ENGINEERING REPORT

Feasibility Study for Producing Class A Biosolids at the Riverhead Water Resource Recovery Facility

2 River Avenue
Riverhead, New York

H2M Project No.
RDSD 1902

MAY 2020

Prepared for:

Town of Riverhead
200 Howell Avenue
Riverhead, New York 11901

Prepared by:

H2M architects + engineers
538 Broad Hollow Road, 4th Floor East
Melville, New York 11747

H 2 M architects + engineers

Executive Summary

The Town of Riverhead has been in the forefront of the sustainability movement by recently upgrading their Water Resource Recovery Facility (WRRF) from a tertiary treatment facility with surface water discharge to a wastewater reuse facility by adding a second 450,000 gpd outfall to divert highly treated effluent from the facility to the neighboring golf course, further reducing the total nitrogen load to the protected Peconic River while also preserving groundwater supplies normally utilized for golf course irrigation purposes. To continue with this objective, the Town has authorized preparation of this report to determine the feasibility and economic benefit to upgrading the WRRF process to produce Class A, Exceptional Quality (EQ), biosolids from their sewage sludge.

Sewage sludge is defined by the United States Environmental Protection Agency (USEPA) as "the solids separated during the treatment of municipal wastewater (including domestic septage)". Biosolids are defined as "treated sewage sludge that meets the EPA pollutant and pathogen requirements for land application and surface disposal." The Town of Riverhead owns and operates a 1.5 million gallons per day (MGD) WRRF and a 100,000 gallon per day (gpd) Scavenger Waste Facility (SWF), both located at 2 River Avenue in Riverhead, New York and a 62,000 gpd Calverton Sewer District sewage treatment plant (Calverton STP) located at 200 Burman Boulevard in Calverton, New York. Currently, the WRRF is producing approximately 2,800 lbs./day of sewage sludge and the SWF is producing approximately 1,400 lbs./day, which equates to a total sewage sludge production rate of 4,200 lbs./day with minimal contribution from the Calverton STP. Current operations include aerated holding tanks to collect and maintain the sewage sludge in liquid form prior to a series of thickening and dewatering operations. The end product of the current sludge process operations is a sludge cake currently measured at approximately 15-20% solids by weight, which is hauled off site for disposal at a permitted landfill located in Pennsylvania. The cost to haul the sludge cake from the site is a significant portion of the annual operating budget, with a current cost ranging between $600,000-$650,000/year.

In 2007, H2M was retained by Riverhead to produce a Feasibility Study titled 'Beneficial Use of Class B Biosolids – Direct Land Application – Sod Farms'. Class B biosolids as defined by the USEPA are sewage sludge solids treated to reduce pathogens to low but detectable levels that do not pose a threat to public health and the environment as long as actions are taken to prevent exposure to the biosolids after their beneficial reuse or disposal. The use of Class B biosolids comes with restrictions including but not limited to being allowed to be applied in bulk and being subject to the general requirements and site management practices as defined by the USEPA.

The benefit to producing Class A biosolids is that they are virtually unregulated for use and can be used in bulk or sold/given away. This report evaluates potential Class A biosolids alternatives and provides a detailed comparison of two alternatives, autothermal thermophilic aerobic digestion and heat drying.

++ NO TEXT ON THIS PAGE ++

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1.0 PROJECT BACKGROUND AND HISTORY

1.1 Owner and Site Information

The Town of Riverhead (Town) is located in Suffolk County, New York and owns and operates under SPDES Permit No. NY-0020061 **(Appendix A)** a 1.5 million gallons per day (MGD) Water Resource Recovery Facility (WRRF) and a 100,000 gallon per day (gpd) Scavenger Waste Facility (SWF), both located at 2 River Avenue in Riverhead, New York and under SPDES Permit No. NY-0025453 **(Appendix B)** a 62,000 gpd Calverton Sewer District sewage treatment plant (Calverton STP) located at 200 Burman Boulevard in Calverton, New York. The WRRF serves a mixed commercial/residential collection system that is located throughout the south-central portion of the Town and encompasses an area of approximately 2,190 acres (3.4 square miles). The SWF serves as an environmental business that receives septage from independent haulers/carriers Monday through Friday during the hours of 9am-5pm. The Calverton STP serves a mixed commercial/industrial collection system that is located in the Enterprise Park at Calverton.

1.2 Existing Facilities

The WRRF was originally constructed in 1937 and has been upgraded several times including the most recent, which was completed in 2016 to include an effluent reuse component to divert up to 450,000 gpd on a seasonal basis to the neighboring Indian Island Country Club golf course for irrigation purposes. The SWF was constructed circa 1981 and has not been fully upgraded since. The Calverton STP was constructed circa 1969 and has not been fully upgraded since.

1.2.1 Sludge Production

The WRRF biological treatment process utilizes a membrane biological reactor (MBR) designed and permitted to treat an average daily flow of 1.5 MGD to accommodate the following influent loading and effluent permit conditions:

Table 1: WRRF Influent and Effluent Design and Permit Characteristics

Parameter	Influent (Design)	Effluent (SPDES Permit Monthly Limits)
Flow	1.5 MGD	1.5 MGD
BOD5	500 mg/L	25 mg/L
TSS	400 mg/L	30 mg/L
TN	100 mg/L	40 lbs/day (5/1 – 9/30) 130 lbs/day (10/1 – 4/30)

Table 2: 3-Year Averages for WRRF Influent/Effluent Characteristics

Month	Influent (mg/L) – BOD5	Effluent (mg/L) – BOD5	Influent (mg/L) - TSS	Effluent (mg/L) – TSS	Influent (mg/L) – TN	Effluent (mg/L) – TN
January	284.14	5.31	191.08	1.65	55.35	4.06
February	248.42	4.45	187.33	1.83	54.80	5.06
March	222.00	4.52	162.83	2.10	53.00	10.75
April	256.10	4.00	206.20	3.37	58.79	4.15
May	257.77	4.38	219.54	3.77	60.25	3.15
June	244.91	4.47	199.09	3.35	61.57	3.32
July	254.92	6.56	187.33	2.21	56.35	3.02
August	251.91	4.56	176.55	2.73	59.05	2.92
September	263.56	5.70	189.78	2.33	56.17	2.96
October	263.08	6.10	188.02	3.11	56.62	2.89
November	230.83	4.32	153.00	2.02	47.43	6.92
December	257.18	4.00	181.64	2.69	57.14	5.01

[1]These values are generated based on an average of monthly data for 2017, 2018 and 2019.

The WRRF is expected to produce an average of 4,914 lbs./day of waste sewage sludge at the theoretical sludge production at full design flow and load. Current flow and influent characteristics are such that the WRRF has averaged a daily sludge production rate of approximately 2,800 lbs./day or approximately 57% of the design value.

The SWF has varying influent conditions due to the unpredictable nature of septage hauling throughout the calendar year. However, the current SWF process at full design flow and load is projected to produce approximately 3,202 lbs./day of waste sewage sludge. The current operational conditions are such that

the SWF has averaged a daily sludge production rate of approximately 1,400 lbs./day or approximately 44% of the design value.

The Calverton STP is currently producing minimal sludge due to the nature of the collection system contributors being mostly daytime workers producing minimal influent loading. The minimal sludge produced, approximately 2,000 gallons per load, 2-3 times per month at 2,500 mg/L, is being collected by the Riverhead WRRF personnel to be processed at the WRRF. There is anticipated expansion within the sewer district of which it is expected that the Riverhead WRRF would continue to accept and process the sludge produced at the Calverton STP for upgrades up to 0.3 MGD which would produce an average of 513 lbs./day of waste sewage sludge at the theoretical sludge production at full design flow and load. Should the Calverton STP require upgrades past 0.3 MGD, it is anticipated that sludge processing would be incorporated into the design of that facility.

The totals for each scenario are as follows:

Table 3: Current and Design Daily Sludge Production

	Current Sludge Production[1] (lbs./day)	**Expected Sludge Production (current load, full design flow) (lbs./day)**	Maximum Design Sludge Production (full design load, full design flow) (lbs./day)
Riverhead WRRF (1.5 MGD)	2,800	**3,500**	4,914
Riverhead SWF (0.1 MGD)	1,400	**1,750**	3,202
Calverton STP (0.3 MGD)	<5	**384 (projected @75%)**	513
Totals:	**4,200**	**5,634 (say 6,000)**	**8,629**

(1) Current sludge production values are based on an average of annual data from 2017-2019 wet tons and solids content in % solids by weight.

1.2.2 Existing Sludge Processing Equipment

The SWF has the following equipment/processes in place for handling the sewage sludge produced on a daily basis:

- Scavenger Sludge Holding Tank (SSHT) – an 84,600 gallon concrete tank for holding SWF waste sewage sludge under aerated conditions
- Scavenger Sludge Holding Tank Blower – a dedicated 50 HP blower that provides air to the SSHT
- Scavenger Sludge Pump Station – transfers aerated SWF waste sewage sludge to the Blended Sludge Tanks at the WRRF for further processing

The WRRF utilizes the following process equipment for handling the combined waste sewage sludge produced on a daily basis from both the SWF and the WRRF:

- Blended Sludge Holding Tanks (BSHT) – Two (2) cast-in-place concrete tanks (116,317 gallons each, 232,634 gallons total) are adjacent to the existing MBR treatment process tanks. Both of these tanks are used to hold waste sewage sludge from both the WRRF process and from the SWF facility's SSHT under aerated conditions. Submersible pumps located in each tank are used to transfer this sludge for further processing. These tanks provide for approximately 2 days of sludge storage if no additional steps are taken.
- Supernatent Pumps – 3.8 HP pumps (quantity of 2 total, 1 duty and 1 shelf spare) have been provided that can be lowered in the BSHT with a manual hoist to skim water from the surface of the tank to be returned to the headworks after sludge has been allowed to settle for up to 8 hours to provide for additional storage capacity and further thicken the blended sludge tank contents up to approximately 0.5% solids.
- Blended Sludge Holding Tank Blowers – Two (2) dedicated 50 HP blowers located in a blower room within the Operations Building provide air to the BSHTs, one duty and one standby. These blowers are turned off periodically to allow sludge to settle.
- Gravity Belt Thickeners (GBT) – Two (2) GBT's are installed to accept the waste sewage sludge from the Blended Sludge Holding Tanks and thicken the sludge from as low as 0.2% to up to 5% solids by weight. Plunger style pumps located adjacent to the GBT's transfer the thickened sludge to the Thickened Sludge Holding Tank (TSHT)

- Thickened Sludge Holding Tank – a single concrete tank is utilized to store thickened/blended waste sewage sludge under aerated conditions. This tank provides for 178,722 gallons, or approximately 1.5 days of sludge storage if no further steps are taken from the BSHT. Should the GBT's be utilized, the storage capacity would be increase.

- Thickened Sludge Holding Tank Blower (TSHT) – a dedicated 50 HP blower provides air to the TSHT. A common spare is located between this blower and the SSHT blower that can take the place of either blower when one is offline for maintenance or repair.

- Belt Filter Press (BFP) – a single BFP in the existing operations building dewaters the thickened/blended waste sewage sludge from the TSHT to increase solids from as low as 0.2% to up to 30% by weight. Shaftless screw conveyors are provided to convey the dewatered waste sewage sludge cake from the BFP to a 21 ton capacity trailer for off-site disposal.

- Polymer Delivery Systems – a total of two (2) separate polymer delivery systems are installed to transfer neat polymer (already mixed with water) to the GBT's and the BFP. The GBTs and BFP have individual and dedicated polymer lines from each system.

See **Figure 1 - Existing Conditions Site Plan** and **Figure 2 - Existing Conditions Sludge Process Flow Diagram** for more information.

1.3 Definition of the Problem

The WRRF has been hauling sewage sludge cake from the facility to an off-site disposal location for since the first belt filter press was installed in 1986. The original BFP was replaced in 2008. Since then the cost of hauling has continued to rise, with increasing scrutiny placed on landfilling of such material. With the facility being upgraded to a water reuse facility, the Town has investigated additional opportunities for beneficial reuse, primarily for the sludge treatment system. In order to make a future project feasible, the improvements must result in not only beneficial reuse opportunities, but also provide an annual cost savings to the Town should the beneficial reuse opportunities change and/or become obsolete over time.

1.4 Current Operations and Maintenance Costs

The current costs of the existing systems can be broken out into three separate categories:

- Utility Costs

- Equipment Consumables Costs

- Sludge Hauling Costs

In each of the following sections of the report, the costs will be discussed, and an annual equivalent cost will be identified. For purposes of this report, each annual cost will be adjusted with an inflation factor to project to the midpoint of a 30-year life cycle for use in comparison to the projected capital cost and 30-year life cycle cost of the potential Class A biosolids options utilizing the same inflation projection.

1.4.1 Utility Costs

The utility costs associated with the existing sludge processing equipment are almost exclusively due to electricity demand. Since the WRRF utilizes treated effluent as reuse water, there are no associated water consumption costs other than the share of the electricity used by the booster pump to circulate reuse water through the distribution piping. **Table 4** has a listing of the existing systems with associated motors and what the daily usage is in hours and cost per day to run to give an estimated annual total projected to the mid-point of a 30 year cycle.

1.4.2 Consumables

The consumable costs associated with the sludge processing equipment fall within the following categories:

1. Preventative maintenance items
2. Rebuild/Replacement

Table 5 has a listing of the existing systems and consumables associated with each as well as what the frequency is and cost per item to give an estimated current annual total which has been projected to the mid-point of a 30 year cycle.

1.4.3 Hauling Costs

The cost associated with hauling is based on a contract that is renewed every 2 years. The current contract cost to haul a full 21-ton trailer is $2,850 and has historically gone up approximately 1.2% year over the past 10 years. The facility under normal conditions is producing dewatered sludge that is 15-20% solids by weight, which may vary slightly depending on sludge conditions and polymer dosage. **Table 6** gives the projected annual cost for hauling sludge at several different concentration values at the current sludge production rates along with the same information at full design sludge production rates, projected to the mid-point of a 30-year life cycle.

2.0 ALTERNATIVES ANALYSIS

2.1 USEPA Guidelines for Class A Biosolids

The USEPA Part 503 rule provides comprehensive requirements for the management of biosolids generated during the process of treating municipal wastewater. Furthermore, the intention of the rule is to create incentives for beneficial reuse of biosolids since the USEPA believes that biosolids are an important resource that can and should be used.

2.2 Pathogen and Vector Attraction Reduction Alternatives

The USEPA has provided Subpart D of the Part 503 rule which covers the alternatives for reducing pathogens in the treated biosolids.

2.2.1 The pathogen reduction alternatives are:

A. Composting – Composting involves the biological degradation of waste, such as organic materials, under aerobic conditions. This includes maintaining a certain temperature in a composting device such as in-vessel composting, for a given period.

B. Heat Drying – The heat produced from dryers evaporates water from wastewater solids. Direct, indirect, or other types of dryers can be utilized to reduce the moisture content of the biosolids.

C. Heat Treatment – Heat treatment consists of heating up liquid biosolids to a temperature of at least 180 degrees Celsius for 30 minutes.

D. Thermophilic Aerobic Digestion – This process consists of agitating liquid biosolids with air or oxygen to maintain aerobic conditions. The mean cell residence time of the biosolids is 10 days when the temperature is between 55 and 60 degrees Celsius.

E. Beta Ray Irradiation – Irradiation alters the colloidal nature of cell protoplasm, which grants it ability to destroy organisms. In this process, biosolids are irradiated with beta rays from an accelerator, at dosages of at least 1.0 megarad at 20 degrees Celsius.

F. Gamma Ray Irradiation – In this process, biosolids are irradiated with gamma rays from isotopes such as Cobalt 60, at 20 degrees Celsius.

G. Pasteurization – Pasteurization involves maintaining a minimum biosolids temperature of 70 degrees Celsius for at least 30 minutes.

H. Thermally Treated – This process involves subjecting biosolids to one of four specific, time-temperature based thermal heating procedures. The four regimes identified in the Part 503 rule are as follows:

- Regime A requires maintaining the temperature of biosolids at 50ºC or higher for 20 minutes or longer for biosolids with 5% solids or greater, except those covered by Regime B.
- Regime B maintains a 50ºC or higher biosolids temperature for 15 seconds or greater. This regime applies for biosolids with 7% solids or greater in the form of small particles by contact heating with gases or an immiscible liquid.
- Regime C is for biosolids with solids less than 7%, where the temperature must be heated for at least 15 seconds but less than 30 minutes.
- Regime D is also for biosolids with solids less than 7% but the temperature of the sludge must be 50ºC or higher with at least 30 minutes or longer of contact time.

I. Treated in High pH/High Temp – This process consists of a specific temperature and pH process to reduce pathogen concentrations.

J. Treated in 'Other' Process – Other known processes may be used if they reduce enteric viruses and viable helminth ova. As a baseline, they require a known presence before treatment begins and then comprehensive monitoring of enteric viruses and viable helminth ova must be performed throughout the process to demonstrate that it is adequately and effectively treating pathogens. If found to be present, the density of enteric viruses in the biosolids after treatment must be less than 1 plaque-forming unit (PFU) per 4 grams of total solids, and the viable helminth ova density in the biosolids after treatment must be less than 1 per 4 grams of total solids, both on a dry-weight basis.

K. Treated in 'Unknown' Process – This process is utilized when a process is unknown, or where the biosolids were treated under less-stringent process conditions than those which classify Class A biosolids, under any alternatives. The 'unknown' process requires that biosolids must be tested for Salmonella sp. or fecal coliform bacteria, enteric viruses, and viable helminth ova either when the biosolids are used or disposed, or in some cases, when they are prepared for use or disposal.

L. Treated in Process Equivalent to PFRP – This consists of treating biosolids in a process that is equivalent to one of the Processes to Further Reduce Pathogens, or PFRP, which must be determined by the permitting authority. In addition, they must meet the Pathogen Requirements

for all Class A Alternatives. The process must be equivalent in achieving Class A status by reducing enteric viruses and viable helminth ova as long as it is operated under the same conditions which produced the required reductions.

2.2.2 Upon treatment, the biosolids must also meet at least one (1) of the vector attraction reduction requirements:

A. Volatile solids mass reduced by >38%

B. If not reduced by 38% anerobically: digest portion of digested sludge for an additional 40 days at 30-37 deg. C, and produce 17% further reduction

C. If not reduced by 38% aerobically: digest portion of digested sludge at 2% or less solids for an additional 30 days at 20 deg. C, and produce 15% further reduction

D. Specific oxygen uptake rate (SOUR) in aerobic process is ≤ 1.5 mg/L per gram total solids at 20 deg. C

E. Aerobic digestion for 14 days or longer at 40 deg. C, with average temperature higher than 45 deg. C

F. pH raised to 12 or higher by alkali addition, remain at 12 with no additional alkali for 2 hours, then remain at 11.5 for 22 hours

G. % solids not containing unstabilized solids greater than 75% total solids

H. % solids containing unstabilized solids from primary process greater than 90% solids

I. Sludge to be injected below ground surface

J. Incorporate biosolids into soil within 6 hours of application

2.3 Preliminary Evaluation of Potential Alternatives

Each of the alternatives has been evaluated from the standpoint of Owner preferences, site restrictions and commercial availability. A meeting was held with the Superintendent of the Sewer District on September 4, 2019 to discuss the potential alternatives at which time it was determined that there were several alternatives that could be eliminated based on the availability or nature of the equipment necessary to perform the treatment. For example, there was no interest in beta ray or gamma ray irradiation nor was there a desire to have a process which includes a chemical storage/delivery system such as the high temperature/high pH alternative.

From discussions during this meeting, it was determined that the acceptable alternatives would be heat and/or biological treatment systems only. Thermal treatment alternative was eliminated based on client preference, since there was no interest in installing and maintaining a boiler to achieve the necessary heating requirements. The next criteria that was evaluated was whether the existing site has enough space. Since the site is adjacent to and inclusive of wetlands and the available space is already being utilized by the other systems, there are no reasonable options for expanding the limits of the existing facility. Therefore, alternatives must not require expansion of the site. Consequently, composting was also eliminated from further consideration.

The final criteria for this portion of the evaluation was that any selected system must be currently commercially available with an amount of systems in place to ensure equipment reliability and manufacturer support during the life cycle of the system.

Having completed the preliminary evaluation, each of the following alternatives remain:

- Heat Drying
- Thermophilic Aerobic Digestion

A minimum of two examples of each alternative were selected for outreach to equipment representatives. Information was obtained regarding system components, capital costs and operations and maintenance requirements. For purposes of this report, a detailed evaluation was conducted on a single selection of each alternative. The following categories were used in the evaluation of the selections:

- Capital, Construction and Engineering Costs
- Utility Consumptions
- Consumables
- Disposal Cost (if no end user interest)
- Potential Give-away Savings
- Operations/Labor

3.0 COMPARISON OF SELECTED ALTERNATIVES

3.1 Alternative #1 – Autothermal Thermophilic Aerobic Digestion (ATAD)

3.1.1 Thermal Process Systems - ThermAer

The first alternative selected for further evaluation is the ThermAer system, a two-step autothermal thermophilic aerobic digestion (ATAD) process provided by Thermal Process Systems. The system is designed to process up to 6,000 lbs per day of dry sludge material at 4-7% total solids (TS), seven (7) days per week. This will require the use of gravity belt thickeners for dewatering sludge from the BSHT's prior to entering the ThermAer system to achieve the minimum % solids in order to optimize the digestion process and energy requirements by limiting the amount of water to be brought up to temperature. See **Figure 3 – ThermAer Process Proposed Flow Diagram** for more information for the ATAD system and how it will be integrated into the existing sludge processing systems.

The first step of the digestion process occurs in the ThermAer reactor. The ATAD process is typically batch-fed 3-5 times per week with thickened sludge, with actual loads depending on the RWRRF's daily flow rates and sludge production. Conditions in the process are contingent on oxygen demand so there are sensors measuring oxygen reduction potential (ORP) as a surrogate for dissolved oxygen. During and after a batch feed to the ThermAer reactor, the oxygen demand rapidly increases and oxygen is used to drive biological activity which generates heat from the exothermic reactions that take place. A constant food source is produced for the naturally occurring thermophilic bacteria as the cells of the mesophilic bacteria rupture and degrade, resulting in 50% reduction of TS.

To maintain optimal conditions, a positive displacement aeration blower controlled by a variable frequency drive (VFD) modulates the air flow to provide sufficient aeration for the digestion process to effectively destroy pathogens and stabilize the sludge material. As the system is fed and heat is produced, the system is in what is called the "burn mode" where the ORP recovers towards zero. The next phase, "react mode," is in response to the generation of heat and slowdown of biological activity. The blower speed is optimized to save energy while retaining heat. Temperatures between 65-70ºC are maintained in the tank due to the presence of continuing exothermic reactions from this phase. No external heat sources are needed to maintain thermophilic conditions for the ATAD process. Following the "react mode," the system's "isolation mode" is initiated, which is when the sludge is retained in the reactor for a temperature-dependent period of time until United States EPA 503 regulations are met to achieve "Class A" Biosolids. The hydraulic retention time (HRT) for the reactor is typically kept at 10 to 12 days to maintain a sufficient reactor volume for treatment.

Following the ThermAer process, the biomass may contain upwards of 800-1200 mg/L of ammonia. In order to reduce this load to the front of the RWRRF during dewatering operations, the second step of the process is the conversion of ammonia to nitrates as the end product of nitrification reactions, followed

by conversion of nitrate to nitrogen gas by denitrification. To initiate the second step, a transfer pump conveys biosolids from the ThermAer reactor to the Storage Nitrification/Denitrification Reactor (SNDR) to reduce nitrogen and ammonia concentrations and provide additional reactor volume at a HRT of 11 days. ORP monitoring is used in the SNDR to turn the reactor's blower on and off in alignment with nitrification-denitrification cycles. Mesophilic digestion occurs in the second step of the process to further reduce total solids by 15%. In order to recover the mesophilic nitrifying/denitrifying bacteria population and lower the temperature to the necessary range of 35-40ºC, the biosolids pass through the CoolAer (heat exchanger) between the ThermAer and SNDR reactors. Reuse water from WRRF is the proposed cooling medium and would be returned to the headworks when the heat exchange process is complete. Following the batch feeding of the SNDR, the full tank contents are recycled through the CoolAer again to ensure there is a suitable environment for the bacteria. Upon completion of the nitrification/denitrification process, the liquid biosolids from the SNDR are conveyed by a transfer pump to the BFP for final dewatering. The sludge cake concentration is expected to come off the belt press in a range of 25-35% TS, an increase from current concentrations, based on manufacturer data from facilities currently implementing the ThermAer process.

The jet aeration system that fuels digestion in both the ThermAer and SNDR reactors introduces oxygen and a flow of recirculating liquid sludge to a header centered in each tank which has nozzles where the air and sludge are forcefully mixed to form high-velocity jet plumes, creating high oxygen transfer to the reactor due to high shear forces. A single 100 HP jet pump and a single 50 HP jet pump are necessary for the ThermAer and SNDR tanks respectively. Three (3) Gardener-Denver HeliFlow blowers currently used for the existing scavenger and thickened sludge holding tanks are to be converted are no longer needed and will be repurposed for the aeration of both reactors. Additionally, foam control will be handled by the use of actuated valves and a recirculation line from each jet pump that runs to splash cones suspended in the headspace of both reactors to break up accumulating foam.

In addition to the ammonia concentrations in the biomass, an amount of ammonia remains entrained in the air of headspace of both the ThermAer and SNDR reactors. This ammonia is isolated in the reactor headspaces by tank covers for conveyance to the BiofiltAer system for odor control and ammonia removal. The off-gas scrubber recommended for this installation precedes the BiofiltAer unit for additional ammonia removal and temperature modifications when the SNDR reactor is bypassed. Air from the headspace is drawn from the reactors through piping to the BiofiltAer by a 5,000 scfm fan. The BiofiltAer is composed of an air distribution plenum and two layers of media serving as the fixed-film filter. The first layer consists of an organic stone (such as Haydite) and a second organic layer of woodchips. Each layer has been chosen for its ability to provide essential substrate necessary for the growth of the microbiology.

3.1.2 Site Integration and Storage of Biosolids

Existing structures will be repurposed for all the main tanks for the ThermAer process (ThermAer, BiofiltAer and SNDR). The Thickened Sludge Holding Tank (TSHT) onsite will be repurposed for the 152,000 ThermAer reactor with a diameter of 39-feet and side water depth of 17-feet, and an out of service covered digester at RWRRF will be repurposed for the 159,800 gallon SNDR reactor with a diameter of 40-ft. and a side water depth of 17-ft. The 30-ft. diameter Scavenger Sludge Holding Tank (SSHT) will be repurposed as the BiofiltAer. A new 26-ft. by 65-ft. two-story biosolids control building will be located on the east side of the SNDR reactor and house the two jet pumps, three transfer pumps, and CoolAer heat exchanger used in the process, as well as the electrical power and control elements (mechanical and control panel). Two process blowers that previously serviced the sludge holding tanks and will be repurposed for the reactors remaining in the scavenger/thickened sludge tanks blower room attached to the west side of the proposed SNDR reactor. It is anticipated that the dewatered biosolids will be temporarily stored on site.

A 125' x 250' (31,250 sq. ft.) fenced in area adjacent to the entrance to the plant will be considered as the storage location for the purposes of this report. It will be assumed this location is acceptable and that the town will provide a vehicle to transport the biosolids to the stockpile area from the BFP discharge area. In order to protect the stockpile from moisture, a tarp style building will be proposed. The proposed stockpile is enclosed by a 6-foot high chain-link fence with double-leaf access gate exterior to the plant so that treatment areas remain separate from potential end users. See **Figure 4 - ThermAer System Proposed Site Plan** for more information.

3.1.3 Operations

To operate the ThermAer process would require some additional effort to oversee and maintain above and beyond the current operations but does not require 24-hour attention when running in normal conditions. The system is fully automated through the communications and controls utilizing the various sensors and flow meters and automatic modulation of the VFD's through the PLC control panel. The new control panel would also become fully integrated within the existing site SCADA computer system for remote accessibility and monitoring. It is not anticipated that the ThermAer process would require any additional hires over the normal workforce currently operating and maintaining the WRRF and SWF due to minimal additional equipment maintenance and lab sampling. The main effort will be put towards running the GBT systems during batch-feed events and since there are no pieces of specialty equipment and the lab testing is mostly ammonia sampling and checking sludge concentrations for monitoring the GBT performance, this can be handled at the Operator or mechanic level.

3.1.4 30-Year Life Cycle Cost Evaluation

The scope of supply for the ThermAer system costs $1,940,000 **(Appendix C)**, which includes startup services and O&M manuals, as well as the following:

- All jet and transfer pumps for the process (duty and spare) and spare belts
- In-basin piping & accessories from the ThermAer and SNDR reactors to the pumps and blowers with 4" and 6" actuated valves
- Foam control SplashCones
- All probes, sensors, magnetic flow meters and transmitters necessary for the process
- CoolAer heat exchanger
- MCC and control panel
- 120/240 VAC Lighting panel with 10-20 A breakers and pre-wired control panel
- BiofiltAer components – off-gas WC fan, scrubber, organic & inorganic media, biofilter plenum & instrument cabinet

Outside of the equipment vendor scope of supply, the following will be included in the final design:

- Repurposed blowers and associated accessories and VFD's
- Masonry/cast-in-place concrete control building and foundation
- Piping
- Site work and restoration
- Electrical conduit, wire, and local disconnects (where required)

Included in the proposed construction work will be trenching and excavation for foundations of new structures and piping, as well as modifying existing structures and tying into existing piping. Since some of the piping will be installed under paved roads, asphalt paving and repair will also be necessary. See **Table 7** for the construction and engineering cost opinions.

The main additional utility costs required by to the ThermAer process are from motor operation for the pumps and blowers at an energy cost of $0.17 per kilowatt-hour and the inclusion of the regular operation

of the gravity belt thickeners. Along with the additional loads, the scavenger sludge holding tank and thickened sludge holding tank blowers have been repurposed as the ThermAer and SNDR blowers. See **Table 8** for a summary of motors and horsepower, with expected daily run time equivalents. Additional routine costs for the ATAD process include consumables, such as oil and belts for equipment, and polymer for sludge processing. For purposes of this evaluation, included in these costs are rebuilds for pumps and blowers. **Table 9** contains the above consumables and the associated costs.

It is expected that following a 65% reduction in TS within the digestion process, a design annual sludge production of 766,500 dry pounds per year (6,000 lbs/day * 365 days * 0.65 = 766,500) will be conveyed to the BFP for final dewatering. At full load (766,500 lbs/yr) and 30% solids content, there will be a total of approximately 1,218 tons per year produced. This amount could continue to be hauled as it is now at the same cost per ton, with a reduction of between 77-81% in weight and cost. Or, by having the biosolids stockpiled on the site, both the transportation and disposal cost could potentially be reduced to $0 if end users pick up directly from RWRRF. This would be the ideal disposal scenario for Class A biosolids. See **Table 10** for the projected annual cost for hauling ATAD produced biosolids at several different concentration values at the current sludge production rates along with the same information at design sludge production rates, projected to the mid-point of a 30-year life cycle.

