ARCADIS

Infrastructure, environment, buildings

Imagine the result

Operation, Maintenance, and Monitoring Manual

Groundwater Interim Remedial Measure

Operable Unit 3 – Former Grumman Settling Ponds,
Bethpage, New York
NYSDEC Site # 1-30-003A

December 2009

ARCADIS

Infrastructure, environment, buildings

Imagine the result

Operation, Maintenance, and Monitoring Manual

Groundwater Interim Remedial Measure

Operable Unit 3 – Former Grumman Settling Ponds,
Bethpage, New York
NYSDEC Site # 1-30-003A

December 2009

ARCADIS

Operation, Maintenance, and Monitoring Manual Groundwater Interim Remedial Measure

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York
NYSDEC Site # 1-30-003A

Patricia Riche
Engineer 2

Christine Esposito
Engineer 2

Carlo San Giovanni III
Principal Scientist
Project Manager

William S. Wittek, P.E.
Principal Engineer
License Number 080827-1, New York

Prepared for:
Northrop Grumman Systems Corporation

Prepared by:
ARCADIS
Two Huntington Quadrangle
Suite 1S10
Melville
New York 11747
Tel 631.249.7600
Fax 631.249.7610

Our Ref.:
NY001493.0909.00002

Date:
December 2009

Table of Contents

Table of Contents

Figures

Appendices

1. Introduction

This Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Operation, Maintenance and Monitoring (OM&M) Manual was prepared by ARCADIS U.S., Inc. (ARCADIS), on behalf of Northrop Grumman Systems Corporation (Northrop Grumman), and is the primary resource describing the requirements for the operation, maintenance and monitoring of the Groundwater IRM system. This OM&M Manual was prepared pursuant to the Order On Consent (Consent Order or CO) Index # W1-0018-04-01 executed by the New York State Department of Environmental Conservation (NYSDEC) and Northrop Grumman, effective July 4, 2005.

The present day Bethpage Community Park property (Park), which the NYSDEC has termed the "Former Grumman Settling Ponds Area" and designated as OU3, is referred to herein as the Site (Figure 1). Currently, a remedial investigation (RI)/focused feasibility study (FFS) program is underway for OU3 and a final Site remedy has not been selected. The Groundwater IRM system that was implemented at the Site and discussed herein is an interim remedial measure.

2. Site Description and Background

2.1 Site Description

The Site is bordered by Cherry Avenue Extension and the Robert Plan Company Building to the north, Stewart Avenue and Bethpage High School to the east, the former Plant 24 Access Road and residential areas to the south, the former Plant 24 Access Road and the former Northrop Grumman Plant 24 to the west. Other properties owned by Northrop Grumman, including the McKay Field property, ball fields and former nursery area are located to the west. The Site location is shown on Figure 1.

The present-day Park is operated by the Town of Oyster Bay (TOB or Town) and is comprised of approximately 18 acres. The Park is open year-round and contains two swimming pools, an ice rink, offices, parking lot, picnic and playground areas, tennis courts, paddleball courts, basketball court, shuffleboard courts, horseshoe pits, baseball field, bicycle rack areas, and a stormwater recharge basin. Currently, a portion of the Park remains closed to the public to allow OU3 RI/FFS activities to be completed. Adjoining the Park property to the south and west is the Former Plant 24

Access Road Property, which is partially asphalt-paved/partially grassed. Site features are shown on Figure 2.

The general layout of the Groundwater IRM is shown on Figure 2. As shown on Figure 2: The four Groundwater Remedial Wells (RW-1 through RW-4) are located along the southern property boundary/southern portion of the Former Plant 24 Access Road; the four influent pipelines and the electrical conduits are located along the western and southern portions of the Former Plant 24 Access Road and on McKay Field; the Groundwater IRM Area, which consists of the treatment plant, emission control units (ECUs), and a portion of the discharge line are also located on McKay Field; access to the Groundwater IRM Area is via a gravel drive and through two lockable gates; and the remainder of the discharge pipeline is located on the ball fields and former nursery areas. Section 4 presents a detailed description of the individual Groundwater IRM components.

2.2 Site History and Ownership

Originally, the land that comprises the present day Park was primarily farmland and was purchased by the Grumman Aircraft Engineering Corporation (Grumman) (a predecessor of Northrop Grumman) in 1941. Based on an interpretation of aerial photographs and other antidotal information, the December 2003 Field Report - Town of Oyster Bay, Bethpage Community Park, Investigation Sampling Report, prepared by Dvirka & Bartilucci Consulting Engineers (D&B) on behalf of Northrop Grumman (D&B 2003), provides a description of activities conducted at the Park property before it was donated to the Town in 1962.

On October 17, 1962, the Park property was donated by Grumman to the Town for exclusive use as parkland. Shortly after Grumman donated the land to the Town, the Town commenced construction and other work on the site. The Park structures, as they are today, were built by the Town without any Grumman involvement.

The Former Grumman Plant 24 Access Road is still owned by Northrop Grumman.

The Groundwater IRM was constructed in general accordance with the NYSDEC-approved Final Design Report (ARCADIS 2008b) between January 2009 and May 2009, and started continuous operation on July 21, 2009.

2.3 Environmental Setting

The Site is approximately 120 feet above mean sea level and is, topographically, generally flat. In general, the Site geology from land surface down to the basal Magothy Formation consists primarily of sand with interbedded lenses of silt, clay, and gravel. The uppermost sequence of these sediments is part of the Upper Pleistocene glacial outwash deposits, while the lower geologic sequence comprises the Magothy Formation. The Upper Pleistocene deposits in this area of Long Island tend to be coarser than the underlying upper portion of the Magothy Formation. Within the Magothy Formation, the deposits tend to become finer with depth, except for the basal Magothy, where coarse sand and gravel deposits are more prevalent. Vertical profile borings drilled at the Site indicate the presence of a low permeability zone (LPZ), consisting of interbedded slit, clay, and sandy silts and clays, which underlies most of the Site between the recharge basin and the ball field, as well as the western portion of the parking lot (Figure 2). The upper surface of the LPZ was encountered from approximately 36 to 46 feet below land surface (ft bls) and the LPZ ranged in thickness from approximately 1 ft to greater than 20 ft. A more detailed description of the Site geology is provided in the OU3 Site Area Remedial Investigation (RI) Report (ARCADIS 2008a).

The principal aquifers underlying the Site are the Upper Glacial and Magothy Formations; these hydrogeologic units are in direct hydraulic connection with each other. Groundwater in the Upper Glacial and Magothy Formations occur under unconfined conditions at and near the Site (although the Magothy Formation in other areas of Long Island can exhibit semi-confined conditions). Within the Site vicinity, the average horizontal hydraulic conductivity of the Upper Glacial Formation is approximately 270 feet per day (ft/d); with an anisotropy of approximately 10:1 (horizontal to vertical, respectively). The average horizontal hydraulic conductivity of the Magothy Formation in the project area is approximately 50 ft/d, with an anisotropy ratio of approximately 100:1 (horizontal to vertical, respectively) (Geraghty & Miller, Inc. 1994).

Depth to groundwater at the Site is approximately 55 ft bls. Water-level elevation data collected in the area of the Site indicate a resultant direction of shallow groundwater flow that is horizontally south-southeasterly and vertically, slightly downward. The on-site stormwater recharge basin may produce local, water-table mounding during intense storm events, however no data currently exist to verify this. Perched water is present above the LPZ.

2.4 Summary of Site Area Groundwater Impacts

As summarized in the Site Area RI Report (ARCADIS 2008a) and shown on Figure 3 and 4, groundwater beneath the Site is impacted by volatile organic compounds (VOCs) in excess of NYSDEC Standards, Criteria, and Guidance Values (SCGs). Commonly detected VOCs in Site groundwater include cis-1,2-Dichloroethene, Trichloroethene, Tetrachloroethene, Vinyl Chloride, Freon 12, Freon 22, and Toluene. Detections of Freon 12 and Freon 22 have been attributed to the Town's historical operation of a skating rink. As shown on Figure 3, the highest total volatile organic compound (TVOC) concentrations are located in the southwestern portion of the Park. The surficial groundwater in this area is directly underneath the LPZ soils, which appears to be a primary source of TVOC contamination in this area. In addition to high TVOC concentrations, the groundwater in this area, as measured in groundwater monitoring wells, also has high total iron concentrations (up to 10 mg/L).

3. Groundwater IRM Remedial Action Objectives, Discharge Criteria, and Termination Criteria

3.1 Remedial Action Objectives and Discharge Criteria

The Groundwater IRM remedial action objectives (RAOs) are:

- Mitigate the off-site migration of dissolved-phase VOCs through the implementation of a groundwater pump-and-treat system that will extract groundwater along the former Plant 24 Access Road property, south of the Park (i.e., the Groundwater IRM). Specifically, the Groundwater IRM will address:
  - Groundwater that has TVOC concentrations greater than 5 micrograms per liter (ug/L) in the upper twenty feet of the surficial aquifer across the 1,200-foot wide lateral extent of the Site boundary.
  - Groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations above 50 ug/L.

  Figure 4 illustrates the cross section area, along the southern property boundary/Former Plant 24 Access Road, targeted for hydraulic containment by the Groundwater IRM System.

- Comply with applicable NYSDEC SCGs for the various Groundwater IRM emissions (i.e. treated water and the air emissions). The discharge criteria for water and air emissions are provided in Tables 1 and 2, respectively.

Additionally, a secondary benefit of the Groundwater IRM is the creation of a clean-water front atop the downgradient groundwater, which acts to minimize the potential for vapor intrusion issues with groundwater downgradient of the site.

3.2 Termination Criteria

It is typical that remedial system termination (or shut-down) criteria be developed and incorporated into the respective OM&M Manual. However, since a final Site remedy has not yet been selected, it is unknown if the Groundwater IRM will be part of the selected remedy or, specifically, how source areas that were identified at the Site will be addressed in the final remedy. Since source area remediation could potentially affect how long the Groundwater IRM is required to operate, development of termination criteria for the Groundwater IRM has been postponed until after determination of the final Site remedy is complete. At that time, termination criteria for the Groundwater IRM will be developed and submitted under separate cover as an appendix to this Groundwater IRM OM&M Manual. Should the operation of the Groundwater IRM not be required for the final Site remedy, it will be shut down as soon as is practicable.

4. Description of Groundwater Interim Remedial Measure

The Groundwater IRM will achieve the RAOs described in Section 3.1 of this OM&M Manual by:

- Continuously extracting groundwater from four Remedial Wells (i.e., Remedial Wells RW-1 thru RW-4), located along the Southern Property Boundary.

