APPENDIX G

Correspondence with Suffolk County Department of Health Services (STP Siting Letter); STP Report; and BURBS Analysis

December 10, 2020

VIA ELECTRONIC MAIL

Mr. Jason Hime, P.E.
Suffolk County Department of Health Services
360 Yaphank Avenue, Suite 1C
Yaphank, NY 11980

Re: HK Ventures, LLC – Proposed Industrial Park, Calverton, NY
STP Siting Report Review of Proposed Onsite STP

Dear Mr. Hime,

We are kindly requesting a siting review by the Suffolk County Health Department Services (SCHDS) for a proposed on-site Sewage Treatment Plant (STP) and private domestic and fire wells to serve a proposed industrial park. The proposed industrial park, being developed by HK Ventures, LLC is located at 4285 Middle Country Road, Calverton, Town of Riverhead, Suffolk County, New York. The Suffolk County Tax Map Number for the lot is 600-116-1-2. The site is 30.28 acres in size.

Currently, the site is undeveloped. The site is in Suffolk County Groundwater Management Zone III, which has an allowable sanitary flow of 300 gpd/acre. Based on net lot size of 30.28 acres, the site has an allowable sanitary flow of 9,084 gallons per day (gpd) (300 gpd/acre x 30.28 acres = 9,084 gpd).

The proposed development of the Site will include the construction of eight new multi-tenant industrial buildings. The proposed buildings will range from approximately 49,000 to 56,000 square feet (SF). Based on the current SCDHS standards for general industrial buildings of 0.04 gpd per SF, the proposed development will require a flow of approximately 17,920 gpd of sanitary flow (8 buildings x 56,000 SF/building x 0.04 gpd/SF = 17,920 gpd). To allow for some flexibility with future tenants, the proposed STP will be designed to accommodate a flow of 20,000 gpd. Therefore, since the project exceeds density, a STP must be constructed. The new STP would be designed and constructed to meet SCDHS standards. It is intended to use the provisions for a modified sub-surface STP such that the reduced setbacks can be achieved.

With respect to the water supply for the proposed project, while a water main exists on Middle Country Road, the development would require an extension of the Riverhead Water District (RWD) to serve the entirety of the site. However, it is our understanding that public water from the RWD may not be currently available for this project, due to limited capacity within the district. Therefore, it is proposed to utilize private wells for the domestic, irrigation and fire demands for the project. Currently, the domestic well is being evaluated based upon an estimated domestic flow requirement of 360 gpm, as per the NYS Plumbing Code. This estimate is being refined with

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the development of the proposed floor plans for the buildings and will likely be reduced to a peak flow in the range of 150 gpm with an average of 37.5 gpm. This reduced flow rate is more consistent with the proposed sanitary flows. It is understood that the proposed domestic well must conform to both the requirements of the SCDHS as well as the NYDOH requirements.

Based upon Guidance Memo Number 28 – STP Siting, PWGC evaluated the location of the STP with respect to public water supply wells and surface water contributing areas. Based upon our preliminary evaluation, the proposed STP is located within a known 100-year contributing area to RWD's Plant 17 well field. Additionally, the proposed domestic well will be located on the site as to ensure the contributing area of the proposed well is outside that of the proposed effluent disposal system.

The proposed STP is not located within a surface water contribution area. Because the proposed STP is within the contributing area to RWD, a nitrogen mass balance was performed, in accordance with Guidance Memo 28, as shown below:

As of Right Development – Allowable Sanitary Flow
Area = 30.28 acres
Flow = 9,084 gpd (9,084 gpd/1,000,000 = 0.00908 mgd)
Total Nitrogen Influent Concentration (TN) = 50 mg/L
Total Nitrogen Influent Quantity = 50mg/L * 8.34 *0.00908 mgd =**3.78 lbs/day**

Proposed Development with STP
Flow = 17,920 gpd/1,000,000 =0.0179 mgd
Total Nitrogen Effluent Concentration = 10 mg/L
Total Nitrogen Effluent Quantity = 10 mg/L * 8.34 *0.0179 mgd = **1.49 lbs/day**

Proposed Development with STP at Design Flow
Flow = 20,000 gpd/1,000,000 =0.02 mgd
Total Nitrogen Effluent Concentration = 10 mg/L
Total Nitrogen Effluent Quantity = 10 mg/L * 8.34 *0.02 mgd = **1.67 lbs/day**

Based upon the above calculations, the utilization of the proposed STP, with an effluent of 10 mg/L would result in a nitrogen loading that is approximately 2.11 lbs/day less than the as of right development. This difference equates to approximately 770 lbs/yr less nitrogen than if the property were developed as of right.

In addition to the above analysis, PWGC prepared a 500-foot radius map to determine if private wells exist within 500 feet of the proposed development. A total of nine (9) properties were identified within the 500-foot radius of the subject property. PWGC contacted the RWD to determine whether any site in the 500-foot radius operates a private well. Of the nine (9) nearby sites, four (4) were identified as not connected to the public water supply, as follows:

1) 600-97-2-35
2) 600-98-1-1.1
3) 600-116-1-3.1
4) 600-98-1-3.3

According to the available aerial images, it appears that all four (4) of the aforementioned lots are currently vacant and three (3) of the four (4) appear to be actively farmed.

PWGC also reviewed the available groundwater contour maps for Suffolk County. According to those maps, the groundwater flow in this area appears to be flowing northeast towards the Long Island Sound.

Based upon the above information, it does not appear that the proposed STP will adversely impact the public drinking water supply in the immediate area.

In addition to the above information, please find a copy of the proposed site plan including the STP and private well location(s). These locations are preliminary and will need to be refined to ensure compliance with SCDHS and NYDOH requirements, especially with respect to the well separation distances, as this site plan was originally developed utilizing public water.

Please feel free to contact me if you have you have questions or comments. Thank you.

Sincerely Yours,

P.W. Grosser Consulting

Bryan Grogan, PE
Vice President

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4285 MIDDLE COUNTRY ROAD
CALVERTON, NEW YORK

ENGINEERING REPORT
PROPOSED SEWAGE TREATMENT PLANT

PREPARED FOR:

HK Ventures, LLC
147 Steamboat Road
Great Neck, New York 11024
Attn: Keith P. Brown, Esq.
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PREPARED BY:

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PWGC Project Number: TPO2001

MAY 2021

PROPOSED SEWAGE TREATMENT PLANT ENGINEERING REPORT
4285 MIDDLE COUNTRY ROAD
CALVERTON, NEW YORK

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1.0 SUMMARY

In order to develop the Calverton Industrial Park (CIP) site, it will be necessary to construct a sewage treatment plant (STP) on the property. Construction of an on-site STP will require the approval of this Engineering Report and subsequent construction plans and specifications by the Suffolk County Department of Health Services (SCDHS).

The proposed location of the on-site STP with a 100 percent expansion area will comply with the minimum setback distances to the existing property lines and habitable structures. Therefore, the construction of an on-site STP will not require variances from the Suffolk County Board of Review.

The closest STP to potentially service this facility would be the Calverton Sewer District (TSD-04) , which is located approximately 1.5 miles southwest of the subject site.

The preliminary cost estimate to construct an on-site STP is $2,000,000 or about $100 per gallon of capacity. This includes the cost of the STP and effluent disposal systems, control building, engineering, legal and contingencies.

2.0 INTRODUCTION

This report has been prepared to provide a preliminary design for the construction of a new STP designed to meet current SCDHS nitrogen limits for discharge to the groundwater and in compliance with the effluent limitations included in the State Pollution Discharge Elimination System (SPDES) permit.

This report describes the proposed sewage disposal requirements of the new CIP Facilities which will be roughly located in the middle of the site. The new facilities will consist of eight industrial buildings and one commissary. The square footage of the proposed industrial buildings varies from 49,000 to 56,000, and the commissary is approximately 1,500 sq. ft. The CIP facilities will not have basements. The site is located at the west side of Middle Country Road and about 405 ft east of Fresh Pond Avenue in Calverton and consists of one lot. The Tax Map Number for the Suffolk County lots is 600-116-1-2 and has a total gross area of 30.25 acres (1,317,884 sq. ft.)

Based on the current SCDHS standards of 0.04 gpd per sq. ft. for general industrial, the facilities will generate 20,000 gpd of sewage. The site is located in the 300 gpd/acre Suffolk County Groundwater Management Zone III. Based on net lot size of 30.25 acres the site can only discharge about 9,076 gpd of untreated wastewaters into the ground (300 gpd/acre x 30.25 acres = 9,076 GPD). Therefore, to develop the site as proposed, a STP must be constructed. The new STP would be designed and

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constructed to meet SCDHS standards. It is intended to use the provisions for a modified sub-surface STP such that the reduced setbacks can be achieved.

The closest STP to potentially service this facility would be the Calverton Sewer District (TSD-04), which is located approximately 1.5 miles from the project site. This treatment plant serves the EPCAL property and much of the available flow is allocated to EPCAL uses and connection to that plant is not likely. Additionally, this option is cost prohibitive due the required cost to build a force main from the subject site to the existing STP.

Since the off-site disposal option is not viable, it is proposed to build a new modified subsurface STP, at the site. The proposed design would comply with the SCDHS, New York State Department of Environmental Conservation (NYSDEC) and Ten States Standards.

The proposed STP and below grade effluent disposal facilities would be constructed in the middle of the new industrial facilities. The facility would be provided with standby power. The sanitary house connection will be an 8” gravity sewer that will collect effluent and direct it toward an oversized influent pump station that will store and provide a continuous flow to the STP throughout the day. A continuous flow of sewage will improve the treatment plant performance by providing a continuous source of organic material for the micro-organisms to use for the synthesis of ammonia nitrogen to nitrates and a continuous source of organic carbon to cover nitrates to nitrogen gas.

Final effluent from the treatment plant will be recharged on-site with a groundwater disposal system comprised of leaching pools.

The new STP and dedicated STP expansion area will be sited on the property at a location that provides a minimum setback distance of 10 feet from the owner’s property line and 10 feet from any existing or proposed habitable structure. The dedicated STP expansion area is to be contiguous with the STP area and be set aside to provide for a future 100% expansion of the STP and disposal system.

A buffer area of 10 feet will also be provided around the proposed STP and dedicated expansion area. The area is to be used exclusively for the STP appurtenances.

The location of the proposed STP is shown on Appendix B– Site Plan with the SCDHS set-back requirements.

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3.0 LOCATION AND SITE CONDITION

The CIP Facilities will be located at the south side of Middle Country Road and about 367 ft east of Fresh Pond Avenue in Calverton, in the Town of Riverhead, Suffolk County, New York. The specific location is shown in Appendix A - Location Plan.

The facilities will consist of eight industrial buildings and one commissary.

The site is generally sloped and is currently undeveloped with cleared and wooded areas. The surface elevation on site varies from approximately 84-64 feet above mean sea level (AMSL).

The proposed development of the site will include on-site stormwater recharge systems. The on-site systems consist of both subsurface drywells and stormwater recharge basins.

4.0 WASTEWATER CHARACTERISTICS

The sanitary wastewater from Calverton Industrial Park facility is expected to be typical sewage normally found in other industrial facilities. The SCDHS generally has approved design of new treatment facilities assuming the following wastewater characteristics:

5 day Biochemical Oxygen Demand	BOD_{5}	= 272 mg/L
Total Suspended Solids	TSS	= 320 mg/L
Total Nitrogen as N	TN-N	= 65 mg/L
Ammonia Nitrogen as N	NH_3-N	= 45 mg/L

The Calverton Industrial Park STP will be designed to produce an effluent with less than 10 mg/L total nitrogen during the average and peak hourly flow rates.

5.0 DESCRIPTION ON-SITE SEWAGE TREATMENT AND DISPOSALS SYSTEM

The process selected to treat the wastewaters is the Biologically Engineered Single Sludge Treatment (BESST). This process is a variation of the activated sludge process and will effectively remove BOD_5, TSS and nitrogen levels to comply with the New York State Department of Environmental Conservation (NYSDEC) State Pollution Discharge Elimination System (SPDES) Permit.

The BESST process is designed to reduce the five-day carbonaceous biochemical oxygen demand (BOD_5), and ammonia nitrogen. In this process, ammonia nitrogen is oxidized to nitrite and then to nitrate by Nitrosomonas and Nitrobacter bacteria, respectively. The nitrate is then reduced by dissimilarity nitrate reduction. In this reaction, the incoming BOD_5 serves as the carbon source or

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electron donor for the reduction of nitrate to elemental nitrogen. In the process, fermentation of soluble BOD_5 occurs in the anoxic zone.

The BESST process is a modified version of the Lawrence and McCarty biological process. This process introduces sewage into an anoxic section of the tank where the micro-organisms will use the endogenous carbon to perform denitrification. This stream is mixed with a stream of nitrified wastewater coming from nitrified return active sludge from the sludge blanket clarifier. Submersible mechanical mixers are installed in the anoxic compartment to facilitate homogeneous mixing and increase the denitrification efficiency. Mixed liquor flows in a plug flow manner to the aeration zone where fine bubble diffusers provide the oxygen required for nitrification and BOD5 reduction.

After aeration, the mixed liquor enters the bottom of an upflow clarifier where solid and treated effluent is separated. Mixed liquor settles to the bottom and an air lift pump conveys RAS into the anoxic tank. A weir box at the top of upflow clarifier allows treated effluent to go the on-site groundwater disposal system.

Sanitary wastewater from CIP Site Elevation Approximately 73 feet AMSL facility will flow by gravity to the STP via a new sewage collection system. Sewage will flow by gravity into the new exterior oversized influent pump station with flow equalization. Wastewater would be pumped via one (1) of two (2) submersible explosion proof, solids handling pumps to a self-cleaning, mechanical screen. The pumps will invoke a new technology called “adaptive impellers”. This new technology will prevent all noncompressible solids from becoming clogged within the pump impeller without the necessity of utilizing grinders, shredder or cutter mechanical devices. The new mechanical screen will be located on an exterior precast concrete pad. Solids removed by the screen will be discharged by gravity into a screen trash bin. The trash bin will be emptied on a daily basis. Screened wastewater will flow by gravity to the new constant head / splitter box. This box controls the forward flow rate to the BESST treatment and the return flow rate to the influent pump station. The splitter box automatically splits the flow equally to the influent ends of the two (2) BEEST process tanks.

Refer to Appendix C - Proposed On-Site Sewage Treatment Plant Schematic and Hydraulic Profile and Appendix E -Floor Plan of STP Control Building for the general layout and process piping for the proposed STP.

The BESST STP will be comprised of dual train treatment process comprised of two (2) separate aeration tank and anoxic tank sections. A pipe and slide gate will connect the two anoxic tanks such that mixing of the RAS will occur between the two anoxic tanks thus causing both trains to have an approximately equal amount of mixed liquor suspended solids in both tanks. This will make operational control of the process much easier.

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The BESST STP is an easy treatment process to operate because there are no cycles within the process. This STP is a flow-through process. Blowers are continuously energized to provide diffused air within the aeration and sludge holding tanks and to operate the air lift pumps to return nitrified activated sludge from the upflow clarifier to the anoxic tanks. The STP operator will be required to manually open a sludge waste valve that will divert the RAS to the sludge holding tank.

The sludge holding tank will continue to process the RAS. Periodically the sludge holding tank blower will be de-energized such that the digested sludge will be able to settle. A supernatant return pump located in the sludge holding tank will convey top water from the sludge holding tank back to the influent pump station for reprocessing. This will significantly reduce the cost to haul sludge off-site for additional processing and disposal.

The SCDHS allows the BESST STP process to operate with three (3) blowers. One dedicated blower will be used for the aeration and the RAS air lift pumps. One blower is used exclusively for the aeration of the sludge holding tank. The third blower is used as a standby blower in the event either one of the other two blowers is out of service. Periodically the aeration tank duty blower and the standby blower is alternated such that there will be equal run time on each blower. The blowers will be located within the control building and have a soundproof enclosure.

A control building will be incorporated into Building 4, which is adjacent to the STP. The control building will provide the required space for a laboratory and bathroom. The building will also provide additional sound attenuation for the blowers and odor control treatment system. The control building will also permit STP electrical equipment to be located indoors and not exposed to the elements.

A flow monitoring station and sampling manhole will be installed upstream of the groundwater disposal system and downstream of the two (2) effluent pipes from the BESST process. An effluent weir with an ultrasonic meter will be used to continuously measure the flow exiting the STP. The flow meter display will be set up within the control building.

Effluent from the STP will flow into a groundwater disposal system comprised of leaching pools. The leaching pools will be sized for long-term disposal of effluent without the use of effluent filtration equipment. Groundwater on the site is approximately 40 feet below grade surface. Based on preliminary design, the maximum effective depth of the leaching pools will be approximately 18.5 feet.

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6.0 DESCRIPTION OF ON-SITE SEWAGE COLLECTION SYSTEM

Sanitary wastewater from the eight industrial buildings and the commissary will flow by gravity to the STP via a new sewage collection system. Each industrial building will have a wastewater line that connects to an 8" diameter sewer main leading to the STP. Each industrial building will have a typical clean-out installed. The 8" diameter sewer main is to be installed to SCDHS standards with a minimum slope of 0.4%. To prevent sewage build-up and allow for regular maintenance, 4' diameter manholes will be installed at every bend in the sewer main.

A gravity collection system was chosen based on its practicality, reliability, and longevity.

7.0 DESCRIPTION OF REQUIRED MONITORNING WELLS

To comply with SCDHS standards, two (2), 2" diameter monitoring wells are required to be provided in the vicinity of the groundwater disposal systems to permit quarterly monitoring of the effect the STP effluent has on groundwater quality. The necessary new wells will consist of two (2), 2" diameter monitoring wells properly sited up and downgradient of the leaching pool disposal system. Review of available source of groundwater maps indicates groundwater at this site is flowing northeast toward to the Long Island Sound.

Each new well will include the installation of a 4" diameter surface casing with lock, 2" diameter PVC schedule 40, 15 feet long, 20 slot, screened well a minimum of 10 feet into groundwater. The screen shall be installed 5 feet above and 10 feet below the prevailing groundwater table. New wells will be installed in compliance with the most recent requirements of the SCDHS. Wells will be monitored quarterly for required water quality parameters included in the NYSDEC SPDES permit. All well construction would be performed by a New York State licensed well driller. The proposed number and location of monitoring wells are shown on Appendix B – Site Plan.

The installation of the monitoring wells will also include:

1. Meeting with the SCDHS to properly site the required monitoring wells based on the determined flow direction of groundwater.
2. Retain the services of a licensed well driller to file for required permits.
3. Installation of monitoring wells at the location(s) approved by the SCDHS.
4. File completion logs with the NYSDEC and the SCDHS.
5. Initial bailing of wells and collection of water samples.
6. Provide well tags and casing keyed locks on all wells.
7. Locate and inspect all new monitoring wells and record the well number, the NYSDEC number, the well casing size, and height above finished grade. Verify the depth of water in each well and if samples can be properly obtained.

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8.0 SETBACK DISTANCES

As required by the SCDHS standards, a 100% expansion area immediately adjacent to the STP should be provided. This area is for the construction of a replacement STP. The proposed site of the STP and the location of the 100% expansion area will comply with the setback standards of the SCHDS, namely 10 feet from the property lines and 10 feet from habitable structures or building setback lines, as per Appendix A, Standards for Approval and Construction of Modified Sewage Disposal Systems and Small Community Sewerage Systems, of the SCDHS Commercial Standards, since the subject property and surrounding properties are commercial properties. Additionally, the proposed STP complies with the 100 foot setback distance to any on or off-site wetland areas. The proposed construction of the STP will comply with the setback requirements for the surrounding the project area.

9.0 ODOR CONTROL TREATMENT SYSTEM

Since the treatment system will be classified as a modified subsurface sewage treatment plant, an odor control treatment system will be installed for the process tanks and equalization pump station. The odor control treatment system will be installed within the control building.

The proposed ventilation system will utilize mechanical ventilation equipment to collect all air discharge and provide twelve (12) air changes per hour within the STP. The basis of design for the ventilation system is as follows:

Volume above Process Tanks (Freeboard) = 39.92ft x 12ft x 1.5ft = 718.56 ft^3
Wet Well / Equalization Volume = 826 ft^3
Sludge Holding Tank = 10.5 feet x 12 feet x 4.83 feet = 608.58 ft^3
Constant Head Splitter Box Above Water 2.5' x 6' x 2' = 30 ft^3

Total Volume = 2,183.14 ft^3

Required cubic feet of air to be treated per hour = 2,184 ft^3x 12 (changes/hr.) = 26,208 ft^3/hr.
Require air volume = 26,208 ft^3/hr. / 60 min./hr. = 436.8 ft^3/min.

The proposed odor control treatment system will be a two-stage granular activated carbon system. The system will have an air flow rate of 437 CFM at 7-inch of water column. Each tank size will be 36” in diameter by 54” in height. The fan will operate with a 110 volt, 1 phase, 1 hp motor.

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10.0 BASIS OF DESIGN – ON-SITE STP

A. Average Daily Design Flow

Based on SCDHS Criteria:

1. General Industrial - 8 buildings & 1 commissary = 412,629 SF
   Average sanitary daily flow = 412,629 SF @ 0.04 gpd/sf= 16,506 GPD
   Kitchen daily flow = 40 seats x 2.5 gpd/seat = 100 GPD
   Future Flow from Tenant Changes = 3,394 GPD
   Total average daily flow provided = 20,000 GPD

B. Peak Daily Design Flow of the Sewage Treatment Plant

Average daily flow = 20,000 GPD
Population equivalent = 20,000 gallons / 100 gals. per capita = 200 capita
Peak Factor = $(18+ 0.20^{1/2)})/ (4 + 0.20^{½}) = 4.15$

Peak daily flow = 4.15 x average daily flow GPD = 4.15 x 20,000 GPD = 83,000 GPD
Peak daily flow = 83,000 GPD or 57.64 GPM

C. Influent Wastewater Characterizes/Design Criteria

1. Influent Wastewater Characteristics

BOD_5 = 272 mg/L
Suspended Solids = 320 mg/L
TKN = 65 mg/L
Alkalinity = 150 mg/L
Maximum Wastewater Temperature 20 °C
Minimum Wastewater Temperature 10 °C (Enclosed process tanks)
Ambient Air Temperature 10 - 90 °F
Site Elevation Approximately 73 feet AMSL

2. Design 5-day Biochemical Oxygen Demand (BOD_5)

Average BOD_5 = 272 mg/L (Recommended Standard)
Design Pounds BOD_5/day = 272 mg/L x 8.34 lbs./gal. x 0.02 MGD
Design Pounds BOD_5/day = 45.36 lbs./day

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3. Design Suspended Solid

Design Suspended Solids/day = 320 mg/L (Recommended Standard)
Design Suspended Solids/day = 320 mg/L x 8.34 lbs./gal. x 0.02 MGD
Design Suspended Solids/day = 53.38 lbs./day

4. Design Total Nitrogen

Design TN = 65 mg/L (Recommended Standard)
Design TN - Nitrogen = 65 mg/L x 8.34 lbs./gal. x 0.02 MGD
Design TN – Nitrogen = 10.84 lbs./day

5. Design Ammonia Nitrogen

Design NH_3 - Nitrogen = 45 mg/L (Recommended Standard)
Design NH_3 - Nitrogen = 45 mg/L x 8.34 lbs./gal. x 0.02 MGD
Design NH_3TKN – Nitrogen = 7.51 lbs./day

6. Design Nitrite Nitrogen

NO_2 = Trace

7. Design Nitrate Nitrogen

Design Nitrate - Nitrogen = 2 mg/L (Recommended Standard)
Design Nitrate - Nitrogen = 2 mg/L x 8.34 lbs./gal. x 0.02 MGD
Design Nitrate – Nitrogen = 0.33 lbs./day

8. Design Alkalinity (Recommended Range)

Design Alkalinity = 250 mg/L as $CaCO_3$
Design Alkalinity = 250 mg/L x 8.34 lbs./gal.) x 0.02 MGD
Design Alkalinity = 41.70 lbs./day

9. Design pH

Design pH = 6.8 to 7.2 **Say: 6.8 to 7.2**

10. Design Minimum Wastewater Temperature

Minimum Temperature = 10°C **Say: 10°C**

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D. Process Design

1. Influent Pump Station

A. Criteria

(1.) The influent pump station will be used for flow equalization such that there will be a constant flow of influent sewage to provide a carbon source for equalization. The influent wet well should be designed to hold a minimum of 25 percent of the average daily design flow plus an additional 25 percent of the total volume of the sludge hold because supernatant will be sent back to the influent pump station for processing through the STP.

B. Wet Well Volume and Size Based on Average Daily Flow

25 Percent of Daily Flow: 20,000 GPD x 0.25 = 5,000 gallons (668 Cubic Feet)
25 Percent of Sludge Holding Tank: 10.50 feet x 12 feet x 4.83 feet x 0.25 x 7.48 = 1,138 Gallons (152 Cubic Feet)
Total Wet Well Volume = 6,138 Gallons (820 Cubic Feet)

Proposed Wet Well Dimensions:

Inside Diameter:	10'-0"
Overall Height:	25.52'
Invert In	62.15'
Elev. High Water Level Alarm	61.65'
Elev. of Lag Pump On	61.40'
Elev. of Lead Pump Off	50.90'
Elev. of Low Water Level Alarm	50.65'
Elev. Of Inner Bottom of Wet Well	49.15'
Effective Depth (Lag on – Lead Off)	10.50 ft (61.40 – 50.90 = 10.50')
Effective Volume	825 CF (6,169 gallons)

C. **Influent/Equalization Pumps**

Peak Factor = 4.15

Minimum Pump Size = $\frac{4.15 \times 20{,}000 \text{ GPD}}{1440 \text{ minutes / day}}$

Minimum Pump Size = 57.64 GPM

Provide two (2) submersible explosion proof solids handling pumps in new influent pump station with breakaway couplings, rails and lifting chains and reversing starters. Pumps will have adaptive impeller. Pump discharge and force main to be a minimum of 3” in diameter.

2. Mechanical Screen

Provide one mechanical screen with 2 mm opening mounted above a new concrete pad. Screen capacity shall a rating greater than the pumping rate of the influent equalization pump station.

3. Constant Head/Flow Splitter Box

Provide new 316 stainless steel Constant Head/Splitter Box at discharge from the mechanical screen. Box to be provided with one (1) broad crested weir on an adjustable valve for return flow to Influent Pump Station. Fixed 45-degree V notch will be utilized to measure and control forward flow to the aeration tanks. V notch weir to discharge into a compartment with additional weirs with divider wall to split influent flow equally to each process tank. Compartments to be provided with plug valves to permit isolation of each process tank. Forward flow 45-degree v-notch weir to have a design flow of 14 GPM or about 20,000 GPD.

Return flow over the broadcrest weir with 2” of head will be approximately 44 gallons per minute. Range of operation should be a minimum of 6” inches (3 inches above and below the bottom of the V-Notch Weir.

Forward flow to the BESST Treatment System is based on Average Flow = 14 GPM: Use 45 Degree V –notch weir. Height required for 14 GPM is 3 inches.

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4. Aerated Sludge Holding Tank

A. Criteria

Minimum capacity based on population equivalent of average daily flow.

Equivalent population = 20,000 gpd / 100 gpd/capita = 200 equivalent population

Minimum volume required =3 (ft^3/capita) x 200 people
Minimum volume required = 600 ft^{3} (4,488 gallons)

Nominal Length	= 12.0 ft
Nominal Width	= 4.83 ft
Nominal Height	= 10.5 ft^2
Nominal Volume	= 608.6 ft^3/ft (4,552 gallons)

B. Supernatant Return Volume

Minimum of 25% of the sludge holding tank
Supernatant Volume = 10.50 feet x 12 feet x 4.83 feet x 0.25 x7.48= 1,138 gallons

C. Aerated Sludge Holding Tank Blower Capacity

Tank Volume = 609 ft^3

Minimum Air Flow Required	= 30 Scfm / 1,000 ft^3
	= 609 ft^3 x (30 Scfm / 1,000 ft^3) = 18.27 Scfm
Blower Discharge Pressure	= Aeration Depth x (0.432 psi/ft H^2O) x H_L
	= 10.50 x (0.432 psi/ft) + 1ft (head losses) = 5.54 psi

5. Effluent Disposal System

A. Criteria

Design Leaching Rate without Filtration: 5.0 GPD/ft^2

B. Required Disposal System Capacity

$$\text{Required Sidewall Leaching Area} = \frac{20{,}000\ \text{GPD}}{5.0\ \text{GPD/ft}^2}$$

Required Sidewall Leaching Area = 4,000 (ft^2.)

C. Proposed Disposal System

Provide 10 Feet diameter x 18.5 feet effective depth leaching pools.
Capacity/ leaching pool = 18.5 feet x 10 feet x 3.14 x 5.0 GPD/ft2 = 2,904 GPD
Required number of leaching pools = average daily flow (GPD) / capacity/pool
Required number of leaching pools = 20,000 GPD / 2,904 GPD/pool
Required number of leaching pools =6.88 **Say: 7 leaching pools**

Provide two (2) sets of leaching pool systems, one set with one (1) distribution pool and two (2) leaching pools and one set with one (1) distribution leaching pool and three (3) leaching pools. Each leaching pool cluster will have isolation valves installed to allow clusters to rest.

NOTE: Required disposal system capacity for future expansion will be the same size as the current design.

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6. **See Appendix for BESST Process Calculations**

7. **PWGC AERATION CALCULATIONS BASED ON TEN STATES STANDARDS**

BOD Removal
Pounds of BOD to be removed. 45.36 Pounds per Day
SCDHS requirement for BOD removal = 1.8 Pounds of Oxygen per Pound of BOD
45.36 x 1.8 = 81.65 Pounds of Oxygen Per Day

TN Removal
SCDHS requirement for TN removal = 4.6 Pounds of Oxygen per Pound of TN
10.84 x 4.6 = 49.84 Pounds of Oxygen Per Day

Total Oxygen Requirement = 81.65 + 49.84 = 131.49 Pounds of Oxygen Per Day
Fractional Percentage of Oxygen in air = 23.2%
Density of Air = 0.075 lb / Cubic Feet

131.49 Pound of Oxygen Per Day / 0.075 lbs per Cubic Feet / 0.232 = 7,557 Cubic Feet per Day

Depth of Diffusers Below Water Surface = 9.5
Efficiency Rating = 1.5% per foot of submergence 9.5 x 1.5 = 14.25%

7,557 / 0.1425 =53,032 Cubic Feet per day
53,032 / 1440 = 36.83CFM

Ten States Standards minimum for aeration utilizing the extended aeration process = 2,050 CF per Pound of BOD5
2,050 x 45.36 = 92,988 CF > 53,032 CF
92,988 CF / 1440 = 64.58 CFM **(THIS IS FOR BOTH TRAINS)**

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8. PWGC AERATION CALCULATIONS BASED ON SCDHS REQUIREMENTS

1-1

Carbonaceous Oxygen Demand		
$AOR_1 = A\ X\ \frac{Q\ X\ BOD_{IN}}{1{,}000{,}000}\ X\ 8.34$	40.83	lbs./day/basin
A = Lbs. of O_2 / Lbs. BOD_5 Removed per Day	1.80	O_2 Lbs. / Lbs. BOD_5

1-2

Net Nitrogen for Oxidation		
$\Delta N = \frac{((NH3_{in} - NH3_{out}) - (BOD5_{in} - BOD5_{out})\ x\ Y_{obs\ x}\ x\ N_S)\ x\ Q\ x\ 8.34}{1{,}000{,}000}$	4.34	lbs./day/basin
N_s = Sludge Nitrogen Content	0.07	
Observed Yield Factor (Yobs)	0.65	

1-3

Nitrification Oxygen Demand		
$AOR_2 = \Delta N\ x\ 4.60$	19.98	Lbs./Day/Basin
Lbs of O_2 / Lbs. of NH_3 Removed	4.60	O_2/NH_3

1-4

Total Actual Oxygen Required		
$AOD_T = AOD_1 + AOD_2$	60.81	Lbs./Day/Basin

1-5

Convert Actual Oxygen Required (AOR) to Standard Oxygen Required (SOR) Ratio	
$\frac{AOR}{SOR} = \frac{\propto\ x\ \theta^{(Tsite-20)}\ x\ (\beta\ x\ C_{sat} x\ P_{site}) x (P_{std}\ x\ (Csurf_T)) \div (Csurf_{20} - D.O.)}{C_{sat20}}$	0.49

1-6

Alpha and Beta Factors	Value	Symbol
Alpha Factor	0.650	α
Temperature Coefficient	1.024	θ
Water Temperature	10.000	T_{SITE}
Beta Factor	0.950	β
Site Atmospheric Pressure	14.700	P_{SITE}
Standard Atmospheric Pressure	14.700	P_{STD}
Dissolved oxygen solubility at standard conditions	9.080	C^*sat_{20}
Dissolved oxygen solubility at 10 Degrees Celsius	11.280	$Csurf_T$
Dissolved oxygen solubility at 20°C	9.080	$Csurf_{20}$
Residual dissolved oxygen concentration	2.000	DO

1-7

Standard Oxygen Requirement		
$SOR = \frac{AOD}{\frac{AOD}{SOD}}$	123.55	Lbs O_2/Day/Basin

1-8

Aeration System Standard Oxygen Transfer Rate		
$SOTR = \frac{SOR}{TA}$	5.15	Lbs./hr
TA = Total Aeration in hours		

1-9

Process Air Flow Required		
$Process\ Air\ Flow = \frac{SOTR\ X\ 10{,}000}{\rho_{air}\ x\ SOTE\ x\ O_{pw}\ x\ 60}$	34.60	SCFM PER BASIN
Air Density	0.075	Lbs./Day/Ft^3
Submerged Depth of Diffuser	9.500	Feet
Efficiency per Depth	1.500	
Standard Oxygen Transfer Efficiency at submerged Depth	14.250	Percent
Fraction of Oxygen in Air by Weight	23.200	Percent

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11.0 SUMMARY OF PROPOSED TREATMENT UNITS

A. Influent Pump Station and Headworks Design

DESIGN CRITERIA	PROPOSED VALUES
Average Daily Influent Sanitary Flow	20,000 GPD
Equalization Volume (25% of design flow)	5,000 GPD
Aerated Sludge Holding Tank	609 cu. ft. (4,552 Gallons)
Required Wet Well Capacity (25 Percent of Daily Flow + 25 Percent of Sludge Holding Tank)	0.25 x 20,000 = 5,000 Gal. 0.25 x 4,552 = 1,138 Gal. Total = 6,138 Gallons
Proposed Wet Well Dimensions	6,169 gallons (825 CF)
Required Wet Well Pumps	2 submersible explosion proof
Minimum Capacity	57.64 GPM
Proposed Capacity	80 GPM @ 24.9' TDH (Average Depth)
Wet Well Pump Horsepower	4
Use Flygt, explosion proof, solids handling, sewage pump, 3" discharge Model No. NP 3085 SH, 1755 rpm, 3 phase, 208 volt, 4 hp motor	80 GPM @ 24.9' TDH (Average Depth)

Influent Pump Station equipment will consist of the following:

Two (2) Influent pumps, ITT Flygt, explosion proof, solids handling, sewage pumps, 3" discharge Model No. NP 3085 SH, 1755 rpm, capacity of 80 (gals./min.) at 24.9 feet total discharge head, 3 phase, 208 volt, 60 hertz, 4 hp motor with reversing starters, 3" schedule 10 stainless steel discharge piping (velocity = 3.63 (ft./sec.). Provide 316 stainless steel lift outs chains with 316 stainless steel schedule 80-guide rails. Pumps shall be complete with leak and over temperature sensors.