3.2 Alternative #2 – Heat Drying

3.2.1 Komline Sanderson – Paddle Dryer

The second alternative selected for further evaluation is the Komline-Sanderson (K-S) Paddle Dryer. The selected model 9W-840 dryer model is sized to process 3,000 lbs/hour of wet cake, which will be provided to the dryer at approximately 20% solids from the BFP to produce a minimum of 92% dry biosolids. The dryer size has been selected such that the operation time of the dryer can be flexible. The operations can be tailored around the RWRRF's current staffing hours or it can be worked around storing as much sludge as possible and then periodically running continuously until the supply to the dryer has been depleted. A way to increase the flexibility of the dryer operations would be to increase liquid sludge storage, which has not been evaluated as part of this report but can be included in a final design if desired by the Town. See **Figure 5 – Paddle Dryer Process Proposed Flow Diagram** for more information for the heat drying system and how it will be integrated into the existing sludge processing systems

The first step of the drying process is the temporary storage of the sludge cake from the BFP within a carbon steel hopper preceding the dryer unit with a storage capacity of 30 cubic yards for temporary storage. Leveling screws are supplied with the hopper to assist the cake towards the inlet to the pumps and minimize the mounding of the cake. 15 HP progressive cavity feed pumps transport the sludge cake from the bottom of the hopper to the dryer. A VFD allows the speed of the pump to be changed, therefore

altering the feed rate. The second step is to introduce the incoming sludge material to the dryer, where it is mixed by the agitators to increase the surface area of the material as well as completely mix the material for even heating distribution. The agitators and hydraulic head pressure move sludge material by displacement through the dryer. Thermocouple sensors monitor the temperature ranges during treatment in the dryer to maintain the proper feed rate, thereby increasing/decreasing the time within the unit. The final stage is when the dry granular sludge is discharged over a motorized weir and through a rotary valve.

The process is considered an indirect dryer because the heating works by conduction, which reduces the chance of overheating and fire concerns of a traditional direct hot air dryer. The hollow agitators contain circulating thermal fluid that is heated by a 5 MMBTU per hour gas fired heater. The maximum natural gas required for the thermal fluid is 5,320 cu ft. per hour. There is also a metal trough underneath the counter-rotating shafts that serves as another barrier separating the hot oil and sludge material. This fluid heating system is supplied as a skid mounted package and includes a natural gas heater, recirculating pump, combustion fan, thermal fluid expansion tank and a thermal cooler heat exchanger to quickly cool down the thermal fluid in case of process shutdown or bypass.

The heating mechanism causes high evaporation rates of 1,957 pounds of water per hour from the dryer and the evaporated water is trapped in the dryer's vaulted cover. The off-gas from the process is conveyed to a stainless-steel condenser that is connected to a separator for the condensed liquid and the non-condensable components are vented out of the separator by a 3 HP off-gas exhaust fan. An odor control system will be included with the system to cool and condense the off-gas component as well as divert the effluent that is drained from the separator back to the headworks of the plant.

Through the drying and mixing process, the sludge has different stages during treatment marked by handling characteristics. The phases in succession are slurry, plastic, shearing, wet granular and dry granular. The slurry phase is when cake from the BFP is fed into the dryer. As the material begins to dry, it enters the plastic phase and the torque required by the dryer increases rapidly. The dryer is designed to have a high torque and low operating speed so that it can handle the intermediate stages where the material is "sticky." The torque required starts to decline during the shearing phase in which the sludge starts to break up into large granules. As the temperature increases, the product lightens in color and breaks down into consistent, small particles in the final dry granular stage. Removing moisture causes the sludge volume to be reduced to as little as a third of the original volume, accomplishing both the pathogen and vector attraction reductions necessary for "Class A" biosolids.

Dry biosolids are then transported via a discharge conveyor to a cooling conveyor. The cooling conveyor contains an outer jacket for reuse water to flow as well as a path through the screw for heat exchange from the heated biosolids. This cooling step is important because the heating medium

temperature can range from 380 to 750ºF depending on the material composition and combustibility. The cooled biosolids are then passed to the vibratory screening system for classification. The particles that are above and below the specified size are returned to the front of the dryer for re-processing.

3.2.2 Site Integration and Storage of Biosolids

A biosolids control building housing new equipment and will be constructed directly south of the existing operations building, replacing the covered digester and sludge blower building. The existing covered digester will be demolished and the existing sludge blower building will either be completely or selectively demolished with the existing equipment being incorporated in the new building design. Due to the nature of the heat drying process, it is anticipated that a full fire suppression system will be included. It is anticipated that this system will require a dedicated water service separate from the existing 6" water service. Access to the building will include two (2) sets of double doors for worker access, a roll-up door for placement and/or removal of the major equipment, HVAC and electrical systems along with new LED lighting. The new wet cake hopper will be placed where the sludge cake is currently discharged into the disposal trucking container and the existing canopy would be removed. A corridor extending from the proposed dryer building will contain the wet cake hopper to keep the process completely indoors.

Biosolids that pass the screening system will be conveyed by a last conveyor towards the storage system, which consists of a hopper, compressed air assisted transport pipe and 6,000 ft^3 elevated storage silo. Biosolids will be stored in the elevated silo ready for discharge into either a hauling container or taken away by potential end users. The silo would be elevated such that end users could pull below the silo to receive up to 95% solids as well as pass below to receive wet cake directly from the sludge hopper in the event that the dryer was down for maintenance. See **Figure 6 – Paddle Dryer Process Proposed Site Plan** for more information.

3.2.3 Operations

To operate the Komline Sanderson Paddle Dryer process would require additional effort to oversee and maintain above and beyond the current operations. To optimize performance of the thermal fluid heating system (i.e. – natural gas demand) the system may warrant 24-hour operation each time it is started to run until the sludge storage is emptied based on the time needed to warm up and cool down the paddle dryer. The system is semi-automated through the communications and controls utilizing the various sensors and flow meters and automatic modulation of the VFD's through the PLC control panel, however with the high temperatures and the difficult nature of pumping dewatered sludge cake, it is anticipated that there will be attention required for the duration of each cycle. The new control panel would become fully integrated within the existing site SCADA computer system for remote accessibility and monitoring. It is anticipated that the paddle dryer process would require two or more additional hires over the normal workforce required to currently operate and maintain the WRRF and SWF due to additional equipment

maintenance, oversite, overnight hours and additional lab sampling. Since there are no pieces of specialty equipment and the lab testing is mostly checking sludge concentrations for monitoring the BFP performance, these can be handled by general hires at the Operator or mechanic level. In this case, it may be prudent to make specific hires and/or departmentalize the operations for the overall sludge management train since there will be considerable potential benefits from consistency of operations.

3.2.4 30-Year Life Cycle Cost Evaluation

The scope of supply for the Komline-Sanderson paddle dryer system costs $3,771,000 **(Appendix D)**, which includes startup services and O&M manuals, as well as the following:

- Wet cake storage hopper
- Progressive cavity wet cake pump, with standby spare
- One (1) K-S 9W-840 Paddle Dryer with a TEFC 75 HP motor
- A rotary valve for control of flow to conveyors
- Discharge and cooling conveyors
- Product screening classifier system
- A spray tower condenser and exhaust fan for dryer offgas
- A 5 MMBTU/h gas fired heater with a natural gas fuel and pilot train, burner controls, combustion fan, thermal fluid recirculating pump, thermal fluid expansion tank and control panel
- Dry product conveyance system with elevated storage silo
- PLC Control Panel with Operator Interface Terminal
- Start-up service, operator training and system engineering which includes process flow diagrams, piping and instrumentation diagrams, general equipment layout drawings, OEM manuals

Outside of the equipment vendor scope, the following will be included in the final design:

- Masonry/cast-in-place control building and slab
- Odor control equipment for dryer offgas
- MCC, motor starters and VFDs

- Miscellaneous piping
- Necessary site work and rehabilitation
- Electrical conduit, wire, and local disconnects (if required)

Included in the proposed construction work will be trenching and excavation for foundations of new structures and piping, as well as modifying existing structures and tying into existing piping. Since some of the piping will be running through paved roads of the treatment plant, asphalt paving and repair will also be necessary. See **Table 11** for the construction and engineering cost opinions.

The main additional utility costs for the Komline Sanderson paddle dryer process are due to motor operation for the dryer and conveyors at an energy cost of $0.17 per kilowatt-hour and the natural gas supply to the thermal fluid heating system at a cost of $0.02 per cu.ft. Along with the additional loads, the scavenger sludge holding tank and the gravity belt thickeners will no longer be needed and will not be part of normal operations with a sludge drying system in place. See **Table 12** for a full breakdown of motors and horsepower, with expected daily run time equivalents as well as the expected natural gas demand with the assumption of 75% of maximum demand due to variations during dryer runs. Additional routine costs for the heat drying process include consumables, such as oil and belts for equipment, and polymer deliveries. For purposes of this evaluation, included in these costs are rebuilds for the dryer, pumps and blowers. **Table 13** contains the consumables and the associated costs.

It is expected that following a 95% reduction in percent solids by weight, a design annual sludge production of 6,000 lbs/day will produce a total of approximately 1,151 tons per year. This amount could continue to be hauled as it is now at the same cost per ton, with a reduction of between 82-86% in weight and cost. With the biosolids stored on the site, both the transportation and disposal cost could potentially be reduced to $0 if end users are able to pick up their share directly from RWRRF. This would be the ideal disposal scenario for Class A biosolids. See **Table 14** for the projected annual cost for hauling heat dryer produced biosolids at the current sludge production rates along with the same information at design sludge production rates, projected to the mid-point of a 30-year life cycle.

4.0 RECOMMENDED ALTERNATIVE

4.1 30 Year Life Cycle Cost Comparison

Table 15 contains the comparative costs for the two alternatives evaluated within this report compared to continued use of the existing sludge processing:

4.2 Basis of Selection

Having completed the 30-year life cycle evaluation, it can be determined that the Town of Riverhead has the potential to move forward with a Class A biosolids program that can not only produce a sustainable product, but also show a potential return on investment of between 10-16 years and a total of $27 million savings over the course of 30 years should an Autothermal Thermophilic Aerobic Digestion (ATAD) process such as the ThermAer process by Thermal Process Systems be incorporated into the existing facility. This evaluation shows that an ATAD process can provide savings at the current sludge production rate as well as the future design rate, where the return on investment is shortened as the sludge production is increased.

The heat drying system has the ability to provide savings as well. However, these savings are only realized as sludge production rates are increased and/or natural gas can be supplemented or replaced by biogas produced by sludge digestion. The Riverhead WRRF does not currently produce biogas and the sludge production rates would need to increase before there would be any realized savings. Even at full design, the heat drying system would not provide a return on investment within the 30-year life cycle period.

These figures assume that the full financial burden of the capital costs for the project rest on the Town and that the product continue to be hauled off site as it currently is.

4.3 Disposal Opportunities

The potential disposal opportunities for each of the alternatives are very similar. Class A biosolids are increasingly being sought after by farmers of both sod as well as crops. The major difference in the material from the ATAD and the heat drying systems are that they will be approximately 30% and 95% by solids, respectively. Storage of the biosolids at the WRRF will be such that any end user will be able to pick up any amount from what is available during normal working hours. By having this Class A product, the potential for eliminating the entire bulk hauling of biosolids increases. One note to keep in mind as part of the cost evaluation is that the ThermAer process does not require giving away all of the biosolids to attain future savings.

4.4 Next Steps

Should the Town want to move forward with a Class A biosolids program, the next steps would be to prepare a Map & Plan / Engineering Design Report where a detailed design can be identified, and potential funding sources can be explored. Should additional funding sources become available to supplement Town funds, the return on investment will be shortened further (i.e. - $2M grant = 6 years removed from ROI = 10 year ROI at current sludge production rates).

TABLES

++ NO TEXT ON THIS PAGE ++

Table 4 - Present Day Sludge Operation - 30-Year Projected Utility Consumption Cost

Process	Motor	Power (Hp)	Power (KW)	Average Daily Run Time (Hours/Day)	Energy Cost ($/kw·h)	Daily Operation Cost ($/day)
Scavenger Sludge Holding Tank	SSHT Blower Motor	50.0	37 kw	24	$0.17	$152.18
	SSHT Transfer Pump Motor	10.0	7.5 kw	2	$0.17	$2.54
Blended Sludge Tanks	BSHT Blower Motor	50.0	37 kw	24	$0.17	$152.18
	BSHT Transfer Pump Motor	5.0	3.7 kw	8	$0.17	$5.07
Gravity Belt Thickeners	GBT Belt Drive Motor	2.0	1.5 kw	OFFLINE	$0.17	OFFLINE
	GBT Plunger Pump Motor	3.0	2.2 kw	OFFLINE	$0.17	OFFLINE
	GBT Booster Pump Motor	3.0	2.2 kw	OFFLINE	$0.17	OFFLINE
	GBT Air Compressor	1.5	1.1 kw	OFFLINE	$0.17	OFFLINE
Thickened Sludge Holding Tanks	TSHT Blower Motor	50.0	37 kw	24	$0.17	$152.18
	TSHT Transfer Pump Motor	30.0	22 kw	8	$0.17	$30.44
	TSHT Mixer Motor	15.0	11 kw	24	$0.17	$45.66
Belt Filter Press	BFP Gravity Belt Drive Motor	3.0	2.2 kw	8	$0.17	$3.04
	BFP Pressure Belt Drive Motor #1	3.0	2.2 kw	8	$0.17	$3.04
	BFP Hydraulic Pump Motor	1.5	1.1 kw	8	$0.17	$1.52
	BFP Horizontal Conveyor Motor #1	3.0	2.2 kw	8	$0.17	$3.04
	BFP Inclined Conveyor Motor #2	5.0	3.7 kw	8	$0.17	$5.07
	BFP Booster Pump Motor	7.5	5.6 kw	8	$0.17	$7.61
Polymer Systems	BFP Dilution Pump Motor	1.0	0.7 kw	8	$0.17	$1.01
	BFP Polymer Pump Motor	0.5	0.4 kw	8	$0.17	$0.51
	GBT Mixed Polymer Pump Motor	0.4	0.3 kw	OFFLINE	$0.17	OFFLINE
	GBT Polymer Mixer Motor	0.5	0.4 kw	OFFLINE	$0.17	OFFLINE
	GBT Liquid Polymer Motor	1.0	0.7 kw	OFFLINE	$0.17	OFFLINE
					TOTAL/DAY	**$565**
					TOTAL/YEAR	**$206,265**
					30 Year Total	**$6,188,000**
				1.5% Escalation Projected to Mid Point of 30 Year Cycle:		**$7,735,000**

Table 5 - Present Day Sludge Operation - 30-Year Projected Consumables Cost

Process	Consumable	Frequency	Cost to Replace	Annual Equivalent	Qty	Annual Cost
Scavenger Sludge Holding Tank	PL300 Lobe Rebuild Kit	2 years	$ 5,000	1/2	1	$ 2,500
	Defoamer					$ -
	SSHT Blower	20 years	$ 6,000	1/20	1	$ 300
	SSHT Blower Oil	2x/year	$ 187	2	1	$ 374
	SSHT Blower Belts	2 years	$ 90	1/2	1	$ 45
Blended Sludge Tanks	BSHT Blower	20 years	$ 6,000	1/20	2	$ 600
	BSHT Blower Oil	2x/year	$ 187	2	2	$ 748
	BSHT Blower Belts	2 years	$ 90	1/2	2	$ 90
Gravity Belt Thickeners	*Not used in existing operations*					
Thickened Sludge Holding Tanks	TSHT Blower	20 years	$ 6,000	1/20	2	$ 600
	TSHT Blower Oil	2x/year	$ 187	2	2	$ 748
	TSHT Blower Belts	2 years	$ 90	1/2	2	$ 90
Belt Filter Press	Gravity Belt	5 years	$ 650	1/5	1	$ 130
	Pressure Belts	5 years	$ 1,100	1/5	2	$ 440
	Horizontal Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
	Inclined Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
Polymer Systems	Polymer	6x/year	$ 9,610	6	1	$ 57,660
					Annual Total:	**$ 64,825**
					30 Year Total:	**$ 1,945,000**
		1.5% Escalation Projected to Mid Point of 30 Year Cycle:				**$ 2,431,000**

Feasibility Study for Producing Class A Biosolids for the Riverhead Water Resource Recovery Facility
H2M Project No.: RDSD1902

Table 6 - Present Day Sludge Operation - 30-Year Projected Cost to Haul

Current Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	292	$832,200	$1,040,000
15.0%	6,300	243	$692,550	$866,000
17.5%	**7,350**	**209**	**$595,650**	**$745,000**
20.0%	8,400	183	$521,550	$652,000
22.5%	9,450	162	$461,700	$577,000
25.0%	10,500	146	$416,100	$520,000
27.5%	11,550	133	$379,050	$474,000
30.0%	12,600	122	$347,700	$435,000
95.0%	39,900	38	$108,300	$135,000

Current annual sludge production (dry lbs/year):	1,533,000	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 17.5% solids:	**$745,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$22,350,000**	

Design Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	417	$1,188,450	$1,486,000
15.0%	6,300	348	$991,800	$1,240,000
17.5%	**7,350**	**298**	**$849,300**	**$1,062,000**
20.0%	8,400	261	$743,850	$930,000
22.5%	9,450	232	$661,200	$827,000
25.0%	10,500	209	$595,650	$745,000
27.5%	11,550	190	$541,500	$677,000
30.0%	12,600	174	$495,900	$620,000
95.0%	39,900	55	$156,750	$196,000

Design sludge production (dry lbs/year):	2,190,000	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 17.5% solids:	**$1,062,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$31,860,000**	

Feasbility Study for Producing Class A Biosolids at the Riverhead Water Resource Recovery Facility
H2M Project No.: RDSD1902

Table 7 - Thermal Process Systems ThermAer - Construction and Engineering Cost Opinion

	Cost Component	Cost
	General Requirements	
	Superintendent	$50,000
	Periodic & Final Cleaning	$2,000
	Submittals	$5,000
1	***Subtotal for This Category:***	$57,000
	Electric and Controls	
	Lighting	$5,000
	MCC	$75,000
	Conduit, Wiring and Terminations	$50,000
2	***Subtotal for This Category:***	$130,000
	Concrete	
	Concrete (building foundation)	$223,000
3	***Subtotal for This Category:***	$223,000
	Control Building	
	Masonry Walls	$120,000
	HVAC Work	$30,000
	Doors (x2, double-leaf)	$12,000
	Roofing	$45,000
4	***Subtotal for This Category:***	$207,000
	Site Work	
	Trenching	$50,000
	Frame and Fabric Biosolids Storage Building	$500,000
	Pavement repair	$50,000
5	***Subtotal for This Category:***	$600,000
	Mechanical	
	Piping Modifications	$100,000
	ThermAer Equipment Package	$1,939,847
	ThermAer Equipment Install (50%)	$969,924
6	***Subtotal for This Category:***	$3,009,771
	Subtotal Categories 1 - 6:	$4,226,771
	General Conditions	
	Bonds and Insurance (3%):	$126,800
7	***Subtotal :***	$4,353,571
	Overhead (10%):	$435,357
8	***Subtotal :***	$4,788,928
	Profit (10%):	$478,893
	Total Construction Cost:	$5,267,820
	Contingency (20%):	$1,053,560
	Say:	**$6,322,000**

Design and Construction Administration (ACEC %):	**$550,000**
Inspection (assumes 8 months construction):	**$300,000**
Soft Costs (Survey, SEQRA, Soil Borings, etc.):	**$65,000**

	Engineering Total:	**$915,000**

	Capital Cost Total:	**$7,237,000**

Table 8 - Thermal Process Systems ThermAer - 30-Year Projected Utility Consumption Cost

Process	Motor	Power (Hp)	Estimated Brake Power (hp)	Power (KW)	Average Daily Run Time (Hours/Day)	Energy Cost ($/kw·h)	Daily Operation Cost ($/day)
Blended Sludge Tanks	BSHT Blower Motor	50.0	50.0	37 kw	24	$0.17	$152.18
	BSHT Transfer Pump Motor	5.0	5.0	3.7 kw	8	$0.17	$5.07
Gravity Belt Thickeners	GBT Belt Drive Motor	2.0	2.0	1.5 kw	8	$0.17	$2.03
	GBT Plunger Pump Motor	3.0	3.0	2.2 kw	8	$0.17	$3.04
	GBT Booster Pump Motor	3.0	3.0	2.2 kw	8	$0.17	$3.04
	GBT Air Compressor	1.5	1.5	1.1 kw	8	$0.17	$1.52
ThermAer Reactor	TR Jet Pump Motor	100.0	52.0	39 kw	24	$0.17	$158.27
	TR Blower Motor	50.0	16.0	12 kw	24	$0.17	$48.70
	TR Transfer Pump Motor	15.0	15.0	11 kw	1.5	$0.17	$2.85
SNDR Reactor	SR Jet Pump Motor	50.0	24.0	18 kw	24	$0.17	$73.05
	SR Blower Motor	50.0	6.0	4.5 kw	6	$0.17	$4.57
	SR Transfer Pump Motor	15.0	15.0	11 kw	2	$0.17	$3.80
BiofiltAer	BA Exhaust Fan Motor	15.0	7.0	5.2 kw	24	$0.17	$21.31
Belt Filter Press	BFP Gravity Belt Drive Motor	3.0	3.0	2.2 kw	2	$0.17	$0.76
	BFP Pressure Belt Drive Motor #1	3.0	3.0	2.2 kw	2	$0.17	$0.76
	BFP Hydraulic Pump Motor	1.5	1.5	1.1 kw	2	$0.17	$0.38
	BFP Horizontal Conveyor Motor #1	3.0	3.0	2.2 kw	2	$0.17	$0.76
	BFP Inclined Conveyor Motor #2	5.0	5.0	3.7 kw	2	$0.17	$1.27
	BFP Booster Pump Motor	7.5	7.5	5.6 kw	2	$0.17	$1.90
Polymer Systems	BFP Dilution Pump Motor	1.0	1.0	0.7 kw	2	$0.17	$0.25
	BFP Polymer Pump Motor	0.5	0.5	0.4 kw	2	$0.17	$0.13
	GBT Mixed Polymer Pump Motor	0.4	0.4	0.3 kw	8	$0.17	$0.44
	GBT Polymer Mixer Motor	0.5	0.5	0.4 kw	8	$0.17	$0.51
	GBT Liquid Polymer Motor	1.0	1.0	0.7 kw	8	$0.17	$1.01
						TOTAL/DAY	**$488**
						TOTAL/YEAR	**$177,980**
						30 Year Total	**$5,339,000**
	1.5% Escalation Projected to Mid Point of 30 Year Cycle:						**$6,674,000**

Notes:

1. ThermAer and SNDR blowers are repurposed sludge holding tank blowers.
2. ThermAer tank is repurposed TSHT.
3. BiofiltAer tank is repurposed SSHT.

Table 9 - Thermal Process Systems ThermAer - 30-Year Projected Consumables Cost

Process	Consumable	Frequency	Cost to Replace	Annual Equivalent	Qty	Annual Cost
Scavenger Sludge Holding Tank	*Repurposed as BiofiltAer in ThermAer Process*					
Blended Sludge Tanks	BSHT Blower	20 years	$ 6,000	1/20	2	$ 600
	BSHT Blower Oil	2x/year	$ 187	2	2	$ 748
	BSHT Blower Belts	2 years	$ 90	1/2	2	$ 90
Gravity Belt Thickeners	Gravity Belts	5 years	$ 650	1/5	1	$ 130
	GBT Air Compressor	5 years	$ 2,000	1/5	1	$ 400
ThermAer	TR Jet Pump	20 years	$ 6,000	1/20	1	$ 300
	TR Jet Pump Oil	2x/year	$ 187	2	1	$ 374
	TR Jet Pump Belt	2 years	$ 90	1/2	1	$ 45
	TR Blower	20 years	$ 6,000	1/20	1	$ 300
	TR Blower Oil	2x/year	$ 187	2	1	$ 374
	TR Blower Belts	2 years	$ 90	1/2	1	$ 45
	TR Transfer Pump	20 years	$ 6,000	1/20	1	$ 300
	TR Transfer Pump Oil	2x/year	$ 187	2	1	$ 374
	TR Transfer Pump Belt	2 years	$ 90	1/2	1	$ 45
SNDR	SR Jet Pump	20 years	$ 6,000	1/20	1	$ 300
	SR Jet Pump Oil	2x/year	$ 187	2	1	$ 374
	SR Jet Pump Belt	2 years	$ 90	1/2	1	$ 45
	SR Blower	20 years	$ 6,000	1/20	1	$ 300
	SR Blower Oil	2x/year	$ 187	2	1	$ 374
	SR Blower Belts	2 years	$ 90	1/2	1	$ 45
	SR Transfer Pump	20 years	$ 6,000	1/20	1	$ 300
	SR Transfer Pump Oil	2x/year	$ 187	2	1	$ 374
	SR Transfer Pump Belt	2 years	$ 90	1/2	1	$ 45
BiofiltAer	Rock Media	5 years	$ 5,000	1/5	1	$ 1,000
	Wood Chip Media	5 years	$ 5,000	1/5	1	$ 1,000
Thickened Sludge Holding Tanks	*Repurposed as SNDR in ThermAer Process*					$ -
Belt Filter Press	Gravity Belt	5 years	$ 650	1/5	1	$ 130
	Pressure Belts	5 years	$ 1,100	1/5	2	$ 440
	Horizontal Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
	Inclined Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
Polymer Systems	Polymer	6x/year	$ 9,610	6	1	$ 57,660
					Annual Total:	**$ 67,012**
					30 Year Total:	**$ 2,010,000**
				1.5% Escalation Projected to Mid Point of 30 Year Cycle:		**$ 2,513,000**

Feasibility Study for Producing Class A Biosolids for the Riverhead Water Resource Recovery Facility
H2M Project No.: RDSD1902

Table 10 - Thermal Process Systems ThermAer - 30-Year Projected Cost to Haul

Current Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	97	$276,450	$346,000
15.0%	6,300	81	$230,850	$289,000
17.5%	7,350	70	$199,500	$249,000
20.0%	8,400	61	$173,850	$217,000
22.5%	9,450	54	$153,900	$192,000
25.0%	10,500	49	$139,650	$175,000
27.5%	11,550	44	$125,400	$157,000
30.0%	**12,600**	**41**	**$116,850**	**$146,000**
95.0%	39,900	13	$37,050	$46,000

Design annual sludge production (dry lbs/year):	511,000	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 30% solids:	**$146,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$4,380,000**	

Design Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	146	$416,100	$520,000
15.0%	6,300	122	$347,700	$435,000
17.5%	7,350	104	$296,400	$371,000
20.0%	8,400	91	$259,350	$324,000
22.5%	9,450	81	$230,850	$289,000
25.0%	10,500	73	$208,050	$260,000
27.5%	11,550	66	$188,100	$235,000
30.0%	**12,600**	**61**	**$173,850**	**$217,000**
95.0%	39,900	19	$54,150	$68,000

Design annual sludge production (dry lbs/year):	766,500	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 30% solids:	**$217,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$6,510,000**	

Table 11 - Komline Sanderson Paddle Dryer - Construction and Engineering Cost Opinion

	Cost Component	Cost
	General Requirements	
	Superintendent	$50,000
	Periodic & Final Cleaning	$2,000
	Submittals	$5,000
1	***Subtotal for This Category:***	$57,000
	Electric and Controls	
	Lighting	$5,000
	MCC	$150,000
	Conduit, Wiring and Terminations	$50,000
2	***Subtotal for This Category:***	$205,000
	Concrete	
	Concrete (building foundation)	$200,000
3	***Subtotal for This Category:***	$200,000
	Control Building	
	Masonry Walls	$500,000
	HVAC Work	$75,000
	Fire Suppression	$125,000
	Doors (x2, double-leaf)	$12,000
	Doors (x1, roll up)	$30,000
	Roofing	$250,000
4	***Subtotal for This Category:***	$992,000
	Demolition	
	Digester Cover	$20,000
	Digester Tank Walls	$50,000
5	***Subtotal for This Category:***	$70,000
	Mechanical	
	Komline Equipment Package	$3,771,000
	Komline Equipment Install (50%)	$1,885,500
	Gas Service	$75,000
	Fire Service	$75,000
6	***Subtotal for This Category:***	$5,806,500
	Subtotal Categories 1 - 6:	$7,330,500
	General Conditions	
	Bonds and Insurance (3%):	$219,920
7	***Subtotal :***	$7,550,420
8	Overhead (10%):	$755,042
	Subtotal :	$8,305,462
9	Profit (10%):	$830,546
10	**Total Construction Cost:**	$9,136,008
11	**Contingency (20%):**	$1,827,200
	Say:	**$10,964,000**
	Design and Construction Administration (ACEC %):	**$850,000**
	Inspection (assumes 12 months construction):	**$400,000**
	Soft Costs (Survey, SEQRA, Soil Borings, etc.):	**$65,000**

	Engineering Total:	**$1,315,000**

	Capital Cost Total:	**$12,279,000**

Table 12 - Komline Sanderson Paddle Dryer - 30-Year Projected Utility Consumption Cost

Process	Motor	Power (Hp)	Estimated Brake Power (hp)	Power (KW)	Average Daily Run Time (Hours/Day)	Energy Cost ($/kw·h)	Daily Operation Cost ($/day)
Blended Sludge Tanks	BSHT Blower Motor	50.0	50.0	37.3 kw	24	$0.17	$152.18
	BSHT Transfer Pump Motor	5.0	5.0	3.73 kw	8	$0.17	$5.07
Gravity Belt Thickeners	GBT Belt Drive Motor	2.0	2.0	1.492 kw	OFFLINE	$0.17	OFFLINE
	GBT Plunger Pump Motor	3.0	3.0	2.238 kw	OFFLINE	$0.17	OFFLINE
	GBT Booster Pump Motor	3.0	3.0	2.238 kw	OFFLINE	$0.17	OFFLINE
	GBT Air Compressor	1.5	1.5	1.119 kw	OFFLINE	$0.17	OFFLINE
Thickened Sludge Holding Tanks	TSHT Blower Motor	50.0	50.0	37.3 kw	24	$0.17	$152.18
	TSHT Transfer Pump Motor	30.0	30.0	22.38 kw	6	$0.17	$22.83
	TSHT Mixer Motor	15.0	15.0	11.19 kw	24	$0.17	$45.66
Belt Filter Press	BFP Gravity Belt Drive Motor	3.0	3.0	2.238 kw	8	$0.17	$3.04
	BFP Pressure Belt Drive Motor #1	3.0	3.0	2.238 kw	8	$0.17	$3.04
	BFP Hydraulic Pump Motor	1.5	1.5	1.119 kw	8	$0.17	$1.52
	BFP Horizontal Conveyor Motor #1	3.0	3.0	2.238 kw	8	$0.17	$3.04
	BFP Inclined Conveyor Motor #2	5.0	5.0	3.73 kw	8	$0.17	$5.07
	BFP Booster Pump Motor	7.5	7.5	5.595 kw	8	$0.17	$7.61
Polymer Systems	BFP Dilution Pump Motor	1.0	1.0	0.746 kw	8	$0.17	$1.01
	BFP Polymer Pump Motor	0.5	0.5	0.373 kw	8	$0.17	$0.51
	GBT Mixed Polymer Pump Motor	0.4	0.4	0.32078 kw	OFFLINE	$0.17	OFFLINE
	GBT Polymer Mixer Motor	0.5	0.5	0.373 kw	OFFLINE	$0.17	OFFLINE
	GBT Liquid Polymer Motor	1.0	1.0	0.746 kw	OFFLINE	$0.17	OFFLINE
Komline Dryer	KSD Bottom Auger Motor #1	5.0	4.0	2.984 kw	12	$0.17	$6.09
	KSD Bottom Auger Motor #2	5.0	4.0	2.984 kw	12	$0.17	$6.09
	KSD Wet Cake Pump Motor	15.0	12.0	8.952 kw	12	$0.17	$18.26
	KSD Dryer Drive Motor	75.0	45.0	33.57 kw	12	$0.17	$68.48
	KSD Discharge Weir Gate Motor	0.5	0.0	0.00373 kw	12	$0.17	$0.01
	KSD Discharge Rotary Valve Motor	1.5	1.2	0.8952 kw	12	$0.17	$1.83
	KSD Product Cooling Conveyor Motor	5.0	4.0	2.984 kw	12	$0.17	$6.09
	KSD Off Gas Exhaust Fan Motor	3.0	2.4	1.7904 kw	12	$0.17	$3.65
	KSD Thermal Fluid Pump Motor	50.0	42.5	31.705 kw	12	$0.17	$64.68
	KSD Thermal Fluid Combustion Fan Motor	5.0	4.3	3.1705 kw	12	$0.17	$6.47
						TOTAL/DAY	**$584**
						TOTAL/YEAR	**$213,313**
						30 Year Total	**$6,399,000**
						1.5% Escalation Projected to Mid Point of 30 Year Cycle:	**$7,999,000**

Notes:
1. SSHT is not needed in a dryer scenario.