- Conveying the extracted groundwater from the four remedial wells to the treatment plant located at McKay Field via four, separate (remedial well-specific) underground influent pipelines.

- Treating the extracted groundwater (via air stripping) to reduce concentrations of site-related VOCs to below applicable regulatory criteria and to remove oxidized metals (via a series of bag filters) in the air stripper effluent.

- Discharging the treated groundwater to one of three recharge basins, located on the neighboring former Naval Weapons Industrial Reserve Property (NWIRP) property (now owned by Nassau County).

- Treating the air stripper off-gas (via vapor phase granular activated carbon [VPGAC] and potassium permanganate-impregnated zeolite [PPZ]) to reduce concentrations of site-related VOCs below applicable regulatory criteria.

The layout of the Groundwater IRM is shown on Figure 2; the Groundwater IRM process schematic/flow diagram is shown on Figure 5. Major components of the Groundwater IRM are described in the following sections.

4.1 Groundwater Extraction System

The groundwater extraction system consists of four remedial wells (i.e., Remedial Wells RW-1 thru RW-4), each with its' own dedicated submersible pump (Pumps P-110 thru P-140) and conveyance pipeline. The remedial wells are strategically located, constructed, and operated to mitigate the off-site migration of TVOC-impacted groundwater by the establishment of an area of hydraulic containment, as described in Section 3.1. The extracted groundwater is conveyed to the treatment plant via the four influent pipelines.

4.1.1 Remedial Wells

Remedial Wells RW-1 thru RW-4 are located along the southern property boundary/southern portion of the Former Plant 24 Access Road and are enclosed in below-grade, locked vaults. Remedial Wells RW-1, RW-3, and RW-4, are constructed of 8-inch diameter, polyvinyl chloride (PVC) well casing; Remedial Well RW-2 is constructed of 6-inch diameter, steel casing. The remedial wells range in depth from 105 to 133 feet below land surface (ft bls), have 20-foot long, stainless steel well screens. The following information on the remedial wells is provided in this OM&M Manual:

- Well Vaults (Appendix A and Appendix B - Record Drawing 8).

- Well locations (Figure 2 and Appendix B - Record Drawing 1).

- Remedial well construction details (Table 3, Appendix B – Record Drawing 8, and Appendix C).

- Additional information about the recovery wells and their ancillary equipment (Appendix – cut sheets, and Appendix B - Record Drawings 8 and 11).

4.1.2 Remedial Well Pumps

Groundwater is extracted from Remedial Wells RW-1 thru RW-4 and pumped to the treatment plant by four Grounfos submersible pumps (i.e., Pumps P-110 thru P-140), respectively. Pump horsepowers (HP) range from 3 HP for Pumps P-110 and P-140 to 7.5 HP for Pumps P-120 and P-130. Under normal conditions, the respective pumping rates for P-110, P-120, P-130, and P-140 are 35 gallons per minute (gpm), 75 gpm, 75 gpm, and 35 gpm, for a total normal system pumping rate of 210 gpm. As a contingency, each pump was sized to be able to pump an additional 10 gpm. Pumping rates are manually controlled via valves located in the treatment plant.

Power is supplied to the pumps from the treatment plant via underground electrical cables inside PVC conduit. Each well has an above- ground electrical junction box, with a local disconnect switch, located near the well vault.

The following information on the remedial well pumps is provided in this OM&M Manual:

- Pump make and model numbers and design parameters (Table 4, Appendix B - Record Drawing 11, and cut-sheets in Appendix A).

- Pump performance curves and other information (Appendix A).

- A typical well detail with additional well information (Appendix B - Record Drawing 8).

- Electrical details (Appendix B - Record Drawings 13, 14, and 17).

4.1.3 Influent Pipelines

Extracted groundwater is conveyed from the remedial wells to the treatment plant via four, remedial well- specific, influent pipelines. The subsurface influent pipelines range in length from 1,050 ft (Remedial Well RW-1) to 1,825 ft (Remedial Well RW-4) and are constructed of high-density polyethylene (HDPE) with a standard dimension ratio of (SDR)-17. The Remedial Well RW-1 and RW-4 pipelines are 3-inch diameter and Remedial Well RW-2 and RW-3 pipelines are 4-inch diameter.

Valves and instrumentation on the influent pipes are located within the treatment building. Upon entering the building, the influent pipeline transitions from HDPE to Schedule 80 PVC pipe and each influent pipeline is equipped with a low-pressure switch, pressure transmitter, globe valve, local pressure gauge, magnetic flowmeter with a bypass loop, sample tap, and a check valve. Influent pipelines are connected into a common 4-inch-diameter Schedule 80 PVC header that conveys the combined influent to the air stripper.

The following information on the influent pipelines is provided in this OM&M Manual:

- Pipeline layout (Figure 2 and Appendix B - Record Drawings 1 and 2).
- Additional Information on the pipelines, their ancillary instrumentation, and the pipe trenches (Appendix A – cut sheets, and Appendix B - Record Drawings 6, 9, 10, and 11).

4.2 Groundwater Treatment System

The groundwater treatment system consists of an air stripping system, to reduce the concentration of VOCs in the recovered groundwater to below regulated levels, and a bag filter system, to remove oxidized metals in the air stripper effluent. The groundwater treatment system is also designed with the flexibility to add a chemical feed (e.g., a sequestering agent) system in the future.

4.2.1 Air Stripping System

An air stripping system is used to treat the extracted groundwater. The following sub-sections briefly discuss the air stripping process, the air stripping system design parameters, and the air stripper and its major components.

4.2.1.1 Air Stripping Process

Air stripping is a mass transfer process. In a low-profile air stripper, like the one used for the Groundwater IRM (see Section 4.2.1.3 for details), air and water are run in a counter-flow arrangement through multiple aeration trays. The trays enhance the air/water contact by facilitating the formation of microbubbles in the water thereby exposing a larger water surface area to the counter-flowing air. This enhanced water surface area allows efficient transfer of the VOCs out of the water into the passing air.

4.2.1.2 Air Stripper System Design Criteria

The Groundwater IRM design criteria for the air stripping system are:

Maximum Water Flow Rate	250 gpm
Typical Water Flow Rate	210 gpm
Minimum Water Temperature	40 degrees Fahrenheit
Influent VOC Concentrations	see Table 1
Effluent VOC Concentrations	50% of the regulatory limit (see Table 1)

4.2.1.3 Air Stripper and Major Components

The air stripper (AS-400) is a skid-mounted, low-profile air stripper (i.e., NEEP Systems Model 31261) with six aeration trays. The pre-packaged air stripping system includes: an induced draft blower (B-410), discharge pump (P-400), two variable frequency drive (VFD) controllers, ancillary valving and instrumentation, and a local control panel. The vendor-supplied air stripper OM&M Manual is provided in Appendix A.

In summary, extracted groundwater is pumped into the air stripper by the remedial well pumps. As the groundwater flows through the air stripper, VOCs are removed from the groundwater by the counter-current air that is pulled through the air stripper by the air stripper blower (Blower B-410). Blower B-410 is also used to push the VOC-impacted air stripper off-gas through the VPGAC and PPZ Emission Control Units (ECUs). The treated water, which collects in the air stripper sump, is pumped through the bag filter units, and out to one of the recharge basins by the air stripper discharge pump (Pump P-400).

The 40-HP radial-bladed pressure blower, Blower B-410 and the 10-HP centrifugal Pump P-400 have VFD motor controllers. The Blower B-410 VFD is used to manually control the system air flow rate resulting in reduced power consumption over that which would be achieved if the blower was operated at maximum capacity and the flow was controlled by throttling (closing) a control valve. Pump P-400 is controlled by a VFD and feedback control loop based on the water level in the air stripper sump. If the water level in the sump increases then the P-400 pump speed increases accordingly and, similarly, slows down when the water level decreases. This type of control loop is needed to ensure continuous operation of the Groundwater IRM.

Air Stripper AS-400 is 12-feet long by 4-feet wide by 9 ½ -feet high, constructed of 316 stainless steel and requires an air to water ratio of 54:1 to achieve a removal efficiency of >99.5%, under design conditions.

The following information on the air stripping system is provided in this OM&M Manual:

- Pump and blower make and model numbers, and design parameters (Table 4, Appendix A – cut sheets, and Appendix B - Record Drawing 11).
- Pump performance curves and other information (Appendix A).
- Electrical details (Appendix B - Record Drawing 14).
- Troubleshooting tips for the air stripper pump and blower, and air stripper cleaning tips are provided in the Manufacturer's OM&M Manual provided in Appendix A.

4.2.2 Bag Filter System

Groundwater treated by the air stripper is pumped through a bag filter system for removal of suspended solids/particulates. Specifically, the bag filter system consists of the following:

- Four filter housing units (Filtration Systems Model NC-223-V), each containing one 25-micron mesh filter bag.
- The four bag filters are arranged in two parallel treatment trains, with each treatment train containing two bag filters arranged in parallel. Under normal operation, only one set of bag filters (two bag filters) is operated, while the other set of bag filters is in "standby". The controls can be manually-overridden to allow all four units to be operated in-parallel.

The actuators are controlled based on the differential pressure across the bag filter unit. When the differential pressure reaches the filter system changeover set point, an actuator opens the valve for the bag filter system that is in "stand-by" (and at the same time initiates an advisory condition), then closes the valve for the unit that has been "in service". This redirects the flow through the fresh filter units. When the operator replaces the filter bags in the unit that was just taken off line with new filter bags, the unit is placed in stand-by mode by the operator acknowledging the advisory condition.

Should the influent pressure reach the high set point without having a "stand-by" filter available, the entire system will automatically and immediately shutdown.

The following information on the bag filter system is provided in this OM&M Manual:

- The physical layout of the bag filters (Appendix B - Record Drawing 7).
- Additional information on the bag filter units (Appendix A).

4.2.3 Chemical Feed System

The treatment system has been designed with the flexibility to add a chemical feed system in the future.

4.3 Treated Water Discharge System

The treated water discharge system consists of a pump (Pump P-400), a conveyance pipeline, and three recharge basins. The discharge pump (Pump P-400) is the air stripper pump (See Section 4.2.1.3. for information on Pump P-400). The layout of the discharge pipeline is shown of Figure 2 and Record Drawings 1 and 2 (Appendix B). The treated water is pumped to one of the three recharge basins located on the neighboring former NWIRP property (now owned by Nassau County) via the discharge pipeline.

