FORMER IBM EAST FISHKILL FACILITY
DUTCHESS COUNTY
TOWN OF EAST FISHKILL, NEW YORK

2070 ROUTE 52
HOPEWELL JUNCTION, NEW YORK 12533

Appendix M
Operation and Maintenance Manuals

NYSDEC Site Number: 314054
EPA Site Identification Number: NYD000707901

Revisions Summary:

Revision #	Submitted Date	Summary of Revision	NYSDEC Approval Date
0	August 2017		
1	May 2021	Updated organizational structure to December 2020 SMP template. Includes updates to reflect new ownership and property boundaries; remedial systems installations and operators.	

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LIST OF ATTACHMENTS

UPDATE TABLE

The table below will be used to track minor administrative updates/changes to this Appendix and its Attachments. Major revisions will be recorded and summarized on the Cover Sheet.

Date	Page No. (Note Appendix if Applicable)	Description of Update/Change

SUMMARY

Procedures for operating and maintaining the constructed Engineering Controls (ECs) are documented in the Operations and Maintenance Manuals (O&M Manuals) for the Sub-slab Vapor Extraction Systems (SSD Systems) (**Appendix M-2**) and Operation, Maintenance and Monitoring Plan for the Groundwater Collection and Treatment Systems (**Appendix M-1).**

The O&M Plans for the SSD Systems and OM&M for the Groundwater Extraction and Treatment Systems include full design details of the ECs including specifications of equipment components and operating parameters.

Appendix F contains As-Built drawings for constructed Engineering Controls (ECs) and Layout Designs for (ECs) that are under construction or proposed for quick reference.

This appendix will be updated to reflect conditions once systems are operational or as systems are modified.

M-1 OM&M Groundwater Collection and Treatment Systems

M-2 OM&M Sub-slab Vapor Extraction Systems
- M-2.a B330D VE-1 and VE-10
- M-2.b B330C VE-7 and VE-8
- M-2.c B310 VE-9 and B310/B308 Linkway VE-11
- M-2.d B338 VE-30
- M-2.e B339 VE-31
- M-2.f B330C VE-32 (placeholder)

M-1 OM&M Groundwater Collection and Treatment Systems

INTERNATIONAL BUSINESS MACHINES CORPORATION

FORMER IBM EAST FISHKILL FACILITY
DUTCHESS COUNTY
TOWN OF EAST FISHKILL, NEW YORK

2070 ROUTE 52
HOPEWELL JUNCTION, NEW YORK 12533

Appendix M-1
Operation, Maintenance and Monitoring Plan
Groundwater Remedial Systems

NYSDEC Site Number: 314054
EPA Site Identification Number: NYD000707901

Operations, Maintenance and Monitoring Plan Revisions

Revision #	Submitted Date	Summary of Revision	NYSDEC

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OM&M UPDATE TABLE

The table below is used to track minor updates/changes (such as text edits and changes not affecting treatment process or effectiveness of GTF performance) to the OM&M and its Attachments. Major revisions (not considered minor) will be recorded and summarized on the Cover Sheet.

Date	Page No. (Note Attachment, if Applicable)	Description of Update/Change	

LIST OF ABBREVIATIONS AND ACRONYMS

amsl	above Mean Sea Level
AOC	Area of Concern
bgs	below ground surface
B	B preceding a number indicates a Site building number. B/ was used historically to indicate the same information (Building)
CAMP	Community Air Monitoring Plan
CCTS	Central Carbon Treatment System
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COCs	constituents of concern
CP	Commissioner Policy
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
DNAPL	dense non-aqueous phase liquid
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
EWP	Excavation Work Plan
FDS	Field Data Sheet
Freon® TF	1,1,2-trichloro-1,2,2-trifluoroethane
Freon® 123a	1,2-dichloro-1,1,2-trichloroethane
GAC	granular activated carbon
GF	GlobalFoundries US2 LLC
GHG	Greenhouse Gas
GTF	Groundwater Treatment Facility
gpm	gallons per minute
HASP	Health and Safety Plan
HVAC	Heating, Ventilation and Air Conditioning
IHWDS	Inactive Hazardous Waste Disposal Site Remedial Program
IAWP	Intrusive Activities Work Plan
IBM	International Business Machines Corporation
IC	Institutional Control
iPark	iPark collectively refers to any and all iPark East Fishkill entities unless a specific iPark entity is referenced in the text or other documents associated with this ISMP.
ISMP	Interim Site Management Plan
IWTF	Industrial Waste Treatment Facility
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operations, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P.E. or PE	Professional Engineer
P.G. or PG	Professional Geologist

PFAS	Per- and Polyfluoroalkyl Substances
PCE	tetrachloroethene
PMP	Performance Monitoring Plan
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objectives
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TAGM	Technical and Administrative Guidance Memorandum
TCE	trichloroethene
TCL	target compound list
ug/L	micrograms per Liter
ug/m3	micrograms per cubic meter
Use Area	Portions of the Property designated as Area A, Core Area, Landfill, Perimeter, Use Modification Area and Restricted Area.
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VI	Vapor Intrusion
VOC	volatile organic compound
WMP	Waste Management Plan
WPCF	Wastewater Pollution Control Facility

1.0 INTRODUCTION

The Operations, Maintenance, and Monitoring (OM&M) Plan was prepared for the approximately 460-acre Former IBM East Fishkill Facility (Site) located in East Fishkill, Dutchess County, New York (Figure 1-1). The Plan complies with Section 7.1(b) of the Site's Statement of Basis issued pursuant to the Part 373 Permit for the Corrective Measures Program and addresses operation of groundwater recovery and treatment systems identified as the PW-1 Groundwater Treatment Facility (GTF), PW-2 GTF, PW-25 GTF, and the Building 384 (B384) GTF.

This OM&M Plan is the primary reference document for personnel involved in day-to-day operation, maintenance and monitoring activities performed for the four GTFs. Users should refer to the Process and Instrumentation Diagrams (P&IDs), Process Flow Diagrams (PFDs), checklists, tables, forms, shop drawings, and manufacturer's literature for detailed information for over-all system performance requirements. Operations, maintenance, monitoring, and main components information for each treatment system are included as Attachments.

2.0 BACKGROUND

On July 1, 2015, the Site was acquired by GlobalFoundries U.S. 2 LLC (GF). In 2017, GF subdivided the property into eight lots totaling approximately 431.1 acres; an additional 27.5 acres of roadways exist within the property boundary. On September 1, 2017, i.Park East Fishkill LLC and i.Park East Fishkill I LLC, purchased Lots 2, 3, 4, 6, 7, and 8. Subsequently iPark[1] leased portions of the Site to industrial and commercial entities; however, Lot 1 and Lot 5 remain GF property. GF, i.Park East Fishkill LLC, and i.Park East Fishkill I LLC are listed as facility owners under the current NYSDEC Part 373 Permit.

IBM maintains responsibility for Groundwater Corrective Action. IBM reconfigured the existing overall groundwater remediation system into the four units, referenced in Section 1.0, to segregate GTF operations from the GF infrastructure at the Site. Groundwater recovery and treatment for Area A (Operable Unit (OU) 5), and the Bedrock Remediation Area (OU2) are described in Section 3.0. Figure 2-1 and Table 2-1 provide OU locations and OU groundwater treated by each GTF, respectively. Table 2-2 provides information for active and inactive extraction wells and GTFs that provide treatment of groundwater withdrawals.

[1] iPark collectively refers to any and all iPark East Fishkill entities unless a specific iPark entity is referenced in the text or other documents associated with this Plan..

3.0 TREATMENT AND DISCHARGE OBJECTIVES AND COMPLIANCE

The GTFs treat groundwater to meet the NYSDEC surface water discharge criteria for Constituents of Concern (COCs) at groundwater pumping rates that impede off-Site COC migration. The primary COCs at the Site are volatile organic compounds (VOCs). Groundwater containing COCs are collected by extraction wells shown on Figure 3-1 and conveyed to the GTFs for treatment. Table 3-1 provides the range of design flows and hydraulic capacity for each GTF. Table 3-2 contains the average influent concentration and treatment goals for each SPDES COC at the estimated daily flow range. Tables 3-3a, 3-3b, 3-3c, and 3-3d provide a summary of the anticipated SPDES treatment requirements, as submitted in the pending SPDES Permit Application, for each surface-water outfall associated with GTFs PW-1, PW-2, PW-25, and B384, respectively.

As shown on Figure 3-1, the PW-1 GTF is located east of Building 325 (B325) and treats groundwater from bedrock production well PW-1. PW-2 GTF is located west of Building 316 (B316) and treats groundwater from bedrock production well PW-2R. The PW-25 GTF is located west of Building 334 (B334) and treats groundwater from bedrock production well PW-25. The B384 GTF is near Building 308 (B308), Building 309 (B309), and Building 310 (B310) and treats groundwater collected using two, 16-foot perforated drains leading to a 6-foot diameter concrete collection sump. A venturi pumping system, connected to well-points installed in the sump, conveys water to the B384 treatment system. Table 3-4 provides a summary of pumping well characteristics at the Site. Logs for extraction wells PW-1, PW-2R, and PW-25 are contained in Attachment A.

Treated water from the PW-1 GTF, PW-2 GTF, and PW-25 GTF is conveyed to B316 owned by GF and reused for manufacturing process purposes. Groundwater treated by the PW-1, PW-2, and PW-25 GTFs, and not reused by GF, is discharged into the existing storm sewer network in compliance with SPDES requirements at outfalls 42A, 04A, and 28A, respectively. The treated water from the B384 Sump system is discharged to GF's Building 312 (B312) Industrial Waste Treatment Facility (IWT) and mixes with GF-generated industrial wastewater. The B384 GTF is also connected to the existing on-Site storm sewer network at Outfall 04B. Table 2-1 shows the general areas and associated OUs addressed by remediation systems on Site, and the SPDES outfalls associated with each GTF. A discussion of the GTFs for Area A and the Bedrock Remediation Area (OU2) is presented, below.

3.1 Overview of Treatment System – Areas and OUs

The occurrence of VOCs in groundwater in Area A (OU5) is believed to have resulted from the handling of hazardous constituents from the mid-1960s to the mid-1970s. Groundwater containing VOCs from Area A is collected and treated by the B384 GTF. The groundwater is collected by two 16-foot perforated drains and conveyed to a 6-foot diameter concrete collection sump. A venturi pumping system extracts groundwater from the sump and conveys it to two temporary storage tanks and eventually to an equalization tank in B384. Groundwater is then pumped to an air-stripper followed by aqueous filtration by GAC; the air stream effluent from the air stripper is treated by vapor-phase GAC. Effluent from the air stripper is pumped through bag filters and aqueous-phase GAC, and conveyed to an industrial waste treatment facility by a gravity sewer.

Historically, the Area A treatment system has treated an annual flow range between 0.5 and 2.5 gpm containing total VOCs that range from approximately 10,000 µg/l to 30,000 µg/l. The objective of the B384 extraction and treatment system is to capture near-source groundwater containing VOCs, primarily tetrachloroethene (PCE), prior to migration into bedrock groundwater captured by PW-2R. The perched overburden groundwater is extracted in the vicinity of the B308 and B310 linkway.

Three bedrock extraction wells operated to contain bedrock groundwater plumes in the Bedrock Remediation Area (OU2) beneath the Site. Groundwater primarily containing low levels of PCE, trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), and Freon® TF is collected by bedrock extraction well PW-1 and treated in the PW-1 GTF. Aqueous-phase GAC technology is used to treat groundwater from well PW-1. The apparent PW-1 capture zone includes bedrock groundwater beneath the northwestern portion of the Site, including a bedrock plume originating from the B322 AOC (OU7).

Groundwater primarily containing PCE, TCE, cis-1,2-DCE, vinyl chloride (VC) and Freon® TF is collected by bedrock extraction well PW-2R and treated in the PW-2 GTF. The PW-2 GTF treatment process consists of UV-Oxidation made up of a hydrogen peroxide injection system and a UV light reactor followed by catalytic carbon to remove residual hydrogen peroxide. The UV-Oxidation process is followed by aqueous phase GAC to remove VOCs not eliminated by UV-Oxidation. The apparent PW-2R capture zone includes bedrock groundwater beneath the northeastern portion of the Site, including a bedrock groundwater plume originating from Area A (OU5).

Groundwater primarily containing PCE, TCE, cis-1,2-DCE, and Freon® TF is collected by bedrock extraction well PW-25 and treated in the PW-25 GTF. Aqueous-phase GAC is the technology used to treat groundwater from well PW-25. The apparent PW-25 capture zone includes bedrock groundwater beneath the southern portion of the Site, including bedrock groundwater plumes originating in the Building 330 (B330) AOC and the Area C Landfill (OU6).

Process Flow Diagrams for the PW-1, PW-2, and PW-25, and B384 GTFs are provided on Figures 3-2, 3-3, and 3-4, and 3-5, respectively. The Central Carbon System (CCS) in B316 is owned by GF and accepts the treated water from the PW-1, PW-2, and PW-25 GTFs.

3.2 Treatment System Operational Objectives

Major remediation system components (e.g., groundwater extraction and treatment systems) must operate as an integrated system. Therefore, through combined operations, the PW-1, PW-2, PW-25, and B384, treatment systems must meet Remedial Action Objectives for the Site. These objectives are as follows:

- Maintain capture of VOC plumes;
- Maintain inward hydraulic gradients in the Bedrock Remediation Area (OU2);
- Maintain extraction well withdrawals at a constant rate;
- Maintain dependable operations and high run times; and
- Maintain system design operating parameters to meet permitted discharge limits.

3.3 Treatment System Monitoring Objectives

Extraction well performance will be gauged by the volume of groundwater extracted, pumping water levels, and mass removed from the aquifer by pumping and treatment. VOC concentration and groundwater elevations will be monitored in key wells to evaluate the containment objective of the monitoring network. The treatment system will be monitored to demonstrate VOC removal efficiency, performance of treatment system components, and compliance with SPDES permit limits. The monitoring program is designed to provide a complete picture of the system (wells and treatment system) performance. Site monitoring and extraction wells are shown on Figure 3-1. The groundwater monitoring plan is included as Attachment B.

3.3.1 Treatment System Compliance and Performance Sampling

Monthly sampling of the treated effluent in each GTF is conducted to evaluate system performance. These samples will be used to verify that the anticipated future SPDES discharge limits, as submitted in the pending SPDES Permit Application, for VOCs and other parameters shown on Tables 3-3a, 3-3b, 3-3c, and 3-3d are met. Sampling locations for SPDES compliance are labeled SP-CTW-EFF for the PW-1, PW-2, PW-25, and B384 GTFs shown on Tables 3-5a, 3-65b, 3-5c, and 3-5d, respectively. Flow is metered and monitored on a continuous basis to ensure that a daily maximum flow is not exceeded per the anticipated SPDES permit requirements.

Sampling locations within each GTF used to determine treatment system performance are listed on Tables 3-5a, 3-5b, 3-5c, and 3-5d. Sample collection locations for each GTF are shown on the GTF piping schematics and P&IDs discussed in Section 4. The labeled sampling locations are used to determine liquid- and vapor-phase carbon performance and when carbon change-outs need to occur. The locations are shown for the influent, mid-point and effluent of the aqueous phase granular activated carbon (GAC).

To verify compliance and performance, headspace-free samples are collected in three 40 ml glass VOA vials per sampling location. Inorganic samples and indicator parameters are collected in the containers specified by the method. All containers for each sample will be labeled with a unique sample identification (SampleID) following the designated locations and nomenclature shown on Tables 3-5a, 3-5b, 3-5c, and 3-5d.

3.3.2 Sampling, Analysis, and Reporting Responsibilities

The responsibilities of Program Manager, Scientists, GTF Operators, Field Technicians, Engineers, and the vendor laboratory(s) involved in the operation, monitoring and reporting for the Areas A (OU5) and Bedrock Remediation Area groundwater treatment and recovery systems are summarized in Table 3-6. The Program Manager is in charge of overall program performance that includes operations and maintenance of the GTFs, compliance, permits, reports, program health and safety, and Site emergency co-contact along with the IBM Emergency Coordinator. Scientists are responsible for data management, data quality, hydrogeologic performance of pumping system, compliance reports, and groundwater sampling. Site Operators and Field Technicians are responsible for facility O&M, completing operations logbooks, collecting operations and maintenance data, and managing the performance of groundwater extraction and treatment systems. Environmental Engineering is responsible for system operational quality, process engineering support to Program Manager and Site Operators, and regulatory agency interface regarding system treatment and GTF system performance.

3.3.2.1 Sample Analysis and Reporting

Samples are analyzed by the vendor laboratory using SW-846 Method 8260C or 8021. The reporting level is 1 µg/l for most VOCs. Holding times and analytical and quality control procedures are specified in the method. Laboratory reports are distributed to a GSC scientist. Example forms for sample collection in GTFs are contained in Attachment C.

3.3.2.2 Effluent Concentration Treatment Levels

Tables 3-3a, 3-3b, 3-3c, and 3-3d contain effluent limits, submitted as part of the pending SPDES Permit Application, for each GTF related to future SPDES discharge requirements.

3.4 Compliance Reporting and Notifications

Monthly Discharge Monitoring Reports (DMR) will be submitted under the future SPDES permit. Site Operators will submit results of routine GTF and pump house inspections to GSC engineers and scientists monthly. The information includes totalizer and electrical readings, date(s) the plant was not operational, cause(s) of problem(s), and corrective actions taken. IBM will notify NYSDEC in writing as per Part 373 Permit, Module II E. 8 whenever the Groundwater Corrective Measures Program is inoperable (i.e., shut-down) for a period of time that exceeds 15 consecutive days, when the shutdown jeopardizes the containment of contaminated groundwater, or if the system is inoperable for more than 15 days in any given 30-day time period. Written notification will address the cause of the shutdown(s) and any planned or implemented remedies.

4.0 EXTRACTION AND TREATMENT SYSTEM EQUIPMENT

Groundwater from Area A (OU5) and the Bedrock Remediation Area (OU2) is pumped from bedrock wells or the B384 sump prior to treatment by GTFs. Common equipment for all GTFs include pumps, filters, valves, piping, drives, flow meters, tanks and vessels, controls, sensors, and electrical and instrumentation control panels. Figures 4-1, 4-2, 4-3, 4-4a, and 4-4b include Process and Instrumentation Diagrams (P&IDs) that show equipment function and treatment equipment relationships within each GTF. Schematics for the PW-1 GTF, PW-2 GTF, and PW-25 GTF are shown on Figures 4-5, 4-6, and 4-7, respectively, and provide sample collection locations in the sampling sink within each GTF.

Extraction wells PW-1, PW-2R, and PW-25 are plumbed and wired to pump houses PH-1, PH-2, and PH-25, respectively. The pump houses are plumbed to each GTF but the main power feeds for the PW-2, PW-25, and B384 GTFs originate in GF or iPark buildings. The power source for PW-1 originates at PH-1. In the case of the B384 sump located within the B384 GTF, a venturi-driven pump extracts water from well points within the sump and is plumbed and wired directly to the B384 treatment system. The following Subsections contain information for extraction wells and pumps, pump houses and GTF buildings, equipment and building layout, and treatment system components common to all GTFs. Specific manufacturer information and cut-sheets for equipment in the GTFs are included in Attachment D.

4.1 Extraction Wells and Pumps

Groundwater is pumped from three (3) wells and a sump at rates shown on Table 4-1. Tables 2-2 and 3-4 provide details regarding well construction, and pump information including settings, rates, sizes, make, and model.

4.2 Pump Houses and GTF Buildings

Nine (9) pump houses exist on-Site; however, only three associated with wells PW-1, PW-2R, and PW-25 are currently operational. Tables 4-2 and 4-3 provide information for the active and inactive pump houses regarding building dimensions, access, contents, locations, operational status, discharge conveyance and electrical system information. PW-5 and PW-5A occupy a single pump house.

Maintenance of all remaining structures is required. Table 4-4 provides information for HVAC, lighting, well head type, and location for active pump houses PH-1, PH-2, and PH-25. Table 4-5 provides information about instruments meters, and transducers for active Pump Houses and Table 4-6 provides VFD information for each active pump house. Table 4-7 presents local instruments for active pump houses.

Tables 4-8 and 4-9 contain structure dimensions, construction materials, lighting, HVAC, power feed and utility information for the PW-1, PW-2, PW-25, and B384 GTFs. General building layouts for these GTFs are provided on Figures 4-8, 4-9, 4-10, and 4-11.

4.3 GTF System Pumps

Table 4-10 contains information for the pumps in wells PW-1, PW-2R, and PW-25. Tables 4-11 and 4-12 contain information for pumps in the four operating GTFs that includes P&ID identification number; pump make, model, and capacity; motor information including horse-power, voltage, phase, and amperage; and pump service factor, flow range, and pump function.

