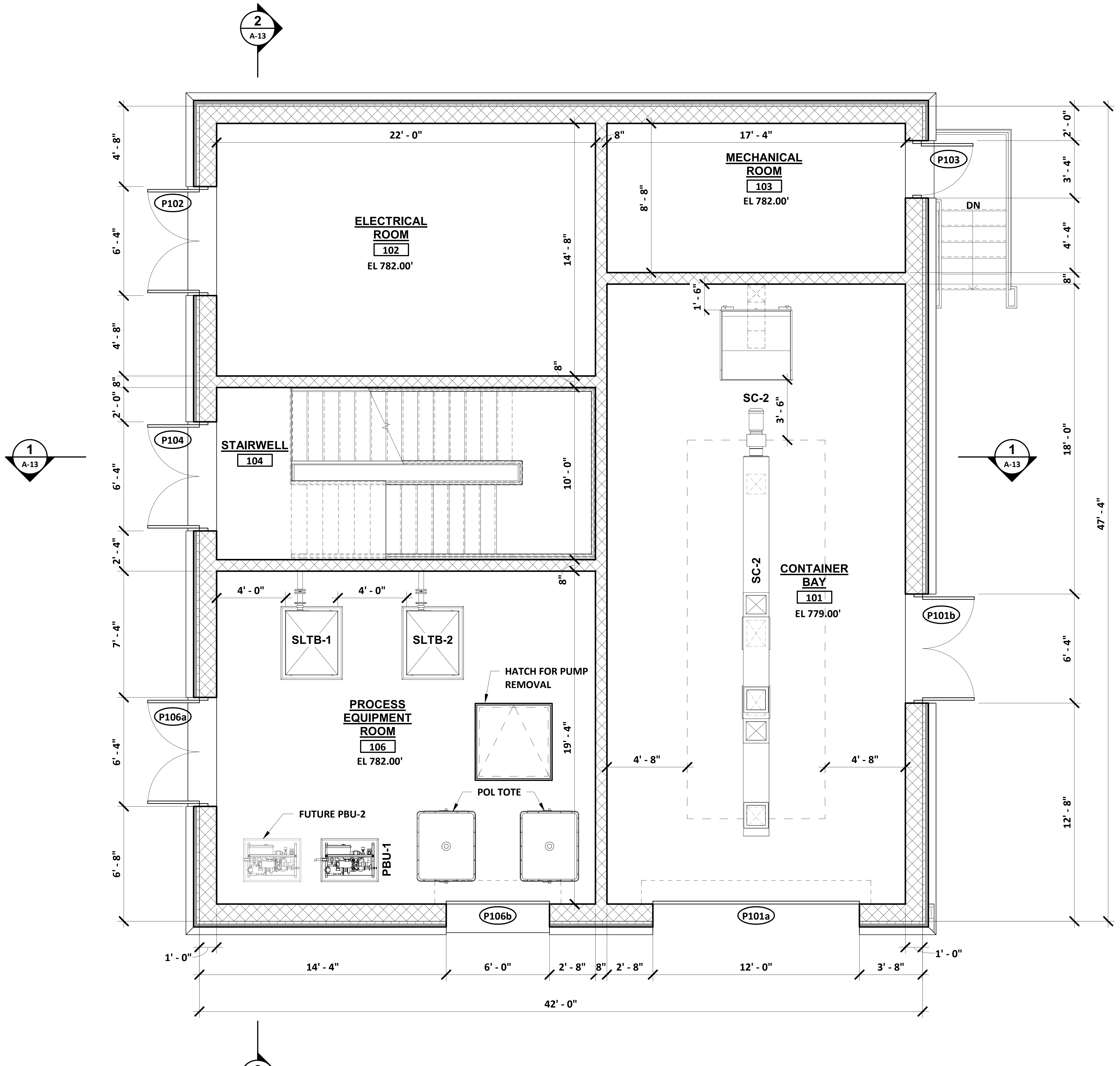
Marc Jacobs

*WP-NewportNH-PutnamRd-WW [illegible] 2122*

