Attachment F
Wastewater Management System Operation and Maintenance Manual

Onsite Engineering, Inc.

Water, Wastewater and Stormwater Specialists

Operation and Maintenance Manual

for

Cold Brook Crossing
Water Resource Recovery Facility
Sudbury, Massachusetts

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Emergency Contact	*Emergency #*	*Business #*
Ambulance	911	NA
Sudbury Fire Department	911	978-440-5301
Sudbury Police Department	911	978-443-1042
State Police (Weston Barracks)	911	781-431-5050
MA Poison Information Center	911	617-232-2120
Emerson Hospital	911	978-369-1400
Chemtrec (Chemical Spills)	NA	800-262-8200
RCRA (Hazardous Wastes)	800-424-8802	888-372-7341
OSHA	NA	978-837-4455

Chemical Suppliers	*Business #*
<u>Sodium Bicarbonate</u> Saybrook Environmental 111 Tosca Drive Stoughton, MA 02072	781-341-1998
<u>Micro C</u> Environmental Operating Solutions 160 MacArthur Boulevard Units 6 & 7 Bourne, MA 02532	866-642-7621 508-743-8440
<u>Citric & Phosphoric Acid</u> Saybrook Environmental 111 Tosca Drive Stoughton, MA 02072	781-341-1998
<u>Chlorine</u> Saybrook Environmental 111 Tosca Drive Stoughton, MA 02072	781-341-1998

Operations	*Business #*
Facility Cold Brook Crossing WRRF North Road Sudbury, MA 02043	
Owner Quarry North Road, LLC Sudbury, MA 02043	
Contractor	
Treatment Facility Operator	
Consulting Engineer Onsite Engineering, Inc. 279 East Central Street, #241 Franklin, MA 02038	508-553-0616
Waste Hauler J. Hockman 11 Sherwood Drive Norfolk, MA 02056	508-660-6644
Solids Disposal Facility Water Solutions Group 35 Mozzone Avenue Taunton, MA 02780	508-880-992
Backup Solids Disposal Facility Upper Blackstone Clean Water 50 Route 20 Millbury, MA 01527	508-755-1286

Operations	*Business #*
Testing Laboratory Rhode Island Analytical 131 Coolidge Street Suite #105 Hudson, MA 01749	978-568-0041
MBR Equipment Supplier Smith & Loveless, Inc. 14040 Santa Fe Trail Drive Lenexa, KS 66215-5201	913-898-5201
Utilities National Grid	1-800-465-1212 (Emergency/Outage-Electric) 1-800-233-5325 (Emergency Gas) 1-800-322-3223 (Customer Service)
Verizon 24/7 Support	1-800-VERIZON

Reporting	*Business #*
Department of Environmental Protection Wastewater Management Program Northeast Regional Office 205B Lowell Street Wilmington, MA 01887	978-694-3200
Department of Environmental Protection Wastewater Management Program One Winter Street Boston, MA 02108	617-292-5500
DEP Emergency Response Monday through Friday (9:00 AM to 5:00 PM) After Hours, Weekends & Holidays	 978-694-3400 888-304-1133
Sudbury Board of Health 275 Old Lancaster Road Sudbury, MA 01776	978-440-5479

SECTION 1 – INTRODUCTION

1.1 BACKGROUND

A copy of this document was submitted to the Massachusetts Department of Environmental Protection and the local Board of Health at the completion of the construction of the facilities and prior to placing the system into operation. This operation and maintenance manual should be kept current and reviewed by the owner(s) at least every two years.

This operation and maintenance manual includes copies of all plans, permits and approvals. Also included is a detailed description of the owner's responsibilities; a copy of the agreement with a qualified individual or firm responsible for the removal and transport of sludge to an appropriate, approved off-site treatment and disposal facility; a description of the sludge handling and disposal requirements, including the name and telephone number of the sludge hauler, name and telephone number of the sludge disposal facility; and record keeping requirements.

This operation and maintenance manual includes a detailed compliance-monitoring plan providing for monthly compliance monitoring reports. The compliance-monitoring plan includes a listing of all sampling and compliance monitoring requirements, together with appropriate protocols for proper sample collection, storage, and transportation to an approved laboratory for analysis. The compliance monitoring reports include an assessment of the condition of the facilities, results of sampling and recommendations for improving operation. The owner should maintain all testing results, along with septage pumping history (date and volume) and certification of disposal for inspection, with copies submitted to the Board of Health.

Also included in this document are minimum recommended maintenance requirements to adequately maintain and operate the system, forms to track repairs/replacement of equipment, and forms to record maintenance performed on the equipment. Lastly, an emergency operating and response plan is also included in the manual. This plan details the procedures to be followed in the event of flooding or system failure.

1.2 SITE DESCRIPTION

Cold Brook Crossing is located in at 36 North Road off Route 117 in Sudbury, Massachusetts. The 40.5-acre Project site is bordered by Route 117 on the south, Sudbury conservation land and a private age restricted condominium development (55+) to the west, Concord conservation land to the north, and a wetland system to the north and east. The site consists of planned residential facility consisting of 274 residential units totaling 452 bedrooms to be developed on 25± acres. The development will consist of a mix of 1, 2 and 3 bedroom units and include some rental units and designated affordable housing units.

Given the site's use and that the treatment system will not service industrial users, it is anticipated that the incoming wastewater characteristics will be consistent with typical residential strength sewage in terms of pollutants, chemicals and pathogens. We would anticipate that typical cleaning products, as well as residential

organic and inorganic waste products, to be present in the sewage however in low quantities as not to upset the treatment process.

The water resource recovery facility is located along the site's northeast boundary. The treatment facility utilizes a Smith & Loveless Titan MBR membrane bioreactor treatment system to meet the Groundwater Discharge Permit's effluent requirements. The facility utilizes pretreatment tanks for primary screening of sewage, a flow equalization tank to attenuate flows, and a final effluent pump chamber to store treated effluent prior to discharge to the ground. Effluent disposal for the facility is accomplished via a single effluent disposal system located in the northern portion of the site. Sewage generated from the site is directed via the site wide sewage collection system to the headworks located at the WRRF building.

In addition to removing organic matter, MBR treatment systems are also capable of oxidizing influent nitrogen typically present in the reduced Ammonia-Nitrogen and Organic Nitrogen forms. The anoxic zones provide further treatment of oxidized wastewater, performing a treatment step referred to as denitrification. This process releases nitrogen to the atmosphere as nitrogen gas, enabling the treatment facility to comply with the stringent total nitrogen and nitrate-nitrogen limitations included in the Ground Water Discharge Permits.

Table 1 details a sequential listing of the components comprising the wastewater treatment facility:

Insert Table 1

SECTION 2 – PERMITS AND APPROVALS

The Massachusetts Department of Environmental Protection, Wastewater Management Program granted final approval of the Sewage Treatment Facility for Quarry Road North, LLC under the Individual Permit Category on XXXX,XX 2020. A complete set of the approved final design plans must be maintained at the treatment facility at all times.

A copy of the Groundwater Discharge Permit is included in Appendix A. In addition to maintaining an approved set of plans at the site, the following provisions of the final approval letter and Discharge Permit must be satisfied prior to the operation of the treatment facility:

- The permittee shall notify the Department at least 30 days in advance of the proposed transfer of ownership of the facility for which the permit is written.
- A copy of this Operation and Maintenance Manual must be submitted to the Wastewater Management Program;
- A commitment with a licensed waste hauler and identification of the ultimate sludge disposal facility must be submitted to the Wastewater Management Program;
- A commitment with an Engineer for engineering consulting services must be submitted to the Wastewater Management Program;
- A copy of the Operations Firm Contract must be submitted to the Wastewater Management Program.

SECTION 3 – DESCRIPTION OF WASTEWATER TREATMENT FACILITIES

This section is intended to provide a description of the various treatment facility components and their function. Each component is presented in sequential order and discussed individually in the following sections. Detailed maintenance requirements for each component are listed in the Maintenance Summary Table located in Section 11 of this Manual.

3.1 SEWAGE COLLECTION SYSTEM

Sewage generated from the site is collected and conveyed via a gravity collection/building sewer system, designed by others (refer to Drawings prepared by Civil Design Group, LLC included as part of the GWDP application package), that terminates at the pretreatment tanks adjacent to the WRRF Facility. The collection system consists of a 6-inch gravity sewers and 4-inch building sewers.

3.2 PRETREATMENT TANKS

Primary settling is accomplished by using two (2) 20,000 gallon capacity reinforced concrete underground septic tanks. The septic tanks are used for primary clarification purposes to remove coarse and floating solids, grit and other materials from the incoming wastewater. The total pretreatment tank volume (40,000 gallons) provides settling for over 75% of the Title 5 design flow in accordance with the Guidelines for screening and use of garbage disposals. The sludge depth in the pretreatment tank shall be monitored by the operator and sludge shall be pumped out and removed from the site as needed.

Oversight of the tanks generally includes determining the sludge depth in the tank. The accumulated sludge and scum that is collected in the pretreatment tanks must be removed by a septage waste hauler licensed through the State and Town at least once every year and/or when the sludge depth reaches approximately 4'-0. Floating scum may occupy more space, and therefore it is recommended that scum be removed twice each year. The operator may find that more frequent removal of these wastes is necessary. A complete list of observation and maintenance tasks for the pretreatment tank system is included in Section 11 of this Manual.

A complete laboratory analysis of the sludge should be performed by a certified laboratory prior to removal of this material. Since the treatment facility services residential units, and there are no industrial wastes disposed into the system, the sludge is anticipated to display properties similar to those produced at other facilities treating domestic sewage. Sludge produced at the facility shall be transported by a licensed septage hauler, to the primary or backup MassDEP licensed sludge disposal facility.

This sludge material should be non-hazardous and can be expected to exhibit characteristics shown in Table 3.1.