4.4 GTF System Filters

Table 4-13 provides bag filter information for each GTF including the P&ID identification number, make and model of the filters, filter and housing size, filter opening in microns, and treatment system use.

4.5 GTF System Valves

Tables 4-14a, 4-14b, 4-14c, and 4-14d provide system valve information for each GTF including the P&ID identification number, descriptions, and treatment system use. These tables are available in in each GTF.

4.6 GTF System Piping

Tables 4-15a, 4-15b, 4-15c, and 4-15d provide system pipe information for each GTF including pipe diameters, P&ID identification number, pipe material, and descriptions for the process piping.

4.7 GTF System Variable Frequency Drives

Table 4-16 provides variable frequency drive information for each GTF including motor size, make and model, and drive rating.

4.8 GTF Flow Meters

Table 4-17 provides flow meter information for each GTF including P&ID identification number, pipe diameter, make and model, and intended function for meters.

4.9 GTF System Tanks and Carbon Vessels

Table 4-18 provides general tank information for each GTF including intended use, make, material, size, empty weight, and volume for each tank. Tables 4-19a, 4-19b, 4-19c, and 4-19d provide more specific tank features such as diameter, height, construction material, manway, fittings, gaskets, flanges, vents, drains, overflows, and ports for the tanks in PW-1, PW-2, PW-25, and B384 GTFs, respectively. Table 4-20 provides liquid-phase carbon vessel information for each GTF including make and model, carbon type, design flow, hydraulic capacity, backwash rate, identification number, carbon weight per vessel and volume.

4.10 Electrical Meter Information

Information regarding electrical meters at the Site is shown on Table 4-21.

5.0 GTF SYSTEM OPERATIONS

This section contains operational information and a description of the GTFs at the Site.

5.1 System Descriptions

A description of the PW-1, PW-2, PW-25, and B384 GTFs is provided in the following subsections.

5.1.1 PW-1 GTF

The PW-1 GTF treats groundwater pumped from well PW-1 at a maximum anticipated flow rate of 100 gpm. The primary constituents that require treatment are PCE, TCE, cis-1,2-DCE, and Freon® TF. The treatment technology, aqueous phase GAC, consists of dual-stage, eight-foot diameter vessels with a carbon capacity of 10,000 pounds each. The dual-phase system consists of vessels operated in series with a total hydraulic capacity of 500 gpm; this configuration can treat COCs to non-detectable levels. Following GAC treatment, the groundwater flows to treated water tank T-300 and from there is pumped by Discharge Pump P-300 to B316 for GFs use in their manufacturing operations. The GTF is also constructed to allow discharge to future SPDES location Outfall 42A. A process flow diagram for the PW-1 treatment system is provided as Figure 3-2.

The treatment system includes backwash/grit pump P-400 and bag filters F-401/402. GAC vessels will be backwashed, when required, using treated water from tank T-300; the backwash water is collected in grit tank T-400. Backwash water collected in the grit tank is then pumped through the bag filters to Stage 1 of the GAC system. Individual sample ports, pressure gauges, flow meters and flow control valves are provided for operation and monitoring of treatment system performance.

5.1.2 PW-2 GTF

The PW-2 GTF treats groundwater pumped from well PW-2R at a maximum anticipated flow rate of 150 gpm. The primary constituents that require treatment are PCE, TCE, cis-1,2-DCE, VC, and Freon® TF. The primary treatment technology, advanced oxidation and aqueous-phase GAC polishing, uses a hydrogen peroxide injection system and photo-oxidation via ultraviolet light to oxidize VOCs, a PeroxCarb® media to reduce residual hydrogen peroxide, and a final polishing step using aqueous-phase carbon. The aqueous-phase GAC treats effluent for residual VOCs not oxidized by the Rayox® treatment system prior to discharge.

Prior to the Rayox® treatment system, groundwater from extraction well PW-2R is pumped through bag filters F-901/F-902 to remove solids. A 30% aqueous hydrogen peroxide solution is injected into the Rayox® treatment system influent at approximately 50 ppm that is reduced to approximately 36 ppm leaving the Rayox® treatment system.

To reduce the concentration of hydrogen peroxide not consumed by oxidation, the Rayox® treatment system effluent flows to transfer tank T-700 where it is pumped by transfer pumps P-700/701 through the catalytic GAC treatment vessel containing 10,000 pounds of PeroxCarb® media supplied by Calgon Carbon Corporation (Calgon). The PeroxCarb® media is a catalytic impregnated GAC that is designed to reduce residual hydrogen peroxide concentrations to levels of less than 1 ppm.

The 90-KW Rayox® treatment system is the first step in the groundwater treatment process to effectively treat a maximum hydraulic load of 215 gpm. Rayox® treatment system influent passes under a bank of three, 30-KW (each) reactor lamps where the UV light emitted by the reactor vessels reacts with the hydrogen peroxide to oxidize vinyl chloride, and other VOCs. Because the Rayox® treatment system does not achieve 100% reduction of all VOCs contained in the groundwater influent and does not oxidize Freon® compounds, a dual-stage, aqueous-phase GAC system configured in series follows the catalytic media step. The catalytic media and dual-stage GAC systems have a hydraulic capacity of 500 gpm and can treat VOCs remaining in the Rayox® treatment system effluent to non-detectable levels. Following GAC treatment, water flows to treated water tank T-300 and is pumped to B316 by discharge pump P-300. The GTF is configured to allow discharge to future SPDES permitted Outfall 04A.

The PW-2 backwash system contains backwash/grit pump P-400 and bag filters F-401/402. GAC vessels are backwashed using treated water from tank T-300. Backwash water collected in grit tank T-400 is pumped through the bag filters to the inlet of the catalytic GAC vessel. Sample ports, pressure gauges, flow meters, and flow control valves are provided for operation and monitoring of treatment system performance. A process flow diagram for the treatment system is shown as Figure 3-3.

5.1.3 PW-25 GTF

The PW-25 GTF treats groundwater pumped from well PW-25 at a maximum anticipated flow rate of 250 gpm. The primary constituents that require treatment are PCE, TCE, cis-1,2-DCE, and Freon® TF. The treatment technology, aqueous phase GAC, consists of dual-stage, ten-foot diameter vessels with a carbon capacity of 20,000 pounds each. The dual-stage system consists of vessels operated in series with a total hydraulic capacity of 710 gpm; this configuration can treat COCs to non-detectable levels. Following GAC treatment, the groundwater flows to treated water tank T-300 and then pumped by discharge pump P-300 to B316. The GTF is also constructed to allow discharge to future SPDES permitted Outfall 28A. A process flow diagram for the treatment system is provided as Figure 3-4.

The treatment system includes backwash/grit pump P-400 and bag filters F-401/402. GAC vessels are backwashed, when required, using treated water from tank T-300; the backwash water is collected in grit tank T-400. Backwash water collected in T-400 is then pumped through the bag filters to Stage 1 of the GAC system. Individual sample ports, pressure gauges, flow meters and flow control valves are provided for operation and monitoring of treatment system performance.

5.1.4 B384 GTF

The B384 GTF treats groundwater pumped from the Area A collection sump, monitoring well purge water, and condensate collected from various soil vapor extraction (SVE) and sub-slab depressurization (SSD) systems operating at the Site. The primary constituents of concern include VOCs (PCE, TCE, cis-1,2-DCE) and Poly- and Perfluoroalkyl Substances (PFAS). The B384 GTF treats groundwater pumped at a maximum anticipated flow rate of 10 gpm. The treatment technology is air stripping followed by aqueous-phase GAC polishing. A process flow diagram for the treatment system is provided as Figure 3-5.

A venturi pumping system extracts groundwater from the Area A Collection sump. Pump P-700 circulates water from tank T-700 through eductors connected to extraction points installed in the sump. The groundwater drawn from the extraction points enter T-700 and excess groundwater overflows from T-700 to Tank T-200.

Pump P-200 pumps groundwater from T-200 to Influent Storage Tank T-100 and from there, groundwater is pumped to the treatment system. Transfer pumps P-101/102 pump groundwater to a QED EZ-Tray Model 6.6 Tray-Type Air Stripper (S-300) that uses six (6) treatment trays and an air flow rate of 340 cfm to strip VOCs from groundwater. The air-stripper effluent is pumped by transfer pump P-300 through bag filters F-401/402, and then through a dual-stage, aqueous-phase GAC system. The air stripper has a hydraulic capacity of 65 gpm and can treat VOCs to non-detectable levels. The GAC system contains two vessels in series, each containing 1,000 pounds of aqueous phase GAC. The aqueous phase GAC has a hydraulic capacity of 80 gpm and can treat PFAS compounds to non-detectable levels. The overall treatment system hydraulic capacity is limited by the 65 gpm capacity of the air stripper. Following GAC treatment, the water is discharged to GF's B312 IWT Facility. The GTF is also constructed to allow discharge to future SPDES Outfall 04B.

A chemical feed system using Redux 390 is needed in the B384 process to prevent the accumulation of calcium carbonate scale in the treatment system. The system feeds a sequestering agent to Circulation Tank T-700 of the groundwater extraction system. Groundwater pre-treated with the Redux 390 sequestering agent is then pumped to Transfer Tank T-100 for treatment in the Air Stripper, S-300, and the Liquid Phase GAC vessels, PV-501/502.

The treatment system also includes dual-stage, vapor-phase GAC Vessels V-601/ 602 for treatment of the air stripper (S-300) off-gas. Duct heater DH-1 pre-heats the air stream prior to the vapor-phase GAC to reduce the relative humidity and prevent condensation in the vessels; duct heater DH-2 preheats the outside air stream prior to the air stripper sump to prevent ice formation in cold weather. Blower B-100 is connected to the vent piping of tank T-100 and redirects vapors collected in the tank for treatment by the vapor-phase GAC. On occasion, water from other sources, such as groundwater sampling purge water or SVE and SSD condensate water, is added to tank T-100. Individual sample ports, pressure gauges, flow meters and flow control valves are provided for operation and monitoring of treatment system performance.

5.2 System Operations

The following subsections provide general system operations for extraction wells, carbon system, Rayox® treatment system, air stripper, instrumentation, controls, remote monitoring, and alarms. A complete description of operations and operational sequence are provided, below. The HASP for Site operations is included in Attachment E.

5.2.1 Pumping from Extraction Wells

Groundwater from extraction wells PW-1, PW-2R, and PW-25 is pumped to GTFs for treatment. Electrical submersible pumps in extraction wells are operated by VFDs that provide a constant flow-rate from wells. The motor frequency of the pump and pump speed are electronically varied based on a signal sent from PLC that is programmed to maintain a constant flow under changing aquifer conditions.

Control system interlocks disable the extraction well pumps from starting if a high-level condition is detected in the equalization tank or flooding is detected on the building floor. VFD information is provided in Table 4-6 and Attachment D and includes pump characteristics controls data.

5.2.2 Carbon Adsorption Operations

Groundwater treatment for removal of VOCs in all EFK GTFs is accomplished by GAC adsorption using Calgon Filtrasorb® (F-300) carbon (Table 4-20). Calgon Model 8 vessels are used in PW-1 and PW-2 and Calgon model 10 vessels are used in PW-25; Calgon model TW-36 vessels are used for the air-phase carbon in B384. The vessels are piped in a series, lead-lag arrangement except for the PeroxCarbon® vessel in PW-2. Aqueous-phase carbon usage estimates provided by Calgon using the design influent concentrations and treatment system flow rates predict a range of between three to six pounds of carbon used per day for the GTFs.

Performance monitoring of aqueous-phase GAC units is accomplished with monthly sampling and analysis of the influent, midpoint and effluent groundwater VOC concentrations. Upon detection of VOCs in the monthly midpoint sample, additional sampling of the influent and midpoint may be warranted to confirm the detection result and monitor the concentrations until the time when a GAC change can be scheduled and completed.

The aqueous-phase GAC change-out procedure involves shutting down extraction wells and using the services of a carbon supplier to transfer spent GAC from the vessel into the truck for disposal or regeneration. The spent carbon is transferred via piping to the carbon vendor truck by pressurizing the carbon vessel and opening the valve to the truck. Once empty, the carbon vessel is inspected and then filled with unused GAC by adding either potable or treated water to the carbon in the vendor truck. The truck is then pressurized, a valve opened, and the virgin carbon flows into the carbon vessel. The vessel is verified to be full by checking the air vent valve at the top of the vessel. Following wetting and refilling, flow direction valves are positioned to place the changed vessel in the lead position and the former lead carbon vessel in the lag position.

A specific protocol has been developed for IBM sites that ensures carbon vessels are safely depressurized prior to opening the vessel. Pressure gages were installed in the vessels and piping of the carbon systems to allow the vessel pressure to be known prior to accessing the carbon vessels.

Backwashing is done on an as-needed basis based on observed pressures in GAC vessels. Back-wash procedures are included in the manufacturer literature in Attachment D and in sample operational procedures (Attachment F).

5.2.3 Rayox® Treatment System and Hydrogen Peroxide Feed

The Rayox® treatment system in the PW-2 GTF uses an advanced oxidation process containing three 30 kilowatt (kW), medium pressure UV lamps to activate hydrogen peroxide injected into the groundwater. The lamps emit high energy UV radiation through a quartz sleeve to activate the hydrogen peroxide to form hydroxyl radicals that oxidizes dissolved-phase chlorinated VOCs.

Water enters at the bottom of the Rayox® reactor and flows upward in a turbulent plug-flow pattern. The UV Lamp in the center of the Reactor emits ultraviolet light that is absorbed by the target chemicals. A combination of UV light and peroxide forms a highly reactive hydroxyl radical that instantly breaks down the VOCs to carbon dioxide, water, and chloride (in the case of chlorinated compounds) that can be safely discharged to the environment.

The UV Lamp is physically isolated from the reactor chamber by means of a quartz sleeve. The surface of the quartz sleeve is wiped clean at regular intervals by an air-actuated transmittance controller. The power required to drive the UV Lamp is supplied by a high-voltage Rayox® power supply. A blower assembly mounted at the top of Rayox® Reactor is used to blow cooling air across the electrical connections to the UV Lamp. Ultraviolet shielding is constructed in the reactor assembly. The Rayox® treatment system operates under control of a Programmable Logic Controller PLC) that monitors various sensors, adjusts parameters accordingly, and displays status information. Various interlocks and alarms increase safety for personnel and improves the quality of discharged water. If, for example, a UV Lamp fails, an alarm is activated, and the system is placed in recycle mode or is automatically shut down.

Aries 0351, a 30% hydrogen peroxide solution, is used as a water treatment chemical (WTC) in the PW-2 GTF as part of the Rayox® treatment system. Hydrogen peroxide, stored in an above ground Tank T-800 inside a secondary containment vault set in the floor of the PW-2 GTF, is injected into the influent groundwater stream to the Rayox® treatment system. Hydrogen peroxide is introduced to the Rayox® treatment system via a metering pump set to a specific feed rate based on contaminant concentrations in the influent.

The primary safety concern associated with the use of hydrogen peroxide within PW-2 is spillage during the transfer of bulk hydrogen peroxide from the delivery truck to the hydrogen peroxide storage tank T-800. Additionally, the oxidizing nature of hydrogen peroxide can intensify a fire. A camera is installed in PW-2 that monitors the secondary containment of the peroxide bulk tank and sends an alarm to the operator if liquid is detected in the sump in the secondary containment area. The Rayox contains a conductivity bar beneath the unit that disables it if it gets wet; an alarm is sent if this condition is triggered. A Job Safety Analysis for the handling and loading of hydrogen peroxide is included in the HASP (Attachment E).

Ports are provided at appropriate points in the system to allow for sampling of treated water prior to discharge. The Reactor is fitted with a drain line and drain valve to drain the Reactor for maintenance purposes. The Rayox® treatment system Operator Manual is provided in Attachment D.

5.2.4 Air Stripping

In the B384 GTF, a QED EZ-Tray Model 6.6 Tray-Type Air Stripper S-300 uses six (6) treatment trays and an air flow rate of 340 cfm to strip VOCs from groundwater at a flow rate of approximately 10 gpm. Specifications for the Air Stripper are located in Attachment D and on Table 5-1.

5.2.5 Venturi Pumping System

A skid-mounted venturi pumping system installed in the B384 GTF is designed to remove groundwater from the three well points installed in the sump. The venturi pumping system uses a separate vacuum source for each well point that allows a total flow of between 0-9 gpm. A two-inch stainless steel pressure header comes off the circulation pump to drive water through three venturis. The venturis are powered by high pressure water from a single multi-stage centrifugal pump (P-700) that operates continuously to supply the venturi pumping system with water. The circulation and storage tank (T-700) stores the water to feed the circulation pump. Fluids recovered from each well point accumulate in the circulation tank and are transferred by gravity to the transfer tank T-200. From the transfer tank, recovered fluid is pumped using a second centrifugal pump into the process piping for treatment. With this shallow well configuration, the maximum lift is 32 feet. The Operations Manual for the venturi pumping system is included in Attachment D.

5.2.6 Bag Filters

Bag filters are installed to protect the carbon media from being clogged by solids. Location of each bag filter pair within each GTF treatment train are shown on Figures 4-1, 4-2, 4-3, 4-4a, and 4-4b. Manufacturer information for the filter housing and filters is contained in Attachment D.

5.2.7 Meters, Sensors, and Transducers

Location of meters, sensors, and transducers are shown on the P&IDs for each GTF treatment train (Figures 4-1, 4-2, 4-3, 4-4a, and 4-4b). Manufacturer information for the equipment is contained in Attachment D.

5.2.8 GTF Electrical Systems

From the exterior power meter, the supply is fed through a disconnect switch and then through conduit to the main power panel in each GTF. Table 4-3 contains well conveyance and pump house electrical information. GTFs PW-2 and PW-25 are fed from different circuits than GTFs PW-1 and B384. PW-2 and PW-25 are fed from GF Buildings B316 and B334 (second floor), respectively, while PW-1 and B384 use a dedicated service fed directly to the GTFs. The power panel feeds the exterior and interior lights, receptacles, exhaust fan, electric heater and the PLC control panel. The VFD’s used to control system motors are located inside the PLC control panel. The four GTF electrical systems consist of 460-volt, 60-hertz, three-phase systems. The service capacities are as follows:

- PW-1 = 200 Amps,
- PW-2 = 300 Amps,
- PW-25 = 300 Amps, and
- B384 = 200 Amps.

GTF Electrical Meter Information for the Site is included on Table 4-21.

5.2.9 Instrumentation, Controls, Monitoring, and Alarms

This section describes the existing components and systems for instrumentation, monitoring and control of the extraction wells and associated treatment systems. The first subsection describes the treatment system controls and the second subsection describes the extraction and collection system controls. For discussion purposes, the term "controls" refers to the electrical components and logic used to operate and protect each well pump and the associated buildings and/or conveyance systems. The control system documentation including drawings and component manuals for the GTFs is included in Attachment D. A figure showing the controls communication network operations and a document that describes the production well control integration and ladder logic is also contained in Attachment D.

5.2.9.1 Treatment System Controls

Instrumentation equipment is used to display, store, and alert operators of alarm conditions requiring attention. IBM uses Verizon Cradle Point cellular transmitters installed at the B384, PW-2 and PW-25 GTFs. A Verizon Cradle Point cellular receiver at the PW-1 GTF is used to create a local communications network that allows the remote locations (B384, PW-2 and PW-25 GTFs) to send operating data and alarms to a monitoring computer (PC) located in the office area of the PW-1 GTF that is running Intellution® iFix SCADA software.

A Verizon FiOS fiber optic broadband service cable has been installed to the PW-1 GTF to provide internet access and the ability for remote monitoring and communication with the Site PC and its data. Real-time operating data readouts and historical databases are accessible on the IBM iFix system both locally on the PC and remotely through a secure, cloud-based connectivity service, LogMeIn®, by authorized operators and other personnel.

The SCADA system includes graphical screens to display real-time operating data and a historical database to allow logging and trending of instrumentation and control inputs throughout the Site-wide monitoring and control network. In addition to the iFix SCADA software, Specter Instruments Win-911 alarm monitoring and notification software is used to log alarm occurrences and notify operators to respond to alarm conditions at GTF locations. A third software product, Sytech's XLReporter, is used to supply operators with a daily report of system status and to create custom reports using information from the iFix database.

Instrumentation and controls for the treatment systems have been designed to provide extraction well flow rate and cumulative flow total monitoring, operating levels and pressures for extraction wells, operating levels and pressures for tanks and pumping systems within the GTFs, freeze protection, leak detection and alerts to operators of alarm conditions. The following paragraphs describe the typical configuration of those functions at the various GTFs.