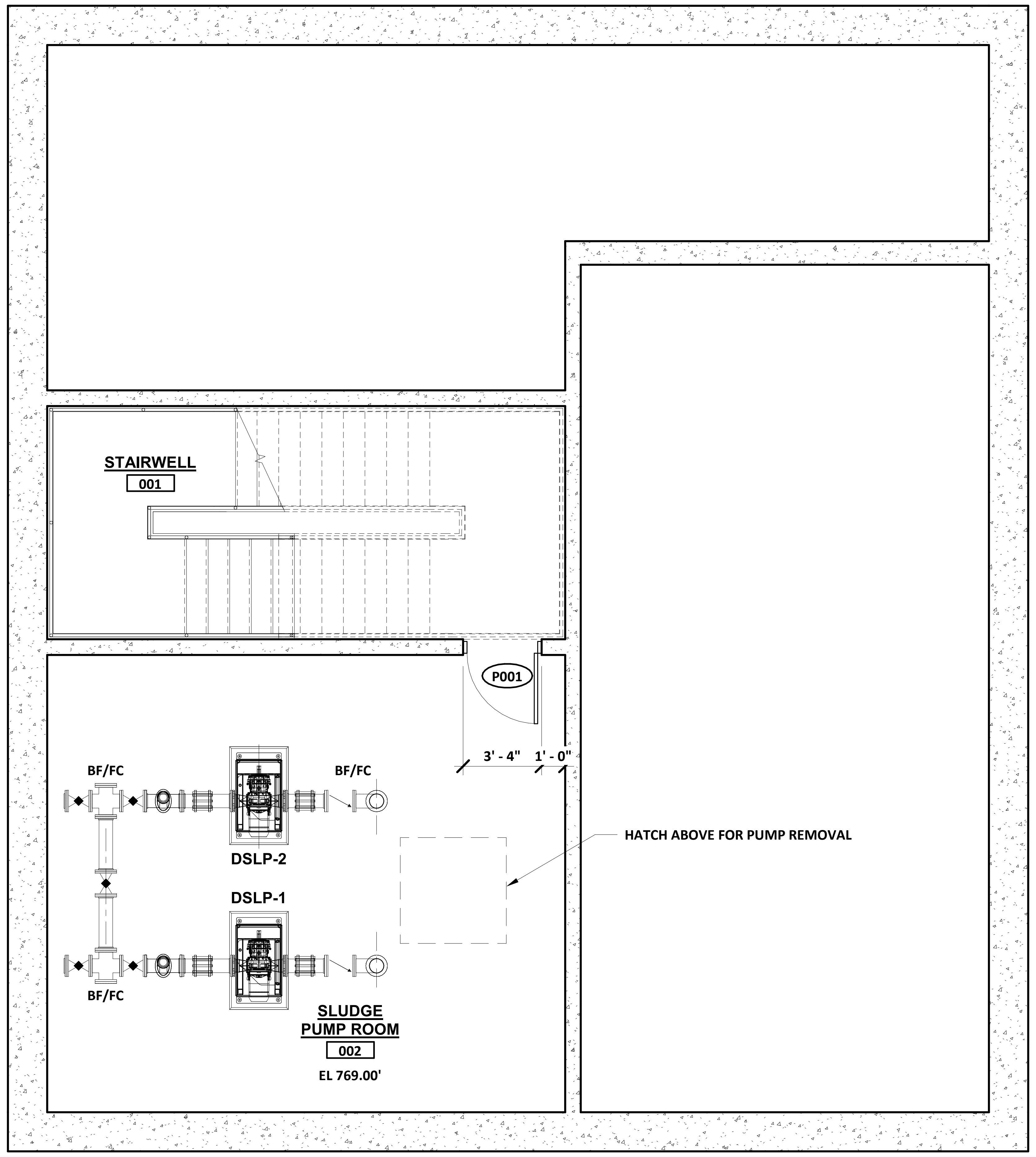
# Appendix H
# Alternative Process Building Layout