Table 3.1
Typical Sludge Characteristics
Cold Brook Crossing
Sudbury, MA

Property	Range	Typical
Total dry solids (TS), %	6.0 – 12.0	10.0
Volatile solids (% of TS)	30 – 60	40.0
Grease and fats (ether soluble, % of TS)	5.0 – 20.0	18.0
Protein (% of TS)	15 – 20	18.0
Nitrogen (N, % of TS)	1.6 - 6.0	3.0
Phosphorous (P_2O_5, % of TS)	1.5 - 4.0	2.5
Potash (K_2O, % of TS)	0.0 - 3.0	1.0
Cellulose (% of TS)	8.0 – 15.0	10.0
Iron (not as sulfide)	3.0 - 8.0	4.0
Silica (SiO_2, % of TS)	10 – 20	-
pH (standard units)	6.5 - 7.5	7.0
Alkalinity (mg/l as $CaCo_3$)	2,500 - 3,500	3,000

(Source: Metcalf & Eddy, Wastewater Engineering, 1991)

3.3 FLOW EQUALIZATION TANK

The vast majority of wastewater flows for the site are expected to occur over an eight to twelve hour period. Flow equalization, which attenuates the variations in flow volume, is accomplished by using a 25,000 gallon precast tank. The flow equalization tank is provided with a duplex pump system, with each pump capable of providing a minimum of 40 gpm, in order to accommodate the maximum day flow (49,755 gallons per day) with one pump out of service.

The influent stored in the equalization system is pumped to the screen system prior to the pre-anoxic zone. Oversight of the flow equalization tank generally includes periodic visual inspections to check for solids accumulation and inspecting the pumps for operational defects. A complete list of observation and maintenance tasks for the flow equalization system is included in Section 11 of this Manual.

3.4 SCREEN SYSTEM

The sewage from the flow equalization tank system is lifted to the fine screen system prior to pre-anoxic zone. The screening system consists of one (1) 3 mm fine screen, as manufactured by OBEX, rated for 0.63 MGD. A complete list of observation and maintenance tasks for the screen system is included in Section 11 of this Manual.

3.5 SUPPLEMENTAL CARBON SYSTEM

The addition of a carbon source to provide a food source may be necessary to sustain denitrification bacteria when a sufficient food source (BOD) is not present. To address this condition, a supplemental carbon chemical feed system is provided. As deemed necessary, a supplemental carbon source, in the form of Micro-C® or other "food source" chemical, is added to the pre-anoxic and post-anoxic zones. The Micro-C® is available in bulk containers. Chemical metering pumps are used to transfer the supplemental carbon source or food source mixture. The chemical feed rate is adjustable, with feed pump operation tied to flow equalization tank pumps.

Oversight of the supplemental carbon feed system includes checking on a daily basis the pump(s) operation, chemical inventory, and leaks/damage. A complete list of observation and maintenance tasks for the supplemental carbon system is included in Section 11 of this Manual.

3.6 ALKALINITY ADJUSTMENT SYSTEM

Dissolved constituents of the domestic water supply generally contribute alkalinity to the wastewater. During the biological process of nitrification, however, bicarbonate alkalinity will be consumed and the pH of the wastewater may be lowered. Since the optimum pH range for nitrification is between 7.5 and 8.5 standard units with a minimum alkalinity of 150 mg/L, supplemental alkalinity may be required.

The treatment facility design includes provisions for the addition of alkalinity. As deemed necessary, alkalinity adjustment is achieved by sodium bicarbonate addition to the pre-anoxic zone. The sodium bicarbonate is typically supplied in dry powder form and mixed in a polyethylene bulk storage tank. Chemical metering pumps are used to transfer the dissolved sodium bicarbonate to the pre-anoxic zone. The chemical feed rate is adjustable, with the ability to operate the chemical feed pumps with the operation flow equalization tank feed pumps via the control panel.

Oversight of the alkalinity adjustment system includes checking on a daily basis the pump(s) operation, chemical inventory, and leaks/damage. A complete list of observation and maintenance tasks for the alkalinity adjustment system is included in Section 11 of this Manual.

3.7 PRE-ANOXIC ZONE

The function of the pre-anoxic zone is to convert the nitrate-nitrogen initially present in the wastewater into nitrogen gas, thereby removing the total nitrogen from the incoming wastewater to be treated. This is accomplished biologically by creating an environment that forces specific bacteria to use the oxygen tied to the nitrate as a source of oxygen for food consumption. To accomplish this, a completely mixed, but oxygen free environment must be maintained. Additionally, organic (BOD) material must be available in sufficient quantities to provide a food source. These criteria are accomplished by mixing the reactor with nitrified effluent from the aerobic reactor. These conditions promote the removal of the oxygen from the nitrate molecule and the subsequent generation of nitrogen gas, which is harmlessly sent up into the atmosphere.

The pre-anoxic zone, with a capacity of 7,495 gallons (divided into two zones), is situated as the first treatment process section of the Titan MBR unit. Zone one of the reactor includes two S&L LiquidLift pump units to provide recycle from the MBR and aerobic zones of the system. In addition, in order to provide for consistent mixing without air entrainment, both anoxic zones include submersible mixers.

Oversight of the anoxic reactor includes daily measurement of the dissolved oxygen content and ORP, and checking for proper recycled flows and mixing. A complete list of observation and maintenance tasks for the anoxic zone is included in Section 11 of this Manual.

3.8 PRE-AEROBIC ZONE

Wastewater from the pre-anoxic zone is directed to the pre-aerobic zone. The aerobic treatment that occurs in this reactor includes removal of organic material via biological oxidation and the oxidation of any remaining ammonia-nitrogen to the less toxic form of nitrate-nitrogen. This process is commonly referred to as nitrification. This treatment occurs because bacteria already present in the wastewater grow in the tank and use the combination of organic material, ammonia-nitrogen and oxygen to grow and rapidly multiply. The aerobically treated wastewater, which is now low in BOD with any remaining ammonia-nitrogen converted to nitrate-nitrogen, along with any suspended solids and detached microorganisms, flows via gravity to the next step in the treatment process, the post-anoxic zone.

The operator of the facility must pay particular attention to the food/mass ratio within aerobic zone in order to maintain optimum treatment. The ratio of food (incoming wastewater) to mass (organisms within the aeration tank) is the primary control in the activated sludge process. As organisms generally tend to increase with the incoming wastewater (food) load and time spent in the aeration tank, the operator will need to waste sludge in order to decrease the amount of microorganisms in the tank such that there is a proper balance with the available food.

The pre-aerobic zone, with a capacity of 6,343 gallons, situated next in the Titan MBR unit includes three (3) S&L Plenum air diffuser units to provide for complete oxygenated mixing of the wastewater. Sludge return/MLSS recycle from this zone to the pre-anoxic zone can be accomplished via the LiquidLift system located over the pre-anoxic section of the Titan MBR tank.

Oversight of the aerobic reactor includes checking the air pattern, pump operation, dissolved oxygen and pH in the zone on a daily basis, with the measurement of the mixed liquor suspended solids (MLSS) on a weekly basis. A complete list of observation and maintenance tasks for the aerobic reactor is included in Section 11 of this Manual.

3.9 POST-ANOXIC ZONE

The function of the post-anoxic zone is to convert any remaining nitrate-nitrogen not removed in the pre-anoxic reactor into nitrogen gas, thereby removing the total nitrogen from the final wastewater to be treated.

Similar to the pre-anoxic zone, this is accomplished biologically by creating an environment that forces specific bacteria to use the oxygen tied to the nitrate as a source of oxygen for food consumption. To accomplish this, a completely mixed, but oxygen free environment must be maintained. Additionally, organic (BOD) material must be available in sufficient quantities to provide a food source. These criteria are accomplished by mixing the reactor with nitrified effluent from the aerobic reactor and adding a carbon source as a supplemental organic material source. These conditions promote the removal of the oxygen from the nitrate molecule and the subsequent generation of nitrogen gas, which is harmlessly sent up into the atmosphere. In addition to treatment, at certain intervals during normal operations, the operator will need to waste sludge from the process for disposal. This is done via a dedicated air-lift pump system located in this zone in order to maintain a specific age of the micro-organisms as well as to maintain a specific range of MLSS that is deemed appropriate for treatment. Waste sludge from this zone is directed to the sludge handling section of the Titan MBR skid, located prior to the pre-anoxic zone.

The post-anoxic reactor, with a capacity of 5,147 gallons, is after the aerobic zone on the Titan MBR skid unit.

Oversight of the post-anoxic reactor includes daily measurement of the dissolved oxygen content and ORP in addition to ensure an adequate mixing and the supply of supplemental carbon source for denitrification. A complete list of observation and maintenance tasks for the anoxic zones is included in Section 11 of this Manual.

3.10 POST AEROBIC/MEMBRANE BIOREACTOR

Wastewater from the post-anoxic zone is directed to the post-aerobic membrane bioreactor for reaeration and final treatment. Within this bioreactor, located after the post-anoxic zone and before the clearwell, there is active aeration as well as cassettes of flat plate membranes that provide a physical barrier from the solids and bacteria laden wastewater (referred to as MLSS) within the tank while allowing clean water to pass through them. Each membrane plate has microscopic pores that are smaller in size than common solids contaminants and pathogens such as bacteria and viruses. The physical barrier that the membranes provide results in allowing only clean water to be pulled through the membrane via gravity.

Sludge return/MLSS recycle from the membrane bioreactor system occurs to the pre-anoxic zone via the LiquidLift system. The recycle of sludge/MLSS is done to enhance the nitrification/denitrification of the wastewater.

Oversight of the MBR includes checking on a daily basis the flux rates, trans-membrane pressure, number of backwash cycles and air patterns in the reactor. A complete list of observation and maintenance tasks for the membrane bioreactor system is included in Section 11 of this Manual.

In addition to the observation and maintenance tasks listed in Section 11, the operator should record and conduct daily measurements for the parameters listed below in order to establish an operational history of the facility in order to compare influent loading conditions and process operation modes to the quality of the final effluent. This data could then be used by the operator to make "real-time" adjustments to the system, if necessary, based on the current influent loading and treatment system operating conditions.