One (1) Pump and alarm MultiTrode level probe with low level and high-level duplicate floats to control pump starters in NEMA 4X, 316 stainless steel Pump Control Panel. Panel to be installed on unistut supports next to influent wet well. Pumps to be provided with explosion-proof remote disconnect switches mounted on kindorf adjacent to equipment.

One (1) 1,000 lbs. minimum capacity 316 stainless steel hoist and socket for removal of influent pumps and mixers.

C. **BEEST Process/Anoxic Tank**

DESCRIPTION	UNITS
Total Design Flow	20,000 GPD
Number of Process Tanks	2
Bottom of Process Tanks	Elev. 60.5
Top of Process/Anoxic Tanks	Elev. 72.5
Freeboard	1.5'
Design High Water Level	Elev. 71.0
Process Tank Width	12.0'
Total Aeration Volume	15,000 Gallons Total
Total Anoxic Volume	12,500 Gallons Total
Hydraulic Residence Time @ 20,000 GPD	33 Hours
Clarifier Surface Area	69 ft^2 Each
Clarifier Volume	5,397 Gallons Each
Aeration System	Fine Bubble
Number of Blowers	Two (2) 1 Duty and 1 Standby
Blower Horsepower	5 hp
Blower Discharge Pressure	6 PSI
Air Lift Pump	1 each basin
Mixer Horsepower	2.4 hp

Each Process/Anoxic Tank will be provided with the following equipment:

One (1) airlift pump, 2 ½ inches in diameter, with their suction end directly connected to the bottom of each clarifier to facilitate the return of activated sludge to the anoxic zones.

One (1) mixed liquor transfer pipes system that will enable the liquid to move, in a plug flow fashion, into the aeration compartment.

One (1) 10' diameter hole with a 10" flanged, full port plug valve located between two tanks. An extended valve handle provided for access from top of tank.

Two (2) stainless steel submersible mixer ABS series XRW 210 model 2121 mixer with 2.4 (hp), 3 phase, 60 Hz, 208-volt explosion-proof electric motor. The mixer and stainless steel propeller shall operate at a speed of 1,756 RPM. Mixers slide rail shall be assembled to facilitate its vertical adjustment within the tank, or removal from the tank when necessary. A portable hoist shall be provided for this purpose. One (1) spare unit to be provided as spare for both tanks.

Two (2) 1,000 lbs. maximum capacity 316 stainless steel portable hoists and sockets for mixers removal and supernate pump from the tank. Three hoist mounting socket, one socket located at each mixer and one at the supernate pump, shall be bolted to the walls of the S.T.P. Each equipment shall include 30 feet of stainless steel cable for the portable hoist.

One (1) Fine bubble aeration system consisting of air headers, diffuser drops with adjustable ball valves, and fine bubble diffusers. Each air diffuser shall be connected to the air header with a 1 ¼" Schedule 40 type 316L stainless steel drop pipe.

D. Aerated Sludge Holding Tank Design

DESIGN CRITERIA	PROPOSED VALUES
Average Daily Flow	20,000 GPD
Number of tanks	1
Required Sludge Volume	Population equivalent (3 ft^3 per capita)
Population Equivalent	100 (gpd per capita)
Equivalent Population	200 (people)
Minimum Required Tank volume	600 (ft^3) 4,488 gallons
Proposed Tank Height	12.00'
Proposed Freeboard	1.5'
Proposed Tank Length	12.00'
Proposed Tank Width	4.83'
Max. Water Depth	10.5'
Effective Tank Volume	609 ft_3 (4,552 gallons)
Minimum Air Flow Rate	30 ft^3/min. / 1,000 ft3
Minimum Air Flow Rate	18.27 ft^3/min
Min. Static Pressure	5.54 PSI

Sludge Holding Tank equipment will consist of the following:

One (1) Supernatant return "T" pipe positioned to facilitate gravity flow of the return supernatant to the anoxic zone.

One (1) Stainless steel plenum coarse bubble aeration system located parallel to and near the bottom of the chamber.

One (1) Kaisser positive displacement, sound attenuating blower (Blower/Motor units Model BB 52C with TEFC motors 5 HP, 200-volt, 3 phase, 60 hertz, maximum capacity rated at 50 (ft^3/min.) @ 6.0 (lbs./sq.in.), with integral frame/sound enclosure, inlet filter/silencer, discharge silencer, check valve, flexible connector, and pressure relief valve. One blower will be operational and the other blower will be for standby. Blowers shall automatically alternate and be equipped with variable frequency drives (VFD's).

One (1) Supernatant pump equipped with a slide rail system and a flexible hose to allow the pump to draw off liquid from various levels. The pump shall be a Flygt Model FS 3069 LT with 2.7 hp, 208 volt, 3 phase, 60 cycles pump motor.

One (1) High water level switch with mounting hook.

One (1) Coarse bubble aeration system consisting of air header, supports, schedule 10, 316 stainless steel diffuser drops and course bubble PVC diffusers. All above water piping, fittings and valves to be 316 stainless steel.

One (1) 316 stainless steel hoist and socket for removal of pumps.

One (1) Provide Flygt Model 3045 Supernatant Return Pump, Rating 90 GPM at 10.18 ft. TDH

12.0 ESTIMATE ELECTRICAL LOADS

Estimated Three Phase – 208-Volt Electrical Loads

NO.	EQUIPMENT	SIZE (HP)	AMPERAGE
1 A	Equalization Pump Station Pump No. 1	3.0	10.76
1 B	Equalization Pump Station Pump No. 2 **	3.0	10.76
2A	Mechanical Screen	1.0	6.22
3A	Aeration Tank Blower	5.0	17.93
3B	Backup Aeration Tank / Sludge Holding Tank Blower**	5.0	17.93
3C	Aerated Sludge Holding Tank Blower	5.0	17.93
4A	Process Tank No.1 Mixer No. 1	2.4	8.61
4B	Process Tank No.2 Mixer No. 2	2.4	8.61
4C	Sludge Decant Pump	3.0	10.76
4D	WAS Pump No. 1	3.0	10.76
5A	Odor Control Treatment System	2.0	7.17

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NO.	EQUIPMENT	SIZE (HP)	AMPERAGE
7	Total 3 Phase Loads (All)	34.80	127.44
	Total 3 Phase Loads During Power Failure	26.80	98.75
Estimated at 0.9 power factor 98.75A x .36 x 0.9 = 29.43 KW			
** Indicates loads not essential or are not required to be operated during power outage			
Spare Capacity for additional loads Estimated at 25 percent. 29.43 x 1.25 = 36.8 KW			

Estimated Single Phase – 120/240 Volt Electrical Loads

NO.	EQUIPMENT	SIZE KW	AMPERAGE
1	Interior and Exterior lighting	1.7	14.0
2	Heaters (1 @ 1.5 KW)	1.5	12.5
3	Vent Fans 1 @0.2 KW)	0.2	2
4	Misc. Controls (flow meter, etc.)	2	20
7.	Hot Water Heater	1.5	12.5
Total Estimated 1 Phase Electrical Loads		6.9 kw	61 amps
Minimum Recommended Spare Capacity (25%)		2 kw	15 amps
			76 amps
Subtotal Emergency Single Phase KW = 76 A x 0.120 = r			9.1 KW

Generator Capacity Required = 36.8 KW +9.1 KW = 45.9 KW
Provide 208 Volt, 3 Phase, 50 KW Generator

13.0 DESCRIPTION OF REQUIRED NORMAL AND EMERGENCY STAND-BY POWER

The STP will be serviced by a new, underground, 3 phase, four (4) wire, 208 volt, power feeder from the new buildings extended to the new STP. A self-standing motor control center will be provided in the proposed control building.

The treatment plant will require standby electrical power to provide emergency power for the various critical electrical devices to be incorporated into the treatment plant design. The generator fuel will be either diesel or natural gas.

14.0 CONCLUSIONS AND RECOMMANDATIONS

The sanitary wastewaters from the proposed CIP facility will require treatment and disposal by a STP. Construction of a BESST STP does meet the required setbacks and will not require a variance. The estimated cost to construct the STP including the gravity sewer system, pump station, and disposal field is approximately $2,000,000.

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APPENDIX A
LOCATION PLAN

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THE CALVERTON INDUSTRIAL PARK
TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

PROPOSED SEWAGE TREATMENT PLANT

LOCATION MAP

SCALE : 1" = 1,000'

0 1,000 2,000

AERIAL MAP

SCALE : 1" = 200'

0 200 400

PWGC
CLIENT DRIVEN SOLUTIONS
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CONSULTANTS

Number	Revision Description	Revision Date
7		
6		
5		
4		
3		
2		
1	-	-

Designed By: BAG	Date Submitted: DATE_SUBMITTED
Drawn By: LT	Date Created: 05-12-2020
Approved By: BAG	Scale: AS NOTED

Client:
HK VENTURES, LLC
399 WEST JOHN STREET
HICKSVILLE, NY 11801

Project:
INDUSTRIAL PARK PROPOSED SEWAGE TREATMENT PLANT

Project Address:
4285 MIDDLE COUNTRY ROAD
CALVERTON, TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

County Tax Map Number: 600-116-1-2

Contract Number: TPO2001

Regulatory Reference Number: REFERENCE NUMBER

Title of Drawing:
LOCATION MAP

Drawing Number: **G-1**

Sheet 1 of 14

PWGC Project Number: TPO2001

PWGC FILE NAME: J:\Projects S-Z\TPO - The Pinewood Organization\TPO2001 - 4285 Middle Country Rd, Calverton\CAD\TPO2001_STP Plans.dwg (Location Map)
PLOT DATE/TIME: May 03, 2021-5:31pm By: ltang

PWGC
CLIENT DRIVEN SOLUTIONS

APPENDIX B
SITE PLAN

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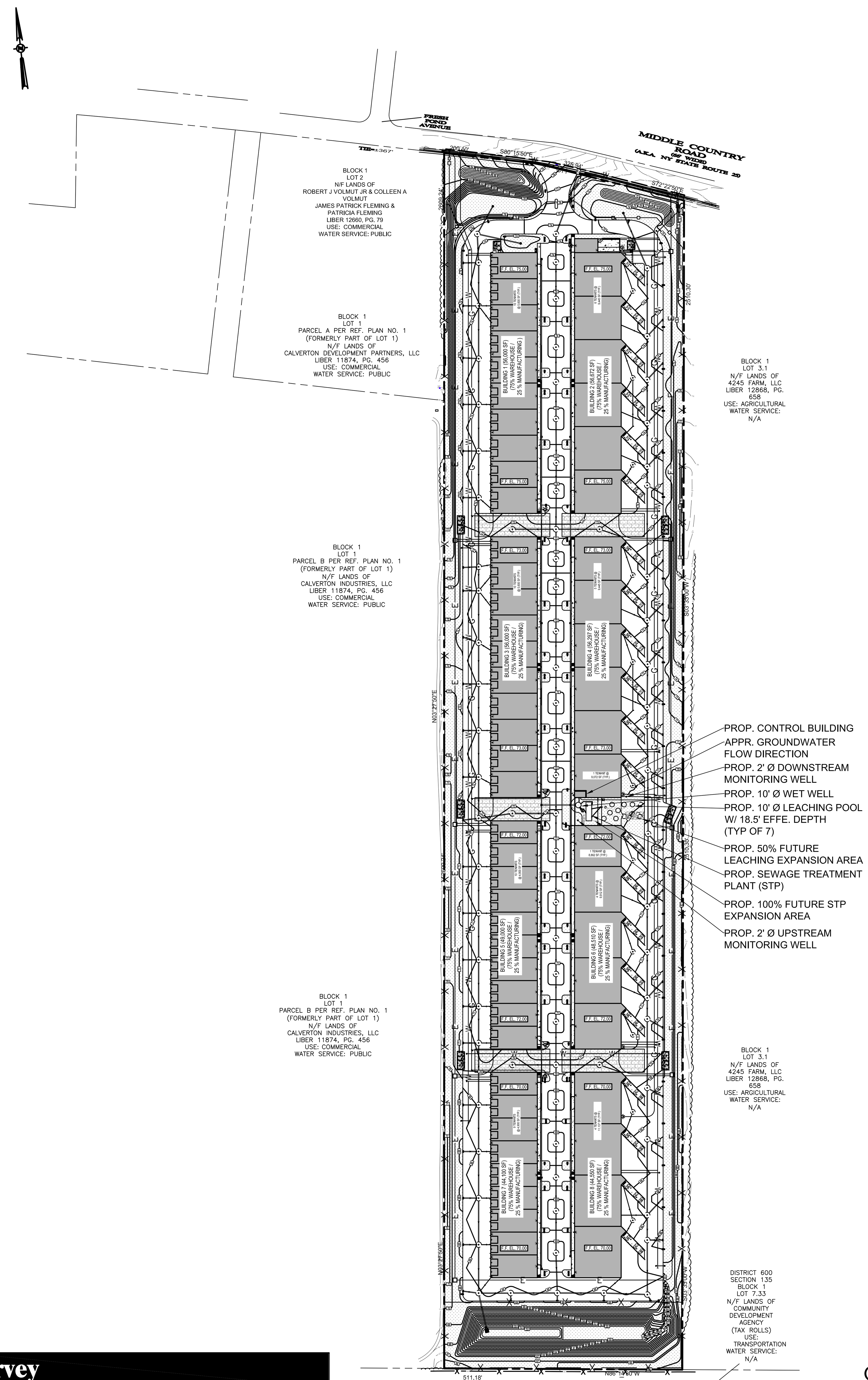

OVERALL SITE PLAN

SCALE : 1" = 150'

0 150 300

Survey

SURVEY AND PLAN INFORMATION & LAYOUT OBTAINED FROM KEY CIVIL ENGINEERING DATED 04/20/2021.

LOCATION MAP

SCALE : 1" = 1,000'

0 1,000 2,000

PROPERTY INFORMATION

SITE:	CALVERTON INDUSTRIAL PARK 4285 MIDDLE COUNTRY ROAD RIVERHEAD, NY 11933
SCTM #:	600-116-1-2
GROSS LOT AREA:	1,317,884 SF OR 30.2545 ACRES
BUILDING CLASSIFICATION:	INDUSTRIAL BUILDINGS
GWMZ #	ZONE III (300 GPD/ACRE)

DENSITY CALCULATIONS

ALLOWABLE SANITARY FLOW:

30.2545 ACRES X 300 GPD/ACRE = 9,076.35 GPD

DESIGN SANITARY FLOW:

TOTAL FLOW = 20,000 GPD

SYSTEM CALCULATIONS

PROPOSED DESIGN FLOW = 20,000 GPD

SEWAGE TREATMENT PLANT DESIGN

REQUIRED: 20,000 GPD
PROVIDED: 20,000 GPD TREATMENT CAPACITY

EFFLUENT LEACHING POOL DESIGN

REQUIRED: 20,000 GPD
DESIGN FOR: 20,000 GPD / 5.0 GPD/SF = 4,000 SF
PROVIDED: NEW LEACHING POOLS
10' DIA. LEACHING POOL HAS 31.4 SF PER VERTICAL LINEAR FEET (VLF)
4,000 SF / 31.4 SF/VLF = 127.4 VLF MIN. REQUIRED
PROVIDE SEVEN (7) 10' DIA. DISTRIBUTION LEACHING POOL BY 18.5 FT EFF. DEPTH = 4,070 SF
TOTAL PROVIDED: 4,070 SF

SUFFOLK COUNTY DEPARTMENT OF HEALTH GENERAL NOTES

1. NO CONSTRUCTION SHALL COMMENCE UNTIL THE FOLLOWING CONDITIONS ARE MET:
   1.1. PERMIT TO CONSTRUCT A WASTE DISPOSAL SYSTEM (SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES - WWM FORM 2) HAS BEEN DULY ISSUED BY THE SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES (S.C.D.H.S.).
   1.2. THE CONTRACTOR OR HIS REPRESENTATIVES HAS NOTIFIED THE S.C.D.H.S., IN WRITING, OF HIS INTENTION TO COMMENCE CONSTRUCTION AND HE SHALL SUBMIT AN ACCURATE SCHEDULE OF ANTICIPATED WORK PROGRESS AT LEAST 7 CALENDAR DAYS PRIOR TO ACTUAL COMMENCEMENT DATE. IF FOR ANY REASON CONSTRUCTION IS TEMPORARILY SUSPENDED, A WRITTEN NOTICE OF SAME SHALL BE TRANSMITTED TO THE S.C.D.H.S. AND A WRITTEN NOTICE OF RECOMMENCEMENT OF CONSTRUCTION TOGETHER WITH A REVISED PROGRESS SCHEDULE SHALL BE TRANSMITTED TO THE S.C.D.H.S. AT LEAST THREE (3) WORK DAYS PRIOR TO THE ACTUAL RECOMMENCEMENT DATE.
2. ALL WORKMANSHIP AND MATERIALS FOR SEWER CONSTRUCTION, AND TESTING THEREOF, INCLUDED IN THIS PROJECT SHALL CONFORM TO THE LATEST REQUIREMENTS OF THE S.C.D.P.W.'S SPECIFICATIONS FOR SEWER CONSTRUCTION INCLUSIVE OF ALL REVISIONS AND ADDENDA THERETO. IN ALL CASES WHERE CONFLICTS EXIST BETWEEN THE CONTRACT DOCUMENTS AND THE LATEST REVISIONS OF THE SPECIFICATIONS FOR SEWER CONSTRUCTION, THE INTERPRETATION AND RULINGS OF THE S.C.D.H.S. SHALL BE BINDING.
3. DURING CONSTRUCTION, THE OWNER SHALL RETAIN A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER WHO IS TO BE PRESENT TO OBSERVE AND EXAMINE THE WORKMANSHIP AND MATERIALS BEING INCORPORATED INTO THE PROJECT. THE ENGINEER SHALL BE THE SOLE JUDGE AS TO WHETHER THE CONSTRUCTION PROVIDED IS IN CONFORMANCE WITH THE REQUIREMENTS. AT ANY TIME DURING THE COURSE OF CONSTRUCTION THAT THE WORK IS DEEMED UNACCEPTABLE, A STOP WORK ORDER WILL BE ISSUED AND ANY WORK PERFORMED AFTER THE ISSUANCE OF SUCH AN ORDER SHALL NOT BE ACCEPTED BY THE ENGINEER. ALL WORK AND/OR MATERIAL FOUND UNACCEPTABLE SHALL BE REMOVED AND REPLACED TO THE SATISFACTION OF THE ENGINEER BEFORE WORK WILL BE PERMITTED TO RECOMMENCE. THE SCDHS WILL PERIODICALLY INSPECT THE PROJECT TO SEE THAT THE CONSTRUCTION IS IN COMPLIANCE WITH THE APPROVED PLANS AND SPECIFICATIONS. ANY DISCREPANCIES WILL BE CALLED TO THE ATTENTION OF THE ENGINEER BY S.C.D.H.S.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE CONSTRUCTION SITE IN A SAFE NON-HAZARDOUS CONDITION ALL IN ACCORDANCE WITH THE REQUIREMENTS OF THE ENGINEER, THE NEW YORK STATE DEPARTMENT OF LABOR, OSHA, AND ALL OTHER AGENCIES HAVING JURISDICTION. UNLESS OTHERWISE ACCEPTED, IN WRITING, BY THE ENGINEER OR OWNER, THE CONTRACTOR SHALL ERECT AND MAINTAIN TEMPORARY FENCING AROUND SEWER TRENCHES OR OPEN EXCAVATIONS WHICH WILL REMAIN OPEN AT THE TERMINATION OF EACH DAY'S WORK. THE ENGINEER/OWNER, OR HIS REPRESENTATIVES, ASSUMES NO RESPONSIBILITY FOR SAFETY CONDITIONS AT THE SITE, AS THIS IS UNDER THE SOLE CONTROL AND COMPLETE RESPONSIBILITY OF THE CONTRACTORS AND HIS SUBCONTRACTORS.
5. FINAL APPROVAL SHALL NOT BE GRANTED UNTIL ALL THE FOLLOWING REQUIREMENTS ARE FULFILLED TO THE SATISFACTION OF THE ENGINEER AND DEPARTMENT OF HEALTH SERVICES.
6. THE CONTRACTOR SHALL PREPARE SUITABLE "AS BUILT" RECORD DRAWINGS OF THE COMPLETED SEWAGE WORKS WHICH SHALL BE SUBMITTED TO THE OWNER, THE ENGINEER AND THE S.C.D.H.S. "AS BUILTS" MUST INCLUDE, BUT NOT BE LIMITED TO: SITE PLAN AND PROFILES CONTAIN CORRECT INVERT INFORMATION.

PWGC
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Designed By: BAG	Date Submitted: DATE_SUBMITTED
Drawn By: LT	Date Created: 05-12-2020
Approved By: BAG	Scale: AS NOTED

Client:
HK VENTURES, LLC
399 WEST JOHN STREET
HICKSVILLE, NY 11801

Project:
INDUSTRIAL PARK PROPOSED SEWAGE TREATMENT PLANT

Project Address:
4285 MIDDLE COUNTRY ROAD
CALVERTON, TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

County Tax Map Number: 600-116-1-2
Contract Number: TPO2001
Regulatory Reference Number: REFERENCE NUMBER

Title of Drawing:
OVERALL SITE PLAN

Drawing Number: C-1

Sheet 2 of 14

Unauthorized alteration or addition to this drawing and related documents is a violation of Section 7209 of the New York State Education Law

PWGC Project Number: TPO2001

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APPENDIX C
PROPOSED ON-SITE SEWAGE TREATMENT PLANT SCHEMATIC DIAGRAM AND HYDRAULIC PROFILE

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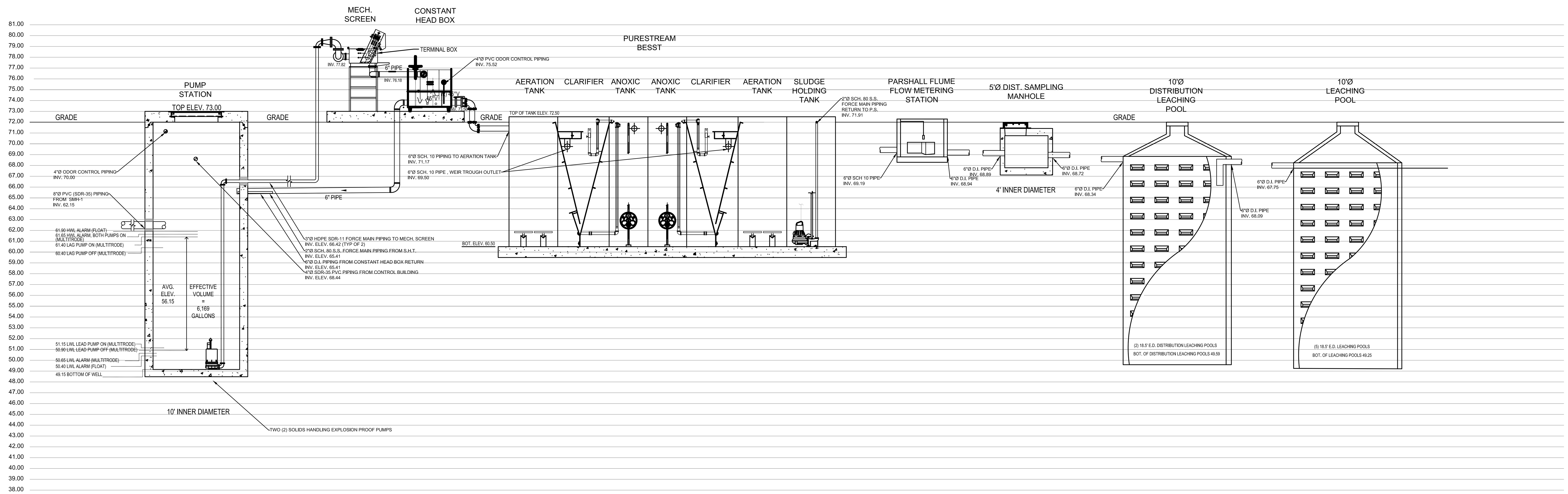
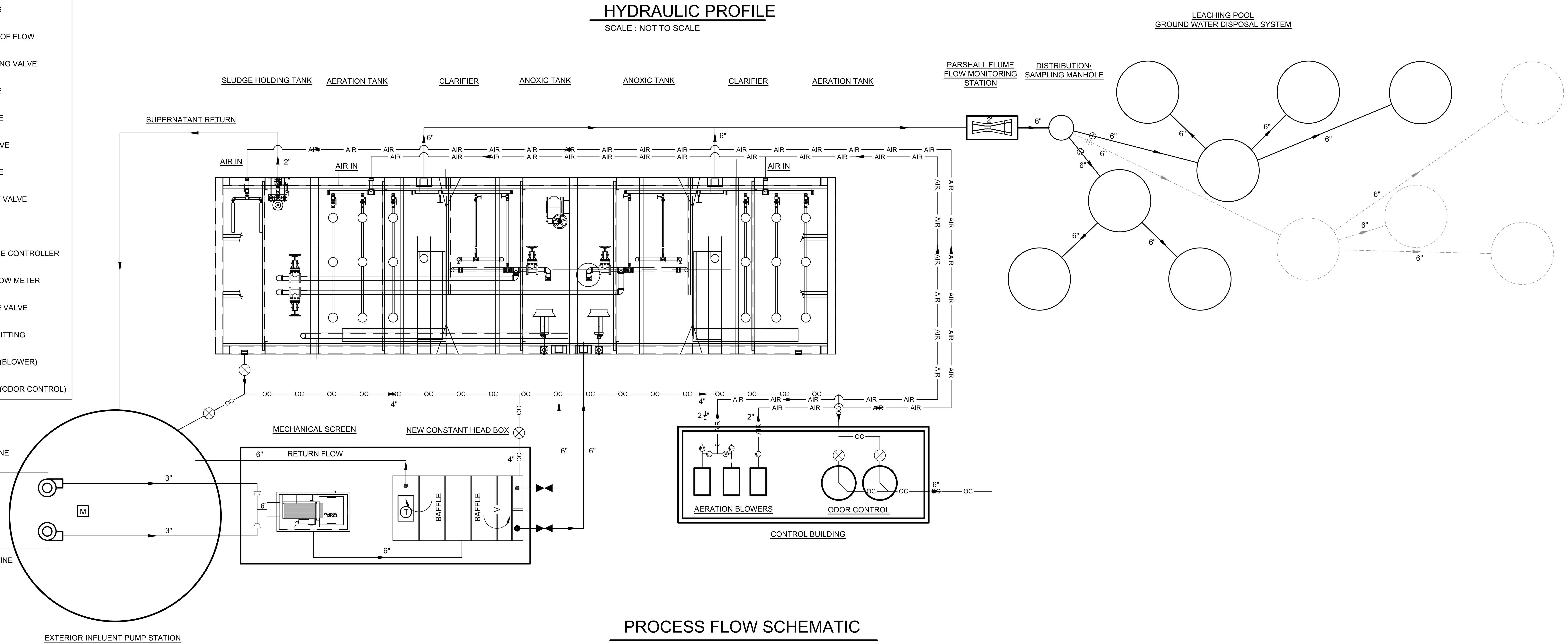


HYDRAULIC PROFILE

SCALE : NOT TO SCALE

LEGEND

- NEW PIPING
- DIRECTION OF FLOW
- TELESCOPING VALVE
- BALL VALVE
- GATE VALVE
- CHECK VALVE
- PLUG VALVE
- BUTTERFLY VALVE
- PUMP
- MULTITRODE CONTROLLER
- DOPLER FLOW METER
- SLIDE GATE VALVE
- REDUCER FITTING
- AIR PIPING (BLOWER)
- AIR PIPING (ODOR CONTROL)



PROCESS FLOW SCHEMATIC

SCALE : NOT TO SCALE

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Project:
INDUSTRIAL PARK PROPOSED SEWAGE TREATMENT PLANT

Project Address:
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CALVERTON, TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

County Tax Map Number: 600-116-1-2 — Contract Number: TPO2001
Regulatory Reference Number: REFERENCE NUMBER

Title of Drawing:
HYDRAULIC PROFILE & FLOW SCHEMATIC

Drawing Number: M-1
Sheet 6 of 14
PWGC Project Number: TPO2001

APPENDIX D
FLOOR PLAN OF ON-SITE SEWAGE TREATMENT PLANT

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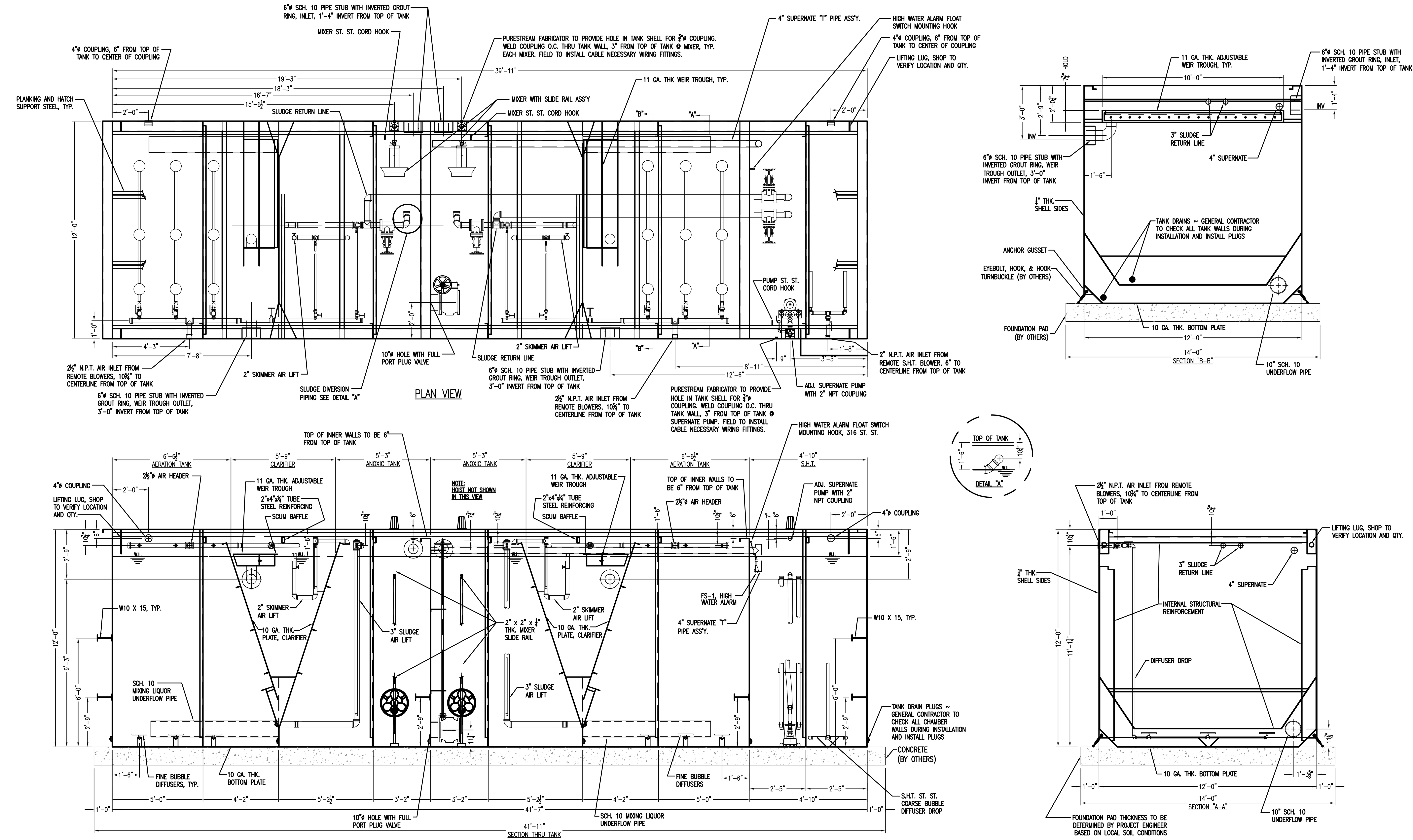

NOTE: INTERNAL REINFORCING MUST BE IN LOCATIONS SHOWN.