# Potential Cost Savings Option No. 1 - Alternative Process Building Layout





**FIRST FLOOR**
SCALE: 1/4" = 1'-0"



**SLUDGE PUMP ROOM**
SCALE: 1/4" = 1'-0"

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

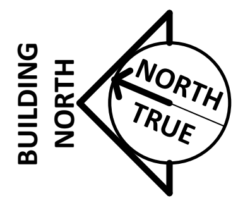
WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
230 COMMERCE WAY, SUITE 302, PORTSMOUTH, NH 03801

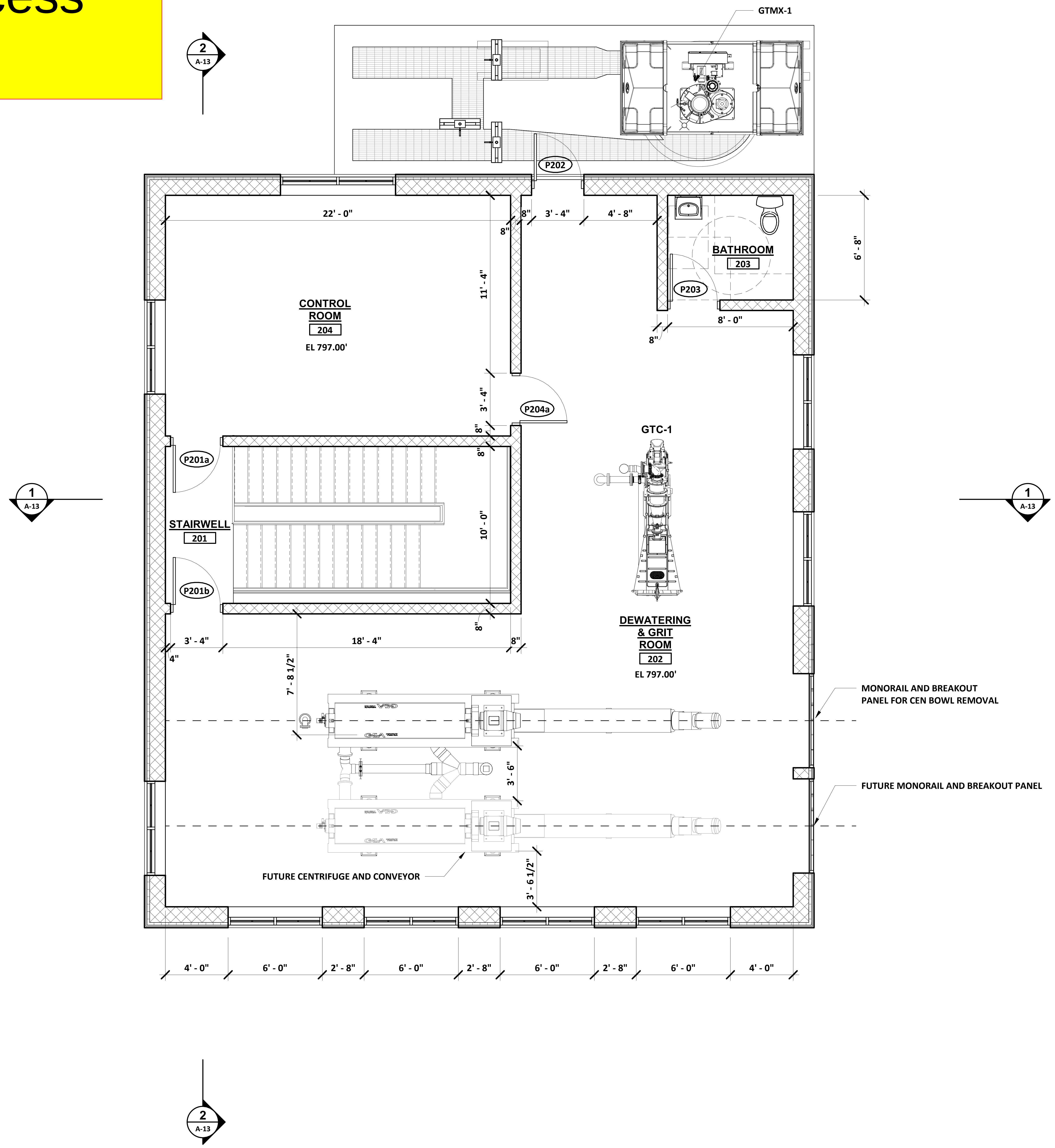
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
FLOOR PLANS I