The discharge pipeline consists of the following four sections:

- Section 1: located in the treatment plant, between the air stripper and the bag filters, consists of overhead, four-inch diameter, Schedule 80 PVC pipe.
- Section 2: located between the bag filter and a pre-existing underground pipeline in the Former Northrop Grumman Ball Field and Nursery Area, and consists of both overhead (inside the treatment building) and below grade (outside the treatment building), six-inch-diameter, SDR17 HDPE pipe. A 2-inch diameter, PVC vacuum breaker (Plast-O-Matic Model VBS200V-PV (cut-sheet in Appendix A)) was installed at the high point of discharge pipeline (which is inside the building) to break the vacuum that may be created when the system shuts down and the discharge line gravity drains into the manhole.

- Section 3: is a pre-existing below grade, eight-inch diameter Schedule 80 PVC line located in the Northrop Grumman Ball Field and Former Nursery Areas.

- Section 4: is a below grade, six-inch diameter pipe, SDR 17 HDPE pipeline that connects Section 3 to the pre-existing manhole (manhole connection shown on Record Drawing 9 (Appendix B), where the plant discharge feeds into Northrop Grumman's stormwater system, which ultimately discharges into the three recharge basins located on the former NWIRP property.

The configuration of the stormwater system on the former NWIRP property allows the stormwater/treated water to be discharged to any one of the three available recharge basins. It is ARCADIS' understanding that combined stormwater/treated water discharge is rotated periodically among the three basins. A copy of the Use Permit allowing the treated water to be discharged to the Nassau County Recharge Basins is provided in Appendix E.

4.4 Air Stripper Off-Gas Treatment System

The air stripper off-gas treatment system consists of four ECUs, two of which are filled with VPGAC and two that are filled with PPZ, to reduce the concentration of non-Freon VOCs in the air stripper off-gas to below their respective annual guideline concentrations (AGCs), and short-term guideline concentrations (SGCs).

The following subsections include a description of the VPGAC and PPZ treatment processes, design criteria and parameters, and information on the system components.

4.4.1 Air stripper Off-Gas Treatment System Process Descriptions

VOCs are removed with VPGAC by the process of adsorption. VPGAC is manufactured to ensure an extensive natural surface area that is available for the adsorption process. The surface area of granular carbons can range up to 1,400 square meters per gram of material. The physical adsorption of VOCs on, and into VPGAC is a concentration gradient driven process. Thus, the adsorption capacity of the VPGAC is dependent on the concentration of VOCs in the air stripper exhaust. For example, as VOC concentration increases, additional pounds of VOCs per pound of VPGAC can be adsorbed.

Due to the need for direct contact between the VOC molecule and the VPGAC surface, the presence of moisture in the air stream will impact the rate of adsorption. The capacity of the activated carbon declines rapidly as the relative humidity of the air increases above 60%. The air stripper blower is installed after the air stripper and before the ECUs. As the air stripper off gas (100% relative humidity) passes through the induced draft blower, the air stream is heated and the relative humidity is reduced to less than 50%. To ensure proper operation and efficient use of the carbon, the temperature of the air stream is periodically monitored to ensure the temperature stays elevated and the relative humidity of the air stays low.

PPZ is an oxidant (potassium permanganate) that is coated onto an inert material (zeolite) to create an oxidizing media with a large surface area and can be used to treat many VOCs, like vinyl chloride.

In this application, VPGAC is used to reduce the concentration of the non-vinyl chloride VOCs and then PPZ is used to oxidize the vinyl chloride in the VPGAC effluent.

Both the VPGAC and the PPZ treatment trains used in the Groundwater IRM consist of two ECUs each, for a total of four ECUs. To optimize treatment effectiveness, both sets of VPGAC and PPZ ECUs are operated in lead/lag configuration; whereby each set of ECUs are operated in-series (flow is directed thru one ECU (lead bed) and then into the next one (lag bed)) and the ducting is configured to allow either bed to the lead or the lag bed. This configuration is both efficient and cost-effective for the following reasons:

- By operating the ECUs in-series, the first (lead) ECU can be operated until the media is completely spent. If only one bed was present, the media would have to be changed out prior to breakthough of a VOC at a concentration greater than its' allowable emission concentration. Therefore, the media can be operated until "complete breakthrough" is achieved since the partially treated air stream is treated by the media in the "lag" unit, compared to only being operated to "project required breakthrough" if the lag bed was not present.

- Once the media in the lead ECU has been changed out, the flow direction is switched and the former lag ECU is now the lead ECU and vice-versa.

4.4.2 Air Stripper Off-Gas Treatment System Design Criteria

The Groundwater IRM design criteria for the air stripper off-gas treatment system are:

Maximum Air Flow Rate	2,000 SCFM
Typical Air Flow Rate	1,800 SCFM
VOC loading	See Tables 1 and 2, assumes 100% of VOCs are stripped from recovered groundwater
Relative Humidity	100% at the blower inlet, 40% at the blower outlet
Influent (raw) Temperature	55 degrees Fahrenheit
Effluent VOC Annual Emission Rate	See Table 2
Expected Changeout Frequency	43 days or greater (per manufacture)
Expected PPZ Changeout Frequency	107 days or greater (per manufacture)

4.4.3 Air Stripper Off-Gas Treatment System Components

The following subsections describe the air stripper off-gas emission control system components.

4.4.3.1 Emission Control Units

The sizing and configuration of the VPGAC and PPZ ECUs were determined based on expected air flow rates, as well as VOC characteristics and estimated loadings. In summary, the ECUs beds and the media were selected to allow for a minimum changeout frequency of 43 days, based on the maximum groundwater design flow rate of 250 gpm and the design concentrations (see Tables 1 and 2). The following ECUs with VPGAC type, PPZ type, and mass media loadings were selected:

- Primary Units: Two (2) Maple Leaf Environmental Equipment 10,000-pound carbon canisters, each filled with 8,000 pounds (lbs) of virgin TIGG 6 x 12-mesh vapor-phase coconut-based carbon (for a total of 16,000 pounds of VPGAC) or equivalent; and

- Secondary Units: Two (2) Maple Leaf Environmental Equipment 10,000-pound carbon canisters, each filled with 10,000 lbs of Hydrosil 600 PPZ.

The ECUs are configured in a series arrangement, with the air stripper gas passing through the VPGAC-filled ECUs first, then into the two PPZ-filled ECUs.

Material safety data sheets (MSDSs) for the PPZ and VPGAC are located in Appendix A and in the Site HASP (Appendix H).

All four of the ECUs are insulated with 2-inch thick, rigid Styrofoam boards to help maintain desired temperature and relative humidity conditions throughout the vapor-phase treatment system. The insulation is finished with stucco embossed aluminum jacketing. The insulation is applied to the top of the ECUs to withstand mild personnel traffic. The ECUs have safety railings, sampling ports, and access ladders.

4.4.3.2 Duct and Insulation

The duct is 14-inch-diameter, schedule 10 (~1/8-inch thick), aluminum. The exterior duct has a 2-inch thick, 370 Melamine foam insulation with white PVC coating. Condensate traps are installed in duct low points to collect condensation from various locations in the duct. Condensate is collected and disposed of on an as-needed basis by operating personnel.

The duct work is outfitted with two, strategically placed fernco fittings between the air stripper and the blower to simplify access to the air stripper for maintenance requirements, and a stack cap (Air Handling Model UB14 – cut sheet is in Appendix A) at the duct effluent to minimize the rain intrusion into the effluent duct.

Additional information about ECUs, Media, and duct work is provided in the Record Drawings 7, 10, and 11 (Appendix B) and cut sheets provided in Appendix A.

4.5 Process Controls and System Alarms

The process control system is designed to provide the necessary safeties and interlocks to ensure that the recovery wells, piping, and treatment system operate smoothly, efficiently, and as one unit. Additionally, the system includes the capability of allowing local or remote operator(s) to observe and control the operation of the system from a single computer workstation. The process instrumentation and controls are shown on Record Drawings 3 through 6 (Appendix B) and the main control panel

(MCP) diagrams are provided in Appendix A. The system parameters that are continually tracked using the supervisory control and data acquisition (SCADA) System are listed in Table 5.

Controls and instrumentation for the system are interconnected via a MCP, even the controls and instrumentation associated with the air stripper, which as a remote, locally-mounted, control panel (RCP). The MCP, located in the control room of the treatment plant, includes a programmable logic controller (PLC), which monitors and integrates the operation of the remedial wells, air stripping system, emission control system, the bag filter system, and the treatment system interlocks. This panel serves as the node through which communication with the control system takes place. The PLC is integrated with an operator interface station. The control system also utilizes fail-safe logic to automatically and immediately shut down the entire treatment system in the event of a critical alarm input or a failure of the PLC. An alarm light located within the treatment building notifies the operator of any critical alarms. If operating personnel are not on-site, project team members will be alerted of the shut down by a dedicated cellular autodialer. The dedicated autodialer will also notify project team members of power loss.

The power supply for the PLC, system instrumentation, and process control devices are protected with transient voltage surge suppression (TVSS) systems to limit voltage spikes to the systems. The PLC, system instrumentation, and process control devices are also protected by separate uninterrupted power supplies (UPS) that maintain power to these devices in case of a power outage.

4.5.1 Operation and Programmable Logic Controller

Operation of the Groundwater IRM is controlled and integrated through the PLC located in the system's MCP. The PLC provides the necessary control logic to coordinate signals from the remote switches and instrumentation throughout the treatment system. These interlocks ensure proper operating conditions are maintained within the treatment system.

Under normal operating conditions, the control system has the following functions:

- Provides run indication signals and elapsed run-time for each extraction well.
- Monitors the line pressure on the influent pipelines to ensure that the pipes maintain structural integrity and there are no leaks.

- Monitors the groundwater flow rate from each remedial well to ensure that there is no degradation in flow produced by each well or loss of flow due to leakage of the influent piping.
- Monitors combined groundwater flow rate to the air stripper to ensure that air stripper influent flow rate is within design conditions.
- Monitors air stripper system pressure and level alarms via dry contacts provided at the local air stripper control panel.
- Provides run indication signals for air stripper blower and discharge pump.
- Monitors the air stream discharge flow rate, pressure, and temperature from the air stripper blower to ensure that they are within design conditions.
- Monitors bag filter system influent pressure which controls the bag filter sequencing.
- Monitors groundwater flow rate discharging from the air stripper through the bag filter system to discharge.
- Monitors groundwater treatment building temperature to ensure that building heating and ventilation system is functioning.
- Maintains fail-safes and alarm interlocks to maintain safe and effective operation of the system. Fail-safes and alarm interlocks are described in the Section 4.2.5, including calling project team members when plant shut downs occur.
- Ensures that once the system is shut down, regardless of whether it is due to a power failure or an alarm condition, the system does not automatically restart. The system will have to be manually restarted. Manual restart is required so that the cause of the alarm is investigated and the problem can be addressed prior to restart.