DESIGN DATA					
MODEL NUMBER	DESIGN FLOW G.P.D.	ANOXIC TANK VOLUME GALLON	CLARIFIER VOLUME GALLON	AERATION TANK VOLUME GALLON	SLUDGE HOLDING VOLUME GALLON
PES-20	20,000	12,500 total	5,397 total	15,000 total	4,552

NOTE:
THIS TANK STRUCTURE IS REINFORCED TO WITHSTAND NORMAL PRESSURES FROM THE SOIL AND FROM THE INTERIOR HYDROSTATIC LOAD ON ABOVE GRADE INSTALLATIONS. IF THERE IS A GROUND WATER PROBLEM, NOTIFY YOUR ENGINEER AND PURESTREAM IMMEDIATELY. PURESTREAM WILL NOT BE RESPONSIBLE FOR DAMAGE TO THE TANK STRUCTURE OR EQUIPMENT DUE TO GROUND WATER.

NOTES:
1. PLANT TO BE SHIPPED WITH BLOWER MOTOR UNITS AND CONTROL PANEL SHIPPED LOOSE FOR FIELD INSTALLATION BY OTHERS. SUGGESTED LOCATION OF BLOWERS AND CONTROLS IS AT THIS END OF THE PLANT.
2. LOCATION OF ALL FLOAT SWITCHES TO BE DETERMINED BY PROJECT ENGINEER.
3. ALL MATERIAL SHALL BE 316L ST. ST.

BESST PROCESS TANKS DETAIL

SCALE : NOT TO SACALE

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Client:
HK VENTURES, LLC
399 WEST JOHN STREET
HICKSVILLE, NY 11801

Project:
INDUSTRIAL PARK PROPOSED SEWAGE TREATMENT PLANT

Project Address:
4285 MIDDLE COUNTRY ROAD
CALVERTON, TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

County Tax Map Number: 600-116-1-2 — Contract Number: TPO2001
Regulatory Reference Number: REFERENCE NUMBER

Title of Drawing:
PROCESS TANK DETAILS

Drawing Number: M-3
Sheet 8 of 14
PWGC Project Number: TPO2001

APPENDIX E
FLOOR PLAN OF STP CONTROL BUILDING

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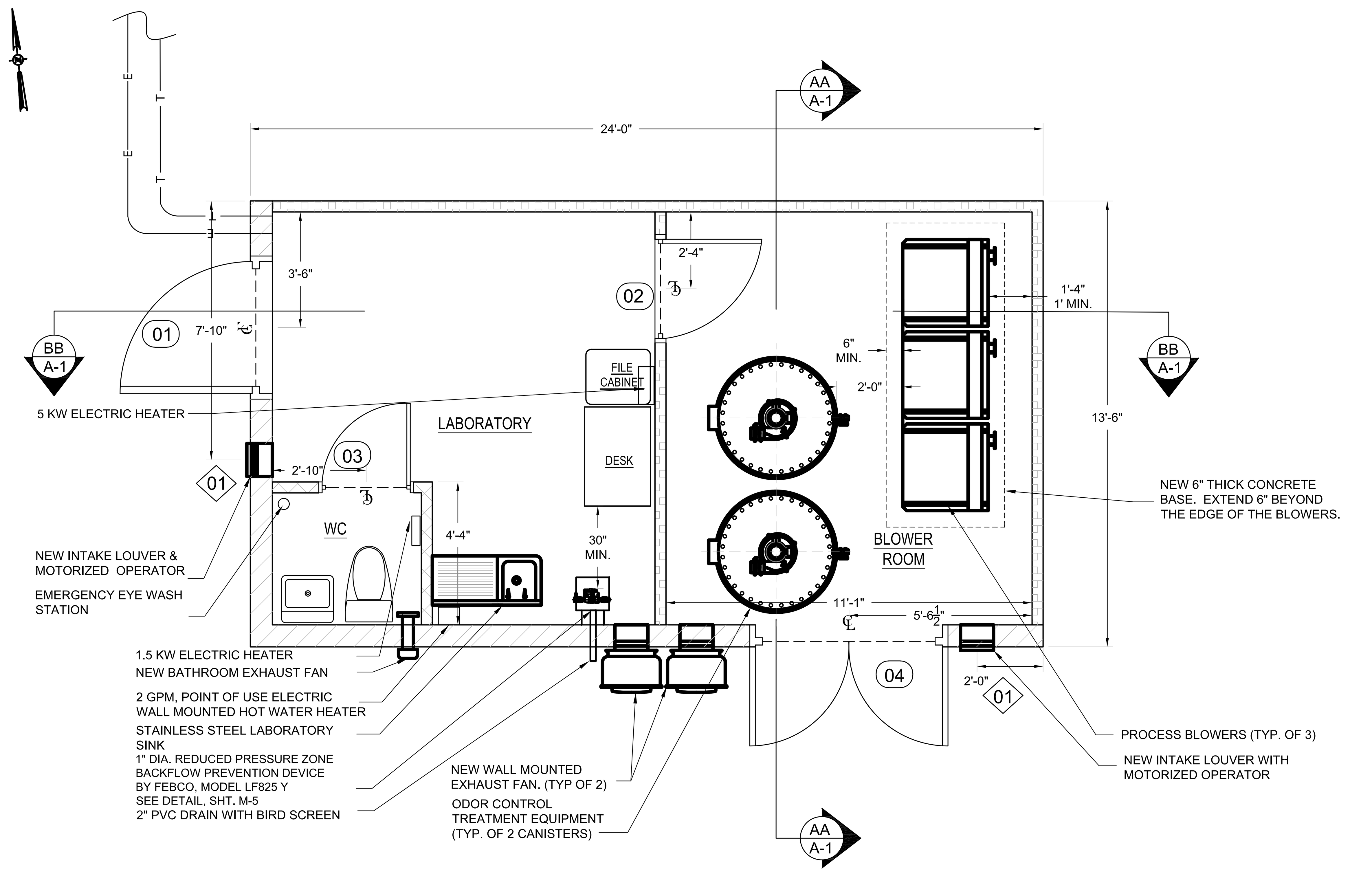
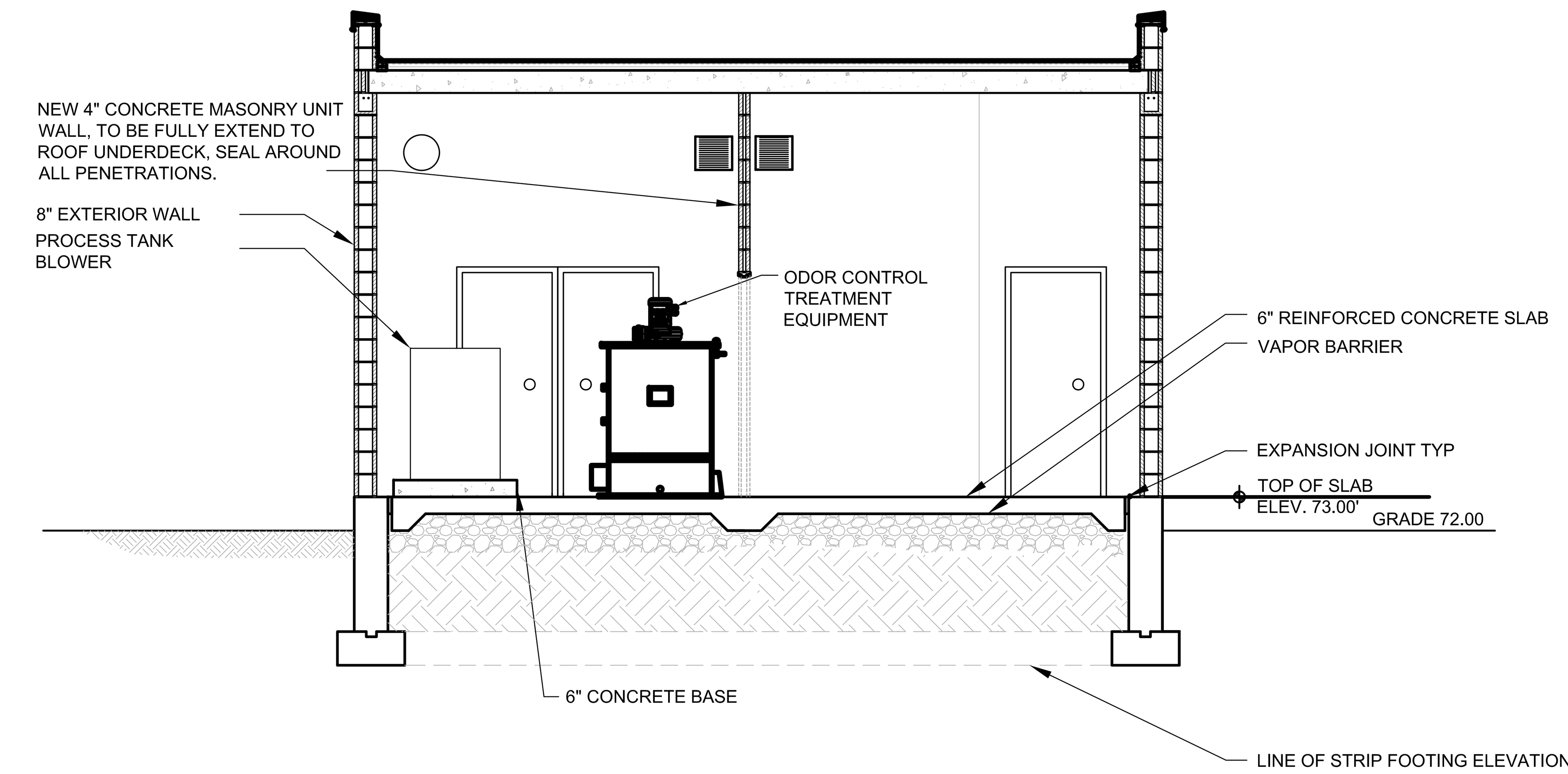


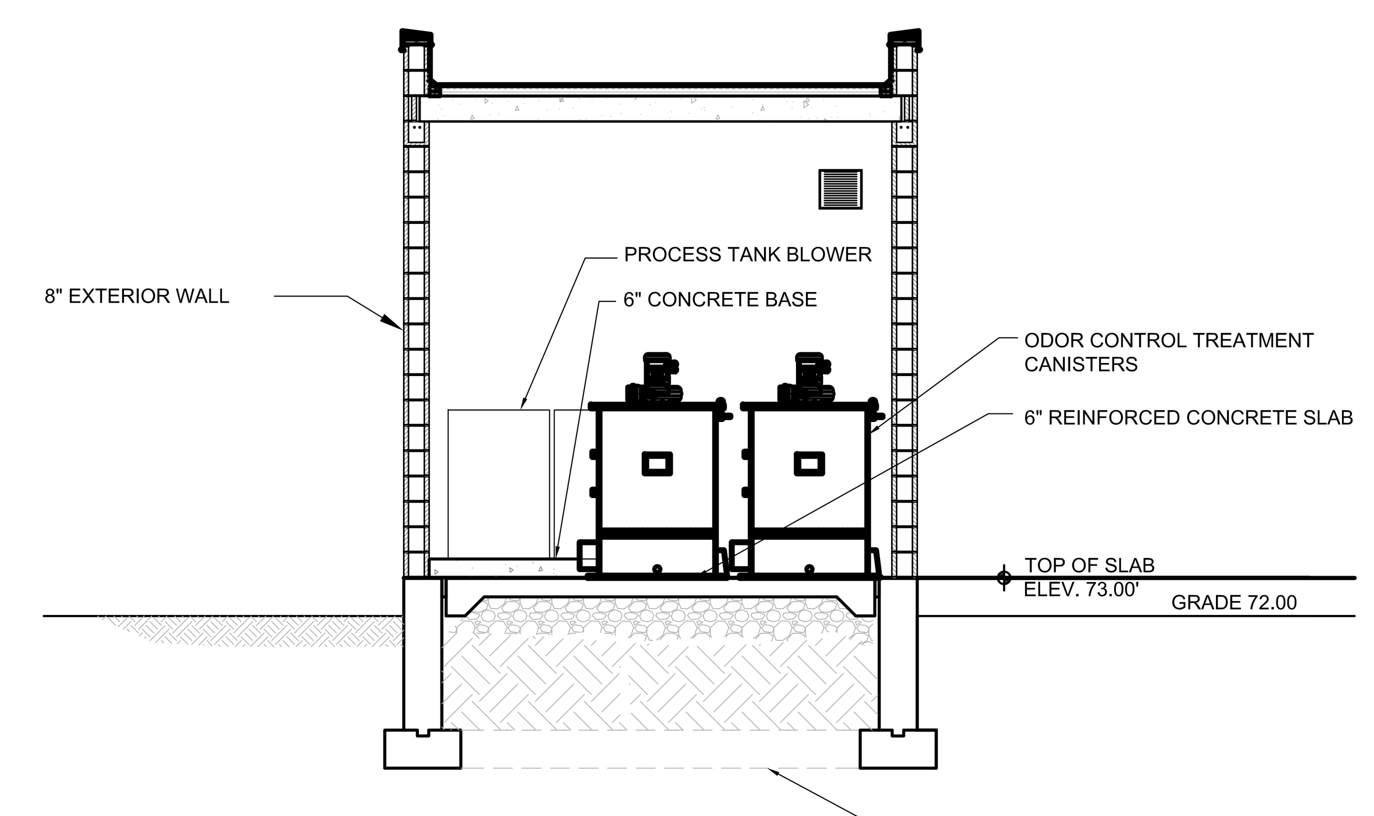
FLOOR PLAN

SCALE : 3/8" = 1'



SECTION B-B

SCALE : 1/4" = 1'



SECTION A-A

SCALE : 1/4" = 1'

DOOR & HARDWARE SCHEDULE

NO.	DOOR SLAB			FRAME		HARDWARE	LINTEL *	REMARKS
	QUANTITY	SIZE	TYPE	MATERIAL	THRESHOLD			
01	1	4'-0" x 8'-0"	1-3/4" FRP	FRP	AL	GROUP #1	8" x 8" CMU W/ TWO (4) NO.5 REBAR	EXTERIOR DOORS
02	1	3'-0" x 6'-8"	1-3/4" FRP	FRP	AL	GROUP #2	8" x 8" CMU W/ TWO (2) NO.5 REBAR	BLOWER ROOM
03	1	2'-8" x 6'-8"	1-3/4" FRP	FRP	AL	GROUP #2	8" x 8" CMU W/ TWO (2) NO.5 REBAR	BATHROOM
04	1	6'-0" x 8'-0"	1-3/4" FRP	FRP	AL	GROUP #1	8" x 8" CMU W/ TWO (4) NO.5 REBAR	EXTERIOR DOORS

ABBREVIATIONS

FRP FIBERGLASS REINFORCED DOORS

AL ALUMINUM

*LINTEL REINFORCEMENT SHALL EXTEND 12" PAST EDGE OF OPENIGS.

LEGEND

	8" SPLIT MASONRY BLOCK WALLS
	4" MASONRY BLOCK WALLS 8' HIGH
	4" MASONRY BLOCK WALLS TO THE UNDERSIDE OF THE ROOF

HARDWARE GROUP #1

HINGES:	4-1/2" x 4-1/2" STAINLESS STEEL
EXIT DEVICE:	HAGER - 4500 SERIES STAINLESS STEEL
EXIT TRIM:	HAGER - 4500 SERIES0 - 45CE STAINLESS STEEL
SURFACE CLOSER:	HAGER - 5200 SERIES - ALUMINUM ALLOY
KICK PLATE:	IVES - STAINLESS STEEL (DULL)
SADDLE:	NATIONAL GUARD PRODUCTS, ALUMINUM
DOOR BOTTOM:	NATIONAL GUARD PRODUCTS - 36VA - VINYL
SEALS:	NATIONAL GUARD PRODUCTS - 130NA - NEOPRENE

HARDWARE GROUP #2

HINGES:	4-1/2" x 4-1/2" STAINLESS STEEL
EXIT DEVICE:	YALE - 4700 SERIES - (F76A)
SURFACE CLOSER:	HAGER - 4500 SERIES0 - 45CE STAINLESS STEEL
KICK PLATE:	IVES - STAINLESS STEEL (DULL)
SADDLE:	NATIONAL GUARD PRODUCTS, ALUMINUM
DOOR BOTTOM:	NATIONAL GUARD PRODUCTS - 36VA - VINYL
SEALS:	NATIONAL GUARD PRODUCTS - 130NA - NEOPRENE

LOUVER SCHEDULE

NO.	QUANTITY	MAKE	MODEL	SIZE	TYPE	FRAME	LINTEL	NOTES
01	2	GREENHECK	EAD-601	2'-0" x 1'-6"	MOTORIZED	EXTRUDED ALUMINUM	12" x 12" CMU W/ TWO (4) NO.5 REBAR AND ONE 3 x 3-1/2" x 5/16" STEEL BRICK SHELF	LABORATORY ROOM & BLOWER ROOM

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Client:
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399 WEST JOHN STREET
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Project:
INDUSTRIAL PARK PROPOSED SEWAGE TREATMENT PLANT

Project Address:
4285 MIDDLE COUNTRY ROAD
CALVERTON, TOWN OF RIVERHEAD
SUFFOLK COUNTY, NEW YORK

County Tax Map Number: 600-116-1-2 | Contract Number: TPO2001

Regulatory Reference Number: REFERENCE NUMBER

Title of Drawing:
CONTROL BUILDING FLOOR PLAN

Drawing Number: A-1

Sheet 5 of 14

PWGC Project Number: TPO2001

APPENDIX F
EQUIPMENT MANUFACTURER'S SUBMITTALS

BESST PROCESS CALCULATIONS

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PES Project #	BJB-042821-HK	Date:	4/28/21
Job Name:	HK Ventures		
QTY & Flow			

BESST DESIGN CALCULATIONS

1) $\mathbf{B_x}$ Actual Sludge Load [kg BOD_5 / kg VSS / d]

$\mathbf{B_x}$ = $B \times 1.02^{(tmin-20)}$
$\mathbf{B_x}$ = $0.120 \times 1.02^{(10 - 20)}$
$\mathbf{B_x}$ = 0.0984 kg BOD_5 / kg VSS / d

2) **A** Sludge Age [days]

A = $(1 / (YB_x)) \times (1-0.5((YB_x) / k_{ac})) + (Sqrt(1 + ((YB_x) / 2k_{ac})^2))$
A = (1/ (0.60 x 0.0984)) x (1- 0.5 x((0.60 x 0.0984) / 0.090))+
(Sqrt (1 + (0.60 x 0.0984) / (2x 0.090 $)^2$))
A = 29.1936 days

3) $\mathbf{k_d}$ Actual Rate of Decay [d^{-1}]

$\mathbf{k_d}$ = $k_{ac} / (1 + Ak_{ac})$
$\mathbf{k_d}$ = 0.090 / (1+ (29.1936) (0.090))
$\mathbf{k_d}$ = 0.0248 d^{-1}

4) **X** Sludge Concentration [kg ss / m^3]

X = $1000 \times V_x / Kl$
X = 1000 x 0.600) / 100
X = 6.0000 kg ss / m^3

5) $\mathbf{X_v}$ Volatile Suspended Solids Concentration [kg VSS / m^3]

$\mathbf{X_v}$ = (X)(p)
$\mathbf{X_v}$ = 6.0000 x 0.65
$\mathbf{X_v}$ = 3.9000 kg VSS / m^3

PES Project #	BJB-042821-HK	Date:	4/28/21
Job Name:	HK Ventures		
QTY & Flow	0		

BESST DESIGN CALCULATIONS, Cont'd.

6) **v** Actual Hydraulic Loading [m / h]

v = Lesser of v_l or v_c, where v_l = 1
$\mathbf{v_c}$ = $(N_x / X) \times e^{0.03(tmin-20)}$
$\mathbf{v_c}$ = (6.0000 / 6.0000) ($e^{0.03 *(10 - 20)}$)
$\mathbf{v_c}$ = 0.7408 m / h
v = 0.7408 m / h

7) $\mathbf{V_B}$ Aeration Volume [m^3]

$\mathbf{S_R}$ = S_T - (0.966(p)(NL))
$\mathbf{V_B}$ = $(Q(S_O - S_R)) / X_vB_x$
$\mathbf{V_B}$ = ((75.7002)(0.2720 - 0.0000) / (3.900)(0.0984)
$\mathbf{V_B}$ = 53.63 m^3
53.63 m^3 x 264.2 gal/m^3 = 14170 gallons

8) $\mathbf{S_S}$ Clarifier Surface Area [m^2]

$\mathbf{S_S}$ = $((Q_Q)(Q) / 24v$
$\mathbf{S_S}$ = ((3)(75.700)/ (24 * 0.7408)
$\mathbf{S_S}$ = 12.773 m^2
12.773 m^2 x 10.76 ft^2/m^2 = 137 ft^2

9) $\mathbf{V_S}$ Clarifier Volume [m^3]

$\mathbf{V_S}$ = S_S / SV
$\mathbf{V_S}$ = 12.773 / 0.69
$\mathbf{V_S}$ = 18.512 m^3
18.51 m^3 x 264.2 gal/m^3 = 4891 gallons

PES Project #	BJB-042821-HK	Date:	4/28/21
Job Name:	HK Ventures		
QTY & Flow	0		

BESST DESIGN CALCULATIONS, Cont'd.

10) $\mathbf{P_X}$ Net Mass of Volatile Suspended Solids Produced [kg VSS / d]

$\mathbf{P_X}$ = $(Y / (1 + Ak_d))(Q)(S_O - S_R)$
$\mathbf{P_X}$ = (0.60 / (1 + (29.1936) (0.0248)) (75.70)(0.2720 - 0.0000)
$\mathbf{P_X}$ = 7.165 kg VSS / d

11) $\mathbf{P_t}$ Sludge Production [kg ss / d]

$\mathbf{P_t}$ = P_X / p
$\mathbf{P_t}$ = 7.165 / 0.6500
$\mathbf{P_t}$ = 11.023 kg ss / d

12) $\mathbf{V_N}$ Nitrification Volume [m^3]

$\mathbf{V_N}$ = $(Q(N_O - N)) / (p_N m_U X_V)$
$\mathbf{V_N}$ = (75.7002 (0.0550 - 0.0000)) / ((0.0546)(0.6085)(3.9000))
$\mathbf{V_N}$ = 32.120 m^3
32.12 m^3 x 264.2 gal/m^3 = 8486 gallons

13) $\mathbf{V_D}$ Denitrification Volume [m^3]

$\mathbf{V_D}$ = $(QN_OY) / (0.75 m_Z X_V)$
$\mathbf{V_D}$ = (75.70 ((0.0550)(0.60))) / (0.75 (0.0250)(3.9000))
$\mathbf{V_D}$ = 34.162 m^3
34.16 m^3 x 264.2 gal/m^3 = 9026 gallons

PES Project #	BJB-042821-HK	Date:	4/28/21
Job Name:	HK Ventures		
QTY & Flow	0		

BESST DESIGN CALCULATIONS, Cont'd.

14) $\mathbf{V_A}$ Volume of Aeration [m^3]

$\mathbf{V_A}$ = Larger of V_{AB} or V_N

$\mathbf{V_{AB}}$ = $V_B - V_D((1 + Ak_d) / (2.77(Am_Z)))$

$\mathbf{V_{AB}}$ = 53.63 - 34.162 ((1 + (29.1936)(0.0248)) / (2.77 (29.1936)(0.0250))

$\mathbf{V_{AB}}$ = 24.494

$\mathbf{V_A}$ = 32.120 m^3

32.12 m^3 x 264.2 gal/m^3 = 8486 gallons

NOTE: Aeration Zone Volume will b(**15000** gallons due to Suffolk County requirements

Anoxic Zone Volume will be **12500** gallons due to Suffolk County requirements

15) $\mathbf{V_T}$ Total Volume of Reactor [m^3]

$\mathbf{V_T}$ = $V_A + V_D + V_S$

$\mathbf{V_T}$ = 32.120 + 34.162 + 18.512

$\mathbf{V_T}$ = 84.79 m^3

84.79 m^3 x 264.2 gal/m^3 = 22402 gallons

NOTE: Actual total volume of reactor may be greater due to oversized Aeration and Anoxic Zones

16) $\mathbf{O_2}$ Oxygen Consumption [kg O_2 / d]

$\mathbf{O_2}$ = $Q((S_O - S_R) / 0.55) - 1.42P_X + 4.57Q(N_O - N)$

$\mathbf{O_2}$ = 75.70 ((0.2720 - 0.0000) / 0.68) - 1.42 (7.165) + 4.57 (75.70) (0.0550 - 0.0000)

$\mathbf{O_2}$ = 46.291 kg O_2 / d

46.291 kg O_2 / d x 2.205 lbs./kg = 102.07 lbs. O_2/d

PES Project #	BJB-042821-HK	Date:	4/28/21
Job Name:	HK Ventures		
QTY & Flow	0		

BESST DESIGN CALCULATIONS, Cont'd.

17) **Nm** Air Consumption [Nm^3 / h]

Nm = $O_2(c_S / (c_S - 2))(o_k / (0.024a))$
Nm = 46.291 (9.1580 / (9.1580 - 2))
(1.3000 / (0.024 (30)))
Nm = 106.93 Nm^3 / h
106.93 Nm^3 / h x 35.31 ft^3/Nm^3= 3775.81 ft^3/h
3775.81 ft^3/h divided by 60 min/hr = 63 ft^3/min

BESST PROGRAM AND FORMULA LISTING

The following variable and formula lists represent the program listing for the computer model used to design and size the BESST system. Not all of the formulas are listed due to copyright and patent protection. Formulas that are NOT shown are mainly sub-formulas of those listed. For formula verification see Metcalf & Eddy: Wastewater Engineering; and K.R. Imhoff: Taschenbuch def Stadtenwasterung. 28. Auflage, Oldenbou Munchen - Wien 1993.

INPUT VALUES

1.)	**B**	**Sludge Load (kg BOD / kg VSS)**	**0.03 to 0.20**
2.)	N_X	**Flux Flow (kg ds / m^2 / h)** function of temperature (use @ 20 degrees Celsius)	**6.00**
3.)	V_L	**Limit Hydraulic Loading (m / h)**	**0.99 to 1.1**
4.)	V_X	**Sludge Volume (mL / L)**	**4.0 to 0.7**
5.)	**KI**	**Sludge Index (mL / g)**	**70 to 120**
6.)	**p**	**Volatile Suspended Solids (%)**	**0.62 to 0.68**
7.)	**Y**	**Maximum Yield Coefficient (kg VSS / kg BOD)**	**0.53 to 0.6**
8.)	k_{ac}	**Decay Rate (d)** constant	**0.09**
9.)	**Q**	**Flow Rate (m^3 / d)**	
10.)	Q_Q	**Flow Variation**	**1.5 to 3**
11.)	S_O	**Influent BOD (kg / m^3)**	
12.)	S_T	**Effluent BOD (kg / m^3)**	
13.)	N_O	**Influent Ammonia (kg / m^3)**	
14.)	**N**	**Effluent Ammonia (kg / m^3)** typically	**0.005**

INPUT VALUES

15.)	**N_3**	**Effluent Nitrates N-NO_3 (kg / m^3)**	typically	**0.001 to 0.015**
16.)	**NL_O**	**Influent TSS (kg / m^3)**		
17.)	**NL**	**Effluent TSS (kg / m^3**		
18.)	**min**	**Minimum Water Temperature (^oC)**		
19.)	**max**	**Maximum Water Temperature (^oC)**		
20.)	**a**	**Oxygen Transfer Coefficient (g / Nm^3)**		**15 to 50**
21.)	**SV**	**Ratio, Separation Surface to Separation Volume**		
22.)	**m_i**	**Specific Growth Rate of Nitrificants**	constant	**1.37**
23.)	**pH**	**pH**		**6.0 to 8.0**
24.)	**m_{id}**	**Specific Growth Rate of Denitrificants**	constant	**0.1 to 0.3**
25.)	**O_k**	**Peak Load of Aeration**	constant	**1.3**

Nitrification and Denitrification

Nitrogen is removed by the nitrification and denitrification processes. Nitrification is autotropic and all Purestream *ES*, LLC integrated bioreactors are designed for complete nitrification of ammonia to NO_3 (pleas see Metcalf & Eddy, Third Edition, Chapter 11-6).

Denitrification, however, is heterotropic and requires a carbon source. Conventional plants' "separate sludge denitrification" requires that carbon is added, typically in the form of methanol. This adds to operating costs, and if used in excess, to increased BOD_5 content. BESST technology's "single-sludge denitrification" approach uses an endogenous carbon source to maintain dentrifiers. Influent is combined with nitrified mixe liquor in the anoxic compartment providing the carbon source needed for denitrification. Relatively high mixe liquor recycle rates are employed and sufficient denitrification retention times provided.

Total nitrogen reduction ($\mathbf{N_T}$) is a subject of not only providing sufficient anoxic volume for denitrification and keeping temperature above a certain minimum, but also a function of Recycled Activated Sludge (RAS) flow rate. The efficiency of $\mathbf{N_T}$ reduction is expressed as follows:

$$\eta = (1 - 1/(1 + n)) \times 100$$

Where n = RAS flow multiple of average flow Q.

The following are typical efficiencies and RAS flow multiples used / required:

	n	η (%)
Domestic	2	66
	3	75
	4	80
Slaughterhouse Wastewater	14	93
Hog Manure	29	97

Phosphorous Reduction

BESST technology delivers not only high efficiency reduction of organic matter, but also increased efficiency of phosphorous removal. Two processes, biological and chemical precipitation are employed with advantage

The mechanics of biological phosphorous removal, known as "Luxury Uptake", are due to exposure of activated sludge to alternating oxic and anoxic conditions. Under these conditions, the cells store more energy in the form of phosphorous than needed for their survival. If strictly oxic conditions are maintained during subsequent clarification, phosphorous will be retained by the cells and will eventually be removed with the excess sludge. Unlike most other methods of clarification, these conditions are maintained by the BESST process, and biological phosphorous reduction to less than 3 mg/L are readily achievable.

The basic reaction involved in the precipitation of phosphorous with iron is as follows:

$$Fe^{+3} + H_n(PO_4)^{n-3} \blacklozenge \quad FePO_4 + nH^+$$

In the case of iron, 1 mole will precipitate 1 mole of phosphate. The advantage of the process is its low chemical consumption, close to stoichiometric, and consequently, the reduction of ballast sludge production. Followed by microfiltration, reductions to 0.5 mg/L are possible.

If yet further reduction of phosphorous is required, ferric sulfate precipitation after the bioreactor followed by microfiltration must be used.