Location	*Parameter*
Influent (Flow Equalization Tank)	• pH • Alkalinity • Ammonia
Pre and Post Anoxic Zones	• Dissolved Oxygen
Pre-Aerobic Zone	• Dissolved Oxygen • pH • Alkalinity • Ammonia • Nitrate
Final Effluent	• pH • Alkalinity • Ammonia • Nitrate
Chemical Feed System	• Chemical Feed Pump Setting • Volume of Chemical Consumed • Strength of Chemical

3.11 MEMBRANE CLEANING SYSTEM

The membranes have a system that allows for periodic cleaning of the membranes in place. The membrane cleaning system consists of pumps, chemical storage tanks, blowers, and chemical cleaning solutions (citric acid and sodium hypochlorite chemical feed systems) to allow for the in place cleaning of the membranes.

In addition, to facilitate periodic inspections and physical cleaning of the membranes, the facility has also been provided with a hoist and beam system to allow for the removal of a membranes for setting on the upper level floor of the facility.

3.12 CLEARWELL

The permeate from the membranes are directed to and stored in the clearwell zone of the Titan MBR skid system. Clean effluent is stored in this zone of the skid system to provide a set storage volume required to periodically backwash the membranes and restore permeate flow through the membrane fiber's pores. Effluent from this tank is discharged through the WWTF flow meter to the GAC and UV systems for final treatment.

Oversight of the clearwell includes periodic inspections of the tank to ensure no regrowth of bacteria which could impact disinfection and permit compliance as well as to check the pumps and annually calibrate the effluent flow meter. A complete list of the protocols and tasks associated with performing clearwell system checks included in Section 11 of this Manual.

3.13 GRANULATED ACTIVATED CARBON SYSTEM

A granulated activated carbon (GAC) system is provided to meet the site's Total Organic Carbon (TOC) limit. In addition to TOC removal, GAC also provides beneficial removal of Volatile Organic Carbons (VOCs) and odor. The GAC system is fed by the MBR clearwell pumps and discharges to the ultraviolet disinfection system. The system consists of two 86-inch tall by 48-inch diameter cylinders, each filled with 2,000 lbs. of GAC plumbed in parallel, capable of flow rates up to 45 gpm. The GAC media treats the permeate wastewater by an adsorption process where dissolved compounds collect on or adhere to the surface of the carbon.

When the GAC reaches its adsorptive capacity, the units will begin to show breakthrough, or the detection of TOC in the system effluent stream. In addition, influent and effluent pressure readings should be recorded weekly to determine baseline pressure readings. If the pressure readings increase, it is likely solids accumulation is limiting the unit performance and the system should be backwashed/serviced.

A complete list of observation and maintenance tasks for the GAC system is included in Section 11 of this Manual.

3.14 DISINFECTION SYSTEM

Disinfection of treatment facility's effluent allows for the destruction or inactivation of pathogenic bacteria and viruses to further protect the environment and public health. Disinfection is commonly performed utilizing either chlorination, or in sensitive areas, ultraviolet radiation. At this facility, disinfection is accomplished by the use of ultraviolet disinfection system.

The ultraviolet process is capable of inactivating all types of pathogens in clear liquids without the addition of chemicals or heat. The membrane system will remove virtually all particulate matter from the wastewater allowing for the effective transmittance of ultraviolet rays. The ultraviolet disinfection system is sized to process up to 60 gpm of treated effluent with an anticipated TSS of less than 10 mg/L.

A complete list of observation and maintenance tasks for the disinfection system is included in Section 11 of this Manual.

3.15 FINAL EFFLUENT PUMP CHAMBER

The final effluent is collected and stored in the underground precast concrete final effluent pump chamber. The final effluent pump chamber system is equipped with a duplex pump system, which delivers effluent to

the effluent disposal system. The pumps operate in a duty/standby system to dose the effluent disposal system.

A complete list of observation and maintenance tasks for the pump chamber system is included in Section 11 of this Manual.

3.16 SLUDGE STORAGE ZONE

The MBR skid includes dedicated sludge storage zone to hold sludge wasted from the MBR treatment process. The sludge storage zone have been designed to accommodate 4,968 gallons of wasted sludge volume to facilitate pumping on a monthly basis. The sludge storage zone has a coarse bubble diffuser to keep the sludge aerated to prevent septic conditions and potential odor issues.

The operator shall, prior to routine wasting of sludge from the MBR, check the levels and condition of the sludge in the tank. Periodic pumping and hauling of this sludge is required based upon the volume and percent solids as well as sludge age and odors.

3.17 EFFLUENT DISPOSAL SYSTEM

The effluent disposal system is based on loading rates established by the percolation tests and soil evaluations for this site. Based on the preliminary development program and the State's Title 5 sanitary code, the project could produce approximately 49,755 gallons of wastewater on a single day. The effluent disposal design uses a system of leaching chamber trenches and loading rate of 2.59 gpd/ft^2. This loading rate is based on guidance found in MassDEP's Guidelines for the Design, Construction, Operation and Maintenance of Small Sewage Treatment Facilities with Land Disposal (MassDEP, 2014) and MassDEP's hydrogeological analysis approval letter.

Oversight of the effluent disposal system generally includes periodic visual inspections of the areas for signs of breakout, ponding, and significantly lush vegetation, inspection of the system for signs of hydraulic backups or solids retention and periodic checking of the observation ports. This work is in addition to the required sampling and testing of the surrounding monitoring wells, in accordance with the Groundwater Discharge Permit requirements. A complete list of observation and maintenance tasks for the effluent disposal system is included in Section 11 of this Manual.

3.18 REDUNDANCY FEATURES

The facility is designed to provide safe and efficient operation. The design also includes contingencies intended to prevent any bypassing of treatment processes in the event of a system failure.

Duplicate pumps and process blowers are installed where possible. Pumping systems associated with the sewage pump station and final effluent pump chamber are capable of handling the peak daily flow with the largest unit out of service. The flow equalization tank pumps have been sized in accordance with the

equipment manufacturer's standards in order to maintain minimum flow requirements. The pumping capacities of the remaining pumps utilized for the treatment system have been selected by the treatment equipment manufacturer based on their specific design requirements.

3.19 STANDBY GENERATOR

The site is equipped with a permanently mounted standby generator of sufficient size to operate the entire facility including all pumps, treatment processes and lighting. The facility's main control panel is integrated with an automatic transfer switch associated with the main building switch, which is designed to activate the standby generator in the event of a prolonged power outage. A sequential starter prevents overload of the circuitry upon transfer to, or from, the standby electric source. The standby generator is natural gas powered and is located to the east of the WRRF building.

The owner should maintain a service contract with the generator manufacturer to perform periodic maintenance on the equipment. At a minimum, the generator should be exercised once a week to maintain the equipment in proper working order. The ATS has the ability to exercise the generator under load if deemed necessary.

3.20 ALARMS

Alarms are provided to signify low and/or high water level, or failure of any pump, drive unit or compressor. The alarm system includes visual and audible alarms at the treatment facility building and an automatic electronic telephone dialer. The automatic telephone dialer contacts a predetermined list of individuals in the event of an alarm situation.

3.21 SPARE PARTS INVENTORY

An on-site inventory of high wear items shall be maintained at the treatment facility to facilitate repairs. A complete listing of spare parts that should be included and maintained at the facility is listed in Section 11.

3.22 SAFETY EQUIPMENT

Pertinent safety equipment including all chemical MSDS sheets, first aid kit, fire extinguisher, emergency lighting and smoke detectors have been provided. All safety equipment, including the emergency eye wash station, should be inspected regularly for defects.

3.23 ELECTRIC SYSTEM

All electrical controls are specified for NEMA 4 or 4X where applicable to prevent malfunction due to contact with moisture or corrosive gasses. Electrical fixtures are non-corrosive and moisture proof. Any improvements to the electrical system should be designed by a Professional Electrical Engineer.

3.24 FLOW MEASURING

Permanent flow measuring and recording devices are provided. The flow measuring devices (mag meter) installed on the MBR skid measures the treated effluent flow from the treatment system.

3.25 VENTILATION

The treatment facility building is equipped with an automatic venting device. Process area ventilation should provide a minimum of 12 complete air changes per hour. Automatic timers with manual switch override also were furnished. Ventilation for the restroom was sized to provide at least five air changes per hour. The owner should maintain a service contract with an HVAC firm to perform annual maintenance on the equipment.

3.26 POTABLE WATER

The water resource recovery facility has potable water for sanitary use. The water supply to the facility is protected by an approved backflow prevention device in accordance with the requirements of the Massachusetts Department of Environmental Protection and local Board of Health.

3.27 HEAT

The treatment facility control building is equipped with thermostatically controlled unit heaters installed in the treatment facility.

3.28 ACCESSORIES

Hose bibs should be maintained onsite to facilitate cleanups.

SECTION 4 – PERSONNEL

4.1 QUALIFICATIONS

The facility is to be staffed by a Chief Operator and Operators who must devote part of their time to general attention of facility process operations, daily report requirements, and routine housekeeping and maintenance chores. The majority of the operator's time is spent conducting laboratory testing, equipment maintenance and repair, and general facility process attention. In order to ensure proper and efficient operation of the treatment facility, it is necessary to have sufficient and qualified personnel on staff.

The chief operator of water resource recovery facility must be certified by the State Board of Certification of Operators of Wastewater Treatment Plants in accordance with the requirements of 257 CMR 2.00 and shall have the following qualifications:

- Grade: Commonwealth of Massachusetts minimum Grade 4 Wastewater Treatment Plant operator's license.
- Experience: At least one year as a Grade 4 Operator working under the supervision of an operator with a Grade 4 License.
- A backup operator possessing at least a Grade 3 license must also be designated.

All other personnel employed at the facility shall be familiar with the operations of water resource recovery facility. Such personnel shall work under the direction and supervision of the chief operator.