Each GTF has a similar control panel installed to provide local control of the treatment systems, extraction pumps, local operator control and interface and interlocks with the downstream systems receiving the treated water. A summary of the main components of each control system is as follows:

1. PW-1 GTF Control Panel and SCADA Server

- 1 – Control Panel 74" x 60" x 18" w/ Back Plane
- 1 – C-more 10" HMI (for local displays and operator interface of GTF controls)
- 11 – analog inputs (AI), 22 – digital inputs (DI), 4 –digital outputs (DO) w/ spares
- SCADA Server:
  - iFix (data collection and graphics), XLReporter (automated reports), Win911 (alarms)
  - SonicWall (VPN software)
- Variable Frequency Drives (VFDs) 10hp P-400, 15hp P-300, 15hp P-500
- UPS backup

- Radio, cabling, and Cradle Point (for Site cellular network communication)

2. PW2 GTF Control Panel

- 1 – Control Panel 74” x 60” x 18” w/ Back Plane
- 1 – C-more 10” HMI (for local displays and operator interface of GTF controls)
- 11 – AI, 22 – DI, 4 – DO w/ Spares
- VFD’s 10hp P-400, 20hp P-300, 15hp P-701, 15hp P-700, 15hp P-500
- UPS backup
- Radio, cabling, and Cradle Point (for Site cellular network communication)

3. PW-25 GTF Control Panel

- 1 – Control Panel 74” x 60” x 18” w/ Back Plane
- 1 – C-more 10” HMI (for local displays and operator interface of GTF controls)
- 11 – AI, 22 – DI, 4 – DO w/ spares
- VFDs 20hp P-400, 25hp P-300, 15hp P-500
- UPS backup
- Radio, cabling, and Cradle Point (for Site cellular network communication)

4. B384 Control Panel

- 1 – Control Panel 74” x 60” x 18” w/ Back Plane
- 1 – C-more 10” HMI (for local displays and operator interface of GTF controls)
- 11 – AI, 22 – DI, 4 – DO w/ spares
- VFDs 15hp P-500, 15hp P-101, 15hp P-300
- UPS backup radio control meters radio, cabling, and Cradle Point (for Site cellular network communication)

The following devices are used in the GTF systems to provide performance and warning information:

- **Potable Water Meters** - Each GTF has a positive displacement meter installed for monitoring potable water usage. A two-inch BADGER Recordall® mechanical flowmeter is installed where the potable water lines enter the PW-1, PW-2 and PW-25 GTF buildings. The potable water for the B384 GTF is inside B310 but does not meter B384 exclusively.
- **Extraction Well and GTF Transfer Systems Flow Meters** – In the B384 GTF, George-Fisher Signet insertion-style magnetic meters are used. In the PW-1, PW-2 and PW-25 GTFs, the flow meters are three-inch WMP 101 Seametrics polypropylene magnetic flow meters.

Each meter is equipped with a local digital display of rate and total and is connected to the associated GTF PLC.

- **Alarms** - Each GTF building is equipped to detect alarm conditions that are presently monitored by the IBM SCADA system. These alarm conditions are summarized in Table 5-2. The response to alarm conditions is provided by the system operators. Critical alarms automatically shut down the influent wells feeding the GTF.

5.2.9.2 Extraction and Collection System Controls

The following devices are used for the extraction and collection systems to provide performance and warning information:

- **GTF Enable/Disable Interlock with Global Foundries -** GF can prevent flow from each GTF via the Enable/Disable interlocks installed to disable each GTF (PW-1, PW-2R, and PW-25) well pump should there be any reason that treated water from the GTFs cannot be received by B316. The GTF Enable/Disable interlock consists of two interposing relays installed in the existing Modbus PLC control panel in each pump house. In each control panel, one relay is wired to receive a signal from GF and a second relay is wired to receive a start/stop signal from the GTF PLC that starts and stops the well pump VFD. Each Enable/Disable interlock signal from GF is a hardwired input to the GTF PLC from the Modbus PLC control panel in the well house. In addition to the hard-wired connection, the Enable/Disable control is connected to B316 via the Site's spread-spectrum radio system. Information can be sent by GF to either stop flow to the GTF or send a signal indicating well pump operation is acceptable (no downstream leaks or other problems). The GTF PLC must see the GF enable/disable in the "enable" condition in order to start the well pump. If the well pump is running and the GF enable/disable contact condition changes to "disable," a pump "stop" signal is issued in the logic and the pump shuts down. Each well pump is started by pushing a button on the associated GTF PLC control panel touchscreen display (HMI). As long as the GF enable/disable mode is in the "enable" condition, the well pump will start and operate.
- **Well Pump VFD Control Operation –** Once started, each well pump VFD is controlled via the associated GTF PLC. The operator can enter a level control set point in feet above the transducer on the associated HMI located on the GTF PLC panel door. During pump start-up, each well pump will ramp immediately to the minimum required motor speed of 30 Hz and then begin a slow ramp-up to the programmed level-control set point. A proportional/integral/derivative (PID) control loop within the associated GTF PLC control panel controls the VFD speed to maintain the level control set point.
- **Devices Installed at All GTF Locations** – Devices include: GTF low temperature, building sump high level, conveyance piping secondary containment leak sensor alarms, extraction well low flow alarms, influent pressure high alarms (for liquid-phase carbon systems), low air flow alarms (for air stripping systems), and PLC communication failure alarms. Provisions have

been made to detect and contain leaks as groundwater is pumped and treated. All extraction well underground piping and aboveground piping is constructed with secondary containment piping encasing the carrier piping and leak detection sensors and alarms are installed. Each GTF is equipped with a leak alarm and secondary containment. All pump house locations (PW-1, PW-2 and PW-25) are equipped with leak detection sensors and alarms.

5.2.9.3 System Alarms

A summary of the system alarms is shown on Table 5-2.

5.2.10 B384 GTF Chemical Feed System

The B384 chemical feed system consists of an LMI model AA151-498HI chemical metering pump that feeds Redux 390 sequestering agent at a rate of approximately 0.35 gal/hour while the Venturi pumping system is operating. The PFD for the chemical feed system, safety data sheet for the Redux 390, and information regarding the Redux 390 for the SPDES discharge permit is contained in Attachment D.

5.3 System Startup and Shutdown

After the pumps or treatment system have been shut down, a final check must be made before startup. Special instructions or procedures that may apply to the activity should be noted and followed. Manufacturer’s recommendation for startup of each equipment item should be reviewed. All system startup and shutdown checklist items and the Pre-Startup Checklist shown on Table 5-3 should be reviewed. A detailed discussion of GTF system Startup Procedures is contained in Attachment F. PW-1, PW-2, PW-25, and B384 GTF startup chemical data are included in Attachment G.

System start-up of GTFs includes the following activities:

- Contact and confirm restart authorization from O&M Team and Regulators, if required.
- Confirm that GTF maintenance work is completed (if conducted during outage).
- Confirm that Site Communications are functional.
- Confirm that PC, software and external communications (i.e. HMI) are working.
- REMOVE any Lock-out/Tag-out (LOTOs), if used. TURN ON UPS power to PLC.
- ENABLE power to MCP. via exterior panel Disconnect.

- ENABLE power to MCC.
- ENABLE Pump House and Production Well.
- ENABLE/TURN ON Influent/transfer pump from main control panel. Pump will not activate until the EQ tank level is above set point.
- Monitor all GTF system components: Chemical pumping system, hot water heater, etc. for normal function. Contact appropriate subcontractor(s) for assistance, if necessary.
- TURN ON Auto-Dialer at main control panel.
- TURN ON the UPS for the PLC and ENABLE power. OPEN manual valves for all GTF wells; and TURN ON each well using the selector switch (turn each well pump to the run position) on panel.
- Check for leaks.
- Clear all alarms.
- Notify Regulators and O&M team that system has been restarted and problems identified.

During a pump start-up, each well pump will automatically ramp to the minimum required motor speed of 30 Hz and then begin a slow ramp to the programmed level control set point to prevent well agitation. A PID control loop within the associated GTF PLC control panel controls the VFD speed to maintain the level control set point once at operating levels.

System testing for GTFs contains the following activities:

- Check for critical alarms – If a critical alarm exists, additional documentation on the GTF daily log sheet and/or the HMI Monitoring Form must be made by the operator including identifying the critical alarm, the time of the alarm, who was notified, and what was done to clear the alarm.
- Check for non-critical alarms – Non-critical alarms are shown in green on the HMI. The fault should be addressed as soon as practical.
- Check the water level in the EQ tank and the influent pump cycle rate – The desired holding tank level is near the lower portion of the tank (approximately 35”).
- Check High level alarms – These indicate that insufficient groundwater withdrawal is being maintained by a well pump, and **increased pumping rates** are needed if level control is desired.
- Check excessive pump cycling – Check that flow rate is not greater than design rates for each well location, Check the number of pump cycles for each well and system pump.
- Check for leaks during start-up.

- Perform sampling and analysis to verify treatment system performance.
- Confirm that extraction well pumps controlled by variable speed drive are operating based on extraction rate.
- Check communication between the pumps and the GTFs.
- Document/log adjustments made by the operator on the on the GTF log sheet and/or the HMI Monitoring Form.
- Document pending or scheduled maintenance work. Indicate if maintenance work has been authorized, scheduled or completed.
- Document operating conditions observed (i.e., water dripping from piping, unusual noise, vibrations, or odors, etc.). Reported immediately to the manager.
- Review GTF start-up, testing, and daily logs to identify needed maintenance.

6.0 GTF SYSTEM INSPECTION, MONITORING, AND MAINTENANCE

GTF operational objectives for the PW-1, PW-2, PW-25, and B384 GTFs are to ensure that each GTF is functioning within the acceptable range of parameters, data are collected as required, and SPDES and other regulatory parameters are in compliance. Maintenance objectives include maximizing systems operational run time, efficiency, and effectiveness. These objectives will be met by routine and preventative maintenance, record keeping of system inspection and performance monitoring, and timely response to emergency alarm conditions. Routine maintenance items and schedule are shown on Tables 6-2, 6-3, 6-4, and 6-5 for PW-1, PW-2, PW-25, and B384 systems, respectively. Sample inspection, maintenance, monitoring, and checklists are included in Attachment H. Attachment I includes As-Built Electrical, Instrumentation, and Control Drawings. Attachment J includes reference photos of the GTFS, process equipment, and control panels. Attachment D includes Manufacturer's Literature for equipment and GTF components.

Daily average flow rates, flow totals, and other operating parameters are monitored electronically. Weekly operator inspections are performed to collect manual readings, and to physically check the various components of the system and record observations. To ensure system dependability and avoid downtime, an inventory of critical backup and replacement parts maintained at the Site is shown on Table 6-1. Preventive maintenance of major treatment system components is performed according to manufacturers' recommendations. Corrective actions, repairs, and maintenance are performed by trained, service technicians (Operators) and qualified electrical and mechanical subcontractors, when needed. Requirements for GTF inspections, required reporting, preventative maintenance, routine maintenance, and standard operations are described, below. GTF system inspection and monitoring forms for each GTF are contained in Attachment K.

6.1 System Inspections and Monitoring

The Operator will inspect the GTFs and production well pump houses a minimum of 3 times per week. Upon inspection of each GTF, the Operator will complete a Groundwater Inspection and Maintenance Log for the PW-1, PW-2, PW-25, and B384 GTFs using inspection logs included in Attachment K. Log entries are signed and dated as indicated on the form. A hard copy is maintained in the GSC Beacon office and an electronic copy is created for use by project team members. A yearly inspection form for the Site is included in Attachment L.

During the visit, the operator will use the Operator Notes function of the SCADA system to create an electronic and searchable record of the activities performed, problems encountered, and other GTF observations. A camera is installed in the PW-2 GTF that allows the Operator to remotely view the secondary containment vault and the peroxide bulk storage tank. A leak detection device is installed in the secondary containment vault that sends an alarm to the Operator if liquid is detected in the containment area sump. A daily log is completed that monitors camera function. If the inspector encounters an unsatisfactory condition or operation, the inspector will perform the following:

- Notify Environmental Engineering,
- Complete the Inspection Log entry that documents the problem condition, and
- Indicate the measures taken to correct the unsatisfactory condition in the "notes" section of the Inspection Log.

IBM will notify NYSDEC in writing as per Part 373 Permit, Module II E. 8 whenever the Groundwater Corrective Measures Program is in-operable (e.g., shut-down) for a period of time that exceeds 15 consecutive days, when the shutdown jeopardizes the containment of contaminated groundwater, or if the system is shut down for 15 days within a 30-day time period. Written notification will address the cause of the shut-down.

6.2 Preventative Maintenance

During the three weekly visits, the Operator will ensure that the system is operating, as intended, and will perform preventative maintenance tasks at a frequency specified by the manufacturer cut sheets, operations manuals, or as indicated by system performance inspections (Attachment D). Preventative maintenance activities will be conducted in a manner consistent with technical guidelines specified by equipment cut-sheets and operations manuals (Attachment D).

The minimum annual maintenance tasks performed for the GTFs are as follows:

- Check the battery in each PLC associated with the GTF.
- Calibrate all extraction well flow meters, sensors, and water level transducers.
- Clean EQ tank/holding tank sight tube and associated water level probes.
- Cycle all valves for operation and proper seating.

Critical backup and/or replacement parts will be available within 2 days after equipment failure. These critical backup components will include particulate filters (cloth filters), spare submersible pumps, and various piping and valves. Other components are available through arrangements made with vendors of this equipment as shown in Attachment D.

6.3 Routine Maintenance

Provided, below, is information regarding routine maintenance of the GTF Systems. Sample inspection, maintenance, monitoring, and checklists for various maintenance items are included in Attachment H. Tables 6-2, 6-3, 6-4, and 6-5 provide a summary of required routine maintenance for PW-1, PW-2, PW-25, and B384 systems, respectively.

6.3.1 GTF and Pump House Building Maintenance and Monitoring

GTFs and Pump Houses are to be kept clean, organized and in good repair. The operators will record and correct problems with buildings that require minor maintenance; a maintenance activity request for major repair work is submitted to the IBM Project Coordinator for approval before the work is started. The building is inspected monthly to ensure that heating, ventilation, drainage and lighting systems are in good working order. In addition, communication with the spill containment and leak detection alarms are inspected and tested daily.

6.3.2 Groundwater Extraction System Maintenance and Monitoring

This Subsection contains extraction well maintenance monitoring, well testing and tele-viewing, well rehabilitation, conveyance piping, leak detection, and well pumps.

6.3.2.1 Extraction Well Monitoring

PW-1, PW-2R, PW-25 and B384 maintenance requirements are based on Operator observation of equipment performance and pumping performance (volume and quality) trends. Performance is determined by instrument and manual measurements of extraction well pumping water levels, tracking well yields, and monitoring groundwater quality and levels in the aquifer at key locations. Extraction well flow rates are monitored electronically and recorded several times per week by the Operator. Operator readings are taken manually to measure key extraction and associated monitoring well water levels to check electronic readings, when indicated, or to collect data from wells not monitored electronically.

The need for extraction well testing and cleaning is determined by reviewing operational measurements. These measurements may indicate a trend of decreasing well performance (pumping rate/water level) and associated trend of rising water levels in nearby monitoring wells that cannot be remedied with pump maintenance or cleaning of the discharge piping. In this case, well testing and tele-viewing is conducted to determine if rehabilitation is warranted, as discussed, below.

6.3.2.2 Well Testing and Tele-viewing

If well rehabilitation is warranted, both pre- and post-cleaning tests on the well may be performed. This step may be skipped on extraction wells with a history of fouling. Tele-viewing involves lowering a specialized remote camera equipped with a light source into the well that indicates the depth of the video output. The camera is attached to a display output that can be watched at the surface. Tele-viewing provides valuable information for factors that may affect well performance. For example, evidence of bio-fouling, scale formation, inorganic deposits and well damage are typically visible using this technique. A complete description of the tele-viewing process is included in Attachment F.

6.3.2.3 Well Rehabilitation

Both mechanical and chemical well rehabilitation methods are usually preceded by a borehole inspection using a downhole camera and/or a step-drawdown test at each location to establish data on the well performance prior to cleaning. Carbon-dioxide treatment is sometimes used to rehabilitate extraction wells. An in-well heating approach is also used in conjunction with cleaning chemicals to break down materials in the well screen and well pack. The heating and chemical cleaning process is typically followed by mechanical cleaning using special surging and wiping tools sized to fit different well diameters, followed by use of an air lift pump to remove residual sediments and materials from the well bottom and screen. Recovered sediment and materials are drummed and disposed of appropriately. Depending on the results of the tele-viewing and fouling assessment, the operators may elect to eliminate or modify one or more of the procedures shown in Attachment F.

6.3.2.4 Well Head Inspection and Maintenance

A yearly inspection is conducted to determine competency of both extraction and monitoring well heads. This includes checking the well completion (drive overs, stick ups, land grading, caps, and covers) for erosion, cracks, missing pieces, breaks, or instability. Well problems are repaired, as needed, to restore to design conditions.

6.3.2.5 Conveyance Piping

The Operator will check potential piping problems and perform pipe cleaning upon evidence of line blockage indicated by either increasing discharge pressures or decreasing flow rates. The operator will conduct the following activities:

- Inspect visible piping weekly for evidence of leaks.
- Perform annual inspection and document findings on all visible and accessible conveyance piping.
- Inspect straight runs, joints, valves, flanges, unions and other piping components for signs of stress, corrosion, deformities, weeping, and leaks.
- Compare weekly pressure data for trends that may indicate a problem.

6.3.2.6 Leak Detection System

Spill containment alarms were tested on startup. The alarm in the hydrogen peroxide secondary containment pit is not accessible due to the confined space and the walkway around the tank. However, communication checks that send emails to the operators confirming operating conditions are performed daily. Communication with the high sump and high tank level alarms are checked daily. System checks are performed during scheduled carbon changes. The Operator performs overall checks to determine that the correct alarm message is transmitted to the PC and that the PLC dialer reached the correct respondent. The Operator also makes sure that the message sent is accurate and corresponds to the correct alarm location. Leak detection alarms are tested weekly in this way.

6.3.2.7 Well Pumps

Extraction well pumps are monitored a minimum of three times per week for pump discharge pressure, flow rate, electrical usage, and pumping water level to verify that extraction wells consistently deliver the target flows shown on Table 3-1. Attachment D contains pump curves and pump and motor specifications. The Operator will compare pump curves to field measurements of discharge pressure, well level and flow rate, and amperage and voltage readings to troubleshoot pump problems.

6.3.3 Treatment System Maintenance and Monitoring

Maintenance and Monitoring of major system components that include carbon, Rayox®, air stripper, and venturi pumping systems are described below.

6.3.3.1 Carbon System Maintenance/Monitoring

Routine monitoring and maintenance of the liquid-phase carbon systems consists of recording pressures and flows and inspecting the exterior of the vessels and piping for signs of corrosion or leaks. These activities are performed three-times per week. The Operator checks each observed reading against the range of allowable design operating pressures to predict possible plugging of carbon media. If inlet and mid-point pressures deviate from baseline by more than 10 psi, then back flushing of the beds with potable water or treated groundwater may be necessary. Groundwater used in the back flushing is collected in the building sump, pumped through bag filters and then through the carbon treatment system. The GAC vessels should be fully wetted during operations. Entrained air can cause reduced treatment efficiency or accelerated breakthrough. Electrical power losses or routine or unscheduled system maintenance may cause partial drainage of the vessels in some situations, allowing air to build up within the units. This entrained air must be purged prior to use. The vapor-phase carbon in the B384 system should be checked for duct-heater function and temperature, relative humidity, pressures, air flow, and performance to removed target COCs. A sample carbon change-out procedure is provided as Attachment F. The O&M Manual for the GAC Systems in PW-1, PW-2, PW-25 is included in Attachment D; cut-sheets for B384 carbon systems are contained in Attachment D. Prior to disposal on a three-year cycle, the carbon must be profiled per carbon vendor recommendations as described in the Waste Management Plan (Attachment M).