BESST Sizing and Pricing Program v7.9.2004.01

P/E Job No.	BJB-042821-HK	Date	4/28/21
Job Name	HK Ventures		

B	0.12	kg BOD/kg VSS d	0.12	Bx	0.098441796
Nx	6	kg SS/m2h	6	A	29.19360047
vl	1	m/h	1	kd	0.024810995
Vx	0.6	ml/l	0.6	X	6
Kl	100	ml/g	100	Xv	3.9
p	0.65	MLVSS/MLSS	0.65	v	0.740818223
Y	0.6	kg-1 VSS/kg BOD	0.6	VB	53.63
kac	0.09	d-1	0.09	Ss	12.77
Flow	20,000	GPD	75.70023	Vs	18.51
Peak	3	QQ	3	Px	7.16
BODin	272	mg/l	0.272	Pt	11.02
BODout	0	mg/l	0	Vn	32.12
NH3-Nin	55	mg/l	0.055	Vd	34.16
NH3-Nout	0	mg/l	0	Va	32.12
TNout	0	mg/l	0	Vt	84.79
TSSin	320	mg/l	0.32	O2	46.29
TSSout	0	mg/l	0	Nm	106.93
T min	10	C	10	uc	100.00%
T max	20	C	20		
			30		
			0.69		
			1.37		
			7		
			0.1		
			1.3		

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EQUALIZATION PUMPS

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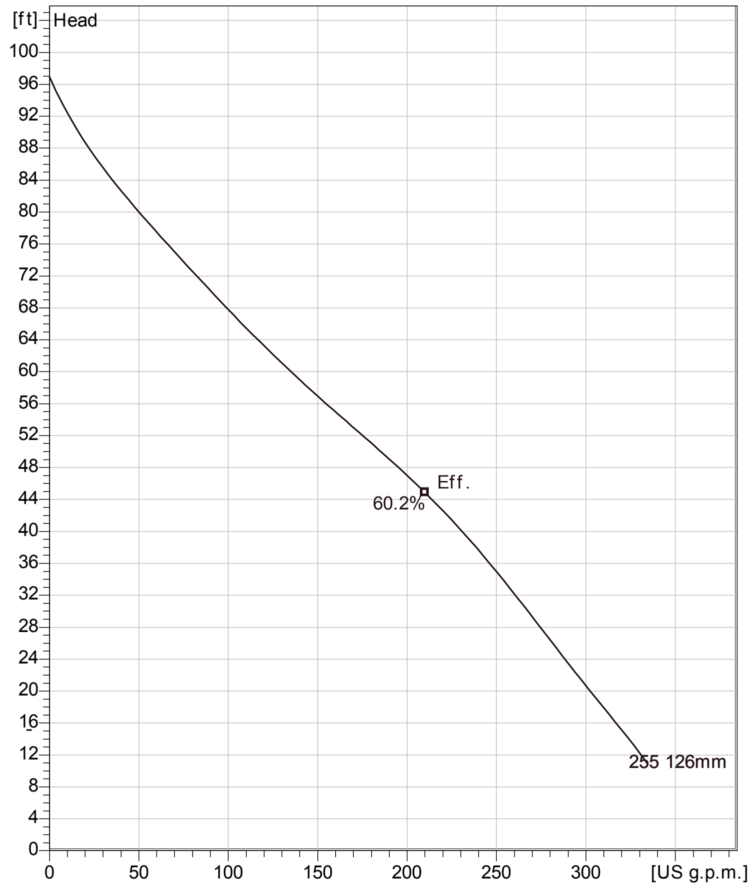
NP 3085 SH 3~ Adaptive 255

Technical specification



Water, pure *Curve according to: ISO 9906 grade 2 annex 1 or 2*

Note: Picture might not correspond to the current configuration.

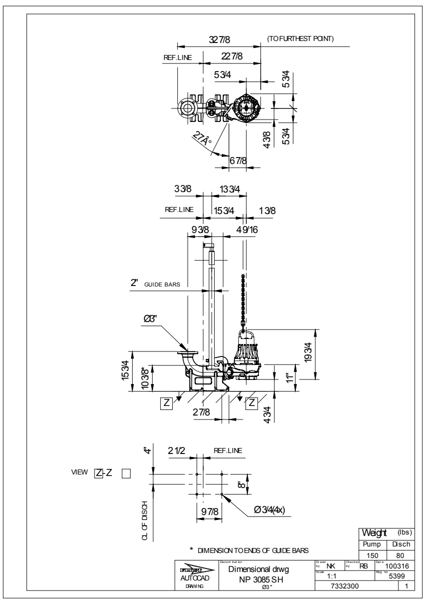
General

Patented self cleaning semi-open channel impeller, ideal for pumping in waste water applications. Possible to be upgraded with Guide-pin® for even better clogging resistance. Modular based design with high adaptation grade.

Impeller

Impeller material	Grey cast iron
Discharge Flange Diameter	3 1/8 inch
Suction Flange Diameter	80 mm
Impeller diameter	126 mm
Number of blades	2

Installation: P - Semi permanent, Wet



Motor

Motor #	N3085.160 15-09-2AL-W 4hp
Stator variant	12
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	4 hp
Rated current	5.1 A
Starting current	30 A
Rated speed	3415 rpm
Power factor	
1/1 Load	0.91
3/4 Load	0.88
1/2 Load	0.81
Efficiency	
1/1 Load	80.5 %
3/4 Load	82.5 %
1/2 Load	82.5 %

Configuration

Project	Project ID	Created by	Created on	Last update
			2015-01-13	

xylem
Let's Solve Water

NP 3085 SH 3~ Adaptive 255

Performance curve

FLYGT

Pump

Discharge Flange Diameter	3 1/8 inch
Suction Flange Diameter	80 mm
Impeller diameter	4 15/16"
Number of blades	2

Motor

Motor #	N3085.160 15-09-2AL-W 4hp
Stator variant	12
Frequency	60 Hz
Rated voltage	460 V
Number of poles	2
Phases	3~
Rated power	4 hp
Rated current	5.1 A
Starting current	30 A
Rated speed	3415 rpm

Power factor	
1/1 Load	0.91
3/4 Load	0.88
1/2 Load	0.81

Efficiency	
1/1 Load	80.5 %
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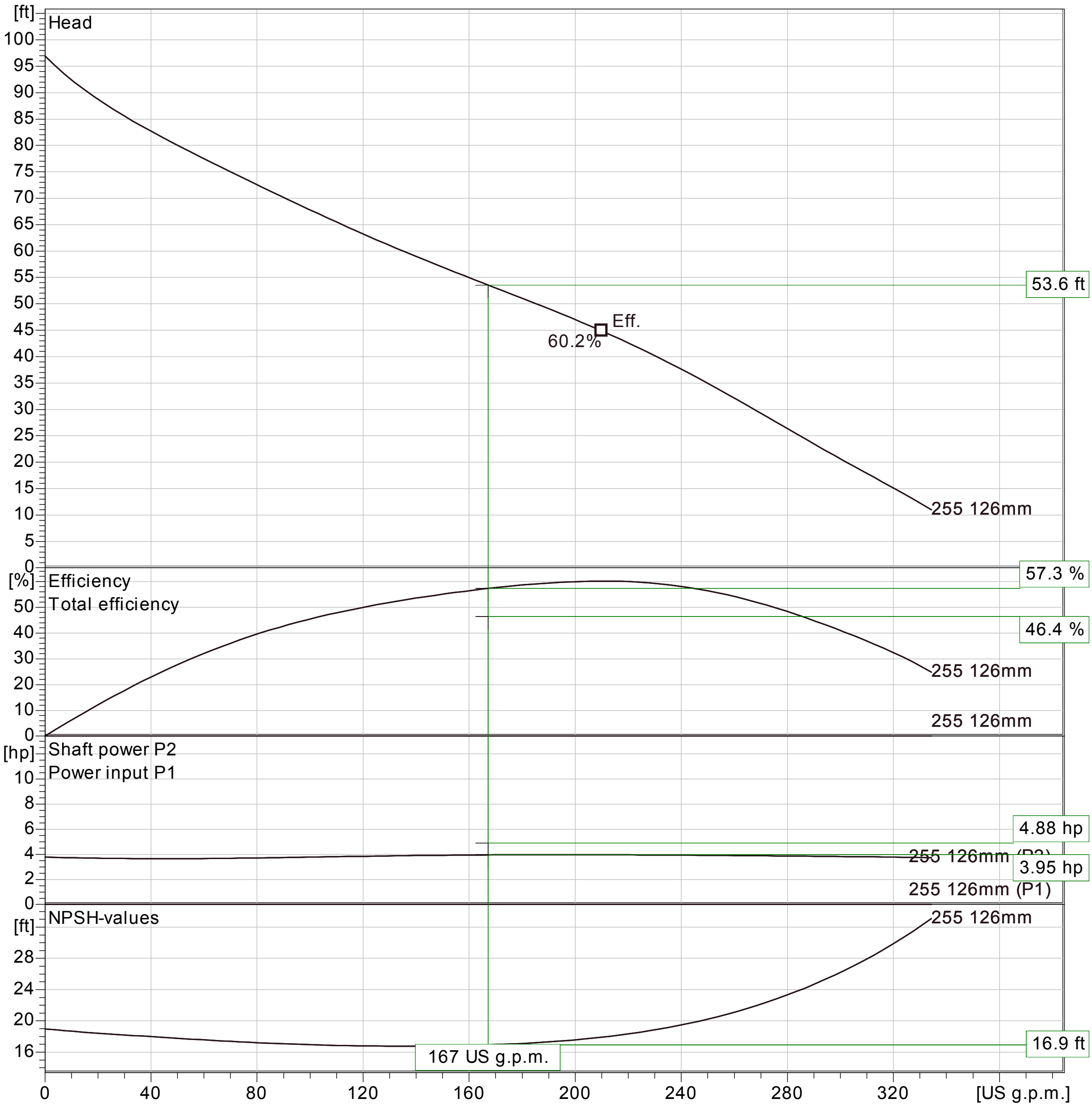
1/2 Load	82.5 %



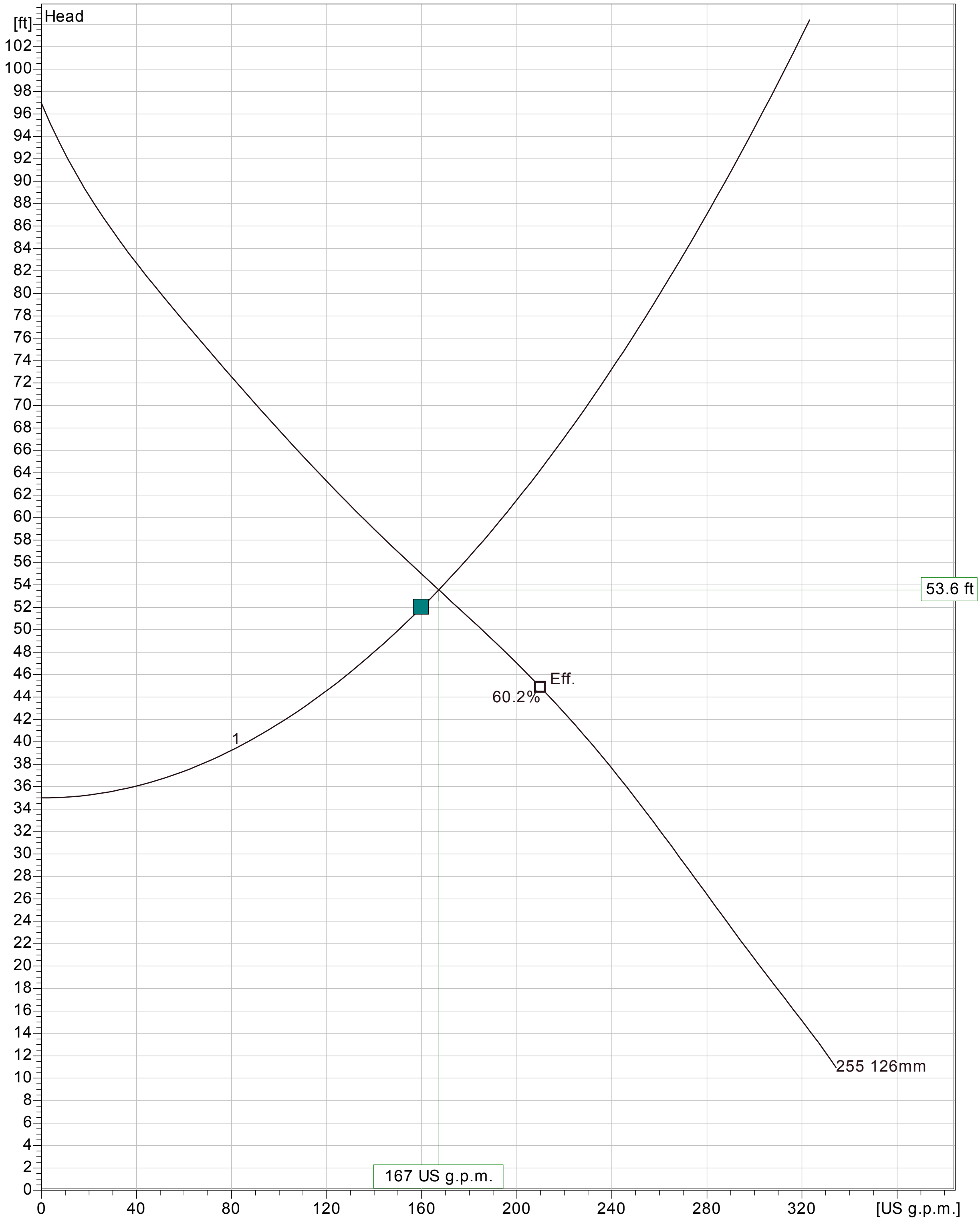
Water, pure

Curve according to: ISO 9906 grade 2 annex 1 or 2

Project	Project ID	Created by	Created on	Last update
			2015-01-13	

NP 3085 SH 3~ Adaptive 255

Duty Analysis



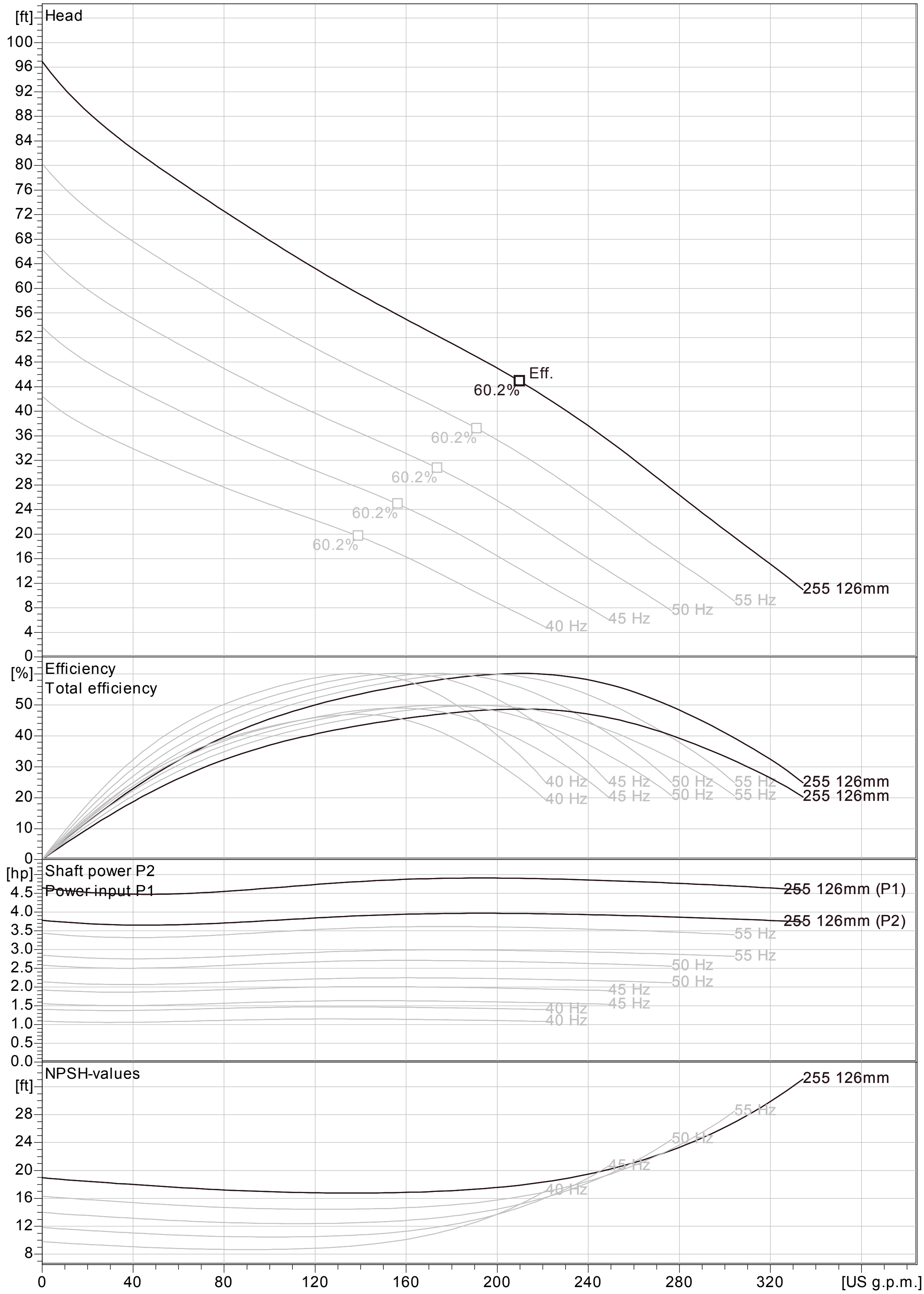
Water, pure *Curve according to: ISO 9906 grade 2 annex 1 or 2*

	Individual pump			Total					
Pumps running /System	**Flow**	**Head**	**Shaft power**	**Flow**	**Head**	**Shaft power**	**Pump eff.**	**Specific energy**	**NPSHre**
1	167 US g.p.m.	53.6 ft	3.95 hp	167 US g.p.m.	53.6 ft	3.95 hp	57.3 %	363 kWh/US MG	16.9 ft

Project	Project ID	Created by	Created on	Last update
			2015-01-13	

NP 3085 SH 3~ Adaptive 255

VFD Curve



Water, pure

Curve according to: ISO 9906 grade 2 annex 1 or 2

Project	Project ID	Created by	Created on	Last update
			2015-01-13	

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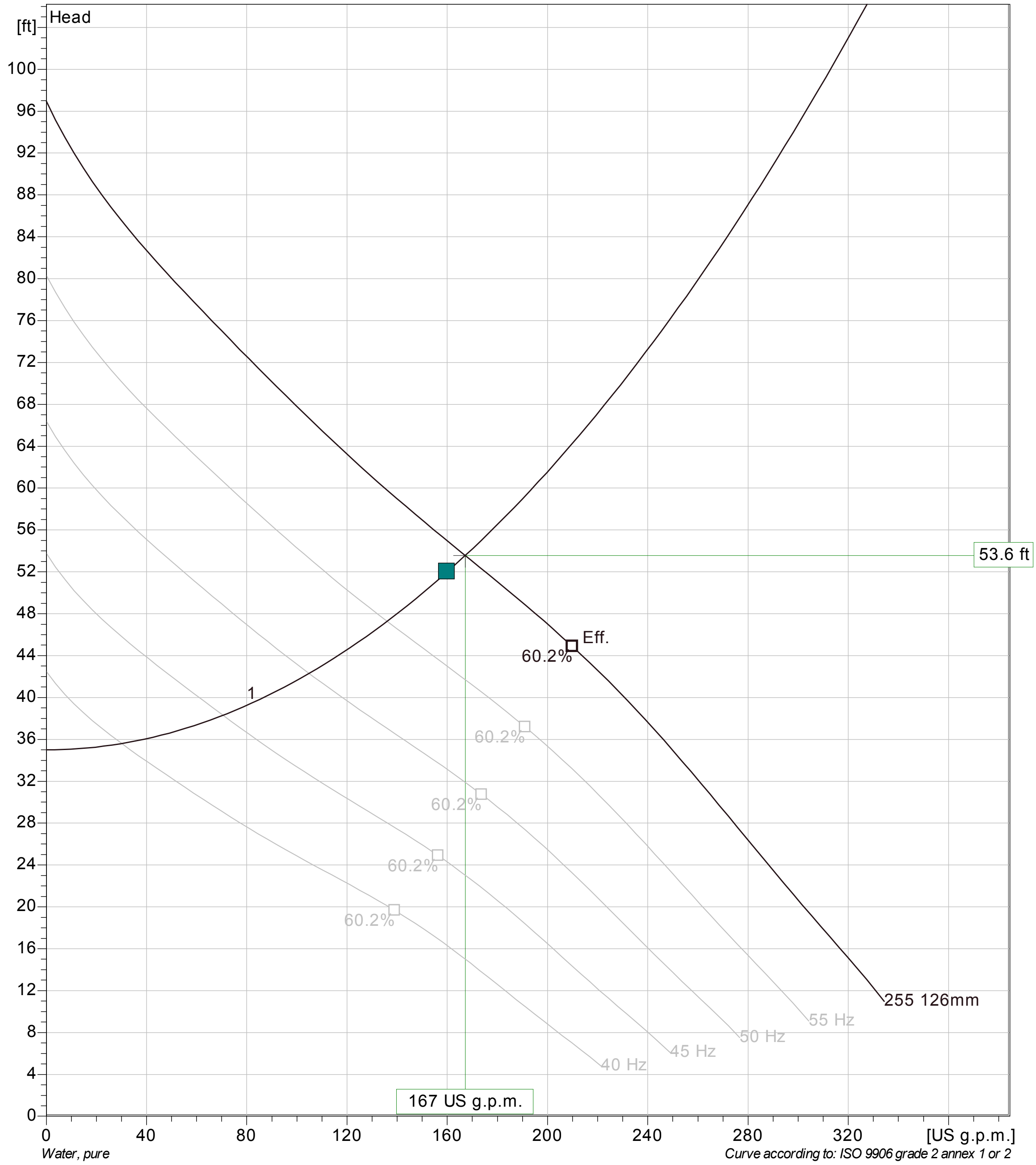
VFD Analysis

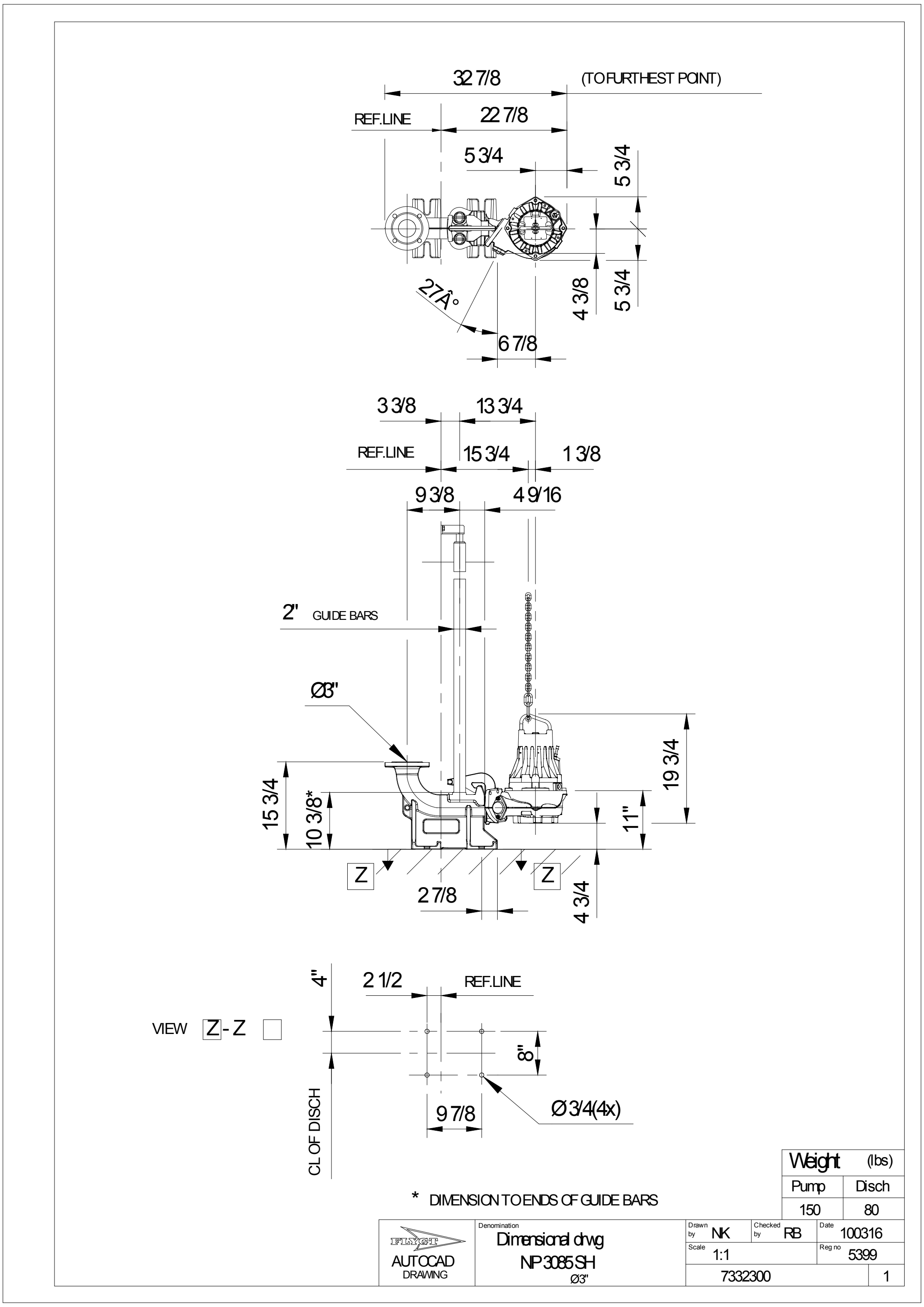


Pumps running /System	Individual pump Frequency	Flow	Head	Shaft power	Total Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
1	60 Hz	167 US g.p.m.	53.6 ft	3.95 hp	167 US g.p.m.	53.6 ft	3.95 hp	57.3 %	363 kWh/US MG	16.9 ft
1	55 Hz	136 US g.p.m.	47.3 ft	2.96 hp	136 US g.p.m.	47.3 ft	2.96 hp	55 %	326 kWh/US MG	14.5 ft
1	50 Hz	105 US g.p.m.	42.3 ft	2.19 hp	105 US g.p.m.	42.3 ft	2.19 hp	51.3 %	313 kWh/US MG	12.4 ft
1	45 Hz	70.5 US g.p.m.	38.3 ft	1.55 hp	70.5 US g.p.m.	38.3 ft	1.55 hp	44 %	337 kWh/US MG	10.6 ft
1	40 Hz	30.1 US g.p.m.	35.6 ft	1.06 hp	30.1 US g.p.m.	35.6 ft	1.06 hp	25.6 %	568 kWh/US MG	9.24 ft

Project	Project ID	Created by	Created on	Last update
			2015-01-13	

NP 3085 SH 3~ Adaptive 255

Dimensional drawing



Project	Project ID	Created by	Created on	Last update
			2015-01-13	

MULTITRODE PUMP LEVEL CONTROLLER

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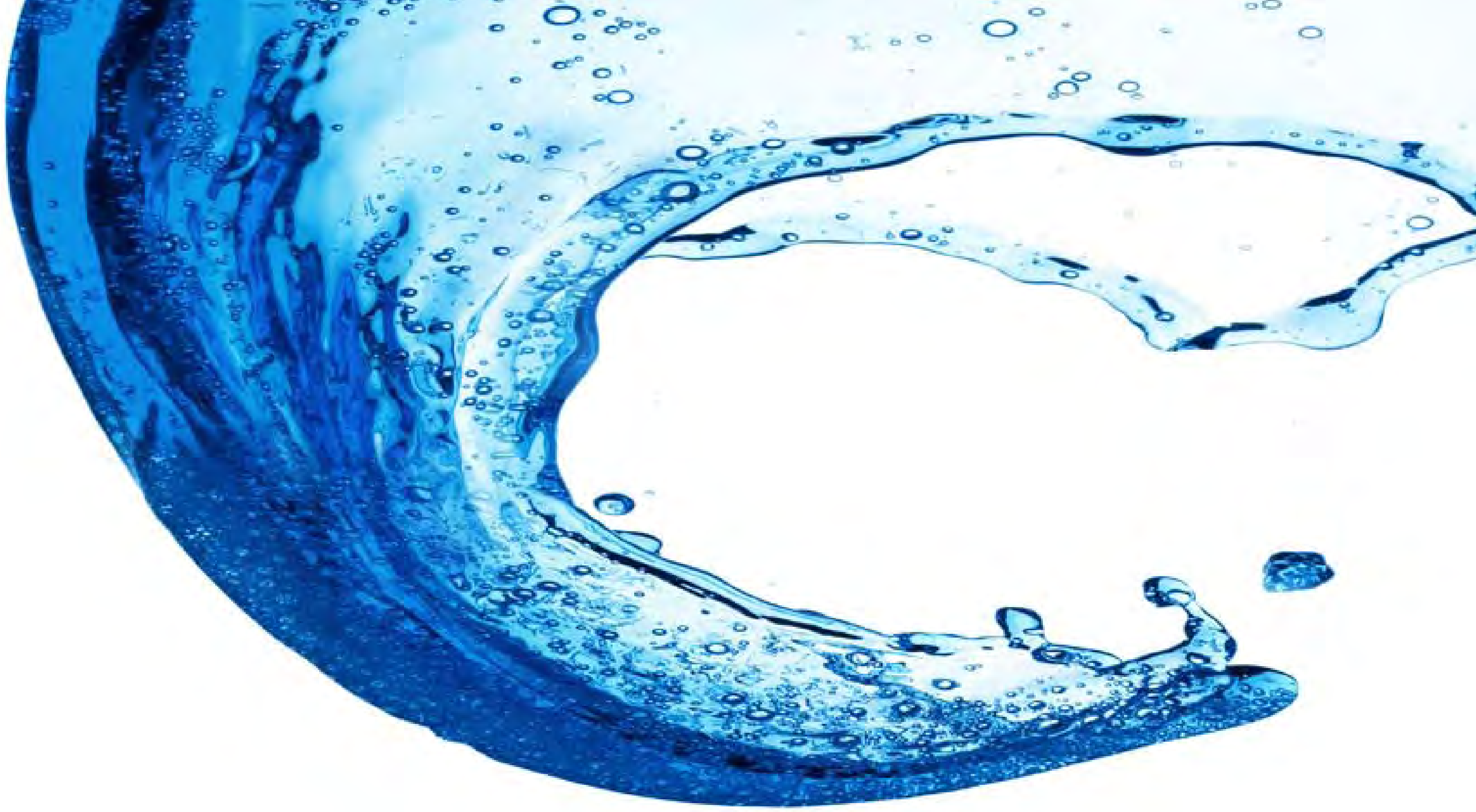
MultiSmart Pump Station Manager.

The new face of technology.

multitrode

WATER • WASTEWATER • PUMP STATION • TECHNOLOGY



What is a pump station manager?

It's the next generation of technology for water & wastewater pump stations – combining the best of PLCs, RTUs and pump controllers into a comprehensive and intuitive package.