The advantages of training courses for treatment facility operators are obvious. This training, along with experience, provides the operators with the technical background necessary to properly operate the facility and to obtain the required operator's certification license.

Every effort should be made to provide continuing education and training for all facility personnel. Operators should take advantage of those courses offered in the Commonwealth of Massachusetts. Subscription to trade magazines and membership in the local chapter of Water Environment Federation aids in providing continuing education.

4.2 PERSONNEL

The Owner shall employ sufficient personnel to ensure the proper operation of the facility. At a minimum, the Owner shall employ a chief operator with the qualifications outlined in Section 4.1. An assistant operator shall be available to perform facility duties in the absence of the chief operator. Either the chief operator or his/her assistant shall be at the facility at least 5 days each week. Each visit shall be of sufficient duration, at least 1.5 to 2 hours, to permit the proper inspection of equipment and to check the performance of equipment and perform other daily duties. The chief operator or his/her assistant shall be on call 24 hours a day, seven days

a week, in the event of an emergency.

SECTION 5 – SAMPLING & ANALYSIS

5.1 DAILY SAMPLING

The influent and effluent from the facility shall be tested on a daily basis to determine its pH, alkalinity, ammonia, and nitrates. The operator shall have the capability of conducting these tests at the facility. Flow shall also be recorded on a daily basis.

5.2 INFLUENT SAMPLING

In accordance with the Permit, the influent from the facility shall be sampled and tested for the parameters specified below:

Parameter	Frequency	Sample Type
BOD_5	Monthly	24 Hour Composite
Total Suspended Solids	Monthly	24 Hour Composite
Total Solids	Monthly	24 Hour Composite
Ammonia-Nitrogen	Monthly	24 Hour Composite

5.3 EFFLUENT SAMPLING

In accordance with the Permit, the effluent from the facility shall be sampled and tested for the parameters specified below:

Parameter	Frequency	Sample Type
Flow	Daily	Maximum-Minimum-Average
pH	Daily	Grab
UV Intensity	Daily	-
BOD_5	Weekly	24 Hour Composite
Total Suspended Solids	Weekly	24 Hour Composite
Fecal Coliform	Weekly	Grab
Nitrate-Nitrogen	2x/Week	24 Hour Composite
Total Nitrogen (NO_2+NO_3+TKN)	2x/Week	Calculated
Total Organic Carbon	2x/Week	24 Hour Composite
Oil & Grease	Monthly	Grab
Turbidity	Continuous	Continuous Recording
Total Phosphorous	Quarterly	24 Hour Composite
Orthophosphate	Quarterly	24 Hour Composite
VOCs USEPA Method 624	Semi-Annually	Grab

Any grab sample or composite sample required to be taken less frequently than daily shall be taken during the period of Monday through Friday, inclusive. All composite samples shall be collected over the operating day.

5.4 GROUNDWATER SAMPLING

Samples shall be taken from the approved monitoring wells as specified below. The wells associated with the effluent disposal system are up-gradient wells CMW-1 and downgradient wells CMW-2 and CMW-3.

Parameter	Frequency	Sample Type
pH	Monthly	Grab
Static Water Level[1]	Monthly	Measurement
Specific Conductance	Monthly	Grab
Nitrate-Nitrogen	Quarterly	Grab
Total Nitrogen (NO_2+NO_3+TKN)	Quarterly	Grab
Total Phosphorous as P	Quarterly	Grab
Orthophosphate	Quarterly	Grab
Total Organic Carbon	Quarterly	Grab
VOCs USPEA Method 624	Annually	Grab

1 Static Water Level shall be reported as an elevation referenced to the survey datum established for the site.

5.5 PROCESS MONITORING

The entire treatment facility has been designed to be fully automated, controlled by a PLC located within the Equipment Control Panel. All time sequences have either been preset based upon the manufacturer's and operator's experience at other similar installations or based on the manufacturer's recommendations. There are no routine process control functions to be performed by the operator and adjustments should only be necessary in the event of an unusual circumstance.

The treatment facility has been designed to minimize operator attention requirements. Wastewater analysis is only necessary to monitor overall facility performance and to identify and correct specific problems. The laboratory analysis required by the MassDEP in the facility's Discharge Permit provides an important chronology that enables the operator to interpret and predict unusual events. This data needs only to be supplemented with a record of daily visual and olfactory observations.

The pH of the effluent should be within the range of 6.5 to 8.5 as specified in the facility's Discharge Permit. A value outside of this range for extended periods of time will result in an overall decrease in system efficiency. A low pH value is of particular concern, as this will affect the facility's ability to remove nitrogen. The incoming sewage should have sufficient alkalinity present to maintain a pH within the 6.5 to 8.5 range without chemical addition.

A visual inspection should be made of all of the facility's unit processes each day of operator coverage. Particular attention should be given to the appearance of the wastewater in the anoxic zones, pre-aeration zone and membrane zone, as well as the number of backwashes. The membranes should also be inspected regularly for fowling and clogging. In general, the operator should pay particular attention to the effluent of

the processes for the presence of solids, the presence of odors, and/or foaming or frothing of the wastewater.

The facility operator should refer to the operation and maintenance manuals of the individual equipment suppliers located in the appendices of this manual for additional details on problem identification and appropriate corrective measures as well as the California State University Field Study Training Program Manuals for specific troubleshooting techniques. In addition, if the treatment system experiences inadequate treatment, the operator should contact the system manufacturer to determine the proper process/operation changes that should be made based on actual flow and influent loading conditions.

Lastly, the operator should be aware of the condition of the facility structure and building systems in itself and report any deficiencies to the owner. In particular, attention should be paid to the adequacy and condition of the ventilation system, humidity within the building, lighting and electrical systems, and any safety issues.

5.6 LABORATORY SAMPLING PROTOCOL

All sampling, sample preservation and analyses shall be performed utilizing procedures approved by the US EPA and MassDEP. In addition, influent, effluent and groundwater samples shall be analyzed by a Commonwealth of Massachusetts certified laboratory.

5.7 EQUIPMENT CALIBRATION

A pH meter shall be maintained at the treatment facility for use by the operator in monitoring the pH of samples collected as required in the facility's Discharge Permit. The meter shall be calibrated against standard solutions of known pH each day prior to its use. A fresh supply of standard solutions should be obtained each month from the contracted laboratory.

The facility operator shall refer to the instructions provided with the pH meter for more comprehensive details on proper calibration procedures. The use and care of the instrument shall be in strict accordance with the manufacturer's recommendations.

All flow meters, process control meters, gauges, electric valves, etc. shall be testing and calibrated for accuracy on an annual basis.

SECTION 6 – SLUDGE HANDLING

6.1 SOURCES OF WASTE SOLIDS

The treatment process utilized at facility generates waste solids that require handling separate from the wastewater treatment system. Grit and screenings are trapped removed via the pretreatment tanks and disposed of.

The MBR treatment process also produces biological solids during the normal course of operations. The MBR generates waste activated sludge to be stored as MLSS within the system and the sludge storage zone. The operator is required to monitor MLSS concentrations and arrange for the removal of waste when MLSS concentrations exceed the recommended concentration. A septic hauler must be contracted to remove the waste material

6.2 SLUDGE CHARACTERISTICS

The sewage treatment facility produces waste solids requiring disposal. These solids should be removed from selected treatment processes by a waste hauler at least once per year, or as needed. A complete laboratory analysis of the sludge should be performed by a certified laboratory prior to removal of this material.

Since the treatment facility services residential type uses, there should not be any industrial wastes disposed within the system and the sludge should be similar to that produced at other facilities at which domestic sewage is treated. The following Table shows typical sludge characteristics that are generated from the treatment facility.

Table 6.1
Typical Sludge Characteristics
Cold Brook Crossing
Sudbury, MA

Property	Range	Typical
Total dry solids (TS), %	6.0 – 12.0	10.0
Volatile solids (% of TS)	30 – 60	40.0
Grease and fats (ether soluble, % of TS)	5.0 – 20.0	18.0
Protein (% of TS)	15 – 20	18.0
Nitrogen (N, % of TS)	1.6 - 6.0	3.0
Phosphorous (P_2O_5, % of TS)	1.5 - 4.0	2.5
Potash (K_2O, % of TS)	0.0 - 3.0	1.0
Cellulose (% of TS)	8.0 – 15.0	10.0
Iron (not as sulfide)	3.0 - 8.0	4.0
Silica (SiO_2, % of TS)	10 – 20	-
pH (standard units)	6.5 - 7.5	7.0
Alkalinity (mg/l as $CaCo_3$)	2,500 - 3,500	3,000

Source: Metcalf & Eddy, Wastewater Engineering, 1991)

6.3 DESIGNATED SLUDGE HAULER AND DISPOSAL FACILITY

A long-term agreement should be executed with the septage hauler licensed in the Commonwealth of Massachusetts and the Town of Sudbury. Sludge produced at the project site must be transported by a licensed septage hauler and must be disposed of at an approved facility. Documentation of removal and legal disposal shall be sent to the Town of Sudbury Board of Health. Refer to the Telephone Index at the beginning of this manual for the names, addresses and telephone numbers of the licensed sludge hauler and the primary and backup sludge disposal sites.

SECTION 7 – FACILITY RECORDS & REPORTING

The operator shall maintain a daily log of facility operations, process changes and equipment maintenance. At a minimum, the following information should be recorded in the facility's log and log sheets as applicable:

- Results of daily and monthly influent and effluent monitoring as required in the Discharge Permit;
- Results of daily and monthly monitoring of other wastewater samples;
- Date and quantity of sludge removed from the facility;
- Changes in the appearance of the wastewater;
- Process changes;
- Equipment maintenance records **(Shall be recorded in log book and on log sheet provided in Appendix D per MassDEP requirements)**;
- Equipment failures and replacements **(Shall be recorded in log book and on log sheet provided in Appendix D per MassDEP requirements)**; and
- Emergency situations.