6.3.3.2 Rayox® Treatment System

Operating personnel perform weekly system inspections following procedures on the inspection checklist provided in Section 3.2 of the Rayox® treatment system O&M Manual (Attachment D). Weekly flow rate, temperature, pressure, and lamp power tracking is recorded. Review of these data is done weekly to ensure optimum performance. Problems identified are corrected as soon as possible. The frequency of maintenance is performed as recommended by the manufacturer and adjusted, as needed, based on performance data collected weekly. A monthly assessment of the weekly data is conducted to assess performance by comparing present readings with those recorded for the previous month. The Operator will perform the following:

- Investigate the cause of questionable readings (Refer to Section 3.3 for operating parameters in the Rayox® treatment system O&M Manual, Attachment D).
- Review the Operating Logs for the previous months and note trends, indications of component failure, or performance deterioration. The Operator identifies entries related to equipment requiring service or replacement such as meters, light bulbs, probes, etc.
- Indicate that repairs are required in Part (G) of the Maintenance Checklist. Depending on the nature of the condition, it may be possible to correct the identified issue while the system is on-line. If this is not possible and the condition can wait for correction until the next maintenance session, a visit by a Calgon technician is scheduled. If immediate attention is needed, a. Calgon technician is immediately summoned. When inspecting the equipment, pay particular attention for leaks, unusual vibrations, unusual sounds, etc.
- Make sure that the moisture sensor is operational.
- Check the metering pump for noise and vibrations.
- Inspect all accessible manual valves should be checked for correct positioning.
- Inspect all tanks to ensure there is sufficient water for continuous operation.
- Confirm proper operation of blowers; blower air flow switches should be tested when the UV lamps are off. Air filters should be kept clean.
- Ensure air supply is within operating range and solenoids are operating properly.
- Drain water from air compressor tank.
- Check supply of lubricant and drying agent.
- Check that the transmittance controller is firing normally by observing solenoids being actuated or listening for it.
- Check peroxide delivery system for adequate supply and correct flow.

- Follow the steps in the maintenance checklist to verify the operation of the transmittance controller(s).
- Use the troubleshooting section to address difficulties with the transmittance controller.
- Check that the wiper traverses the entire surface of the quartz sleeve smoothly and that there are no unusual vibrations or sounds.
- Record the activities performed in the Maintenance Checklist provided in Section 8 of the Rayox® treatment system O&M Manual (Attachment D).

6.3.3.3 Air Stripper

Operating personnel perform a weekly system inspection of the air stripper following manufacturer recommendations in the manufacturer's literature (Attachment D). The key operating parameter is air-to-water ratio (A/W) that controls process efficiency and performance. Other monitoring conditions include existing air pressure sufficient to hold water on tray (back pressure); pressure drop across trays; liquid flow rate; liquid level in integral sump; and seals to ensure equal torque on front hatch to prevent leaks and that trays are properly latched to prevent air and water bypass.

6.3.3.4 Venturi Pumping System

During each visit, the operator inspects the system for signs of water leaks or air suction leaks; listens for unusual noises from pumps and motors; and checks vacuum, pressure, and flow. The Operator also records values for operational performance. Quarterly, the operator should inspect all equipment for loose fasteners; check motor mounts, unions, flanges and all connectors; inspect connectors, tanks, pumps, and hoses for evidence of leaks; and clean "Y" strainer screen. Additional information is available in the Venturi Pumping System Manual included in Attachment D.

6.3.3.5 Bag Filter Changes

It is necessary to periodically replace the filter bags in the bag filter vessels due to high solids loading indicated by the pressure drop measured across the filters. Bags can be changed without shutting down operations by using a bypass piping valve sequence.

6.3.3.6 Meters, Transducers, and Sensors

Periodic inspection and calibrations are needed for meters, transducers, and sensors, per the manufacturer's recommendations found in each equipment manual (Attachment D). Yearly calibration and calibration certification are required for the meters that monitor flow measured as required by the SPDES permit. Example calibration procedures are found in Attachment H.

6.4 Non-Routine Operation and Maintenance

Non-routine operation and maintenance activities are typically the result of equipment conditions that could cause damage to the system or result in reduced effectiveness of operations. These conditions are either detected by impaired performance over time, equipment failure, or an indication by alarms or warning devices of system problems. System alarms and reduced equipment performance can result in system or component replacement. The following types of alarm conditions can occur at the GTFs:

- **Advise (Av) alarms** – These alarms are associated with components of the treatment system that are working but are not functioning at their optimal level or proper condition. These components typically require some type of adjustment to return to their optimal working order and are designated as "Monitor" on Table 5-2.
- **Non-critical (Nc) alarms** – These alarms are associated with a failure of a treatment system component that, when in alarm mode, does not completely shut the system down. Response time should be prompt to inspect the cause of the alarm, attempt to reset the fault, or request assistance from a contractor. These alarms are designated "high" and "Low" on Table 5-2.
- **Critical (Cr) alarms** – These alarms are associated with problems or failure of components necessary for the system to pump and treat groundwater. Failure of these components means that the entire treatment system is, or may, shut down. Critical alarms require immediate response. These alarms are designated "Critical" on Table 5-2.

6.5 Waste Management

A waste management plan is included in Attachment M that describes sampling procedures, waste disposal procedures, and waste generated during GTF operations. With the exception of the spent GAC and spent bag filters, the extraction and treatment system does not routinely generate waste streams. Some activities related to the maintenance of the equipment and systems do result in the generation of wastes such as solid waste generated from pipe cleaning, well rehabilitation, and irreparable mechanical components such as pumps, motors, and instrumentation that has contacted contaminated water. Also, drill cuttings containing solids (soil and/or rock chips) and liquids are generated sporadically at the Site during investigation activities.

6.6 Safety Guidelines for Lock-Out/Tag-Out

All tasks described in this manual are performed in accordance with the Health and Safety Plan (HASP) provided as a separate standalone document (Attachment E). The use of proper personal protective equipment (PPE) is essential during sampling, monitoring, chemical handling and other procedures involving the handling of or potential contact with groundwater, granular activated carbon and other substances that are potentially harmful or hazardous. Since the systems use electrically powered equipment and pressurized mechanical systems, electrical safety procedures and precautions to relieve mechanical system energies and pressures prior to performing certain maintenance tasks are necessary to ensure operator safety. Lock-out/Tag-out procedures must be followed prior to accessing any powered equipment or system. Procedures for each component of the GTF are contained in the Manufacturer's literature in Attachment D.

6.6.1 Electrical Safety and Lock-Out/Tag-Out

In the preceding steps, if more than one individual is required to lock-out or tag-out equipment, each shall place his/her own personal lock-out/tag-out device on the energy isolating device(s). When an energy isolating device cannot accept multiple locks or tags, a multiple lock-out or tag-out device (hasp) may be used. If lock-out is used, a single lock may be used to lock-out the machine or equipment with the key being placed in a lock-out box or cabinet which allows the use of multiple locks to secure it. Each employee will then use his/her own lock to secure the box or cabinet. As each person no longer needs to maintain his or her lock-out protection, that person will remove his/her lock from the box or cabinet.

6.6.2 Temporary Removal of Lock-Out/Tag-Out Devices

In situations where lock-out/tag-out devices must be temporarily removed from the energy isolating device and the machine or equipment energized to test or position the machine, equipment or component thereof, the following sequence of actions will be followed:

- Remove non-essential items and ensure that machine or equipment components are operationally intact.
- Notify affected employees that lock-out/tag-out devices have been removed and ensure that all employees have been safely positioned or removed from the area.
- Have employees who applied the lock-out/tag-out devices remove the lock-out/tag-out devices.
- Energize and proceed with testing or positioning. De-energize all systems and reapply energy control measures in accordance with section 1.3.2.2 of these procedures.

6.6.3 Lock-Out/Tag-Out

Lock-out/tag-out information is included in the Site HASP (Attachment E) and is to be adhered to in all situations when working on electrically powered equipment.

7.0 EMERGENCY PERSONNEL CONTACT LIST

The following is an emergency personnel contact list for the Site.

IBM Emergency Coordinator(s)	**Work Phone**	**Cell Phone**
Linda Daubert	(703) 257-25813	(814) 574-2717
GlobalFoundries Security	(845) 894-2122	
Systems Operations Contact(s)	**Work Phone**	**Cell Phone**
Mitchell Ruchin, GSC	(845) 896-0288, x8118	(914) 456-1400
Tim McAmblay, GSC	(845) 896-0288, x8130	(845) 505-0224
Dorothy Bergmann, GSC	(845) 896-0288, x8114	(914) 456-2822
Matthew Luckman, GSPC	(717) 901-8186	(717) 645-2615
NYSDEC Contact		
Jessica LaClair	(518) 402-9821	

All emergencies shall be directed to GlobalFoundries (GF) on-Site Emergency Response Team who will contact the appropriate outside emergency providers and provide initial on-Site emergency response.

Fire Department	(845) 894-3333 (GF Emergency Response) (845) 226-1652 (Non-Emergency, Town of East Fishkill)
Police Department	(845) 894-3333 (GF Emergency Response) (845) 221-2111 (Non-Emergency, Town of East Fishkill)
First Responder	(845) 894-3333 (GF Emergency Response)
Putnam Hospital Center 670 Stoneleigh Avenue Carmel, NY 10512	(845) 279-5711 (Non-Emergency Number)
New York State DEC Spills Hotline	(800) 457-7362
National Response Center	(800) 424-8802

Emergency Response Equipment Location

Fire Extinguishers	Door exits
First Aid Kit	Mounted on Wall
Portable Eyewash Station	Mounted on Wall

TABLES

TABLE 2-1: Areas and OUs per GTF

GTF	General Areas/OUs Addressed	SPDES Outfall
PW-1	Bedrock Remediation Area (OU2), treats bedrock groundwater extracted in the northwestern portion of the Site, including a VOC plume originating in the area of the B322 AOC (OU7)	42A
PW-2	Bedrock Remediation Area (OU2), treats bedrock groundwater extracted from the northeastern portion of the Site, including VOC plumes originating in Area A (OU5)	04A
PW-25	Bedrock Remediation Area (OU2), treats bedrock groundwater extracted from the southern portion of the Site, including VOC plumes originating in the area of the B330 AOC (OU8), and Area C (former landfill) (OU6)	28A
B384 Sump	Area A (OU5), treats perched overburden groundwater extracted in the area of B384 in the central portion of Area A	04B

TABLE 2-2: Current Active/Inactive Production Wells and GTFs – East Fishkill

Historic Production Wells	Treatment	Pump Information	Flow Meter	Current Status
PW-1 - Bedrock	PW-1 GTF	Submersible - 75hp/480vac	Badger Meter Model 170 serial number 50116368	Active
PW-2 - Bedrock	PW-2 GTF	Submersible – American Marsh S8LC-4, 50HP/480vac	Badger Meter Model 170 serial number 50080398	Inactive
PW-2R - Bedrock	PW-2 GTF	Submersible - Grundfos pump head Franklin 6", 20 HP 460 vac, 3 phase motor	Polysonic DCT6088	Active
PW-4 - Bedrock	None	Submersible - 40HP/480vac	Polysonic DCT6088	Inactive
PW-5 - Bedrock	None	Turbine - 75HP/480vac	Polysonic DCT6088	Inactive
PW-5A - Bedrock	None	Submersible – Pfleuger, 75HP/480vac	Polysonic DCT6088	Inactive
PW-6 - Bedrock	None	Submersible - 25HP/480vac	Polysonic DCT6088	Inactive
PW-7 - Bedrock	None	Submersible - 50HP/480vac	Polysonic DCT6088	Inactive
PW-9 - Bedrock	None	Turbine - 75HP/480vac	Polysonic DCT6088	Inactive
PW-23 - Bedrock	None	N/A - Submersible Pump Removed from Well	Polysonic DCT6088	Inactive
PW-25 - Bedrock	PW-25 GTF	Submersible - 75HP/480vac	Badger Meter- Model 170 serial number 50080401	Active

TABLE 3-1: GTF Flow Rates

Location	Design Flow	Daily Flow Rates (max/ave)	Hydraulic Capacity
PW-1 GTF	100 gpm	0.216/0.101MGD	500 GPM
PW-2 GTF	150 gpm	0.310/0.173 MGD	215 GPM
PW-25 GTF	250 gpm	0.432/0.274 MGD	710 GPM
B384 GTF	10 gpm	0.084/0.042 MGD	40 GPM

TABLE 3-2: Treatment Goals and Flows			
Compound	**Design Influent Concentration (ppb)**	**Effluent Concentration (ppb)**	**Daily Flow Range (GPM)**
PW-1			70-100
Freon® TF	4.5	<10	
cis12DCE	3.1	<10	
PCE	29	<10	
TCE	12	<10	
PW-2R			120-150
Freon® TF	380	<10	
Freon® 123a	22	<10	
cis12DCE	2,600	<10	
PCE	31,000	<10	
TCE	2,200	<10	
Vinyl Chloride	580	<10	
PW-25			190-250
Freon® TF	31	<10	
Freon® 123a	ND	<10	
cis12DCE	84	<10	
PCE	820	<10	
TCE	220	<10	
Vinyl Chloride	ND	<10	
B384			0.5-10
Freon® TF	150	<10	
PCE	42,000	<10	
TCE	1,300	<10	
cis12DCE	220	<10	

TABLE 3-3a: SPDES Effluent Limits for Outfall 42A – PW-1

Pollutant	Maximum Daily Concentration (mg/l)	Maximum Daily Mass (lbs/day)
Biological Oxygen Demand (BOD)	4 U	<7.2
Chemical Oxygen Demand (COD)	10 U	<18.1
Total Suspended Solids (TSS)	13	23.4
Total Dissolved Solids (TDS)	670	1206
Oil and Grease	5.1 U	<9.2
Total Residual Chlorine (TRC)	0.1 U	<0.18
Total Organic Nitrogen (TON)	1 U	<1.8
Ammonia (as N)	0.5 U	<0.90
Temperature	Winter – 13.2/ Summer – 16.5	NA
pH	6.8 – 7.9	NA
Priority Pollutants, Toxic Pollutants, Hazardous Substances	**Long-Term Average**	**Units**
Freon® TF: CAS Number: 76-13-1	<10	(ug/L)
PCE: CAS Number: 127-18-4	<10	(ug/L)
TCE: CAS Number: 79-01-6	<10	(ug/L)
cis-1,2-dichloroethene (cis12DCE) CAS Number: 156-59-2	<10	(ug/L)

TABLE 3-3b: SPDES Effluent Limits for Outfall 04A – PW-2

Pollutant	Maximum Daily Concentration (mg/l)	Maximum Daily Mass (lbs/day)
Biological Oxygen Demand (BOD)	4 U	<10.3
Chemical Oxygen Demand (COD)	15	38.8
Total Suspended Solids (TSS)	1.0 U	<2.6
Total Dissolved Solids (TDS)	850	2196
Oil and Grease	5.1 U	<13.2
Total Residual Chlorine (TRC)	0.1 U	<0.26
Total Organic Nitrogen (TON)	1.0 U	<2.6
Ammonia (as N)	0.5 U	<1.3
Temperature	Winter – 15.2/ Summer – 16.2	NA
pH	6.0 – 8.0	NA
Priority Pollutants, Toxic Pollutants, Hazardous Substances	**Long-Term Average**	**Units**
Freon® TF: CAS Number 76-13-1	<10	(ug/L)
Freon® 123a: CAS Number 354-23-4	<10	(ug/L)
PCE: CAS Number 127-18-4	<10	(ug/L)
TCE: CAS Number 79-01-6	<10	(ug/L)
Vinyl Chloride: CAS Number 75-01-4	<10	(ug/L)
cis-1,2-dichloroethene (cis12DCE) CAS Number 156-59-2	<10	(ug/L)

TABLE 3-3c: SPDES Effluent Limits for Outfall 28A – PW-25

Pollutant	**Maximum Daily Concentration (mg/l)**	**Maximum Daily Mass (lbs/day)**
Biological Oxygen Demand (BOD)	4 U	<14.4
Chemical Oxygen Demand (COD)	10 U	<36
Total Suspended Solids (TSS)	13 U	46.8
Total Dissolved Solids (TDS)	670	2413
Oil and Grease	5.1 U	<18.4
Total Residual Chlorine (TRC)	0.1 U	<0.36
Total Organic Nitrogen (TON)	1 U	<3.6
Ammonia (as N)	0.5 U	<1.8
Temperature	Winter – 15.0/ Summer – 15.8	NA
pH	6.6 – 8.0	NA
Priority Pollutants, Toxic Pollutants, Hazardous Substances	**Long-Term Average**	**Units**
Freon® TF: CAS Number 76-13-1	<10	(ug/L)
Freon® 123a: CAS Number 354-23-4	<10	(ug/L)
PCE: CAS Number 127-18-4	<10	(ug/L)
TCE: CAS Number 79-01-6	<10	(ug/L)
Vinyl Chloride: CAS Number 75-01-4	<10	(ug/L)
cis-1,2-dichloroethene (cis12DCE) CAS Number 156-59-2	<10	(ug/L)

TABLE 3-3d: SPDES Effluent Limits for Outfall 04B – B384

Pollutant	Maximum Daily Concentration (mg/l)	Maximum Daily Mass (lbs/day)
Biological Oxygen Demand (BOD)	4 U	<2.8
Chemical Oxygen Demand (COD)	10 U	<7.0
Total Suspended Solids (TSS)	1.6	1.12
Total Dissolved Solids (TDS)	820	574
Oil and Grease	5.1 U	<3.8
Total Residual Chlorine (TRC)	0.1 U	<0.07
Total Organic Nitrogen (TON)	1 U	<0.70
Ammonia (as N)	0.5 U	<0.35
Temperature	Winter – 19.7/ Summer – 20.8	NA
pH	7.2 – 7.9	NA
Priority Pollutants, Toxic Pollutants, Hazardous Substances	**Long-Term Average**	**Units**
Freon® TF: CAS Number 76-13-1	<10	(ug/L)
PCE: CAS Number 127-18-4	<10	(ug/L)
TCE: CAS Number 79-01-6	<10	(ug/L)
cis-1,2-dichloroethene (cis12DCE) CAS Number 156-59-2	<10	(ug/L)

TABLE 3-4: Production Well Summary

Production Well	Installation Date	Total Depth (ft bgs)	Depth of Casing (ft bgs)	Screen Type and Length	Well Screen Depth (ft bgs)	Screen/Open Hole Length (ft amsl)
PW-1	1962	515 (541)[1]	85	Open Hole	85-515	174 to -256
PW-2R	2018	320	240	0.95 Wrapped SS	240-310	15 to -55
PW-25	2000	431	329.6	0.90 Wrapped SS	329.4-420.7	-80.3 to -171.4
B384 Sump[2]	1985	18.9	NA	NA	NA	NA

1) Original depth of well
2) B384 sump collects groundwater by subsurface laterals.mp collection system. A venturi pump transfers water from the sump to the treatment components in the GTF.

TABLE 3-5a: PW-1 GTF Sample Tap Locations

Location	Tag ID	Description	Tap ID	Notes
PW-1 Pump-House Port^	None	PW-1 Raw Water.	210	Influent sample point.
SP-PW-1*	P01	PW-1 Raw Water.	210A	GTF influent sample point.
SP-CTW-EFF*	P02	System Effluent.	210F	Effluent sample point.
SP-PV100-EFF#	P03	Carbon midpoint when bed is in lead position, GAC effluent when bed is in the lag position.	210C	Sampled as midpoint when PV100 is the lead vessel.
SP-PV100-INF	P04	Raw water when bed is in lead position, carbon midpoint when bed is in lag position.	210B	NA
SP-PV200-INF	P05	Carbon midpoint when bed is in lead position, raw water when bed is in the lag position.	210D	NA
SP-PV200-EFF&	P06	GAC effluent when bed is in the lag position, carbon midpoint when bed is in the lead position.	210E	Sampled as midpoint when PV200 is the lead vessel.
Sample IDs are as follows (PWYYMMDDLLLL): YY = Year MM = Month DD = Day LLLL = Tap Identification				

^ Sampled quarterly.
* Sampled monthly.
\# Sampled monthly when PV100 is in the lead position.
& Sampled monthly when PV200 is in the lead position.
NA – Not Applicable
To verify system is in proper working order, contact the Plant Operator (Tim McAmblay: 845-505-0224) prior to sampling.

TABLE 3-5b: PW-2 GTF Sample Tap Locations				
Location	Tag ID	Description	Tap ID	Notes
PW-2 Pump-House Port^	None	PW-2 Raw Water.	220	Influent sample point.
SP-PW-2	P01	PW-2 Raw Water.	220A	GTF influent sample point (sample during startup).
SP-Rayox®-INF	P02	Rayox® System influent.	220B	Rayox® influent sample point
SP-Rayox®-EFF*	P03	Rayox® System effluent.	220C	Rayox® effluent sample point
SP-PV600-INF	P04	Influent to peroxide-carbon (Rayox® system effluent).	220D	H2O2 field screening influent
SP-PV600-EFF*	P05	Peroxide-carbon effluent.	220E	H2O2 field screening effluent
SP-PV100-INF	P06	Influent from peroxide-carbon when bed is in the lead position, carbon midpoint when bed is in lag position.	220F	
SP-PV200-INF	P07	Carbon midpoint when bed is in lead position, influent from peroxide-carbon when bed is in the lead position.	220H	
SP-PV100-EFF#	P08	Carbon midpoint when bed is in lead position, GAC effluent when bed is in the lag position.	220G	Sampled as mid-point when PV100 is lead vessel
SP-PV200-EFF	P09	GAC effluent when bed is in the lag position, carbon midpoint when bed is in the lead position.	220I	Sampled as mid-point when PV200 is lead vessel
SP-CTW-EFF*	P10	System effluent.	220J	
Sample IDs are as follows (PWYYMMDDLLLL): YY = Year MM = Month DD = Day LLLL = Tap Identification				
^ Sampled quarterly. * Sampled monthly. # Sampled monthly when PV100 is in the lead position. & Sampled monthly when PV200 is in the lead position. **To verify system is in proper working order, contact the Plant Operator (Tim McAmblay: 845-505-0224) prior to sampling**.				