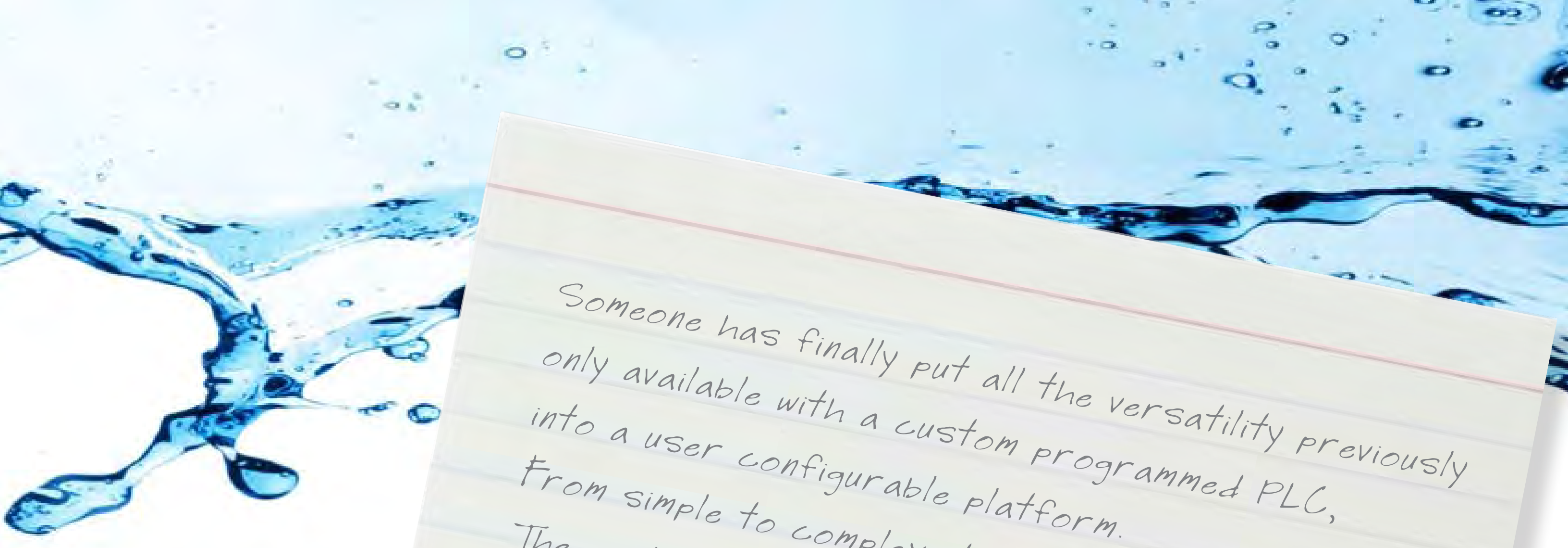
The pump station manager also integrates up to 15 control panel components, reducing control panel cost and enabling energy cost/CO_2 reduction.

Why choose MultiSmart?

MultiSmart was designed to make Utilities better managers of their assets.
Benefits include:

- Lower cost of control panel (over $10,000 is often achievable).
- Reduces operational costs by up to 70%.
- Reduces energy costs & CO_2 footprint by up to 15%.
- Wealth of asset management data.

multitrode
WATER • WASTEWATER • PUMP STATION • TECHNOLOGY



Someone has finally put all the versatility previously only available with a custom programmed PLC, into a user configurable platform. From simple to complex, this unit handles it all. The wealth of pump station operational information available to the end user is virtually limitless.

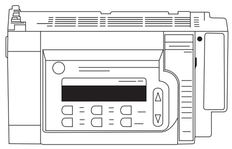
J.C. Van Harn. President, GrandTech Inc., Byron Centre, Michigan.

MultiSmart at a glance.

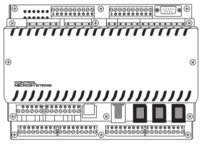
- “Setup wizard” for commissioning of a new station
- Save/Copy configuration using compact flash card
- Advanced pump control functionality for up to 6 pumps
- Flow without a flow meter
- Data logger for 50,000 events (10,000,000 direct to CF card)
- History page with detailed fault & event data
- 3-phase supply voltage monitoring and protection
- Flexible RTU with Modbus & DNP3 protocol for SCADA & local connectivity
- Energy, power & pump efficiency monitoring
- Expandable I/O

Why invest in PLCs, RTUs, pump controllers and $1000s of programming...

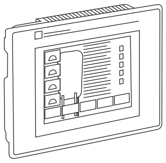
PLC



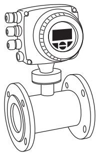
RTU



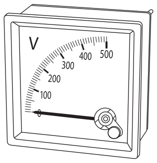
HMI



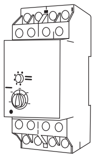
FLOWMETER



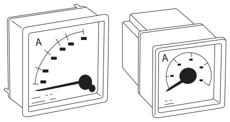
VOLTMETER



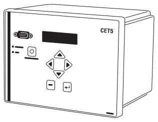
PHASE FAIL RELAY



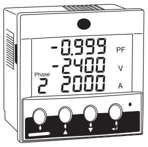
CURRENT METER



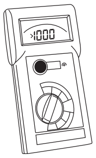
MOTOR PROTECTION



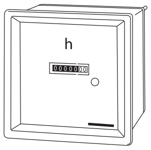
ENERGY & POWER METER



INSULATION RESISTANCE TESTER

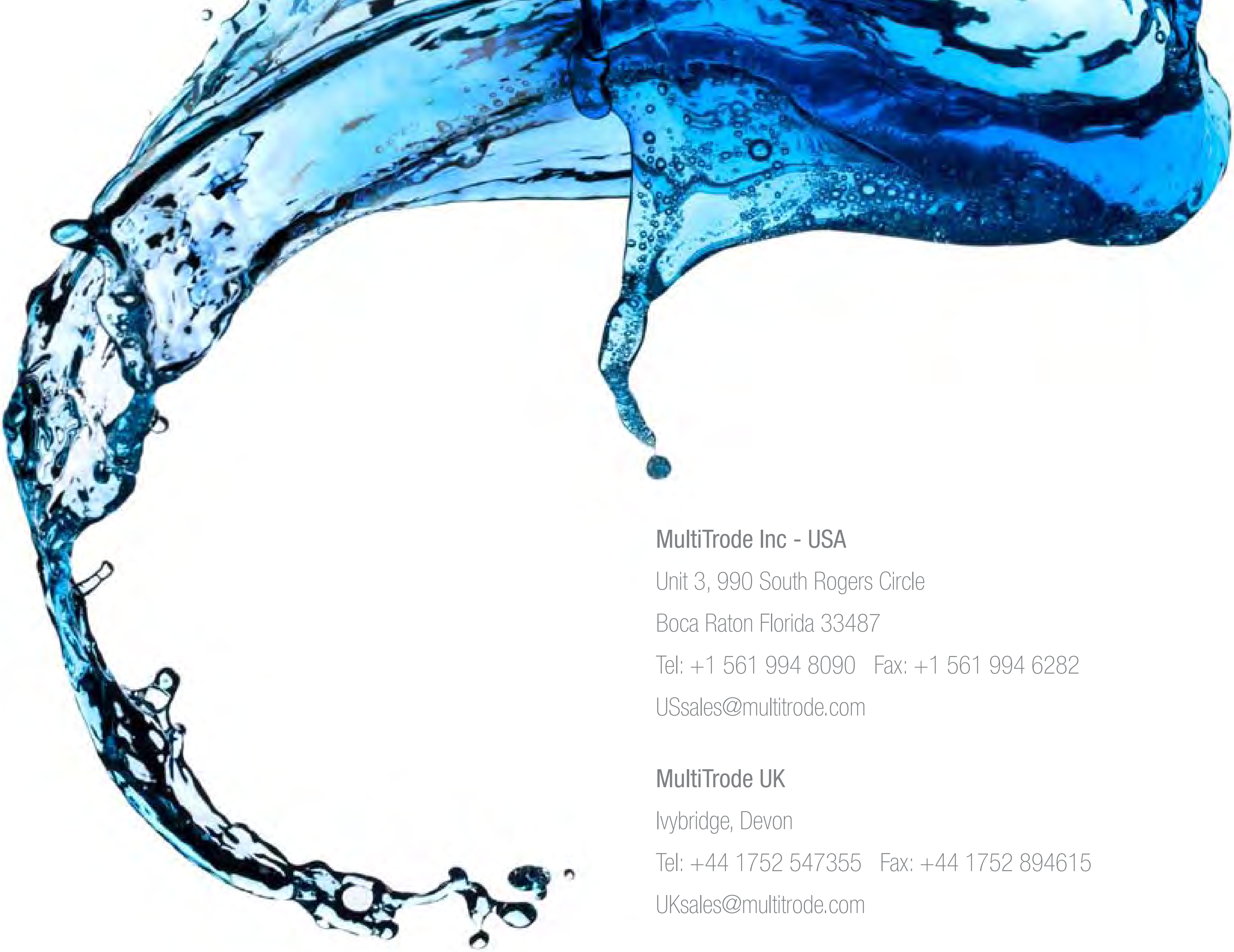


HOURS RUN METER



$10,000s
of design,
programming
and integration.

when MultiSmart does it all.



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WATER • WASTEWATER • PUMP STATION • TECHNOLOGY

MultiTrode. For ultra-reliable level sensing and control.

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The Liquid Level Sensor you don't need to clean.

The most reliable and cost-effective level sensor for wastewater.

Lasts for over 20 years!

- Reduces maintenance costs.
- No more false readings or burnt-out pumps.
- Simple to install and guaranteed for 10 years.
- Cuts the risk of spills.

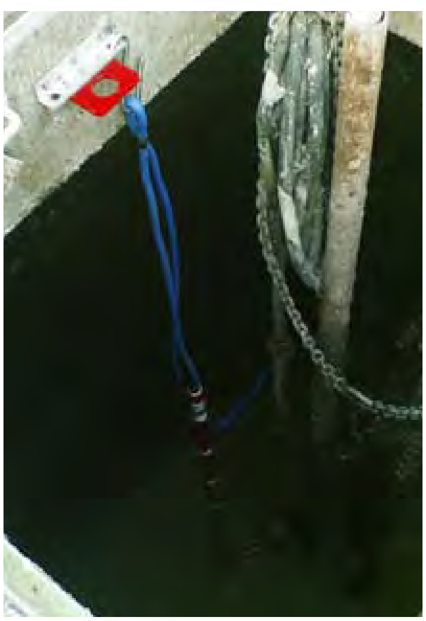
Why is it so reliable?

No electronics and no moving parts means there is nothing to fail – that's why it gets a 10-year warranty.

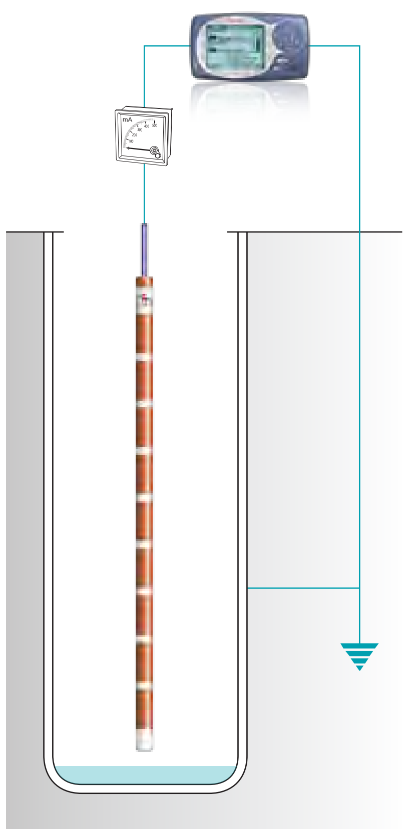
How does it work?

The Probe works by using the conductive properties of the water itself to complete a circuit with a controller. It's mounted near the inflow, allowing the turbulence to keep it clean. Even if a build-up does occur it's usually conductive (in wastewater) and so the Probe keeps right on working.

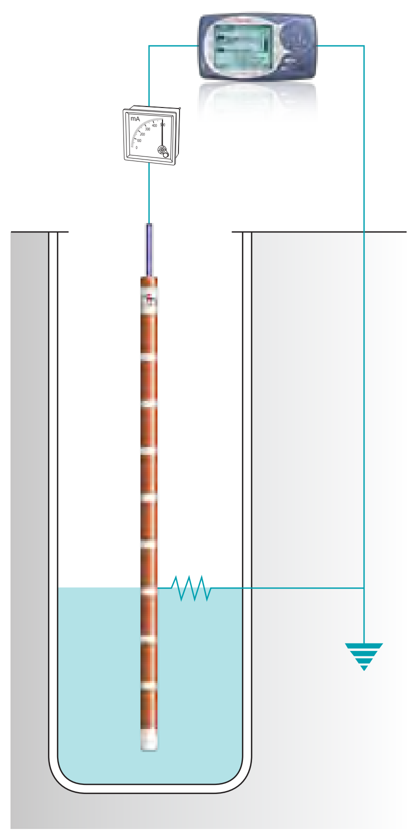
When cleaning is required, the probe is installed off a mounting bracket that includes a cleaning device.



Typical installation in the UK.



When a sensor is not covered with liquid there is no circuit to ground/earth.



Each sensor completes a separate circuit to ground/earth through the liquid.

Primary Level in Wastewater.

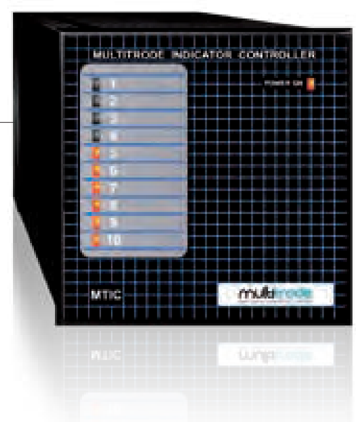
Connects to:

MultiSmart Pump Station Manager

Full control and monitoring with SCADA connectivity – see MultiSmart brochure for details.

MTDPC Pump Controller

Simple lead/lag control with level display, typically non-utility.



MTIC Indicator Controller

4-20mA output to connect to PLC control and 10 Digital Outputs (for each level sensor) for simple control.

MTISB Intrinsically Safe Barrier

The MTISB is used between the MultiTrode probes and control equipment. It eliminates the risk of dangerous energy entering the potentially explosive environment where the probe is located. 5-channel (MTISB5) and 10-channel (MTISB10) barriers available.

Primary Level in Industrial Applications.

Two single sensor probes (e.g. from a sump pack), with optional extender bracket.

Single Pump Control.

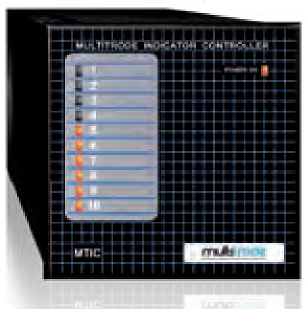
Works well in confined spaces and with a wide variety of effluents.

MTR with 2 single sensor probes

MTRA with 3 single sensor probes

SafeSmart-TL version with 3-sensor probe

2 Pump Control.



MTIC with 10-sensor probe

MTDPC with 10-sensor probe

How accurate is the Probe?

The probe gives 10% resolution, more than enough for most pump stations.

Why is it easier to install than other level devices?

All you do is hang the Probe on its own cable into your wet well, using the bracket we supply. Installation is simple – any one of your technicians could do it in an hour or so. What's more, you install the Probe relatively low down in the wet well, so compared to ball floats it allows the well to be cleaned out more thoroughly. That means less debris build-up, odors and pump clogs.

Why do we like the Probe? It's simple, safe, cuts maintenance time and makes life so much easier!

Gray Walls, Public Works Director, Town of Troy, NC

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MECHANICAL SCREEN

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SUBMITTAL DATA

OR-TEC INC.

MICRO BAR SCREEN

with

SCREEN CHAMBER

INDEX

PART 1 – GENERAL

OPERATION CONDITIONS

Item	Requirements
Influent Type	municipal wastewater
Average Flow per Screen	45gpm
Peak Flow per Screen	105gpm
Inlet TSS	≤ 500mg/L
Channel Width	Screen Chamber
Channel Depth	Screen Chamber

EQUIPMENT SPECIFICATIONS

BAR SCREEN

MODEL: MB-240	
Number of Screens	1
Construction	304 Stainless Steel
Length	≈41.5”
Unit Width	≈10”
Screen Face Width	≈5”
Screen Openings	2mm

Drive HP	15 Watt (1/50Hp)
Power Supply (V/P/Hz)	208 / 3 / 60

SCREEN TANK

SCREEN TANK	
Number of Screen Chambers	1
Construction	316 Stainless Steel
Width of Chamber	≈ 15.75”
Length of Chamber	≈31.5”
Depth of Chamber	≈15.75”

PART 2

SCREENING SYSTEM

GENERAL SYSTEM DESCRIPTION OF BAR SCREEN

One (1) Mechanically Cleaned Bar Screen shall be provided to remove debris including fibrous rag-like materials from the influent wastewater, and this screen shall be installed in a screen chamber. During operation, even when capturing the small scum particles and hairs, the screen opening should not be blinded because of the mechanical rake's continuous action of removing anything in its path. Screenings shall be discharged continuously to the trash bin. Incline of bar screen shall be 75 degrees from horizontal. Screen components including fasteners shall be manufactured from Type 304 stainless steel.

2.1 SYSTEM COMPONENTS

A. Bar Rack

1. Bar Rack shall be made of a parallel array of wedge sectioned screen bars with even spaces. Rear side of the screen bars shall be cross supported by v-notched support beams at 10"~ 15" intervals, and welded on the support beams. All material for screen bars and the support beams shall be made of Type 304 Stainless Steel. This bar rack shall be mounted between a pair of side frames with fasteners.
2. Wedge bars shall be of 1/8" wide x 13/64" deep sectional.
3. Screen opening between bars: 2 mm.
4. Bars shall extend to height 0.5~1ft. higher than the top water level, and connect at that point to the dead plate that extends to the point of discharge.

B. Side Frames

1. Structural stainless steel side frames shall be tied to rack supports and dead plate resulting structural self-supporting unit. Structural stainless steel used shall be min. 3mm thick Type 304 stainless steel and include U-shaped guides for carrying and return runs of rake travelling chains.
2. Portions of the framework fastened by welding, riveting, or bolting shall be braced as necessary to insure a rigid structure.

C. Hinge Cushioned Rakes + Rake Traveling Chains

1. Rakes shall be designed to fully penetrate the screen slots with their teeth while lifting the captured debris up to the top of the dead plate. They shall be

mounted on the rake traveling chains on both sides. They shall have hinge cushioned mounting brackets enabling the rakes to move backwards 60~90° in the event of meeting oversized debris. They shall return to normal raking position as soon as the dangerous status is passed providing an instant and repeatable protection mechanism. Rakes shall be fabricated from Type 304 Stainless Steel.

2. Traveling speed of rakes shall be 13~15ft/min. and the rakes shall be mounted on the rake traveling chain at less than 3~4 ft intervals.
3. Rake traveling chains shall be Bi-pitch roller type chains made of Type 304 stainless steel, and U-shaped chain guides provided shall be securely fixed to the screen frame for the full travel height of the unit. The chains shall not require lubrication.

D. Rake Scraper

1. Screenings shall be positively cleaned from the rakes via a mechanical scraper assembly and deposited into the discharge chute.
2. Scraper assembly shall be designed to travel on a controlled motion path allowing the scraper to return to the home position by gravity between cleaning cycles.
3. Rake scraper shall be made of Type 304 stainless steel.

E. Discharge Chute

1. Discharged material from each screen shall be directed to a tapered chute providing a smooth transition from bar screen discharge to a compactor or a screenings conveyor. Chute shall have a minimum slope of 60 degrees.
2. Discharge chute shall be made of Type 304 stainless steel.

F. Sprocket

1. Head shaft sprocket for the rake traveling chains shall be manufactured of Type 304 stainless steel. Return block at the tail part shall be made of UHMW PE.
2. Sprockets shall be fitted to head shaft using precisely cut keyways.

G. Shafting

1. Head shaft shall be made of Type 304 stainless steel, straight and true, sized to transmit required power to the head sprockets.
2. Head shaft shall be equipped with heavy duty, grease-lubricated, adjustable, take-up bearing assemblies.

H. Drive Unit

1. Motor/reducer shall be Hypoid Geared Motor of Totally Enclosed type IP65 / UL listed, manufactured by Nissei Corporation.

2. Power : 1/50Hp (0.015kW)/ 220 Volt, 3 ph, 60 Hertz
3. Motor/reducer assembly shall be directly connected to the drive shaft via the reducer's hollow drive shaft.
4. Positive overload protection shall be initiated at the control panel by excessive motor current.

I. Level Sensor

Switch-Tek Vibration Level Switch Part # LZ12

J. Front Cover

1. A removable front cover is bolted onto the screen.
2. The screen section will be completely inside the tank.

PART 3

SCREEN CHAMBER

Screen Chamber shall be designed to act as the wastewater channel in which the Bar Screen to be installed. Chamber shall include flanged connecting ways to receive the influent and to discharge the screened effluent out. A flanged connecting way for handling overflow shall be applied too. Screen Chamber shall be constructed of Type 316 stainless steel.

There shall be a support structure made to lift the screen and the screen chamber to the required height. Material of construction will be 316 Stainless Steel 2”x2” 3/16 angle and ½”x 2” bar.

PART 4

CONTROL PANEL

4.1 SYSTEM DESCRIPTION

The control panel shall be a NEMA 4X Stainless Steel enclosure, and shall contain all electrical controls, wires, starters, terminals, relays, overloads, fuses, and labels required for operation of the screen and ancillary equipment described herein. Panel shall be suitable for 208 volt, 3 phase,60 hertz power source.

Only a continuous operation of the screen or by level sensor control is recommend as the fine screens of 1~6mm openings can meet sudden blinding of the screen opening compare to the coarse screens. The system is fully operational in both manual and automatic modes. The system mode selector switch shall allow the operator to select the desired mode.

4.2 SYSTEM COMPONENTS

- The control panel shall be a NEMA 4X Stainless Steel.

A. The front of the Panel Door shall include.

1. The main disconnect switch (power on/off). In the off position all power to the control panel shall be off.
2. E-stop pushbutton. This will shut the operation off if engaged.
3. An Hours Run Meter
4. Running Green light
5. HOA selector switch
6. Start push button (Green)
7. Stop push button (Red)

B. The enclosure will house.

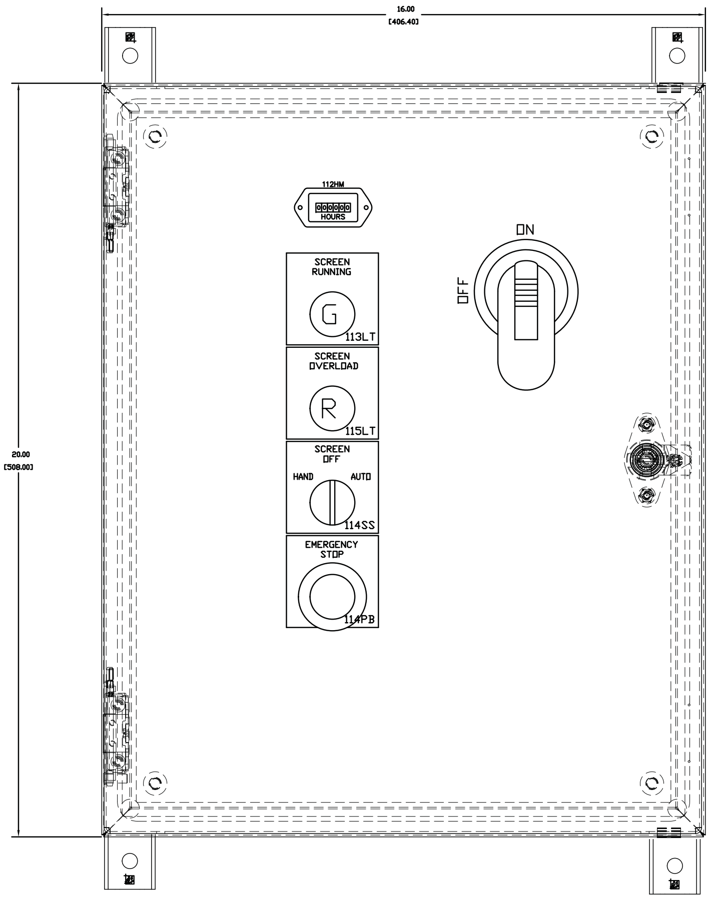
1. Main Disconnect, 10amp fusible disconnect with 5amp fuses
2. Control transformer with primary and secondary fusing.
3. Control relays, fuses and terminal blocks.

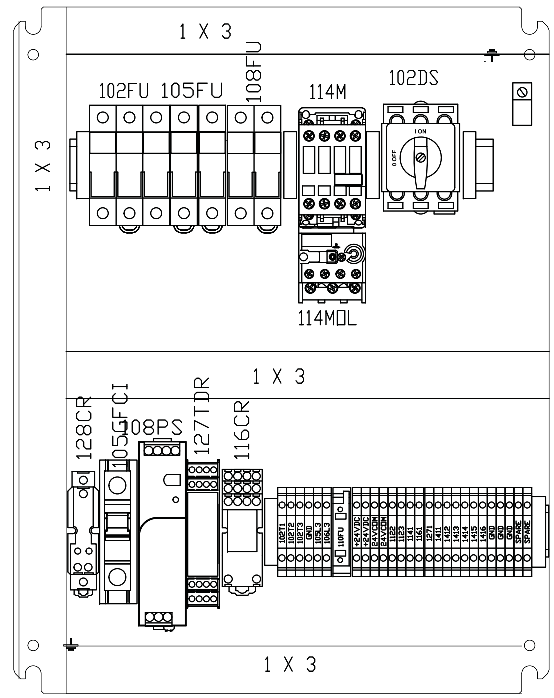
C. Heat Trace will include

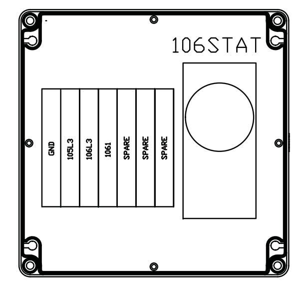
1. 240 V items with t-stat, circuit breaker fuses in a outdoor rated Junction Box

4.3 SYSTEM OPERATION

1. The lower level switch is for the motor turn on and off based on flow.
2. Upper level switch will signal a dry contact which will be picked up by a MCP.







LET.	REVISIONS	DATE	BY	CK
A	FOR SUBMITTAL	03/13/2018	MLS	MLS
B	FOR CONSTRUCTION	01/04/2019	MLS	MLS

SOUTH SHORE
CONTROLS INC.
4823 NORTH RIDGE RD. PERRY, OH 44081 PH: (440) 259-2500

TITLE:
OR-TEC, INC.
SCREEN CONTROL PANEL-ARTIS STP
PANEL LAYOUT

CUSTOMER: OR-TEC, INC.

DRN. BY MLS	ENG. MLS	CAD FILE 25803M001	DRAWING NO.	25803M001	SHEET 1
DATE 03/13/2018	SCALE	PROJECT NO. 25803			OF 2

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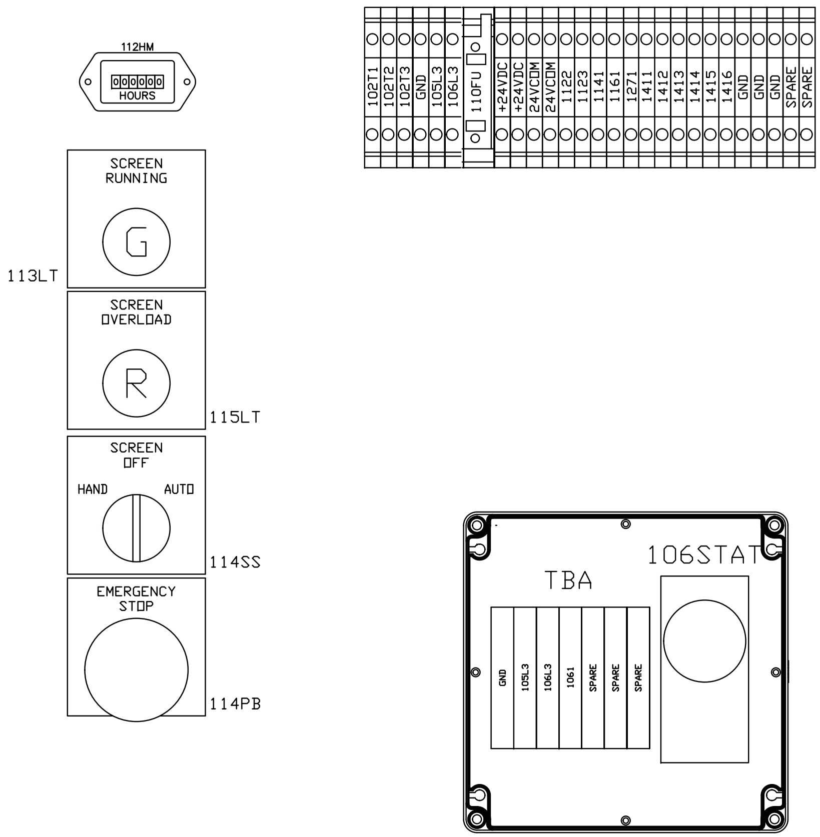


LET.	REVISIONS	DATE	BY	CK
A	FOR SUBMITTAL	03/13/2018	MLS	MLS
B	FOR CONSTRUCTION	01/04/2019	MLS	MLS

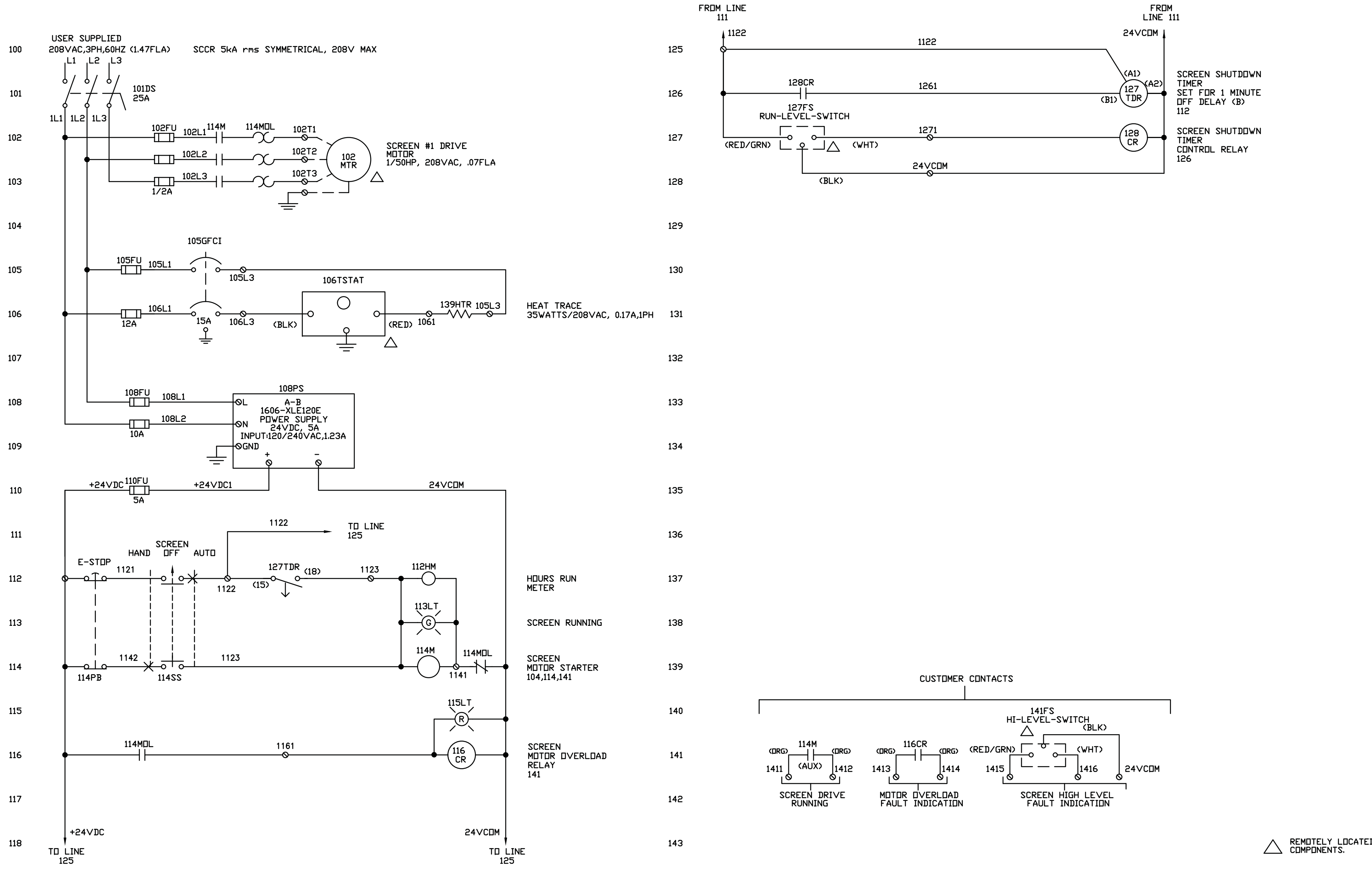
SOUTH SHORE
CONTROLS INC.
4823 NORTH RIDGE RD. PERRY, OH 44081 PH: (440) 259-2500

TITLE:
OR-TEC, INC.
SCREEN CONTROL PANEL-ARTIS STP
CONTROL PANEL DOOR/TB DETAIL & BOM

CUSTOMER:
OR-TEC, INC.

DRN. BY MLS | ENG. MLS | CAD FILE 25803M002 | DRAWING NO. 25803M002 | SHEET 2 OF 2
DATE 03/13/2018 | SCALE | PROJECT NO. 25803

PRINTED IN U.S.A.