The operator shall also report any of the following to the Massachusetts Department of Environmental Protection, Wastewater Management Program, Northeast Regional Office and Boston Office:

- Planned physical alterations and additions to the facility;
- Anticipated non-compliance;
- Occurrence of a facility non-compliance (reported within 24 hours); and
- Any proposed sewer connections or changes of a present sewer user.

Copies of the daily logs, as well as the Consulting Engineers monthly inspection reports, shall be kept at the facility at all times and for a minimum of three (3) years. All facility record keeping and reporting shall meet the requirements of the Groundwater Discharge Permit Program (314 CMR 5.00).

All operation and maintenance records should be recorded in the attached operations and maintenance logs in Appendix D per MassDEP requirements. It is critical to keep these records as up to date and detailed as possible. These records should include all calibration and maintenance records of equipment and all original strip chart recordings for continuous monitoring instrumentation

Record keeping and reporting on the operation of the treatment facility and related appurtenances must also conform to the provisions of 314 CMR 12.07. Specifically, monthly operating records shall be maintained by the facility operator in accordance with the most recent edition of the MassDEP, Wastewater Management Program's publication entitled "Directions for Completing Monthly Report Forms for Wastewater Treatment Plants" and submitted on forms supplied by the Division. A copy of the regulations is included in Appendix D.

Additional provisions relating to monitoring requirements, compliance schedules, planned changes, and 24 hour reporting are contained in Division Regulations at 314 CMR 5.19 (20). A copy of these regulations, which

are incorporated in the general conditions section of the facility's Discharge Permit, are also provided in Appendix D.

The MassDEP requires inspections of the treatment facility be completed by a Massachusetts Registered Professional Engineer knowledgeable in wastewater treatment processes. These inspections should occur at least once a month to inspect the operation of the collection, treatment, and disposal facilities and to consult with the facility operator. During these visits the engineer will review the facilities operation and maintenance records, check the monitoring reports and inspect the treatment, sampling and flow measurement equipment.

SECTION 8 – EMERGENCY OPERATIONS & RESPONSE

8.1 FIRE AND MEDICAL EMERGENCIES

The following agencies shall be contacted when a fire or medical emergency occurs at the treatment plant:

Emergency Contact	Emergency #	Business #
Ambulance	911	NA
Sudbury Fire Department	911	978-440-5301
Sudbury Police Department	911	978-443-1042

A fire at the facility also necessitates that the Massachusetts Department of Environmental Protection, Wastewater Management Program, Northeast Regional Office be contacted. If possible, all electrical power to the facility and emergency generator should be shut down during fire emergencies.

A written report shall be prepared following any fire emergency assessing damage to the facility and proposing a schedule of remedial action. This report shall be sent to the agencies listed in Section 8.2.

8.2 SPILL CONTROL AND REPORTING

In the event of an overflow or accidental spillage of untreated wastewater or sludge, the following authorities shall be contacted immediately:

Reporting	Business #
Department of Environmental Protection Wastewater Management Program Northeast Regional Office 205B Lowell Street Wilmington, MA 01887	978-694-3200
Department of Environmental Protection Wastewater Management Program One Winter Street Boston, MA 02108	617-292-5500

DEP Emergency Response	
Monday through Friday (9:00 AM to 5:00 PM)	978-694-3400
After Hours, Weekends & Holidays	888-304-1133
Sudbury Board of Health	
275 Old Lancaster Road	978-440-5479
Sudbury, MA 01776	

A written report shall be prepared, and submitted to the above agencies, describing the event, required remedial actions and the steps to prevent a future occurrence.

8.3 EMERGENCY CONDITIONS

Emergency conditions can be imposed on a treatment system by natural disasters, civil disorders, faulty maintenance, negligent operation and accidents. Planning is essential to ensure continued effective operation during emergency situations

This section of the Operations and Maintenance Manual provides a detailed account of the emergency response plan necessary for ensuring the continued effective operation of the wastewater treatment system under emergency conditions. The objectives of this emergency response plan will be as follows:

- To eliminate or minimize adverse effects from emergency situations affecting the treatment system;
- To develop procedures for properly responding to emergencies;
- To provide instruction for system personnel to ensure that they understand their responsibilities during emergency situations; and,
- To provide inventories of available emergency equipment and outline existing mutual aid agreements and contracts with outside organizations for specialized assistance.

It is important for the operators to recognize what procedures should be followed in the event of an emergency. Emergency situations are of varying degrees of seriousness. In any event, the operators should be concerned with:

- Safety of personnel within the facility and the surrounding area.
- Safety of equipment within the facility area.
- Best treatment of sewage, given the emergency situation.

There is a logical sequence of steps in responding to any emergency, which should be followed by the operator on duty. The response sequence includes identifying the emergency, investigating and assessing the severity of the emergency, determining the proper initial course of action, implementing the corrective action to rectify the situation and following up with a post-emergency investigation and report.

8.3.1 IDENTIFY EMERGENCY

This step is obvious for most situations and is essentially that of becoming aware that an emergency exists. Natural disasters, power failures, equipment breakdowns and injuries are usually rather dramatic and will seize the operator's attention almost immediately upon occurrence. Under certain circumstances, the operator may have prior warning of an impending emergency through weather reports or through trends in process or equipment performance.

Some impending emergency situations exist long before the operator is aware that a problem exists. These situations may produce a larger emergency, which then becomes more immediate and obvious. Poorly maintained equipment may have minor breakdowns, which, if gone unnoticed, may lead to complete failure of the equipment with possible injury to unwary facility personnel. A spill or discharge of toxic or hazardous materials into the tributary sewerage system is another example of an emergency situation that may go unnoticed for an extended period of time. If no waste monitoring and warning system exists, the operator will not be aware of the emergency until a treatment process fails or until the facility alarm system activates.

8.3.2 INITIAL INVESTIGATION

Once the operator becomes aware that an emergency situation exists or that a natural disaster is imminent, an initial investigation should be immediately initiated. This investigation is undertaken to assess the severity of the emergency and to gather the information necessary for determining the proper initial course of action.

Under emergency conditions, the operator should assess the seriousness of injury to personnel and damage to structures and equipment, noting possible impending damage which could occur if corrective action is not immediately undertaken. The operator should then list personnel and emergency equipment immediately necessary to remedy the situation.

8.3.3 INITIAL ACTION

Once the severity of the emergency is known, the operator should make an immediate determination as to what initial action should be undertaken. This initial action usually consists of notifying responsible authorities and calling for necessary assistance in order of priority.

After the necessary calls, the operator should immediately initiate action within specified limits to remedy the situation. The operator should not endanger himself or other facility personnel by undertaking tasks for which the proper personnel or equipment are not available. If the operator is not familiar with first-aid techniques; he should not attempt to move injured persons unless further danger exists. Moving an injured person or attempting first-aid without proper knowledge of the technique may cause more serious, permanent injury.

8.3.4 CORRECTIVE ACTION

If handling the emergency is beyond the operator's capabilities, he should wait until the necessary assistance

is available. The operator should immediately appoint the proper personnel to supervise the corrective action. While corrective actions are being undertaken, the operator should notify all relevant agencies and persons not informed initially.

Corrective action should be continued until the emergency situation is completely reconciled. If the correction will take a considerable amount of time, necessitated by equipment orders, etc., the operator should consult with the necessary parties to outline a long-range program to complete the task.

8.3.5 FOLLOW UP

After the emergency situation has been corrected, the operator should make every effort to determine the cause of the emergency and to review the corrective actions implemented. The operator should then undertake preventive measures to minimize the possibility of recurrence.

In the case of accidents, the operator should institute stricter safety practices, as outlined in the Water Environment Federation's *Safety, Health and Security in Wastewater Systems*. In the case of equipment failure, if negligence was not the problem, then a revised maintenance schedule would be the most likely preventive measure. For natural disasters which cannot be prevented from recurring, corrective measures may be undertaken to minimize the severity of the emergency. In any case, the procedures in dealing with an emergency situation should be reviewed to develop more effective courses of action.

For all emergencies, the Massachusetts Department of Environmental Protection, Wastewater Management Program should be notified and a follow-up report made, detailing what happened and how the situation was handled. Also, the operator should ask for and expect assistance from this agency when the situation warrants. This agency was established not only to regulate facility design and operation, but also to assist the operator in meeting the effluent requirements.

8.3.6 EMERGENCY PREPAREDNESS

In order to alleviate confusion during an emergency, and to be prepared for emergency situations, the following items are recommended:

- A telephone list of emergency numbers should be posted at all telephones. The list should include fire, police, utility companies, highway department, and others who should be contacted during emergencies.
- At times of predicted storms or other natural phenomena which may create emergencies, all relevant personnel should be on duty at the treatment plant.
- Arrangements for the use of battery powered radios and other necessary equipment should be made.
- All vehicles, diesel generators, portable pumps, compressors and other emergency tools and equipment should be fueled and in good repair for immediate and prolonged use.
- Develop a program for training personnel in emergency operation procedures. Work closely with Local Police and Fire Departments (who are familiar with such programs).

8.3.7 SUMMARY

This section has outlined a general pattern of response actions which the operator should follow in responding to emergencies. In most small emergencies the operator will go through these steps automatically; however, they should be reviewed periodically in order to effectively deal with major emergency situations. In general, the pattern of response actions is:

- Identify the emergency.
- Investigate and assess the severity of the emergency.
- Take initial action and notify responsible authorities.
- Implement corrective action to rectify the situation.
- Follow up with an investigation to prevent or minimize future similar emergencies.

8.4 POSSIBLE EMERGENCY CONDITIONS

In a treatment system, the following emergency situations may develop the need for modifying the normal operating, maintenance and processing procedures.

- Failure of commercial (prime) power;
- Storms;
- Explosions;
- Fires;
- Hydraulic overloading, ruptures and blockage;
- Equipment breakdown and process failures;
- Spills of oil, toxic or hazardous materials into sewers or at the treatment works; and,
- Personnel injury.