Major instrument operational controls are listed below.

- The remedial well pumps (P-110 thru P -140) are operated with start/stop switches mounted at the MCP. The remedial well pumps will not operate unless permitted by the PLC interlocks and fail-safe interlocks.

- The air stripper system, which has its own local control panel, will not operate unless permitted by the PLC interlocks and fail-safe interlocks.

- The differential pressure across the bag filters is continuously monitored. Once the differential pressure reaches the high set point value, the PLC opens the valve for the stand-by unit, activates an advisory, and then closes the valve for the previously operating filter unit. Upon switching to the stand-by unit, an advisory is sent out to the project team members alerting them that a bag filter change out is required. If this advisory is not cleared, which can only be done manually at the site, before the influent pressure reaches the high-high set point value, the entire system will be automatically and immediately shut down.

4.5.2 Alarms and Interlocks

The recovery well, air stripping, emission control, and treated water discharge systems are interlocked and alarmed to ensure that water and air are properly treated, and to ensure efficient system operation. Three types of interlocks and alarms are incorporated into the treatment system to prevent water from being discharged from the air stripper system in the event that an air stripper blower is not operating, a leak in either the influent conveyance lines, or flooding conditions in the air stripper or building sump. The three types of alarms and interlocks used are: primary alarms, fail-safe alarms, and advisories. Each type of alarm/interlock, including the fail-safe circuitry, is described below. A list of the alarms and advisories is provided in Tables 6 through 8.

Primary alarms are alarms that are processed by the PLC to shut the system down. The PLC is constantly receiving signals from the system instrumentation, and when the PLC detects an alarm condition it automatically and immediately sends a signal to relays causing the starter coils for the extraction wells and air stripper system (blower and discharge pump) to open, which causes all the equipment to shut down. The one exception is that there is a delay on the air stripper blower and discharge pump, which allows for additional treatment of the water remaining within the air stripper when an alarm condition occurs. The PLC will alert project team members of the shut down via cell phone when there is a primary alarm.

Secondary, or critical, alarms are used to back-up key primary alarms or to shut the system down in the event of a PLC failure. If a primary alarm instrument fails to appropriately respond to an alarm condition (or the PLC fails), a hard-wired fail-safe circuit switch will open a remote relay contact, thus shutting down the process equipment automatically and immediately. Relay contacts also send inputs to the PLC and the autodialer as advisories.

Fail-safe circuitry means the normal condition of a circuit is energized. If for some reason (e.g., loss of power, a broken wire or a relay burns out) the "switch" becomes de-energized and opens, the circuit is broken, which immediately cuts power to other devices on the circuit. These systems are implemented to make sure (fail-safe) that a circuit does not close, or remain closed, when the circuit/switch is de-energized. At the Groundwater IRM, this system shuts the treatment process down once the circuit is broken by any of the hard-wired switches (the secondary alarms), and ensures that if there is a power failure or a key system component loses power, switches will open causing the entire system to shut down. For example, the fail-safe circuitry act as a permissive signal in that it is wired in series with the starter coils associated with all the process equipment (well pumps and air stripper) such that if a critical, hard-wired switch (i.e., a critical alarm) opens, the failsafe circuitry will cause the output relays to all process equipment to de-energize, thus shutting all the process equipment down. The failsafe circuitry is wired such that it has to be manually reset in the field before the process can be restarted and to prevent unwanted automatic restart. Critical alarms also send a signal to the autodialer to call project team members.

Advisory conditions occur when process variables are outside of their desired range, but do not require immediate shut down of the Treatment Plant. An advisory is programmed to allow operators to get an advanced warning of a possible problem.

4.6 Treatment Building

The treatment building is 26-feet by 32-feet pre-engineered, butler-type, metal building that is located near the Soil Gas IRM treatment equipment at McKay Field (Figure 2) and is used to house the Groundwater IRM air stripper system, bag filter system, and the majority of the instrumentation, controls, and electrical components. The treatment building is installed on a concrete slab with 6-inch high secondary containment curb. Next to the treatment building an 8-inch thick concrete slab was installed for the ECUs.

The following information is provided for the treatment building and ECU concrete pad in this OM&M Manual:

- Structural specifications (Appendix B - Record Drawings 18 thru 22).
- Vendor supplied drawing for the treatment building (Appendix A).

4.7 Utilities

The following utility services are available at the Groundwater IRM:

- An electric service to power the system, heat the building, and to provide lighting.
- Treated water can be stored at the site and can be used for non-potable uses.
- Wireless telephone service for alarm call-outs and remote telemetry operations.

4.7.1 Electrical

During the construction of the Soil Gas IRM, a new primary feed line transformer (i.e., 480V/277V, 3 Phase, 4 wire, 600 Amp main) with one 200 amp circuit breaker and one 400 amp circuit breaker was installed. The Soil Gas IRM draws its' power via the 200 amp service. As shown on Record Drawing 14 (Appendix B), a secondary 400 amp feed line was run to the Groundwater IRM 200 amp main disconnect, and the 200 amp line to the Motor Control Center (MCC).

4.7.2 Non-Potable Water

To support maintenance of the treatment building, piping and air stripper, the groundwater treatment system is equipped with a 300-gallon HDPE tank and a booster pump system (Davey Model HS12-40HTI – cut sheets in Appendix A) to provide treated water to hose bibs installed inside the building.

4.7.3 Wireless Telephone

Two wireless modems are used for alarm call outs and to remotely monitor the system. The alarm call out autodialer uses a Telular Phonecell SX5e GSM wireless modem and has a Sprint SIM card with a voice service plan provided by Northrop Grumman. Additional modem information includes: IMEI # 010211000737016, Model No. 1C02A161, with Software Version 5.36.UD2 (additional information on the Modem is provided in Appendix A).

5. Monitoring Program

The monitoring program for the Groundwater IRM is divided into two components, as follows: an Environmental Effectiveness Monitoring Program, and a Remedial System

Performance and Compliance Monitoring Program. The Sampling and Analysis Plan (SAP), located in Appendix D, describes the Groundwater IRM Monitoring Program in detail. A brief summary of the Groundwater IRM Monitoring Program is provided below.

5.1 Basis of Design

The Groundwater IRM Monitoring Program was developed with the intent to collect appropriate data to evaluate the effectiveness and efficiency of the system towards achieving the RAOs described in Section 3.1. Data collected will also be used to assess whether the treatment system is meeting performance objectives and evaluate the need for maintenance activities.

5.2 Environmental Effectiveness Monitoring Program

The Groundwater IRM Environmental Effectiveness Monitoring Program includes both hydraulic (i.e., water-level measurement) and groundwater quality monitoring elements. The objectives of the Groundwater IRM Environmental Effectiveness Monitoring Program are:

- To monitor groundwater flow patterns and determine/verify that operation of the Groundwater IRM has established and maintains an area of hydraulic containment (i.e., capture zone) that is sufficient to achieve RAOs.

- To determine and monitor groundwater quality concentration trends at strategic locations.

- Table 1 of the SAP (Appendix D) summarizes the Groundwater IRM Environmental Effectiveness Monitoring Program, the main elements of which include: The monitoring network, which consists of 35 monitoring locations (i.e., 17 monitoring wells, 4 remedial wells and 14 piezometers) (monitoring locations are shown on Figure 1 of the SAP).

- Construction details for the 35 wells and piezometers.

- The hydraulic monitoring schedule (i.e., the location and frequency of water level measurements).

- The groundwater quality monitoring schedule (i.e., the location, frequency, and analytical parameters of groundwater sampling).

Groundwater samples collected as part of the Environmental Effectiveness Monitoring Program will be submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program- (ELAP-) certified laboratory, and analyzed for the following analyses, per Table 1 of the SAP:

- VOCs – Samples will be analyzed for the VOCs listed on Table 3 of the Quality Assurance Project Plan (QAPP, Appendix A-1 of the SAP) by NYSDEC Analytical Services Protocol (ASP) 2000 Method OLM 4.3.

- Metals– When required, samples will be analyzed for the specified metal(s) by USEPA Method 6010, except for chromium which will be analyzed by USEPA Method 7470.

Environmental effectiveness data will be:

- Tabulated, added to the existing database, and summarized and reported in OM&M Reports.

- Used to determine hydraulic containment consistent with the RAOs, and, if possible, contoured to illustrate the configuration of the potentiometric surface and horizontal direction of groundwater flow.

- Used to determine groundwater project - VOC quality trends at selected groundwater monitoring wells, and to compare against NYSDEC SGCs.

- Used to determine compliance with system termination criteria (to be developed). .

Additional information on the project reporting requirements is provided in Section 7. The environmental effectiveness monitoring program may be modified based on a review of the monitoring reports and with NYSDEC's prior approval.

5.3 Remedial System Compliance and Performance Monitoring Program

The objectives of the Remedial System Compliance and Performance Monitoring Program are:

- To determine compliance with applicable NYSDEC SCGs for the various Groundwater IRM emissions (i.e. treated water and the air emissions).

- To continually assess whether the treatment system is meeting performance objectives (i.e., to design specifications).

- To monitor treatment processes to help determine when maintenance activities are needed.

- To monitor data trends to help identify a potential problem in time to prevent a system failure.

The Remedial System Compliance and Performance Monitoring Program is summarized in Table 5 (also Table 2 of the SAP (Appendix D)).

Table 2 of the SAP provides:

- Water and air compliance sampling requirements, including location, frequency, and parameters. Water and Vapor sampling locations are schematically shown on Figure 5 and on Record Drawings 3 thru 5 (Appendix B).

- Performance monitoring locations, frequency, and parameters for key process parameters. Monitoring locations are shown on Record Drawings 3 thru 5 (Appendix B).

In addition to the performance monitoring listed on Table 2 of the SAP, additional performance monitoring may be performed, at the operator's discretion, to further assess status of select system operations.

Water quality samples are analyzed for the same analytes and by the same analytical methods as the groundwater samples (see Section 5.2). Air quality samples will be analyzed for the VOCs listed on Table 5 of the QAPP) by Modified EPA Method TO-15.

Data collected during the Remedial System Compliance and Performance Monitoring Program will be used to evaluate the following:

- Effectiveness of Groundwater IRM at meeting the design objectives.

- Compliance and discharge air and water quality requirements.

- The need for maintenance activities.

Following monitoring data collection, if the data is outside of the acceptable range, an evaluation will be performed to determine the cause and a corrective action to be implemented, as necessary. Based on the results of these analyses, system alterations may be made to optimize the system performance or comply with discharge requirements. Required, specific preventative maintenance tasks determined from the data evaluation will be added to the preventative maintenance schedule, which is discussed in the next section of this OM&M Manual.