DRAWING
A-10

# Potential Cost Savings Option No. 1 - Alternative Process Building Layout





## SECOND FLOOR

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| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

WRIGHT-PIERCE
603.430.3728 | www.wright-pierce.com
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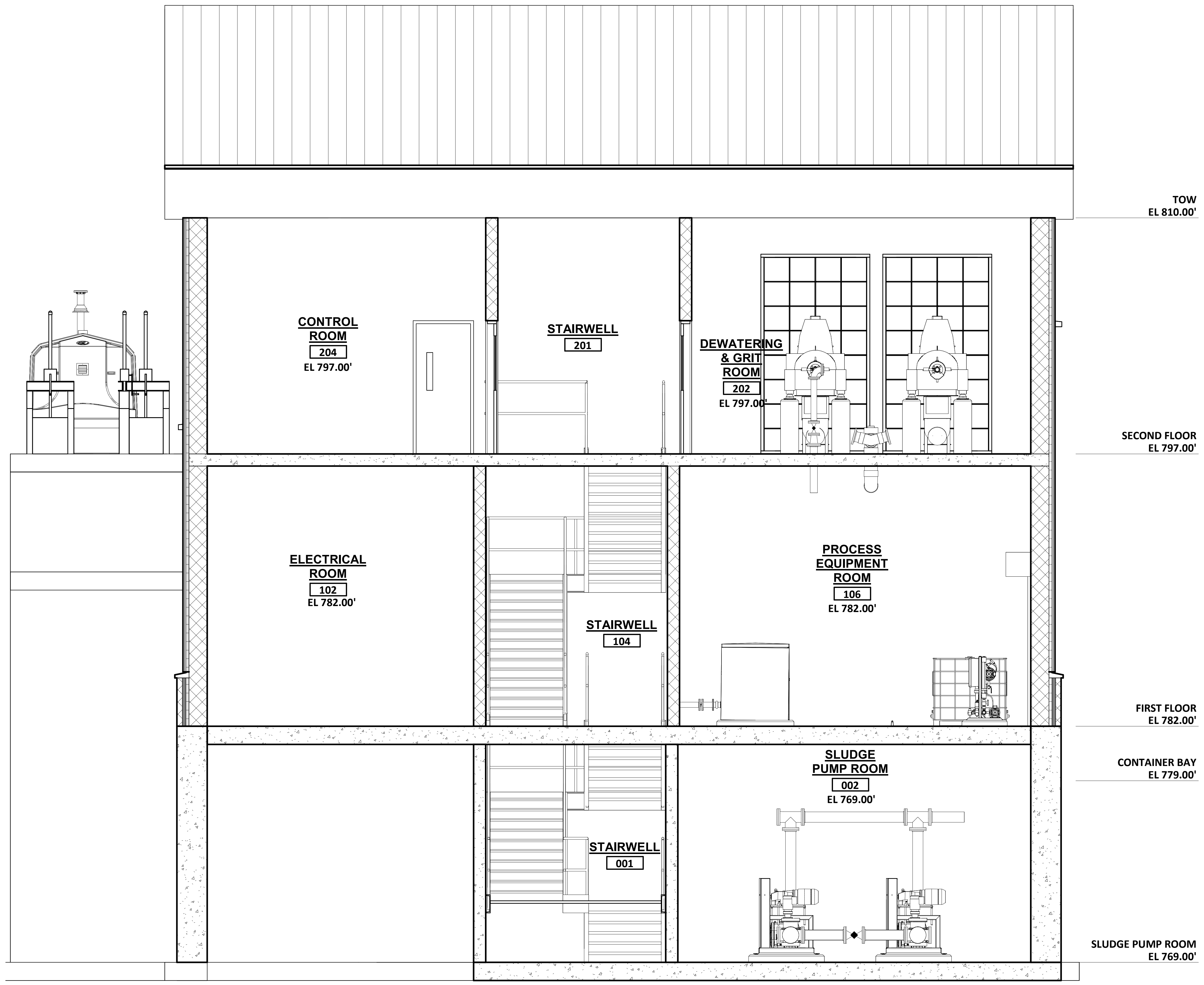
TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
FLOOR PLANS II