Some of these situations can also produce additional emergency situations requiring decisions which will have to be assigned on a priority basis; i.e., a storm could directly create or cause (1) failure of commercial power to treatment facility and pumping station; (2) flooding conditions; (3) failure of the alarm system; (4) personnel injuries; and (5) hazardous transportation conditions for maintenance and operating personnel, repair of equipment or removal of injured. The listed situations are analyzed in detail throughout the remainder of this section.

8.4.1 FAILURE OF COMMERCIAL (PRIMARY) POWER

Partial or complete loss of primary power to motors, controls, alarms and reporting systems at the wastewater treatment facility can result in a complete inability to transfer the raw sewage through the treatment facility and impairment of the efficiency of the sewage processing and handling.

While the wastewater treatment facility has been provided with a natural gas standby generator system

capable of operating the facility without primary power, the pattern of response and precautions taken by the operator will be influenced by the cause and the duration of the electrical failure. The longer a power failure continues the greater the extent of the corrective and notification activities. The severity of the power failure will be dependent upon the time of the year, cause of the loss of power and estimated time that power will be off.

In the event of a power failure the operator should immediately notify the chief operator, the facility electrician and the electric utility company. The operator should not attempt to correct an electrical problem on his/her own. The operator should wait until experienced electrical personnel arrive on the scene and allow them to take corrective action. In addition, the operator shall monitor the operating conditions of the standby generator to maintain a consistent power supply.

After restoration of the primary power supply, normal operation of the facility shall be resumed by a manual start-up of the equipment which was not operational during the power loss. Some equipment will restart automatically when power is returned.

8.4.2 STORMS

In addition to disruption of the primary electric power and possible flooding damage, storms can result in felled trees, broken branches or downed utility poles which may disrupt the alarm reporting system or telephone communications, stop or greatly hamper movement of personnel and increase the problems of restoring operations.

An assessment of severity of other effects will depend upon the character of the damages as they affect the sewer system operation:

- Rupture of water distribution lines which can become polluted is of prime importance.
- Felled trees, branches, electric or telephone poles which will hinder or stop travel required for repair are of secondary importance.
- Damaged buildings and structures take third priority.
- Hazards such as washouts, holes in the road, and impassable areas where pavement has been destroyed, are of lesser importance.

In the event of fallen trees, telephone poles and the like, the operator should immediately notify the Police, Fire and Highway Departments and the affected utility company. Fallen trees, branches, poles and the like will be the responsibility of the Owner and the Power and Telephone Companies. All power lines should be treated as being "live" and should only be handled by the utility companies. Trees or branches held up by electric wires should be moved only in extreme emergency and, if moved, extreme care should be exercised to avoid collapse, which may cause fires or electrocution.

8.4.3 EXPLOSIONS

Explosions can result from ignition of accumulated dusts, sewer or petroleum gases. Explosions may occur in pump rooms, wet wells, sewer manholes, large trunk sewers, chemical rooms, or laboratories. Explosions may disrupt power, cause flooding or damage sewers, structures or other equipment and may be accompanied by fire.

A brief investigation of the explosion should be made. The fire department must be notified immediately, telling them the nature and location of the mishap and whether or not any personnel have been injured.

An explosion with accompanying fire will probably create structural damage, disrupt electrical circuits and damage pumps and piping. Any fire should be contained, if possible, using the fire extinguisher or by closing all entrances to the area. Electrical power and water flow to the area should be shut off from outside the affected area. If structural damage has occurred, do not enter the control room, but rather make an examination from the exterior through the doors. Determination of the soundness of the structure should be made by a structural engineer. If damage is not apparent, the structure may be entered for assessment of damage to equipment, pumps, piping or electrical system and the shut-down of affected systems. The first entrance should be made cautiously and preferably after the fire department has arrived.

Explosion in a manhole or trunk sewer will expend itself upward by blowing off the manhole cover and through the connecting pipes. Upon arriving at the scene, it should be determined if any damage has been done by the cover in flight. Also, the manhole and piping should be checked for damage. Adjacent manholes should also be examined since some of the explosive pressure will pass through the pipes to these structures.

After the immediate danger of the explosion has passed and any fire extinguished, the operator should implement the following plan:

- Determine what pieces of equipment are available for processing and what piping paths are available for handling the wastewater. Appropriate alterations in the normal process to continue or resume treatment. At all times, the safety of personnel and equipment must be considered.
- If pumping equipment or piping is damaged, flow may have to be rerouted through other pumping units not normally used for this purpose. If other pumps or equipment are not available, portable pumps and temporary piping may have to employ. Breaks in pipelines should be isolated temporarily by closing valves and repaired as soon as possible.
- Clean up all sewage, oil, gasoline and chemical spills immediately and vent the area against an accumulation of explosive vapors. In the event that a release exceeds the MCP thresholds, the appropriate cleanup and reporting must be adhered to. Refer to Section 8.4.7 – Spills of Oils, Acids, Toxic and Hazardous Materials in the Section.
- Damaged electrical equipment, switches and controls should be temporarily by-passed or taken out of service completely and replaced at the earliest convenience.
- If a cubicle or section of a motor control center is damaged, locate if possible, an undamaged plug-in unit which services a nonessential piece of equipment and make the connections to that unit, until

the damaged unit is repaired or replaced.

- Damage to instrumentation units will necessitate replacement of the units. Operation will have to be continued until repairs or replacements are made. Manual measurements of essential parameters should be made wherever practical.
- Wiring circuits that are damaged must be replaced immediately, before connections can be made to new or repaired parts.

No structural damage should be considered minor until it has been inspected by professionals. The building inspector should be notified as soon as possible and professionals hired to make temporary and permanent repairs. The affected areas should be closed off until after an inspection has been completed by persons experienced in this field and any temporary repairs have been made. Areas adjacent to the affected areas should be covered with tarpaulins to prevent damage to equipment, instruments and records by inclement weather, spillage, broken pipes and the like.

Manhole or pipeline explosions will constitute a minor emergency. Portable pumps and temporary piping may have to be employed during repair operations. Damaged manholes must be repaired as quickly as possible. Paved inverts can be restored by blocking incoming lines and setting brick with hydraulic cement or other quick setting compounds. If regular cement is used, it can be protected by using a length of stove-pipe or similar material for temporarily carrying sewage through the manhole and sealing the annular spaces at the pipes. Cracks in the walls can be sealed using hydraulic cement. Displaced frames should be reset.

8.4.4 FIRES

Fires at the treatment facility will typically be of wastepaper, oily cloths or electrical types and may also be the result of explosions, spontaneous combustion, smoking or arson. All structures have been built to be fire resistant, comprised of as little combustible material as possible. Fire extinguishers, dry-chemical, types A, B or C are installed within the building.

Determination of the extent of damage caused by the fire to equipment, such as motors, controls, instruments and circuits is of primary importance. The investigation of the cause of the fire is of secondary importance. The severity of the fire will depend on the damage done to essential items of equipment.

In the event of fire, the operator should immediately notify the Fire Department and the Owner.

Prevention of fire damage is of utmost importance and can be accomplished by carefully adhering to the following:

- Empty wastebaskets daily.
- Clean up all oil and chemical spills immediately and completely.
- Dispose all oily, greasy or paint cloths after each use by putting them in airtight, fireproof metal containers. Do not leave them lying around!
- Check all oil, fuel and gasoline drips and repair leaks immediately.

- Know where all fire extinguishers are located, which ones to use for which type of fire, and how to use them.
- Check extinguishers semiannually and have them recharged annually.

If present when a fire starts, move immediately to the nearest exit door. Fire extinguishers are mounted near the door. Activate the appropriate extinguisher and try to put out the fire keeping between the fire and the exit. If the fire cannot be put out with one extinguisher, retreat towards the door and exit the structure.

8.4.5 HYDRAULIC OVERLOADS, RUPTURES AND BLOCKAGE

Hydraulic overloads will be caused by water entering the sewers through broken pipes, flooded manholes or leaking joints. Hydraulic overloads may be the result of floods, hurricanes, severe storms or infiltration due to high ground water conditions. Ruptures may result from flooding, earthquakes or explosions. Blockage will generally result from the deposition of foreign material in manholes, leaking pipes, accumulation of solids in sewers which have "flat" slopes or pipeline breaks.

Hydraulic overloads will be marked by unusual increases in the flow characteristics as recorded by the flow meters. Ruptures will be indicated by an increase or decrease in flow to the treatment plant. Blockage will result in backing up sewage in the lines above the point of stoppage resulting in the leaking of sewage at manhole covers or where watertight covers exist, sewage entering adjacent structures through service connections.

8.4.6 EQUIPMENT BREAKDOWNS AND PROCESS FAILURES

All components of the treatment facility are connected to a central alarm system in the Equipment Control Panel. Should an equipment failure or overload occur, an alarm light and horn mounted on the treatment facility building will be actuated.

Upon discovering an equipment failure, the operator shall immediately make the necessary arrangements to replace or repair the failed unit. The failure of major equipment requires the prompt notification of the Department of Environmental Protection, Wastewater Management Program, Northeast Regional Office in Wilmington.

Breakdown of essential equipment, such as pumps, aeration facilities and settling tanks, could endanger the entire treatment operation. Duplicate units have been provided for most of the essential equipment such as pumps and blowers; however, failure of any piece of equipment may result in a partial failure of the treatment process, which will necessitate process adjustments, and may also result in a loss of time and costly repairs.

Overloading of the equipment will initiate audible and visual alarms in the instrumentation panel. As soon as an alarm is sounded and the location of the emergency displayed on the equipment control panel, the operator should investigate and determine the cause and extent of the emergency. This investigation should minimize the possibility of permanent damage to equipment, flooding or injury to personnel.

If the failure is electrical in nature and is not the result of primary power source failure, the switch handle on the motor control center for that piece of equipment should be shut off, the reset button pushed and the handle set to "ON". If the unit fails to run, the standby unit should be made the lead unit. The unit that failed should be disconnected and checked out by the facility electrician.