6. System Operation and Maintenance

The anticipated Groundwater IRM maintenance activities and their associated schedules are described in this section. In addition to the activities described below, the operator should always refer to the individual system component OM&M manuals located in Appendix A for the manufacturer-recommended maintenance activities. A detailed preventative maintenance schedule is also provided as Table 8.

6.1 Regularly Scheduled Maintenance

Regular site inspections to perform operation and maintenance activities and check the system status will be completed on a monthly basis. Regularly scheduled maintenance activities for the Groundwater IRM are as follows:

- Daily (recommended)
  - Inspect the treatment building and site grounds for damage, vandalism, or other abnormal conditions.
  - Inspect the treatment building and site grounds for damage, vandalism, or other abnormal conditions.
  - Check the treatment system for leaks.
  - Check for proper system operation by checking key water flow measurements, air flow measurements, water pressure measurements and air temperature measurements.
  - Check for excessive or abnormal noise from various system components.

- Check building sump water level. If appropriate, pump water to air stripper (especially critical in the summertime to prevent system shut-down due to high water level in sump caused by air stripper condensation).

- Check site computer for system status, advisories, and alarm conditions.

- Check bag filter status and replace bag filters, if needed.

- Weekly Maintenance:

  - Manually check and record key water flow measurements, air flow measurements, water pressure measurements and air temperature measurements.

  - Inspect sump pump cartridge filter and replace, if needed.

  - Check for air stripper fouling by comparing air flow rate and air pressure loss across the air stripper versus past readings; troubleshoot cause of increased pressure loss and/or schedule an air stripper cleaning, if needed.

  - Check for abnormal pressure loss in Remedial Well RW-2 influent line by comparing current pressure reading versus recent pressure readings: troubleshoot and/or schedule appropriate maintenance, if needed.

- Monthly Maintenance:

  - Check for obvious moisture accumulation around electrical components; implement corrective measures, as necessary.

  - Check system components for corrosion and grease moving parts, if necessary.

  - Inspect site fencing, gates, and locks.

- Quarterly Maintenance:

  - Record key air pressure values.

- Yearly Maintenance (NOTE: To be performed by a certified electrician or appropriately trained personnel):
  - Test critical inputs for proper shutdown capacity.
  - Test the operation of overloads.
  - Test each input.
  - Check for excessive moisture inside the control panel and wiring boxes.
  - Test the operation of each output device.

The schedule for the above-described regularly scheduled maintenance activities can be modified with prior NYSDEC approval. All maintenance activities will be documented on the maintenance form provided in Appendix E. A hard copy of the completed form will be filed in the designated location. An electronic copy of the completed form will also be filed.

6.2 Preventative Maintenance Schedule

In addition to the maintenance activities listed above, scheduled preventative maintenance activities for specific system components are summarized in Table 9. The preventative maintenance schedule was developed in accordance with the manufacturer's recommendations included in the manufacturer's O&M manuals, which are provided in Appendix A. All preventative maintenance activities will be documented on the maintenance form provided in Appendix F. A hard copy of the completed form will be filed in the designated location. An electronic copy of the completed form will also be filed.

6.3 Standard Operating Procedures

Standard operating procedures are included in Appendix G.

6.4 Disposal of Used Materials and Wastes

Used materials and wastes generated onsite include spent bag filters and accumulate water generated during system maintenance. All waste generated will be stored onsite, characterized, and disposed of in accordance with applicable state and federal laws.

7. Reports

This section describes the preparation of OM&M reports designed to aid in tracking system performance and effectiveness.

7.1 Interim Reports

Interim OM&M reports, which summarize the Groundwater IRM System monitoring and sampling results, will be prepared for the first three months of system operation, followed by quarterly thereafter. The first two months of operation will be summarized in one report and the third months results will be summarized in a separate report. Interim reports will be submitted 60 days after the monitoring period ends.

The following information will be provided in the interim OM&M reports:

- The permit equivalent data, specifically:

  - Comparison of treated water quality and the NYSDEC-required discharge standards, per the interim State Pollutant Discharge Elimination System (SPDES) Equivalency (a copy of the interim site-specific SPDES equivalence requirements is provided in Appendix H).

  - Comparison of the treated air quality and applicable Short-term Guidance Concentrations (SGCs) and Annual Guidance Concentrations (AGCs), as required by NYSDEC Division of Air Resources (DAR-1) Guidelines for the Control of Toxic Air Contaminants, revised September 10, 2007.

- A cumulative data summary of contaminants of concern including tables and selected graphs of: remedial well groundwater quality data, air stripper influent data, cumulative mass removed, and rate of mass removal.

- A summary of the system performance data collected during the reporting period, including groundwater extracted per remedial well, cumulative volume of groundwater treated, and selected system pressures and temperatures.

- A description of routine maintenance completed.

- A description of breakdowns or major system repairs completed with an explanation for significant downtime.

- Comments conclusions and recommendations based on the evaluation of system performance.

7.2 Annual Reports

An annual report, which summarizes the Groundwater IRM monitoring program results, will be prepared by a licensed, professional engineer and submitted 90 days after the annual monitoring period ends. The annual report will summarize all of the monitoring reports completed throughout the year and document the results, conclusions and recommendations of an annual project evaluation. The annual report will include the information contained in the interim monitoring reports as well as the following information:

- A location map and site map along with any additional figures.

- A brief description of the applicable standard test method runs.

- Relevant quarterly or semi-annual data with comments and conclusions.

- Comments, conclusions and recommendations based on an engineering evaluation of information included in the report.

7.3 5-Year Review Reports

A 5-year review report, which summarizes the Groundwater IRM monitoring program results, will be prepared by a licensed, professional engineer following the completion of every five years of system operation. The 5-year reports will summarize the monitoring reports completed to date and document the results, conclusions and recommendations of a 5-year project evaluation; including a trend analysis of key groundwater quality data to assess overall system effectiveness and to compare against project RAOs to determine whether the continued operation of the Groundwater IRM is warranted.

8. Citizen Participation

8.1 Citizen Participation Plan

A separately-bound Citizens Participation Plan (CPP) (ARCADIS 2006b) was prepared by ARCADIS as part of the OU3 Remedial Investigation (RI) Work Plan, (ARCADIS 2006a). The intent of the CPP is to promote communication among all parties involved with, or affected by contamination in and around the Park. The CPP also provides the public and other parties with an opportunity to become informed and involved, and to influence decisions regarding response actions on or near Park.

Citizen participation (CP) activities already completed at the Site, as well as activities planned as part of the ongoing CP program, are discussed in the CPP.

8.2 Contact List

A Contact List of potentially affected or interested parties has been developed to support the CP activities for the Site. The Contact List includes the following groups:

- Citizens within or near the study area.
- Citizens owning property within the study area.
- Citizens that have requested to be on the mailing list.
- Elected officials.
- Commissioners of local public water supply districts.
- Local news media.
- Community action groups.
- Regulators.

The Contact List also includes individuals who have attended a past site meeting or who have expressed an interest in being placed on the mailing list. Individuals participating in future site activities may, if requested, be added to the existing Contact List for this project. Individuals or groups wishing to be added to or removed from the Contact List can do so by contacting the NYSDEC (William Fonda) at 631-444-0350.

The NYSDEC and NYSDOH have established toll-free numbers that citizens can call to ask questions or discuss the project. The toll free numbers are as follows:

NYSDEC: 1-800-388-8223

NYSDOH: 1-800-458-1158, ext. 27880

The following project-related individuals may also be contacted for information about the project:

New York State Department of Environmental Conservation
Steven Scharf
Project Manager
625 Broadway
Albany NY 12233-7015
(518) 402-9620

New York State Department of Health
Jacquelyn Nealon
Flanigan Square
547 River Street, Room 300
Troy, New York 12180-2216
(1-800) 458-1158 Ext. 27870

Nassau County Department of Health
Joe DeFranco
106 Charles Lindbergh Blvd.
Uniondale, New York 11553
(516) 227-7302

Northrop Grumman Systems Corporation
John Vosilla
Manager Communications, NE Region
609 South Oyster Bay Road
Mail Stop C65-05
Bethpage, New York 11714
(516) 575-5119

Additionally, information about this Site and the Department's Hazardous Waste Remediation program, in general, may be found at the following web site:

http://www.dec.state.ny.us/website/der/index.html

8.3 Foil Package

Records related to this project are available by request under New York State's Freedom of Information Law (FOIL). Interested parties may also discuss information needs with the contacts listed above.

9. Personnel

The following subsections provide a brief description of the site personnel organization, site manpower requirements and responsibilities and duties of all personnel.

9.1 Organization

Northrop Grumman and subcontractor personnel for the site are as follows:

- Northrop Grumman Manager – Site & Infrastructure Operations: Robert Hollingsworth
- Northrop Grumman Manager – Environmental Operations: John Cofman
- Northrop Grumman Lead Worker – Environmental System: Richard Quilty
- Northrop Grumman - Environmental Mechanic: Tom Smith
- Northrop Grumman – Safety and Health Contact: Fred Weber
- ARCADIS Project Director: Mike Wolfert
- ARCADIS Project Manager: Carlo San Giovanni
- ARCADIS Professional Engineer/Task Manager: William Wittek, P.E.
- ARCADIS Site Engineer: Patricia Richè
- ARCADIS Project Engineer: Christine Esposito
- ARCADIS Site Health and Safety Officer: Patricia Richè

9.2 Manpower Requirements

No daily manpower presence is required at the site. An autodialer system is installed to alert personnel of alarm or system shut down conditions. Regular site visits, to perform site inspections, maintenance and monitoring activities, will be conducted in accordance with the monitoring schedule provided in Section 4 of this report. Qualifications

Information related to qualifications of the project team is provided in Appendix I.

9.3 Training

All personnel working onsite will have the appropriate OSHA 40-Hour HAZWOPER training. Additional training requirements are outlined in the Health and Safety Plan, which is included in Appendix J.

10. Health and Safety Plan

The site-specific Health and Safety Plan for the Facility is provided in Appendix J.

11. Records and Forms

Records documenting the operation and maintenance of the Groundwater IRM System will be maintained as described below. Electronic and system inspection and maintenance logs will be retained a minimum of 10 years after data collection and submission of logs.

Inspection forms, monitoring forms, and maintenance forms to be completed during routine monitoring events are included in Appendix F.

12. Emergency Contingency Plan

The follow subsections describe the site-specific Emergency Contingency Plan. Further information regarding health and safety procedures can be found in the Health and Safety Plan (Appendix J).