LET.	REVISIONS	DATE	BY	CK
A	FOR SUBMITTAL	03/12/2018	MLS	MLS
B	FOR CONSTRUCTION	01/04/2019	MLS	MLS

SOUTH SHORE CONTROLS INC.
4823 NORTH RIDGE RD. PERRY, OH 44081 PH: (440) 259-2500

TITLE: OR-TEC,INC
SCREEN PANEL FOR ARTIS STP
ELECTRICAL SCHEMATIC

CUSTOMER: OR-TEC

DRN. BY MLS | ENG. MLS | CAD FILE 25803E001 | DRAWING NO. 25803E001 | SHEET 1 OF 2
DATE XX/XX/XXXX | SCALE | PROJECT NO. 25803

PRINTED IN U.S.A.

PART 5
DELIVERY, *WARRANTY, START-UP TRAINING SERVICES*

1. Equipment will be delivered to jobsite on skids suitable for unloading. Or-Tec will not unload, place or install equipment.

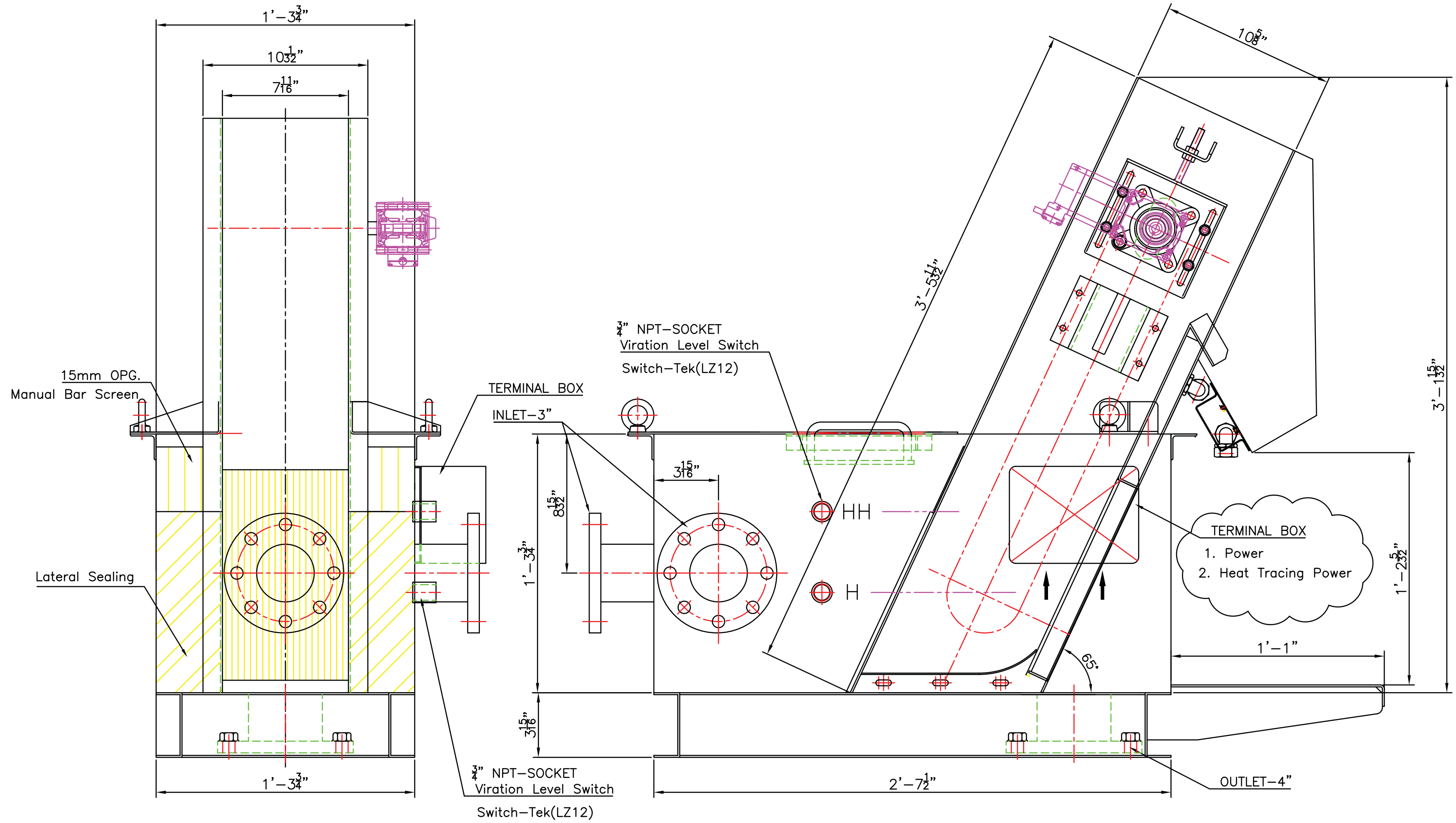
2. All Or-Tec manufactured equipment will come with a two year warranty beginning from the acceptance date by regulatory agency.

3. Equipment supplied by Or-Tec and manufactured by others will come with that manufacturers warranty.

4. Or-Tec will be present on site to check the installation and alignment. Upon acceptance Or-Tec will e present to start the unit up and provide training to operators.

PART 6
DRAWINGS

NO	REVISIONS	DATE	DRAWING	CHEKCED

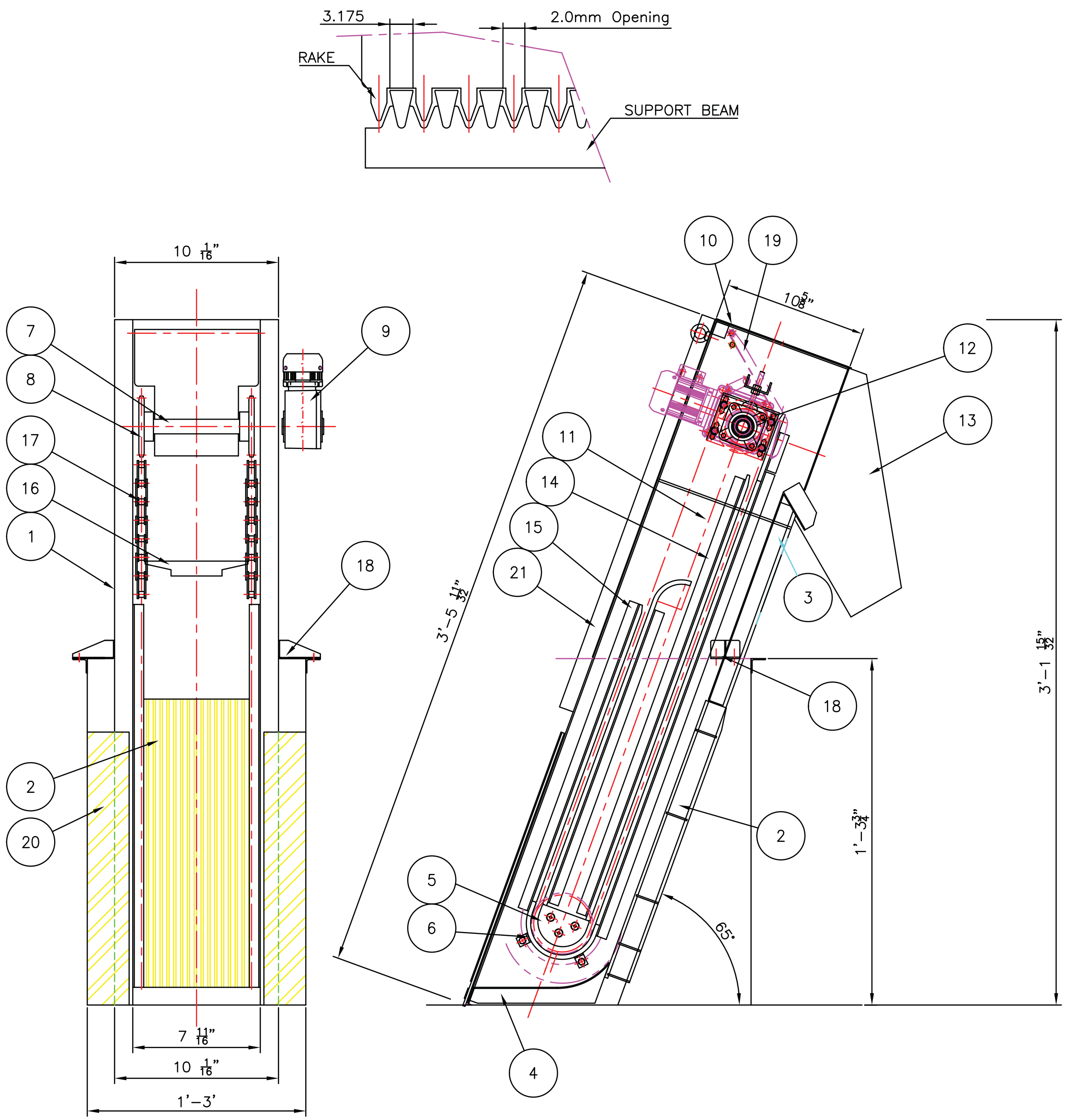


FILE NAME MICRO BAR SCREEN ASSY

NO	DESCRIPTION	MAT'L	Q'TY	REMARKS
1	MICRO BAR SCREEN	STS 304	1	MB240x2mm

DWG.NO. SNS-MB240-Q01	DATE 03/07/2018	SCALE 1/1
DRAWING NAME MICRO BAR SCREEN		DRAWING
		DESIGNING
		CHECKED
		APPROVED

OR-TEC INC.



NO	REVISIONS	DATE	DRAWING	CHEKCED

NO	DESCRIPTION	MAT'L	Q'TY	REMARKS
21	FRONT COVER	STS 304	1 set	2t
20	WATER SEALING	RUBBER STS 304	1 set 1 set	6.4t,3.2t 3t
19	SCRAPER	STS 304	1	1.5t
18	MOUNTING KIT	STS 304	1 set	3t
17	RAKE TRAVELING CHAIN	STS 304	1 set	R.F.2060–S
16	RAKE ASSEMBLY	STS 304	3 sets	3t
15	RETURN CHAIN RAIL	STS 304	1 set	L25x3t, S.Q.10x10
14	LIFT UP CHAIN RAIL	STS 304	1 set	L25x3t, S.Q.10x10
13	CHUTE	STS 304	1	2t
12	HEAD BEARING	STS 304	2	UCF 206
11	TAKE–UP SET	STS 304	2	60 S.T.–M10
10	HEAD COVER	STS 304	1	2t
9	DRIVE MOTOR	NISSEI	1	15W,3ø, –Volt,60Hz
8	HEAD SPROCKET	STS 304	2	R.F.2060–Sx19N.T.
7	HEAD SHAFT	STS 304	1	ø30
6	TAIL RAIL	STS 304	2	SQ10x10
5	RETURN BLOCK	UHMW–PE	2	10t
4	TAIL FRAME	STS 304	1	3t
3	DEAD PLATE	STS 304	1	3t
2	BAR RACK	STS 304	1	2.0mm Opening
1	SIDE FRAME	STS 304	1	3t

DWG.NO. SNS–MB240–A02
DATE 03/07/2018
SCALE N/S
DRAWING NAME
MB–240 MICRO BAR SCREEN
DRAWING
DESIGNING
CHECKED
APPROVED

OR-TEC ,Inc.

FILE NAME | MB SCREEN ASSEMBLY

PART 8

SPARE PARTS and ACCESSORIES

1. One(1) Rake Blade/ Type 304 Stainless Steel
2. Tools in a tool box include appropriate spanners and wrenches.

AIR LIFT PUMPS

P.W. GROSSER CONSULTING, INC.
P.W. GROSSER CONSULTING ENGINEER & HYDROGEOLOGIST, P.C.
PHONE: 631.589.6353
PWGROSSER.COM
630 JOHNSON AVENUE, STE 7
BOHEMIA, NY 11716
LONG ISLAND • MANHATTAN • SARATOGA SPRINGS • SYRACUSE • SEATTLE • SHELTON

April 28, 2021
Project: HK Ventures

SLUDGE AIRLIFT CALCULATIONS AND DATA

A. Maximum flow at eleven times average daily flow

$\frac{20,000 \times 11}{1440} = 153$ GPM total

B. Two (2) 3” airlifts provided, each rated at 77 GPM

C. See performance curve attached for 3” airlift

At Lift (H_L) = 1’
Flow = 77 GPM
Submergence (H_S) = 9’

% Subm. = $\frac{9}{10} \times 100 = 90\%$
Required Air = 12 CFM per airlift

At Lift (H_L) = 2’
Flow = 77 GPM
Submergence (H_S) = 9’

% Subm. = $\frac{9}{11} \times 100 = 81.8\%$
Required Air = 20 CFM per airlift

At actual lift (H_L) = 1.5’, use 16 CFM per sludge airlift

D. Minimum flow at seven times average daily flow

$\frac{20,000 \times 7}{1440} = 98$ GPM total

E. Two 3” airlifts provided, each rated at 49 GPM

F. See performance curve attached for 3” airlift

At Lift (H_L) = 1’
Flow = 49 GPM
Submergence (H_S) = 9’

% Subm. = $\frac{9}{10} \times 100 = 90\%$
Required Air = 7 CFM per airlift

At Lift (H_L) = 2’
Flow = 49 GPM
Submergence (H_S) = 9’

% Subm. = $\frac{9}{11} \times 100 = 81.8\%$
Required Air = 10 CFM per airlift

At actual lift (H_L) = 1.5’, use 9 CFM per sludge airlift

April 28, 2021
Project: HK Ventures

SKIMMER AIRLIFT CALCULATIONS AND DATA

A. Maximum flow at two times average daily flow

$\frac{20,000 \times 2}{1440} = 28$ GPM total

B. Two (2) 2” airlifts provided, each rated at 14 GPM

C. See performance curve attached for 2” airlift

At Lift (H_L) = 1’
Flow = 14 GPM
Submergence (H_S) = 5’

% Subm. = $\frac{5}{6} \times 100 = 83.3\%$
Required Air = 2 CFM per airlift

At Lift (H_L) = 2’
Flow = 14 GPM
Submergence (H_S) = 5’

% Subm. = $\frac{5}{7} \times 100 = 71.4\%$
Required Air = 4 CFM

At actual lift (H_L) = 1.5’, use 3 CFM per sludge airlift

CLIENT DRIVEN SOLUTIONS

MIXER

P.W. GROSSER CONSULTING, INC.
P.W. GROSSER CONSULTING ENGINEER & HYDROGEOLOGIST, P.C.
PHONE: 631.589.6353
PWGROSSER.COM
630 JOHNSON AVENUE, STE 7
BOHEMIA, NY 11716
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SULZER

Sulzer Pumps

ABS Submersible Mixer XRW

abs

The World-Class Range of Submersible Mixers

Sulzer Pumps first launched the ABS submersible mixer XRW as an innovative medium-speed mixer concept in 2010. After widespread success, it is now available as a complete mixer range with motor technologies adapted to varying applications.

The ABS submersible mixer XRW was introduced as the first submersible mixer with a permanent magnet motor. But its defining feature was not the motor itself. It was the mixer's unique balance of energy efficiency and value.

Sulzer Pumps has kept this balance in focus when expanding the ABS submersible mixer XRW into a full product range. To maintain it at various speeds, three distinct motor configurations have been used:

- **High speeds**
  Shaft-mounted premium-efficiency IE3 motor
- **Medium speeds**
  Premium-efficiency permanent-magnet motor (IE3-equivalent)
- **Medium-low speeds**
  Premium-efficiency IE3 motor with gearbox

Choosing the right configuration for the job has substantial advantages over applying the same construction to every need.

The Most Appropriate Motor Technology

The use of multiple motor configurations gives the ABS submersible mixer XRW the best balance of equipment price, motor efficiency and long-term operating costs. No single motor technology can achieve this.

When you choose the ABS submersible mixer XRW, you therefore choose the market's best energy performance. But you also get the best lifecycle economy, from initial purchase to ongoing operation.

Minimal Energy Consumption

The use of premium-efficiency motor technologies, together with optimized and proven propeller designs, gives the ABS submersible mixer XRW the lowest energy consumption for each mixing speed. You gain a total efficiency improvement of up to 35% compared with other mixer designs, which reduces your power consumption and carbon footprint.

Cost-Effective Installation and Maintenance

The combination of compact design and considerably reduced weight allows easy mixer installation and removal. Additional maintenance advantages are offered by the medium-speed models of the ABS submersible mixer XRW (see right).

Superior Reliability

The reliability of the ABS submersible mixer XRW is just as high as its efficiency. Contributing factors include:

- Optimized mechanical seal
- Enhanced design of the solids deflection ring
- Strong new bearings with a life of 100 000 hours
- High overload capacity (medium-speed models)
- Robust gearbox with hardened helical gears (medium-low-speed models)

Medium-speed models of the ABS submersible mixer XRW come in a CR version manufactured entirely from stainless steel. All other models are available in both the CR version and an EC version, which has a mixer body of epoxy-painted cast iron.

Additional Benefits with Permanent Magnets

Medium-speed models of the ABS submersible mixer XRW offer several additional advantages. These derive from the use of permanent-magnet motors and include:

- **Greater process control**
  A variable-speed drive allows process optimization and further reductions in energy consumption – beyond the savings obtained through the high-efficiency equipment design.

- **Fewer mixers for wide application**
  The use of a permanent-magnet motor and a variable-speed drive allows a limited number of basic mixer sizes to cover a wide range of applications. Uptime can thus be ensured with a reduced stock of spare equipment and parts.

- **Even more cost-effective maintenance**
  An ABS EffeX Exchange Program for permanent-magnet motors, together with the smaller number of basic mixer sizes, gives you cost-effective maintenance without the need for specialist equipment.

Part of the ABS EffeX Revolution

The ABS EffeX revolution is an ongoing effort from Sulzer Pumps to push the boundaries of wastewater technology, especially in the area of energy efficiency. Encompassing the whole chain from design to manufacturing, it has resulted in the most innovative and resource-conserving solutions on the market.

The revolution began in 2009 with the launch of the ABS submersible sewage pump XFP. Since then, it has expanded to comprise a complete range of world-class wastewater products. Their energy savings, reduced carbon footprint and high reliability contribute to efficient processes and satisfy the growing demands placed on the wastewater industry.

TheABSEffeXRevolutioncontinues

The Most Appropriate Motor Technology

Two factors decide the configuration of the ABS submersible mixer XRW. The first is the required intensity of the mixing and flow. The second is how premium efficiency can be achieved most economically. Three motor configurations provide the best possible balance.

For High Speeds

In more intense applications with high speeds, the most economical way to premium efficiency is a squirrel-cage induction motor of IE3 standard. This configuration is direct-driven, which means the motor is mounted on the shaft without any gearbox.

For Medium Speeds

In the medium-speed range, an IE3-equivalent permanent-magnet motor provides the lowest possible energy consumption and best lifetime economy. Variable-speed control allows precise optimization of your process, as well as a reduction in spare parts, since one mixer size covers a wider range of speeds.

Sulzer Pumps has an extensive knowledge of permanent-magnet motors, derived from their development and inclusion in our range of ABS turbocompressors HST. You can learn more about permanent-magnet motors and their advantages by folding out the adjacent page.

For Medium-Low Speeds

In applications involving medium-low speeds, a squirrel-cage induction motor of IE3 standard is used with a speed reducer. While a permanent-magnet motor would be effective here as well, a more traditional solution provides better value at these speeds.

The speed reducer is a robust single-stage helical gearbox with high efficiency and a very long operating life. Its hardened helical gears allow numerous reduction ratios, which makes the drive both compact and lightweight.

The gearbox has the same design as that of the low speed ABS flow booster XSB, which is part of the ABS EffeX range and an ideal choice for low-speed mixing.

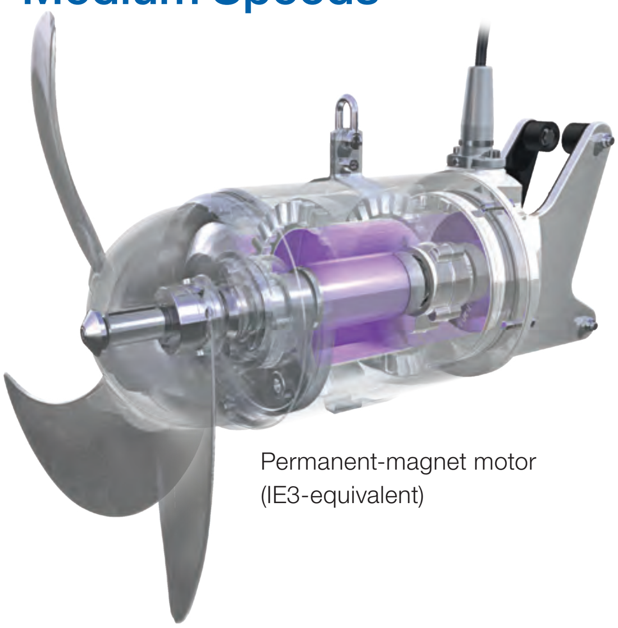
High Speeds

Premium-efficiency IE3 squirrel-cage induction motor

XRW210
(4-pole motor)

XRW300
(6-pole motor)

Medium Speeds



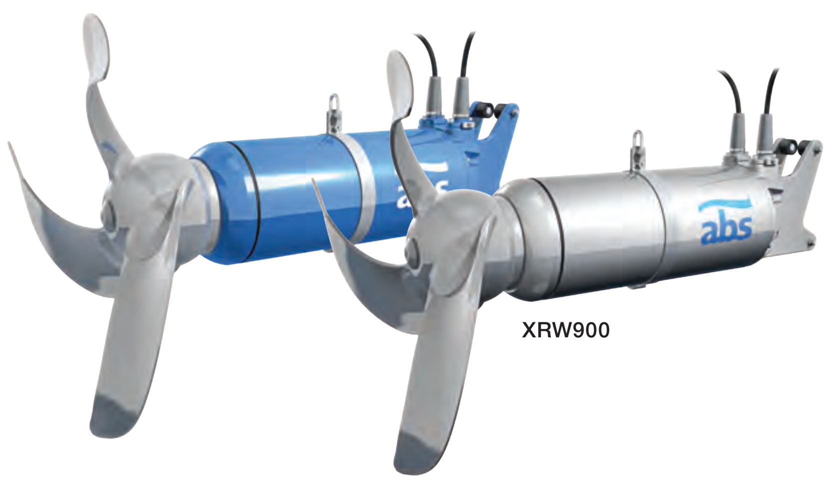
Permanent-magnet motor
(IE3-equivalent)

XRW400

XRW650

Medium-Low Speeds

Premium-efficiency IE3 squirrel-cage induction motor
Single-stage planetary gearbox



XRW900

Fold out for a detailed look at the mixer construction and the advantages of permanent-magnet motors.

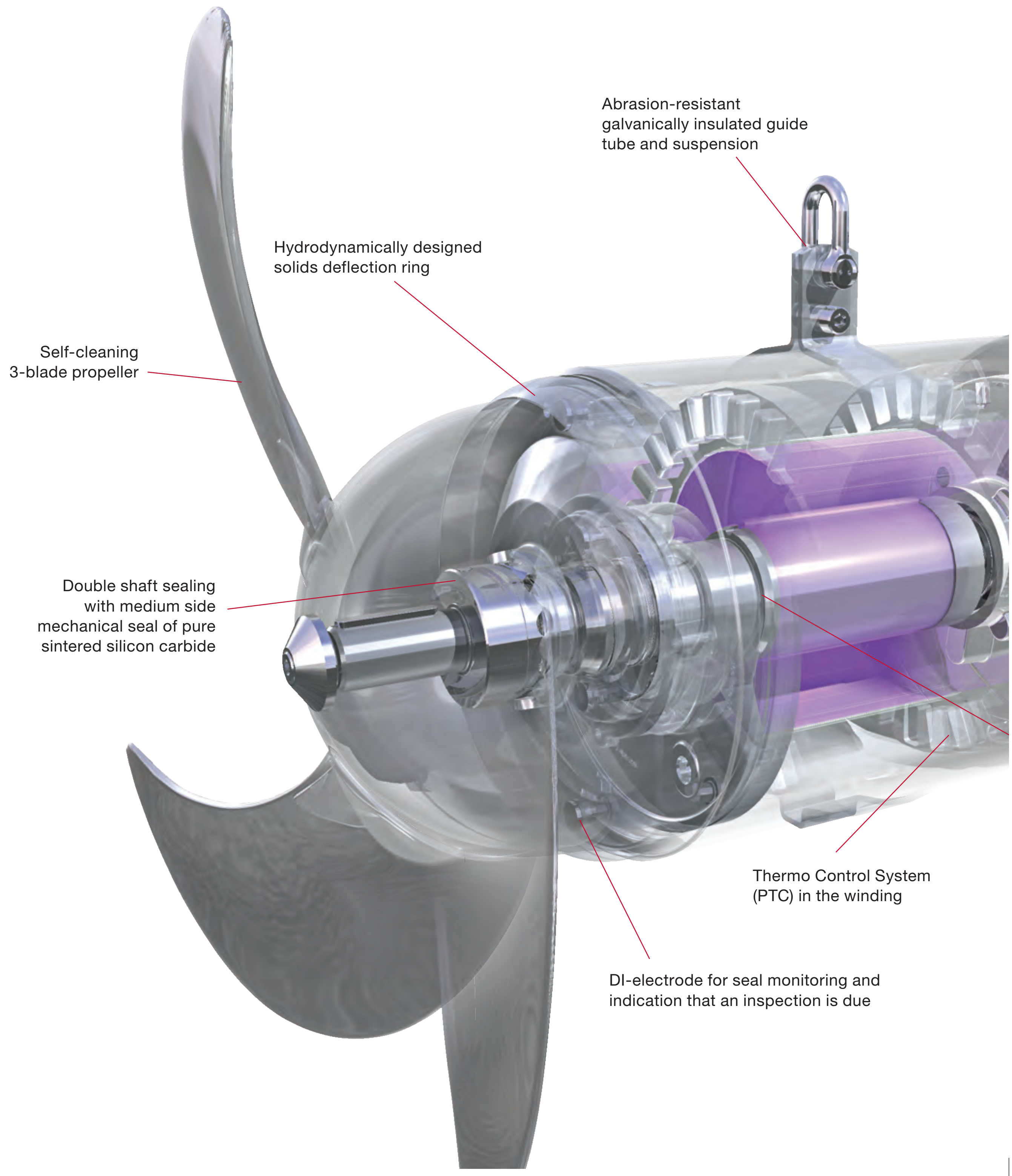
An Overview of Permanent-Magnet Motors

Permanent-magnet motors provide unique advantages in medium-speed models of the ABS submersible mixer XRW. Sulzer Pumps has an extensive knowledge of their use, derived from their development and inclusion in our range of ABS turbocompressors HST.

A Growing Trend

Permanent-magnet motors have been commercially available for about 20 years, but lower component prices and and better technology have recently made them more attractive. For example, there has been a continuous reduction in the cost of the variable-frequency drives (VFD) used to run them.

In addition, their growth is being driven by the demand for energy savings. Permanent magnet motors require less electrical power, and they provide higher motor efficiency within a wide range of speeds.



SULZER

Submersible Mixer XRW 210

Date: 06/14
Dwg: DS-M30-002 **Rev:** A

Submittal Data

Motor Specification

Motor Design		NEMA design B, squirrel cage induction
Motor Type		Fully enclosed Premium Efficiency submersible, IP68 protection rating
Motor Efficiency Standard and Rating		IEC 60034-30, IE3 rating
Motor Efficiency Test Protocol		IEC 60034-2-1
Insulation Materials		Class H, 180ºC (356ºF), copper windings
Motor Filling Medium		Air
Temperature Rise		Class A
Maximum Fluid Temperature		40ºC (104ºF) continuous
Motor Protection	**Thermal**	Normally closed bimetallic switch in each phase, connected in series, 140ºC (284ºF)
	Leakage	ABS Sealminder moisture detection probe in oil chamber, motor and cable connection chamber
Sensing Chamber Filling Medium		Environmentally safe, non-toxic oil
Bearing Type	**Upper**	Pre-loaded Single row ball permanently lubricated
	Lower	Single row ball permanently lubricated
Motor Starter Types		DOL, Suitable for use with Variable Frequency Drives
Maximum Starts per Hour		15, evenly spaced
Inverter Duty Rating		Motors meet NEMA MG1, part 31 requirements
Maximum Submergence		20 meters (65 feet)
Available Voltages		208, 230, 480, 600
Voltage Tolerance from Rated		+/-10%

Motor Ratings

Motor Model	Input Power (P1)	Power Output (P2)	Nominal Speed	Rated Voltage	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	NEMA Service Factor	Motor Efficiency at % Load			Power Factor at % Load		
	(kW)	(kW/HP)	(RPM)	(V)	(A)	(A)			100	75	50	100	75	50
PA 18/4	2.11	1.80/2.41	1750	208	8.1	51.3	J	1.3	85.2	85.3	83.5	.73	.63	.50
				230	7.3	44.4								
				480	3.5	22.2								
				600	2.8	17.8								

Cable Data

Cable	Motor	Motor Voltage	Cable Qty	Cable Type	Cable Nominal Dia. +/- .5mm (.02”)
Power Cable	**PA 18/4**	208 volt	1	SOOW 14/7	18.5mm (0.72”) diameter
		230 volt			
		480 volt			
		600 volt			
Control Cable	All	All	Included in Power Cable		
Cable Length	Standard: 10m (33 ft)		Optional: 15m (49 ft), 20m (65 ft), 30m (98 ft), 40m (131 ft), 50m (164 ft)		

abs

SULZER

Submersible Mixer XRW 210

Date: 06/14
Dwg: DS-M30-002 **Rev:** A

Submittal Data

Hydraulic Data

Propeller Data without Flow Ring, 60Hz.							
Mixer Hydraulic Number	**Number of Blades**	**Propeller Diameter in (mm)**	**Thrust ISO 21630 lbf (N)**	**Propeller Speed (RPM) ①**	**Mixing Capacity ② GPM (m^3/s)**	**Mixing Power P_P③ HP (kW)**	**Power Consumption P1③ HP (kW)**
2121	2	8.27 (210)	51.0 (227)	1765	1426 (0.09)	1.53 (1.14)	1.80 (1.34)
2131	3	8.27 (210)	73.3 (326)	1750	1586 (0.10)	2.36 (1.76)	2.70 (2.01)

Propeller Data with Flow Ring, 60Hz.							
Mixer Hydraulic Number	**Number of Blades**	**Propeller Diameter in (mm)**	**Thrust ISO 21630 lbf (N)**	**Propeller Speed (RPM)**	**Mixing Capacity ① GPM (m^3/s)**	**Mixing Power P_P② HP (kW)**	**Power Consumption P1③ HP (kW)**
2141	2	8.27 (210)	---	1765	---	---	---
2151	3	8.27 (210)	---	1750	---	---	---

① Nominal speed at full load
② Flow rate in clean water at 68°F (20°C)
③ Power in clean water at 68°F (20°C)

Materials of Construction

Parts		EC	CR
Motor Housing		Cast Iron EN-GJL-250 (ASTM A-48, Class 35B)	Stainless Steel 1.4404 (AISI 316L SS)
Motor Shaft		Stainless Steel 1.4021 (AISI 420 SS)	Stainless Steel 1.4401 (AISI 316 SS)
Propeller		Duplex Stainless Steel 1.4460 (AISI 329 SS)	Duplex Stainless Steel 1.4460 (AISI 329 SS)
Fasteners		Stainless Steel 1.4401 (AISI 316 SS)	Stainless Steel 1.4401 (AISI 316 SS)
Lifting bracket		Stainless Steel 1.4404 (AISI 316L SS)	Stainless Steel 1.4404 (AISI 316L SS)
O-Rings and Cable Glands		Nitrile (Buna-N)	Nitrile (Buna-N)
Dual Mechanical Seal	**Lower**	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS
	Upper	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS	Silicon Carbide / Silicon Carbide, Nitrile, 316 SS

General Data

Motor Size	PA 18/4
Mixer Weight without Flow Ring	90.0 lbs (41.0 kg)
Mixer Weight with Flow Ring	102.0 lbs (47.0 kg)

abs

BLOWER

P.W. GROSSER CONSULTING, INC.
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BOHEMIA, NY 11716
LONG ISLAND • MANHATTAN • SARATOGA SPRINGS • SYRACUSE • SEATTLE • SHELTON

KAESER OMEGA BLOWERS

OMEGA PLUS ROTARY BLOWERS - RECOMMENDATIONS BLOWERS -

Customer: Artis - Process/Airlift/SHT

Prepared By: David W. Martine

INPUT DATA:

Operating mode:	Gauge pressure	Flow medium :	Humid Air	
Kind of package:	Com-paK Plus on frequency control	Specific heat constant κ :	1.40	
Inlet temperature:	90 °F	Specific weight at standard conditions :	0.0760	lb/ ft³
Inlet pressure:	14.7 psia	Pressure difference :	6.0	psig
Inlet flow:	**50 icfm**	Discharge pressure :	20.7	psia
		Air humidity:	85	[%]

Technical data:

Package:	**BB 52C**	Blower speed(60Hz) :	2652 rpm
Blower: OMEGA	21P	Connection ANSI:	2"
Motor power:	5.0 hp	% of maximum speed:	43
Operating voltage:	208V/60Hz		

Performance data:	**min. frequency**	**Design point**	**max. frequency**	
Blower: OMEGA 21P				
Frequency:	29.0	54.6	60.0	Hz
Speed:	1280	2410	2650	rpm
Inlet flow Q1*:	14	50	56	icfm
Inlet air flow Q1 (standard): Standard conditions 14.7 psia, 68°F and 0% RH	13	46	52	scfm
Discharge temperature*:	253	185	181	°F
Blower shaft power*:	1.5	2.5	2.7	bhp
Motor shaft power:			3.0	bhp

		without sound enclosure	with sound enclosure
Sound pressure level**:	**at fmax**	79dB(A)	72 dB(A)
Sound pressure level**:	**at 60 Hz**	79dB(A)	72 dB(A)
Sound power level**:	**at 60 Hz**	94dB(A)	87 dB(A)
Dimension [inches](W x L x H)		31 x 31 x 37	31 x 31 x 44
Estimated Weight		ca. 260 lbs	ca. 414 lbs

IGBT Frequency controlled **208V ± 5 % 60 Hz**

The stated control range can vary depending on manufacturer and type of the frequency converter. Standard motor with impulse peak resistance in accordance with IEC 60034-1 for operation with a IGBT frequency converter.