Process	System	%		Consumption (cf/hr)	Average Daily Run Time (Hours/Day)	Energy Cost ($/cf/hr)	Daily Operation Cost ($/day)
Komline Dryer	KSD Natural Gas Supply	75%		2660 cf/hr	12	$0.02	$478.80
						TOTAL/DAY	**$479**
						TOTAL/YEAR	**$174,762**
						30 Year Total	**$5,243,000**
						1.5% Escalation Projected to Mid Point of 30 Year Cycle:	**$6,554,000**

TOTAL/DAY	**$1,063**
TOTAL/YEAR	**$388,075**
30 Year Total	**$11,642,000**
1.5% Escalation Projected to Mid Point of 30 Year Cycle:	**$14,553,000**

Table 13 - Komline Sanderson Paddle Dryer - 30-Year Projected Consumables Cost

Process	Consumable	Frequency	Cost to Replace	Annual Equivalent	Qty	Annual Cost
Scavenger Sludge Holding Tank	*Not used in Dryer Process*					
Blended Sludge Tanks	BSHT Blower	20 years	$ 6,000	1/20	2	$ 600
	BSHT Blower Oil	2x/year	$ 187	2	2	$ 748
	BSHT Blower Belts	2 years	$ 90	1/2	2	$ 90
Gravity Belt Thickeners	*Not used in Dryer Process*	5 years	$ 650	1/5	1	$ 130
Thickened Sludge Holding Tanks	TSHT Blower	20 years	$ 6,000	1/20	2	$ 600
	TSHT Blower Oil	2x/year	$ 187	2	2	$ 748
	TSHT Blower Belts	2 years	$ 90	1/2	2	$ 90
Belt Filter Press	Gravity Belt	5 years	$ 650	1/5	1	$ 130
	Pressure Belts	5 years	$ 1,100	1/5	2	$ 440
	Horizontal Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
	Inclined Conveyor Liner	10 years	$ 2,500	1/10	1	$ 250
Polymer Systems Komline Dryer	Polymer	6x/year	$ 9,610.00	6	1	$ 57,660
	Dryer Unit 9W-840 Replaced	15 years	$ 1,200,000	1/15	1	$ 80,000
	Wet Cake Pump	15 years	$ 30,000	1/15	1	$ 2,000
	Conveyor Liners	10 years	$ 10,000	1/10	1	$ 1,000
	Vibratory Screener Motor	3 years	$ 5,000	1/3	1	$ 1,667
	Heating Fluid	5 years	$ 5,000	1/5	1	$ 1,000
					Annual Total:	**$ 147,403**
					30 Year Total:	**$ 4,422,000**
				1.5% Escalation Projected to Mid Point of 30 Year Cycle:		**$ 5,528,000**

Feasibility Study for Producing Class A Biosolids for the Riverhead Water Resource Recovery Facility
H2M Project No.: RDSD1902

Table 14 - Komline Sanderson Paddle Dryer - 30-Year Projected Cost to Haul

Current Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	292	$832,200	$1,040,000
15.0%	6,300	243	$692,550	$866,000
17.5%	7,350	209	$595,650	$745,000
20.0%	8,400	183	$521,550	$652,000
22.5%	9,450	162	$461,700	$577,000
25.0%	10,500	146	$416,100	$520,000
27.5%	11,550	133	$379,050	$474,000
30.0%	12,600	122	$347,700	$435,000
95.0%	**39,900**	**38**	**$108,300**	**$135,000**

Design sludge production (dry lbs/year):	1,533,000	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 95% solids:	**$135,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$4,050,000**	

Design Annual Sludge Production

Average % Solids	Pounds of Sludge Per Truck	Number of Trucks Per Year	Cost to Haul Per Year	1.5% Escalation to Mid-Point of 30-Year Cycle
12.5%	5,250	417	$1,188,450	$1,486,000
15.0%	6,300	348	$991,800	$1,240,000
17.5%	7,350	298	$849,300	$1,062,000
20.0%	8,400	261	$743,850	$930,000
22.5%	9,450	232	$661,200	$827,000
25.0%	10,500	209	$595,650	$745,000
27.5%	11,550	190	$541,500	$677,000
30.0%	12,600	174	$495,900	$620,000
95.0%	**39,900**	**55**	**$156,750**	**$196,000**

Design sludge production (dry lbs/year):	2,190,000	
D.O.T. allowable tons per truck:	21	
Bid price per truck:	$2,850	
Estimated annual cost @ 95% solids:	**$196,000**	(Assumes truck is fully loaded)
30 Year Projected Cost:	**$5,880,000**	

Feasbility Study for Producing Class A Biosolids at the Riverhead Water Resource Recovery Facility
H2M Project No.: RDSD1902

Table 15 - 30-Year Projected Cost Comparison

Design Annual Sludge Production (6,000 lbs/day)

Cost Component	Current Operation	ATAD	Heat Dryer
Construction	$ -	$ 6,322,000	$ 10,964,000
Engineering (ACEC Curve % and Soft Costs)	$ -	$ 915,000	$ 1,315,000
Additional Labor[1]	$ -	$ -	$ 6,000,000
O&M[2]	$ 44,059,000	$ 15,697,000	$ 25,961,000
30 Year Total	**$ 44,059,000**	**$ 22,934,000**	**$ 44,240,000**
Potential Class A Savings if Given Away	$ -	$ (6,510,000)	$ (5,880,000)
Savings if Hauled		$ (21,125,000)	N/A
Savings if Given Away		$ (27,635,000)	$ (5,699,000)
ROI if Hauled (years):		10	N/A
ROI if Given Away (years):		8	65

Current Annual Sludge Production (4,200 lbs/day)

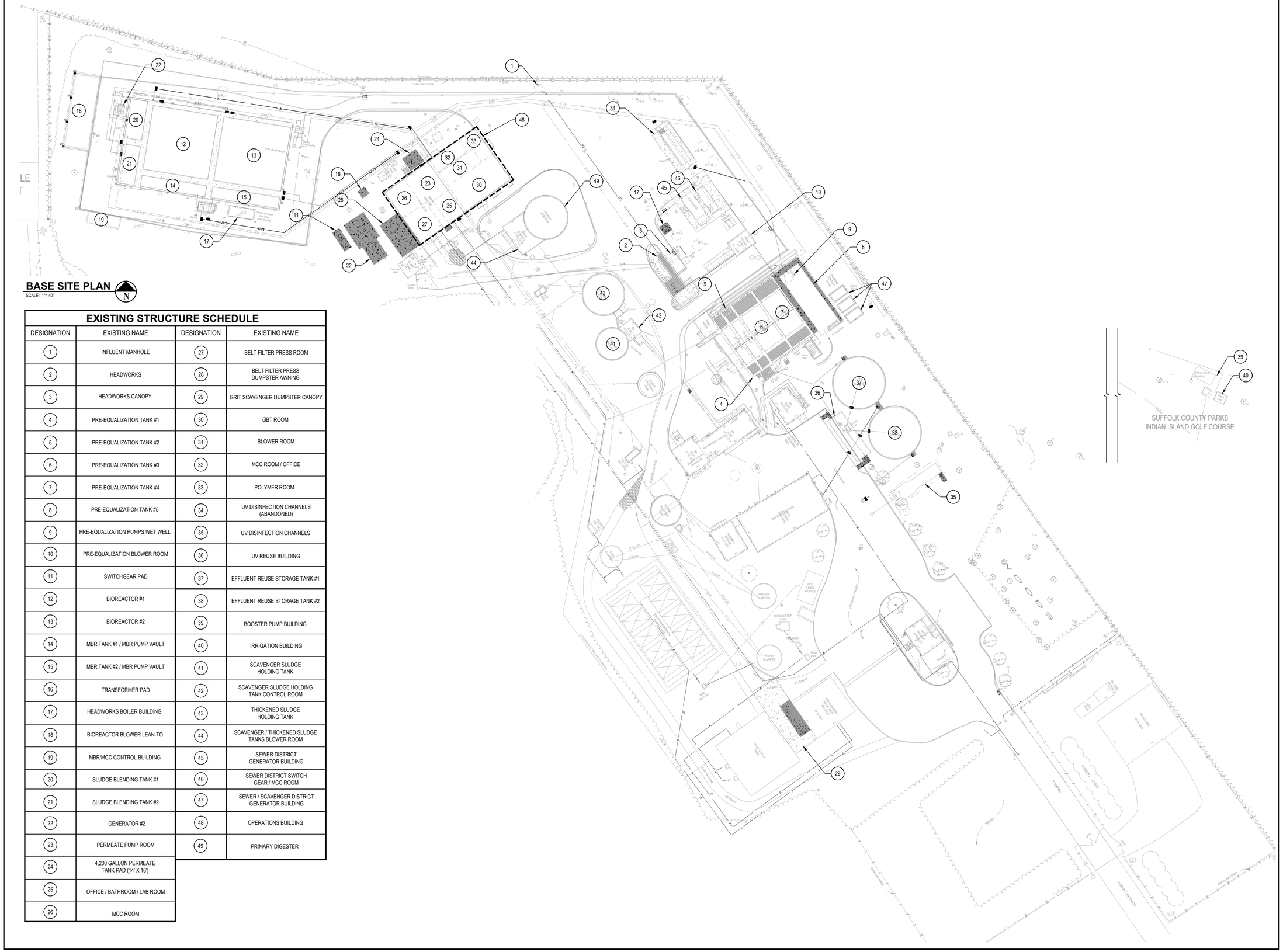
Cost Component	Current Operation	ATAD	Heat Dryer
Construction	$ -	$ 6,322,000	$ 10,964,000
Engineering (ACEC Curve % and Soft Costs)	$ -	$ 915,000	$ 1,315,000
Additional Labor[1]	$ -	$ -	$ 6,000,000
O&M[3]	$ 32,516,000	$ 11,729,000	$ 20,114,000
30 Year Total	**$ 32,516,000**	**$ 18,966,000**	**$ 38,393,000**
Potential Class A Savings if Given Away	$ -	$ (4,380,000)	$ (4,050,000)
Savings if Hauled		$ (13,550,000)	N/A
Savings if Given Away		$ (17,930,000)	N/A
ROI (years):		16	N/A
ROI (years):		12	N/A

Notes:

1. Labor costs are assumed to average $100,000 per year to cover annual salary and benefits per full time equivalent (FTE) employee over 30 years. Zero additional FTE is assumed for the ATAD process and two additional FTE's are assumed for the Heat Dryer.
2. Utility Consumption and Consumables for Existing System is assumed to be 20% higher at design sludge production as compared to existing.
3. Utility Consumption and Consumables for new systems are assumed to be 20% lower at existing sludge production as compared to design.
4. Return on Investment = Construction Cost + Engineering Cost / Average Savings per Yea

FIGURES

++ NO TEXT ON THIS PAGE ++



BASE SITE PLAN
SCALE: 1"= 40'

EXISTING STRUCTURE SCHEDULE

DESIGNATION	EXISTING NAME	DESIGNATION	EXISTING NAME
1	INFLUENT MANHOLE	27	BELT FILTER PRESS ROOM
2	HEADWORKS	28	BELT FILTER PRESS DUMPSTER AWNING
3	HEADWORKS CANOPY	29	GRIT SCAVENGER DUMPSTER CANOPY
4	PRE-EQUALIZATION TANK #1	30	GBT ROOM
5	PRE-EQUALIZATION TANK #2	31	BLOWER ROOM
6	PRE-EQUALIZATION TANK #3	32	MCC ROOM / OFFICE
7	PRE-EQUALIZATION TANK #4	33	POLYMER ROOM
8	PRE-EQUALIZATION TANK #5	34	UV DISINFECTION CHANNELS (ABANDONED)
9	PRE-EQUALIZATION PUMPS WET WELL	35	UV DISINFECTION CHANNELS
10	PRE-EQUALIZATION BLOWER ROOM	36	UV REUSE BUILDING
11	SWITCHGEAR PAD	37	EFFLUENT REUSE STORAGE TANK #1
12	BIOREACTOR #1	38	EFFLUENT REUSE STORAGE TANK #2
13	BIOREACTOR #2	39	BOOSTER PUMP BUILDING
14	MBR TANK #1 / MBR PUMP VAULT	40	IRRIGATION BUILDING
15	MBR TANK #2 / MBR PUMP VAULT	41	SCAVENGER SLUDGE HOLDING TANK
16	TRANSFORMER PAD	42	SCAVENGER SLUDGE HOLDING TANK CONTROL ROOM
17	HEADWORKS BOILER BUILDING	43	THICKENED SLUDGE HOLDING TANK
18	BIOREACTOR BLOWER LEAN-TO	44	SCAVENGER / THICKENED SLUDGE TANKS BLOWER ROOM
19	MBR/MCC CONTROL BUILDING	45	SEWER DISTRICT GENERATOR BUILDING
20	SLUDGE BLENDING TANK #1	46	SEWER DISTRICT SWITCH GEAR / MCC ROOM
21	SLUDGE BLENDING TANK #2	47	SEWER / SCAVENGER DISTRICT GENERATOR BUILDING
22	GENERATOR #2	48	OPERATIONS BUILDING
23	PERMEATE PUMP ROOM	49	PRIMARY DIGESTER
24	4,200 GALLON PERMEATE TANK PAD (14' X 16')		
25	OFFICE / BATHROOM / LAB ROOM		
26	MCC ROOM		

H2M architects + engineers
538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN	SNM		

PROJECT No.: RDSD 1902 | DATE: DEC 2019 | SCALE:

CLIENT
Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

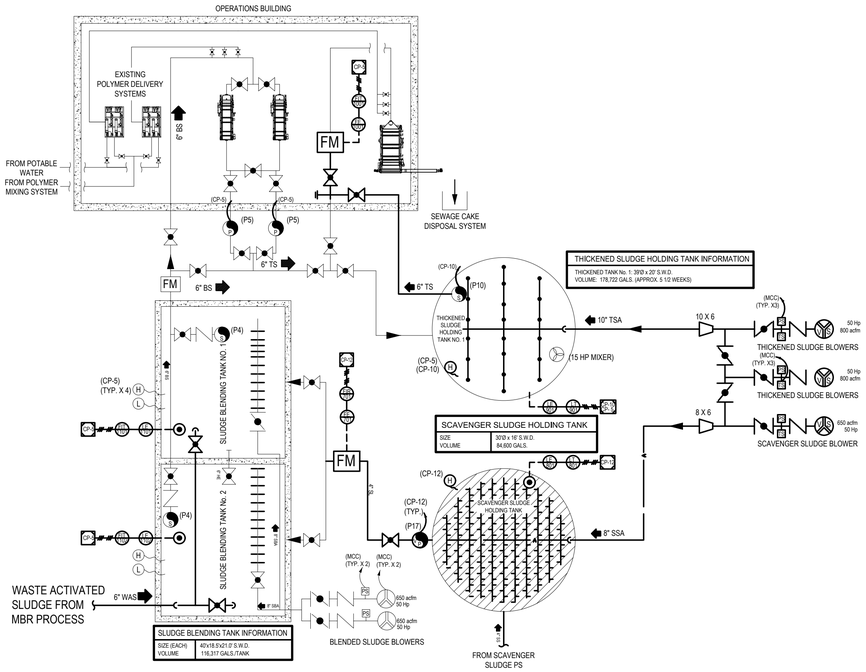
2 River Avenue
Riverhead, NY 11901

CONTRACT
ALL CONTRACTS

STATUS
NOT FOR CONSTRUCTION

SHEET TITLE
EXISTING CONDITIONS SITE PLAN

DRAWING No.
FIGURE 1



THICKENED SLUDGE HOLDING TANK INFORMATION

THICKENED TANK No. 1:	39'Ø x 20' S.W.D.
VOLUME:	178,722 GALS. (APPROX. 5 1/2 WEEKS)

SCAVENGER SLUDGE HOLDING TANK

SIZE	30'Ø x 16' S.W.D.
VOLUME	84,600 GALS.

SLUDGE BLENDING TANK INFORMATION

SIZE (EACH)	40'x18.5'x21.0' S.W.D.
VOLUME	116,311 GALS./TANK

Existing Conditions Sludge Treatment Process Flow Diagram

SCALE: NTS

PROCESS LEGEND

- PROCESS AIR LINE
- HYPOCHLORITE
- CITRIC ACID
- PROCESS SLUDGE LINE
- DOMESTIC WATER LINE
- MOTOR OPERATED VALVE
- SOLENOID VALVE
- PNEUMATIC OPERATING VALVE
- PLUG VALVE
- CHECK VALVE
- BALL VALVE
- GATE VALVE
- BUTTERFLY VALVE
- GLOBE VALVE
- VALVE TAG
- EQUIPMENT TAG (SEE DWG. M-1)
- BLOWER - FIXED SPEED
- BLOWER - VARIABLE SPEED
- PUMP — S - SUBMERSIBLE SEWAGE; D - DRY PIT; P - POSITIVE DISPLACEMENT; V - VARIABLE SPEED; R - SUBMERSIBLE RECESSED IMPELLER; C - CENTRIFUGAL
- (P1) PUMP DESIGNATION
- B.F. (BLIND FLANGE)
- EXIST. PROCESS LINE
- TELESCOPIC VALVE
- FLOW METER
- SUSPENDED SOLIDS METER
- EQUALIZING PIPE ASSEMBLY
- FLOAT SWITCH — H - HIGH WATER LEVEL; L - LOW WATER LEVEL; C - CONTROL
- LEVEL TRANSDUCER
- DISSOLVED OXYGEN PROBE
- FIXED AIR DROP
- REDUCER
- LEVEL TRANSMITTER
- PRESSURE TRANSMITTER
- PRESSURE SWITCH ASSEMBLY
- TEMPERATURE SWITCH ASSEMBLY
- POINT OF CHEMICAL ADDITION
- MIXER
- MOTOR (DENOTES HORSEPOWER)
- IN-LINE CLEANOUTS NOT SHOWN. (SEE YARD PIPING)

PIPE ABBREVIATIONS

BS	- BLENDED SLUDGE
HE	- HYDRAULIC EQUALIZATION
SBA	- SLUDGE BLENDING AIR
SL	- SLUDGE
SS	- SECONDARY SLUDGE
SSA	- SCAVENGER SLUDGE AIR
TS	- THICKENED SLUDGE
TSA	- THICKENED SLUDGE AIR
WAS	- WASTE ACTIVATED SLUDGE

PUMP INFORMATION

No.	APPLICATION	MODEL NUMBER	RATED (GPM/TDH/Hp)
P2	SCAVENGER SLUDGE	VOGELSANG VX136-1050	180/297/7.5
P3	WAS	GORMAN RUPP 13A20-B	280/15/3
P4	BLENDED SLUDGE	FLYGT CP-3102	425/27.5/5.0
P5	THICKENED SLUDGE	KOMLINE-SANDERSON KSK-7.5	92/14.1/3.0
P10	FINAL BLENDED SLUDGE	FLYGT NP-3171	480/94.14/30
P17	SCAVENGER SLUDGE	VOGELSANG VX136-1050	100/43/7.5

CONTROL PANEL SCHEDULE

No.	DESIGNATION
CP-5	SLUDGE CONTROL PANEL
CP-10	BELT FILTER PRESS SYSTEM
CP-12	SCAVENGER SLUDGE HOLDING TANKS

H2M architects + engineers

538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN			

PROJECT No.:	DATE:	SCALE:
RDSD 1902	DEC 2019	

CLIENT

Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

2 River Avenue
Riverhead, NY 11901

CONTRACT

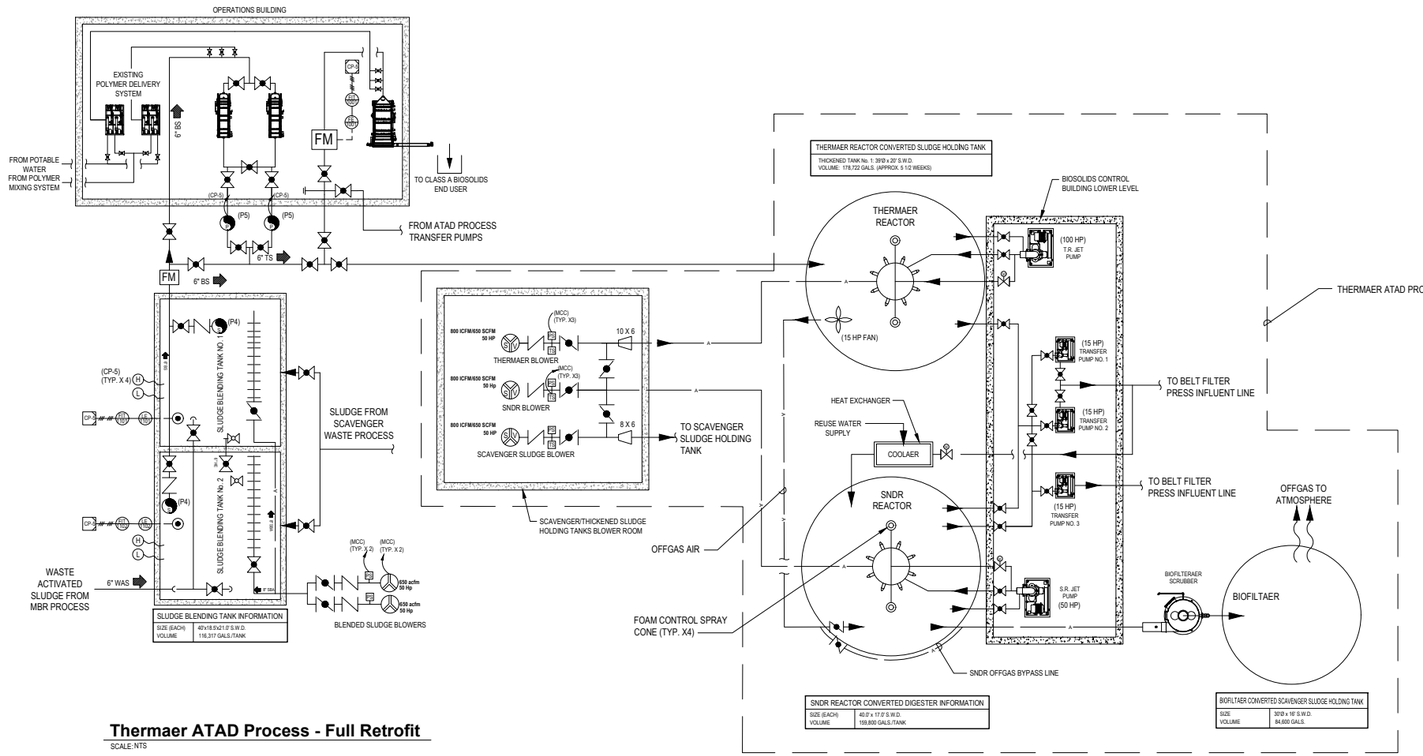
STATUS: **NOT FOR CONSTRUCTION**

SHEET TITLE

EXISTING CONDITIONS SLUDGE PROCESS FLOW DIAGRAM

DRAWING No.

FIGURE 2



Thermaer ATAD Process - Full Retrofit

SCALE: NTS

PROCESS LEGEND

PROCESS AIR LINE	B.F. (BLIND FLANGE)
PROPOSED FREE AIR PATH	EXIST. PROCESS LINE
MOTOR OPERATED VALVE	TELESCOPIC VALVE
SOLENOID VALVE	FLOW METER
PNEUMATIC OPERATING VALVE	SUSPENDED SOLIDS METER
PLUG VALVE	EQUALIZING PIPE ASSEMBLY
CHECK VALVE	FLOAT SWITCH (H - HIGH WATER LEVEL, L - LOW WATER LEVEL, C - CONTROL)
BALL VALVE	LEVEL TRANSDUCER
GATE VALVE	DISSOLVED OXYGEN PROBE
BUTTERFLY VALVE	FIXED AIR DROP
GLOBE VALVE	REDUCER
VALVE TAG	LEVEL TRANSMITTER
EQUIPMENT TAG (SEE DWG. M-1)	PRESSURE TRANSMITTER
BLOWER - FIXED SPEED	PRESSURE SWITCH ASSEMBLY
BLOWER - VARIABLE SPEED	TEMPERATURE SWITCH ASSEMBLY
PUMP (S - SUBMERSIBLE SEWAGE, D - DRY PIT, P - POSITIVE DISPLACEMENT, V - VARIABLE SPEED, R - SUBMERSIBLE RECESSED IMPELLER, C - CENTRIFUGAL)	OFFGAS FAN
PUMP DESIGNATION	MOTOR (DENOTES HORSEPOWER)
JET NOZZLES	IN-LINE CLEANOUTS NOT SHOWN. (SEE YARD PIPING)
SPLASHCONE	

architects + engineers

538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN	SNM		

PROJECT No.: RDSD 1902 | DATE: DEC 2019 | SCALE:

CLIENT

Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

2 River Avenue
Riverhead, NY 11901

CONTRACT

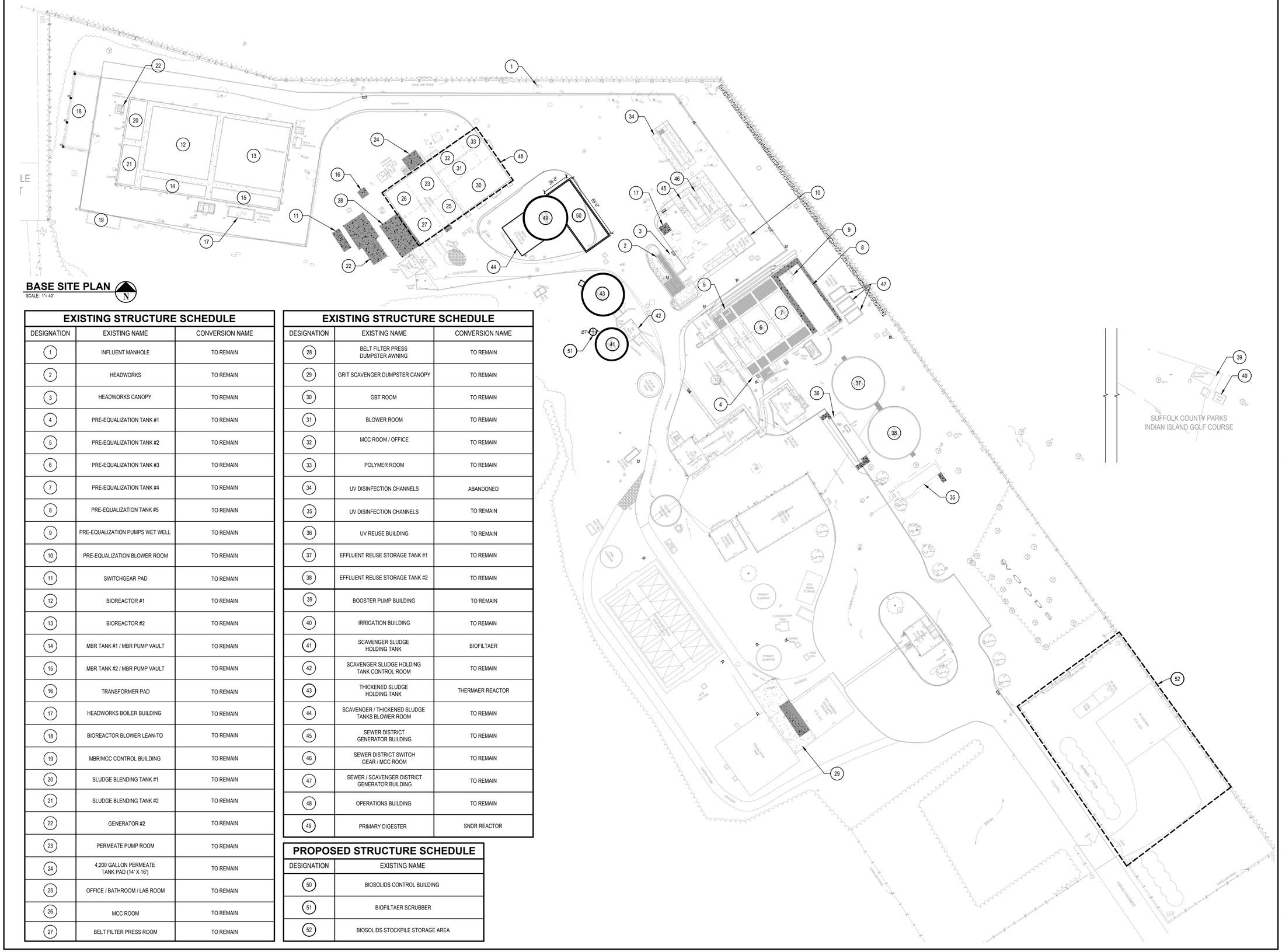
STATUS: **NOT FOR CONSTRUCTION**

SHEET TITLE

THERMAER PROCESS PROPOSED FLOW DIAGRAM

DRAWING No.