When any major piece of mechanical equipment fails, the standby unit should be placed in operation prior to investigating the failure. Surety of the standby unit's operation must be ascertained prior to working on the failed unit to ensure continuation of the process. The failed unit should then be checked carefully to pinpoint the cause of the failure. Any part that is damaged should be replaced from the parts inventory of the equipment supplier. Spare parts should be stocked as recommended by the manufacturer and an inventory maintained. New parts should be ordered to replace those used for repair.

Normally, process failures can be attributed to equipment failure, elimination of some feature of the treatment process or may result from oils, acid, bases or toxic wastes in the influent. The presence of these materials will generally be caused by accidental spills or illegal discharges. The appropriate emergency action necessary to correct the situation is covered under the section entitled "Spills of Oils, Acids, Toxic or Hazardous Materials."

All electrical equipment is equipped with thermal overload protection which trips at the appropriate motor starter in motor control centers or individual motor starters.

8.4.7 SPILLS OF OILS, ACIDS, TOXIC AND HAZARDOUS MATERIALS

Spills of oil, acids, toxic or hazardous materials into the treatment works or the sewer system may be deliberate or the result of an accident with spillage entering the sewer system through manhole covers or service connections.

Deliberate spills of deleterious materials into the sewer system are not likely to be discovered until they appear at the treatment facility and interfere with the treatment process. Generally, accidental spills will not be known until evidence of the accident reaches the plant. Spills at the treatment facility by facility personnel are usually known, enabling corrective measures to be initiated immediately.

When a spill results from an accident on city or state roads where sewer lines are installed, the Fire Department or others will usually be called to clean up the spill. In some instances they may inadvertently flush the oil, gasoline or other materials down the storm drainage system. Some of this flushing may also enter the sanitary sewer system. If the chemical is unidentified, attempt to get a sample for test.

Deliberate spills will be harder to investigate since they will often be done illegally in batch dumpings. Samples should be obtained and analyzed to determine its identity and probable source. If a prolonged spill occurs, a systematic search starting at the treatment facility may be necessary.

The operator will be responsible for ensuring that corrective measures are undertaken. The operator should

coordinate actions by the Police and Fire departments, and the Department of Public Works.

Liquid spills shall be flushed heavily down the sewer line to reduce their concentration. Acids or bases will have their concentrations reduced by the flushing operation.

Powdered substances should be flushed to the next manhole. The outlet side of the downstream manhole should be plugged to prevent the material from reaching pumping stations or the treatment plant. The manhole should be pumped out and the material properly disposed of.

8.4.8 PERSONNEL INJURY

Personnel injury can result from falls, from working in tight places, cuts, abrasions or broken bones resulting from improper use of tools, being overcome by gas, electrical shock, carelessness, slipping into tanks or manholes and during facility emergencies.

The operator should immediately call a physician, ambulance service, Police or Fire Department and the Owner. Personnel should have available and be familiar with a copy of a first aid manual such as is published by "The American Red Cross."

Cleanliness, proper maintenance, correct operating procedures, a team approach to work in remote or hazardous areas, and properly coordinated safety programs are the main ways of minimizing the risk of personnel injuries.

8.5 EMERGENCY READINESS PROGRAM

8.5.1 EMERGENCY TELEPHONE NUMBERS

A list of emergency telephone numbers should be completed and posted in a conspicuous location near each telephone in the plant.

The facility operator should be given the responsibility for maintaining the accuracy of the list. This list should be checked periodically for accuracy and changes made to all posted lists.

8.5.2 EMERGENCY EQUIPMENT INVENTORY

An inventory should be made of equipment, materials and chemicals available at the treatment facility that can be used in case of an emergency. Any additional emergency equipment and supplies required should be purchased and stockpiled or arrangements made to obtain these items through outside contracts.

8.5.3 TREATMENT FACILITY RECORDS

A program should be established for the protection of essential records, plans and reports. All originals should

be stored near the operator's desk in a watertight container. These items must be available for immediate use and can be reproduced as required.

8.5.4 COORDINATION WITH POLICE AND FIRE DEPARTMENT

Establish a program for local fire and police departments to periodically review the treatment facility for adequacy of fire prevention and security measures. These agencies should be made aware of any potential chemical emergencies.

The treatment plant's emergency response action should be coordinated with the local police and fire departments. Coordinating instructions are outlined below and consideration should be given to the items in the following checklists:

Police Department Checklist:

1) Critique existing treatment facility security measures.
2) Make routine checks of treatment plant.
3) Notify treatment facility in the event of a street spill of hazardous materials.
4) Be prepared to assist during emergencies at the treatment plant.

Fire Department Checklist:

1) Routinely check firefighting equipment at the facility and inspect the facility for potential fire hazards.
2) Provide first-aid instruction to treatment facility personnel.

SECTION 9 – SAFETY

The first rule of any safety program is good housekeeping. Work areas should be well lighted. Service walkways and handrails should be inspected periodically to ensure they are in suitable condition and free of rust. Floors should be well swept and free of spills which may cause slipping. For safety reasons, the facility should have a fully stocked first-aid kit, complete with a sufficient supply of gauze, bandages, first-aid creams, disinfectants and eye-wash kit. An adequate supply of fully charged fire extinguishers should also be maintained at the facility in conspicuous locations.

In addition to the preceding, personal hygiene is of utmost importance when working around wastewater. It is advised that hands and fingers be kept away from the eyes, mouth, ears and nose to prevent the risk of infection. Gloves should be worn whenever cleaning or repairing equipment which is in contact with wastewater or when collecting wastewater samples. Any cuts or scratches received while working at the facility should be attended to immediately. As a further precaution, gloves should be worn when hands are chaffed, burned or when the skin has been broken.

Noxious gases and vapors can present a serious hazard in wastewater treatment facilities and related appurtenances. Operating personnel should be thoroughly familiar with the characteristics, sources and means of testing for the common gases associated with sewage treatment facilities.

Safe practice requires that, before entering any manhole, pump chamber or enclosed tank, tests should be conducted for the presence of dangerous gases. The chamber should be blown out with fresh air if there is any evidence of flammable or toxic gases. A hydrogen sulfide kit is recommended for use in testing the plant's pretreatment and equalization tanks.

As a further precaution, operating personnel should not enter any confined space unless accompanied by someone capable of providing assistance in the event of an accident. Should the operator be alone at the facility and the need to enter an underground tank or confined area presents itself, the operator should make arrangements to have trained staff and associated equipment onsite to provide assistance. A safety harness and rope should be worn at all times by the person entering the chamber.

Employee hazards in wastewater treatment facilities include exposure to: physical injuries, body infections, oxygen deficiency, noxious gases or vapors, etc. These occupational hazards are largely avoided by the execution of safe practices and the use of safety equipment. It is the responsibility of facility operators to acquaint themselves with the hazards associated with facilities maintenance and operation and to take steps to eliminate them.

OSHA standards require the management to furnish safe tools, equipment, layout, and materials, and to define policies which will keep them properly maintained in safe working condition. In addition, a list of emergency telephone numbers and contacts should be available at all telephones.

It is also the management's responsibility to select workers who are physically and mentally capable of

performing the work required and possess the necessary aptitude for the specific tasks within the facilities. In addition, the management must provide adequate education and training in accepted safety procedures.

Workers have a responsibility to themselves, their families, and their jobs to do everything they can to prevent personal injuries. This can be accomplished by conformance to established safety regulations and utilization of the proper safety equipment in the performance of the daily work routine. Human error is the most significant cause of accidents and it is the employee's responsibility to perform their job safely.

Development of a safety program is a necessity. The purpose of this safety program should be to define the principle under which the work within the facility is to be accomplished, and to make the employees of the facility aware of safe working procedures.

Perhaps the most essential element of a good safety program is the incorporation of some form of safety training. The purpose of safety training is to convey the importance of safety to the employees at the plant. Safety training can be accomplished through safety manuals, safety meetings, safety posters placed in strategic areas in the plant, and a safety suggestion program.

The overall danger of accidents is the same whether in manholes, pumping stations or treatment plants. These hazards include:

- Physical injuries;
- Body infections;
- Noxious gasses or vapors; and,
- Oxygen deficiency.

In many areas of the facility where sewage solids collect and are pumped, sludge gas may be produced. Sludge gases may contain low levels of life-sustaining oxygen. Sludge gas may also contain explosive concentrations of methane. However, the most important point to remember is that areas may contain toxic concentrations of hydrogen sulfide and are, therefore, the greatest hazard.

In wet wells and pump suction wells, flammable vapors such as gasoline and solvents may be present. Gasoline vapor is heavier than air, and presents the hazards of asphyxiation and explosion. Such places should be provided with forced ventilation. All electrical switches, lights, motors and fixtures should be explosion proof, and smoking prohibited.

Ammonia, which is explosive and harmful to the respiratory tract and eyes, may be found in sewers or enclosed treatment facility areas.

Solvent vapors, resulting from the discharge of gasoline, lubricating oils, benzene, naphtha and similar solvents and petroleum products, may cause suffocation or possibility of explosion.

A safety training program should be instituted by the supervisory personnel to prevent injuries. Following is

a list of some of the items which should be incorporated in the safety program:

- Employee training
- Maintenance of safe working conditions
- Medical and first aid
- Accident record system
- Accident investigation
- Safety program:
  - a. storage facilities
  - b. illumination
  - c. ventilation
  - d. fire control
  - e. water supply
  - f. safety facilities considerations
  - g. personal hygiene
  - h. safety equipment
  - I. good housekeeping
  - j. oxygen deficiency
  - k. electrical safety
  - l. hazardous operations
  - m. material handling
  - n. ladder operations

List of some safety equipment possibly needed on-site or available to the facility operator (quantities will vary):

- Three conductor grounded extension cord (50' long)
- First-aid kit
- Self-contained breathing apparatus
- Hose mask
- Safety harness and line
- Warning signs and tags
- Portable air blower
- Rubber gloves and boots
- Hard hat
- Fire extinguisher
- Safety eye glasses
- Oxygen deficiency detector
- Explosive gas detector
- Hydrogen sulfide detector
- Ammonia detector
- Rain gear and/or chemical suit

- Volt meter or indicator
- Speedy dry for spills (chemicals, polymer, lubricants, etc.)