TABLE 3-5c: PW-25 GTF Sample Tap Locations

Location	Tag ID	Description	Tap ID	Notes
PW-25 Pump-House Port^	None	PW-25 Raw Water.	325	Influent sample point.
SP-PV100-EFF#	PV01	Carbon midpoint when bed is in lead position, GAC effluent when bed is in the lag position.	325C	Sampled as midpoint when PV100 is the lead vessel.
SP-PV100-INF	PV02	System Effluent.	325B	
SP-PV200-INF	PV03	Raw water when bed is in lead position, carbon midpoint when bed is in lag position.	325D	
SP-PV200-EFF&	PV04	GAC effluent when bed is in the lag position, carbon midpoint when bed is in the lead position.	325E	Sampled as midpoint when PV200 is the lead vessel.
SP-WELL WATER*	PV05	PW-25 Raw Water.	325A	GTF influent sample point (sample during startup).
SP-CTW-EFF*	PV06	System effluent.	325F	Effluent sample point.
Sample IDs are as follows (PWYYMMDDLLLL): YY = Year MM = Month DD = Day LLLL = Tap Identification				

^ Sampled quarterly.
* Sampled monthly.
# Sampled monthly when PV100 is in the lead position.
& Sampled monthly when PV200 is in the lead position.
To verify system is in proper working order, contact the Plant Operator (Tim McAmblay: 845-505-0224) prior to sampling.

TABLE 3-5d: B384 GTF Sample Tap Locations

Location	Tag ID	Description	Tap ID	Notes
B/384 Sump^	None	B384 Raw Water	395	Refers to open sump or well points.
T-200*	None	Venturi System Effluent.	384A	Sump influent sampling port.
T-100 Effluent*	HV-08	Tank T-100 EQ tank effluent/ air stripper influent.	384B	Air stripper influent sampling port.
S-300*	None	Air stripper treated water tray (port at the base of the unit).	384C	Air stripper effluent sampling port.
Piping from S-300	HV-22	Air stripper effluent.	384D	
F-401 Influent	HV-28	Before bag filter #1.	384E	
F-401 Effluent	HV-29	After bag filter #1.	384F	
F-402 Influent	HV-38	Before bag filter #2.	384G	
F-402 Effluent	HV-32	After bag filter #2.	384H	
PV-501 Influent	HV-44	Carbon influent when bed is in lead position, carbon midpoint when bed is in lag position.	384I	
PV-501 Effluent*	HV-45	Carbon midpoint when bed is in lead position, carbon and system effluent when bed is in lag position.	384J	GAC mid when bed is lead, system effluent when bed is lag.
PV-502 Influent	HV-50	Carbon midpoint when bed is in lag position, carbon influent when bed is in lead position.	384K	
PV-502 Effluent*	HV-52	Carbon train and system effluent when bed is in lag position, carbon midpoint when bed is in lead position.	384L	System effluent when bed is lag, GAC mid when bed is lead.

<u>Sample IDs are as follows (SWYYMMDDLLLL):</u> YY = Year: MM = Month: DD = Day: LLLL = Tap Identification

^ Sampled quarterly.
* Sampled monthly.
To verify system is in proper working order, contact the Plant Operator (Tim McAmblay: 845-505-0224) prior to sampling.

TABLE 3-6: Summary of Data and Program Responsibilities

Personnel	Responsibilities
Program Manager and Scientists	1. Overall compliance attainment 2. Groundwater capture 3. Permits and Reports 4. Data management and quality 5. Program Health and Safety
Site Operators and Field Technicians	1. Facility O&M 2. Operations logbook 3. Distribution of monthly process records 4. Performance sample collection 5. Waste Management 6. Operations Health and Safety
Environmental Engineering	1. Detection and correction of process control excursions 2. Process engineering support 3. Process control guidelines 4. Regulatory agency interface
Vendor Laboratory *	1. Sample analysis 2. Distribution of analytical reports

*Eurofins Lancaster Laboratories LLC of Lancaster, PA, EnviroTest Laboratories LLC of Newburgh, NY, or other certified laboratory.

TABLE 4-1: Extraction System Information

Extraction Well	Pump Intake Setting (Feet Below Top of Casing)	Operating Level Set Point (Feet Below Top of Casing)	Submersible Pump Make/Model/HP	Minimum/Maximum Extraction Rate (GPM)
PW-1	364	NA	Flowserve/ Model M8-508-2 5-stage/75 HP	70/100
PW-2R	220	NA	Grundfos 150S200-9 pump head/ Franklin Model 3W460V-320 HP	120/150
PW-25	310	NA	Goulds /Model 7CSHC 5-stage/75 HP	190/250
B384 Sump	NA	NA	Venturi-jet pump	0.5/10

TABLE 4-2: Pump House Building Information

Pump House	Pump House Structure Dimensions	Access	Building Contents	Location
PH-1	Building: 10'x14'x10' steel roof, concrete walls	Well roof Hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	East of B325
PH-2	Building: 17' x 13' x 11" tall, steel flat roof, concrete walls	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	North of B316
PW-4 (Inactive)	Shares Building w/ Plant Fire Protection	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	North of Bldg. 334
PH-5 (Inactive)	Building: 22'x14'x10' steel roof, concrete walls	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	West of B323
PH-5A (Inactive)	Building: 10'x14'x10' steel roof, concrete walls, extension of PH-5	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	West of B323
PH-6 (Inactive)	Building: 22'x14.5'x10.5' steel flat roof, concrete walls	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	Southwest corner of Site, west of B330D
PH-7 (Inactive)	Building: 9'x14'x10' steel flat roof, concrete walls	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	South of B338
PH-9 (Inactive)	Building: 10'x16'x10' steel flat roof, concrete walls	Well roof hatch, man door - double steel 71" wide x 83' tall	Well Head, Pump, Local Controls, Electrical	Northeast of B304
PW-23 (Inactive)	Building: 7'x7'x8' pre-fab concrete	man door - single steel 36" wide x 83" tall	Local Controls, Electrical	Southeast Quadrant
PW-25	Building: 11'x19'x9' cinder block	man door - single steel 36" wide x 83" tall	Local Controls, Electrical, well head in hotbox	West of B334

TABLE 4-3: Well Conveyance and Pump House Electrical Information

Wells	Discharge Conveyance Components	Discharge Piping Length (ft)**	Power	Electrical Connection Location
PW-1	4"Steel - backflow preventer - 8" to underground conveyance	1800	200 Amp 480vac 3ph, 480V/208V/120V. PH-1 Meter: Serial No: 1524TMAJ0048 Model E20-480200-JKIT (200 AMPS)	From J094MCC-LF-9 SECT-1 BKR-1D
PW-2*	4" Steel - backflow preventer - 8" to underground conveyance	-	-	-
PW-2R*	4" Steel - backflow preventer - 8" to underground conveyance	250	200 Amp 480vac 3ph, TCI KLCUL80A2 pwr filter before VFD, GE Model 9T21A15G3 15KVA dry type	From MCC X4-5 SW.E-6, LOC. B316 COL. Q-3
PW-4*	6" from well - 4"Steel through backflow preventer - 8" underground conveyance	775	100 Amp 480vac 3ph	--
PW-5*	6" from well - 4"Steel through backflow preventer - 8" to underground conveyance	3575	400 Amp, 480V main, J104MCC-LE9	From J104MCC-LE9, SECT 4, BKR 4A
PW-5A*	6" from well - 4"Steel through backflow preventer - 8" to underground conveyance	3575	same as PW-5, power switch installed	same power as PW-5
PW-6*	4" from well - 2"Steel through backflow preventer then 6" to underground conveyance	5250	400 Amp, 480V main	--
PW-7*	2" from well - 2"Steel through backflow preventer - 6" to underground conveyance	3825	Power 200 amp, 480V, 15 KVA MINI- Power center	--
PW-9*	6"Steel through backflow preventer - 8" to underground conveyance	4125	400 Amp, 480V main	From PP-K12-5, B304
PW-23*	2" stainless steel from well - 6" to underground conveyance	3425	100 Amp 480vac 3ph	From X17-EDP-1, B351
PW-25	6" HDPE x 10" HDPE from well - 6" HDPE x 10" HDPE to underground conveyance	900 buried: 700 feet trestle	200 Amp 480vac 3ph. PH-25 meter: Serial No: 1524TMAJ0047 Model E20-480200-JKIT (200 AMPS)	From PDP-2-K14, B334, Floor 2

* Inactive Wells and Pump Houses
** Estimated

TABLE 4-4: Active Pump House Electrical, HVAC, and Lighting and Well Head Information

Pump House	HVAC	Lighting	Well Head Location	Well Head Type
PH-1	Electric – Wall mounted heater	3@4-ft T8 Florescent Light Fixtures	Pump House Building	Layne Pitless adapter
PH-2	Electric – Wall mounted heater w/WR Thermostat	2@4-ft T8 Florescent Light Fixtures	Hot Box – Adjacent to Pump House	Custom 3" elbow through 1" thick steel plate 3" MAAS Pitless adapter
PH-25	Electric – Wall mounted heater	4@4-ft T8 Florescent Light Fixtures	Hot Box – Adjacent to Pump House	Baker Monitor w/ underground Pitless adapter

TABLE 4-5: Active Pump House Instruments, Meters, and Transducers

Location	Device	Type / Model	Range	Output	Comment
PH-1	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600 PSI	4-20mA	Pump discharge pressure
	Flow Meter	Polysonic / DCT6088	--	--	Inactive—In GTF
	Submersible Transducer	unknown	--	--	--
PH-2	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600 PSI	4-20mA	Pump discharge pressure
	Building Temperature	Foxboro I/A Series/RTT20-I1WAOFN-L1	0-140˚F	--	--
	Flow Meter	Polysonic / DCT6088	--	--	Inactive---In GTF
	Submersible Transducer	unknown	--	--	--
PH-25	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600 PSI	4-20mA	Pump discharge pressure
	Building Temperature	Rosemont / 144HNJ6X3	0-150˚F	--	--
	Flow Meter	Polysonic / DCT6088	--	--	Inactive---In GTF
	Submersible Transducer	Unknown	--	--	--

TABLE 4-6: Active Pump House Variable Frequency Drive Information

Location	Motor	Motor Size (HP) 230V - 3PH	Drive Make/ Model / Model Number	Amperage / Service Factor	Overload Amps	Drive Rating (HP)	Drive Rating (KW)
PH-1	PW-1 Well Pump	75	Altivar / 66 / ATV66D64N4U	98 / 1.15	116	75	55
PH-2	PW-2R Well Pump	20	Altivar / 61 / ATV61HD30N4	65 / 1.15	71.5	50	37
PH-25	PW-25 Well Pump	75	Altivar / 66 / ATV66D64N4U	98 / 1.15	116	75	55

TABLE 4-7: Active Pump House Local Instruments

Location	Description	Type / Model	Range	Output	Comment
PH-1	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600PSI	4-20mA	Well pump discharge pressure
PH-1	Flow Meter	Polysonic / DCT6088	--	--	Inactive
PH-1	Submersible Transducer				
PH-2	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600PSI	4-20mA	Well pump discharge pressure
PH-2	Building Temperature	Foxboro I/A Series / RTT20-I1WAOFN-L1	0-140˚F	--	
PH-2	Flow Meter	Polysonic / DCT6088	--	--	Inactive
PH-2	Submersible Transducer				
PH-25	Pressure Transmitter	Rosemont / TG3A2B21AB4E5M5	0-600PSI	4-20mA	Well pump discharge pressure
PH-25	Building Temperature	Rosemont / 144HNJ6X3	0-150˚F	--	
PH-25	Flow Meter	Polysonic / DCT6088	--	--	Inactive
PH-25	Submersible Transducer				

TABLE 4-8: GTF Building Utility Information

GTF	HVAC	Exterior Lighting	Interior Lighting	Utilities (other)
PW-1	Intake louvers	1 @ RAB Model, WPLED26YMS/PC, LED 16.5 Inch Fixture	16 @ Columbia Model, LXEM4-35VL-DFAEU-XEHC, LED 4 Foot Fixtures	Public water – rest rooms and domestic hot water
	Roof exhaust fan		8 @ Columbia Model, LAW4-35ML-EU, LED 4 Foot Fixtures	
	7 @ electric wall mounted heaters	4 @ Spaulding Model, TRP-30L4K-053-3-U-BL-BBU	2 @ Columbia Model, LAW4-35ML-EU-518, LED 4 Foot Fixtures	
PW-2	Intake louvers	1@ RAB Model, WPLED26YMS/PC, LED 16.5 Inch Fixture	12 @ Columbia Model, LXEM4-35VL-DFAEU-XEHC, LED 4 Foot Fixtures	Public water – fire suppressions system and domestic hot water
	Roof exhaust fan	4 @ Spaulding Model, TRP-30L4K-053-3-U-BL-BBU	6 @ Columbia Model, LAW4-35ML-EU, LED 4 Foot Fixtures	
	4 @ electric wall mounted heaters	---	---	
PW-25	Intake louvers	1@ RAB Model, WPLED26YMS/PC, LED 16.5 Inch Fixture	12 @ Columbia Model, LXEM4-35VL-DFAEU-XEHC, LED 4 Foot Fixtures	Public water – domestic hot water
	Roof exhaust fan	2 @ Spaulding Model, TRP-30L4K-053-3-U-BL-BBU	6 @ Columbia Model, LAW4-35ML-EU, LED 4 Foot Fixtures	
	4 @ electric wall mounted heaters	---	---	
B384	Intake louvers	3 @ Exterior lights (Not changed no know references).	2 @ Columbia Model, LXEM4-35VL-DFAEU-XEHC, LED 4 Foot Fixtures	Public water – domestic hot water
	Roof exhaust fan			
	3 @ electric wall mounted heaters			

TABLE 4-9: Building Structure and Electrical Information for GTFs

GTF	GTF Structure Dimensions	Access	Building Construction	Electrical Power Feed
PW-1	42.7' x 82.7' x 30' tall	1. 12' wide x 22' tall roll up door 2. Double Steel 71" wide x 83" tall access door 3. Single Steel 39" wide x 83" tall access door	Concrete block with metal roof	400 Amp, 480vac, 3ph, Main; Underground Service Feed, Northwest Side of Building; From Power Company. Meter: Central Hudson utility owned meter Serial No: ZLGE291M059832240
PW-2	32.7' x 60.7' x 30' tall	1. 12' wide x 22' tall roll up door 2. Double Steel 71" wide x 83" tall access door 3. Single Steel 39" wide x 83" tall access door	Concrete block with metal roof	1200 Amp, 480vac, 3ph, Main Lug; Overhead Feed Off of Trestle; From B316-2 Substation Room. Meter: Serial No: 1850TMAJ0665 Model E20-480800-JKIT (300 AMPS)
PW-25	30.7' x 52.7' x 30' tall	1. 12' wide x 22' tall roll up door 2. Double Steel 71" wide x 83" tall access door	Concrete block with metal roof	200 Amp 480vac Main Lug; Overhead; From: Building 334. Meter: Serial No: 1851TMAJ0844 Model E20-480800-JKIT (300 AMPS)
B384	50' x 40' x 30' tall	1. 10' wide x 10' tall roll up door 2. Double Steel 71" wide x 83" tall access door 3. 2 @ Single steel 39" wide x 83" tall access door	Steel frame, metal siding metal roof	200 amp, 480 vac, Motor Control Center; overhead feed from Bldg. 308 substation K9 Room Meter: Serial No: 1524TMAJ0045 Model E20-480100-JKIT (100 AMPS)

TABLE 4-10: Well Pump Information

Well No	Pump Diam (In)	Pump Discharge (in)	Motor Diam (in)	Motor Make/Model	RPM	Date Installed	On-Site Spare
PW-1	8	5	8	Plueger	3450	Apr-12	No
PW-2R	6	6	6	Franklin 3W460V-3_	3600	Sep-18	No
PW-25	6	6	4	Franklin/ 2396036021	3450	_	Yes
B384 Sump	NA	NA	NA	NA	NA	Nov-18	No

TABLE 4-11: GTF System Pump Information						
Treatment System	**P&ID Number**	**Motor**				**Flow Range (GPM)**
		Horse Power	**Voltage**	**Phase**	**Amperage / Service Factor**	
PW-1	P-300	15	460	3	17 / 1.15	0-210
	P-400	10	460	3	14.2 / 1.15	>1,000
	P-500	7.5	460	3	11.5 / 1.15	0-525
PW-2	P-300	20	460	3	23 / 1.15	0-400
	P-400	10	460	3	14.2 / 1.15	0-650
	P-500	7.5	460	3	11.5 / 1.15	0-525
	P-701 & 702 P-702	15	460	3	17 / 1.15	0-375
	P-800	NA	110	1	NA	0-8 (GPH)
PW-25	P-300	25	460	3	31 / 1.15	>1,000
	P-400	20	460	3	24 / 1.15	>1,000
	P-500	7.5	460	3	11.5 / 1.15	0-525
B384	P-700	1.5	460	3	2 / 1.15	3-22
	P-300	3.0	460	3	4.10 / 1.15	85-170
	P-101 & P102	0.75	460	3	1.2 / 1.15	5.5-68
	P-300	2.0	460	3	4.3 / 1.15	5.5-68

TABLE 4-12: Additional GTF Pump Information

GTF Location	ID	Description	Make	Model/Size	Max Flow (gpm)	TDH (feet)	FLA	RPM	Min RPM	Max RPM	Frame Size
PW-1	P-300	Discharge Pump	Fybroc	1530/1.5x3-6	150	125	21	3400	600	3600	215JM
PW-1	P-400	Backwash/Grit Pump	Fybroc	1530/4x6-13	500	40	14	940	600	1200	256JM
PW-1	P-500	Sump Pump	Sulzer/ABS	EJ75D-3	250	50	11.5	1690	600	1750	N/A
PW-2	P-300	Discharge Pump	Fybroc	1530/2x3-8	215	150	27	2700	600	3600	256JM
PW-2	P-400	Backwash/Grit Pump	Fybroc	1530/4x6-13	500	40	14	940	600	1200	256JM
PW-2	P-500	Sump Pump	Sulzer/ABS	EJ75D-3	250	50	11.5	1690	600	1750	N/A
PW-2	P-701	Transfer Pump	Fybroc	1530/2x3-6	215	120	21	3390	600	3600	215JM
PW-2	P-702	Transfer Pump	Fybroc	1530/2x3-6	215	120	21	3390	600	3600	215JM
PW-25	P-300	Discharge Pump	Fybroc	1530/3x4-13	300	110	34	1410	600	1800	284JM
PW-25	P-400	Backwash/Grit Pump	Fybroc	1530/4x6-10	750	75	27	1610	600	1800	256JM
PW-25	P-500	Sump Pump	Sulzer/ABS	EJ75D-3	250	50	11.5	1690	600	1750	N/A
B384	P-101/102	Influent Pumps	EBARA	ACDU70/17T3C	32.5	50.5	1.4	3450	600	3600	56J
B384	P-300	Effluent Pump	EBARA	ACDU70/5B20T3C	36	100.8	3.4	3450	600	3600	56J

TABLE 4-13: Bag Filter Information

GTF	P&ID-ID Number	Make / Model	Filter Size	Micron Size	Comment
PW-1	F-401 & 402	Filtra Systems FSCS010303S4NR	2 (8" Housing)	100	Series
PW-2	F-401 & 402	Filtra Systems FSCS010303S4NR	2 (8" Housing)	100	Series
	F-901 & 902	Filtra Systems FSCS010303S4NR	2 (8" Housing)	100	Series
PW-25	F-401 & 402	Filtra Systems FSCS010303S4NR	2 (8" Housing)	100	Series
B384	F-401 & 402	Filtra Systems FSCS010303S4NR	2 (8" Housing)	100	Series