FIGURE 3



BASE SITE PLAN

SCALE: 1"= 40'

N

EXISTING STRUCTURE SCHEDULE		
DESIGNATION	EXISTING NAME	CONVERSION NAME
1	INFLUENT MANHOLE	TO REMAIN
2	HEADWORKS	TO REMAIN
3	HEADWORKS CANOPY	TO REMAIN
4	PRE-EQUALIZATION TANK #1	TO REMAIN
5	PRE-EQUALIZATION TANK #2	TO REMAIN
6	PRE-EQUALIZATION TANK #3	TO REMAIN
7	PRE-EQUALIZATION TANK #4	TO REMAIN
8	PRE-EQUALIZATION TANK #5	TO REMAIN
9	PRE-EQUALIZATION PUMPS WET WELL	TO REMAIN
10	PRE-EQUALIZATION BLOWER ROOM	TO REMAIN
11	SWITCHGEAR PAD	TO REMAIN
12	BIOREACTOR #1	TO REMAIN
13	BIOREACTOR #2	TO REMAIN
14	MBR TANK #1 / MBR PUMP VAULT	TO REMAIN
15	MBR TANK #2 / MBR PUMP VAULT	TO REMAIN
16	TRANSFORMER PAD	TO REMAIN
17	HEADWORKS BOILER BUILDING	TO REMAIN
18	BIOREACTOR BLOWER LEAN-TO	TO REMAIN
19	MBR/MCC CONTROL BUILDING	TO REMAIN
20	SLUDGE BLENDING TANK #1	TO REMAIN
21	SLUDGE BLENDING TANK #2	TO REMAIN
22	GENERATOR #2	TO REMAIN
23	PERMEATE PUMP ROOM	TO REMAIN
24	4,200 GALLON PERMEATE TANK PAD (14' X 16')	TO REMAIN
25	OFFICE / BATHROOM / LAB ROOM	TO REMAIN
26	MCC ROOM	TO REMAIN
27	BELT FILTER PRESS ROOM	TO REMAIN

EXISTING STRUCTURE SCHEDULE		
DESIGNATION	EXISTING NAME	CONVERSION NAME
28	BELT FILTER PRESS DUMPSTER AWNING	TO REMAIN
29	GRIT SCAVENGER DUMPSTER CANOPY	TO REMAIN
30	GBT ROOM	TO REMAIN
31	BLOWER ROOM	TO REMAIN
32	MCC ROOM / OFFICE	TO REMAIN
33	POLYMER ROOM	TO REMAIN
34	UV DISINFECTION CHANNELS	ABANDONED
35	UV DISINFECTION CHANNELS	TO REMAIN
36	UV REUSE BUILDING	TO REMAIN
37	EFFLUENT REUSE STORAGE TANK #1	TO REMAIN
38	EFFLUENT REUSE STORAGE TANK #2	TO REMAIN
39	BOOSTER PUMP BUILDING	TO REMAIN
40	IRRIGATION BUILDING	TO REMAIN
41	SCAVENGER SLUDGE HOLDING TANK	BIOFILTAER
42	SCAVENGER SLUDGE HOLDING TANK CONTROL ROOM	TO REMAIN
43	THICKENED SLUDGE HOLDING TANK	THERMAER REACTOR
44	SCAVENGER / THICKENED SLUDGE TANKS BLOWER ROOM	TO REMAIN
45	SEWER DISTRICT GENERATOR BUILDING	TO REMAIN
46	SEWER DISTRICT SWITCH GEAR / MCC ROOM	TO REMAIN
47	SEWER / SCAVENGER DISTRICT GENERATOR BUILDING	TO REMAIN
48	OPERATIONS BUILDING	TO REMAIN
49	PRIMARY DIGESTER	SNDR REACTOR

PROPOSED STRUCTURE SCHEDULE	
DESIGNATION	EXISTING NAME
50	BIOSOLIDS CONTROL BUILDING
51	BIOFILTAER SCRUBBER
52	BIOSOLIDS STOCKPILE STORAGE AREA

H2M architects + engineers

538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN	SNM		

PROJECT No.: RDSD 1902 | DATE: DEC 2019 | SCALE:

CLIENT

Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

2 River Avenue
Riverhead, NY 11901

CONTRACT

ALL CONTRACTS

STATUS

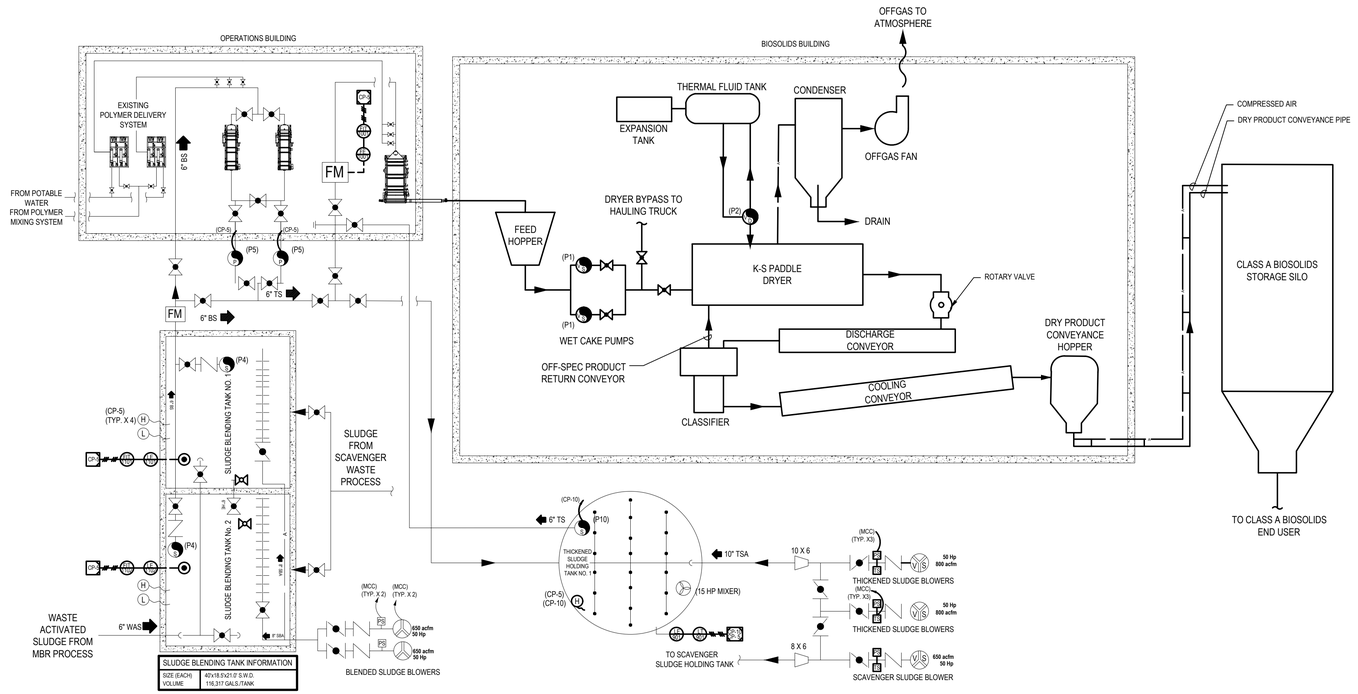
NOT FOR CONSTRUCTION

SHEET TITLE

THERMAER PROCESS PROPOSED SITE PLAN

DRAWING No.

FIGURE 4



Komline-Sanderson Sludge Dryer Process Flow Diagram

SCALE: NTS

PROCESS LEGEND

	PROCESS AIR LINE		B.F. (BLIND FLANGE)
	PROPOSED WATER SUPPLY		EXIST. PROCESS LINE
	MOTOR OPERATED VALVE	T	TELESCOPIC VALVE
	SOLENOID VALVE	FM	FLOW METER
	PNEUMATIC OPERATING VALVE	SS	SUSPENDED SOLIDS METER
	PLUG VALVE		EQUALIZING PIPE ASSEMBLY
	CHECK VALVE	H L	FLOAT SWITCH (H - HIGH WATER LEVEL, L - LOW WATER LEVEL, C - CONTROL)
	BALL VALVE		LEVEL TRANSDUCER
	GATE VALVE		DISSOLVED OXYGEN PROBE
	BUTTERFLY VALVE		FIXED AIR DROP
	GLOBE VALVE		REDUCER
10	VALVE TAG		LEVEL TRANSMITTER
10	EQUIPMENT TAG (SEE DWG. M-1)		PRESSURE TRANSMITTER
HP at No. of RPM	BLOWER - FIXED SPEED		PRESSURE SWITCH ASSEMBLY
HP at No. of RPM	BLOWER - VARIABLE SPEED		TEMPERATURE SWITCH ASSEMBLY
(P#) HP	PUMP (S - SUBMERSIBLE SEWAGE, D - DRY PIT, P - POSITIVE DISPLACEMENT, V - VARIABLE SPEED, R - SUBMERSIBLE RECESSED IMPELLER, C - CENTRIFUGAL)		MOTOR (DENOTES HORSEPOWER)
(P1)	PUMP DESIGNATION		IN-LINE CLEANOUTS NOT SHOWN. (SEE YARD PIPING)

architects + engineers

538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN	SNM		
PROJECT No.: RDSD 1902	DATE: DEC 2019	SCALE:	

CLIENT

Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

2 River Avenue
Riverhead, NY 11901

CONTRACT

STATUS

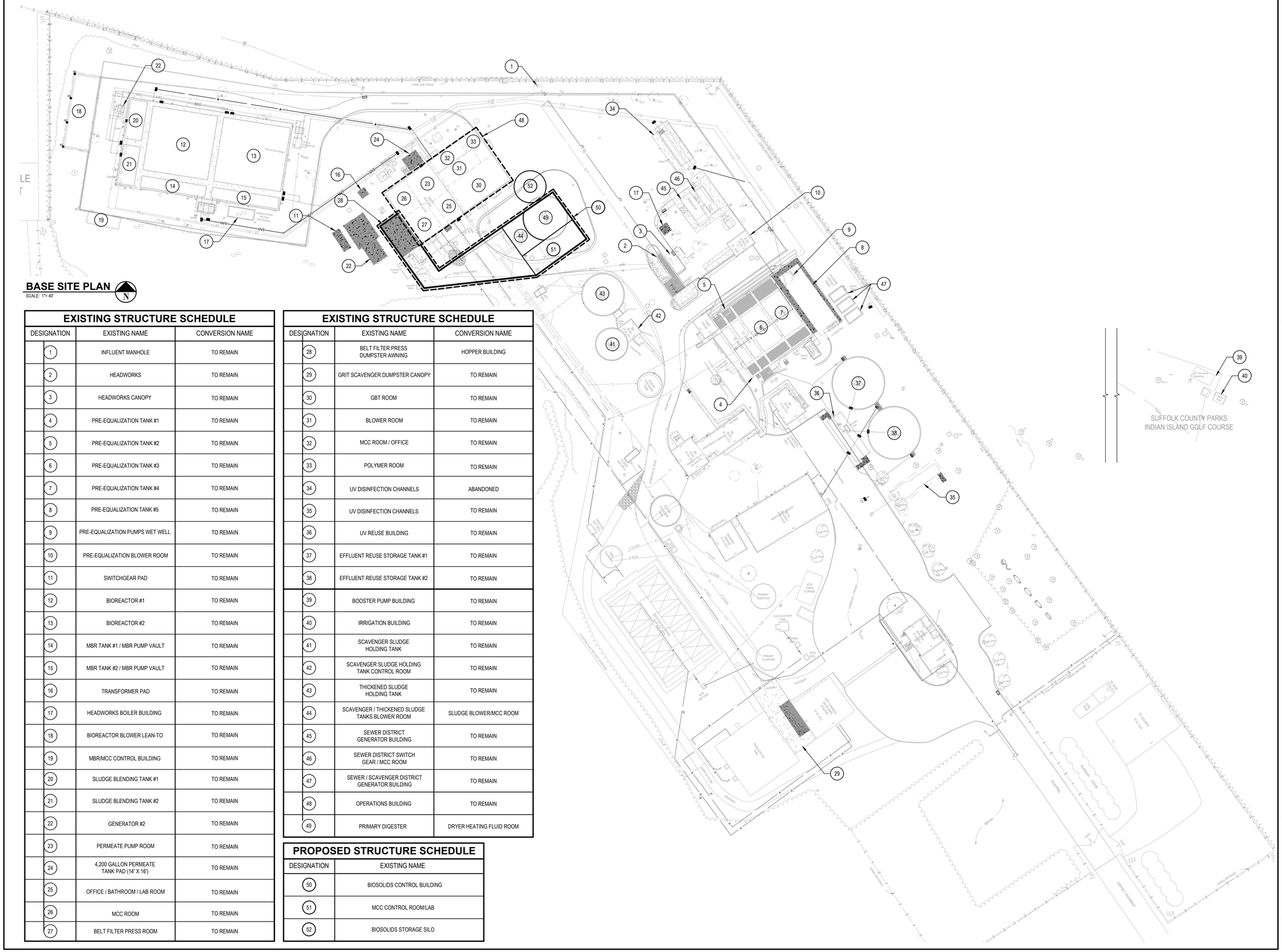
NOT FOR CONSTRUCTION

SHEET TITLE

PADDLE DRYER PROCESS PROPOSED FLOW DIAGRAM

DRAWING No.

FIGURE 5



BASE SITE PLAN

SCALE: 1"= 40'

EXISTING STRUCTURE SCHEDULE

DESIGNATION	EXISTING NAME	CONVERSION NAME
1	INFLUENT MANHOLE	TO REMAIN
2	HEADWORKS	TO REMAIN
3	HEADWORKS CANOPY	TO REMAIN
4	PRE-EQUALIZATION TANK #1	TO REMAIN
5	PRE-EQUALIZATION TANK #2	TO REMAIN
6	PRE-EQUALIZATION TANK #3	TO REMAIN
7	PRE-EQUALIZATION TANK #4	TO REMAIN
8	PRE-EQUALIZATION TANK #5	TO REMAIN
9	PRE-EQUALIZATION PUMPS WET WELL	TO REMAIN
10	PRE-EQUALIZATION BLOWER ROOM	TO REMAIN
11	SWITCHGEAR PAD	TO REMAIN
12	BIOREACTOR #1	TO REMAIN
13	BIOREACTOR #2	TO REMAIN
14	MBR TANK #1 / MBR PUMP VAULT	TO REMAIN
15	MBR TANK #2 / MBR PUMP VAULT	TO REMAIN
16	TRANSFORMER PAD	TO REMAIN
17	HEADWORKS BOILER BUILDING	TO REMAIN
18	BIOREACTOR BLOWER LEAN-TO	TO REMAIN
19	MBR/MCC CONTROL BUILDING	TO REMAIN
20	SLUDGE BLENDING TANK #1	TO REMAIN
21	SLUDGE BLENDING TANK #2	TO REMAIN
22	GENERATOR #2	TO REMAIN
23	PERMEATE PUMP ROOM	TO REMAIN
24	4,200 GALLON PERMEATE TANK PAD (14' X 16')	TO REMAIN
25	OFFICE / BATHROOM / LAB ROOM	TO REMAIN
26	MCC ROOM	TO REMAIN
27	BELT FILTER PRESS ROOM	TO REMAIN

EXISTING STRUCTURE SCHEDULE

DESIGNATION	EXISTING NAME	CONVERSION NAME
28	BELT FILTER PRESS DUMPSTER AWNING	HOPPER BUILDING
29	GRIT SCAVENGER DUMPSTER CANOPY	TO REMAIN
30	GBT ROOM	TO REMAIN
31	BLOWER ROOM	TO REMAIN
32	MCC ROOM / OFFICE	TO REMAIN
33	POLYMER ROOM	TO REMAIN
34	UV DISINFECTION CHANNELS	ABANDONED
35	UV DISINFECTION CHANNELS	TO REMAIN
36	UV REUSE BUILDING	TO REMAIN
37	EFFLUENT REUSE STORAGE TANK #1	TO REMAIN
38	EFFLUENT REUSE STORAGE TANK #2	TO REMAIN
39	BOOSTER PUMP BUILDING	TO REMAIN
40	IRRIGATION BUILDING	TO REMAIN
41	SCAVENGER SLUDGE HOLDING TANK	TO REMAIN
42	SCAVENGER SLUDGE HOLDING TANK CONTROL ROOM	TO REMAIN
43	THICKENED SLUDGE HOLDING TANK	TO REMAIN
44	SCAVENGER / THICKENED SLUDGE TANKS BLOWER ROOM	SLUDGE BLOWER/MCC ROOM
45	SEWER DISTRICT GENERATOR BUILDING	TO REMAIN
46	SEWER DISTRICT SWITCH GEAR / MCC ROOM	TO REMAIN
47	SEWER / SCAVENGER DISTRICT GENERATOR BUILDING	TO REMAIN
48	OPERATIONS BUILDING	TO REMAIN
49	PRIMARY DIGESTER	DRYER HEATING FLUID ROOM

PROPOSED STRUCTURE SCHEDULE

DESIGNATION	EXISTING NAME
50	BIOSOLIDS CONTROL BUILDING
51	MCC CONTROL ROOM/LAB
52	BIOSOLIDS STORAGE SILO

H2M architects + engineers
538 Broad Hollow Road, 4th Floor East
Melville, NY 11747
631.756.8000 • www.h2m.com

CONSULTANTS:

MARK	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	REVIEWED BY:
SNM/TMN	SNM		

PROJECT No.: RDSD 1902 | DATE: DEC 2019 | SCALE:

CLIENT
Town of Riverhead Sewer District

Class A Biosolids Feasibility Study

2 River Avenue
Riverhead, NY 11901

CONTRACT
ALL CONTRACTS

STATUS
NOT FOR CONSTRUCTION

SHEET TITLE
PADDLE DRYER PROCESS PROPOSED SITE PLAN

DRAWING No.
FIGURE 6

X:\RDSD (Riverhead Sewer District) - 1900\RDSD1902 CLASS A BIOSOLIDS FEASIBILITY STUDY\BIM-CAD\Condoctech\FIG 6- PADDLE DRYER PROCESS PROPOSED SITE PLAN.dwg Last Modified: Jan 16, 2020 - 1:04pm Plotted on: Jan 16, 2020 - 1:04pm By tmohberg

APPENDICES

++ NO TEXT ON THIS PAGE ++

APPENDIX A

SPDES Permit NY- 0020061 (Riverhead WRRF)

++ NO TEXT ON THIS PAGE ++

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

State Pollutant Discharge Elimination System (SPDES)
DISCHARGE PERMIT

Industrial Code:	4952	SPDES Number:	NY0020061
Discharge Class (CL):	05	DEC Number:	1-4730-00039
Toxic Class (TX):	N	Effective Date (EDP):	10/1/2011
Major Drainage Basin:	17	Expiration Date (ExDP):	9/30/2016
Sub Drainage Basin:	01	Modification Dates: (EDPM)	1/1/2015
Water Index Number:	FB3-112		
Compact Area:	IEC		

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. §125I et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name:	**Town of Riverhead**	Attention:	**Sean Walter, Supervisor**		
Street:	**200 Howell Avenue**				
City:	**Riverhead**	State:	**NY**	Zip Code:	**11901**

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name:	**Riverhead Sewer District, AWTF**										
Location (C,T,V):	**Riverhead(T)**						County:	**Suffolk**			
Facility Address:	**Riverhead Avenue**										
City:	**Riverhead**				State:	**NY**		Zip Code:	**11901**		
From Outfall No.:	**001**	at Latitude:	**40** °	**55** '	**04** "	& Longitude:	**72** °	**38** '	**25** "		
into receiving waters known as:	**Peconic Tiver**							Class:	**SC**		

and (list other Outfalls, Receiving Waters & Water Classifications)
002 – Water reuse, GA, 40° 55' 21" | 72° 38' 35"

in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1and 750-2.

DISCHARGE MONITORING REPORT (DMR) MAILING ADDRESS

Mailing Name:	**Riverhead Sewer District**				
Street:	**200 Howell Ave**				
City:	**Riverhead**	State:	**NY**	Zip Code:	**11901**
Responsible Official or Agent:	**Michael Reichel, Superintendent**		Phone:	**631-727-3069**	

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above and the permittee shall not discharge after the expiration date unless this permit has been renewed, or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:

CO BWP - Permit Coordinator
RWE
RPA
Region2_NPDES@epa.gov (surface water only & no Class 02 or 04)
NYSEFC (Class 05 & 07 only)

Permit Administrator: Susan Ackerman	
Address: 50 Circle Road Stony Brook, NY 11790	
Signature:	Date: 11/17/2014

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.	See below	See below

PARAMETER	EFFLUENT LIMIT or CALCULATED LEVEL	COMPLIANCE LEVEL / ML	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note I. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the permittee shall use the approved EPA analytical method with the lowest possible detection limit as promulgated under 40CFR Part I36 for the determination of the concentrations of parameters present in the sample unless otherwise specified. If a sample result is below the detection limit of the most sensitive method, compliance with the permit limit for that parameter was achieved. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This ML can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, which trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, temperature, or concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly. All monitoring periods (quarterly, semiannual, annual, etc) are based upon the calendar year unless otherwise specified in this Permit.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Notes:

1. EFFLUENT LIMIT TYPES:
   a. DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.
   b. DAILY MAX: The highest allowable daily discharge. DAILY MIN: The lowest allowable daily discharge.
   c. MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   d. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.
   e. 30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of: the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   f. 7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.
   g. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

2. ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards.

PERMIT LIMITS, LEVELS AND MONITORING – 1.3 MGD

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All Year unless otherwise noted	Peconic River	EDPM	Completion of Construction[1]

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly Average			1.3	mgd	Continuous	Recorder		X	
$CBOD_5$	Monthly Average	25	mg/l	270	lbs/d	1/week	24-hr. Comp.	X	X	2, 4
$CBOD_5$	7-Day Average	40	mg/l	430	lbs/d	1/week	24-hr. Comp.		X	
Solids, Suspended	Monthly Average	30	mg/l	330	lbs/d	1/week	24-hr. Comp.	X	X	2, 4
Solids, Suspended	7-Day Average	45	mg/l	490	lbs/d	1/week	24-hr. Comp.		X	
Solids, Settleable	Daily Maximum	0.3	ml/l			2/day	Grab		X	
pH	Range	6.0-9.0	SU			2/day	Grab		X	
Nitrogen, Total	Monthly Average			170	lbs/d	1/month	24-hr. Comp.		X	3, 4
Nitrogen, Ammonia (as $NH_3 + NH_4$)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen (as Nitrate)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen (as Nitrite)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Phosphorus (as P)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Orthophosphate (as P)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp		X	
Temperature	Daily Maximum	Monitor	Deg C			2/day	Grab		X	
Effluent Disinfection required		[X] All Year		[ ] Seasonal from _____ to _____						
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 ml			1/week	Grab		X	
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			1/week	Grab		X	
Coliform, Total	Monthly Median	700	No./ 100 ml			1/week	Grab		X	
Chlorine, Total Residual	Daily Maximum		mg/l				Grab		X	

FOOTNOTES:

1. The limitations on this page shall expire upon start-up of the 1.5 MGD facility. The start-up date for the 1.5 MOD facility will be identified in a letter from the permittee to the offices listed on the Monitoring, Reporting, and Recording page of this permit and to the Bureau of Water Permits, 625 Broadway, Albany NY 12233. Start-up shall commence only after receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specification.

2. Effluent shall not exceed 15% and 15% of influent concentration values for CBOD, & TSS respectively.

3. An interim limit of 170 lbs/day shall be effective until the treatment system is upgraded to meet the final effluent limit. See Schedule of Compliance page for details.

4. See Page 4 of this Permit for the interim limits applicable during the conversion of the SBR process train #1 to SBR/MBR process train #1.

INTERIM LIMITS during the conversion of SBR train to SBR/MBR train

Note: Limits below arc only effective for a maximum of 6 months during the conversion of the SBR Process Train No. 1 to SBR/MBR Process Train No. 1. The Permittee shall notify the Department in writing upon the start of the conversion. Permittee shall notify the Department in writing upon the start of the conversion.

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
$CBOD_5$	Monthly Average	100	mg/l	1080	lbs/d	Continuous	Recorder	X	X	
Solids, Suspended	Monthly Average	60	mg/l	650	lbs/d	1/week	24-hr. Comp.	X	X	
Residual Chlorine, Total	Daily Maximum	0.5	mg/l			1/week	Grab		X	5
Nitrogen, Total	Monthly Average	Monitor	mg/l			1/week	24-hr. Comp.	X	X	

FOOTNOTES:

5. This limitation is only applicable if chlorine is used for disinfection.

PERMIT LIMITS, LEVELS AND MONITORING – 1.5 MGD

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All Year unless otherwise noted	Peconic River	EDPM	Completion of Construction[1]

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly Average			1.5	mgd	Continuous	Recorder		X	
$CBOD_5$	Monthly Average	25	mg/l	310	lbs/d	1/week	24-hr. Comp.	X	X	7
$CBOD_5$	7-Day Average	40	mg/l	500	lbs/d	1/week	24-hr. Comp.		X	
Solids, Suspended	Monthly Average	30	mg/l	375	lbs/d	1/week	24-hr. Comp.	X	X	7
Solids, Suspended	7-Day Average	45	mg/l	560	lbs/d	1/week	24-hr. Comp.		X	
Solids, Settleable	Daily Maximum	0.3	ml/l			2/day	Grab		X	
pH	Range	6.0-9.0	SU			2/day	Grab		X	
Nitrogen, Total (May 1 – Sept 30)	Monthly Average			40	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen, Total (Oct 1 – Apr 30)	Monthly Average			130	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen, Ammonia (as NH_3 + NH_4)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen, TKN (as N)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen (as Nitrate)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Nitrogen (as Nitrite)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Phosphorus (as P)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp.		X	
Orthophosphate (as P)	Monthly Average			Monitor	lbs/d	1/month	24-hr. Comp		X	
Temperature	Daily Maximum	Monitor	Deg C			2/day	Grab		X	
Effluent Disinfection required		[X] All Year		[ ] Seasonal from _____ to _____						
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 ml			1/week	Grab		X	
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			1/week	Grab		X	
Coliform, Total	Monthly Median	700	No./ 100 ml			1/week	Grab		X	
Chlorine, Total Residual	Daily Maximum		mg/l				Grab		X	

Footnotes

6. The limitations on this page of this shall become effective upon start-up of the 1 .5MGD facility. Thc start-up date for the 1.5 MGD facility shall be identified in a letter from the permittee to the offices listed on the Monitoring, Reporting, and Recording page of this permit and to the Bureau of Water Permits, 625 Broadway, Albany NY 12233. Start-up shall commence only after receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.

7. Effluent shall not exceed 15% and 15% of influent concentration values for CBOD5 & TSS respectively.

PERMIT LIMITS, LEVELS AND MONITORING – 1.5 MGD

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
002	All Year unless otherwise noted	Water Reuse – Groundwater	Completion of Construction	ExDP

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
Flow	Monthly Average	0.45	MGD			Continuous	Recorder		X	
Solids, Suspended	Daily Maximum	5	mg/l			1/week	24-hr. Comp.		X	
Turbidity	24-hr Average	2	NTU			Continuous	Recorder		X	
Turbidity	Daily Maximum	10	NTU			Continuous	Recorder		X	
Coliform, Total	Daily Maximum	23	No. / 100 ml			1/day	Grab		X	9
Coliphage, Total	Daily Maximum	Monitor	No. / 100 ml			Monthly	Grab	See Footnote	X	10

Footnotes

8. The limitations on this page shall become effective upon start-up of the I 5MGD facility. The start-up date for the 1.5 MGD facility shall be identified in a letter from the permittee to the offices listed on the Monitoring, Reporting, and Recording page of this permit and to the Bureau of Water Permits, 625 Broadway, Albany NY 12233. Start-up shall commence only after receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.

9. Fecal colifonn shall be non-detectable in 4 of7 days. The laboratory shall use the most sensitive analytical method approved under 40CFR 136.

10. Weekly monitoring of total coliphagc is required in both the raw sewage and in the treated effluent during the first 4 weeks of the irrigation season.

OTHER REQUIREMENTS for OUTFALL 002:

1. The Permittee shall develop, maintain, and implement Process Operations Safety (POS) Procedure to ensure the quality of the treated effluent. The initial POS procedure shall be submitted !month prior to the irrigation season, to the Department and to the Suffolk County Department of Health Services (SCDHS) for review and approval. The POS shall be reviewed annually and shall be modify if necessary. The Permittee shall certify in writing, as an attachment to the April Discharge Monitoring Report, that the annual review has been completed.

2. The Permittee shall post warning and identification signs approved by the SCDHS.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise note	Peconic River	EDP	ExDP

PARAMETER	EFFLUENT LIMIT or CALCULATED LEVEL		COMPLIANCE LEVEL/ ML	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE	FN
	Monthly Avg	Daily Max						
Nickel, Total				0.05	mg/l	Quarterly		11
Whole Effluent Toxicity (WET) Testing								
WET - Acute Invertebrate				1.05	TUa	Quarterly	See footnote	12
WET - Acute Vertebrate				1.05	TUa	Quarterly	See footnote	12
WET - Chronic Invertebrate		11.8			TUc	Quarterly	See footnote	12
WET - Chronic Vertebrate		11.8			TUc	Quarterly	See footnote	12

Footnotes

11. The permittee shall report both the concentration (mg/l) and the mass loadings (lbs/d) for this parameter.

12. **Whole Effluent Toxicity (WET) Testing:**
Testing Requirements - WET testing shall consist of **Chronic Only**. WET testing shall be performed in accordance with 40 CFR Part 136 and TOGS 1.3.2 unless prior written approval has been obtained from the Department. The test species shall be *Mysidopsis bahia* (mysid shrimp - invertebrate) and *Cyprinodon variegatus* (sheepshead minnow - vertebrate). Artificial salt water should be used for dilution. All tests conducted should be static-renewal (two 24 hr composite samples with one renewal for Acute tests and three 24 hr composite samples with two renewals for Chronic tests). The appropriate dilution series bracketing the 1WC and including one exposure group of 100% effluent should be used to generate a definitive test endpoint, otherwise an immediate rerun of the test is required. WET testing shall be coordinated with the monitoring of chemical and physical parameters limited by this permit so that the resulting analyses are also representative of the sample used for WET testing. The ratio of critical receiving water flow to discharge flow (i.e. dilution ratio) is 3.5:1 for acute, and 11.8:1 for chronic. Discharges which are disinfected using chlorine should be dechlorinated prior to WET testing or samples shall be taken immediately prior to the chlorination system.

Monitoring Period - WET testing shall be performed at the specified sample frequency for the duration of the permit during calendar years ending in 4 and 9.

Reporting - Toxicity Units shall be calculated and reported on the DMR as follows: TUa = (100)/(48 hr LC50) or (100)/(48 hr EC50) (note that Acute data is generated by both Acute and Chronic testing) and TUc = (100)/(NOEC) when Chronic testing has been performed or TUc = (TUa) x (10) when only Acute testing has been performed and is used to predict Chronic test results, where the 48 hr LC50 or 48 hr EC50 and NOEC are expressed in % effluent. This must be done for both species and using the Most Sensitive Endpoint (MSE) or the lowest NOEC and corresponding highest TUc. Report a TUa of 0.3 if there is no statistically significant toxicity in 100% effluent as compared to control.

The complete test report including all corresponding results, statistical analyses, reference toxicity data, daily average flow at the time of sampling and other appropriate supporting documentation, shall be submitted within 60 days following the end of each test period to the Toxicity Testing Unit, Bureau of Watershed Assessment and Management, 625 Broadway, Fourth Floor, Albany, NY 12233-3502. A summary page of the test results for the invertebrate and vertebrate species indicating TUa, 48 hr LC50 or 48 hr EC50 for Acute tests and/or TUc, NOEC, IC25, and most sensitive endpoints for Chronic tests, should also be included at the beginning of the test report.

WET Testing Action Level Exceedances - If an action level is exceeded then the Department may require the permittee to conduct additional WET testing including Acute and/or Chronic tests. Additionally, the permittee may be required to perform a Toxicity Reduction Evaluation (TRE) in accordance with Department guidance. If such additional testing or performance of a TRE is necessary, the permittee shall be notified in writing by the Regional Water Engineer. The written notification shall include the reason(s) why such testing or a TRE is required.

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS

1. General - The Department has determined that stormwater discharges from POTWs with design flows at or above 1 mgd shall be covered under the SPDES permit. If the permittee has already submitted a Notice of Intent to the Department for coverage under the General Storm Water permit, the permittee shall submit a Notice of Termination to the Department upon receipt of this final SPDES permit containing the requirement to develop a SWPPP.

The permittee is required to develop, maintain, and implement a Storm Water Pollutant Prevention Plan (SWPPP) to prevent releases of significant amounts of pollutants to the waters of the State through plant site runoff; spillage and leaks; sludge or waste disposal; and other stormwater discharges including, but not limited to, drainage from raw material storage.

The SWPPP shall be documented in narrative form and shall include the 13 minimum elements below and plot plans, drawings, or maps necessary to clearly delineate the direction of stormwater flow and identify the conveyance, such as ditch, swale, storm sewer or sheet flow, and receiving water body. Other documents already prepared for the facility such as a Safety Manual or a Spill Prevention, Control and Countermeasure (SPCC) plan may be used as part of the SWPPP and may be incorporated by reference. A copy of the current SWPPP shall be submitted to the Department as required in item (2.) below and a copy must be maintained at the facility and shall be available to authorized Department representatives upon request.

2. Compliance Deadlines - The initial completed SWPPP shall be submitted in August 2009 to the Regional Water Engineer. The SWPPP shall be implemented within 6 months of submissions, unless a different time frame is approved by the Department. The SWPPP shall be reviewed annually and shall be modified whenever: (a) changes at the facility materially increase the potential for releases of pollutants; (b) actual releases indicate the SWPPP is inadequate, or (c) a letter from the Department identifies inadequacies in the SWPPP. The permittee shall certify in writing, as an attachment to the December Discharge Monitoring Report (DMR), that the annual review has been completed. All SWPPP revisions (with the exception of minimum elements - see item (4.B.) below) must be submitted to the Regional Water Engineer within 30 days. Note that the permittee is not required to obtain Department approval of the SWPPP (or of any minimum elements) unless notified otherwise. Subsequent modifications to or renewal of this permit does not reset or revise these deadlines unless a new deadline is set explicitly by such permit modification or renewal.

3. Facility Review - The permittee shall review all facility components or systems (including but not limited to material storage areas; in-plant transfer, process, and material handling areas; loading and unloading operations; storm water, erosion, and sediment control measures; process emergency control systems; and sludge and waste disposal areas) where materials or pollutants are used, manufacture stored or handled to evaluate the potential for the release of pollutants to the waters of the State. In performing such an evaluation, the permittee shall consider such factors as the probability of equipment failure or improper operation, cross-contamination of storm water by process materials, settlement of facility air emissions, the effects of natural phenomena such as freezing temperatures and precipitation, fires, and the facility's history of spills and leaks. The relative toxicity of the pollutant shall be considered in determining the significance of potential releases.