SECTION 10 – UTILITIES

The following utilities provide service to the treatment facility:

Operations	*Business #*
Utilities Electric- National Grid	1-800-465-1212 (Emergency/Outage-Electric) 1-800-233-5325 (Emergency Gas) 1-800-322-3223 (Customer Service)
Verizon 24/7 Support	1-800-VERIZON

SECTION 11 – MAINTENANCE SCHEDULE

11.1 SPARE PARTS AND SUPPLIES

The following is a listing of recommended spare parts and supplies that should be available to the facility operator for the maintenance and repair of the treatment facility and related appurtenances.

FET Submersible Pumps, Reactor Tank Pumps, Final Effluent Pumps

- Two (2) float switches of each type
- One (1) set of each type of valve gasket

Blowers

- One (1) complete sets of gaskets
- One (1) year supply of lubricants required for operation and maintenance

Chemical Feed Systems

- One (1) manufacturer's recommended repair kit for each type of pump

PLC, Control Panels

- One (1) output card
- One (1) input card
- One (1) of each type of control relay

11.2 MAINTENANCE SUMMARY

The sheets that follow detail the recommended minimum maintenance tasks associated with the equipment.

Pretreatment Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Pretreatment Tank										
Remove solids (1)										X
Check tees/baffles						X				
Check sludge depth				X						
Check scum thickness				X						
Inspect hatches/covers				X						
Check liquid level with outlet invert				X						
Screens										
Visually inspect functionality/debris build up	X									
Clean screen	X									
Inspect level sensor operation			X							
Lubricate motors/drives/chains				X						
Inspect belts/drives/cables						X				
Inspect motors (amperage)									X	
Visually inspect equipment			X			X				
Inspect fluid levels on motors				X						

Remove scum/sludge as needed per MassDEP Guidelines necessitating removal
Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Flow Equalization Tank Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Flow Equalization Tank										
Remove and inspect pumps										X
Check scum/sludge depth				X						
Inspect level transducer/float switches/timers/alarms				X						
Inspect slide rails/chains				X						
Inspect wiring/junction boxes										X
Inspect hatches/covers				X						
Inspect and exercise valves										X
Inspect liquid level in tank related to normal operation levels			X							

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

MBR Required Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Anoxic Zones										
Check mixer operation				X						
Check Amp draw on mixer motor									X	
Measure DO/ORP	X									
Check carbon feed	X									
Drain and inspect tank										X
Aeration Zone										
Check air patterns in tank	X									
Check DO	X									
Check pH	X									
Measure MLSS			X							
Drain and inspect tank										X
Inspect Diffusers										X
MBR Zone										
Check flux rates	X									
Check trans-membrane pressure	X									
Check backwash cycle	X									
Check air patterns in tank	X									
Check DO	X									
Check pH	X									
Measure MLSS			X							
Check level sensors				X						
Inspect membranes						X				
Chemically clean membrane									X	
Flow Meter										
Calibrate meter										X

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Filtration Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
GAC Filter										
Check inlet and outlet pressures			X							
Monitor TOC removal efficiency			X							
Inspect equipment for overall deficiencies	X									

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Disinfection Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
UV Disinfection										
Replace bulbs										X
Clean UV sleeves				X						
Clean sensor				X						
Check UV intensity meter	X									
Inspect for leakage/damage	X									
Test UV system alarms				X						
Inspect effluent quality into UV system (turbidity)	X									

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Chemical Feed Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Alkalinity Adjustment										
Check pump operation	X									X
Inspect for leaks				X						
Check chemical inventory	X									
Check alkalinity	X			X						
Inspect for leakage/damage	X									
Supplemental Carbon Feed										
Check pump operation	X									X
Inspect for leaks				X						
Check chemical inventory	X									
Inspect for leakage/damage	X									

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Blowers Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Blowers										
Check belts				X						
Inspect air filter				X						
Check oil level				X						
Change air filter										X
Change oil										X
Grease motor bearings						X				
Check amperage									X	

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

Pump Chamber Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
Final Effluent Pump Chamber										
Remove and inspect pumps										X
Inspect level switches/timers/alarms				X						
Inspect slide rails/chains				X						
Inspect wiring/junction boxes										X
Inspect hatches/covers				X						
Inspect and exercise valves										X
Inspect liquid level in tank related to normal operation levels			X							

Tasks to be completed with above schedule or manufacturer's recommended maintenance, whichever is more stringent

General House Keeping Required
Maintenance Summary

Equipment/Task	Daily	Twice Weekly	Weekly	Monthly	45 Days	90 Days	105 Days	125 Days	6 Months	Annually
House Keeping										
Observe ventilation system			X							
spect HVAC system by HVAC Firm										X
Observe humidity control system				X						
Maintain/inventory spare parts						X				
Replace/maintain lights										X
Review safety issues of facility				X						
Maintain standby power system									X	
Check cathodic protection										X
Clean facility			X							
Remove/dispose of lubricants/fluids and/or spills	X									
Calibrate flow meters										X

	DUTIES AND RESPONSIBILITIES	Operator	Owner	Shared
1	Responsible for day-to-day operations by certified operators	☐	☐	☐
2	Ensure permit compliance at all times	☐	☐	☐
3	Daily inspections of all mechanical equipment	☐	☐	☐
4	Perform preventative maintenance as required in permit	☐	☐	☐
5	Measure and observe chemical tanks and usage	☐	☐	☐
6	Order and purchase chemicals	☐	☐	☐
7	Maintain proper sludge and tank levels	☐	☐	☐
8	Schedule and pay for sludge and septic removal as needed	☐	☐	☐
9	Maintain O&M Manual and equipment maintenance repair logs	☐	☐	☐
10	Perform in house compliance testing	☐	☐	☐
11	Maintain proper consumable supplies (oils, grease, PPE, reagents,etc)	☐	☐	☐
12	Maintain housekeeping and housekeeping supplies	☐	☐	☐
13	Collect permit required influent, effluent and well samples	☐	☐	☐
14	Submit reports within time frames specified in permit	☐	☐	☐
15	Complete and submit annual financial report	☐	☐	☐
16	Maintain FAM's as specified in permit	☐	☐	☐
17	Generate submit and pay for permit renewals	☐	☐	☐
18	Payment of annual DEP fee	☐	☐	☐
19	Ensure accuracy of flow meter(s) (annual inspection/calibrations)	☐	☐	☐
20	Accompany regulatory agencies during inspections	☐	☐	☐
21	Maintain compliant log book	☐	☐	☐
22	Maintain and file all pertinent plant records	☐	☐	☐
23	Notify DEP of any spills, bypasses, interruption or significant maintenance events	☐	☐	☐
24	Generate and submit 15 year engineering report and financial plan	☐	☐	☐
25	Notify DEP of any proposed transfer of permit	☐	☐	☐
26	Generate and submit 2-year staffing plan	☐	☐	☐
27	Annual inspection of potable water backflow prevention device	☐	☐	☐
28	Annual inspections or re-generation of fire extinguishers	☐	☐	☐
29	Utility and telecommunication costs	☐	☐	☐
30	Building and grounds maintenance/upkeep	☐	☐	☐
31	Generator maintenance scheduling and costs	☐	☐	☐
32	Snow removal including access to groundwater monitoring wells, pump stations, etc	☐	☐	☐
33	Major equipment repairs	☐	☐	☐
34	Maintain spare parts inventory	☐	☐	☐
35	Alarm responses	☐	☐	☐
36	Pump station maintenance	☐	☐	☐
37	Grease trap care and maintenance	☐	☐	☐
38	Instrumentation maintenance	☐	☐	☐
39	Coordinate and pay for lab analysis	☐	☐	☐
40	Maintain safety equipment (eyewash, fire ext., signs, etc)	☐	☐	☐
41	Maintain and enforce equipment warranties	☐	☐	☐
42	Maintain appropriate PPE (glasses, gloves, facesheilds, etc)	☐	☐	☐
43		☐	☐	☐
44		☐	☐	☐
45		☐	☐	☐
46		☐	☐	☐

Equipment Replacement/Repair Log

Date	Equipment Serviced	Replacement Equipment (Manufacturer/Model#)	Supplier (Firm/Name/Telephone #)	Contractor (Firm/Name/Telephone #)	Shop Drawings Provided (Yes/No)	O&M Provided (Yes/No)	O&M Location (O&M Manual Appendix)	Comments

Equipment Maintenance Log

Date	Equipment	Task	Technician	Next Service Date	Comments

APPENDIX A

GROUNDWATER DISCHARGE PERMIT

APPENDIX B

DESIGN DRAWINGS & SMITH & LOVELESS SHOP DRAWINGS

APPENDIX C

AS-BUILT DRAWINGS

APPENDIX D

SELECTED REGULATIONS AND REPORTING FORMS

APPENDIX E

OPERATING CONTRACTS & STAFFING PLAN

APPENDIX F

MATERIAL DATA SAFETY SHEET

APPENDIX G

MONITORING WELL INFORMATION

APPENDIX H

PRECAST CONCRETE TANKS

APPENDIX I

FLOW EQUALIZATION EQUIPMENT

APPENDIX J

SMITH & LOVELESS TITAN MBR OPERATION AND MAINTENANCE MANUAL

APPENDIX K

CHEMICAL FEED EQUIPMENT

APPENDIX L

TURBIDITY METER

APPENDIX M

ULTRAVIOLET DISINFECTION SYSTEM

APPENDIX N

GRANULAR ACTIVATED CARBON FILTER

APPENDIX O

FLOW METER

APPENDIX P

FINAL EFFLUENT PUMP EQUIPMENT

APPENDIX Q

STANDBY GENERATOR

APPENDIX R

CONTROL EQUIPMENT

APPENDIX S

MISCELLANEOUS FACILITY EQUIPMENT