DRAWING
A-11

# Potential Cost Savings Option No. 1 - Alternative Process Building Layout



2 SECTION
A-10
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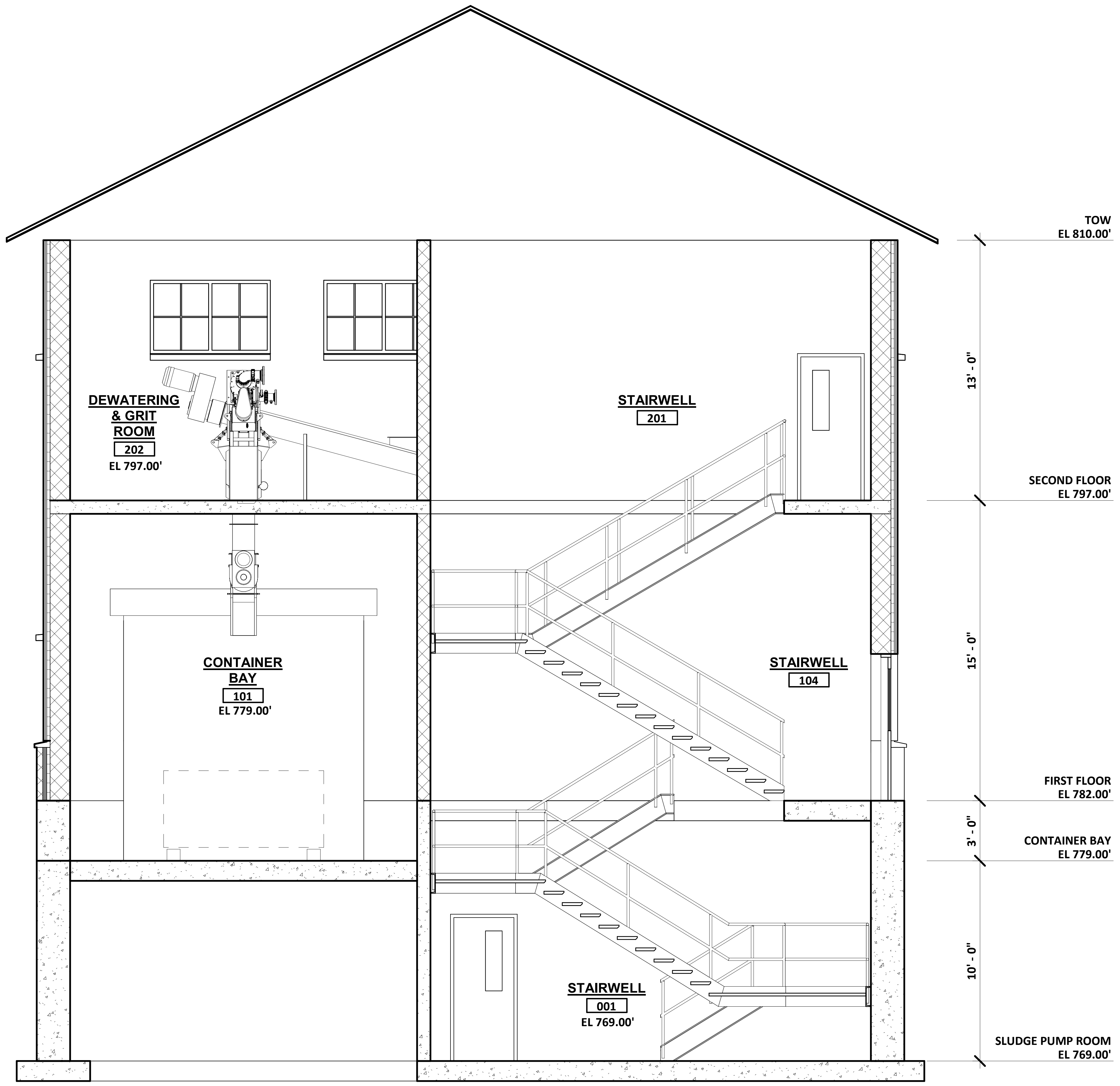

1 SECTION
A-10
SCALE: 1/4" = 1'-0"

| NO | REVISIONS | APP'D | DATE |
|---|---|---|---|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

PROJECT NO: 20828
DESIGNED: C.MICHAUD
CAD COORD: A.COUTURE
CAD: S.RICKLEY
CHECKED:
DATE:
APPROVED:
DATE:
SUBMISSION: PRELIMINARY DESIGN

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TOWN OF NEWPORT NEW HAMPSHIRE
WASTE WATER TREATMENT FACILITY
UPGRADE

PROCESS BUILDING
SECTIONS

DRAWING
A-13

12/8/2022 1:32:12 PM

Autodesk Docs://NH-Newport-20828-WWTF-Upgrade/20828-AM-ProcessBldg-AlternateLayout2.rvt

# Appendix I
# Future Facility Expansion Considerations

WRIGHT-PIERCE
Engineering a Better Environment

# Memorandum

Date: 1/25/2023

Project No.: 20828B – Newport, NH Preliminary Design Submittal

To: Preliminary Design Report – NHDES Comment/Response

From: Michael Curry, PE, Jeff Mercer, PE

Subject: PDR Appendix I: Future Facility Expansion Considerations

---

Based on NHDES' review of the Newport, NH WWTF Preliminary Design Report, the following comment was made:

*Current NPDES permitted annual average flow is 1.3 mgd, WWTF upgrade will provide an ADF capacity 0.66 mgd. The PDR should provide a summary table that lists all major WWTF elements that would need to be upgraded or expanded if the Town seeks to increase capacity above 0.66 mgd in the future. The table should present the current average/peak capacity of each limiting element. Such a table will help future Town management and DES during WWTF expansion planning efforts.*

In response to this PDR comment, this memorandum was developed to outline potential options for WWTF unit process expansion to achieve the permitted average daily flow (ADF) capacity of 1.3 MGD in the future. It must be noted that the permitted ADF is more than double that of the projected design year ADF of 0.66 MGD (2042) presented in the Preliminary Design Report. Barring any significant industrial or commercial expansion within the Town's sewer collection system, expansion to this level is well beyond the 20-year projection based on current growth rates. Estimated future flows and loads which maximize the permitted ADF of 1.3 MGD were developed and presented in Appendix B-1 and presented in Table I-1 below.