The review shall address all substances present at the facility that are identified in Tables 6-10 of SPDES application Form NY-2C (available *at http://www.dec.state.ny.us/website/dcs/permits/olpermits/form2c.pdf*) as well as those that are required to be monitored by the SPDES permit.

4. A. 13 Minimum elements - Whenever the potential for a release of pollutants to State waters is determined to be present, the permittee shall identify Best Management Practices (BMPs) that have been established to prevent or minimize such potential releases. Where BMPs are inadequate or absent, appropriate BMPs shall be established. In selecting appropriate BMPs, the permittee shall consider good industry practices and, where appropriate, structural measures such as secondary containment and erosion/sediment control devices and practices. USEPA guidance for development of minimum elements of the SWPPP and BMPs is available in *Developing Your Stormwater Pollution Prevention Plan – A Guide for Industrial Operators*, February 2009, EPA 833-B-09-002. At a minimum, the plan shall include the following elements:

1. Pollution Prevention Team
2. Reporting of BMP Incidents
3. Risk Identification & Assessment
4. Employee Training
5. Inspections and Records
6. Security
7. Preventive Maintenance
8. Good Housekeeping
9. Materials/Waste Handling, Storage & Compatibility
10. Spill Prevention & Response
11. Erosion & Sediment Control
12. Management of Runoff
13. Street Sweeping

STORM WATER POLLUTION PREVENTION PLAN FOR POTWs WITH STORMWATER OUTFALLS - continued

Note that for some facilities, especially those with few employees, some of the above may not be applicable. It is acceptable in these cases to indicate "Not Applicable" for the portion(s) of the SWPPP that do not apply to your facility, along with an explanation, for instance if street sweeping did not apply because no streets exist at the facility.

B. Stormwater Pollution Prevention Plans (SWPPPs) Required for Discharges of Stormwater From Construction Activity to Surface Waters - As part of the erosion of and sediment control element, a SWPPP shall be developed prior to the initiation of any site disturbance of one acre or more of uncontaminated area. Uncontaminated area means soils or groundwater which are free of contamination by any toxic or non-conventional pollutants identified in Tables 6-10 of SPDES application Form NY-2C. Disturbance of any size contaminated area(s) and the resulting discharge of contaminated stormwater is not authorized by this permit unless the discharge is under State or Federal oversight as part of a remedial program or after review by the Regional Water Engineer; nor is such discharge authorized by any SPDES general permit for stormwater discharges. SWPPPs are not required for discharges of stormwater from construction activity to groundwaters.

The SWPPP shall conform to the *New York Standards and Specifications for Erosion and Sediment Control and New York State Stormwater Management Design Manual*, unless a variance has been obtained from the Regional Water Engineer, and to any local requirements. The permittee shall submit a copy of the SWPPP and any amendments thereto to the local governing body and any other authorized agency having jurisdiction or regulatory control over the construction activity at least 30 days prior to soil disturbance. The SWPPP shall also be submitted to the Regional Water Engineer if contamination, as defined above, is involved and the permittee must obtain a determination of any SPDES permit modifications and/or additional treatment which may be required prior to soil disturbance. Otherwise, the SWPPP shall be submitted to the Department only upon request. When a SWPPP is required, a properly completed Notice of Intent (NOI) form shall be submitted (available at *www.dec.state.ny.us/website/dow/toolbox/swforms.html*) prior to soil disturbance. Note that submission of a NOI is required for informational purposes; the permittee is not eligible for and will not obtain coverage under any SPDES general permit for stormwater discharges, nor are any additional permit fees incurred. SWPPPs must be developed and submitted for subsequent site disturbances in accordance with the above requirements. The permittee is responsible for ensuring that the provisions of each SWPPP is properly implemented.

Mercury Minimization Program for Low Priority POTWs

The permittee shall inspect each tributary dental facility at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Inspection and/or outreach to other industrial/commercial sectors which may contribute mercury is also recommended. All new or increased tributary discharges, including hauled wastes, which are from sources that are industrial in nature must be evaluated for mercury content and if levels exceed 500 ng/L then authorization must be obtained from the Department prior to acceptance. Equipment and materials which may contain mercury shall also be evaluated by the permittee and replaced with mercury-free alternatives where environmentally preferable. A file shall be maintained containing the notices submitted by dental offices and all other pertinent information. This file shall be available for review by DEC representatives and copies shall be provided upon request. A permit modification may be necessary to include more stringent requirements for POTWs which do not maintain low mercury effluent levels. Note – the mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address :

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule:

Outfall(s)	Compliance Action	Due Date
001	The Permittee shall submit approvable final plans and specifications, as well as a schedule of construction, for the facilities described in the approved Engineering Report.	DEC Approval of Engineering Report + 12 Months
	The Permittee shall commence construction of the facilities described in the approved report, plans and of specifications in accordance with the approved schedule of construction.	DEC Approval of Plans & Specs
	The Permittee shall submit progress reports every 6 months detailing the work done in accordance with of the approved engineering report and schedule of construction. The schedule of construction contained in the approved report shall, by this reference, be made part the permit.	DEC Approval of Schedule of Construction + 6 months
	The Permittee shall complete construction in accordance with the approved schedule, but no later than 04/23/2016	04/23/2016

The above compliance actions are one time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.

b) For any action where the compliance date is greater than 9 months past the previous compliance due date, the permittee shall submit interim progress reports to the Department every nine (9) months until the due date for these compliance items are met.

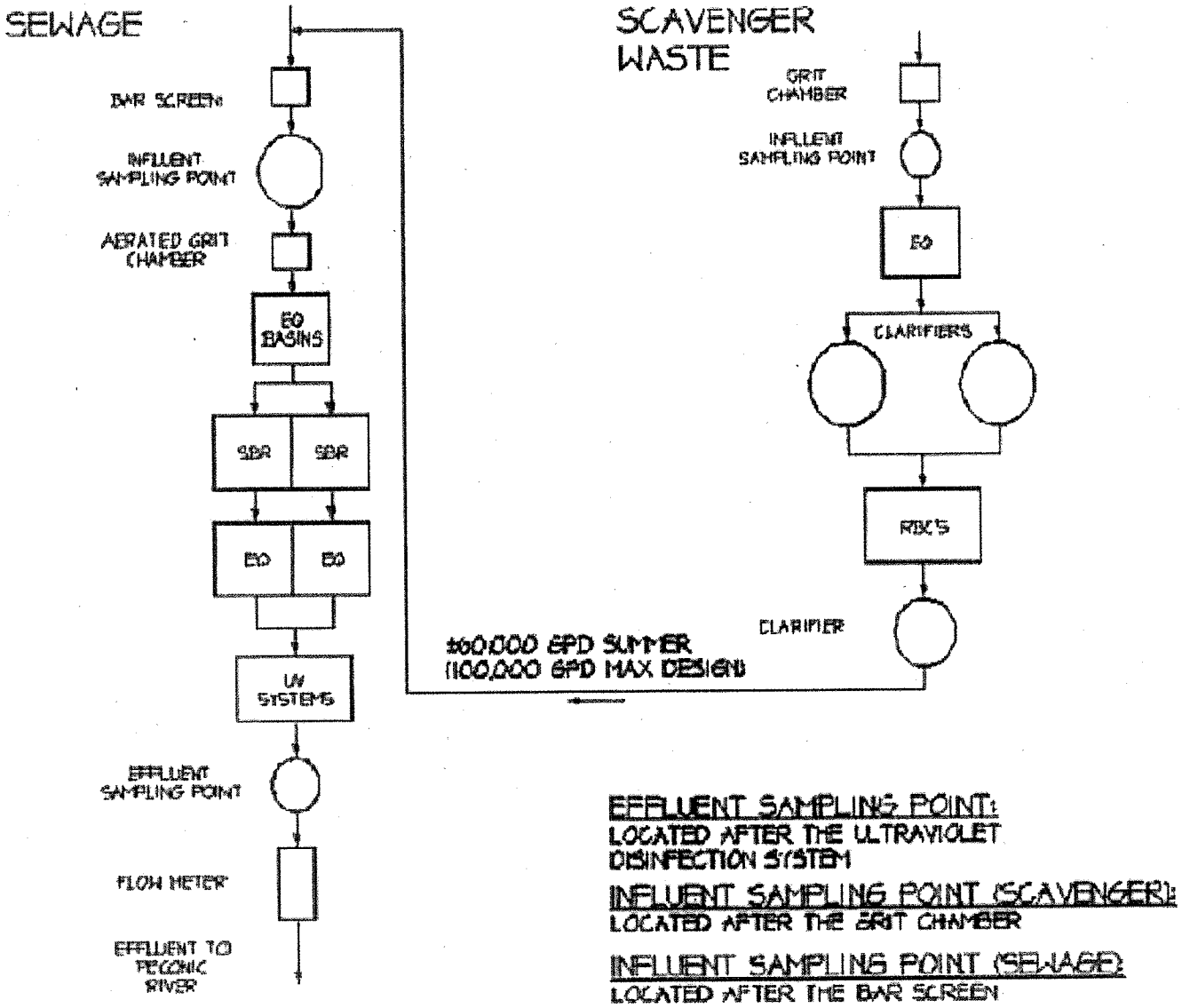
c) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:

1. A short description of the non-compliance;
2. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
3. A description or any factors which tend to explain or mitigate the non-compliance; and
4. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

d) The permittee shall submit copies of any document required by the above schedule of compliance to the NYSDEC Regional Water Engineer at the location listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS and to the Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, unless otherwise specified in this permit or in writing by the Department.

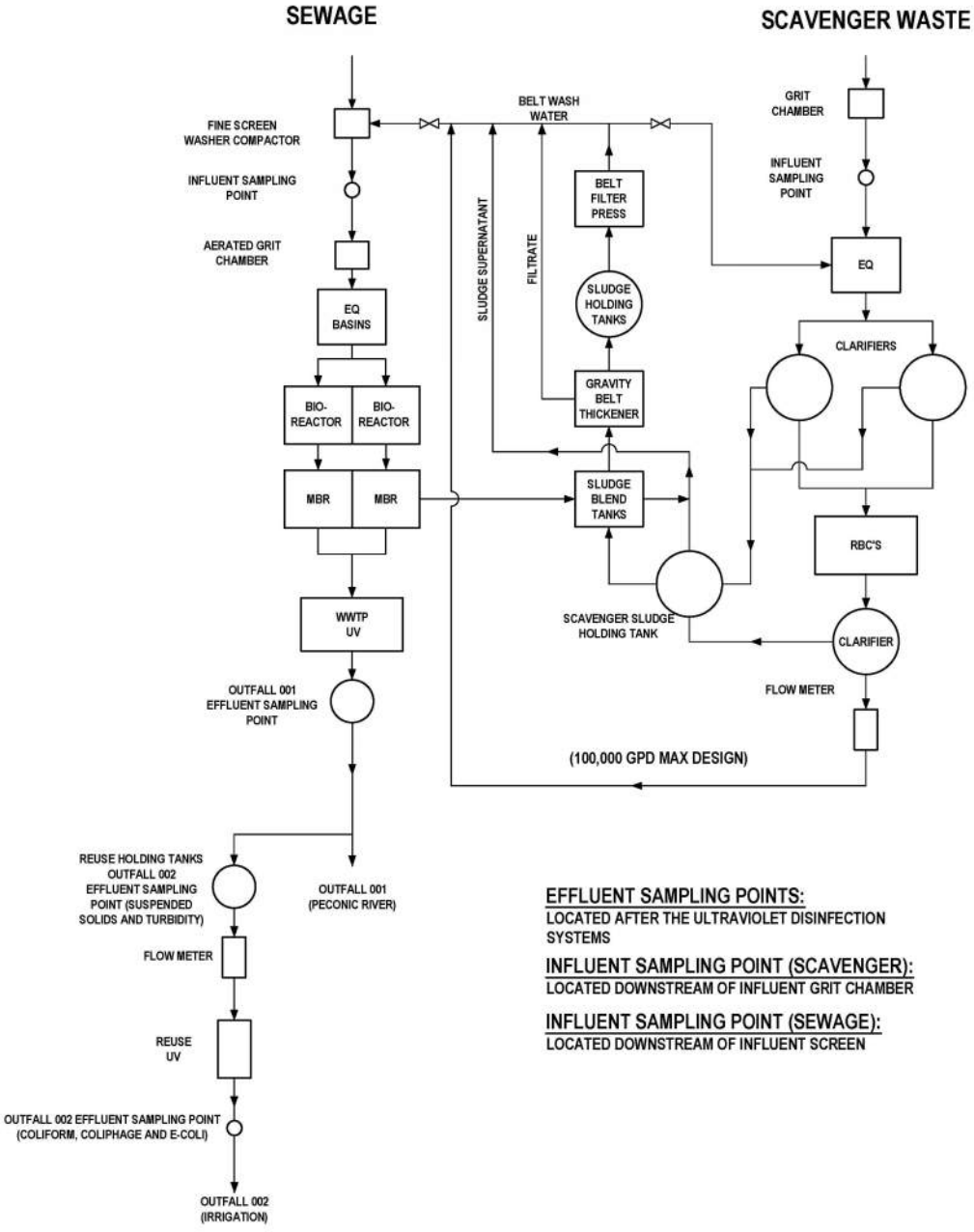
MONITORING LOCATIONS – 1.3 MGD

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:



MONITORING LOCATIONS – 1.5 MGD

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:



GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in paragraphs B through I as follows:.

B. General Conditions

1. Duty to comply	6NYCRR Part 750-2.1(e) & 2.4
2. Duty to reapply	6NYCRR Part 750-1.16(a)
3. Need to halt or reduce activity not a defense	6NYCRR Part 750-2.1(g)
4. Duty to mitigate	6NYCRR Part 750-2.7(f)
5. Permit actions	6NYCRR Part 750-1.1(c), 1.18, 1.20 & 2.1(h)
6. Property rights	6NYCRR Part 750-2.2(b)
7. Duty to provide information	6NYCRR Part 750-2.1(i)
8. Inspection and entry	6NYCRR Part 750-2.1(a) & 2.3

C. Operation and Maintenance

1. Proper Operation & Maintenance	6NYCRR Part 750-2.8
2. Bypass	6NYCRR Part 750-1.2(a)(17), 2.8(b) & 2.7
3. Upset	6NYCRR Part 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1. Monitoring and records	6NYCRR Part 750-2.5(a)(2), 2.5(c)(1), 2.5(c)(2), 2.5(d) & 2.5(a)(6)
2. Signatory requirements	6NYCRR Part 750-1.8 & 2.5(b)

E. Reporting Requirements

1. Reporting requirements	6NYCRR Part 750-2.5, 2.6, 2.7 & 1.17
2. Anticipated noncompliance	6NYCRR Part 750-2.7(a)
3. Transfers	6NYCRR Part 750-1.17
4. Monitoring reports	6NYCRR Part 750-2.5(e)
5. Compliance schedules	6NYCRR Part 750-1.14(d)
6. 24-hour reporting	6NYCRR Part 750-2.7(c) & (d)
7. Other noncompliance	6NYCRR Part 750-2.7(e)
8. Other information	6NYCRR Part 750-2.1(f)
9. Additional conditions applicable to a POTW	6NYCRR Part 750-2.9
10. Special reporting requirements for discharges that are not POTWs	6NYCRR Part 750-2.6

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS continued

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall **maintain a logbook** of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall **submit a completed *WTC Annual Report Form*** each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form* and *WTC Annual Report Form* are available from the Department's website at http://www.dec.ny.gov/permits/93245.html .

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be summarized, signed and retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent. **Also, monitoring information required by this permit shall be summarized and reported by submitting;**

[X] (if box is checked) completed and signed Discharge Monitoring Report (DMR) forms for each 1 month reporting period to the locations specified below. Blank forms are available at the Department's Albany office listed below. The first reporting period begins on the effective date of this permit and the reports will be due no later than the 28th day of the month following the end of each reporting period.

[ ] (if box is checked) an annual report to the Regional Water Engineer at the address specified below. The annual report is due by February 1 each year and must summarize information for January to December of the previous year in a format acceptable to the Department.

[X] (if box is checked) a monthly "Wastewater Facility Operation Report..." (form 92-15-7) to the:
[X] Regional Water Engineer and/or [ ] County Health Department or Environmental Control Agency specified below

Send the **original** (top sheet) of each DMR page to:
Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway
Albany, New York 12233-3506

Phone: (518) 402-8177

Send the **first copy** (second sheet) of each DMR page to:
Department of Environmental Conservation
Regional Water Engineer, Region 1
50 Circle Road
Stony Brook, New York 11790-3409

Phone: (631) 444-0405

Send an **additional copy** of each DMR page to:
Suffolk County Department of Health Services
360 Yaphank Ave, Suite 2C
Yaphank, New York 11980

B. Monitoring and analysis shall be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

C. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

D. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

E. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

F. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

++ NO TEXT ON THIS PAGE ++

APPENDIX B

SPDES Permit NY- 0025453 (Calverton STP)

++ NO TEXT ON THIS PAGE ++

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Permits, Region 1
SUNY @ Stony Brook, 50 Circle Road, Stony Brook, NY 11790
P: (631) 444-0365 I F: (631) 444-0360
www.dec.ny.gov

September 6, 2019

Town of Riverhead
200 Howell Avenue
Riverhead, NY 11901
Attn: Michael Reichel, Superintendent

Re: NYSDEC SPDES Permit Number: 1-4730-01057/00001
SPDES Number: NY0025453

NYSDEC WSR Permit Number: 1-4730-01057/00006
Calverton Sewer District & WWTF, 200 Burman Blvd., Calverton
SPDES Permit Modification, WSR Permit – Transition to Groundwater Discharge

Dear Permittee:

Enclosed is your State Pollutant Discharge Elimination System (SPDES) permit and Wild, Scenic, and Recreational Rivers (WSR) permit.

Please read all permit conditions carefully. All permit documents must be available upon request by the Department staff and must be distributed to and understood by personnel responsible for the proper operation of the facility and compliance with the discharge limits. The Department maintains authority regarding the terms of this permit in accordance with 6 NYCRR 750. Any violations of these permit conditions constitutes a violation of the Environmental Conservation Law.

Pursuant to 621.10(2), if a permit is issued with objectionable conditions the applicant may request a hearing. This must be done within 30 days of the postmark on this letter. To request a hearing, contact the Regional Permit Administrator at the above address.

If you have any other questions regarding this permit, you may contact the Division of Environmental Permits at the above address. Please refer to the above referenced numbers when you are corresponding with this office or when you are applying to renew or modify this permit.

Any questions regarding the annual pollutant discharge elimination fee should be addressed directly to the Regulatory Fee Determination Unit at 1-518-402-9343

Sincerely,

Kevin Kispert
Environmental Analyst II

Enclosures
KAK/File
CC: NYSDEC BoEH
SPDES Permit – Distribution List

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

State Pollutant Discharge Elimination System (SPDES) DISCHARGE PERMIT

Industrial Code:	**4952**	SPDES Number:	**NY0025453**
Discharge Class (CL):	**07**	DEC Number:	**1-4730-01057/00001**
Toxic Class (TX):	**N**	Effective Date (EDP):	**October 1, 2019**
Major Drainage Basin:	**17**	Expiration Date (ExDP):	**September 30, 2029**
Sub Drainage Basin:	**02**	Modification Dates: (EDPM)	
Water Index Number:	**GW**		
Compact Area:			

This SPDES permit is issued in compliance with Title 8 of Article 17 of the Environmental Conservation Law of New York State and in compliance with the Clean Water Act, as amended, (33 U.S.C. '1251 et.seq.)(hereinafter referred to as "the Act").

PERMITTEE NAME AND ADDRESS

Name:	**Town of Riverhead**	Attention:	**Michael Reichel, Superintendent**		
Street:	**200 Howell Avenue**				
City:	**Riverhead**	State:	**NY**	Zip Code:	**11901**
Email:	**reichel@townofriverheadny.gov**	Phone:	**631-727-3069**		

is authorized to discharge from the facility described below:

FACILITY NAME AND ADDRESS

Name:	**Calverton Sewer District and WWTF**														
Location (C, T, V):	**Riverhead**							County:	**Suffolk**						
Facility Address:	**200 Burman Boulevard**														
City:	**Calverton**			State:			**NY**	Zip Code:	**11933**						
Facility Location:		Latitude:	**40**	°	**54**	'	**31**	" N	& Longitude:	**72**	°	**47**	'	**32**	" W
From Outfall No.:	**023**	at Latitude:	**40**	°	**55**	'	**11**	" N	& Longitude:	**72**	°	**46**	'	**22**	" W
into receiving waters known as:	**Long Island Groundwater**							Class:	**GA**						

and the outfalls listed on page 2 of this permit in accordance with: effluent limitations; monitoring and reporting requirements; other provisions and conditions set forth in this permit; and 6 NYCRR Part 750-1 and 750-2.

This permit and the authorization to discharge shall expire on midnight of the expiration date shown above. The permittee shall not discharge after the expiration date unless this permit has been renewed or extended pursuant to law. To be authorized to discharge beyond the expiration date, the permittee shall apply for permit renewal not less than 180 days prior to the expiration date shown above.

DISTRIBUTION:
CO BWP - Permit Coordinator
RWE
RPA
EPA Region II
NYSEFC (Class 05 & 07 only)

Permit Administrator:	Kevin Kispert, Deputy Permit Administrator		
Address:	50 Circle Road, Stony Brook, NY 11790-2356		
Signature:		Date:	09/06/2019

OUTFALL SUMMARY

Outfall	Type of Discharge	Monitoring	
001	**Treated Municipal Wastewater**	**See page 4 of this permit**	
into receiving waters known as:	**McKay Lake**		Class: **C**
Outfall	Type of Discharge	Monitoring	
023	**Treated Municipal Wastewater**	**See page 5 of this permit**	
into receiving waters known as:	**Groundwater**		Class: **GA**

PERMIT LIMITS, LEVELS AND MONITORING DEFINITIONS

OUTFALL	WASTEWATER TYPE	RECEIVING WATER	EFFECTIVE	EXPIRING
	This cell describes the type of wastewater authorized for discharge. Examples include process or sanitary wastewater, storm water, non-contact cooling water.	This cell lists classified waters of the state to which the listed outfall discharges.	The date this page starts in effect. (e.g. EDP or EDPM)	The date this page is no longer in effect. (e.g. ExDP)

PARAMETER	MINIMUM	MAXIMUM	UNITS	SAMPLE FREQ.	SAMPLE TYPE
e.g. pH, TRC, Temperature, D.O.	The minimum level that must be maintained at all instants in time.	The maximum level that may not be exceeded at any instant in time.	SU, °F, mg/l, etc.	See below	See below

PARAMETER	EFFLUENT LIMIT or CALCULATED LEVEL	COMPLIANCE LEVEL / MINIMUM LEVEL (ML)	ACTION LEVEL	UNITS	SAMPLE FREQUENCY	SAMPLE TYPE
	Limit types are defined below in Note 1. The effluent limit is developed based on the more stringent of technology-based limits, required under the Clean Water Act, or New York State water quality standards. The limit has been derived based on existing assumptions and rules. These assumptions include receiving water hardness, pH and temperature; rates of this and other discharges to the receiving stream; etc. If assumptions or rules change the limit may, after due process and modification of this permit, change.	For the purposes of compliance assessment, the permittee shall use the approved EPA analytical method with the lowest possible detection limit as promulgated under 40CFR Part 136 for the determination of the concentrations of parameters present in the sample unless otherwise specified. If a sample result is below the detection limit of the most sensitive method, compliance with the permit limit for that parameter was achieved. Monitoring results that are lower than this level must be reported, but shall not be used to determine compliance with the calculated limit. This Minimum Level (ML) can be neither lowered nor raised without a modification of this permit.	Action Levels are monitoring requirements, as defined below in Note 2, which trigger additional monitoring and permit review when exceeded.	This can include units of flow, pH, mass, temperature, or concentration. Examples include µg/l, lbs/d, etc.	Examples include Daily, 3/week, weekly, 2/month, monthly, quarterly, 2/yr and yearly. All monitoring periods (quarterly, semiannual, annual, etc.) are based upon the calendar year unless otherwise specified in this Permit.	Examples include grab, 24 hour composite and 3 grab samples collected over a 6 hour period.

Notes:

1. EFFLUENT LIMIT TYPES:
   a. DAILY DISCHARGE: The discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for the purposes of sampling. For pollutants expressed in units of mass, the 'daily discharge' is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the 'daily discharge' is calculated as the average measurement of the pollutant over the day.
   b. DAILY MAX: The highest allowable daily discharge.
   c. DAILY MIN: The lowest allowable daily discharge.
   d. MONTHLY AVG: The highest allowable average of daily discharges over a calendar month, calculated as the sum of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   e. 7 DAY ARITHMETIC MEAN (7 day average): The highest allowable average of daily discharges over a calendar week.
   f. 30 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar month, calculated as the antilog of: the sum of the log of each of the daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.
   g. 7 DAY GEOMETRIC MEAN: The highest allowable geometric mean of daily discharges over a calendar week.
   h. 12 MONTH ROLLING AVERAGE: The current monthly value of a parameter, plus the sum of the monthly values over the previous 11 months for that parameter, divided by 12.
   i. RANGE: The minimum and maximum instantaneous measurements for the reporting period must remain between the two values shown.

2. ACTION LEVELS: Routine Action Level monitoring results, if not provided for on the Discharge Monitoring Report (DMR) form, shall be appended to the DMR for the period during which the sampling was conducted. If the additional monitoring requirement is triggered as noted below, the permittee shall undertake a short-term, high-intensity monitoring program for the parameter(s). Samples identical to those required for routine monitoring purposes shall be taken on each of at least three consecutive operating and discharging days and analyzed. Results shall be expressed in terms of both concentration and mass, and shall be submitted no later than the end of the third month following the month when the additional monitoring requirement was triggered. Results may be appended to the DMR or transmitted under separate cover to the same address. If levels higher than the Action Levels are confirmed, the permit may be reopened by the Department for consideration of revised Action Levels or effluent limits. The permittee is not authorized to discharge any of the listed parameters at levels which may cause or contribute to a violation of water quality standards.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
001	All year unless otherwise noted	McKay Lake	October 1, 2019	Completion of Construction[1]

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
								Location		
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Inf.	Eff.	
Flow	Monthly Average	0.062	MGD			Continuous	Recorder		X	3
BOD_5	Monthly Average	30	mg/l	15.5	lbs/d	2/Month	24-hr. Comp.	X	X	2,3
BOD_5	7-Day Average	45	mg/l	23.3	lbs/d	2/Month	24-hr. Comp.	X	X	3
Solids, Suspended	Monthly Average	30	mg/l	15.5	lbs/d	2/Month	24-hr. Comp.	X	X	2,3
Solids, Suspended	7-Day Average	45	mg/l	23.3	lbs/d	2/Month	24-hr. Comp.	X	X	3
Solids, Settleable	Monthly Average	Monitor	ml/l			Daily	Grab		X	3
Solids, Settleable	Daily Maximum	0.3	ml/l			Daily	Grab		X	3
pH	Range	6.0 – 9.0	SU			Daily	Grab		X	3
Temperature	Monthly Average	Monitor	Deg F			Daily	Grab		X	3
Temperature	Daily Maximum	Monitor	Deg F			Daily	Grab		X	3
Effluent Disinfection required		[X] All Year		[ ] Seasonal from **May 1** to **Oct 31**						
Coliform, Fecal	30-Day Geometric Mean	200	No./ 100 ml			Weekly	Grab		X	3
Coliform, Fecal	7 Day Geometric Mean	400	No./ 100 ml			Weekly	Grab		X	3
Chlorine, Total Residual	Daily Maximum	0.25	mg/l			Daily	Grab		X	3,4

FOOTNOTES:

(1) The limitations on this page shall expire upon start-up of the 0.10 MGD facility. The start-up date for the 0.100 MGD facility will be identified in a letter from the permittee to the Regional Water Engineer at 50 Circle Road, Stony Brook, NY 11790. Start-up shall commence only after the Department's receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.
(2) and effluent shall not exceed 15 % and 15 % of influent concentration values for BOD5 & TSS respectively.
(3) Monitoring locations are shown on Page 10.
(4) See Schedule of Compliance on Page 7.

PERMIT LIMITS, LEVELS AND MONITORING

OUTFALL	LIMITATIONS APPLY:	RECEIVING WATER	EFFECTIVE	EXPIRING
023	All year unless otherwise noted	Groundwater	Completion of Construction[1]	September 30, 2029

PARAMETER	EFFLUENT LIMIT					MONITORING REQUIREMENTS				FN
	Type	Limit	Units	Limit	Units	Sample Frequency	Sample Type	Location Inf.	Location Eff.	
Flow	Monthly Average	0.10	MGD			Continuous	Meter		X	2,3
pH	Range	6.5-8.5	SU			Daily	Grab		X	2,3,4
Temperature	Daily Maximum	Monitor	Deg F			Daily	Grab		X	2,3,4
Nitrogen, Total (as N)	Daily Maximum	10	mg/L			Monthly	Grab		X	2,3,4
Kjeldahl Nitrogen, Total	Daily Maximum	Monitor	mg/L			Monthly	Grab		X	2,3,4
Dissolved Solids, Total	Daily Maximum	1,000	mg/L			1/month	Grab		X	2,3,4
Effluent Disinfection required		[ ] All Year		[X] See SPECIAL CONDITIONS						
Chlorine, Total Residual	Daily Maximum	2.0	mg/L			Daily	Grab		X	2,3,4,5

FOOTNOTES:

(1) The limitations on this page shall become effective upon start-up of the 0.10 MGD facility. The start-up date for the 0.100 MGD facility will be identified in a letter from the permittee to the Regional Water Engineer at 50 Circle Road, Stony Brook, NY 11790. Start-up shall commence only after the Department's receipt of certification from a New York State Professional Engineer that the treatment plant was constructed in accordance with the approved Engineering Reports, Plans, and Specifications.
(2) Monitoring locations are shown on Page 11.
(3) See Special Conditions for additional conditions that apply.
(4) Grab samples shall be taken during periods of normally high flow.
(5) Chlorine monitoring is only required during the period when disinfection is underway.

SPECIAL CONDITIONS

1. No Sewer extensions (connections outside the approved district) without prior DEC approval.
2. Additional Process Control and Groundwater Monitoring required, results shall be retained by permittee for three years.
3. In addition to the above requirements for Outfall 023, wastewater disinfection will be required if determined by Department of Health Services acting as the agent of NYSDEC, to be necessary for control of odors or other health purposes. Accordingly, supplies and equipment necessary to assure proper disinfection shall be kept available and operable at all times by the permittee, and tested in manner and frequency as directed by the Department of Health Services. When chlorine is used, daily monitoring of Total Residual Chlorine is required, and the daily maximum effluent limit is 2.0 mg/l.