TABLE 4-14a: PW-1 Hand Valve Chart

Valve #	Description	Valve #	Description	Valve #	Description
001	PH-1 Shut-off to PW-1	501	Forced SUMP – SP	C06	PV100 – GAC – IN
002	PH-1 Shut-off to B316	502	Forced SUMP – ISO	C07	BACKWASH Return
003	PW-1 Shut-off – STORM	503	Forced SUMP – BYPASS	C08	BACKWASH Supply
004	PW-1 – SP	504	Filtered Water –IN	C09	CTW to PV200
005	CTW PW-1 – STORM	400	T400 – DRAIN	C10	CTW to PV100
006	PW-1 – Shut-off	401	T400 – ISO	P01	SP – WELL Water
007	PW-1 CTW – SP	402	T400 to T300 – BACKWASH	P02	SP – CTW
008	CTW Shut-off from PH-1	403	P400 – EF	P03	SP – PV100 – EF
009	PW-1 Shut-off from PH-1	404	P400 – EF – SP	P04	SP – PV100 – IN
010	PW-1 – SP from PH-1	405	P400 – EF – PIT – Shut-off	P05	SP – PV200 – IN
011	WELL Water Shut-off	406	P400 – BACKWASH Supply	P06	SP – PV200 – EF
401	401 Filter – IN	300	T300 - DRAIN		
402	401 Filter – PIT– Shut-off	301	P300 – IN		
403	401 Filter – PIT – IN – SP	302	P300 – EF		
404	401 Filter – EF	303	P300 – EF – SP		
405	401 Filter – EF – SP	304	P300 – PIT – Shut-off		
406	401 Filter – BYPASS	305	GAC – Treated Water		
407	402 Filter – IN	200	PV200 – EF		
408	402 Filter – PIT –Shut-off	206	DOMESTIC water to PV200		
409	402 Filter – IN– PIT – SP	100	PV100 – EF		
410	402 Filter– EF– BYPASS	106	DOMESTIC water to PV100		
411	402 Filter – EF – SP	C01	CTW 4-inch		
412	402 Filter – EF	C02	PV100 – GAC – EF		
413	402 Filter – BYPASS	C03	PV200 – GAC – IN		
414	FE to Forced SUMP	C04	PW-1 WELL Water		
415	FE to WELL water	C05	PV100 – GAC – IN		

TABLE 4-14b: PW-2 Hand Valve Chart

Valve #	Description	Valve #	Description	Valve #	Description
001	PH-2 to PW-2R Shut-off	908	F902 – PIT – Shut-off	408	402 Filter – PIT – Shut-off
002	PH-2 to B316 Shut-off	909	F902 – SP – IN	409	402 Filter – IN – SP
003	CTW to Storm – SP	910	F902 – BYPASS	410	402 Filter – BYPASS
004	CTW to Storm Sewer	911	FE to T-700	411	402 Filter – EF – SP
005	To PH-2 – SP	912	F902 – EF – Shut-off	412	402 Filter – EF
006	To PH-2 Shut-off	913	F902 – SP – EF	413	402 Filter – BYPASS
007	From PH-2 Isolation	914	IN to RAYOX®	414	FE to T700
008	From PH-2 – SP	915	CTW – 4” – SP	415	FE to RAYOX®
009	From PH-2 Shut-off	916	CTW – 2” – to RAYOX®	501	Forced Sump – SP
P01	SP – PW-2R	917	CTW – 4” – BYPASS	502	Forced Sump – ISO
P02	SP – RAYOX® – IN	918	F902 – BYPASS	503	BYPASS
P03	SP – RAYOX® – EF	700	T700 – DRAIN	504	400s Bag Filters – IN
P04	SP – PV600 – IN	701	T700 to P701 IN	300	T300 – DRAIN
P05	SP – PV600 – EF	702	T700 to P700 – IN	301	T300 to 300P – IN
P06	SP – PV100 – IN	703	P701 – EF	302	P300 - EF
P07	SP – PV200 – IN	704	P700 – EF	303	P300 – In – SP
P08	SP – PV100 – EF	705	PIT – 700 – SP	304	P300 – PIT – Shut-off
P09	SP – PV200 – EF	706	PIT – 700 – Shut-off	305	P300 – CTW – Shut-off
P10	SP – CTW – EF	707	Catalytic – IN	400	T400 – DRAIN
901	F901 – IN – Filter	401	401 Filter – IN	401	T400 to P400 – IN
902	F901 PIT Shut-off – IN	402	401 Filter – PIT– Shut-off	402	T400 to P300 – BACKWASH
903	F901 – SP – IN	403	401 Filter – IN – SP	403	P400 – EF
904	F901 – BYPASS / ISO	404	401 Filter – EF	404	P400 – EF – SP
905	F901 – EF	405	401 Filter – EF – SP	405	P400 – PIT – Shut-off
906	F901 – SP – EF	406	401 Filter – BYPASS	406	BACKWASH - SUPPLY
907	F902 – IN	407	402 Filter – IN	200	PV200 – EF

TABLE 4-14c: PW-25 Hand Valve Chart

Valve #	Description	Valve #	Description	Valve #	Description
101	ISO to B316	503	Forced SUMP – BYPASS	C08	BACKWASH Supply
102	SAMPLE port to B316	504	Filtered Water –IN	C09	CTW to PV200
103	GAC to B316	400	T400 – DRAIN	C10	CTW to PV100
104	ISO to STORM	401	T400 – ISO	P01	SP – PV100 – EF
105	SAMPLE port to STORM	402	T400 to P300 – BACKWASH	P02	SP – PV100 – IN
106	GAC water to STORM	403	P400 – EF	P03	SP – PV200 – IN
107	ISO from PH-25	404	P400 – EF – SP	P04	SP – PV200 – EF
108	SAMPLE port - PH-25	405	P400 – EF – PIT – Shut-off	P05	SP – WELL water
109	Shut-off PW-25	406	P400 – BACKWASH Supply	P06	SP – CTW – EF
401	401 Filter – IN	300	T300 - DRAIN		
402	401 Filter – PIT– Shut-off	301	P300 – IN		
403	401 Filter – PIT – IN – SP	302	P300 – EF		
404	401 Filter – EF	303	P300 – EF – SP		
405	401 Filter – EF – SP	304	P300 – PIT – Shut-off		
406	401 Filter – BYPASS	305	GAC – Treated Water		
407	402 Filter – IN	200	PV200 – EF		
408	402 Filter – PIT –Shut-off	206	DOMESTIC water to PV200		
409	402 Filter – IN– PIT – SP	100	PV100 – EF		
410	402 Filter– EF – BYPASS	106	DOMESTIC water to PV100		
411	402 Filter – EF – SP	C01	CTW 4-inch		
412	402 Filter – EF	C02	PV100 – GAC – EF		
413	402 Filter – BYPASS	C03	PV100 – GAC – IN		
414	FE to Forced SUMP	C04	PH-25 WELL Water		
415	FE to WELL water	C05	PV200 – GAC – IN		
501	Forced SUMP SAMPLE	C06	PV200 – GAC – EF		
502	Forced SUMP – ISO	C07	BACKWASH Return		

TABLE 4-14d: B384 Hand Valve Chart			
Valve #	**Description**	**Valve #**	**Description**
01	500 – SUMP	28	F401 – IN – SP
02	T100 – DRAIN	29	F401 – EFF – SP
03A	T100 – EFF	30	F401 – EFF
03B	P101 – EFF	31	F402 - BYPASS
04	P101 – IN	32	F402 – EN – SP
05A	P101 – CHECK	33	F402 - EFF
05B	P102 - CHECK	34	F402 – IN – BYPASS
06	P102 – IN	35	F402 – BYPASS
07	P102 - EFF	36	F402 – IN
08	SAMPLE port	37	F402 – IN – PIT
09	PRESSURE transducer	38	F402 – IN – SP
10	EFF	39	F402 – ISO
11	SKIPPED in numbering sequence	40	FILTER – CHECK
12	V601 – IN	41	PV501/PV502 – ISO
13	V601 – IN – SP	42	PV501– PSIG – IN
14	V601 – EFF	43	PV501– PSIG
15	V601 – EFF – SP	44	PV501 – SP – IN
16	V602 – IN	45	PV501– PSIG – EFF
17	V602 – IN – SP	46	PV501 – SP – EFF
18	V602 – EFF	47	PV501 – EFF
19	V602 – EFF – SP	48	PV502 – IN
20	S300 – IN – to P300	49	PV502 – PSIG – IN
21	P300 - EN	50	PV502 – SP – IN
22	P300 – SP	51	PV502 – PSIG – EFF
23	P300 – PRESSURE transducer	52	PV502 – SP – EFF
24	P300 – ISO	53	PV502 - EFF
25	S300 – CHECK	54	CTW to outfall
26	F401 – IN	55	Vacuum Breaker
27	F401 – IN – PIT		

TABLE 4-15a: PW-1 Piping Chart

Diameter (I.D.)	P&ID Code	Material Type	Description
3-inch x 6-inch	WW-HDPE-SDR-11	HDPE	From: PH-1 To: 4" WW-PPR-B
4-inch	WW-PPR-B	Reinforced Polypropylene	From: 3" x 6" WW-HDPE-SDR-11 To: 4" GI-PPR-B, 2" FE-PPR-B, and to ½" SP-PW-1
4-inch	GI-PPR-B	Reinforced Polypropylene	From: 4" WW-PPR-B To: GAC PV-100 and to ½" SP-PV100-INF.
4-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-100 To: 4" GI-PPR-B and to ½" SP PV100-EFF.
4-inch	GI-PPR-B	Reinforced Polypropylene	From: 4" GE-PPR-B To: GAC PV-200, to ½" SP PV200-INF.
4-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-200 To: 4" CTW-PPR-B, and to ½" SP PV200-EFF
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: 4" GE-PPR-B To: Tank T-300
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: Tank T-300 Through Pump P-300 To: B316 or Storm, ½" SP-CTW-EFF, and to 6"CTW-HDPE-SDR-11.
6-inch	CTW-HDPE-SDR-11	HDPE	From: 4" CTW-PPR-B To: Catch Basin.
2-inch	CTW-PPR-B	Reinforced Polypropylene	From: 4" BS-PPR-B To: 2" PW-CS-40 and 2" PW-PPR-B FOR GAC PV-100 and GAC PV-200.
2-inch	FI-PPR-B	Reinforced Polypropylene	From: 4" FS-PPR-B and 4" BS-PPR-B – To: Filters 401 and 402.
2-inch	FE-PPR-B	Reinforced Polypropylene	From: FILTERS F-401 and F-402 To: 4" WW-PPR-B to GAC PV-100 AND From: Filters F-401 and F-402 To: 4" FS-PPR-B to Grit T-400
4-inch	FS-PPR-B	Reinforced Polypropylene	From: Sump P-500 To: Grit T-400 AND From: SUMP P-500 To: 2" FI-PPR-B.
6-inch	BS-PPR-B	Reinforced Polypropylene	From: Tank T-300 To: Grit T-400
4-inch	BS-PPR-B	Reinforced Polypropylene	From: Grit T-400 To: 4" GE-PPR-B, 2" FI-PPR-B, and 2" CTW-PPR-B.
4-inch	BR-PPR-B	Reinforced Polypropylene	From: 4" GI-PPR-B To: Grit T-400
2-inch	PW-PPR-B	/Brass	From: PW Supply To: GAC PV-100 and GAC PV-200
2-inch	PW-CS-40	/Brass	To: GAC PV-100 and GAC PV-200
4-inch	RC-CS-40	/Galvanized	From: Truck To: GAC PV-100 and GAC PV-200
4-inch	SC-CS-40	/Galvanized	From: GAC PV-100 and GAC PV-200 To: Truck
½-inch	AV-PVC-80	/Galvanized	From: GAC PV-100 and GAC PV-200 To: Floor Drain.
½-inch	SP-PW1	Copper	From: 4" WW-PPR-B To: Sample Sink.
½-inch	SP-PV100-INF	Copper	From: 4" GI-PPR-B To: Sample Sink.
½-inch	SP-PV100-EFF	Copper	From: 4" GE-PPR-B To: Sample Sink.
½-inch	SP-PV200-INF	Copper	From: 4" GI-PPR-B To: Sample Sink.
½-inch	SP-PV200-EFF	Copper	From: 4" GE-PPR-B To: Sample Sink.
½-inch	SP-CTW-EFF	Copper	From: 4" CTW-PPR-B To: Sample Sink.
4-inch	AV-PV-40	HDPE	From: Treated Water Tank T-300 and Grit Tank T-400 To: Building Exterior

TABLE 4-15b: PW-2 Piping Chart			
Diameter (I.D.)	**P&ID Code**	**Material Type**	**Description**
3 x 6-inch	WW-HDPE	/HDPE	From: PW- 2 and PH-2 To: 3" WW-PPR-B
3-inch	WW-PPR-B	/Reinforced Polypropylene	From: 3x6" WW-HDPE To: Filters F-901, and F-902, and to ½" SP-PW2
3-inch	RI-PPR-B	Reinforced Polypropylene	From: Filters F-901, and F-902 To: Rayox® R-900, 2" FE-PPR-B, 2" CTW-PPR-B, ¼" HP-TB-PP, and to ½" SP-RAYOX®-INF
4-inch	RE-PPR-B	Reinforced Polypropylene	From: Rayox® R-900 To: Transfer Tank T-700.
2-inch	CTW-PPR-B	Reinforced Polypropylene	From: 3" RI-PPR-B To: 4" CTW-PPR-B
4-inch	CI-PPR-B	Reinforced Polypropylene	From: Transfer Tank T-700, through Pumps P-700 and P-701To: GAC PV-600.
4-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-600 To: 4" WW-PPR-B and to ½" SP-PV600-EFF.
4-inch	WW-PPR-B	Reinforced Polypropylene	From: 4" GE-PPR-B To: 4" GI-PPR-B.
4-inch	GI-PPR-B	Reinforced Polypropylene	From: 4" WW-PPR-B To: GAC PV-100
4-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-100 To: 4" GI-PPR-B and ½" SP-PV100-EFF.
4-inch	GI-PPR-B	Reinforced Polypropylene	From: 4" GE-PPR-B To: GAC PV-200 and ½" SP-PV200-INF
4-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-200 To: 4" CTW-PPR-B and ½" SP-PV200-EFF.
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: 4" GE-PPR-B To: Treated Water Tank T-300
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: Treated Water Tank T-300 To: 6" CTW-HDPE-SDR-11(Treated Water to Storm Sewer), and to B316 for Re-use via PH-2.
6-inch	CTW-HDPE-SDR-11	HDPE	From: 4" CTW-PPR-B To: Catch Basin Outfall
4-inch	FS-PPR-B	Reinforced Polypropylene	From: Sump P-500 To: 2" FI-PPR-B, 2" FE-PPR-B, and Grit Tank T-400.
2-inch	FI-PPR-B	Reinforced Polypropylene	From: 4" FS-PPR-B To: Filters F-401, F-402, 2" FE-PPR-B, and 4" BS-PPR-B.
2-inch	FE-PPR-B	Reinforced Polypropylene	From: Filters F-401 and F-402 To: 3" RI-PPR-B, 4" FS-PPR-B, and 2" FI-PPR-B.
4-inch	?	HDPE	From: Treated Water Tank T-300 To: Grit Tank T-400.
4-inch	BS-PPR-B	Reinforced Polypropylene	From: Grit Tank T-400, Through Pump P-400 To: 2" FI-PPR-B, 2"CTW-PPR-B, and 4" GE-PPR-B.
4-inch	BR-PPR-B	Reinforced Polypropylene	From: 4"GI-PPR-B To: Grit Tank T-400.
2-inch	CTW-PPR-B	Reinforced Polypropylene	From: 4" BS-PPR-B To: GAC PV-600, GAC PV-100, and GAC PV-200.
2-inch	FE-PPR-B	Reinforced Polypropylene	From: 3" RI-PPR-B To: 4" FS-PPR-B
1-inch	AV-PPR-B	Reinforced Polypropylene	From: GAC PV-600 To: Tank T-700.
2-inch	TF-316L-40	Reinforced Polypropylene	From: Building Exterior To: Tank T-800.
2-inch	AV-PV-40	Reinforced Polypropylene	From: Tank T-800 To: Building Exterior.
¼-inch x 1-inch	HP-TB-PP and PVC-40	Poly Vinyl Chloride	From: Tank T-800, Through Pump P-800 To: 3" RI-PPR-B.

TABLE 4-15b: PW-2 Piping Chart (continued)			
Diameter (I.D.)	**Diameter (I.D.)**	**Material Type**	**Description**
½-inch	SP-PW2	Copper	From: 3” WW-PPR-B To: Sample Sink
½-inch	SP-RAYOX®-INF	Copper	From: 3” RI-PPR-B To: Sample Sink
½-inch	SP-PV600-EFF	Copper	From: 4” GE-PPR-B To: Sample Sink
½-inch	SP-PV100-EFF	Copper	From: 4” GE-PPR-B To: Sample Sink
½-inch	SP-PV200-INF	Copper	From: 4” GI-PPR-B To: Sample Sink
½-inch	SP-PV200-EFF	Copper	From: 4” GE-PPR-B To: Sample Sink
2-inch	PW-PPR-B	/Copper	From: PW Supply To: GAC PV-600, GAC PV-100, and GAC PV-200
2-inch	PW-CS-40	Carbon Steel	From: GAC PV-600, GAC PV-100, and GAC PV-200
4-inch	RC-CS-40	Carbon Steel	From: Truck To: GAC PV-600, GAC PV-100, and GAC PV-200
4-inch	SC-CS-40	Carbon Steel	From: GAC PV-600, GAC PV-100, and GAC PV-200 To: Truck
½-inch	AV-PVC-80	Poly Vinyl Chloride	From: GAC PV-600, GAC PV-100, and GAC PV-200 To: Floor Drain
4-inch	AV-PV-40	HDPE	From: Transfer Tank T-700, Treated Water Tank T-300, and Grit Tank T-400. To: Building Exterior.

TABLE 4-15c: PW-25 Piping Chart			
Diameter (I.D.)	**P&ID Code**	**Material Type**	**Description**
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: Tank T-300 To: B316 for Reuse or to 4" CTW-HDPE-STORM
4-inch	WW-PPR-B	Reinforced Polypropylene	From: PH-25 and PW-25 To: 6" GIPPR-B and to ½" SP-PW-25.
6-inch	GI-PPR-B	Reinforced Polypropylene	From: 4" WW-PBR-B To: GAC PV-100 and to ½" SP PV100-INF
6-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-100 To: 6" GI-PPR-B, to ½" SP PV100-EFF
6-inch	GI-PPR-B	Reinforced Polypropylene	From: 6" GE-PPR-B To: GAC PV-200, and to ½" SP-PV200-INF.
6-inch	GE-PPR-B	Reinforced Polypropylene	From: GAC PV-200 To: 4" CTW-PPR-B, and to ½" SP PV200-EFF
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: 6" GE-PPR-B To: Tank T-300
4-inch	CTW-PPR-B	Reinforced Polypropylene	From: Tank T-300 Through Pump P-300 To: B316 or Storm and ½" SP-CTW-EFF
2-inch	CTW-PPR-B	Reinforced Polypropylene	From: 6" BS-PPR-B To: 2" PW-CS-40 and 2" PW-PPR-B FOR GAC PV-100 and GAC PV-200.
2-inch	FI-PPR-B	Reinforced Polypropylene	From: 4" FS-PPR-B and 6" BS-PPR-B – To: Filters 401 and 402.
2-inch	FE-PPR-B	Reinforced Polypropylene	From: FILTERS F-401 and F-402 To: 4" WW-PPR-B to GAC PV-100 AND From: Filters F-401 and F-402 To: 4" FS-PPR-B to Grit T-400
4-inch	FS-PPR-B	Reinforced Polypropylene	From: Sump P-500 To: Grit T-400 AND From: SUMP P-500 To: 2" FI-PPR-B.
6-inch	BS-PPR-B	Reinforced Polypropylene	From: Tank T-300 To: Grit T-400
6-inch	BS-PPR-B	Reinforced Polypropylene	From: Grit T-400 To: 6" GE-PPR-B, 2" FI-PPR-B, and 2" CTW-PPR-B.
6-inch	BR-PPR-B	Reinforced Polypropylene	From: 6"GI-PPR-B To: Grit T-400
2-inch	PW-PPR-B	/Brass	From: PW Supply To: GAC PV-100 and GAC PV-200
2-inch	PW-CS-40	/Brass	From: GAC PV-100 and GAC PV-200
4-inch	RC-CS-40	/Galvanized	From: Truck To: GAC PV-100 and GAC PV-200
4-inch	SC-CS-40	/Galvanized	From: GAC PV-100 and GAC PV-200 To: Truck
½-inch	AV-PVC-80	/Galvanized	From: GAC PV-100 and GAC PV-200 To: Floor Drain.
½-inch	SP-PW25	Copper	From: 4" WW-PPR-B To: Sample Sink.
½-inch	SP-PV100-INF	Copper	From: 6" GI-PPR-B To: Sample Sink.
½-inch	SP-PV100-EFF	Copper	From: 6" GE-PPR-B To: Sample Sink.
½-inch	SP-PV200-INF	Copper	From: 6" GI-PPR-B To: Sample Sink.
½-inch	SP-PV200-EFF	Copper	From: 6" GE-PPR-B To: Sample Sink.
½-inch	SP-CTW-EFF	Copper	From: 4" CTW-PPR-B To: Sample Sink.
4-inch	AV-PV-40	HDPE	From: Treated Water Tank T-300 and Grit Tank T-400 To: Building Exterior

TABLE 4-15d: B384 Piping Chart

Fluid Process Piping			
Diameter (I.D.)	**P&ID Code**	**Material Type**	**Description**
1 ½-inch	FRP-D2996	Poly Vinyl Chloride	From: Pump P-200 To: Transfer Tank T-100.
1 ½-inch	FRP-D2996	Poly Vinyl Chloride	From: Transfer Tank T-100 To: Air Stripper S-300 Through Pumps P-101 and P-102.
1 ½-inch	FI-PVC-80	Poly Vinyl Chloride	From: Air Stripper S-300 To: Filters F-401 and F-402, Through Pump P-300.
1 ½-inch	FE-PVC-80	Poly Vinyl Chloride	From: Filters F-401 and F-402 To: 1 ½” CTW-PVC-80, Through Liquid GAC PV-501 and GAC PV-502.
1 ½-inch	CTW-PVC-80	Poly Vinyl Chloride	From: Liquid GAC PV-502 To: 4” CTW-HDPE-DR9
4-inch	CTW-HDPE-DR9	HDPE	From: 1 ½” CTW-PVC-80 To: Outfall 04B

Vapor Process Piping			
Diameter (I.D.)	**P&ID Code**	**Make/Material Type**	**Description**
2-inch	AV-PV-40	Poly Vinyl Chloride	From: Jet Skid Tanks T-200 and T-700 To: Transfer Tank T-100, Through Vent Blower B-100, and to 6” AV-PV-40.
6-inch	AV-PV-40	Poly Vinyl Chloride	From: Air Stripper S-300 To: 6” AV-HSA and 2” AV-PV-40, Through Duct Heater DH-1.
6-inch	AV-HSA	Poly Vinyl Chloride	From: 6” AV-PV-40 To: Vapor Phase GAC V-601 and GAC V-602.
6-inch	AV-PV-40	Poly Vinyl Chloride	From: 6” AV-HSA To: Building Exterior.