*** Performance data to DIN ISO 1217, PART 1, ANNEX C**
**** Measured to DIN EN ISO 2151, figures ± 3 dB(A), with sound isolated pipework.**

Motor shaft power includes belt losses in addition to dirty filter losses of 0.6 psig (40 mbar).

 V 9.0 AD VERSION 22 May 2013

Customer: Artis - Process/Airlift/SHT **Prepared By:** David W. Martine

Kind of package: Com-paK Plus on frequency control Operating mode: Gauge pressure

Inlet temperature: 90 °F

Inlet pressure: 14.7 psia

Input inlet flow: 50 icfm

Valve set pressure: **11.7** **psig**

Package: **BB 52C**

Blower: OMEGA 21P

Motor power: 5.0 hp

Operating voltage: 208V/60Hz

Blower speed (60Hz): 2652 rpm

Connection ANSI: 2"

% of maximum speed: 43

Fan voltage: 208V/3Ph/60Hz

NOTE: ACCESSORIES ARE INTENDED FOR AIR USE ONLY!

Accessories:

		yes	no
Unloaded start up valve:	AFM4	☐	☒
Check plate:	G2"	☒	☐
Instrument/ sensor:			
Temperature gauge with switch point:		☒	☐
Pressure gauge:		☒	☐
Filter differential pressure switch:		☐	☒
oil level sensor		☐	☒
speed monitor		☐	☒
Auxiliary heating:		☐	☒
Omega P-GRD:		☐	☒

	yes	no
Sound enclosure:	☒	☐
Suction from ambient:	☒	☐
Suction from pipe:	☐	☒
Optional for package with sound enclosure		
Sound enclosure for outdor installation:	☐	☒
Frequency converter (FC):		
Frequency converter (FC) by customer:	☒	☐
Kaeser FC type OFC:	☐	☒

Standard equipment with s. encl.: 1x 1 1/4" Blowoff valve, pressure gauge, filter with maintenance indicator

Standard equipment without s. encl.: 1x 1 1/4" Blowoff valve, filter with maintenance indicator

Comments for project:

ODOR CONTROL TREATMENT

P.W. GROSSER CONSULTING, INC.
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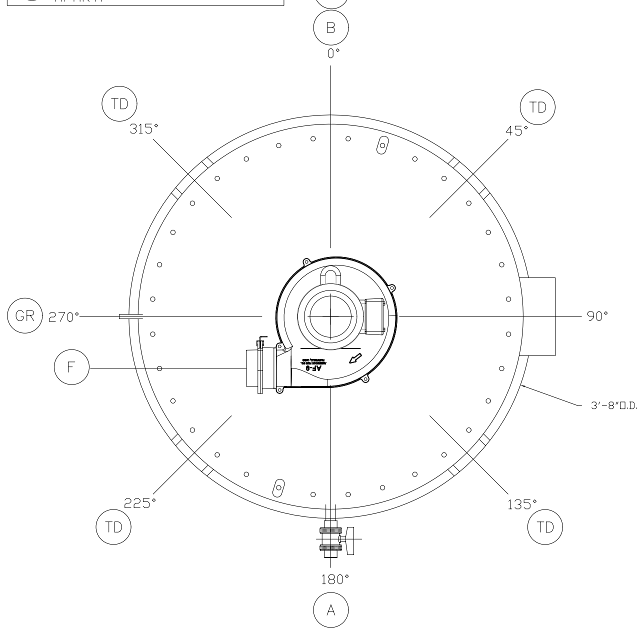
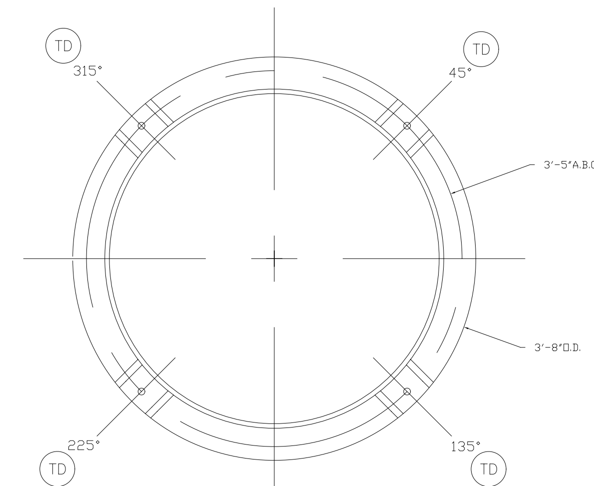
630 JOHNSON AVENUE, STE 7
BOHEMIA, NY 11716
LONG ISLAND • MANHATTAN • SARATOGA SPRINGS • SYRACUSE • SEATTLE • SHELTON

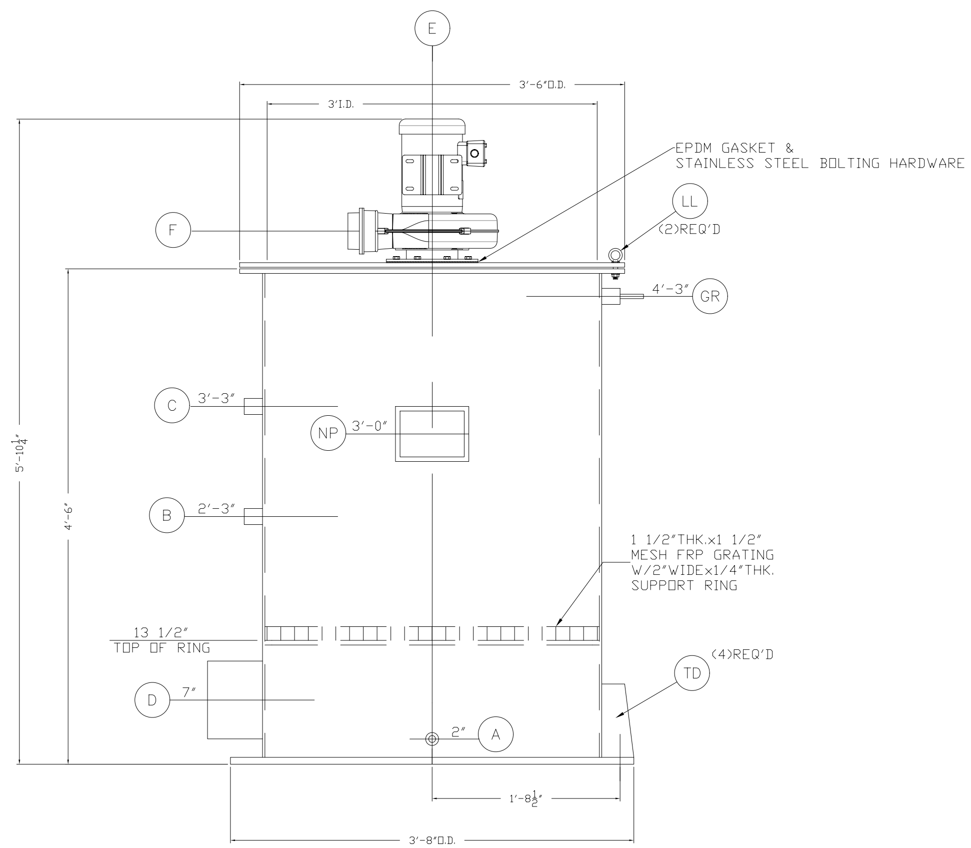
LIFT LUGS TO BE INSTALLED IN ANY TWO HOLES 180° APART. (LL)



PLAN VIEW



TANK FOOTPRINT



ELEVATION VIEW

NOZZLES SCHEDULE

MARK	SIZE	REQ'D	DESCRIPTION	SERVICE
A	3/4"	1	FNPT HALF CPLG W/VALVE	DRAIN
B	1"	1	FNPT HALF CPLG	SAMPLE
C	1"	1	FNPT HALF CPLG	SAMPLE
D	8"	1	FRP PIPE STUB	AIR INLET
E	4 1/2"	1	HOLE	AIR OUTLET
F	4"	1	PIPE STUB	BLOWER OUTLET
TD	---	4	SEE DETAIL	TIE DOWN
LL	---	2	SEE REF028	LIFT LUG
GR	1"	1	SEE REF051	GROUND ROD
NP	---	1	SEE REF010	DF NAMEPLATE

ASSEMBLY PARTS LIST

QTY	SIZE	DESCRIPTION	MATERIAL	SERVICE
1	36"	DUCT GASKET	EPDM	COVER
32	3/8"x2 1/2"	DUCT GASKET	EPDM	COVER
1	3/4"	BALL VALVE	PVC	A
1	3/4"xCLOSE	THD'D NIPPLE	PVC	A
2	1"	BALL VALVE	PVC	B,C
2	1"x4"	THD'D NIPPLE	PVC	B,C
1	---	GRD ROD ASSY	316SS	GR
2	1"	THD'D PLUGS	PVC	GR
1	3'ø	RETENTION SCREEN	POLY	SCREEN
8	7/16"	7/16"x14 HEX BOLTS	SS	
8	7/16"	7/16"x14 HEX NUTS	SS	
16	7/16"	7/16" FLAT WASHERS	SS	

NOTES:

RESIN, CORROSION LINER: HETRON 922 VINYL ESTER
CORROSION LINER THICKNESS: 120 MILS NOMINAL
INTERIOR SURFACING VEIL: SINGLE PLY NEXUS

RESIN, STRUCTURAL: HETRON 922 VINYL ESTER

EXTERIOR GELCOAT: LIGHT GRAY WITH UV INHIBITORS
GELCOAT NOTES: N/A

TOP FLANGE THK: 0.5" X 3"WIDE — COVER THK: 0.55"
BASEPLATE THK: 0.35" — INTERNAL RING THK: 0.25"
SIDEWALL THK: 0.26"

EXTERNAL NOZZLE PROJECTION: N/A
INTERNAL NOZZLE PROJECTION: N/A

BOLT MATERIAL: 316SS
GASKET MATERIAL: 1/8"THK EPDM

POST CURE REQ'D: NO
HYDROTEST REQ'D: NO

TANK WEIGHT EMPTY: 407 LBS.

DESIGN PRESSURE: ±8"W.C. — DESIGNED WIND SPEED: N/A
DESIGN TEMPERATURE: 150'F — DESIGNED SEISMIC ZONE: N/A
DESIGN SPECIFIC GRAVITY: 1.0
CONTENTS: WATER + 700LBS. MEDIA

- TANK TO BE BUILT PER ASTM D3299, ASTM D4097, AND PS 15-69, AS APPLICABLE.
- PROPER VENTING OF THE VESSEL TO BE THE RESPONSIBILITY OF THE CUSTOMER. VENTS SHALL BE SIZED TO PREVENT ANY OCCURRANCE OF PRESSURE OR VACUUM BEYOND THE DESIGN PARAMETERS STATED ABOVE.
- ALL ELEVATIONS TO BE MEASURED FROM REFERENCE LINE.
- ALL NOZZLE BOLT HOLES TO STRADDLE TANK'S MAJOR CENTERLINES.
- ALL NOZZLES TO BE COVERED WITH PLYWOOD DURING TRANSIT.
- FULL FACE GASKETS MUST BE USED ON ALL FIBERGLASS FLANGES. RING TYPE GASKETS ARE NOT SUITABLE.
- FLANGE BOLT-UP TORQUE SHOULD NOT EXCEED 25 FT•LBS. FOR BOLTS UP TO 1/2" DIAMETER AND 50 FT•LBS. FOR 5/8" DIAMETER AND LARGER.

SIERRA ENVIRONMENTAL TECHNOLOGIES

FRP 400 CFM TOP MOUNTED FAN

DWN BY:	CHK BY:	FSCM NO.:		
JDN	DCN			
DATE: 3/11/13	DATE: 3/11/13	SCALE: NTS	SHEET: 1 of 1	REV: 0

PART 5

5.1 **ODOR CONTROL SYSTEM (OCS)**

A. **Overall System**

1.	Foul Air Flow Rate (acfm)	304
2.	Inlet H_2S – ave. (ppmv)	TBD
3.	H_2S Removal Efficiency (%)	> 99.0

B. **Fan**

1.	Capacity (acfm)		304
2.	Total Static Pressure (in. wcg.)		7.0
3.	Fan Speed (rpm)		3450
4.	Fan BHP – Max.		0.56
5.	Motor		
	a.	Hp	1.0
	b.	Speed (rpm)	3450
	c.	Enclosure	TEFC
	d.	Voltage (V) –single phase 60 Hz	115

C. **Odor Control Media**

First Stage

Type:	SWEET-AIRE GC60
Base Material:	Coal based Activated Carbon
Size:	Granular, 4 x 8 mesh
Volume of Media (lbs.):	360
Bed depth (ft.):	2.0
Media Pressure Drop (in. weg.):	3.0
Media Bulk Density (lbs./cu.ft.):	25

Second Stage

Type:	SPECTRUM HS600
Base Material:	Potassium Permanganate Impregnated zeolite
Size:	Granular, 4 x 8 mesh
Volume of Media (lbs.):	400
Bed depth (ft.):	1.0
Media Pressure Drop (in. weg.):	1.5
Media Bulk Density (lbs./cu.ft.):	60

END OF SECTION

PWGC
CLIENT DRIVEN SOLUTIONS

FLOW MONITORING STATION PARSHALL FLUME, LEVEL, PROBES, FLOW METER & CHART RECORDER

P.W. GROSSER CONSULTING, INC.
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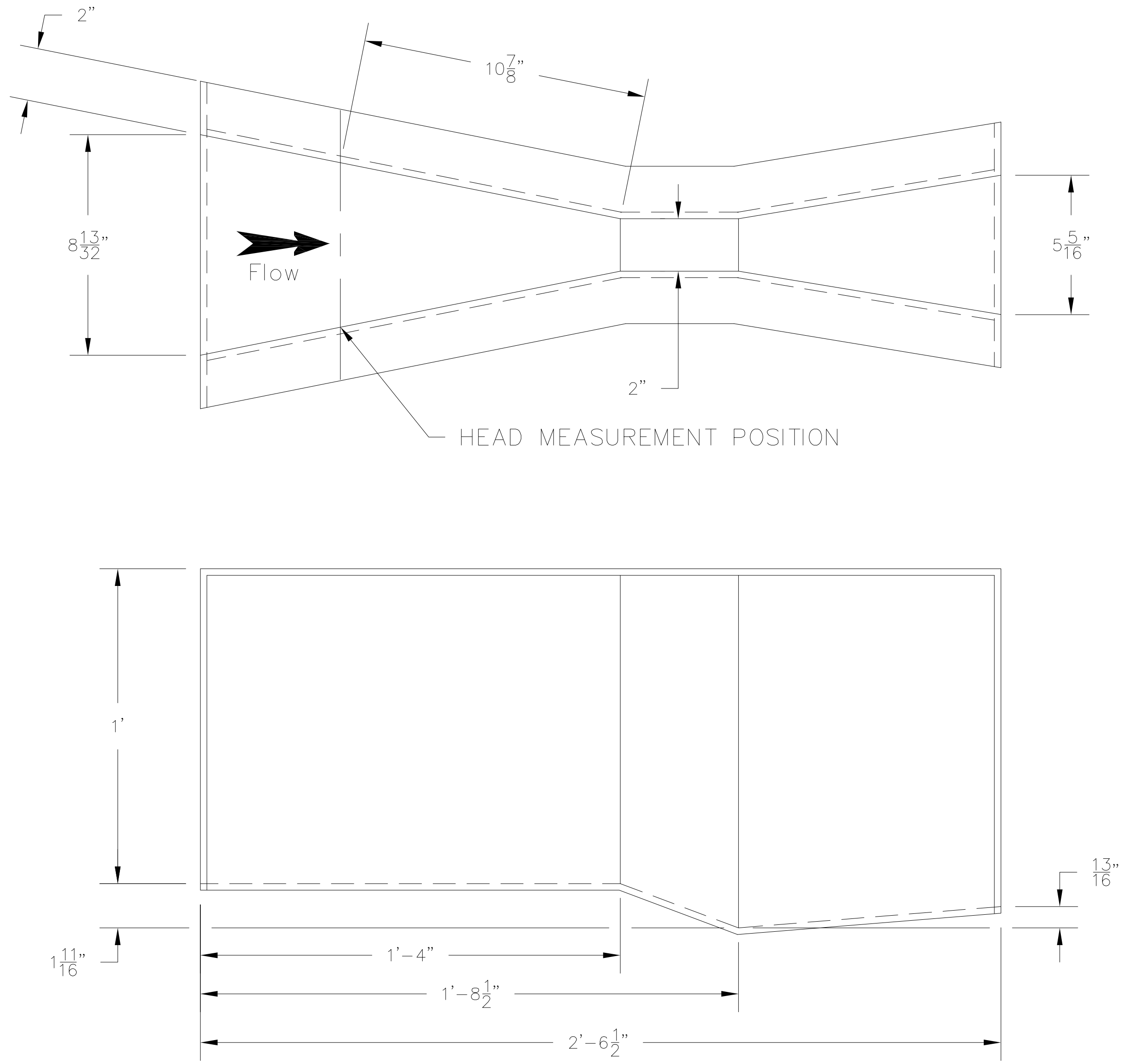
BOHEMIA, NY 11716
LONG ISLAND • MANHATTAN • SARATOGA SPRINGS • SYRACUSE • SEATTLE • SHELTON

ITEM	QTY	DESCRIPTION



IMPORTANT NOTICE

VIRTUAL POLYMER COMPOUNDS, LLC WILL NOT PROCEED WITH FABRICATION UNTIL A SIGNED APPROVAL OF THIS DRAWING IS RECEIVED APPROVAL OR APPROVED AS NOTED (CIRCLE ONE)

BY: ______________ DATE: ________

Rev.	DESCRIPTION	By	Date
–	ORIGINAL RELEASE	JFF	1/17/13

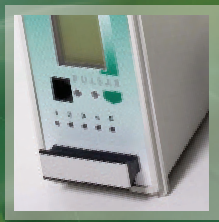
VIRTUAL POLYMER COMPOUNDS, LLC
10478 RIDGE ROAD, MEDINA, NEW YORK 14103
TOLL FREE: 888-290-9522 PHONE: 585-735-9668 FAX: 585-735-9965

TITLE: 2" PARSHALL FLUME

PROJECT:

SCALE: NONE | DATE: 1/17/13 | PROJECT NO.:

Product Overview




Ultra Range

Ultra 3

Ultra sophistication in a smart package, Ultra 3 combines reliable non-contacting ultrasonic level and volume measurement, high specification pump control and open channel flow measurement to international standards. Three control or alarm relays, optional data logging, Pulsar's world-leading DATEM echo processing software and a choice of wall, fascia, panel or 19” rack mounting.

Ultra 5

Ultra 5 continues where Ultra 3 leaves off, maintaining the same reliability, flexibility and menu-driven programming simplicity, with two extra relays, extra features for advanced pump control, differential level and open channel flow, plus the option of RS485 digital communication and 4–20 mA input.

UltraTWIN

Two independent ultrasonic systems in one unit. Each channel is user-configurable to operate in any combination of: a full function open channel flow monitor calculating flow rate to BS ISO standards, a pump control system or as a level and volume monitoring unit for liquids or solids, calculating volumes and providing alarms. UltraTWIN features six relays configurable for either channel as well as four digital inputs and 2 x 4-20mA outputs.

pulsar®
PROCESS MEASUREMENT

Ultra Range:
Ultra 3

Features

- Solids or liquids level measurement
- Choice of wall, panel, fascia or 19" rack mount controllers
- RS232 standard with optional 485 Modbus and Profibus
- AC or DC supply as standard
- No special interconnection cable
- Up to 1000m separation
- Ultra Wizard easy set up
- Backlit display
- DATEM Software

PANEL MOUNT OPTION

19" RACK MOUNT OPTION

Ultra 3 combines several full-function, world-beating ultrasonic level measurement instruments into one. Pulsar engineers have created devices that can be simply configured by the user to provide top-drawer performance . Through the use of ULTRA WIZARD, an integrated high level software configuration tool, you choose your application and the Ultra unit leads you through the set-up process for that specific operation. Full control functions are available: open channel flow is calculated to BS ISO 1438 and 4359. Pump control features are built into Ultra 3, and an extensive set of volume calculations and linearisation facilities are available for a tank or silo level measurement task.

Ultra 3 features the benefits of DATEM, the world's most advanced echo processing software, for level measurement.

Level

Perfect for the wide range of level measurement applications in solids and liquids found in the food, pharmaceutical, chemical, power generation and many more industries. In level measurement configuration, Ultra 3 has three control relays and a measurement range from 125mm to 40m.

Volume

Ultra 3 features pre-programmed tank shape conversion for a wide variety of standard tank shapes including: cylindrical, rectangular, cone base, pyramid base, sloped base, horizontal including parabolic ended tanks and spherical. Unusual shapes are also accommodated through the 32 point linearisation function.

Display:

- 8 digit on-board totaliser
- 6 digit display of flowrate or head
- Bar indicator displaying head or flow

Pump control

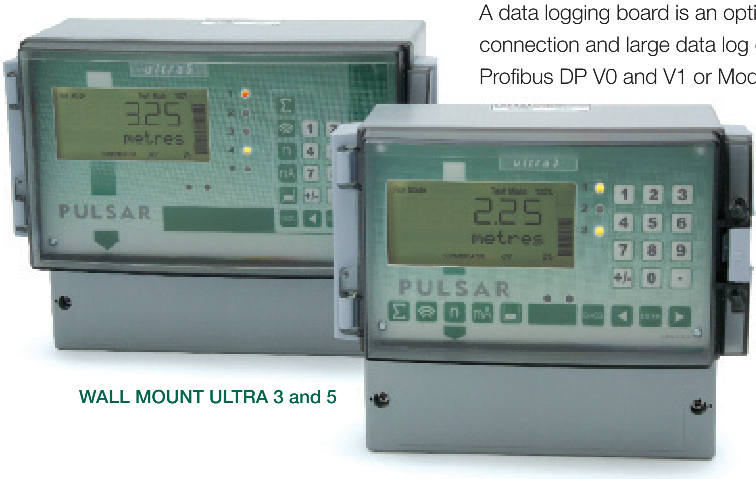
Pulsar pump control units are used throughout the global water and waste industries. Ultra 3 gives you sophisticated pump control on changing level or rate of level change to provide:

- **Power on delay,** allows to delay switching on pumps when power resumes.
- **Pump start delay,** allows delay switching on pumps after another has started.
- **Fixed duty assist**
- **Fixed duty back up**
- **Alternate duty assist**
- **Alternate duty back up**
- **Duty back up and assist**
- **Service ratio duty assist**
- **Service ratio duty back up**
- **FOFO (alternate first on first off duty assist)**

Open Channel Flow

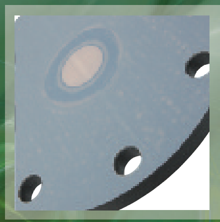
Ultra 3 in open channel flow mode provides non-contacting, maintenance free flow measurement and control in a wide range of flumes and weirs by calculating flow from the measured head preceding a primary element. Flow calculation to BS ISO 1438 and 4359. Three control relays for control choices.

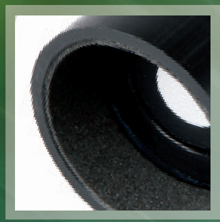
A data logging board is an optional extra with RS485 connection and large data log capability together with Profibus DP V0 and V1 or Modbus communications.



WALL MOUNT ULTRA 3 and 5

Product Overview






Transducers

Standard Range

A range of compact high acoustic output, non contacting transducers are designed for liquids or solids level measurement use. All have ATEX EEx m as standard for use in zone 1 flammable atmospheres.

Threaded Range

These incorporate the performance features of the standard products, but additionally offer a front thread mount option to suit threaded nozzles or flanged tank entries.

pulsar®
PROCESS MEASUREMENT

Transducers:

Standard Range

Features

- Encapsulated ATEX (EEx m) for zones 1 and 2 as standard
- On NPT threaded versions, FM Class I, Div 1, Group A, B, C and D. Class II, Div 1, Group E, F and G. Class III.
- I.S. ATEX (EEx ia) for zone 0 (option)
- Integral temperature compensation
- Narrow beam angles
- Robust IP 68
- PZT ceramic transducer element
- Standard 2 or 3 core screened cable extensions to 1000m
- High acoustic power output
- Patented

Pulsar's main dB series of non contact ultrasonic transducers offer compact, robust measurement and an innovative approach to transducer design. Previously, users had a choice between high-voltage, frequency dependent transducers that were susceptible to electrical noise and needed special, protected interconnecting cables, and weak, low-power transducers that had good hazardous area performance but performed poorly in any but the simplest application.

The dB range has changed all that, creating a compact, low power transducer design that can be I.S. certified and uses standard interconnecting cables, yet produces extremely high acoustic power to give exceptional results in a wide variety of challenging situations.

Team a dB transducer with any of Pulsar's Ultra, FlowCERT, Zenith, Quantum or Blackbox control units to create the perfect solution for your application. All transducers have flammable atmosphere approval as standard.

Standard transducer bodies are made from Valox 357 PBT with a special foam radiating face. Some are available with both body and sealed front face in PVDF for corrosive applications.

(all beam angles defined as, -3dB or half power inclusive)

dB3 – short range solids and liquids measurement

Range – 125mm – 3m, 125kHz, 19mm diameter radiating face, <10º beam angle. All dB3 versions are fitted with a shallow drip shield.

dB6 – short range solids and liquids measurement

Range – 300mm – 6m, 75kHz, 30mm diameter radiating face, <10º beam angle.

dBS6 - short deadband version, solids and liquids measurement

Range 200mm – 6m, at 50kHz, 45mm radiating face, <10º beam angle.

dB10 – solids, powders and liquids measurement

Range – 300mm – 10m, 50kHz, 45mm diameter radiating face, <10º beam angle.

dB15 – narrow beam transducer for solids, powders and liquids

Range – 500mm – 15m, 41kHz, 60mm diameter radiating face, <8º beam angle.

dB25 – narrow beam, mid-range transducer for solids, powders and liquids

Range – 600mm – 25m, 30kHz, 78mm diameter radiating face, <6º beam angle.

dB40 – narrow beam, long range transducer for solids, powders and liquids

Range – 1.2 – 40m, 20kHz, 160mm diameter radiating face, <5º beam angle.

ALL BEAM ANGLES ARE INCLUSIVE, BUT GIVE AN EFFECTIVE BEAM ANGLE OF <3 DEGREES ON OUR CONTROLLERS. RANGE ON POWDERS AND SOLIDS DEPENDS ON APPLICATION.

Data Sheet

SS/C1300–US Issue 7

Advanced Circular Chart Recorder

C1300

- **High-definition backlit display**
  - latest LCD panel display technology ensures instrument operation and configuration is as easy as possible
- **Simple-to-configure totalizers**
  - automatic calculation of the relationship between units of measure and volume flow units
- **Designed to survive**
  - environmental protection options up to NEMA 4X for the entire recorder, providing reliable operation for wall-, panel- and pipe-mount versions
- **Data logging**
  - logging of totalizer and instantaneous readings to a Compact Flash card
- **Fully field-upgradeable**
  - additional options easy to add
- **Configuration backup**
  - ability to backup and restore configurations from a PC

C1300 – dependable recording in a rugged, functional instrument

CALVERTON INDUSTRIAL PARK
4285 MIDDLE COUNTRY ROAD
CALVERTON, NY

BURBS
NITROGEN LOADING MODEL

PREPARED FOR:

HK Ventures, LLC
147 Steamboat Road
Great Neck, New York 11024
Attn: Keith P. Brown, Esq.
Brown Altman and DiLeo, LLP
(516) 222-0222

PREPARED BY:

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Phone: 631-589-6353

Bryan Grogan, PE, Vice President **bgrogan@pwgrosser.com**

PWGC Project Number: TPO2001

MAY 2021

Purpose

The purpose of this report is to document the findings of a nitrogen mass balance prediction performed by P.W. Grosser Consulting (PWGC) for the evaluation of environmental impacts of the proposed industrial development, with respect to nitrogen loading. The subject property is 30.25 acres in size and is currently vacant. The property was historically used as agricultural lands from the 1930s up until the 1986. The project area is located on the south side of Middle Country Road, in the hamlet of Calverton, New York. The proposed development consists of eight (8) multi-tenant commercial buildings with a total building size of 412,629 square feet.

Nitrogen Mass Balance Prediction

PWGC has evaluated the expected nitrogen loading to groundwater under several land use scenarios using the BURBS model. The BURBS model, developed at Cornell University by Hughes et al. (1985), is a computer simulation program that computes the potential impact of various land use on groundwater within a community due to nitrogen. Cornell University has developed this model for specific application on Long Island. For comparative purposes, PWGC has prepared a BURBS computation for five land use scenarios: existing conditions, proposed development plan and three alternate development plans. The three alternative plans analyzed are as follows:

- Alternative #2: Maximum Build Out Plan with As-of-Right Uses
- Alternative #5: Proposed Development with On-Site Septic System Rather Than On-Site STP
- Alternative #6: Proposed Development with Alternative Drainage Design

Alternatives 3, 4 and 7 were not evaluated in this model as there parameters are the same as the proposed action and would result in redundant information being presented. Based on PWGCs experience, this program will predict a conservative estimate of nitrogen recharged to groundwater. It calculates loadings from wastewater, turf/landscaped land, natural land, runoff from impervious surfaces and atmospheric deposition. Each of these parameters is discussed and model parameters are defined.

There are 18 parameters used in the BURBS model:

1. Fraction of Land in Turf
2. Fraction of Land which is impervious
3. Average persons per dwelling
4. Housing density
5. Precipitation rate
6. Water recharged from turf
7. Water recharged from natural land
8. Evaporation from impervious surface
9. Runoff from impervious recharged
10. Home water use per person
11. Nitrogen concentration in precipitation
12. Nitrogen concentration in water used
13. Turf fertilization rate
14. Fraction of nitrogen leached from turf
15. Fraction of wastewater N lost as gas
16. Wastewater fraction removed by Sewer
17. Nitrogen per person in wastewater
18. Nitrogen removal rate of natural land.

Determining Constant Parameter Values

These parameters were constant across all scenarios: items 5-12, 14, and 16-19. Note that in some cases, certain parameters do not apply, but are still considered constant. For instance, the water recharged from turf is considered a constant parameter even in scenarios where there is no turf area. These parameters are summarized in Table 1, below:

Table 1 – BURBS Constant Parameters

BURBS Parameters	Burbs Inputs	Units
5. Precipitation rate	44.2	inches/year
6. Water recharged from turf	33.15	fraction
7. Water recharged from natural land	22.1	fraction
8. Evaporation from impervious surface	0.1	gallons/day
9. Runoff from impervious recharged	1	fraction
10. Home water use per person	100	gallons/day
11. Nitrogen concentration in precip.	0.702	lbs/1000 sq ft
12. Nitrogen concentration in water used	0.34	fraction
14. Fraction of nitrogen leached from turf	0.3	fraction
16. Wastewater fraction removed by Sewer	0	fraction
17. Nitrogen per person in wastewater	10	lbs/year
18. Nitrogen removal rate of natural land	0.9	fraction

Precipitation Rate (5)

The annual average precipitation in inches (BURBS). A value of 44.2 inches was used for this project. This is a typical rainfall amount for Long Island and was derived from the National Atmospheric Deposition Program NTN Site NY96 - Cedar Beach, Southold, New York.