Process Control Monitoring to be recorded on Wastewater Facility Operation Report (Form 92-15-7) and retained for a period of three years:

PARAMETER	UNITS	FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION	FOOT NOTE
Total Flow	MGD	Continuous	Meter	Effluent	1
Turbidity	mg/l	1/month	Grab	MBR Tank	1
Ammonia, as NH3 – Hach	mg/l	2/Week	Grab	Influent, Effluent	1,2
Dissolved Oxygen-probe	mg/l	Daily	Grab	MBR during aeration, anoxic and aerobic tank	1
pH	SU	Daily	Grab	See Note 3	1,3
Temperature-probe	Deg. C	Daily	Grab	Influent, Effluent	1
Visual Observation	----------	Daily	----------	Influent, Effluent, MBR Tankage	1
Nitrate & Nitrite as N – Hach	mg/l	2/Week	Grab	Influent, Effluent	1,2

Groundwater Monitoring to be reported on Discharge Monitoring Report starting at completion of construction and every third month after:

PARAMETER	UNITS	FREQUENCY	SAMPLE TYPE	SAMPLE LOCATION	FOOT NOTE
Water level above MSL	Feet	Quarterly	Measure	MW-1,-2,-3	1,4,5
Total Kjeldahl Nitrogen	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Ammonia	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Nitrate	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1, 4, 5
Nitrite	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Total Nitrogen	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5
Total Dissolved Solids	mg/l	Quarterly	Grab (Bailed)	MW-1,-2,-3	1,4,5

FOOTNOTES:

(1) Process control monitoring locations are shown on Page 11.
(2) Take one sample for Hach Kit analysis at the same time as monthly laboratory sample to enable comparison.
(3) Influent, effluent, and MBR tank.
(4) Three well casings volumes must be evacuated prior to sampling all parameters except water level.
(5) Groundwater sampling locations are shown on Page 12; MW-1: Upgradient, MW-2 & MW-3: Downgradient

SCHEDULE OF COMPLIANCE

a) The permittee shall comply with the following schedule:

<table>
<tr><th>Outfall(s)</th><th>Compliance Action</th><th>Due Date</th></tr>
<tr><td>001</td><td>Monitor and study disinfection treatment to optimize chlorine dosage to comply with Fecal Coliform limits, on Page 4 of this permit, as well as minimize Total Residual Chlorine. Submit this data to the Department. An interim Total Residual Chlorine limit will be determined and applied in a permit modification. This interim limit will be for a two-year monitoring period following the EDPM. If that period elapses and the facility is not discharging to Outfall 023, the facility will be required to comply with the final 0.25 mg/L water quality based effluent limit.
<table>
<tr><th>Parameter Affected</th><th>Interim Effluent Limit</th><th>Final Effluent Limit</th><th>Effective Date of final effluent limit</th></tr>
<tr><td>Total Residual Chlorine</td><td>Monitor Only</td><td>0.25 mg/l</td><td>EDPM + 2 Years</td></tr>
</table></td><td>EDP + 2 months</td></tr>
<tr><td>023</td><td>The permittee shall install 3 monitoring wells; one upgradient (MW-1), and two downgradient (MW-2 and MW-3). These monitoring wells are to be used for groundwater monitoring as outlined on Page 6 of this permit.

An updated process control monitoring location map, Page 12 of this permit, must be submitted to the Department showing the locations of the 3 monitoring wells after installation.</td><td>Completion of Construction</td></tr>
</table>

b) Unless noted otherwise, the above actions are one-time requirements. The permittee shall comply with the above compliance actions to the Department's satisfaction once. When this permit is administratively renewed by NYSDEC letter entitled "SPDES NOTICE/RENEWAL APPLICATION/PERMIT," the permittee is not required to repeat the submission(s) noted above. The above due dates are independent from the effective date of the permit stated in the "SPDES NOTICE/RENEWAL APPLICATION/PERMIT" letter.

c) The permittee shall submit a written notice of compliance or non-compliance with each of the above schedule dates no later than 14 days following each elapsed date, unless conditions require more immediate notice as prescribed in 6 NYCRR Part 750-1.2(a) and 750-2. All such compliance or non-compliance notification shall be sent to the locations listed under the section of this permit entitled RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS. Each notice of non-compliance shall include the following information:
   a. A short description of the non-compliance;
   b. A description of any actions taken or proposed by the permittee to comply with the elapsed schedule requirements without further delay and to limit environmental impact associated with the non-compliance;
   c. Any details which tend to explain or mitigate an instance of non-compliance; and
   d. An estimate of the date the permittee will comply with the elapsed schedule requirement and an assessment of the probability that the permittee will meet the next scheduled requirement on time.

d) The permittee shall submit copies of any document required by the above schedule of compliance to the NYSDEC Regional Water Engineer and to the Bureau of Water Permits.

Mercury Minimization Program for Low Priority POTWs

The permittee shall inspect each tributary dental facility at least once every five years to verify compliance with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. In lieu of an inspection, the permittee can accept a certification from the dental facility owner that the treatment system was properly installed and the facility complies with the wastewater treatment operation, maintenance, and notification elements of 6NYCRR Part 374.4. Prior to acceptance of new or increased tributary discharges that are industrial in nature, including hauled wastes, sample data shall be provided to the permittee for mercury content. Discharges which may exceed 500 ng/L, must receive approval from the Department prior to acceptance. A file shall be maintained containing inspection results, certifications, and other information submitted by dental offices and all other potential dischargers of mercury. This file shall be available for review by NYSDEC representatives and copies shall be provided upon request.

Note: the mercury-related requirements in this permit conform to the mercury Multiple Discharge Variance specified in NYSDEC policy *DOW 1.3.10*.

DISCHARGE NOTIFICATION REQUIREMENTS

(a) Except as provided in (c) and (g) of these Discharge Notification Act requirements, the permittee shall install and maintain identification signs at all outfalls to surface waters listed in this permit. Such signs shall be installed before initiation of any discharge.

(b) Subsequent modifications to or renewal of this permit does not reset or revise the deadline set forth in (a) above, unless a new deadline is set explicitly by such permit modification or renewal.

(c) The Discharge Notification Requirements described herein do not apply to outfalls from which the discharge is composed exclusively of storm water, or discharges to ground water.

(d) The sign(s) shall be conspicuous, legible and in as close proximity to the point of discharge as is reasonably possible while ensuring the maximum visibility from the surface water and shore. The signs shall be installed in such a manner to pose minimal hazard to navigation, bathing or other water related activities. If the public has access to the water from the land in the vicinity of the outfall, an identical sign shall be posted to be visible from the direction approaching the surface water.

The signs shall have **minimum** dimensions of eighteen inches by twenty four inches (18" x 24") and shall have white letters on a green background and contain the following information:

N.Y.S. PERMITTED DISCHARGE POINT

SPDES PERMIT No.: NY_____

OUTFALL No. :____

For information about this permitted discharge contact:

Permittee Name: _____

Permittee Contact: _____

Permittee Phone: ( ) - ### - ####

OR:

NYSDEC Division of Water Regional Office Address:

NYSDEC Division of Water Regional Phone: ( ) - ### -####

(e) For each discharge required to have a sign in accordance with a), the permittee shall, concurrent with the installation of the sign, provide a repository of copies of the Discharge Monitoring Reports (DMRs), as required by the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of this permit. This repository shall be open to the public, at a minimum, during normal daytime business hours. The repository may be at the business office repository of the permittee or at an off-premises location of its choice (such location shall be the village, town, city or county clerk's office, the local library or other location as approved by the Department). In accordance with the **RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS** page of your permit, each DMR shall be maintained on record for a period of five years

(f) The permittee shall periodically inspect the outfall identification sign(s) in order to ensure they are maintained, are still visible, and contain information that is current and factually correct. Signs that are damaged or incorrect shall be replaced within 3 months of inspection.

DISCHARGE NOTIFICATION REQUIREMENTS (continued)

(g) All requirements of the Discharge Notification Act, including public repository requirements, are waived for any outfall meeting any of the following circumstances, provided Department notification is made in accordance with (h) below:

(i) such sign would be inconsistent with any other state or federal statute;

(ii) the Discharge Notification Requirements contained herein would require that such sign could only be located in an area that is damaged by ice or flooding due to a one-year storm or storms of less severity;

(iii) instances in which the outfall to the receiving water is located on private or government property which is restricted to the public through fencing, patrolling, or other control mechanisms. Property which is posted only, without additional control mechanisms, does not qualify for this provision;

(iv) instances where the outfall pipe or channel discharges to another outfall pipe or channel, before discharge to a receiving water; or

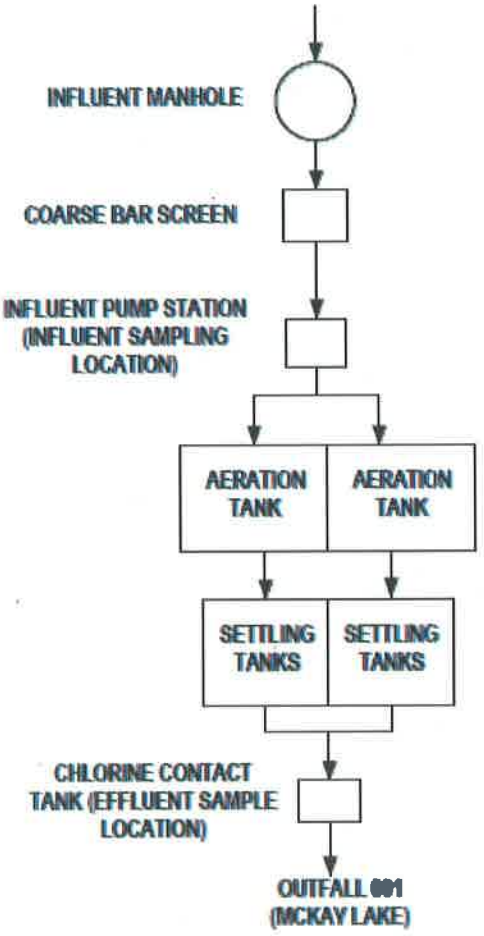
(v) instances in which the discharge from the outfall is located in the receiving water, two-hundred or more feet from the shoreline of the receiving water.

(h) If the permittee believes that any outfall which discharges wastewater from the permitted facility meets any of the waiver criteria listed in (g) above, notification (form enclosed) must be made to the Department's Bureau of Water Permits, 625 Broadway, Albany, N.Y. 12233-3505, of such fact, and, provided there is no objection by the Department, a sign and DMR repository for the involved outfall(s) are not required. This notification must include the facility's name, address, telephone number, contact, permit number, outfall number(s), and reason why such outfall(s) is waived from the requirements of discharge notification. The Department may evaluate the applicability of a waiver at any time, and take appropriate measures to assure that the ECL and associated regulations are complied with.

MONITORING LOCATIONS – Surface Water

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

FROM SEWAGE COLLECTION SYSTEM



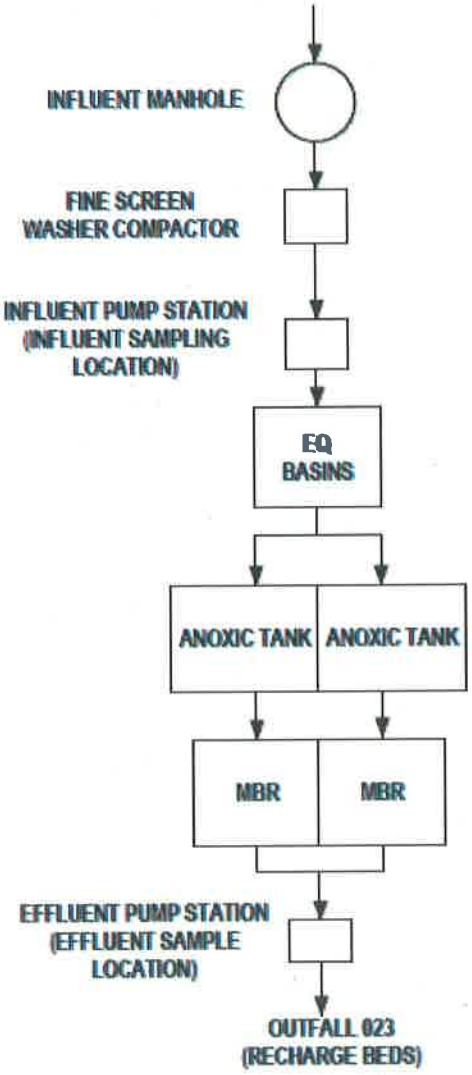
EFFLUENT SAMPLING POINTS:
LOCATED AT THE END OF THE CHLORINE CONTACT TANK

INFLUENT SAMPLING POINT:
LOCATED WITHIN THE WET WELL OF INFLUENT PUMP STATION

MONITORING LOCATIONS – Groundwater

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

FROM SEWAGE COLLECTION SYSTEM



EFFLUENT SAMPLING POINTS:

LOCATED WITHIN THE WET WELL OF EFFLUENT PUMP STATION

INFLUENT SAMPLING POINT:

LOCATED WITHIN THE WET WELL OF INFLUENT PUMP STATION

PROCESS CONTROL MONITORING LOCATIONS

The permittee shall take samples and measurements, to comply with the monitoring requirements specified in this permit, at the locations(s) specified below:

GENERAL REQUIREMENTS

A. The regulations in 6 NYCRR Part 750 are hereby incorporated by reference and the conditions are enforceable requirements under this permit. The permittee shall comply with all requirements set forth in this permit and with all the applicable requirements of 6 NYCRR Part 750 incorporated into this permit by reference, including but not limited to the regulations in the following paragraphs:

B. General Conditions

1.	Duty to comply	6NYCRR 750-2.1(e) & 2.4
2.	Duty to reapply	6NYCRR 750-1.16(a)
3.	Need to halt or reduce activity not a defense	6NYCRR 750-2.1(g)
4.	Duty to mitigate	6NYCRR 750-2.7(f)
5.	Permit actions	6NYCRR 750-1.1(c), 1.18, 1.20 & 2.1(h)
6.	Property rights	6NYCRR 750-2.2(b)
7.	Duty to provide information	6NYCRR 750-2.1(i)
8.	Inspection and entry	6NYCRR 750-2.1(a) & 2.3

C. Operation and Maintenance

1.	Proper Operation & Maintenance	6NYCRR 750-2.8
2.	Bypass	6NYCRR 750-1.2(a)(17), 2.8(b) & 2.7
3.	Upset	6NYCRR 750-1.2(a)(94) & 2.8(c)

D. Monitoring and Records

1.	Monitoring and records	6NYCRR 750-2.5(a)(2), 2.5(a)(6), 2.5(c)(1), 2.5(c)(2), & 2.5(d)
2.	Signatory requirements	6NYCRR 750-1.8 & 2.5(b)

E. Reporting Requirements

1.	Reporting requirements for POTWs	6NYCRR 750-2.5, 2.7 & 1.17
2.	Anticipated noncompliance	6NYCRR 750-2.7(a)
3.	Transfers	6NYCRR 750-1.17
4.	Monitoring reports	6NYCRR 750-2.5(e)
5.	Compliance schedules	6NYCRR 750-1.14(d)
6.	24-hour reporting	6NYCRR 750-2.7(c) & (d)
7.	Other noncompliance	6NYCRR 750-2.7(e)
8.	Other information	6NYCRR 750-2.1(f)
9.	Additional conditions applicable to a POTW	6NYCRR 750-2.9

F. Planned Changes

1. The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

   a. The alteration or addition to the permitted facility may meet of the criteria for determining whether facility is a new source in 40 CFR §122.29(b); or
   b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, or to notification requirements under 40 CFR §122.42(a)(1); or
   c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

In addition to the Department, the permittee shall submit a copy of this notice to the United States Environmental Protection Agency at the following address: U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866.

GENERAL REQUIREMENTS (continued)

G. Notification Requirement for POTWs

1. All POTWs shall provide adequate notice to the Department and the USEPA of the following:
   a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of CWA if it were directly discharging those pollutants; or
   b. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
   c. For the purposes of this paragraph, adequate notice shall include information on:
      i. the quality and quantity of effluent introduced into the POTW, and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

POTWs shall submit a copy of this notice to the United States Environmental Protection Agency, at the following address:
U.S. EPA Region 2, Clean Water Regulatory Branch, 290 Broadway, 24th Floor, New York, NY 10007-1866

H. Sludge Management

The permittee shall comply with all applicable requirements of 6 NYCRR Part 360.

I. SPDES Permit Program Fee

The permittee shall pay to the Department an annual SPDES permit program fee within 30 days of the date of the first invoice, unless otherwise directed by the Department, and shall comply with all applicable requirements of ECL 72-0602 and 6 NYCRR Parts 480, 481 and 485. Note that if there is inconsistency between the fees specified in ECL 72-0602 and 6 NYCRR Part 485, the ECL 72-0602 fees govern.

J. Water Treatment Chemicals (WTCs)

New or increased use and discharge of a WTC requires prior Department review and authorization. At a minimum, the permittee must notify the Department in writing of its intent to change WTC use by submitting a completed *WTC Notification Form* for each proposed WTC. The Department will review that submittal and determine if a SPDES permit modification is necessary or whether WTC review and authorization may proceed outside of the formal permit administrative process. The majority of WTC authorizations do not require SPDES permit modification. In any event, use and discharge of a WTC shall not proceed without prior authorization from the Department. Examples of WTCs include biocides, coagulants, conditioners, corrosion inhibitors, defoamers, deposit control agents, flocculants, scale inhibitors, sequestrants, and settling aids.

1. WTC use shall not exceed the rate explicitly authorized by this permit or otherwise authorized in writing by the Department.
2. The permittee shall maintain a logbook of all WTC use, noting for each WTC the date, time, exact location, and amount of each dosage, and, the name of the individual applying or measuring the chemical. The logbook must also document that adequate process controls are in place to ensure that excessive levels of WTCs are not used.
3. The permittee shall submit a completed WTC Annual Report Form each year that they use and discharge WTCs. This form shall be attached to either the December DMR or the annual monitoring report required below.

The *WTC Notification Form and WTC Annual Report Form* are available from the Department's website at:
http://www.dec.ny.gov/permits/93245.html

RECORDING, REPORTING AND ADDITIONAL MONITORING REQUIREMENTS

A. The monitoring information required by this permit shall be retained for a period of at least five years from the date of the sampling for subsequent inspection by the Department or its designated agent.

B. The monitoring information required by this permit shall be summarized and reported by submitting:

1. Discharge Monitoring Reports (DMRs): Completed DMR forms shall be submitted for each__month reporting period in accordance with the DMR Manual available on Department's website.

DMRs must be submitted electronically using the electronic reporting tool (NetDMR) specified by NYSDEC. Instructions on the use of NetDMR are available in the DMR Manual. Attach the monthly "Wastewater Facility Operation Report" (form 92-15-7) and any required DMR attachments electronically to the DMR.

To submit via hard copy: **Hard copy paper DMRs will only be accepted by the Department if a waiver from the electronic submittal requirements has been granted by DEC to the facility**. Attach a hard copy of the monthly "Wastewater Facility Operation Report" (form 92-15-7) to the DMR. The Facility Operation report and DMRs shall be sent to:

Department of Environmental Conservation
Division of Water, Bureau of Water Compliance
625 Broadway, Albany, New York 12233-3506
Phone: (518) 402-8177

The first monitoring period begins on the effective date of this permit, and, unless otherwise required, the reports are due no later than the 28th day of the month following the end of each monitoring period.

C. Bypass and Sewage Pollutant Right to Know Reporting: In accordance with the Sewage Pollutant Right to Know Act (ECL § 17-0826-a), Publicly Owned Treatment Works (POTWs) are required to notify DEC and Department of Health within two hours of discovery of an untreated or partially treated sewage discharge and to notify the public and adjoining municipalities within four hours of discovery. Information regarding reporting and other requirements of this program may be found on the Department's website. In addition, POTWs are required to provide a five-day incident report and supplemental information to the DEC in accordance with Part 750-2.7(d) by utilizing the Department's Non-Compliance Report Form unless waived by DEC on a case-by-case basis.

D. Monitoring and analysis shall be conducted using sufficiently sensitive test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

E. More frequent monitoring of the discharge(s), monitoring point(s), or waters of the State than required by the permit, where analysis is performed by a certified laboratory or where such analysis is not required to be performed by a certified laboratory, shall be included in the calculations and recording of the data on the corresponding DMRs.

F. Calculations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

G. Unless otherwise specified, all information recorded on the DMRs shall be based upon measurements and sampling carried out during the most recently completed reporting period.

H. Any laboratory test or sample analysis required by this permit for which the State Commissioner of Health issues certificates of approval pursuant to section 502 of the Public Health Law shall be conducted by a laboratory which has been issued a certificate of approval. Inquiries regarding laboratory certification should be directed to the New York State Department of Health, Environmental Laboratory Accreditation Program.

APPENDIX C

Thermal Process Systems – ThermAer Cost Proposal

++ NO TEXT ON THIS PAGE ++

Thermal Process Systems

December 6, 2019

Timothy M. Nordberg
H2M architects + engineers
538 Broad Hollow Road
4th Floor East
Melville, NY 11747

Thermal Process Systems (TPS) is pleased to offer the following solids handling proposal for our ThermAer process. TPS supplies only quality equipment and state-of-the-art technology in its patented ThermAer process. Please find attached the following:

- This Letter of Transmittal;
- ThermAer™ Budget Proposal;
- ThermAer™ Applications Reports;
- Thermal Process Systems' ThermAer™ Brochure;
- Thermal Process Systems' BiofiltAer™ Biofiltration Brochure; and
- Thermal Process Systems' Terms and Conditions.

We look forward to working with you on this project. Please feel free to contact me with questions and/or comments at (315) 440-9750 or by email ehaslam@thermalprocess.com.

Sincerely,

Eric Haslam

Eric Haslam, P.E.
Cc: Cinar Akman, G.A. Fleet Associates, Inc.

Thermal Process Systems

Thermal Process Systems is pleased to offer the following budgetary proposal and preliminary scope of supply for your solids handling and processing project. The following proposal explains the fundamental theory behind Thermal Process Systems' Class 'A' thermophilic aerobic digestor and the components for the successful operation of an autothermal thermophilic aerobic digestion (ATAD) process.

The Thermal Process Systems' **ThermAer™** will provide your project with a process capable of meeting the solids' aeration demands as well as provide a cost-effective process for substantial volume reduction and a Class 'A' virtually pathogen free, the second step of this process is treatment in the Storage Nitrification Denitrification Reactor (SNDR) which further conditions the Class A biosolids into a odor free stabilized material.

The ThermAer Process provides state-of-the-art digestion to the existing plant operations (see figure 1). This preliminary design incorporates the use of existing concrete tanks for the ThermAer digester system. The patented **ThermAer™** system proposed here includes a process system capable of treating primary and waste activated sludge material thickened to an average of ~6% total solids at the average design load to the ThermAer reactor.

Figure 1.Retrofit Construction of ThermAer Tank System, Marshall, MN

The SNDR reactor has the ability to nitrify and also denitrify the ThermAer solids prior to dewatering and/or land application operations. The addition of this aerated SNDR system is an important point to consider as it provides for additional storage prior to final dewatering activities. Tanks require covers to retain heat and control emissions.

The following **ThermAer™** pricing includes the patented **ThermAer™** system, including jet aeration headers, jet motive pumps, blowers, foam control systems, process controls and control logic, and in-basin piping to operate the **ThermAer™** process reactor and the SNDR. This type of solids treatment process is very stable and requires only one actual process tank to complete the entire reaction (Reference Technical Papers, www.ThermalProcess.com). Accordingly, we have developed an operation and cost scenario that has been tailored to the facility's specific needs and provides for maximum flexibility.

Our design calculations are based upon the biological solids specific oxygen requirements. The 'gassing rate' (air/liquid ratio) in the jet system is the only parameter that may change drastically, and so this makes this particular digestion system even more operationally attractive given the complexities and uncertainties of many WTFs. The **ThermAer™** system requires a minimum of ~3.0% total solids but can easily process up to ~7% TS (2.5% to 7% VS). Our initial design calculations are based on the average month design loading of organic sludge solids at about 5% TS. Aeration is sized at the corresponding loading for operation on a 7- day per week loading schedule. TPS has several WWTPs operating under this type of design scenario. The **ThermAer™** aeration system is designed to meet 100% of the daily oxygen uptake requirement in the reactor.

The TPS process design incorporates jet aeration systems (figure 2). The ability to adjust both the liquid flow rate and air flow rate independently allows for the flexibility in this design to operate the system at a given temperature based on the actual solids loadings. Furthermore, this aeration system is designed to operate continuously throughout the daily dynamic process cycle. This digestion process has three basic steps in the process operation: waste, feed, and react. As mentioned previously, the cycle is set up to operate as a reverse draw, batch feed, and isolate and is never shut down, especially during the most critical time, the feeding (highest demand) period. The cycle begins by wasting the estimated daily feed volume from the ThermAer tank to the SNDR just prior to scheduled feeding, (approximately 1/12 (equal to the HRT in the system) the total volume for this (liquid burn reactor).

Figure 2. Interior of new ThermAer reactor with Jet Aeration Header, Blacksburg, VA

Wasting should occur in a fairly rapid fashion directly before the feed cycle begins to maximize the time under aeration during the subsequent reaction/isolation cycle. Feed material can be pumped directly into the reactor during the fill cycle as the waste solids are pumped from a holding tank (by others).

The pump and the blowers are equipped with variable frequency drives to provide the ability to vary the oxygen delivery capacity; to increase flows during high oxygen demand periods and also to decrease flows during low oxygen demand periods and thus conserve energy. This is an extremely important design consideration for this project. The daily cycles have large swings in the oxygen uptake requirement. Process control is based upon an oxidation-reduction potential (ORP) probe signal. This feature, along with the specially designed oxygen delivery system, offers the solids processing operation the ability to meet the high uptake demands that occur during the feed cycles and initial reaction phases and lower oxygen demands during the later reaction, pathogen destruction portion, of the cycle. In addition, this function can aid in the control of the reactors operating temperature throughout the process. This is accomplished by either conserving or wasting heat with the blower airflow rate. Evaporative and convective heat losses are the main method of heat control after attaining the appropriate temperature level from the volatile solids oxidation process. The ability to vary the liquid recycle rate and airflow delivery independently, in addition to the retention time provides the most effective method of reactor temperature control while maintaining optimum process metabolic conversion. The **ThermAer™** process is protected under US Patent Number 5,948,261. This installation is considered a single use license agreement.

TPS has designed this system as a semi-automated process, however, it can easily be operated as a completely automated process or manually. As such, a PLC processor package is included along with a PanelView™ operator interface touch screen. Outputs are provided to tie this local control system into an existing or proposed processor elsewhere in the plant. The instrumentation necessary to properly monitor the process is included and directed into the PLC for the convenience of the operations personnel. The primary function of the processor is to control the reactor mixing intensity and aeration delivery rate. This is accomplished by receiving the primary signal from an ORP probe mounted on the pump suction piping and 'fine-tuning' with secondary signals. The ORP signal (see figure 3) is read by the PLC and then appropriate settings are sent to the pump and blower VFDs and ultimately the pumps and blowers. During the feed cycle, the oxygen demand will increase. As oxygen demand increases, the oxidation-reduction potential decreases.

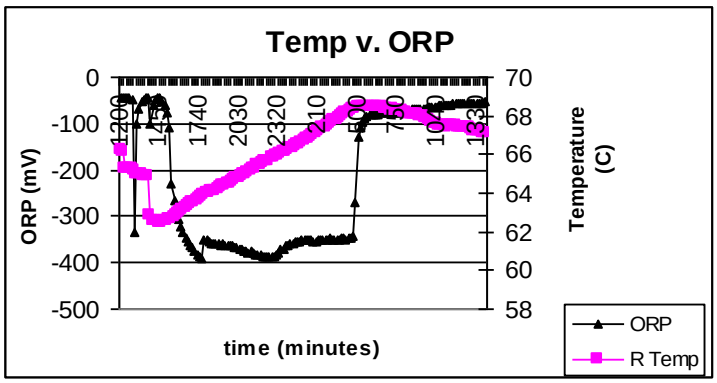


Figure 3. Actual temperature and ORP Response Curve Data (24 hr period)

This is read as a negative millivolt (electrical potential) value when the oxygen demand is not being met by the oxygen delivery system. The aeration system is designed with a maximum and a minimum setting. The maximum setting is based upon the highest requirement of oxygen uptake anticipated during the feed cycle. The purpose of this setting is to minimize the depth of the ORP dip as well as minimize the length of time the ORP signal remains at a low level, i.e., the systems' aerobic nature is maximized. The minimum setting is based upon the turn down capabilities of the process equipment and minimum design mixing intensity. Optimization of this process maximizes aerobic destruction efficiency and minimizes odor potential while minimizing utility electrical costs.

Oxygen demand is based upon the amount of soluble COD available to the microbial community as a food substrate. Therefore, process stability is at its highest when the feed cycle is extended over a relatively long period. The process is designed to be self-regulating and therefore is adaptable to several feed cycle protocols providing the instantaneous uptake demand does not exceed the maximum capability of the aeration equipment. Secondary signals are received from temperature probes mounted near the ORP probe and from our proprietary foam control monitoring system. Liquid and air-flows are controlled independently to sustain optimum reactor performance. This portion of the control process is patented with the U.S. Patent Office number 6,203,701.

The calculated oxygen requirement is based upon 60% VS destruction rate (mass balance) for secondary solids. The actual destruction may vary. The aeration system is designed with positive displacement blowers for the air delivery system. Positive displacement blowers have been selected because of their ability to operate with variable backpressure created by changing liquid depths and reactor temperature. The displacement of airflow is a direct correlation to blower rpm. The blower selected for this application will operate at ≈90% of maximum rpm at the design airflow. This design point offers a high degree of flexibility to turn the blower rpm up or down. Therefore, the system has the inherent capability of increasing O_2 delivery during unexpected high COD feed concentrations. An unusually high uptake or demand is detected by a low ORP reading and is met by increasing pump and blower speeds above the anticipated requirement. It also has the capability to decrease pump and blower speeds for energy and temperature conservation during periods of low solids feeding, unattended weekends, or inactivity.

A hydraulic foam control system is also included as part of our package. The foam layer is the upper reactor's insulation blanket. Foam suppression nozzles connected to a side stream off the jet pump supply the energy source. The pump is designed to operate at sufficient volume and pressure to recycle reactor contents which primary function is breaking down the foam. The foam bubbles are ruptured by the mixing intensity of the nozzle and return SplashCone™ unit. The system is operated when required and controlled by the foam level radar transmitter in the top of the reactor.

The SNDR is cooled and operated with 11 day HRT and below ~95°F to facilitate the introduction of a mesophilic culture and nitrification prior to dewatering and land application activities. The remaining existing tank can serve as a wide spot in the line, allowing for smaller dewatering operations as the material is either removed slowly each day, or campaign dewatered on daily or weekly batch runs. Well-digested biosolids release a portion of the entrained water within the cell structure in the reactor. Therefore, digested material has the ability to release a higher percentage of free water during dewatering. These high temperature processes denature and consume exopolymeric substances (EPS), a form of protein. These EPSs can bind water, up to 5 grams H_2O/gram EPS. As such, TPS **ThermAer™** units typically experience an increase of approximately 25-30% in cake solids as compared to undigested or classical aerobically digested WAS, depending on downstream unit processes. The increased cake solids in conjunction with the high TS destruction rate have a significant impact on the economics of this project. The combination of reducing the mass and increasing the cake solids will decrease the overall amount of material necessary to store and process in all downstream unit operations, material handling, and ultimately removal from site, typical volumetric reductions for dewatered materials result in fewer trucks out the gate reducing transportation costs significantly.

The two-stage **BiofiltAer™** odor control system is described below (figure 4). The initial portion of the odor control system includes the SNDR headspace for cooling/ammonia scrubbing using the recycled biosolid material. This unit serves two major functions for this application. Its primary function is to cool the hot air to assure conditions within the biofiltration media are conducive to mesophilic biological activity. Its secondary function is to effectively remove a high percentage of the ammonia and other soluble compounds contained in the off-gas (an indication of cell breakdown). Ammonia is water-soluble and easily removed with a properly designed scrubber unit. The typical design off-gas, concentration to the SNDR headspace is 1,200 ppm. However, values may range from 500 to 1,500 ppm, throughout the digestion process. Design ammonia feed to the biofilter portion of the gas treatment system is less than 100 ppmv. As such, the SNDR design is based upon 70-80% ammonia removal and 95-100°F exit temperature to assure the proper temperature and nitrification-loading rate is introduced to a second stage biofilter.