12.1 Emergency Response Procedure

In the event of a situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made via the Emergency Contact List. The Site Safety Officer (SSO) will post the Emergency Contact List at the project Site: a copy is also included in the Health and Safety Plan (Appendix J). Where mobile telephones are used for emergency communications, active cellular service will be confirmed from the Site before the initiation of daily work activities.

In the event of any emergency situation, Site personnel will immediately notify the Task Manager who will initiate emergency response actions. The Task Manager will determine the need for off-site emergency response assistance. If the Task Manager determines that on-site personnel can adequately respond and control the situation, the Task Manager and/or SSO will oversee the response and ensure Site personnel are properly protected and use proper procedures. If not, the Task Manager will contact appropriate emergency response personnel per the phone list and other personnel as required by the client for assistance. Personal injury or heat/cold exposure requiring immediate medical help, personal medical emergency, or hazardous chemical exposure situations will require the Task Manager to immediately call the appropriate emergency number for medical assistance. As part of this process, the Task Manager will contact the Project Manager, as soon as is convenient and the Project Manager will contact Client representatives and others, as appropriate.

Potential emergencies may include:

- Personal injury
- Personal exposure
- Fire
- Vehicle accidents
- Disturbance of utilities
- Severe weather

The SSO will conduct regular site inspections to identify any potential emergency situations for the purposes of avoiding those emergency situations.

Site inspection logs (included in Appendix F) will be completed during emergency site inspections (i.e., following a system shutdown). ARCADIS or NG will attempt to notify NYSDEC within 24 business hours of a prolonged (greater than 24 continuous hours) or emergency shutdown. The NYSDEC will be contacted via telephone call upon a prolonged system shutdown, except during the start-up testing period.

Emergencies should also be reported to Northrop Grumman Environmental Health and Safety (ESH) Department at (516) 575-6789.

12.2 Autodialer Response Procedures

The Groundwater IRM System is equipped with an autodialer that is programmed to dial-out to a list of responders in the event of either a main or minor system alarm. During the interim operating period (i.e., prior to transfer of maintenance activities to NGC operators), the following ARCADIS personnel shall be deemed alarm response personnel:

Dennis McClafferty – First responder.

Patricia Riche – First responder.

William Wittek – Project engineer.

The autodialer will call out in the order of the names presented above. Upon receipt of a call out from the autodialer, the alarm recipient should document the specific alarm condition and acknowledge the alarm in accordance with the procedures set forth in the autodialer-specific OM&M manual provided in Appendix A. That recipient should than attempt to contact the other individuals provided on the call out list. Based on availability, a first responder will be designated to go to the site and troubleshoot the specific alarm condition with the project engineer or project manager as soon as feasible. The first responder should record the specific alarm condition and the time the alarm occurred.

Upon transfer of the maintenance activities to NGC operators, the following ARCADIS and NGC personnel shall be deemed alarm response personnel:

NGC Operator 1 – First responder.

NGC Operator 2 – First responder.

Dennis McClafferty – Alternate responder.

Patricia Riche – Alternate responder.

William Wittek – Project engineer.

The response procedures following the transfer of responsibility will be the same as referenced above with the exception that NGC operators will be the primary first response personnel. Accordingly, the consulting personnel will serve as alternate responders in the event of a scheduling conflict, or in the event that an onsite engineer is required.

An alarm response personnel contact list with private contact information will be provided under separate cover to all response personnel.

12.3 Emergency Telephone Numbers, Maps, and Directions to Nearest Health Facility

The site-specific Health and Safety Plan (Appendix J), contains a detailed description of the route to the nearest health facility along with a map of the route. Also contained in the Health and Safety Plan is a list of emergency contacts and their associated contact information. This information will also be posted at the site, inside the treatment building, for a quick reference to all workers onsite.

12.4 Amendments to the OM&M Manual and Contingency Plan

The OM&M Manual and Contingency Plan will be reviewed on an annual basis. At that time, an evaluation of the Plans will be completed and it will be revised on an as-needed basis. Each amendment to the Plan will be documented in Appendix K. In addition, applicable project correspondence that results in a required plan modification, including a copy of the cover letter that accompanies a specific plan modification, shall be included in Appendix K.

13. Record Drawings

The GW IRM System Record Drawings are provided in Appendix B. Additional manufacturer-supplied Record Drawings for selected system components are provided in Appendix A.

14. Electronic Copies of Official Records and References

An electric copy of the documents presented within this document is provided on CD at the end of this manual. Additional electronic documents may be retrieved by contacting the appropriate representatives referenced herein.

References

ARCADIS G&M, Inc. (ARCADIS) 2006a. Remedial Investigation/Feasibility Work Plan, Former Grumman Settling Ponds (Operable Unit 3), Bethpage Community Park, Bethpage, New York. March 8, 2006.

ARCADIS G&M, Inc. (ARCADIS) 2006b. Citizen Participation Plan, Former Grumman Settling Ponds (Operable Unit 3), Bethpage Community Park, Bethpage, New York. March 8, 2006.

ARCADIS U.S. Inc. (ARCADIS) 2008a. Remedial Investigation Report (Site Area). Operable Unit 3 – Former Grumman Settling Ponds, Bethpage, New York. NYSDEC Site #1-30-003A. February 1, 2008.

ARCADIS of New York, Inc. (ARCADIS) 2008b. Final Design Report, Operable Unit 3, Groundwater Interim Remedial Measure, Former Grumman Settling Ponds, Bethpage, New York. Site # 1-30-003A. August 2008.

Dvirka & Bartilucci Consulting Engineers (D&B) 2003. Field Report - Town of Oyster Bay, Bethpage Community Park, Investigation Sampling Report, December 2003.

Geraghty & Miller, Inc. 1994. Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York. Revised September 1994.

New York State Department of Environmental Conservation (NYSDEC), 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation, December 2002.

New York State Department of Environmental Conservation (NYSDEC), 2009a, Interim State Pollution Discharge Elimination System (SPDES) Letter, March 19, 2009.

New York State Department of Environmental Conservation (NYSDEC), 2009b, System Start-up Work Plan Approval Letter, May 19, 2009.

Table 1. Design Influent Groundwater Concentrations and Effluent Limits for Treated Water, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Parameter [1]	Air Stripper Predicted Influent Concentrations (µg/L) [2]	Regulatory Effluent Standard (µg/L) [3]	Design Effluent Concentrations (µg/L) [4]	Treatment Efficiency (%) [5]
Trichloroethene	46	5	<2.5	94.57
cis-1,2-Dichloroethene	780	5	<2.5	99.68
Vinyl chloride	147	2	<1	99.32

Notes:

(1) The three primary project compounds; Trichloroethene, cis 1,2 Dichloroethene, and vinyl chloride are listed.

(2) Predicted influent concentrations are based on data collected during the remedial investigation, projected pumping rates, and include a 50% factor of safety.

(3) Regulatory concentration per "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, per Division of Water Technical and Operational Guidance Series (1.1.1), reissued June 1998 for ambient water classification 'GA - Source Drinking Water (groundwater)".

(4) The design effluent concentrations calculated by dividing the regulatory levels of volatile organic compounds by 2 for a safety factor.

(5) Treatment efficiency calculated by dividing the difference between the predicted influent concentration and the design effluent concentration by the predicted influent concentration.

Acronyms:

µg/L	micrograms per liter
%	Percent

Table 2. Design Influent Vapor Concentrations and Effluent Limits for Air Stripper Off-Gas, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Parameter [1]	VPGAC Predicted Influent Concentrations (µg/m³) [2]	Regulatory Standards [3] AGC [4] (ug/m³)	SGC [4] (ug/m³)	Potential Annual Mass Emissions Predicted [5] (lbs)	Allowable [6] (lbs)
Trichloroethene	855	0.5	14,000	50.8	233
cis-1,2-Dichloroethene	14,498	63	190,000 [7]	854.1	884,172
Vinyl chloride	2,732	0.11	180,000	161.5	51

Notes:

(1) There are three primary project compounds: Trichloroethene, cis 1,2 Dichloroethene, and Vinyl Chloride.

(2) Predicted vapor influent concentrations calculated by multiplying the design influent (water) concentration by the design pumping rate (250 gpm) and dividing by the projected air flow rate (1,800 CFM).

(3) Regulatory concentrations per "New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 Edition and DAR-1 AGC/SGC Tables, revised September 10, 2007".

(4) AGC refers to Annual Guidance Concentrations and SGC refers to Short-term Guidance Concentrations.

(5) The predicted potential (uncontrolled) annual mass emissions were calculated by multiplying the influent (vapor) concentrations by the expected flow rate of 1,800 cubic feet per minute and assuming a continuous discharge for the entire year.

(6) The allowable mass that can be emitted by the system was calculated using the Screen 3 Air Dispersion Model developed by the United States Environmental Protection Agency using the following project information:

Stack Height (ft)	18
Stack Diameter (ft)	1.5
Stack Gas Temp (K)	283.7
Receptor Height (ft)	5.8
Bldg (ECU) Height (ft)	8.5
Bldg Width (ft)	26
Bldg Length (ft)	32

(7) An SGC was not provided in the DAR-1 AGC/SGC tables, revised September 10, 2007. An interim SGC was developed based on guidelines provided in Section IV.A.2.b.1 of the New York State DAR-1 Guidelines for the Control of Toxic Ambient Air Contaminants, 1991 edition. Specifically for cis-1,2 Dichloroethene, which is not defined as a high-toxicity constituent, the interim SGC = (smaller of Time Weighted Average [TWA] -Threshold Limit Value or TWA - Recommended Exposure Limit)/4.2 or 793,000 µg/m3/4.2 = 190,000 µg/m³.

Acronyms:

VPGAC vapor phase granular activated carbon

µg/m³ micrograms per cubic meter

Table 3. Recovery Well Construction Information, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Well	Well Diameter (in)	Well/Screen Material	Well Depth (ft)	Screen Interval (ft bls)
RW-1	8	PVC/SS	134	108 - 128
RW-2	6	Steel/SS	104	84 - 104
RW-3	8	PVC/SS	107	84 - 104
RW-4	8	PVC/SS	133	110 - 130

Notes:
(1) Remedial well construction logs are provided in Appendix C.