Water recharged from Turf (6)

The amount of water per unit area of turf which drains to groundwater (BURBS). Based upon PWGCs experience and Long Island geology, approximately 50% of rainfall is recharged. However, to account for the turf areas being irrigated and the possibility of soil saturation the recharge percentage was increased to 75%. Therefore, 35.25 inches per year was used for water recharged from turf.

Water recharged from Natural Land (7)

The amount of water per unit area of turf which drains to groundwater (BURBS). Based upon PWGCs experience and Long Island geology, approximately 50% of rainfall is recharged. Therefore, 22.10 inches per year was used for water recharged from natural land.

Evaporation from Impervious Surfaces (8)

The fraction of precipitation falling on impervious surface assumed to evaporate (BURBS). A value of .1 was used for each of the models run. This amount is recommended by the BURBS parameter description.

Runoff from Impervious Recharged (9)

The fraction of the runoff which is recharged through recharge basins, ponds, etc (BURBS). Evaporation is subtracted. All the runoff for this project area will be directed to the subsurface. Therefore, a value of 1 was used in each of the models run.

Home Water Use per Person (10)

Average in-home use of water (BURBS). The value used here was 100 gallons per person. This value was based on the Suffolk County Department of Health Services (SCDHS) estimate of 300 gallons of water use per day per single family home. Using an estimate of 3 persons per dwelling and dividing by the number of persons per dwelling, yields approximately 100 gallons used per person. This is conservative estimate and includes all water uses such as bathing, sanitary, irrigation, etc.

Nitrogen Concentration in Precipitation (11)

Average concentration. The Burbs model recommends using data from the closest weather station where nitrogen tests were taken (BURBS). An average value of 0.70 mg/L was used in each of the BURBS models run. This was derived from the National Atmospheric Deposition Program NTN Site NY96 - Cedar Beach, Southold, New York. Concentrations of nitrate (NO3) were given as an annual average for the years 2003 through 2019, ranging from 0.43 mg/L to 0.92 mg/l.

Nitrogen Concentration in Water Used (12)

Average concentration in water used in homes (BURBS). A value of 0.34 mg/L of Nitrate was used when running each of the models. This value was taken from the Riverhead Water District *(RWD) 2019 Annual Drinking Water Quality Report.* The report indicated that the concentrations varied from non-detectable to a high of 6.1 mg/L. As per Frank Mancini of the Riverhead Water District the background nitrate concentration in the water supply in the area of the proposed development is between non-detectable to 0.34 mg/L. To be conservative a value 0.34 mg/L was utilized in the model.

Fraction of Nitrogen Leached from Turf (14)

The fraction of nitrogen applied from fertilizer, precipitation, etc. which leached to groundwater. The BURBS model recommends 0.35 for sandy soil if clippings are removed, or 0.5 if clippings are left on turf. We used 0.30, a comparable value, from the Long Island Nitrogen Action Plans (LINAP) Nitrogen Loading Model (NLM).

Fraction of Wastewater Removed by Sewer (16)

The efficiency of sewer systems. If no sewers are present, use 0 (BURBS). There are no sewers present at this site, thus the fraction of wastewater removed by sewers is 0.

Nitrogen per Person in Wastewater (17)

The average in the United States is 10 pounds per person per day (BURBS). This value was used when running the BURBS model in all scenarios.

Nitrogen Removal Rate of Natural Land (18)

The fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent (BURBS). Based upon the recommendations made by the BURBS parameter description, a value of 0.9 was used for all scenarios.

Determining Variable Parameter Values

These parameters vary by scenario: items 1-4, 13 and 15. These parameters are summarized in Table 2, see below:

Table 2– BURBS Variable Parameters

4825 Middle Country Road Calverton, NY	Area	BURBS Inputs						
		1. Fraction Turf	2. Fraction Impervious	3. Average Persons Per Dwelling	Number of Dwellings	4. Housing Density	13. Turf/Agriculture Fertilization Rate	15. Fraction of wastewater N lost as gas
Scenario	acre	Fraction	fraction	persons	dwellings	dwellings /acre	lbs./1000 sq ft	fraction
Existing Conditions	30.25	0.00	0.00	3	0	0.00	0.00	0.50
Proposed	30.25	0.26	0.74	3	66.67	2.204	2.04	0.85
Alternate Plan #2	30.25	0.28	0.72	3	96.14	3.178	2.04	0.85
Alternate Plan #5	30.25	0.25	0.75	3	55.35	1.830	2.04	0.65
Alternate Plan #6	30.25	0.27	0.73	3	66.67	2.204	2.04	0.85

Fraction of Land in Turf, Impervious, and Natural (1, 2)

The fraction of land in turf refers to areas maintained as lawn, or in the case of the historic conditions, pervious areas. The fraction of land which is impervious is the sum of roof areas, driveways, and roads. Both the fraction of land in turf and impervious must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of the fraction in turf and impervious, thus the sum of these must be less than 1 (BURBS). The exiting land area was derived from the existing conditions survey. For the proposed development and alternate plan, the land areas were derived from the proposed site plans.

Average Persons per Dwelling and House Density (3, 4)

The average number of people living in each house or dwelling unit (BURBS) and the housing density, the number of dwelling units per acre (BURBS) are part of the wastewater calculations in the BURBS model. For the existing scenario, PWGC reviewed the existing condition survey, since the property is vacant no sanitary flow was used.

For the proposed and alternate scenarios, these values (items 3 and 4) were calculated based on the expected gallons of wastewater generated per day. The number of dwellings was then back calculated based on the assumption that there are 300 gallons/day/dwelling – (see Home Water Use per Person (10)). For the proposed scenario, the proposed sewage treatment plant (STP) has been designed with a flow of 20,000 gallons per day. Given that there are 300 gallons/day/dwelling we would then have 66.67 dwellings (2.204 dwellings/acre). For alternate # 2, the proposed wastewater flow is 28,842 gpd, which means that there would be 96.14 dwellings at 300 gallons/day/dwelling (3.178 dwellings/acre). For alternate # 5, we expect 16,606 gpd, which means that there would be 55.35 dwellings at 300 gallons/day/dwelling (1.830 dwellings/acre). For alternate # 6, the proposed wastewater flows are the same as the proposed action. The average persons per dwelling, number of dwellings, and housing density values therefore do not represent the actual circumstance, but rather are used to ensure that it agrees with the expected gallons/day of wastewater produced.

Turf Fertilization Rate (13)

Average yearly nitrogen application rate expected from residential turf (BURBS). PWGC used 2.04 lbs/1000 sqft for the turf fertilization rate, which is the calculated rate according to the Long Island Nitrogen Action Plans (LINAP) Nitrogen Loading Model (NLM) for residential application.

Fraction of Wastewater Nitrogen Lost as Gas (15)

Fraction of nitrogen in wastewater which volatilizes or is converted to gaseous nitrogen through denitrification. Roughly 0.5 under Long Island, New York conditions (BURBS [5]). The proposed development and alternates 2&6 will utilize a formal sewage treatment plant. Which equates to a nitrogen removal efficiency of 85%, a value of 0.85 was used for these scenarios. For alternative 5 the use of I/A OWTS were utilized, which have an nitrogen removal efficiency of 65% or 0.65. For the existing scenario a value of 0.5 was used as a place holder, since there is no existing wastewater flow on the property, which represents a conventional system.

Summary of BURBS Model Results

As described above, PWGC utilized the BURBS model to estimate the nitrogen output from the five scenarios: existing conditions, proposed development, and the three alternate plans. The BURBS model predicts nitrogen leached to groundwater independent of land area (i.e.: lbs N/acre/year). In order to calculate the estimated mass of nitrogen leached to groundwater, the acreage of each of the project components is multiplied by the model output, yielding pounds of nitrogen per year. The total N leached and the N concentration in each scenario is summarized in Table 3, see below:

Table 3– BURBS Results Summary

4825 Middle Country Road Calverton, NY	Sources of N Leached				Total N Leached		N Concentration
	Turf	Natural Land	Waste Water	Impervious Runoff			
Scenario	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs/acre/yr	lbs./yr	mg/L
Existing Conditions	0.00	0.70	0.00	0.00	0.70	21.29	0.14
Proposed	7.40	0.00	10.02	5.22	22.64	685.00	2.13
Alternate Plan #2	7.97	0.00	14.45	5.09	27.50	832.01	2.39
Alternate Plan #5	7.24	0.00	19.41	5.26	31.91	965.38	3.09
Alternate Plan #6	7.69	0.00	10.02	5.15	22.87	691.72	2.15

The detailed model calculations are shown in Attachment A.

Based upon the above results alternate plan # 5, industrial buildings with transfer of development rights (TDR's) and I/A OWTS, has the highest total N leached, 965.38 lbs./year, and the proposed scenario with 685.00 lbs./year, which is 29% less. Alternate # 2, due to the increase in wastewater flow and overall landscape areas both of which in turn increase the overall nitrogen recharged to 832.01 lbs./year.

Alternative # 6, increase the overall landscaped area, which in turn increases the overall nitrogen recharged to 691.72 lbs./year, which is higher than the 685.00 lbs./year of the proposed project. Similar to the pounds of nitrogen leached, the concentration of nitrogen leached is highest for alternative # 5 at 3.09 mg/L, with the proposed action being 2.13 mg/L.

While the proposed action is higher in all aspects than the existing conditions, it is important to note that the proposed development is consistent with the Town of Riverhead's 2003 Comprehensive Plan as well as the Long Island Comprehensive Waste treatment Management Plan (commonly referred to as the "208 Study"). Specifically, the 208 Study recommended a limit on groundwater nitrogen concertation's of 4 mg/L for properties within Groundwater Management Zone III. Based upon the results of the model, the proposed action has a nitrogen concertation of 2.13 mg/L which is 53% of the limit set forth by the 208 Study.

Therefore, the proposed action or alternative 2 and 6 would have less impact on the groundwater from a nitrogen perspective than alternative 5. In all cases the impacts of the project are in line with the comprehensive plans prepared by the Town and County. Additionally, this type of development is consistent with the future growth projections utilized by Suffolk County as part of the Subwatershed's Waste Water Management Plan.

Resources

(1) Riverhead Water District (RWD). (2020, May). 2019 Drinking Water Quality Report (No. 5103705) https://www.townofriverheadny.gov/files/documents/2019AnnualWaterQualityReport958080430052920AM.pdf

(2) Suffolk County. (2015, March). Suffolk County Comprehensive Water Resources Management Plan (Section 8). https://www.suffolkcountyny.gov/Portals/0/FormsDocs/Health/EnvironmentalQuality/ComprehensiveWaterResourceManagementPlan/Section%208%20Wastewater%20Management.pdf

Attachment A – Detailed BURBS Model Calculations

BURBS Summary
"HK Ventures LLC"

	BURBS Inputs																					BURBS Results						
BURBS Input #			1		2	3		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	N Leached (lbs/acre/yr)					N Leached	
Scenario	Total Acreage	Turf Acerage	Fraction Turf	Impervious Acerage	Fraction Impervious	Average Persons Per Dwelling	Number of Dwellings	Housing Density	Precipitation Rate (in/yr)	Water Recharge From Turf (in/yr)	Water Recharge from Natural Land (in/yr)	Evaporation from impervious surface (fraction)	Runoff from impervious recharged (fraction)	Home water use per person (gal/day)	Nitrogen in precip (mg/L)	Nitrogen in water used (mg/L)	Turf/Agriculture Fertilzation Rate (lbs./1k sqft)	Fraction N Leached from Turf	Fraction of wastewater N lost as gas	Wastewater fraction removed by Sewer	Nitrogen per person in wastewater	Nitrogen removal rate of natural land	Turf	Natural Land	Waste Water	Impervious Runoff	Total	Total (lbs/yr)	N Conc. (mg/L)
Existing	30.25	0.00	0.00	0.00	0.00	3	0	0.00	44.2	33.15	22.1	0.1	1	100	0.702	0.3	0.00	0.30	0.50	0.00	10	0.9	0.00	0.70	0.00	0.00	0.70	21.29	0.14
Proposed	30.25	7.79	0.26	22.46	0.74	3	66.67	2.204	44.2	33.15	22.1	0.1	1	100	0.702	0.3	2.04	0.30	0.85	0.00	10	0.9	7.40	0.00	10.02	5.22	22.64	685.00	2.13
Alternative #2	30.25	8.39	0.28	21.86	0.72	3	96.14	3.178	44.2	33.15	22.1	0.1	1	100	0.702	0.3	2.04	0.30	0.85	0.00	10	0.9	7.97	0.00	14.45	5.09	27.50	832.01	2.39
Alternative #5	30.25	7.62	0.25	22.63	0.75	3	55.35	1.830	44.2	33.15	22.1	0.1	1	100	0.702	0.3	2.04	0.30	0.65	0.00	10	0.9	7.24	0.00	19.41	5.26	31.91	965.38	3.09
Alternative #6	30.25	8.10	0.27	22.15	0.73	3	66.67	2.204	44.2	33.15	22.1	0.1	1	100	0.702	0.3	2.04	0.30	0.85	0.00	10	0.9	7.69	0.00	10.02	5.15	22.87	691.72	2.15

BURBS Existing Conditions

"HK Ventures LLC"

```
                         Welcome to  BURBS
                         -----------------
     A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
     development on the nitrate concentration in groundwater.
     <<<< Center for Environmental Research, Cornell University >>>>
                          Ithaca, N.Y.   1985
 There are 9 pages:
                         A      B   C   D  E  F  G  H  I       J
                    1 +-----------------------------------------------+
 Press the "Alt"      š    Welcome    š Instructions  š  Definitions  š
 key with one         š (you are here)š    <Alt> I    š   (3 pages)   š
 letter            20 +---------------+---------------+    <Alt> D    š
 to switch            š  Parameters   š    Results    š               š
 sections.            š   <Alt> P     š    <Alt> R    š               š
                   40 +---------------+---------------+               š
                      š  Calculations š               š               š
 Special              š    <Alt> C    š               š               š
 Commands:         60 +---------------+               +---------------+
 <Alt> W = results + parameters on split screen       š Bibliography  š
 <Alt> U = undo split screen      <Alt> G = graphs    +-----<Alt> B----+
```

DATA - Enter a values for each parameter:

1.	Fraction of land in turf	0.00	fraction
2.	Fraction of land which is impervious	0.00	fraction
3.	Average persons per dwelling	3.00	people
4.	Housing density	0.00	dwellings/acre
5.	Precipitation rate	44.20	inches/year
6.	Water recharged from turf	33.15	inches/year
7.	Water recharged from natural land	22.10	inches/year
8.	Evaporation from impervious surface	0.10	fraction
9.	Runoff from impervious recharged	1.00	fraction
10.	Home water use per person	100.00	gallons/day
11.	Nitrogen concentration in precip.	0.70	mg/l
12.	Nitrogen concentration in water used	0.34	mg/l
13.	Turf fertilization rate	0.00	lbs/1000 sq ft
14.	Fraction of nitrogen leached from turf	0.30	fraction
15.	Fraction of wastewater N lost as gas	0.50	fraction
16.	Wastewater fraction removed by Sewer	0.00	fraction
17.	Nitrogen per person in wastewater	10.00	lbs/year
18.	Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	1.00	
Population Density	0.00	people/acre
Nitrogen addition from precipitation	7.04	lbs/acre/year
N content of wastewater incl. water used	10.10	lbs/person/year

LABELS FOR GRAPH

	Overall
Turf	Nitrate
Natural	Conc. =
Sewage	0.1
Runoff	mg / liter
TOTAL	

MACRO COMMANDS

BURBS Existing Conditions

"HK Ventures LLC"

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	0.0	0%	0.0	0%
Natural Land	22.1	100%	0.7	100%
Wastewater	0.0	0%	0.0	0%
Impervious Runoff	0.0	0%	0.0	0%
TOTAL	22.1		0.7	

Nitrogen concentration in recharge 0.1 mg/l

Graphs of the data can be accessed by typing <Alt> G.

Select a graph, then type "Q" to exit graph menu.

BURBS Existing Conditions
"HK Ventures LLC"

Parameter Definitions
----

1. Fraction of land in turf - refers to area maintaned as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

BIBLIOGRAPHY

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[1] Mather, John R. 1979. The Influence of Land-Use Change on Water Resources. Water Resources Center, University of Delaware. Newark, Delaware.
[2] Long Island Regional Planning Board. 1978. Long Island Comprehensive Waste Treatment Management Plan (208 study). Hauppauge, N.Y.
[3] Hughes, Henry B.F. and K.S. Porter. 1983. Land Use and Ground Water Quality in the Pine Barrens of Southampton. Center for Environmental Research, Cornell University, Ithaca, N.Y.
[4] Hughes, Henry B.F., J. Pike and K.S. Porter. 1985. Assessment of Ground-Water Contamination by Nitrogen and Synthetic Organics in Two Water Districts in Nassau County, N.Y. Center for Environmental Research, Cornell University, Ithaca, N.Y.
[5] Andreoli, A., R. Reynolds, N. Bartilucci and R. Forgione. 1977. Pilot Plant Study: Nitrogen Removal in a Modified Residential Subsurface Disposal System. Suffolk County Department of Health Services, Hauppauge, N.Y.

BURBS Proposed

"HK Ventures LLC"

```
                         Welcome to  BURBS
                         -----------------
     A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
     development on the nitrate concentration in groundwater.
     <<<< Center for Environmental Research, Cornell University >>>>
                          Ithaca, N.Y.   1985
 There are 9 pages:
                          A      B   C   D  E  F  G  H  I       J
                      1 +-------------------------------------------------+
 Press the "Alt"        š    Welcome     š Instructions  š  Definitions  š
 key with one           š (you are here)š    <Alt> I    š   (3 pages)   š
 letter                20 +---------------+---------------+     <Alt> D    š
 to switch              š  Parameters   š    Results    š               š
 sections.              š   <Alt> P     š    <Alt> R    š               š
                     40 +---------------+---------------+               š
                        š  Calculations š               š               š
 Special                š    <Alt> C    š               š               š
 Commands:           60 +---------------+               +---------------+
 <Alt> W = results + parameters on split screen      š Bibliography  š
 <Alt> U = undo split screen      <Alt> G = graphs   +-----<Alt> B----+
```

DATA - Enter a values for each parameter:

1.	Fraction of land in turf	0.26	fraction
2.	Fraction of land which is impervious	0.74	fraction
3.	Average persons per dwelling	3.00	people
4.	Housing density	2.20	dwellings/acre
5.	Precipitation rate	44.20	inches/year
6.	Water recharged from turf	33.15	inches/year
7.	Water recharged from natural land	22.10	inches/year
8.	Evaporation from impervious surface	0.10	fraction
9.	Runoff from impervious recharged	1.00	fraction
10.	Home water use per person	100.00	gallons/day
11.	Nitrogen concentration in precip.	0.70	mg/l
12.	Nitrogen concentration in water used	0.34	mg/l
13.	Turf fertilization rate	2.04	lbs/1000 sq ft
14.	Fraction of nitrogen leached from turf	0.30	fraction
15.	Fraction of wastewater N lost as gas	0.85	fraction
16.	Wastewater fraction removed by Sewer	0.00	fraction
17.	Nitrogen per person in wastewater	10.00	lbs/year
18.	Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.00	
Population Density	6.61	people/acre
Nitrogen addition from precipitation	7.04	lbs/acre/year
N content of wastewater incl. water used	10.10	lbs/person/year

LABELS FOR GRAPH

	Overall
Turf	Nitrate
Natural	Conc. =
Sewage	2.1
Runoff	mg / liter
TOTAL	

MACRO COMMANDS

BURBS Proposed

"HK Ventures LLC"

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

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If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	8.5	18%	7.4	33%
Natural Land	0.0	0%	0.0	0%
Wastewater	8.9	19%	10.0	44%
Impervious Runoff	29.5	63%	5.2	23%
TOTAL	47.0		22.6	

Nitrogen concentration in recharge 2.1 mg/l

Graphs of the data can be accessed by typing <Alt> G.

Select a graph, then type "Q" to exit graph menu.

BURBS Proposed

"HK Ventures LLC"

Parameter Definitions

1. Fraction of land in turf - refers to area maintaned as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

BIBLIOGRAPHY

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[1] Mather, John R. 1979. The Influence of Land-Use Change on Water Resources. Water Resources Center, University of Delaware. Newark, Delaware.

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[5] Andreoli, A., R. Reynolds, N. Bartilucci and R. Forgione. 1977. Pilot Plant Study: Nitrogen Removal in a Modified Residential Subsurface Disposal System. Suffolk County Department of Health Services, Hauppauge, N.Y.

BURBS Alternative # 2

"HK Ventures LLC"

```
                        Welcome to  BURBS
                        -----------------
     A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
     development on the nitrate concentration in groundwater.
     <<<< Center for Environmental Research, Cornell University >>>>
                         Ithaca, N.Y.   1985
 There are 9 pages:
                       A      B   C   D  E  F  G  H  I       J
                    1 +------------------------------------------------+
 Press the "Alt"      š    Welcome     š Instructions  š  Definitions  š
 key with one         š (you are here)š    <Alt> I     š   (3 pages)   š
 letter              20 +---------------+---------------+     <Alt> D    š
 to switch            š  Parameters    š    Results     š                š
 sections.            š   <Alt> P      š    <Alt> R     š                š
                     40 +---------------+---------------+                š
                      š  Calculations  š                š                š
 Special              š    <Alt> C     š                š                š
 Commands:           60 +---------------+                +---------------+
 <Alt> W = results + parameters on split screen      š Bibliography  š
 <Alt> U = undo split screen      <Alt> G = graphs    +-----<Alt> B----+
```

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.28	fraction
2. Fraction of land which is impervious	0.72	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	3.18	dwellings/acre
5. Precipitation rate	44.20	inches/year
6. Water recharged from turf	33.15	inches/year
7. Water recharged from natural land	22.10	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.70	mg/l
12. Nitrogen concentration in water used	0.34	mg/l
13. Turf fertilization rate	2.04	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.85	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.00	
Population Density	9.53	people/acre
Nitrogen addition from precipitation	7.04	lbs/acre/year
N content of wastewater incl. water used	10.10	lbs/person/year

LABELS FOR GRAPH

	Overall
Turf	Nitrate
Natural	Conc. =
Sewage	2.4
Runoff	mg / liter
TOTAL	

MACRO COMMANDS

BURBS Alternative # 2

"HK Ventures LLC"

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	9.2	18%	8.0	29%
Natural Land	0.0	0%	0.0	0%
Wastewater	12.8	25%	14.4	53%
Impervious Runoff	28.7	57%	5.1	18%
TOTAL	50.8		27.5	

Nitrogen concentration in recharge 2.4 mg/l

Graphs of the data can be accessed by typing <Alt> G.

Select a graph, then type "Q" to exit graph menu.

BURBS Alternative # 2

"HK Ventures LLC"

Parameter Definitions

----

1. Fraction of land in turf - refers to area maintaned as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

BIBLIOGRAPHY

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[1] Mather, John R. 1979. The Influence of Land-Use Change on Water Resources. Water Resources Center, University of Delaware. Newark, Delaware.
[2] Long Island Regional Planning Board. 1978. Long Island Comprehensive Waste Treatment Management Plan (208 study). Hauppauge, N.Y.
[3] Hughes, Henry B.F. and K.S. Porter. 1983. Land Use and Ground Water Quality in the Pine Barrens of Southampton. Center for Environmental Research, Cornell University, Ithaca, N.Y.
[4] Hughes, Henry B.F., J. Pike and K.S. Porter. 1985. Assessment of Ground-Water Contamination by Nitrogen and Synthetic Organics in Two Water Districts in Nassau County, N.Y. Center for Environmental Research, Cornell University, Ithaca, N.Y.
[5] Andreoli, A., R. Reynolds, N. Bartilucci and R. Forgione. 1977. Pilot Plant Study: Nitrogen Removal in a Modified Residential Subsurface Disposal System. Suffolk County Department of Health Services, Hauppauge, N.Y.

BURBS Alternative # 5

"HK Ventures LLC"

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                        Welcome to  BURBS
                        -----------------
     A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
     development on the nitrate concentration in groundwater.
     <<<< Center for Environmental Research, Cornell University >>>>
                         Ithaca, N.Y.   1985
 There are 9 pages:
                      A      B    C    D   E   F   G   H   I       J
                   1 +------------------------------------------------+
 Press the "Alt"     š    Welcome     š Instructions  š  Definitions  š
 key with one        š (you are here)š    <Alt> I     š   (3 pages)   š
 letter           20 +---------------+---------------+    <Alt> D    š
 to switch           š  Parameters   š    Results     š               š
 sections.           š   <Alt> P     š    <Alt> R     š               š
                  40 +---------------+---------------+               š
                     š  Calculations š                š               š
 Special             š    <Alt> C    š                š               š
 Commands:        60 +---------------+                +---------------+
 <Alt> W = results + parameters on split screen      š Bibliography  š
 <Alt> U = undo split screen      <Alt> G = graphs   +-----<Alt> B----+
```

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.25	fraction
2. Fraction of land which is impervious	0.75	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	1.83	dwellings/acre
5. Precipitation rate	44.20	inches/year
6. Water recharged from turf	33.15	inches/year
7. Water recharged from natural land	22.10	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.70	mg/l
12. Nitrogen concentration in water used	0.34	mg/l
13. Turf fertilization rate	2.04	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.65	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.00	
Population Density	5.49	people/acre
Nitrogen addition from precipitation	7.04	lbs/acre/year
N content of wastewater incl. water used	10.10	lbs/person/year

LABELS FOR GRAPH

	Overall
Turf	Nitrate
Natural	Conc. =
Sewage	3.1
Runoff	mg / liter
TOTAL	

MACRO COMMANDS

BURBS Alternative # 5

"HK Ventures LLC"

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

You must enter values for all the parameters on the data page which starts in cell A21. These parameters are defined and discussed on the page to right of this one. ----->

If you are uncertain of the appropriate value to use for a parameter, we suggest that you try several values in the range of possible values. The numerical output from this model is only as accurate as the parameters and assumptions and hence should be interpreted carefully.

There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	8.4	18%	7.2	23%
Natural Land	0.0	0%	0.0	0%
Wastewater	7.4	16%	19.4	61%
Impervious Runoff	29.8	65%	5.3	16%
TOTAL	45.5		31.9	

Nitrogen concentration in recharge 3.1 mg/l

Graphs of the data can be accessed by typing <Alt> G.

Select a graph, then type "Q" to exit graph menu.

BURBS Alternative # 5

"HK Ventures LLC"

Parameter Definitions

1. Fraction of land in turf - refers to area maintaned as lawn, must be between 0 and 1.
2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
3. Average persons per dwelling - the average number of people living in each house or dwelling unit.
4. Housing density - the number of dwelling units per acre.
5. Precipitation rate - the annual average precipitation in inches.
6. Water recharged from turf - the amount of water per unit area of turf which drains to groundwater. This can be computed from a water budget for the root zone. A 1-2-3 spreadsheet is available for this. [1]
7. Water recharged from natural land - the amount of water per unit area of natural of natural vegetation which drains to groundwater. This can be computed from a water budget.
8. Evaporation from impervious surface - the fraction of precipitation falling on impervious surface assumed to evaporate. Try 0.10. [1]
9. Runoff from impervious recharged - The fraction of the runoff which is recharged through recharge basins, ponds etc. Evaporation is subtracted. Use 0 here if storm sewers drain all runoff to surface waters.
10. Water use per person - average in-home use of water. Try 44 gallons per person per day. [2]
11. Nitrogen concentration in precipitation - average concentration, Use data from closest weather station where nitrogen tests were done.
12. Nitrogen concentration in water used - average concentration in water used in homes.
13. Turf fertilization rate - average yearly nitrogen application rate expected for residential turf.
14. Fraction of nitrogen leached from turf - the fraction of nitrogen applied from fertilizer, precipitation etc. which leaches to groundwater. For sandy soil try 0.35 if clippings are removed, or try 0.5 if clippings are left on turf. These values are based on Long Island studies [3],[4]. For tighter soils the fraction leached will probably be less.
15. Fraction of Wastewater N lost as gas - fraction of nitrogen in wastewater which volatilizes or is converted to gaseous N through denitrification. Roughly 0.50 under Long Island, N.Y. conditions.[5] This value is dependent on temperature and soil. Warmer areas will probably have higher fractions volatilized as will areas with tighter soils. Colder areas will probably have lower fractions. Vary this widely in your sensitivity analysis. (Perhaps 0.2 to 0.8)
16. Fraction of wastewater removed by sewer - efficiency of sewer. Try 0.90 which is to assume that 10% exfiltrates from sewers. If no sewers are present use 0. [4]
17. Nitrogen per person in wastewater - the average in the U.S. is 10 lbs/person/day. [2]
18. Nitrogen removal rate of natural land - the fraction of nitrogen in precipitation which is removed by natural land before the water is recharged. Should be at least 90 percent. Try 95 percent for forested areas.

BIBLIOGRAPHY

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[1] Mather, John R. 1979. The Influence of Land-Use Change on Water Resources. Water Resources Center, University of Delaware. Newark, Delaware.

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BURBS Alternative # 6

"HK Ventures LLC"

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                       Welcome to  BURBS
                       -----------------
     A Lotus 1-2-3 spreadsheet for calculating the impact of residentia
     development on the nitrate concentration in groundwater.
     <<<< Center for Environmental Research, Cornell University >>>>
                        Ithaca, N.Y.   1985
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 to switch             š  Parameters    š    Results    š               š
 sections.             š   <Alt> P      š    <Alt> R    š               š
                    40 +---------------+---------------+               š
                       š  Calculations  š               š               š
 Special               š    <Alt> C     š               š               š
 Commands:          60 +---------------+               +---------------+
 <Alt> W = results + parameters on split screen        š Bibliography  š
 <Alt> U = undo split screen      <Alt> G = graphs     +-----<Alt> B----+
```

DATA - Enter a values for each parameter:

1. Fraction of land in turf	0.27	fraction
2. Fraction of land which is impervious	0.73	fraction
3. Average persons per dwelling	3.00	people
4. Housing density	2.20	dwellings/acre
5. Precipitation rate	44.20	inches/year
6. Water recharged from turf	33.15	inches/year
7. Water recharged from natural land	22.10	inches/year
8. Evaporation from impervious surface	0.10	fraction
9. Runoff from impervious recharged	1.00	fraction
10. Home water use per person	100.00	gallons/day
11. Nitrogen concentration in precip.	0.70	mg/l
12. Nitrogen concentration in water used	0.34	mg/l
13. Turf fertilization rate	2.04	lbs/1000 sq ft
14. Fraction of nitrogen leached from turf	0.30	fraction
15. Fraction of wastewater N lost as gas	0.85	fraction
16. Wastewater fraction removed by Sewer	0.00	fraction
17. Nitrogen per person in wastewater	10.00	lbs/year
18. Nitrogen removal rate of natural land	0.90	fraction

INTERMEDIATE CALCULATIONS

Fraction Natural Land	0.00	
Population Density	6.61	people/acre
Nitrogen addition from precipitation	7.04	lbs/acre/year
N content of wastewater incl. water used	10.10	lbs/person/year

LABELS FOR GRAPH

	Overall
Turf	Nitrate
Natural	Conc. =
Sewage	2.2
Runoff	mg / liter
TOTAL	

MACRO COMMANDS

BURBS Alternative # 6

"HK Ventures LLC"

INSTRUCTIONS

It is assumed that you already know how to use Lotus 1-2-3. This 1-2-3 spreadsheet is set up to calculate the amount of water and nitrogen which will be recharged from a residential development. It calculates loadings from wastewater, turf, natural land and runoff from impervious surfaces.

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There are several predefined graphs which you can use.

This software is free to all owners of Lotus 1-2-3 and carries no guarantee.

RESULTS:

	WATER RECHARGED		NITROGEN LEACHED	
	inches/yr	percent	lbs/acre/yr	percent
Turf	8.9	19%	7.7	34%
Natural Land	0.0	0%	0.0	0%
Wastewater	8.9	19%	10.0	44%
Impervious Runoff	29.1	62%	5.2	23%
TOTAL	46.9		22.9	

Nitrogen concentration in recharge 2.2 mg/l

Graphs of the data can be accessed by typing <Alt> G.
Select a graph, then type "Q" to exit graph menu.

BURBS Alternative # 6

"HK Ventures LLC"

Parameter Definitions

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2. Fraction of land which is impervious - sum of roof area, driveways and roads; must be between 0 and 1. The fraction of land in natural vegetation is computed as 1 minus the sum of fraction in turf and the fraction impervious, thus the sum of these 2 must be less than 1.
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BIBLIOGRAPHY

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