Figure 4. 15,000 SCFM Biofiltration Unit, Middletown, Ohio

The second stage of the **BiofiltAer™** would typically be installed within a concrete containment area and is used to house the biofilter media. The biofilter media used for this application is unique and different from many other biofilter operations. The media is used to grow and sustain a fixed film mesophilic aerobic biological process. The process design is based upon proven technology with a specific set of criteria. The purpose of the process design is to allow naturally occurring bacteria an environmental condition that is sufficient to break down the influent constituents and biologically remove odorous organic compounds. The critical design criteria are influent constituents and concentration, airflow distribution, temperature, humidity, residence time and media pH. Airflow distribution is accomplished by means of reducing the influent velocity and introducing the airflow into an open plenum providing even distribution across the media bed. Residence time in the bed is selected by using the highest concentration of the least soluble compound. The ammonia scrubber controls saturation and air temperature.

Unlike synthetic media based systems, the TPS natural media based system requires little or no additional nutrients (N, P, K), micronutrients (Mn, S, Se), or buffering chemicals which add to the annual operation cost and complexity. Additionally, periodic loss of the emission stream does not result in a significant loss of biomass because of its backup food source supply contained within the media. Furthermore, once the foul airstream is reintroduced, provided it is properly humidified, there is little if any additional re-acclimation time required. Washing the bed with plant service water on a periodic basis aids in the control of media pH. Overall system design is based upon removing a minimum of 95% of the influent constituents. Thermal Process Systems not only designs its own systems, but is often requested to design and install its biofilter system on competitor's ATAD systems and other failed chemical and biological systems. The initial design includes only the airstream from the ThermAer system, but can be increased to include off-gas components from storage and dewatering operations.

Benefits of the ThermAer Unit:

- Class 'A' as a liquid or solid material,
- Odor free product for land application programs,
- Continued re-seeding of aeration basin with nitrifiers and denitrifiers, (after dewatering)
- Ability to handle septage and grease,
- No odors from process,
- Little operator attention is required,
- Can be integrated into almost any design scheme with existing tankage,
- Substantial volume reduction,
- Nutrient (N and P) removal from the return stream and
- Class 'A' process at Class 'B' price.

Thermal Process Systems provides process and design engineering and design support to the design engineer. Technical instructions for the ThermAer unit, start-up, as well as, operation and maintenance are also included. Thermal Process Systems' personnel will be there every step of the way to ensure a smooth transition to the **ThermAer™** process operation, from initial training and information sessions, access to design data, assistance in permitting, equipment shakedown, startup, operation, and trouble shooting.

Provide ThermAer™ treatment for Class A solids

Proposed design daily loading of 6,000 lbs/day of sludge material loaded on a 7 day work week.

ThermAer Package

Sludge Type	
WAS	6,000 lbs/day average design 7-day/week
Number of ThermAer Reactors	1
Number of SNDR Reactors	1
%TS Average	~6.0%
%TS Range	4 - 7%
%VS	75%

ThermAer Reactor Sizing

One existing concrete tank– 39 ft. Ø x 22 ft. deep, with a proposed SWD of ~17 ft. (Modifications by contractor)

One (1) ThermAer Reactor complete with:

1) One (1) 100 HP, 54-20 ThermAer jet motive pump.
2) Three (3) Foam control SplashCone™ with assemblies.
3) One (1) in-basin FRP piping for the ThermAer system including the 16" liquid and 8" air jet aeration system header with 10 nozzles, pipe supports, connection hardware and anchor bolts for this piping.
4) One (1) Radar foam level sensor.
5) One (1) ORP probe and analyzer with temperature readout.
6) One (1) Vacuum gauge sensor.
7) One (1) Liquid level sensor with local readout.
8) One (1) FRP Tank Cover.

SNDR Reactor Sizing

One existing concrete tank– 40 ft. Ø x 19 ft. deep, with a proposed SWD of ~14 ft. (Modifications by contractor)

One (1) SNDR Reactor complete with:

1) One (1) 50 HP, 52-14 SNDR jet motive pump.
2) Two (2) Foam control SplashCone™ with assemblies.
3) One (1) in-basin FRP piping for the SNDR system including the 14" liquid and 8" air jet aeration system header with 8 nozzles, pipe supports, connection hardware and anchor bolts for this piping.
4) One (1) Radar foam level sensor.
5) One (1) ORP/pH probe and analyzer with temperature readout.
6) One (1) Vacuum gauge sensor.
7) One (1) Liquid level sensor with local readout.

Additional Equipment

1) One (1) 3" Magnetic flow meter and transmitter for feed control and monitoring.
2) One (1) 4" Magnetic flow meter and transmitter for intra-process control and monitoring.
3) Three (3) 15 HP, Transfer Pumps.
4) Three (3) 4" Actuated valves.
5) Three (3) 6" Actuated valves.
6) Two (2) 1" Blower control valves.
7) Two (2) Air flow/pressure Instrument.
8) Three (3) Blower V-Belt Drive Replacement.
9) One (1) Heat Exchanger.
10) One (1) Pre-wired control panel complete with PLC, and system programming.
11) One (1) Battery backup system.

Included Spare Parts

1) One (1) ORP/pH Probe.
2) One (1) Blower Filter.
3) Four (4) Spare Belts one (1) set per pump/blower size.

BiofiltAer Odor Control Unit

One existing concrete Biofilter tank – 30 ft. Ø x 16 ft. deep (By contractor)

One (1) Biofilters each complete with:

1) One (1) 15 HP 5,000 SCFM @ 9" WC Fan.
2) One (1) Biofilter Cover.
3) One (1) Lot, Biofilter plenum for even air flow distribution.
4) One (1) Lot, Biofilter media.
5) One (1) Secondary Humidification.
6) One (1) Humidification Panel.
7) Two (2) RTD temperature sensor.
8) One (1) Biofilter instrument cabinet.

Electrical Package MCC/VFDs

MCC mounting arrangement with Allen Bradley 6 pulse VFDs.

1) One (1) ThermAer Jet Motive Pumps 100 HP VFD.
2) One (1) SNDR Jet Motive Pump 50 HP VFD.
3) Three (3) Transfer Pumps 15 HP VFD.
4) One (1) Off Gas Fan 15 HP VFD.
5) One (1) 120/240 VAC Lighting Panel w/ 10 – 20 Amp Breakers.
6) One (1) Control Panel Power Monitor.
7) One (1) Control Panel Transformer.
8) One (1) Main Disconnect.

ThermAer™ Base Proposal Package Pricing **$1,939,847.00 US Dollars**

Start-up services and O&M manuals are included in the above listed price. Tank construction, modification, covers, equipment installation, and electrical service to the facility control room are assumed to be provided by the general contractor. As stated above, we have included the **ThermAer**™ patented facility and hardware and patented control logic system for the ThermAer reactors and the SNDR as well as the odor control unit. Copies of ThermAer Applications Reports, the **ThermAer**™ brochure, and TPS Terms and Conditions are also included in the following sections of this package. This is a budget estimate, based on 'normally' encountered conditions.

Notes

1) Performance test labor, test equipment and laboratory services are to be Contractor or Owner supplied.
2) Purchased equipment such as electric motors, pumps, blowers, valves, gear reducers, instrumentation, etc. will be furnished with manufacturer's standard finish.
3) Prepaid truck freight to the job site is included.
4) These prices are correct for the next 120 days.
5) Price quoted is exclusive of any Local, State or Federal taxes.

Work and material not included

1) The Contractor shall provide the necessary pump, fan and blower pads, anchor bolts and leveling required for proper setting of all equipment associated with the ThermAer reactor(s), and SNDR.
2) The Contractor shall supply all connections, sample taps, drains, interconnecting spool pieces, and miscellaneous 'small' valves for each pump, blower and fan as shown on drawings.
3) The Contractor shall supply the seal water supply pipe, seal arrangements, pressure regulators, and flow control, drain and accessories for the ThermAer(s), SNDR, and foam control pumps, and coatings (if required by the Engineer).
4) The Contractor shall supply all tank penetrations,
5) The Contractor shall supply all covers for the ThermAer(s) as shown on the drawings.
6) The Contractor shall supply all the tank cover penetrations, flanges, seals, hatches and man ways as shown on the drawings.
7) The Contractor shall supply interconnecting bolts, gaskets, welds, and other miscellaneous fasteners.
8) The Contractor shall supply a communication cable from the ThermAer control panel to the VFDs.
9) The Contractor shall supply all conduits and interconnecting electrical wire for all motors, instruments, and controls.
10) The Contractor shall supply field welds for the in-basin and out-of-basin stainless steel supports associated with the liquid and air headers provided by the ThermAer supplier.
11) The Contractor shall supply all miscellaneous plant service water supply piping.
12) The Contractor shall supply any field installation including delivery point rigging, offloading and storage.
13) The Contractor shall supply all penetrations, nipples, and mounting accessories for field installed instruments and probes.
14) The Contractor shall supply any such items but not limited to as; structural steel, platforms, walkways, ladders, guards, handrails, gratings, supports, piping, valves, weirs, flexible connections, anchor bolts, starters, panel boards, field painting, insulation, or electrical work or material other than that specifically mentioned in the offering which may be required by site specific conditions, federal, state or local requirements.

Field Assembly, Erection, Installation
All equipment will be delivered as fully assembled as possible. When certain items must be delivered partially disassembled because of shipping limitations or other special conditions, field assembly will be the responsibility of the customer. This will normally consist of joining sections by mechanical means such as with bolts, nuts and screws. Equipment installation is the responsibility of the others.

Site Services
TPS shall furnish the services of a technician for a period of approximately twelve (12) days to be covered in four (4) trips to the job site to check the installation, supervise the start-up, supervise performance testing as required by the specifications, and provide operator instruction for the items included in our scope of supply. Service time noted above includes follow-up services for system controls required by the specifications. Additional service is available at our portal to portal per diem rate in effect at the time of service delivery, plus air fare. The current per diem supervision rate is Seven Hundred Fifty dollars ($750.00) plus travel.

Engineering Submittals
Drawings for approval and certified specifications will be submitted within eight-ten (8-10) weeks after date of receipt of acceptable purchase order.

Shipment
Shipment will be made thirty (30) weeks after receipt by ***TPS*** of written approved Engineering Submittal.

Installation, Operation and Maintenance Manuals
Operation and Maintenance Manuals will be provided per specification.

Equipment Warranty
See “Guarantee" in our "Terms and Conditions".

Patents
TPS owns the exclusive rights to Patents 5,948,261; 6,168,717; 6,203,701 and 6,514,411. This offering is considered a single use license agreement.

Validity of Quotation
Prices are valid for one hundred twenty (120) days from date of quotation.

Terms of Payment
Net thirty (30) days from date of invoice.

Conditions of Sale
See attached Thermal Process Systems "Terms and Conditions," which are hereby made part of this quotation.

****

TPS looks forward to working with the **WWTP** staff on this project. If you have any questions regarding this proposal, please do not hesitate to contact Thermal Process Systems or our local representative.

Eric Haslam, P.E. Thermal Process Systems 627 East 110th Ave Crown Point, IN 46307 ehaslam@thermalprocess.com (315) 440-9750	Cinar Akman G.A. Fleet Associates, Inc. 6 International Drive Rye Brook, NY 10573 cakman@gafleet.com (914) 381-7939

APPENDIX D

Komline Sanderson – Heat Dryer Cost Proposal

++ NO TEXT ON THIS PAGE ++

Komline-Sanderson
12 Holland Ave.
Peapack, NJ 07977-0257
www.komline.com
(908) 234-1000

December 9, 2019

Mr. Timothy M. Nordberg, P.E.
H2M Architects + Engineers
538 Broad Hollow Rd
4th Floor East
Melville, NY 11747

Ref: Riverhead, NY
Municipal Biosolids Dryer
K-S Project TPG-7894

Dear Sir,

Thank you for your continued interest in Komline-Sanderson's drying system for the municipal biosolids. Per your recent email of December 5, 2019 please find the requested pricing below.

Wet Cake Hopper

One (1) storage hopper constructed from carbon steel will be provided to store the dewatered cake and meter it to the dryer. The "water filled" capacity of the hopper will be approximately 30 yd^3. The client's screw or belt conveyor will feed the storage hopper.

The hopper is covered to reduce odorous emissions into the building. A hopper vent is provided to prevent a buildup of methane (or H2S) in the storage hopper. The hopper will include one (1) access panel bolted to the sidewall and one (1) inspection port in the top cover. The hopper is equipped with a level transmitter to monitor the cake volume in the hopper as well as low and high level switches.

The hopper has sloped sides down to the live bottom screws which are mounted in a stainless steel trough. Carbon steel support legs are provided to raise the hopper so that the feed pump(s) can be mounted under it. A discharge flange connection will be provided for each dryer feed pump.

The hopper is provided with two (2) 5 hp bottom screws. TEFC inverter duty motors and gear reducers power the bottom screws. Flanged bearings and packed stuffing boxes are used.

The budget estimate for the 30 cubic yard hopper is ..... $182,000 USD

The budget estimate for a 20 cubic yard hopper is ..... $168,000 USD

Wet Cake Feed Pump

A progressive cavity pump with wetted parts fabricated from ductile iron and elastomers will be provided to transport dewatered cake from the storage hopper to the dryer. The pump is designed to transport dewatered cake at rates up to 8 gpm. The pump will include an open throat, Buna (or equal)

stator, and tool steel rotor with hard surfacing. A Class 2 reducer, 15 hp TEFC inverter duty motor, coupling, and guard will be provided.

A glycerin filled 6" pressure ring with pressure transmitter by Onyx or equal is provided at the discharge of each pump to monitor the pump discharge pressure.

A VFD is used to control the pumping rate to the dryer. As a result, the same pump can be used for both the 8W and 9W. Only the gear reducer may be different. The pump will be a Moyno, Seepex (or equal).

The budget estimate for a single wet cake pump ..... $38,000 USD

The budget estimate for two (2) wet cake pumps ..... $69,000 USD

Model 8W-440 Paddle Dryer System

One Model 8W-440 Paddle Dryer System is provided to handle 1,250 wet pounds of secondary municipal sludge cake at 20% solids. The K-S Paddle Dryer utilizes two (2) intermeshing, counter-rotating agitators with heated, hollow, wedge shaped paddles. Thermal fluid enters and exits each agitator through a rotary joint located at the discharge end of the dryer. K-S provides flexible hoses for the rotary joints. The agitators are mounted in a heated (jacketed) trough that is provided with a bolted, vaulted top cover.

The agitators are driven by a 1,750 r/min TEFC motor connected to a shaft mounted gear reducer manufactured by SEW-Eurodrive or equal. Timing gears maintain shaft synchronization. The agitators are supported by pillow block bearings and provided with shaft seals. A heavy-duty, painted, carbon steel base supports the trough and agitator bearings.

Model:	8W-440
Heat transfer area (nominal):	439 ft^2
Working volume:	112 ft^3
Motor rated power:	50 hp
Shaft seal:	Mechanical face seal with air purge
Access ports:	Two (2) 20 inch
View ports:	One (1) with wiper and water rinse connection
Clean out ports:	Two (2)

An unheated, vaulted cover fabricated from 304/304L stainless steel will be bolted to the dryer trough. This cover will include burst (relief) panel(s) for the venting of any potential deflagrations. The cover will also include access manways, which include padlocks to prevent unauthorized opening, and a view port with wiper and water rinse connection. The cover will also include water spray nozzles, an off-gas outlet connection, and instrument connections.

Except for the end heads, the Paddle Dryer will be insulated. The trough will be insulated using a 4 inch thick closed cell glass insulation covered with 24 gauge (0.024 inch) thick stainless steel sheathing. The dryer cover will be insulated with 1-1/2 inch thick fiberglass insulation with a fabric cover.

The K-S Paddle Dryer will be supplied with a thermal fluid manifold to distribute the fluid to the agitators and trough jacket. A return manifold is also provided. These manifolds allow for one (1) supply and one (1) return connection to the piping supplied by others. The required vents and drains for this piping are included.

In addition, a deflagration venting system will be provided to safely vent any pressure buildups and deflagrations. The venting system is provided with burst (relief) panels which are in the dryer cover. A carbon steel duct is provided to vent the deflagration through an outside wall.

Instruments provided by K-S for the Paddle Dryer:

- Four (4) Thermocouples with thermowells and transmitters in the dryer bed
- One (1) Thermocouple with transmitter in the overflow chute
- One (1) High level switch in the product overflow chute
- One (1) Set of high and low proximity switches for the adjustable weir
- One (1) Pressure transmitter for the dryer hood
- Four (4) Shaft seal purge gas manifolds consisting of a pressure regulator, rotameter, and two pressure gages.
- One (1) Dryer motor thermostat

Product discharging from the dryer will be discharged through a rotary valve into a product handling/ cooling conveyor, from which the dried and cooled product material will proceed to further handling by others.

A fines return system is provided to segregate the fines and large particles and return them to the front of the dryer. The fines return system will consist of

- a vibratory type product screener to screen fines and oversized material from the product.
- An inclined screw conveyor to return the “off-spec” material from the product screener back to the feed end of the dryer.
- a rotary type airlock valve will be provided to safely isolate the product handling system from drying process.

A thermal fluid heater which is designed for up to 2.5 MMBtu/h output. The heater will be designed and stamped in accordance with ASME Section I for 750 °F at 225 psig with 300 lb flanges on the inlet and outlet and with a relief valve included.

A 400 gal/min centrifugal pump, air cooled, with a 40 hp 1,750 r/min TEFC motor, spacer coupling and guard, and seal is used to circulate the thermal fluid through the heater and system. A low fluid level switch in the expansion tank shuts off the burner if insufficient fluid is in the system.

A fully modulating, forced draft burner with a 7:1 turndown ratio for natural gas is provided. Natural gas will also be used for the pilot. The system is provided with one (1) fuel train for natural gas only.

The burner is designed to have sufficient fluid velocities to ensure that maximum permissible film temperature of the fluid is not exceeded. The burner includes:

- 3,450 r/min, 3 hp TEFC blower motor
- Full modulation burner control with pilot
- Ignition transformer
- UV flame detection scanner
- Combustion air pressure switch
- IRI insured gas train
- Components are in NEMA 4 enclosures
- NEMA 12 control panel

An expansion tank designed and fabricated (not stamped) to ASME Section VIII for 450 °F at 50 psig with nitrogen blanketing equipment is provided.

A water-cooled thermal fluid cooler heat exchanger is provided for shut down operation.

Instrumentation and Controls are provided by K-S. The system is controlled by an Allen Bradley panel mounted PLC with Operator Interface Terminal. The control panel will be a free standing NEMA 4X panel located near the dryer. MCC and VFD's are supplied by others.

System engineering is provided for those items in our scope of supply. K-S will provide Process Flow Diagrams, Piping and Instrumentation Diagrams, General Equipment Layout Drawings, OEM Manuals for all equipment and instruments provided, as well as 30 days of start-up service and operator training. Additional days can be offered as optional.

The budget estimate for Komline-Sanderson Model 8W-440 drying system with the auxiliary equipment described above is ..... $2,190,000 USD

Model 9W-840 Paddle Dryer System

One Model 9W-840 Paddle Dryer System is provided to handle 3,000 wet pounds of secondary municipal sludge cake at 20% solids. The K-S Paddle Dryer utilizes two (2) intermeshing, counter-rotating agitators with heated, hollow, wedge shaped paddles. Thermal fluid enters and exits each agitator through a rotary joint located at the discharge end of the dryer. K-S provides flexible hoses for the rotary joints. The agitators are mounted in a heated (jacketed) trough that is provided with a bolted, vaulted top cover.

The agitators are driven by a 1,750 r/min TEFC motor connected to a shaft mounted gear reducer manufactured by SEW-Eurodrive or equal. Timing gears maintain shaft synchronization. The agitators are supported by pillow block bearings and provided with shaft seals. A heavy-duty, painted, carbon steel base supports the trough and agitator bearings.

Model:	9W-840
Heat transfer area (nominal):	838 ft²
Working volume:	219 ft³
Motor rated power:	75 hp
Shaft seal:	Mechanical face seal with air purge
Access ports:	Two (2) 20 inch
View ports:	One (1) with wiper and water rinse connection
Clean out ports:	Two (2)

An unheated, vaulted cover fabricated from 304/304L stainless steel will be bolted to the dryer trough. This cover will include burst (relief) panel(s) for the venting of any potential deflagrations. The cover will also include access manways, which include padlocks to prevent unauthorized opening, and a view port with wiper and water rinse connection. The cover will also include water spray nozzles, an off-gas outlet connection, and instrument connections.

Except for the end heads, the Paddle Dryer will be insulated. The trough will be insulated using a 4 inch thick closed cell glass insulation covered with 24 gauge (0.024 inch) thick stainless steel sheathing. The dryer cover will be insulated with 1-1/2 inch thick fiberglass insulation with a fabric cover.

The K-S Paddle Dryer will be supplied with a thermal fluid manifold to distribute the fluid to the agitators and trough jacket. A return manifold is also provided. These manifolds allow for one (1) supply and one (1) return connection to the piping supplied by others. The required vents and drains for this piping are included.

In addition, a deflagration venting system will be provided to safely vent any pressure buildups and deflagrations. The venting system is provided with burst (relief) panels which are in the dryer cover. A carbon steel duct is provided to vent the deflagration through an outside wall.

Instruments provided by K-S for the Paddle Dryer:

- Four (4) Thermocouples with thermowells and transmitters in the dryer bed
- One (1) Thermocouple with transmitter in the overflow chute
- One (1) High level switch in the product overflow chute
- One (1) Set of high and low proximity switches for the adjustable weir
- One (1) Pressure transmitter for the dryer hood
- Four (4) Shaft seal purge gas manifolds consisting of a pressure regulator, rotameter, and two pressure gages.
- One (1) Dryer motor thermostat

Product discharging from the dryer will be discharged through a rotary valve into a product handling/ cooling conveyor, from which the dried and cooled product material will proceed to further handling by others.

A fines return system is provided to segregate the fines and large particles and return them to the front of the dryer. The fines return system will consist of

- a vibratory type product screener to screen fines and oversized material from the product.
- An inclined screw conveyor to return the “off-spec” material from the product screener back to the feed end of the dryer.
- a rotary type airlock valve will be provided to safely isolate the product handling system from drying process.

A thermal fluid heater which is designed for up to 5 MMBtu/h output. The heater will be designed and stamped in accordance with ASME Section I for 750 °F at 225 psig with 300 lb flanges on the inlet and outlet and with a relief valve included.

A 400 gal/min centrifugal pump, air cooled, with a 50 hp 1,750 r/min TEFC motor, spacer coupling and guard, and seal is used to circulate the thermal fluid through the heater and system. A low fluid level switch in the expansion tank shuts off the burner if insufficient fluid is in the system.

A fully modulating, forced draft burner with a 7:1 turndown ratio for natural gas is provided. Natural gas will also be used for the pilot. The system is provided with one (1) fuel train for natural gas only.

The burner is designed to have sufficient fluid velocities to ensure that maximum permissible film temperature of the fluid is not exceeded. The burner includes:

- 3,450 r/min, 5 hp TEFC blower motor
- Full modulation burner control with pilot
- Ignition transformer
- UV flame detection scanner
- Combustion air pressure switch
- IRI insured gas train
- Components are in NEMA 4 enclosures
- NEMA 12 control panel

An expansion tank designed and fabricated (not stamped) to ASME Section VIII for 450 °F at 50 psig with nitrogen blanketing equipment is provided.

A water-cooled thermal fluid cooler heat exchanger is provided for shut down operation.

Instrumentation and Controls are provided by K-S. The system is controlled by an Allen Bradley panel mounted PLC with Operator Interface Terminal. The control panel will be a free standing NEMA 4X panel located near the dryer. MCC and VFD’s are supplied by others.

System engineering is provided for those items in our scope of supply. K-S will provide Process Flow Diagrams, Piping and Instrumentation Diagrams, General Equipment Layout Drawings, OEM Manuals for all equipment and instruments provided, as well as 30 days of start-up service and operator training. Additional days can be offered as optional.

The budget estimate for Komline-Sanderson Model 8W-440 drying system with the auxiliary equipment described above is ..... $2,670,000 USD

Dry Product Storage System

A Dense Phase Pneumatic Conveyance System consisting of a surge hopper, transporter, and air control module can be provided. The surge hopper will be constructed of carbon steel with 60 degree bottom cone, and equipped with hopper cone discharge system, inspection opening and hopper vent connection stub.

Transporter vessel will be constructed of carbon steel. Transporter will be designed to ASME code and National Board Certified. Transporter will be equipped with 60 degree cone with aeration kits to facilitate discharging; inflatable seat inlet, outlet and vent cast iron butterfly valves incorporating an inflatable molded seat utilizing a smooth contour locking design. In the closed position the seat will be inflated automatically with compressed air to create a positive seal around the disc.

Air Control Module for system operation will be equipped with the necessary air controls for proper operation.

Note: Interconnecting piping, elbows, and pipe supports not included. To be furnished and installed by others.

One (1) 6,000 cubic foot product silo will be provided. Dried product from the product dense phase conveying system enters the product silo at a bin vent filter receiver tank located on the top of the silo. The bin vent filter shall be complete with top removal cartridge filters with automatic blowback cleaning cycle, and bottom discharge butterfly valve.

The silo shall be constructed of hot-rolled steel plate ASTM A1011 Grade 40 or equal. The exterior of the silo is painted per the manufacturers standard painting specification. A level transmitter is included to inform the operators of the available capacity inside. A CO detector is included to monitor the CO levels inside the silo and provide an alarm should CO levels begin to rise. Explosion panels are provided in the upper portion of the silo for additional protection. Connections for nitrogen purging are provided to blow approximately 2-3 cfm of N_2 into the silo.

The roof contains deck guard railings, standard inspection openings into the silo, pressure relief valves, and access points to the instrumentation listed above. Access ladders with safety cages, and handrails are provided. Air vent filters are also mounted on the roof and are used to vent the silo.

A standard mechanical bin activator is also included to provide effective and reliable gravity discharge of the material. A retractable loading spout is included for directing the biosolids into a receiving truck. The spout shall be able to rise free and clear of truck passage and be able to lower to the level of the empty trailer bed. The extension and retraction of the spout is automatically controlled through the cable hoisting system provided by an electric motor and controlled by a level sensor. A 0.75 HP constant speed reversible XP motor shall drive the loading spout. The load out spout shall be mounted to a support structure directly beneath the silo.

A dust collector is provided to remove fugitive dust from the product as it discharges through the load out spout. The duct between the load out spout and the dust collector is to be provided and installed by the contractor.

Platforms and silo support steel are by Komline-Sanderson. The contractor will assemble the support steel and platform as well as ladders, instruments, etc. and position the silo on the support steel. The silo cylinder comes as one piece.

Based on historical costs, the budget estimate for Komline-Sanderson dense phase transport system and product silo as described above is ..... $850,000 USD

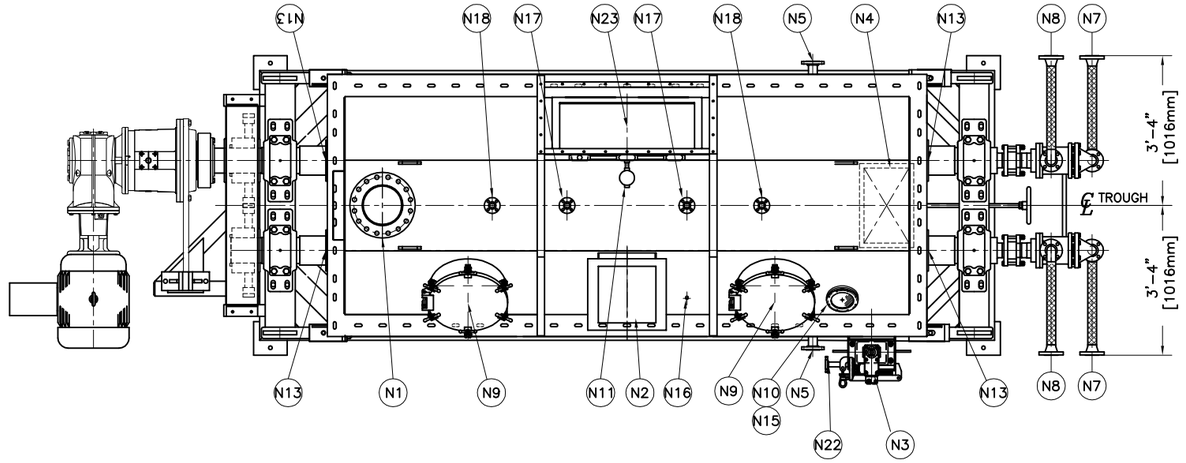
If the above drying system is of interest, we should have some discussions with the plant manager and engineer to discuss various design details to solidify a system design that integrates well with the current operations of the plant.