Table I-1 Approximated Flows and Loads at Full Buildout (2042+)[2]

| Condition | Flow Rate, MGD | BOD | | TSS | |
|---|---|---|---|---|---|
| | | mg/L | lb/day | mg/L | lb/day |
| Minimum Day Flow | 0.47 | - | - | - | - |
| Minimum Day Load | 0.66 | 176 | 969 | 113 | 623 |
| Average Day Flow and Load | 1.30 | 237 | 2,570 | 278 | 3,012 |
| Maximum Month Flow | 2.15 | - | - | - | - |
| Maximum Month Load | 1.93 | 274 | 4,417 | 376 | 6,071 |
| Maximum Day Flow | 2.94 | - | - | - | - |
| Maximum Day Load | 1.45 | 560 | 6,750 | 497 | 5,992 |
| Peak Hour Flow[1] | 4.96[1] | - | - | - | - |

Notes:
1. Peak hour flows from 04/16/2017 do not include a 20% growth factor flow due to the Town's ongoing efforts to reduce significant sources of inflow and infiltration.
2. Future flow conditions are estimated using current peaking factors and may not be representative of actual growth which may occur in the sewer shed.

Table I-2 Unit Process Expansion Considerations

| Unit Process | 2042 Design Capacity | Future Upgrade Considerations (2042 and Beyond) |
|---|---|---|
| Influent Screening | 5.1 MGD (Peak Hour) | Per the Manufacturer's provided information and based on proposed wet well hydraulics, the existing grinding and mechanical screening equipment is adequately sized for current and future flows. The manual bar rack and overflow slide gates will be confirmed to prevent overtopping channels under all hydraulic scenarios. If the Town foresees the need for additional screening capacity a second screen may be able to be installed in the current bypass channel and a bypass pipe or channel could be cut into the existing concrete slab. It must be noted that the hydraulic performance of the screens is highly dependent upon functionality of the auger clean the screen field and the downstream water depth. |
| Influent Pumping | 5.0 MGD (Peak Hour) | The proposed influent pump station will match that of the existing capacity of 3500-gpm. Based on this flowrate, this pump station is adequately sized for current and future flows given the information available at this time and based on assumptions of future peak hour flow conditions. |
| Grit Removal System | 5.0 MGD (Peak Hour) | The proposed grit removal system will be sized to match the influent pump capacity, and therefore will be adequately sized for current and future flow conditions. |
| Solids Handling System | N/A | The proposed solids handling and solids dewatering system includes provisions for installation of a future second centrifuge to accommodate flow and load conditions. Given the Town's preference for dewatering operation runtimes, additional sludge storage tank volume may need to be considered if the Town approaches an ADF of 1.3 MGD. Additional sludge holding tanks would likely be constructed alongside additional SBR tankage in a similar mirrored orientation as the proposed layout. |
| Sequencing Batch Reactor | 0.66 MGD (ADF) | The SBR system can be expanded in the future using several different methods based on how the flow and loading conditions change. Some of these options include:<br>• Increased utilization of influent overflow and influent equalization. As flows increase, the Town may determine that it is operationally effective to shed influent flow to the lagoons more frequently and re-equalize the flow back to the process once influent flows have subsided; and |

| Unit Process | 2042 Design Capacity | Future Upgrade Considerations (2042 and Beyond) |
|---|---|---|
| | | • Construct additional SBR tankage adjacent to the existing SBR basins. This would require permanently closing Lagoon No. 1, Lagoon No. 2 could remain in use for influent equalization in its current configuration based on the future peak flow conditions. |
| Tertiary Filtration System | 1.5 MGD | The future tertiary filter system would need to be upgraded to handle the maximum day flow condition from the SBRs. It's difficult to predict future peaking factors which would accompany an ADF of 1.3 MGD so the true magnitude of tertiary/filter capacity expansion is unknown. Based on the values presented in Table I-1, the tertiary treatment capacity would need to double in capacity assuming no equalization. Two options to expand the existing tertiary filtration setup include:<br>• Excavate the filter bay floor and deepen the filter basins to accommodate larger diameter filtration units within the same footprint; and<br>• Construct additional filter bays adjacent to the existing bays. This would require modifying the existing building superstructure. |
| UV Disinfection System | 1.5 MGD | The UV disinfection system can be expanded by providing larger UV banks within the existing UV channels. This would require modifications of the channel depths within the new Disinfection Building. |

230 Commerce Way, Suite 302
Portsmouth, NH 03801
603.430.3728 | wright-pierce.com