TABLE 4-16: GTF Variable Frequency Drive Information

Location	**Motor Size (HP) 230V - 3PH**	**Drive Make/ Model**	**Drive Rating (HP)**	**Drive Rating (KW)**
PW-1	1	GS3-22P0	2	1.5
PW-2R	1	GS3-22P0	2	1.5
PW-25	1.5	GS3-23P0	3	2.2
B384	3	GS3-27P5	7.5	5.5

TABLE 4-17: GTF Flow Meter Information

Treatment System	PFD-ID Number	Pipe Diameter (Inches)	Make-Model	Comment
PW-1	FIT-PW1	3	Seametrics - WMP 101-300	PW-1 Influent Meter
	FIT-400	3	Seametrics - WMP 101-300	Grit Tank Meter
	FIT-300	3	Seametrics - WMP 101-300	Treated Water Meter / GTF Effluent
PW-2	FIT-PW2	3	Seametrics - WMP 101-300	PW-2 Influent Meter
	FIT-700	3	Seametrics - WMP 101-300	Transfer Pumps Meter
	FIT-400	3	Seametrics - WMP 101-300	Grit Tank Meter
	FIT-300	3	Seametrics - WMP 101-300	Treated Water Meter / GTF Effluent
	FIT-RI	4	GF Signet Magmeter – 8550-3 Seametrics - WMP 101-300	Rayox® Meter
PW-25	FIT-PW25	3	Seametrics - WMP 101-300	PW-25 Influent Meter
	FIT-400	3	Seametrics - WMP 101-300	Grit Tank Meter
	FIT-300	3	Seametrics - WMP 101-300	Treated Water Meter / GTF Effluent
B384	FIT-100	1 1/2	GF Signet Magmeter – 8550-3	Shallow Tray Aerator Influent Meter
	FIT-200	1 1/2	GF Signet Magmeter – 8550-3	Jet Skid Transfer Pump Meter
	FIT-300	1 1/2	GF Signet Magmeter – 8550-3	Shallow Tray Aerator Transfer Pump Meter

TABLE 4-18: GTF General Tank Information

Treatment System	PFD-ID Number	Tank Purpose	Tank Make-Material/Size/weight (empty)	Volume (gallons)
PW-1	T-300	Treated water storage	Augusta Fiberglass-Isophthalic/8'x16.5' (ID)/ 1,900 pounds	6,000
	T-400	Grit tank	Augusta Fiberglass-Isophthalic/8'x15.0' (ID)/ 2,900 pounds	6,000
PW-2	T-300	Treated water storage	Augusta Fiberglass-Isophthalic/8'x16.5' (ID)/ 1,900 pounds	6,000
	T-400	Grit tank	Augusta Fiberglass-Isophthalic/8'x15.0' (ID)/ 2,900 pounds	6,000
	T-700	Transfer tank (30% Hydrogen Peroxide)	Augusta Fiberglass-Derakane 411/4'x 6.0' (ID)/ 1,300 pounds	500
	T-800	30% Hydrogen Peroxide tank	Augusta Fiberglass-Derakane 411/8'x 8.5 (ID)/ 1,300 pounds	3,000
PW-25	T-300	Treated water storage	Augusta Fiberglass-Isophthalic/10.0'x18.0' (ID)/ 2,800 pounds	10,000
	T-400	Grit tank	Norwesco-Polypropylene/12'x16'6" (OD)	10,000
B384	T700	Circulation Tank	Custom Fabricated 316 Stainless Steel/18"x48"(OD)	45*
	T-200	Transfer Tank	Custom Fabricated 316 Stainless Steel/18"x37" (OD)	35*
	T-100	Influent Storage Tank	Augusta Fiberglass – Derakane 470/6'x9' (ID)	2,000

TABLE 4-19a: PW-1 Tank Information		
Tank/Capacity (gallons)	Tank Features	Feature Description
T-300 / 6,000	8.0' Dia.x16.5’ Straight Shell Ht.	Flat Bottom, Dome Top
	Resin Construction	Isophathalic
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder - FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized
T-400 / 6,000	8.0' Dia. x 15' Straight Shell Ht.	Cone Bottom, FRP Skirt
	Resin Construction	Isophathalic
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder - FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized

TABLE 4-19b: PW-2 Tank Information		
Tank/Capacity (gallons)	Tank Features	Feature Description
T-300 / 6,000	10.0' Dia.x18’ Straight Shell Ht.	Flat Bottom, Dome Top, Vertical
	Resin Construction	Isophathalic
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder - FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized
T-400 / 6,000	8.0' Dia. x 15' Straight Shell Ht.	Cone Bottom, FRP Skirt, Vertical
	Resin Construction	Isophathalic
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder – FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized
T-700 / 500	4.0' Dia. x 6' Straight Shell Ht.	Flat Bottom, Dome top, Vertical

TABLE 4-19b: PW-2 Tank Information (continued)		
Tank/Capacity (gallons)	Tank/Capacity (gallons)	Tank/Capacity (gallons)
	Resin Construction	Derakane 411
	Fill (2)	4" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	4" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket
	Vent (1)	4" bulkhead fitting w/ epdm gasket
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Ladder (1)	FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized
T-800 / 3,000	8.0' Dia. x 8.5' Straight Shell Ht.	Flat Bottom, Dome top, Vertical
	Resin Construction	Derakane 411
	Fill (1)	2" flanged fitting w/ stainless steel bolts & Viton gasket (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Level (2)	2" flanged fitting w/stainless steel bolts & Viton gasket
	Spare (2)	2" flanged fitting w/ Viton gasket
	Vent (1)	2" flanged fitting w/ Viton gasket
	Ladder (1)	FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized

TABLE 4-19c: PW-25 Tank Information		
Tank/Capacity (gallons)	**Tank Features**	**Feature Description**
T-300 / 10,000	10.0' Dia.x18' Straight Shell Ht.	Flat Bottom, Dome Top, Vertical
	Resin Construction	Isophathalic
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	24" Top Manway (with cover, 316 SS bolts, EPDM gasket
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	2" flanged fitting w/ epdm gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder - FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized
T-400 / 10,000	12' Dia. x 16.5' Straight Shell Ht.	Conical bottom, Dome Top, FRP Skirt, Vertical
	Plastic	Polypropylene
	Fill (1)	6" flanged fitting w/ stainless steel bolts & epdm gasket and fixed internal dip tube (on top of Tank)
	Manway (1)	22" Top Manway (threaded with EPDM gasket)
	Pump Suction (1)	6" flanged fitting w/ stainless steel studs & epdm gasket (off the bottom of the tank)
	Level (2)	2" flanged fitting w/ stainless steel bolts & epdm gasket
	Spare (2)	2" flanged fitting w/ epdm gasket and blind flange
	Tank Drain (1)	3" Female NPT Bulkhead fitting with Viton Gasket
	Overflow	2" flanged fitting w/ epdm gasket
	Vent (1)	4" flanged fitting w/ epdm gasket
	Ladder (1)	Caged Ladder - FRP
	Lifting Lugs (4)	Carbon Steel Galvanized
	Hold Down Lugs (4)	Carbon Steel Galvanized

TABLE 4-19d: B384 Tank Information

Tank/Capacity (gallons)	Tank Features	Feature Description
T-700 / 45*	18” Dia. x 48” Ht.	Dome Bottom / Flanged Top
	Construction	316 Stainless Steel
	Fill (2)	1” NPT fitting (on top of the Tank) 2” Flange w/ SS bolts & epdm gasket (on the side of tank)
	Manway (1)	18" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	2" flanged fitting w/ stainless steel bolts & epdm gasket (on the side of the tank)
	Level (1)	2" NPT fitting for low level (on the side of the tank)
	Spare (1)	1" NPT fitting (on the top of the tank)
	Tank Drain (1)	1 1/2" NPT fitting (on the bottom of the tank)
	Overflow (1)	2" flanged fitting w/ epdm gasket
	Vent (1)	2" flanged fitting w/ epdm gasket
T-200 / 35*	18” Dia. x 37” Ht.	Dome Bottom / Flanged Top
	Construction	316 Stainless Steel
	Fill (2)	1” NPT fitting (on top of the Tank) 2” Flange w/ SS bolts & epdm gasket (on the side of tank)
	Manway (1)	18" Top Manway (with cover, 316 SS bolts, EPDM gasket)
	Pump Suction (1)	1 1/4" flanged fitting w/ stainless steel bolts & epdm gasket (off the side of the tank)
	Level (4)	2" NPT fittings
	Spare	None
	Tank Drain (1)	1 1/2" NPT fitting
	Overflow	None
	Vent (1)	2" NPT fitting

*Estimated tank capacity

TABLE 4-20: GTF Liquid-Phase Carbon Vessel Information

Treatment System	Carbon Vessel Make-Model/Carbon-Type	Design Flow/ Hydraulic Capacity - (series)/ Backwash Rate (GPM)	PFD-ID Number	Carbon weight per vessel (pounds)/Volume (gallons)
PW-1	Calgon Model 8 / Calgon F-300	100/500/450	Stage 1- PV-100	10,000/4,000
			Stage 2 - PV-200	
PW-2	Calgon Model 8 / Calgon F-300	150/500	Stage 1 PV-100	10,000/4,000
			Stage 2 PV-200	
	Calgon Model 8 / Calgon PeroxCarb	150/500	PV-600	10,000/4,000
PW-25	Calgon Model 10 / Calgon F-300	250/710	Stage 1 PV-100	20,000
			Stage 2 PV-200	
B384	Calgon Model TW-36 /Calgon F-300	10/80	Stage 1 PV-100	1,000
			Stage 2 PV-200	

TABLE 4-21: GTF Electrical Meter Information	
ID	**Electrical Meter Serial Number (service)**
PW-1 GTF	Serial No: ZLGE291M059832240
PW-1 PH	Serial No: 1524TMAJ0048 Model E20-480200-JKIT (200 AMPS)
PW-2 GTF	Serial No: 1850TMAJ0665 Model E20-480800-JKIT (300 AMPS)
PW-2 PH	Serial No: 1524TMAJ0046 Model E20-480200-JKIT (200 AMPS)
PW-4 PH	Serial No: 1524TMAJ0043 Model E20-480200-JKIT (200 AMPS)
PW-25 GTF	Serial No: 1850TMAJ0665 Model E20-480800-JKIT (300 AMPS)
PW-25 PH	Serial No: 1524TMAJ0047 Model E20-480200-JKIT (200 AMPS)
B384 GTF	Serial No: 1524TMAJ0045 Model E20-480100-JKIT (200 AMPS)
PH – Pump House GTF – Groundwater Treatment Facility	

TABLE 5-1: B384 Air Stripper Specs

Model Number	Max. Flow: gpm (Lpm)	Dry Weight: lbs. (Kg)	Operating Weight: lbs./ (Kg)	Shell Dimension: (WxWxH): in/. (cm)	Number of Trays	Working Volume: Gallon/ (Liter)	Active Area: ft2 (m2)	Nominal Air Flow: CFM (m3/min)
QED EZ-Tray 6.6	1-65 (4-246)	978 (443)	1,591 (722)	39 x 34 x 102 (99 x 86 x 259)	6	46 (175)	3.8 (0.35)	320 (9.06)

TABLE 5-2: Alarm Summary Information

Type	Alarm Control System Tag	Tag Description	Severity
Analog	PW1_FT_300	P-300 DISCHARGE PUMP FLOW	MONITOR
Analog	PW1_FT_400	P400 DISCHARGE FLOW	MONITOR
Analog	PW1_FT_PW1	PW1 FLOW	MONITOR
Analog	PW1_LT_300	T-300 TREATED WATER TANK LEVEL	MONITOR
Analog	PW1_LT_400	T-400 GRIT TANK LEVEL	MONITOR
Analog	PW1_PT_400	P400 BACKWASH PUMP DISCHARGE PRESSURE	MONITOR
Analog	PW1_PT_401	F-401 BAG FILTER PRESSURE	MONITOR
Analog	PW1_PT_402	F-402 BAG FILTER PRESSURE	MONITOR
Analog	PW2_FT_300	PW2 P300 DISCHARGE PUMP FLOW	MONITOR
Analog	PW2_FT_400	P400 BACKWASH PUMP FLOW	MONITOR
Analog	PW2_FT_700	PW2 P701 DISCHARGE PUMP FLOW	MONITOR
Analog	PW2_FT_PW2	PW2 PUMPHOUSE PH-2 FLOW	MONITOR
Analog	PW2_FT_RI	PW2 R900 RAYOX® UNIT FLOW	MONITOR
Analog	PW2_LT_300	PW2 T300 TREATED WATER TANK LEVEL	MONITOR
Analog	PW2_LT_400	PW2 T400 GRIT TANK LEVEL	MONITOR
Analog	PW2_LT_700	PW2 T700 TRANSFER TANK LEVEL	MONITOR
Analog	PW2_LT_800	PW2 T800 HYD. PEROXIDE TANK LEVEL	MONITOR
Analog	PW2_PT_401	PW2 BAG FILTER F401 PRESSURE	MONITOR
Analog	PW2_PT_402	PW2 BAG FILTER F402 PRESSURE	MONITOR
Analog	PW2_PT_700	PW2 P700 DISCHARGE PUMP PRESSURE	MONITOR
Analog	PW2_PT_901	PW2 F901 BAG FILTER PRESSURE	MONITOR
Analog	PW2_PT_902	PW2 F902 BAG FILTER PRESSURE	MONITOR
Analog	PW25_FT_300	PW25 P300 DISCHARGE FLOW	MONITOR
Analog	PW25_FT_400	PW25 P400 BACKWASH PUMP FLOW	MONITOR
Analog	PW25_FT_PW25	PW25 INLET FLOW FLOW	MONITOR

TABLE 5-2: Alarm Summary Information (continued)			
Analog	PW25_LT_300	PW25 T300 TREATED WATER TANK LEVEL	MONITOR
Analog	PW25_LT_400	PW25 T400 GRIT TANK LEVEL	MONITOR
Analog	PW25_PT_400	PW25 P400 BACKWASH PUMP PRESSURE	MONITOR
Analog	PW25_PT_401	PW25 F401 FILTER BAG PRESSURE	MONITOR
Analog	PW25_PT_402	PW25 F402 FILTER BAG PRESSURE	MONITOR
Analog	PW384_FT_200	PW384 TRANSFER TANK DISCHARGE FLOW	MONITOR
Analog	PW384_FT_300	PW384 P300 EFFLUENT FLOW	MONITOR
Analog	PW384_FT_634	PW384 634 WELL PUMP FLOW	MONITOR
Analog	PW384_FT_B300	PW384 S300 AIR STRIPPER FLOW	MONITOR
Analog	PW384_HT_300	PW384 DH-300 DUCT HEATER HUMIDITY	MONITOR
Analog	PW384_HT_301	PW384 DH-301 DUCT HEATER HUMIDITY	MONITOR
Analog	PW384_HT_600	PW384 DH-600 DUCT HEATER HUMIDITY	MONITOR
Analog	PW384_LT_100	PW384 T100 TRANSFER TANK LEVEL	MONITOR
Analog	PW384_P300_CV	PW384 P300 SPEED SETPOINT	MONITOR
Analog	PW384_PI_300	PW384 S300 AIR STRIPPER PRESSURE	MONITOR
Analog	PW384_PT_100	PW384 INFLUENT PUMP PRESSURE	MONITOR
Analog	PW384_PT_300	PW384 P300 EFFLUENT PRESSURE	MONITOR
Analog	PW384_PT_401	PW384 F401 FILTER PRESSURE	MONITOR
Analog	PW384_PT_402	PW384 F402 FILTER PRESSURE	MONITOR
Analog	PW384_TMT_300	PW384 DH-300 DUCT HEATER TEMP	MONITOR
Analog	PW384_TMT_301	PW384 DH-301 DUCT HEATER TEMP	MONITOR
Analog	PW384_TMT_600	PW384 DH-600 DUCT HEATER TEMPERATURE	MONITOR
Analog	RAYOX_LAMP2_STATUS	RAYOX® LAMP 2 STATUS	MONITOR
Analog	RAYOX_LAMP3_STATUS	RAYOX® LAMP 3 STATUS	MONITOR
Digital	PW1_AIMOD1_STATUS	PW1 ANALOG MODULE 1 STATUS	CRITICAL
Digital	PW1_AOMOD2_STATUS	PW1 ANALOG MODULE 2 STATUS	CRITICAL

TABLE 5-2: Alarm Summary Information (continued)			
Digital	PW1_DIMOD3_STATUS	PW1 DIGITAL MODULE 3 STATUS	CRITICAL
Digital	PW1_DOMOD4_STATUS	PW1 DIGITAL MODULE 4 STATUS	CRITICAL
Digital	PW1_LAHH_400	T-400 GRIT TANK HIGH HIGH LEVEL	HIGH
Digital	PW1_LAHH_500	P-500 SUMP PUMP HIGH HIGH LEVEL	LOW
Digital	PW1_LAHH_PW1	PUMP HOUSE PH-1 HIGH HIGH LEVEL	HIGH
Digital	PW1_LAH_500	P-500 SUMP PUMP HIGH LEVEL	LOW
Digital	PW1_LALL_100	GAC ABSORBER PV-100 LOW LOW	HIGH
Digital	PW1_LALL_200	GAC ABSORBER PV-200 LOW LOW LEVEL	HIGH
Digital	PW1_LALL_300	T-300 TREATED WATER TANK LOW LOW LEVEL	LOW
Digital	PW1_LALL_400	T-400 GRIT TANK LOW LOW LEVEL	LOW
Digital	PW1_LAL_500	P-500 SUMP PUMP LOW LEVEL	LOW
Digital	PW1_P300_FAULT	PW1 P300 VFD FAULT	LOW
Digital	PW1_P400_FAULT	PW1 P400 VFD FAULT	LOW
Digital	PW1_P500_FAULT	PW1 P500 VFD FAULT	LOW
Digital	PW2_AIMOD1_STATUS	PW2 ANALOG MODULE 1 STATUS	CRITICAL
Digital	PW2_AIMOD2_STATUS	PW2 ANALOG MODULE 2 STATUS	CRITICAL
Digital	PW2_AOMOD3_STATUS	PW2 ANALOG MODULE 3 STATUS	CRITICAL
Digital	PW2_DIMOD4_STATUS	PW2 DIGITAL MODULE 4 STATUS	CRITICAL
Digital	PW2_DIMOD5_STATUS	PW2 DIGITAL MODULE 5 STATUS	CRITICAL
Digital	PW2_DIMOD6_STATUS	PW2 DIGITAL MODULE 6 STATUS	CRITICAL
Digital	PW2_DOMOD7_STATUS	PW2 DIGITAL MODULE 7 STATUS	CRITICAL
Digital	PW2_LAHH_300	PW2 T400 TREAT H2O TANK HIGH HIG LEVEL	HIGH
Digital	PW2_LAHH_400	PW2 T400 GRIT TANK HIGH HIGH LEVEL	HIGH
Digital	PW2_LAHH_500	PW2 FLOOR SUMP HIGH HIGH LEVEL	HIGH
Digital	PW2_LAHH_700	PW2 T700 TRANSFER TANK HIGH HIGH LEVEL	HIGH
Digital	PW2_LAHH_800	PW2 T800 TANK HIGH HIGH LEVEL	HIGH