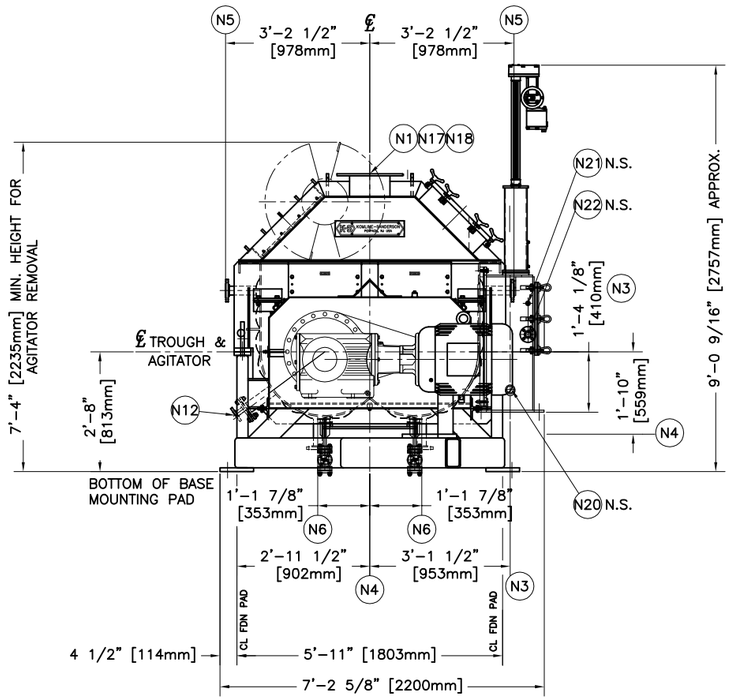
Best regards,

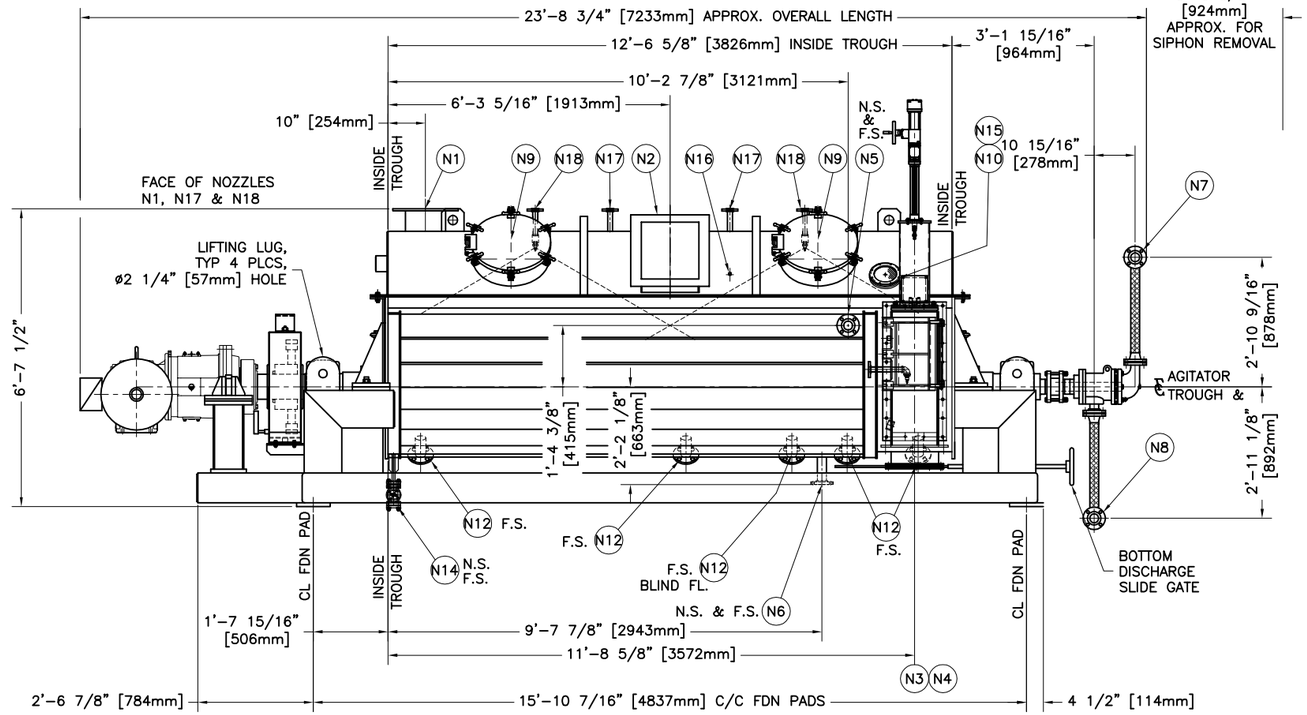
Brian T. Komline

Manager, Municipal Sales
Komline-Sanderson Corporation
12 Holland Avenue, Peapack, NJ 07977
Office: +1-908-234-1000 x317
Mobile: +1-908-229-1981
E-Mail: btkomline@komline.com
www.komline.com

NOZZLE	QTY	SIZE/RATING/MAT'L	SERVICE
N1	1	TO BE DETERMINED PER SYSTEM REQUIREMENTS	FEED INLET
N2	1	TO BE DETERMINED PER SYSTEM REQUIREMENTS	VAPOR OUTLET
N3	1	12" x 12"	SIDE DISCHARGE W/ REMOVABLE WEIR PLATES
N4	1	12" x 24"	BOTTOM DISCHARGE
N5	2	2" 300# RF ANSI FLG	TROUGH JACKET STEAM INLET/LIQUID OUTLET
N6	2	2" 300# RF ANSI FLG	TROUGH JACKET CONDENSATE OUTLET/LIQUID INLET
N7	2	TO BE DETERMINED	AGITATOR STEAM INLET/LIQUID OUTLET
N8	2	TO BE DETERMINED	AGITATOR CONDENSATE OUTLET/LIQUID INLET
N9	2	20" DIA. / NR	ACCESS OPENING W/ SAFETY LOCK
N10	1	6" DIA. / NR	VIEW PORT
N11	1	1/2" NPT	EXPL. PANEL LIMIT SWITCH JUCTION BOX
N12	5	1"–150# RF ANSI FLG	THERMOWELL CONNECTION (1) W/BLIND FLANGE
N13	4	3/8" FNPT	SEAL PURGE CONNECTION
N14	2	1/2"–300# GATE VALVE W/BLIND FLANGE	JACKET OIL DRAIN (THERMAL FLUID DESIGNS ONLY)
N15	1	1/4" NPT	VIEW PORT RINSE CONNECTION
N16	1	1/2" NPT	PRESSURE TRANSMITTER PROCESS CONNECTION
N17	2	1"–150# RF ANSI FLG	SPARE W/BLIND FLANGE
N18	2	1"–150# RF ANSI FLG	WATER SPRAY
N20	1	1 1/2" NPT	LEVEL SWITCH
N21	1	1/2" NPT	THEMOCOUPLE CONNECTION
N22	1	1"–150# RF ANSI FLG	WATER SPRAY
N23	1	TO BE DETERMINED	EXPLOSION VENT DUCT CONNECTION







NOTES:
1. THIS IS A PRELIMINARY DRAWING.
   FOR PROJECT SPECIFIC DRAWING CONTACT KOMLINE–SANDERSON.
2. REFER TO KOMLINE–SANDERSON ENGINEERING CORPORATION PRELIMINARY SPECIFICATIONS FOR ADDITIONAL INFORMATION SUCH AS DRIVE DESCRIPTION, PRESSURE AND TEMPERATURE RATINGS, MATERIALS OF CONSTRUCTION, ETC.
3. TOTAL EMPTY WEIGHT 35,000 LBS
   AGITATOR SHAFT WEIGHT 6,600 LBS EACH
   PROCESS VOLUME 112 CU FT [3.2 CU M]
4. CONNECTIONS ARE NOT DESIGNED TO ACCEPT EXTERNAL LOADS. CONNECTED PIPING AND DUCTS MUST BE INDEPENDENTLY SUPPORTED AND ARRANGED TO ALLOW FOR THERMAL EXPANSION (HORIZONTAL MOVEMENT: 3/4" [19mm]; VERTICAL MOVEMENT: 1/4" [6mm]).
5. LIFTING LUGS ARE DESIGNED FOR VERTICAL LIFT ONLY. SPREADER BARS ARE NOT PROVIDED BY KOMLINE–SANDERSON.
6. ALTERNATE BOTTOM DISCHARGE DESIGN IS USED IF SLIDE GATE IS NOT PROVIDED.

REV | DRWN | CHKD | DATE | APPR

K-S PADDLE DRYER
MODEL 8W-440
SIDE WEIR, STAGGERED

PRELIMINARY
–
–
–

2017-10-04	SCALE 1=20	DESIGNED BY –	DRAWN BY SB	CHECKED BY DAB	APPROVED BY DAB

KOMLINE-SANDERSON
CORPORATION
PEAPACK, NJ 07977 USA

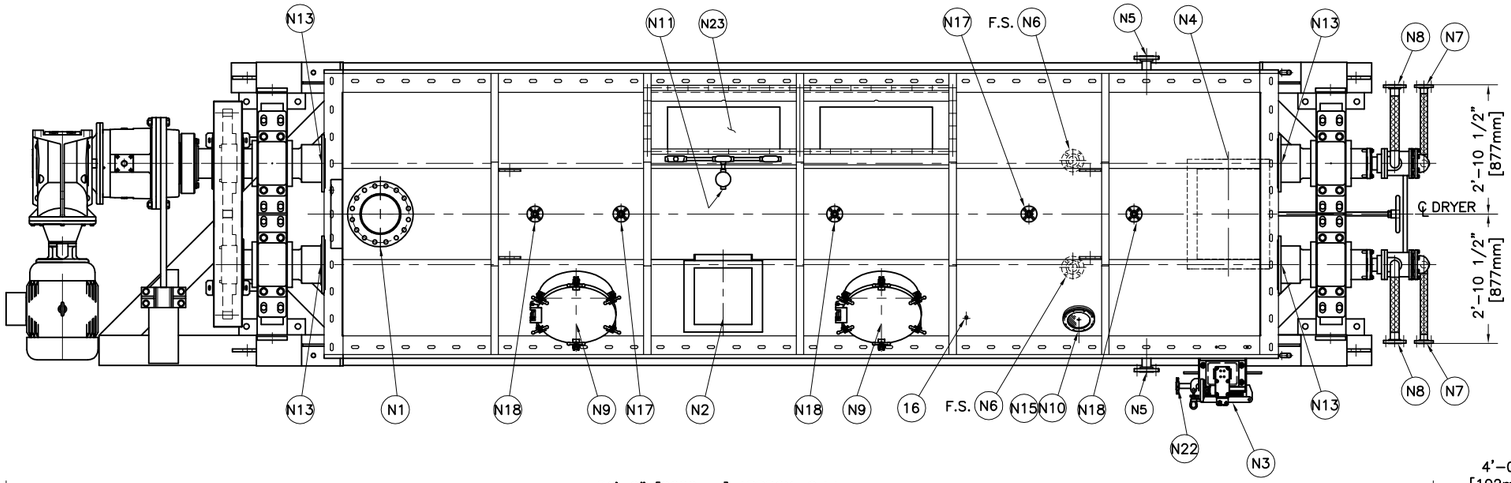
REFERENCE:– SHT – OF –

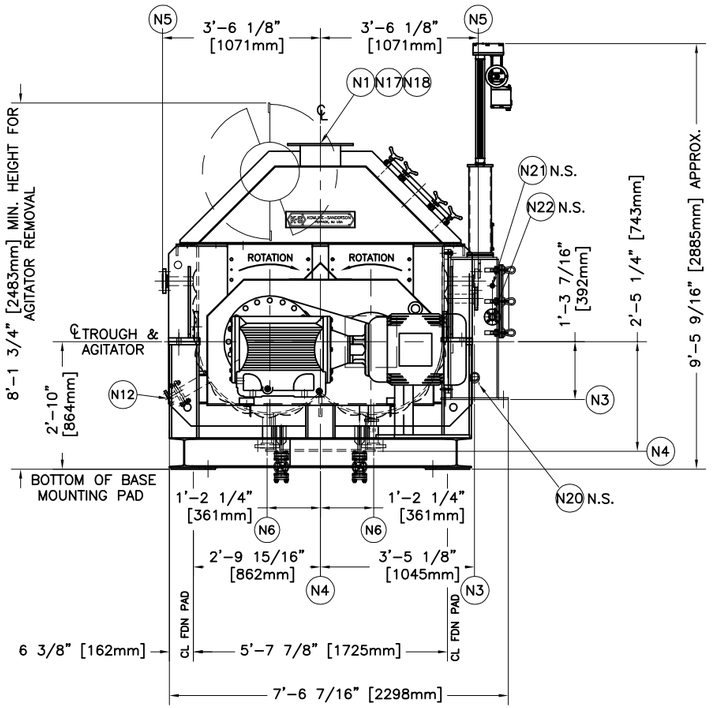
DRAWING NO. B-8W440-SideWeir-180219 REV

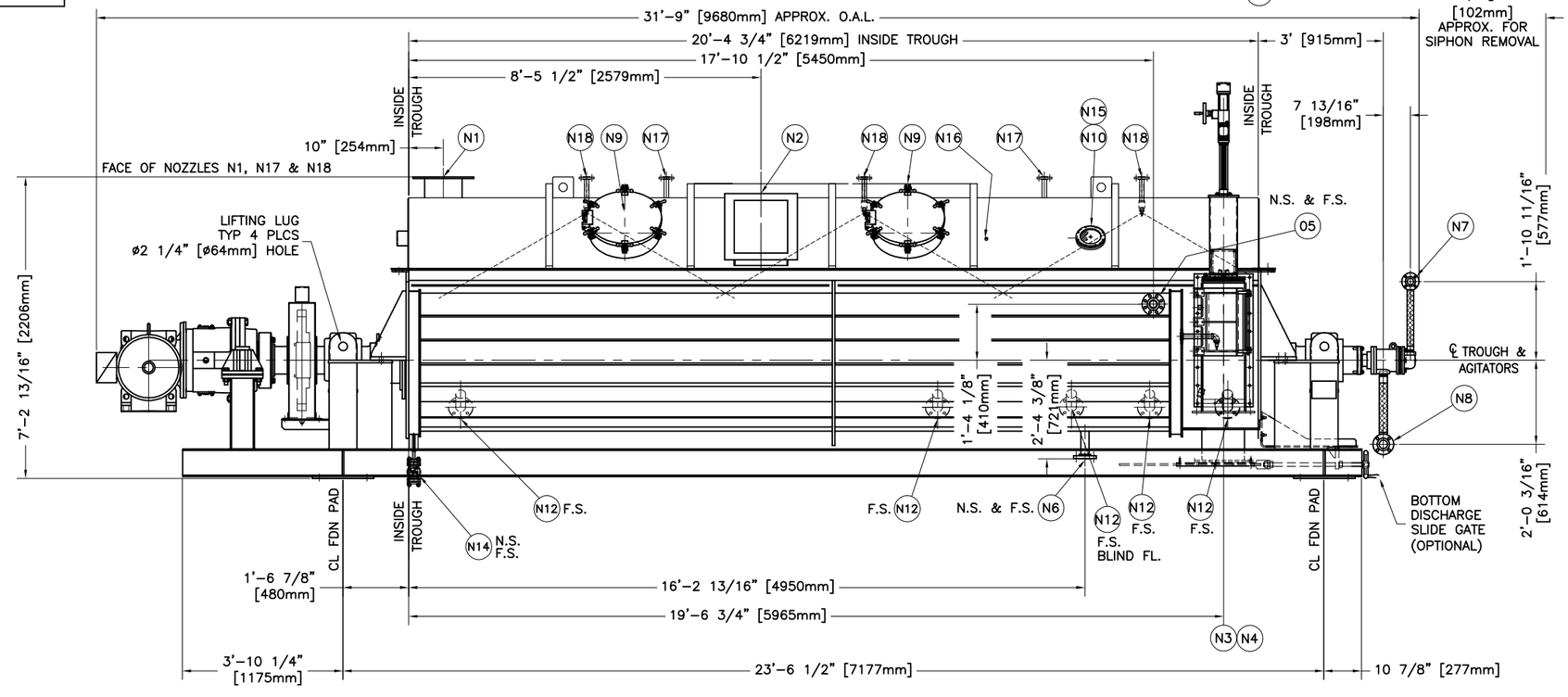
2017-08-18 3/1/2018 2:31:44 PM

PRINT MAY BE REDUCED SIZE, DO NOT SCALE. □□□□□□□□ = ONE INCH(1")

NOZZLE	QTY	SIZE/RATING/MAT'L	SERVICE
N1	1	TO BE DETERMINED PER SYSTEM REQUIREMENTS	FEED INLET
N2	1	TO BE DETERMINED PER SYSTEM REQUIREMENTS	VAPOR OUTLET
N3	1	12" x 12"	SIDE DISCHARGE W/ REMOVABLE WEIR PLATES
N4	1	12" x 27"	BOTTOM DISCHARGE
N5	2	2" 300# RF ANSI FLG	TROUGH JACKET STEAM INLET/LIQUID OUTLET
N6	2	2" 300# RF ANSI FLG	TROUGH JACKET CONDENSATE OUTLET/LIQUID INLET
N7	2	TO BE DETERMINED	AGITATOR STEAM INLET/LIQUID OUTLET
N8	2	TO BE DETERMINED	AGITATOR CONDENSATE OUTLET/LIQUID INLET
N9	2	20" DIA. / NR	ACCESS OPENING W/ SAFETY LOCK
N10	1	6" DIA. / NR	VIEW PORT
N11	1	1/2" NPT	EXPL. PANEL LIMIT SWITCH JUCTION BOX
N12	5	1"–150# RF ANSI FLG	THERMOWELL CONNECTION (1) W/BLIND FLANGE
N13	4	3/8" FNPT	SEAL PURGE CONNECTION
N14	2	1/2"–300# GATE VALVE W/BLIND FLANGE	JACKET OIL DRAIN (THERMAL FLUID DESIGNS ONLY)
N15	1	1/4" NPT	VIEW PORT RINSE CONNECTION
N16	1	1/2" NPT	PRESSURE TRANSMITTER PROCESS CONNECTION
N17	2	1"–150# RF ANSI FLG	SPARE W/BLIND FLANGE
N18	3	1"–150# RF ANSI FLG	WATER SPRAY
N20	1	1 1/2" NPT	LEVEL SWITCH
N21	1	1/2" NPT	THEMOCOUPLE CONNECTION
N22	1	1"–150# RF ANSI FLG	WATER SPRAY
N23	1	TO BE DETERMINED	EXPLOSION VENT DUCT CONNECTION







NOTES:
1. THIS IS A PRELIMINARY DRAWING.
   FOR PROJECT SPECIFIC DRAWING CONTACT KOMLINE–SANDERSON.
2. REFER TO KOMLINE–SANDERSON ENGINEERING CORPORATION PRELIMINARY SPECIFICATIONS FOR ADDITIONAL INFORMATION SUCH AS DRIVE DESCRIPTION, PRESSURE AND TEMPERATURE RATINGS, MATERIALS OF CONSTRUCTION, ETC.
3. TOTAL EMPTY WEIGHT 54,000 LBS
   AGITATOR SHAFT WEIGHT 11,100 LBS
   PROCESS VOLUME 219 CU FT
4. CONNECTIONS ARE NOT DESIGNED TO ACCEPT EXTERNAL LOADS. CONNECTED PIPING AND DUCTS MUST BE INDEPENDENTLY SUPPORTED AND ARRANGED TO ALLOW FOR THERMAL EXPANSION (HORIZONTAL MOVEMENT: 1 1/4" [31.8mm]; VERTICAL MOVEMENT: 1/4" [6.4mm]).
5. LIFTING LUGS ARE DESIGNED FOR VERTICAL LIFT ONLY. SPREADER BARS ARE NOT PROVIDED BY KOMLINE–SANDERSON.
6. ALTERNATE BOTTOM DISCHARGE DESIGN IS USED IF SLIDE GATE IS NOT PROVIDED.

K-S PADDLE DRYER
MODEL 9W-840
SIDE WEIR, STAGGERED

PRELIMINARY
–
–
–

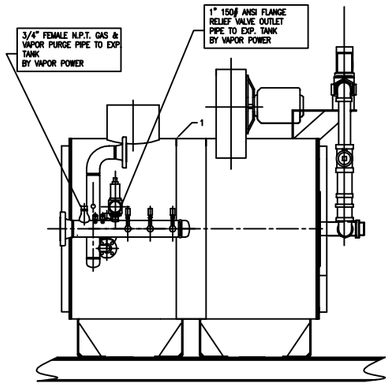
SCALE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY
2017-10-03	1=20	–	SB	DAB	DAB

KOMLINE-SANDERSON
CORPORATION
PEAPACK, NJ 07977 USA

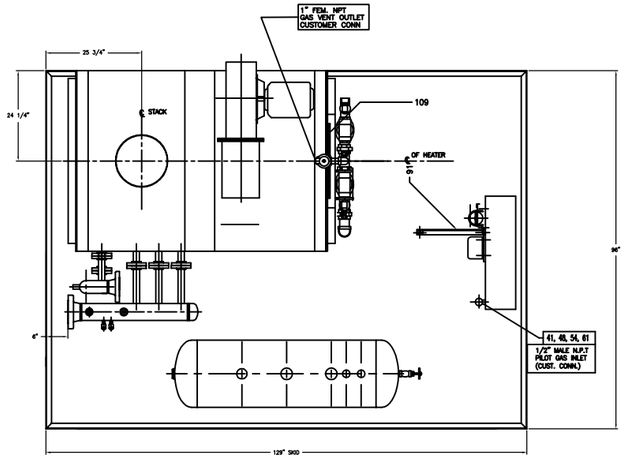
REFERENCE:–
SHT – OF –
DRAWING NO. B-9W840-SideWeir-180219
REV

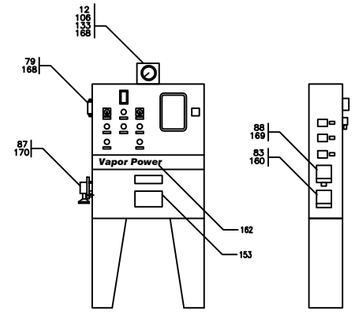
2017-08-18 1/8/2019 7:40:08 AM

PRINT MAY BE REDUCED SIZE, DO NOT SCALE. □□□□□□□□ = ONE INCH(1")

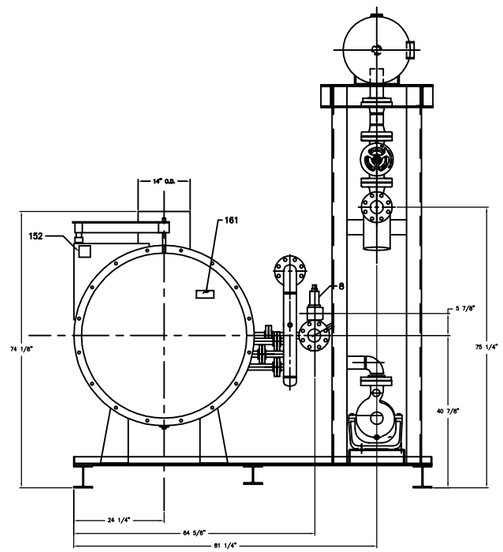


SECTION "A-A"

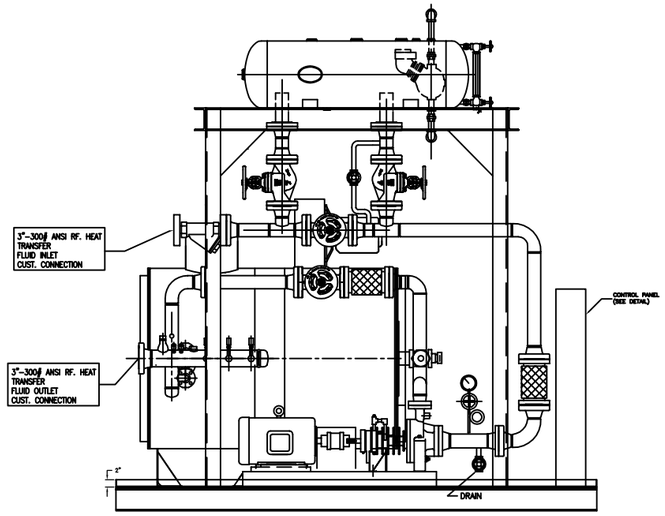




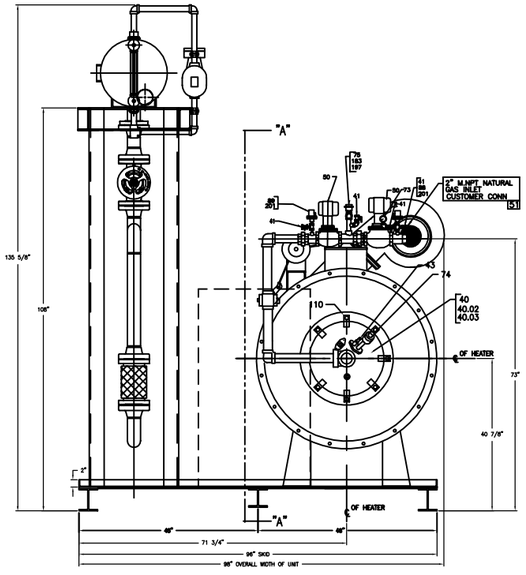
CONTROL PANEL DETAIL



LEFT SIDE VIEW



FRONT ELEVATION



RIGHT SIDE VIEW

MODEL NUMBER	MAX. WORKING PRESSURE	DESIGN TEMPERATURE	ASME CODE	RATED OUTPUT	COIL DWG. NO.	INLET MANIFOLD DWG.	OUTLET MANIFOLD DWG.	HEATING SURFACE AREA	LIST OF PARTS
5935	300 PSIG	750°F	SEE PSS CALCULATIONS	3,300,000 Btu/hr	46164007	40720217	40720218	186 SQUARE FEET	6607501-054

LET	DESCRIPTION	DATE	DRN	CHK	ENG
A	REVISED DRAWING AND DIMENSIONS PER CUSTOMER REQUEST	11/1/07	RJP		
	REVISION				

REF. 40706294

ASSOCIATED DRAWINGS

1. ¼" = 0" UNLESS OTHERWISE SPECIFIED.
2. TOLERANCE ON .XXX = ±.010" .XX = ±.02" ANGLES = ±1°. FRACTIONS = ±1/64"
3. ALL DIMENSIONS SHOWN IN INCHES.
4. DO NOT SCALE DRAWING, USE DIMENSIONS
5. THIS DRAWING PREPARED IN ACCORDANCE WITH ANSI Y 14.5M
6. REMOVE BURRS & BREAK ALL SHARP EDGES
7. ENCLOSURES SHOWN HEREON ARE COVERED BY PATENTS ISSUED OR PENDING

DRAWN BY RJP 10/25/07
CHECKED BY
ENG.APVD.
MATL.SPECS.
MFG.APVD.

MATERIAL DESCRIBED AND INFORMATION CONVEYED IS PROPRIETARY TO VAPOR CORPORATION, IS OR MAY BE THE SUBJECT OF PATENT APPLICATIONS, AND MAY NOT BE COPIED, DIVULGED TO OTHERS, OR USED FOR MANUFACTURING WITHOUT CONSENT.

NEXT ASSY.

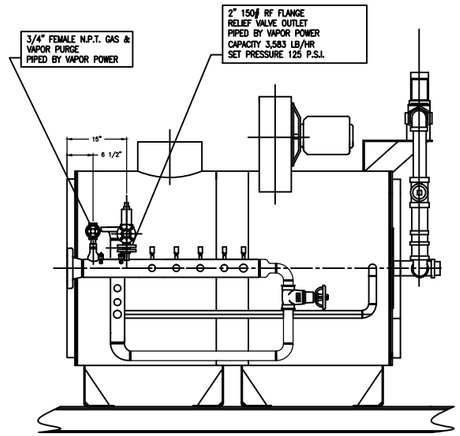
Vapor Power International
551 S. County Line Road
Franklin Park, IL. 60131

TITLE: OG-5935-AHL-35
THERMAL FLUID HEATER

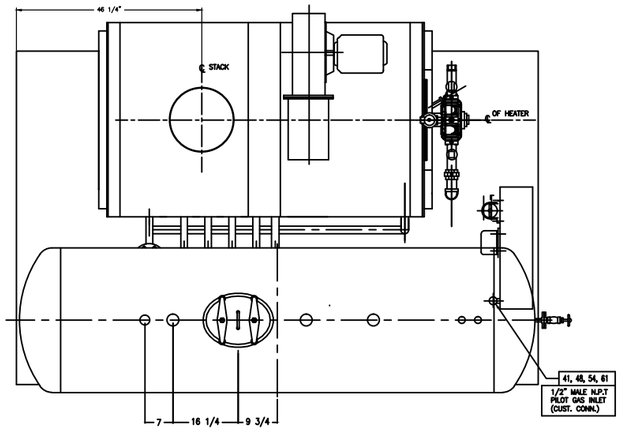
MRN NO. 07501-054 | DWG. NO. 40706362 | REV. A
FINISH | SCALE | WEIGHT | SHEET

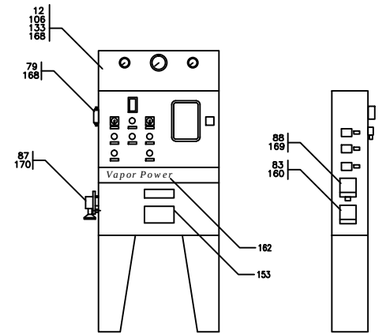
AUTOCAD 14

4 3 2 1 D C B A

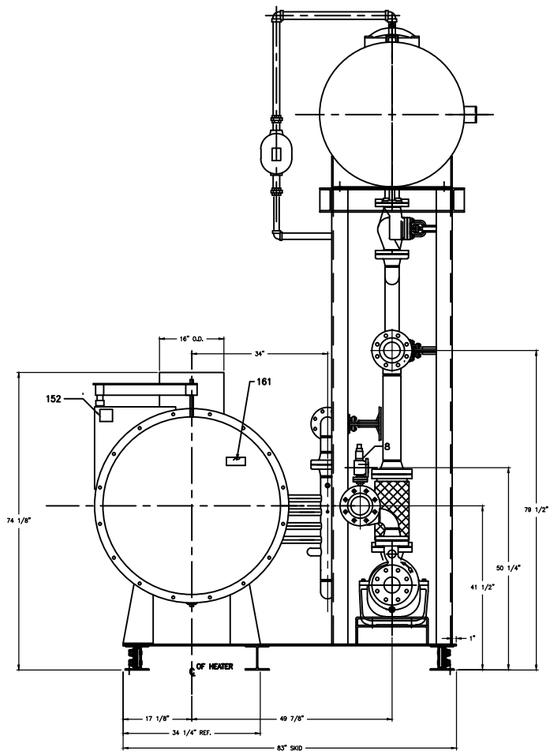


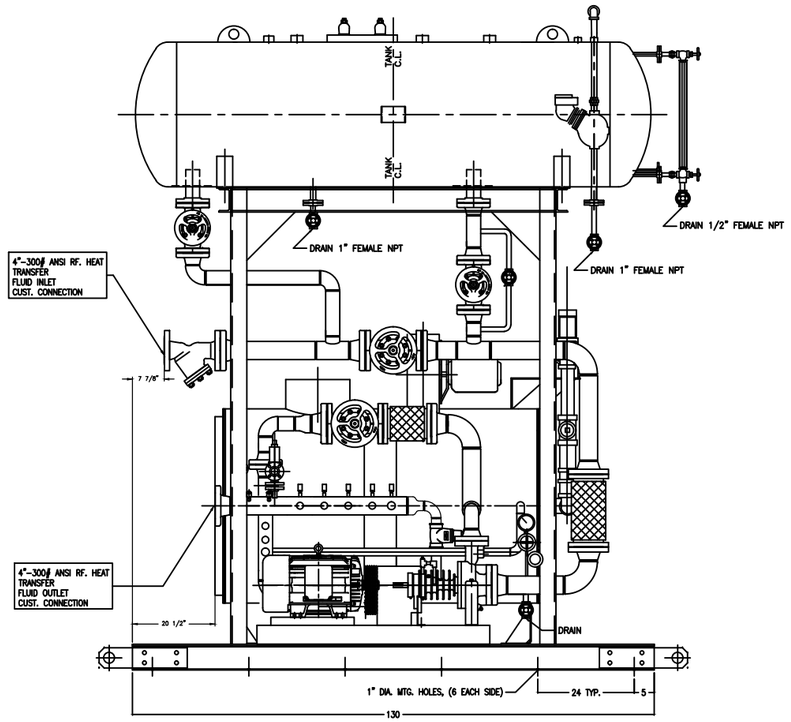
SECTION "A-A"

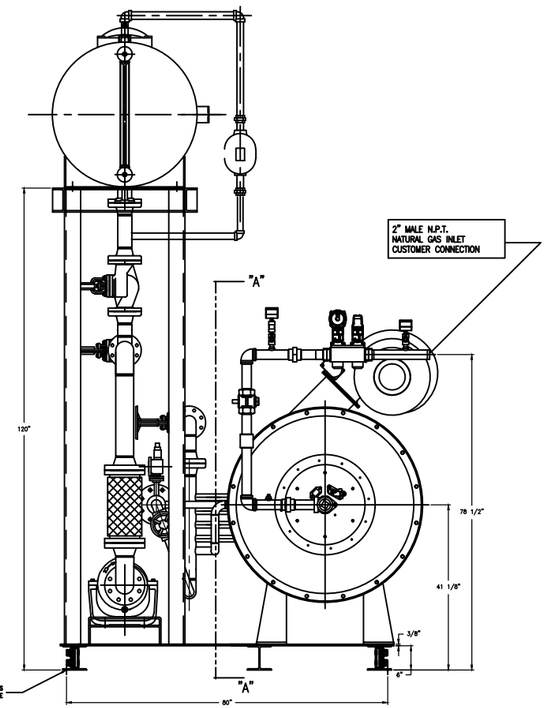




CONTROL PANEL DETAIL







REF. 41406439

LET	DESCRIPTION	DATE	DRN	CHK	ENG
	REVISION				

ASSOCIATED DRAWINGS

1. 1/4" UNLESS OTHERWISE SPECIFIED
2. TOLERANCE X .XX = .XX = ± 1/16"
   TOLERANCE X .XXX = .XXX = ± 1/64"
3. ALL DIMENSIONS SHOWN IN INCHES
4. DO NOT SCALE DRAWING, USE DIMENSIONS
5. THIS DRAWING PREPARED IN ACCORDANCE WITH ASME Y 14.5M
6. REMOVE BURRS & BREAK ALL SHARP EDGES
7. THIS DRAWING AND DESIGN ARE COVERED BY PATENTS ISSUED OR PENDING

DRAWN BY	RJP	5/11/15
CHECKED BY		
ENG.APVD.		
MAT'L SPECS.		
MFG.APVD.		
NEXT ASSY.		

Vapor Power International
551 S. County Line Road
Franklin Park, IL. 60131

TITLE		
OG-5937-AHK-50 THERMAL FLUID HEATER		
MRN. NO. 15501-018	DWG. NO. 41506512	REV. –
FINISH		
SCALE	WEIGHT	SHEET

AUTOCAD 14

H2M architects + engineers
538 Broad Hollow Rd, 4th Floor East, Melville, NY 11747
tel 631.756.8000 fax 631.694.4122
www.h2m.com