Acronyms:

in	Inches
PVC	Schedule 80 Polyvinylchloride
Steel	Carbon Steel
SS	Stainless Steel
ft	Feet
bls	Below Land Surface

Table 4. Pump and Blower Schedule, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Equipment Designation	Pump/Blower				Motor		
	Type	Make	Model	Rating	Make	Model	Rating
P-110	Submersible Pump	Grundfos	40S30-9	40 GPM @ 200 FT TDH	Grundfos	4-inch	3HP/460 V/3,450 RPM
P-120	Submersible Pump	Grundfos	75S75-12	85 GPM @ 220 FT TDH	Grundfos	4-inch	7.5HP/460V/3,450 RPM
P-130	Submersible Pump	Grundfos	75S75-12	85 GPM @ 220 FT TDH	Grundfos	4-inch	7.5HP/460V/3,450 RPM
P-140	Submersible Pump	Grundfos	40S30-9	40 GPM @ 200 FT TDH	Grundfos	4-inch	3HP/460 V/3,450 RPM
P-400	Centrifugal Pump	Goulds	5SH2L 52CO	250 GPM @ 90 FT TDH	Baldor	JMM3711T	10HP/460V/3,500 RPM
P-800	Centrifugla Pump	Davey	HS12-40HT1	12 GPM @ 40 PSI TDH	Coupled with Pump		0.9 KW/120V/3,420 RPM
P-900	Sump Pump	Hydromatic	OSP50	5 GPM @ 25 FT TDH	Coupled with Pump		0.5 HP/120V/1,750 RPM
B-410	Radial Blade Blower	New York Blower	Model 2610A40 Pressure Blower	1,800 SCFM @ 55 IN W.G.	Baldor	M4109T	40HP/460V/3,600 RPM

Notes:
(1) Refer to the Process and Instrumentation Drawings (Drawings 3 thru 6 of the Record Drawings (Appendix B) for equipment designations.

Acronyms:
GPM Gallons Per Minute
FT Feet
TDH Total Discharge Head
V Volts
HP Horsepower
RPM Rotations Per Minute
KW Killowatt
IN WG Inches Water Gague
SP Static Pressure
SCFM Standard Cubic Feet per Minute

Table 5. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency: Short-Term [3] (first month)	Frequency: Short-Term [3] (five month period following first month)	Frequency: Long-Term [4]	SCADA Data Acquisition
Water Samples [5]					
Remedial Well 1 (WSP-1)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 2 (WSP-2)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 3 (WSP-3)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 4 (WSP-4)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Air Stripper Influent (WSP-5)	VOCs (NYSDEC 2000 OLM 4.3)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
	Iron (USEPA 6010)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
Air Stripper Effluent (WSP-6)	Iron (USEPA 6010)	1-hr [6]; As Needed	As Needed	As Needed	NA
Plant Effluent (WSP-7)	**VOCs (NYSDEC 2000 OLM 4.3)**	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	Iron (USEPA 6010)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	ph (field)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
Air Samples [7] [8]					
Air Stripper Effluent/ECU-1 Influent (VSP-1)	VOCs (TO-15 Modified)	Monthly	Monthly	Quarterly	NA
ECU-1 Effluent/ECU-2 Influent (VSP-2)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-2 Effluent/ECU-3 Influent (VSP-3)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-3 Effluent/ECU-4 Influent (VSP-4)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
Total Effluent (VSP-5)	**VOCs (TO-15 Modified)**	**Monthly**	**Monthly**	**Quarterly**	NA

Table 5. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems, Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency: Short-Term [3] (first month)	Frequency: Short-Term [3] (five month period following first month)	Frequency: Long-Term [4]	Frequency: SCADA Data Acquisition
Water Flow Measurements					
Remedial Well RW-1 (FT - 110)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (FT - 120)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (FT - 130)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (FT - 140)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Combined Influent (FR - 200)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
System Effluent (FT-700)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Flow Measurements					
Air Stripper Effluent (FT-500)	Flow rate (SCFM)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Water Pressure Measurements					
Remedial Well RW-1 (PT - 110)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (PT - 120)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (PT - 130)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (PT - 140)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Stripper Effluent (PT-700)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Temperature & Relatively Humidity Measurements					
Air Stripper Effluent (TT-500)	Temperature	Weekly	Weekly	Weekly	Continuously
ECU Mid-Train (TI-503)	Temperature	Weekly	Weekly	Weekly	NA
Effluent (TI-603)	Temperature	Weekly	Weekly	Weekly	NA

Table 5. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems, Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency: Short-Term [3] (first month)	Frequency: Short-Term [3] (five month period following first month)	Frequency: Long-Term [4]	Frequency: SCADA Data Acquisition
Air Pressure Measurements					
Air Stripper Effluent (PT-500)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	Continuously
ECU #1 Influent (PI-501)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #2 Influent (PI-502)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #3 Influent (PI-601)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #4 Influent (PI-602)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
System Effluent (PI-603)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA

Notes:

(1) Refer to Record Drawings 3 thru 6 (Appendix B) in this Operation, Maintenance and Monitoring Manual for a diagram showing referenced sample locations and measurement points.

(2) Parameters/methods may be modified based on review of short-term and/or long-term testing results. Parameters shown in **Bold** indicate parameters that require NYSDEC notification/approval prior to change in monitoring schedule.

(3) Short-term schedule is tentative. Modification may be required/recommended based on the results of start-up and performance testing.

(4) Long-term schedule is tentative. Modification may be required/recommended based on the results of short-term testing or water quality trends.

(5) Water samples will be collected in accordance with the methods described in the Sampling and Analysis Plan, which is included as Appendix A of this Operation, Maintenance and Monitoring Manual. Samples will be analyzed in accordance with the methods and procedures described in the Sampling and Analysis Plan.

(6) Per NYSDEC request, a 1-hr pilot test will be performed during system shake-down. 1-hr pilot test samples will also be analyzed for mercury.

(7) Air samples will be collected and analyzed in accordance with methods described in the Sampling and Analysis Plan, which is included as Appendix A of this Operation, Maintenance and Monitoring Manual.

(8) Additional air samples will be collected to help calculate media usage rates and to help determine media changeout frequencies.

Acronyms:

NA	Not applicable
ECU	Emissions control unit
VOCs	Volatile organic compounds (refer Tables D-3 and D-5 in the Quality Assurance Project Plan (QAPP) (Appendix D) for the analyte lists for aqueous and air samples, respectively).
gal.	Gallons
gpm	Gallons per minute
i.w.g.	Inches water gauge
NYSDEC	New York State Department of Environmental Conservation
EPA	U.S. Environmental Protection Agency
SCADA	Supervisory Control And Data Acquisition

Table 6. Summary of Primary Shut Down Alarms in Main PLC, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

ALARM DESCRIPTION (ALARM SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
EMERGENCY STOP ENGAGED	-	PUSH BUTTON/TOUCH SCREEN	1 IN FIELD, 1 ON MCP AND 1 ON TOUCH SCREEN
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-110	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-110	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-120	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-120	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-130	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-130	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE (SET POINT)	PT-140	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT HIGH PRESSURE (SET POINT)	PT-140	PRESSURE TRANSMITTER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-110	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-120	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-130	FLOW METER	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW FLOW RATE (SET POINT)	FIT-140	FLOW METER	INFLUENT LINE IN BUILDING
AIR STRIPPER INFLUENT LOW FLOW RATE (SET POINT)	FI-200	COMPUTER FUNCTION	PLC
AIR STRIPPER INFLUENT HIGH FLOW RATE (SET POINT)	FI-200	COMPUTER FUNCTION	PLC
AIR STRIPPER HIGH AIR FLOW RATE (SET POINT)	FIT-500	FLOW INDICATING TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR FLOW RATE (SET POINT)	FIT-500	FLOW INDICATING TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING

Table 6. Summary of Primary Shut Down Alarms in Main PLC, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

ALARM DESCRIPTION (ALARM SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
AIR STRIPPER HIGH AIR PRESSURE (SET POINT)	PT-500	PRESSURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR PRESSURE (SET POINT)	PT-500	PRESSURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
AIR STRIPPER LOW AIR TEMPERATURE (SET POINT)	TT-500	TEMPERATURE TRANSMITTER	AIR STRIPPER DISCHARGE DUCTING
BAG FILTER HIGH INFLUENT PRESSURE	PT-700	PRESSURE TRANSMITTER	BAG FILTER INFLUENT PIPING
TREATMENT BUILDING SUMP HIGH LEVEL	LSH-900	FLOAT SWITCH	TREATMENT BUILDING SUMP
AIR STRIPPER DISCHARGE PUMP VFD FAULT	VFD FAULT CONTACT	PUMP P-400 VFD FAULT CONTACT	AIR STRIPPER CONTROL PANEL
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-111	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-121	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-131	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-141	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
AIR STRIPPER LOW AIR PRESSURE	PSL-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER HIGH AIR PRESSURE	PSH-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER SUMP HIGH WATER LEVEL	LSH-AS	LEVEL SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)

Table 7. Summary of Secondary Fail-Safe Alarms, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

ALARM DESCRIPTION	TAG NO.	DEVICE TYPE	LOCATION
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-111	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-121	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-131	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
TREATMENT PLANT INFLUENT LOW PRESSURE	PSL-141	PRESSURE SWITCH	INFLUENT LINE IN BUILDING
AIR STRIPPER LOW AIR PRESSURE	PSL-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER HIGH AIR PRESSURE	PSH-AS	PRESSURE SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)
AIR STRIPPER SUMP HIGH WATER LEVEL	LSH-AS	LEVEL SWITCH	AIR STRIPPER CONTROL PANEL (DRY CONTACT)

Table 8. Summary of Advisory Conditions at PLC, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

ADVISORY DESCRIPTION (ADVISORY SCREEN ON HMI)	TAG NO.	DEVICE TYPE	LOCATION
BAG FILTER PRESSURE ADVISORY FILTER SWITCH OCCURRED	PT-700	PRESSURE TRANSMITTER	INFLUENT LINE TO BAG FILTER
WELL PUMP (P-110) RUN INDICATION ADVISORY	YI-110	RUN INDICATOR	MCP/PLC
WELL PUMP (P-120) RUN INDICATION ADVISORY	YI-120	RUN INDICATOR	MCP/PLC
WELL PUMP (P-130) RUN INDICATION ADVISORY	YI-130	RUN INDICATOR	MCP/PLC
WELL PUMP (P-140) RUN INDICATION ADVISORY	YI-140	RUN INDICATOR	MCP/PLC
AIR STRIPPER BLOWER (B-410) RUN INDICATION ADVISORY	YI-410	RUN INDICATOR	AIR STRIPPER CONTROL PANEL
AIR STRIPPER DISCHARGE PUMP (P-400) RUN INDICATION ADVISORY	YI-400	RUN INDICATOR	AIR STRIPPER CONTROL PANEL
TREATMENT BUILDING LOW TEMPERATURE (SET POINT)	TT-900	TEMPERATURE TRANSMITTER	TREATMENT BUILDING WALL