TABLE 5-2: Alarm Summary Information (continued)

Digital	PW2_LAHH_810	PW2 T800 CONTAINMENT HIGH HIGH LEVEL	HIGH
Digital	PW2_LAHH_PW2	PUMPHOUSE 2 LEVEL HIGH HIGH	HIGH
Digital	PW2_LAHH_SO2	PW2 CATCH BASIN HIGH HIGH LEVEL	HIGH
Digital	PW2_LAH_500	PW2 FLOOR SUMP HIGH LEVEL	HIGH
Digital	PW2_LALL_100	PW2 PV100 GAC ABS. LEVEL LOW LOW	HIGH
Digital	PW2_LALL_200	PW2 PV200 GAC ABS. LEVEL LOW LOW	HIGH
Digital	PW2_LALL_300	PW2 T400 TREAT H2O TANK LOW LOW LEVEL	HIGH
Digital	PW2_LALL_400	PW2 T400 GRIT TANK LOW LOW LEVEL	HIGH
Digital	PW2_LALL_600	PW2 PV600 CAT. GAC ABS. LEVEL LOW LOW	HIGH
Digital	PW2_LALL_700	PW2 T700 TRANSFER TANK LOW LOW LEVEL	HIGH
Digital	PW2_LAL_500	PW2 FLOOR SUMP LOW LEVEL	HIGH
Digital	PW2_LSLL_800	PW2 T800 TANK LOW LOW LEVEL	HIGH
Digital	PW2_P300_FAULT	PW2 P300 VFD FAULT	LOW
Digital	PW2_P400_FAULT	PW2 P400 VFD FAULT	LOW
Digital	PW2_P500_FAULT	PW2 P500 VFD FAULT	LOW
Digital	PW2_P700_FAULT	PW2 P700 VFD FAULT	LOW
Digital	PW2_P701_FAULT	PW2 P701 VFD FAULT	LOW
Digital	PW25_AIMOD1_STATUS	PW25 ANALOG MODULE 1 STATUS	CRITICAL
Digital	PW25_AOMOD2_STATUS	PW25 ANALOG MODULE 2 STATUS	CRITICAL
Digital	PW25_DIMOD3_STATUS	PW25 DIGITAL MODULE 3 STATUS	CRITICAL
Digital	PW25_DOMOD4_STATUS	PW25 DIGITAL MODULE 4 STATUS	CRITICAL
Digital	PW25_LAHH_300	PW25 T300 TREAT H2O TANK LEVEL HIGH HIGH	LOW
Digital	PW25_LAHH_400	PW25 T400 GRIT TANK LEVEL HIGH HIGH	LOW
Digital	PW25_LAHH_500	PW25 SUMP HIGH HIGH LEVEL	LOW
Digital	PW25_LAHH_PW25	PW25 PUMPING WELL P25 HIGH HIGH LEVL	LOW
Digital	PW25_LALL_100	PW25 PV100 GAC ABSORBER LEVEL LOW LOW	LOW

TABLE 5-2: Alarm Summary Information (continued)

Digital	PW25_LALL_200	PW25 PV200 GAC ABS LOW LOW LEVEL	LOW
Digital	PW25_LALL_300	PW25 T300 TREAT H2O TANK LEVEL LOW LOW	LOW
Digital	PW25_LALL_400	PW25 T400 GRIT TANK LEVEL LOW LOW	LOW
Digital	PW25_LAL_500	PW25 SUMP LOW LEVEL	LOW
Digital	PW25_P300_FAULT	PW25 P300 VFD FAULT	HIGH
Digital	PW25_P400_FAULT	PW25 P400 VFD FAULT	HIGH
Digital	PW25_P500_FAULT	PW25 P500 VFD FAULT	HIGH
Digital	PW384_AIMOD1_STATUS	PW384 ANALOG MODULE 1 STATUS	CRITICAL
Digital	PW384_AIMOD2_STATUS	PW384 ANALOG MODULE 2 STATUS	CRITICAL
Digital	PW384_AOMOD3_STATUS	PW384 ANALOG MODULE 3 STATUS	CRITICAL
Digital	PW384_AOMOD4_STATUS	PW384 ANALOG MODULE 4 STATUS	CRITICAL
Digital	PW384_DIMOD5_STATUS	PW384 DIGITAL MODULE 5 STATUS	CRITICAL
Digital	PW384_DIMOD6_STATUS	PW384 DIGITAL MODULE 6 STATUS	CRITICAL
Digital	PW384_DOMOD7_STATUS	PW384 DIGITAL MODULE 7 STATUS	CRITICAL
Digital	PW384_LAHH_100	PW384 T100 TRANSFER TANK HIGH HIGH LEVEL	LOW
Digital	PW384_LAHH_200	PW384 T200 TRANSFER TANK HIGH HIGH LEVEL	LOW
Digital	PW384_LAHH_300	PW384 S300 AIR STRIPPER LEVEL HIGH HIGH	LOW
Digital	PW384_LAH_200	PW384 T200 TRANSFER TANK HIGH LEVEL	LOW
Digital	PW384_LAH_300	PW384 S300 AIR STRIPPER LEVEL HIGH	LOW
Digital	PW384_LAH_500	PW384 SUMP 500 HIGH LEVEL	LOW
Digital	PW384_LALL_100	PW384 T100 TRANSFER TANK LOW LOW LEVEL	LOW
Digital	PW384_LALL_700	PW384 T700 CIRC. TANK LOW LOW LEVEL	LOW
Digital	PW384_LAL_200	PW384 T200 TRANSFER TANK LOW LEVEL	LOW
Digital	PW384_LAL_300	PW384 S300 AIR STRIPPER LEVEL LOW	LOW
Digital	PW384_P101_FAULT	PW384 P101 VFD FAULT	HIGH
Digital	PW384_P102_FAULT	PW384 P102 VFD FAULT	HIGH

TABLE 5-2: Alarm Summary Information (continued)			
Digital	PW384_P200_FAULT	PW384 P200 VFD FAULT	HIGH
Digital	PW384_P300_FAULT	PW384 P300 VFD FAULT	HIGH
Digital	PW384_P500_FAULT	PW384 P500 VFD FAULT	HIGH
Digital	PW384_P700_FAULT	PW384 P700 VFD FAULT	HIGH
Digital	PW384_PAL_300	PW384 S300 AIR STRIPPER PRESSURE LOW	LOW
Digital	RAYOX_ALRM_PRESENT	RAYOX® UNIT PRESENT	HIGH
Digital	RAYOX_COOLAIR1_STATUS	RAYOX® UNIT COOLING AIR FAN 1 STATUS	HIGH
Digital	RAYOX_COOLAIR2_STATUS	RAYOX® UNIT COOLING AIR FAN 2 STATUS	HIGH
Digital	RAYOX_COOLAIR3_STATUS	RAYOX® UNIT COOLING AIR FAN 3 STATUS	HIGH
Digital	RAYOX_ESTOP	RAYOX® UNIT ESTOP STATUS	LOW
Digital	RAYOX_FANDOOR_ERROR	RAYOX® FAN DOOR ERROR	HIGH
Digital	RAYOX_FLOW_STAT	RAYOX® UNIT FLOW STATUS	HIGH
Digital	RAYOX_H2O2_LOWFLOW	RAYOX® H2O2 FLOW STATUS	HIGH
Digital	RAYOX_LAMP1_ASSW_OK	RAYOX® AIR SWITCH 1 OK	HIGH
Digital	RAYOX_LAMP1_BYPRLY_STATUS	RAYOX® LAMP 1 BYPASS RELAY STATUS	LOW
Digital	RAYOX_LAMP1_CONTFAULT	RAYOX® LAMP 1 CONTACTOR FAULT	HIGH
Digital	RAYOX_LAMP1_FAILURE	RAYOX® LAMP 1 FAILURE	HIGH
Digital	RAYOX_LAMP1_HIGHAMPS	RAYOX® LAMP 1 HIGH AMPS	HIGH
Digital	RAYOX_LAMP1_LINKCONT_STAT	RAYOX® LAMP 1 LINK CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP1_MAINCONT_STATUS	RAYOX® LAMP 1 MAIN CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP1_SS_STAT	RAYOX® LAMP 1 SELECTOR SWITCH STATUS	LOW
Digital	RAYOX_LAMP2_ASSW_OK	RAYOX® AIR SWITCH 2 OK	LOW
Digital	RAYOX_LAMP2_BYPRLY_STATUS	RAYOX® LAMP 2 BYPASS RELAY STATUS	LOW
Digital	RAYOX_LAMP2_CONTFAULT	RAYOX® LAMP 2 CONTACTOR FAULT	HIGH
Digital	RAYOX_LAMP2_FAILURE	RAYOX® LAMP 2 FAILURE	HIGH

TABLE 5-2: Alarm Summary Information (continued)

Digital	RAYOX_LAMP2_HIGHAMPS	RAYOX® LAMP 2 HIGH AMPS	HIGH
Digital	RAYOX_LAMP2_LINKCONT_STAT	RAYOX® LAMP 2 LINK CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP2_MAINCONT_STATUS	RAYOX® LAMP 2 MAIN CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP2_SS_STAT	RAYOX® LAMP 2 SELECTOR SWITCH STATUS	LOW
Digital	RAYOX_LAMP3_ASSW_OK	RAYOX® AIR SWITCH 3 OK	LOW
Digital	RAYOX_LAMP3_BYPRLY_STATUS	RAYOX® LAMP 3 BYPASS RELAY STATUS	LOW
Digital	RAYOX_LAMP3_CONTFAULT	RAYOX® LAMP 3 CONTACTOR FAULT	HIGH
Digital	RAYOX_LAMP3_FAILURE	RAYOX® LAMP 3 FAILURE	HIGH
Digital	RAYOX_LAMP3_HIGHAMPS	RAYOX® LAMP 3 HIGH AMPS	HIGH
Digital	RAYOX_LAMP3_LINKCONT_STAT	RAYOX® LAMP 3 LINK CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP3_MAINCONT_STATUS	RAYOX® LAMP 3 MAIN CONTACTOR STATUS	LOW
Digital	RAYOX_LAMP3_SS_STAT	RAYOX® LAMP 3 SELECTOR SWITCH STATUS	LOW
Digital	RAYOX_LEAK_DETECTED	RAYOX® UNIT LEAK DETECTED	HIGH
Digital	RAYOX_LOWER_ACCESS_DOOR	RAYOX® LOWERACCESS DOOR ERROR	HIGH
Digital	RAYOX_LOW_H2OFLW	RAYOX® UNIT LOW WATER FLOW	HIGH
Digital	RAYOX_POWER_CAB_DOOR	RAYOX® POWER CAB DOOR STATUS	HIGH
Digital	RAYOX_PWRCAB_HIGHTEMP	RAYOX® UNIT POWER CABINET HIGH TEMP	HIGH
Digital	RAYOX_REACT1_HIGHTEMP	RAYOX® UNIT REACTOR 1 HIGH TEMP	HIGH
Digital	RAYOX_REACT2_HIGHTEMP	RAYOX® UNIT REACTOR 2 HIGH TEMP	HIGH
Digital	RAYOX_REACT3_HIGHTEMP	RAYOX® UNIT REACTOR 3 HIGH TEMP	HIGH
Digital	RAYOX_REACT_HIGH_TEMP	RAYOX® REACTOR HIGH TEMP ERROR	HIGH
Digital	RAYOX_SYSRUN_STAT	RAYOX® UNIT SYSTEM RUN STATUS	LOW
Digital	RAYOX_SYS_AIR_PRESS_ERROR	RAYOX® AIR PRESSURE LOW	HIGH
Digital	RAYOX_TOPAIR1_SWITCH ERROR	RAYOX® UNIT TOP AIR SWITCH 1 ERROR	HIGH
Digital	RAYOX_TOPAIR2_SWITCH ERROR	RAYOX® UNIT TOP AIR SWITCH 2 ERROR	HIGH

TABLE 5-2: Alarm Summary Information (continued)

Digital	RAYOX_TOPAIR3_SWITCH ERROR	RAYOX® UNIT TOP AIR SWITCH 3 ERROR	HIGH
Digital	RAYOX_TOPAIR_SWITCH_ ERROR	RAYOX® TOP AIR SWITCH ERROR	HIGH
Digital	RAYOX_WIPERD_FAILURE	RAYOX® UNIT WIPER DOWN FAILURE	HIGH
Digital	RAYOX_WIPERUP_FAIL	RAYOX® UNIT WIPER UP FAILURE	HIGH
Digital	RAYOX_WIPER_AUTOMAN _PB	RAYOX® WIPER AUTO MANUAL PB	LOW
Digital	RAYOX_WIPER_EXTEND_P B	RAYOX® WIPER EXTEND PB	LOW
Digital	RAYOX_WIPER_RETRACT_ PB	RAYOX® WIPER RETRACT PB	LOW
Digital	RAYOX_WIPER_SOV_STAT	RAYOX® WIPER SOV STATUS	LOW
Digital	RAYOX_WIPER_STATUS	RAYOX® WIPER STATUS	LOW
Digital	RAYOX_XFRMER1_HIGHT EMP	RAYOX® UNIT TRANSFORMER 1 HIGH TEMP	HIGH
Digital	RAYOX_XFRMER2_HIGHT EMP	RAYOX® UNIT TRANSFORMER 2 HIGH TEMP	HIGH
Digital	RAYOX_XFRMER3_HIGHT EMP	RAYOX® UNIT TRANSFORMER 3 HIGH TEMP	HIGH

Notes:

1. **Advise (Av) alarms** – These alarms are associated with components of the treatment system that are working but are not functioning at their optimal level or proper condition. These components typically require some type of adjustment to return to their optimal working order and are designated as “Monitor.”
2. **Non-critical (Nc) alarms** – These alarms are associated with a failure of a treatment system component that, when in alarm mode, does not completely shut the system down. Response time should be prompt to inspect the cause of the alarm, attempt to reset the fault, or request assistance from a contractor. These alarms are designated “high” and “Low.”
3. **Critical (Cr) alarms** – These alarms are associated with problems or failure of components necessary for the system to pump and treat groundwater. Failure of these components means that the entire treatment system is, or may, shut down. Critical alarms require immediate response. These alarms are designated “Critical.”

TABLE 5-3: Pre-Startup Checklist

Pre-Start Procedure Checklist	Date/Time
1. Check all rotating equipment and drives for correct rotation and servicing according to the pump manufacturer's instructions.	
2. Check the instrument loops for correct hook-up and calibrate the individual flow instruments.	
3. Check all interconnecting field wiring runs and terminations.	
4. Check atmospheric and pressure vessels for cleanliness and any signs of leaks or corrosion. Clean or repair if necessary.	
5. Check the pipe support devices for correct installation and load bearing.	
6. Check the raw water supply for correct pressure and volumes.	

Table 6-1 Spare Parts – To be determined

TABLE 6-2: PW-1 GTF Routine Maintenance Schedule

GTF Component	Maintenance Category	Daily	Weekly	Monthly	Quarterly	Yearly
Liquid-Phase Carbon and Back-Wash System	Inspection or Adjustments		●			
	Cleaning/Backwashing				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Pumps	Inspection or Adjustments	●				
	Lubrication or Cleaning			●		
	Scheduled Maintenance				●	
	Testing or Calibration					●
Controls and VFDs	Inspection or Adjustments		●			
	Lubrication or Cleaning					
	Scheduled Maintenance					●
	Testing or Calibration				●	
Valves, Meters, Piping Indicators, Transmitters	Inspection or Adjustments	●				
	Lubrication or Cleaning		●			
	Scheduled Maintenance			●		
	Testing or Calibration					●
Solids System (Bag Filters)	Inspection or Adjustments			●		
	Lubrication or Cleaning				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Wells, Buildings, Structural Components, and Outfalls	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance			●		
	Testing or Calibration					
Tanks	Inspection or Adjustments				●	
	Lubrication or Cleaning				●	
	Scheduled Maintenance					●

TABLE 6-3: PW-2 GTF Routine Maintenance Schedule

GTF Component	Maintenance Category	Daily	Weekly	Monthly	Quarterly	Yearly
Liquid-Phase Carbon, PeroxCarb®, and Back-Wash System	Inspection or Adjustments		●			
	Cleaning/Backwashing				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Pumps	Inspection or Adjustments	●				
	Lubrication or Cleaning			●		
	Scheduled Maintenance				●	
	Testing or Calibration					●
Controls and VFDs	Inspection or Adjustments		●			
	Lubrication or Cleaning					
	Scheduled Maintenance					●
	Testing or Calibration				●	
Valves, Meters, Piping Indicators, Transmitters	Inspection or Adjustments	●				
	Lubrication or Cleaning		●			
	Scheduled Maintenance			●		
	Testing or Calibration					●
Solids System	Inspection or Adjustments			●		
	Lubrication or Cleaning				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Wells, Buildings, Structural Components, and Outfalls	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance			●		
	Testing or Calibration					●
Rayox® Unit and Hydrogen Peroxide Feed and Storage System	Inspection or Adjustments	●				
	Lubrication or Cleaning		●			
	Scheduled Maintenance			●		
	Testing or Calibration				●	
Tanks	Inspection or Adjustments				●	
	Lubrication or Cleaning				●	
	Scheduled Maintenance					●

TABLE 6-4: PW-25 GTF Routine Maintenance Schedule

GTF Component	Maintenance Category	Daily	Weekly	Monthly	Quarterly	Yearly
Liquid-Phase Carbon and Back-Wash System	Inspection or Adjustments		●			
	Cleaning/Backwashing				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Pumps	Inspection or Adjustments	●				
	Lubrication or Cleaning			●		
	Scheduled Maintenance				●	
	Testing or Calibration					●
Controls and VFDs	Inspection or Adjustments		●			
	Lubrication or Cleaning					
	Scheduled Maintenance					●
	Testing or Calibration				●	
Valves, Meters, Piping Indicators, Transmitters	Inspection or Adjustments	●				
	Lubrication or Cleaning		●			
	Scheduled Maintenance			●		
	Testing or Calibration					●
Solids System	Inspection or Adjustments			●		
	Lubrication or Cleaning			●		
	Scheduled Maintenance				●	
	Testing or Calibration					●
Wells, Buildings, Structural Components, and Outfalls	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance			●		
	Testing or Calibration					●
Tanks	Inspection or Adjustments				●	
	Lubrication or Cleaning				●	
	Scheduled Maintenance					●

TABLE 6-5: B384 GTF Routine Maintenance Schedule

GTF Component	Maintenance Category	Daily	Weekly	Monthly	Quarterly	Yearly
Liquid-Phase Carbon and Back-Wash System	Inspection or Adjustments		●			
	Cleaning/Backwashing				●	
	Scheduled Maintenance				●	
	Testing or Calibration					●
Jet System and Pumps	Inspection or Adjustments	●				
	Lubrication or Cleaning			●		
	Scheduled Maintenance				●	
	Testing or Calibration					●
Controls and VFDs	Inspection or Adjustments		●			
	Lubrication or Cleaning					
	Scheduled Maintenance					●
	Testing or Calibration				●	
Valves, Meters, Piping Indicators, Transmitters	Inspection or Adjustments	●				
	Lubrication or Cleaning		●			
	Scheduled Maintenance			●		
	Testing or Calibration					●
Solids System	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance				●	
	Testing or Calibration					
Wells, Buildings, Structural Components, and Outfalls	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance			●		
	Testing or Calibration					●
Air Stripper and Vapor-Phase GAC	Inspection or Adjustments		●			
	Lubrication or Cleaning				●	
	Scheduled Maintenance				●	
	Testing or Calibration				●	
Tanks	Inspection or Adjustments				●	
	Lubrication or Cleaning				●	
	Scheduled Maintenance					●