Table 9. Summary of Preventative Maintenance Tasks, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Equipment ID [(1)]	Equipment Description	Maintenance Task [(2)]	Frequency [(2)]
P-110, P-120, P-130, P-140	Recovery Well Pumps	Measure phase, voltage and current of individual recovery well pumps (to be completed by certified electrician). Test recovery well pump head pressure at two different flow rates within the allowable range; check pump curve against operation. If actual operation varies by more than 5% from the pump curve, evaluate troubleshooting options.	Annually
P-400	Transfer Pump	Check motor for excessive heat, noise or vibration; ensure that motor and surrounding area are clear.	Monthly
P-800	Transfer Pump	Check motor for excessive heat, noise or vibration; ensure that motor and surrounding area are clear. Check pressure tank air charge.	Monthly Semi-annually
P-900	Transfer Pump	Check the condition of the pump power cord and replace as necessary. Check pump internals; replace worn parts as necessary.	Monthly Annually
B-410	Blower	Check motor for excessive heat, noise or vibration. Ensure motor and surrounding area are clean and that ventilation openings are clear. Purged bearings with new grease; add grease to the bearing while running the fan. Check all setscrews and bolts for tightness; tighten as necessary. Check the fan wheel for any wear, corrosion or build-up of material. Clean or rebalance wheel as necessary. Check shaft seals; replace worn seals as necessary. Check the V-belt drive for proper alignment and tension; replace worn belts as necessary. Clean and repacked bearings with fresh grease (for split pillowblock bearings only). Replace bearings.	Monthly Quarterly Semi-annually Semi-annually Semi-annually Semi-annually 15,000 to 20,000 operating hours
AS-400	Air Stripper	Power wash air stripper internals in accordance with Standard Operating Procedures. Inspect mist eliminator pad; replace as necessary.	Quarterly
FI-410	Air Flow Meter	Check meter for fouling and debris; schedule cleaning as necessary. Disconnect pressure lines to vent both sides of gauge to atmospheric; zero gauge and clear out pitot tubes as necessary. Verify accuracy of flow meter: recalibrate as necessary.	Monthly Quarterly Annually
VI-410	Vacuum Gauges	Check accuracy of gauge; zero/recalibrate gauge as necessary.	Semi-annually

Table 9. Summary of Preventative Maintenance Tasks, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Equipment ID [1]	Equipment Description	Maintenance Task [2]	Frequency [2]
PI-110, PI-120, PI-130, PI-140, PI-400, PI-401a, PI-401b, PI-402a, PI-402b, PI-403a, PI-403b, PI-404a, PI-404b, PI-501, PI-502, PI-601, PI-602, PI-603, PI-800	Pressure Gauges	Check accuracy of gauge; zero/recalibrate gauge as necessary.	Semi-annually
TI-501, TI-601	Temperature Gauges	Check accuracy of gauge; zero/recalibrate gauge as necessary.	Semi-annually
PT-110, FIT-110, PT-120, FIT-120, PT-130, FIT-130, PT-140, FIT-140, LT-400, FIT-500, PT-500, TT-500, PT-700, FIT-700, DPS-700, TT-900	Transmitters	Check unit to ensure proper calibration; schedule recalibration as necessary.	Annually
LSH-900, LSH-400	Level Switches	Check switch for buildup that could cause improper operation; clean as necessary. Check switch wiring and housing to ensure there is no damage or exposed parts; replace wiring/repair exposed parts as necessary. Test switch operation by inducing an alarm condition.	Quarterly Quarterly Annually
PSL-111, PSL-121, PSL-131, PSL-141, PSL-410, PSH-410	Pressure Switches	Check switch for buildup that could cause improper operation; clean as necessary. Check switch wiring and housing to ensure there is no damage or exposed parts; replace wiring/repair exposed parts as necessary. PSL-410 and PSH-410 only: Rotate the vent drain plus and then return it to its original position. Test switch operation by inducing an alarm condition.	Quarterly Quarterly Quarterly Annually
VSP-400, VSP-501, VSP-502, VSP-503, VSP-601, VSP-602, VSP-603	Vapor Sample Ports	Check sample ports for debris accumulation; clean/replace as necessary.	Semi-annually
WSP-1 through WSP-7	Water Sample Ports	Check sample ports for debris accumulation; clean/replace as necessary.	Semi-annually
V-300, V-400, V-401, ABV-401, ABV-402	Ball Valves	Manually open and close valves to ensure proper operation; repair/clean as necessary.	Semi-annually

Table 9. Summary of Preventative Maintenance Tasks, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Equipment ID [1]	Equipment Description	Maintenance Task [2]	Frequency [2]
ADV-402		Test motor operation on motorized valves.	Annually
MV-1 through MV-4, MV-110 through MV-113, MV-120 through MV-123, MV-130 through MV-133, MV-140 through MV-143, MV-401, MV-402, MV-405, MV-501 through MV-506, MV-601 through MV-606, MV-701 through MV-703, MV-801 through MV-	Motorized Valves	Manually open and close valves to ensure proper operation; repair/clean as necessary.	Semi-annually
		Test motor operation on motorized valves.	Annually
CV-110, CV-120, CV-130, CV-140, CV-400 though CV-406, CV-410, CV-900	Check Valves	Manually test valves to ensure proper operation; repair/clean as necessary.	Semi-annually
N/A	Autodialer	Test unit to ensure proper operation.	Annually
Remedial Well RW-2	Remedial Well	Currently Developing a Maintenance Program to address Iron Fouling Issues	TBD
T-800	Tanks	Check tanks for sediment buildup; clean as necessary.	Quarterly
		Drain and flush out tank to remove buildup; check tanks for leaks.	Annually
BF-401, BF-402, BF-403, BF-404	Bag Filters	Check gaskets for wear and proper seating; replace as necessary. Clear out drain lines.	Semi-annually
GAC-501, GAC-502, PPZ-601, PPZ-602	Emission Control Units	Check units for water accumulation; drain as necessary.	Annually
VFD-400	Variable Frequency Drive	Test unit to ensure proper operation.	Annually
Treatment Building	Treatment Building	Ensure temperature is between 40 deg F and 100 deg F.	Year-round
		Maintain heater thermostat between 50 and 75 deg F; set ventilator thermostat to 100 deg F.	October through April

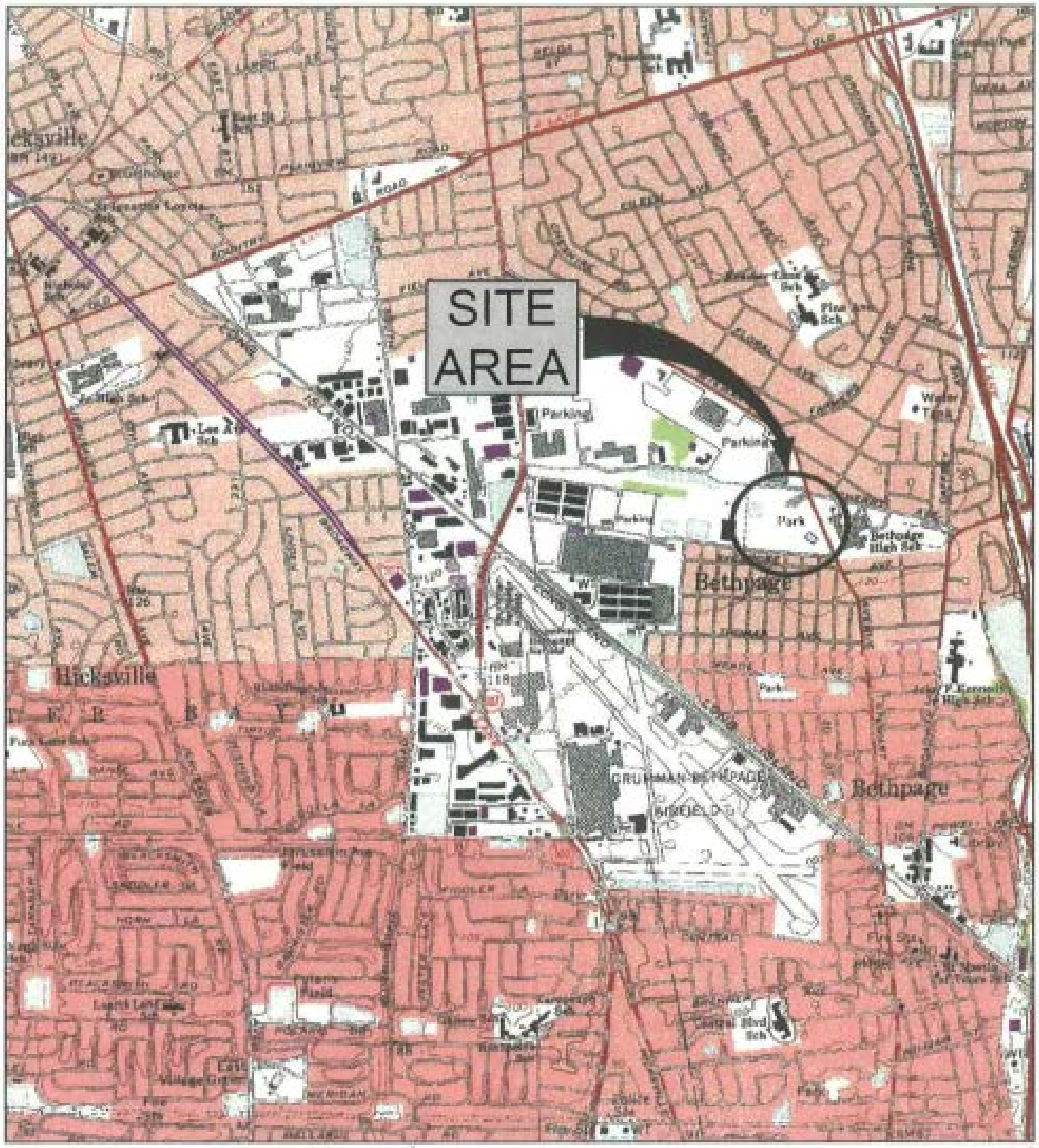
Notes:

Table 9. Summary of Preventative Maintenance Tasks, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Equipment ID (1)	Equipment Description	Maintenance Task (2)	Frequency (2)

(1) Refer to the Process and Instrumentation Drawings (Drawings 3 thru 6 of the Record Drawings (Appendix B) for equipment designations.
(2) Maintenance Activities and Frequencies are based on vendor-supplied information, which is provided in Appendix A.

Acronyms:
TBD To Be Determined



SOURCE
USGS 7.5 MIN. AMITYVILLE QUADRANGLE, AMITYVILLE, NY 1994
USGS 7.5 MIN. FREEPORT QUADRANGLE, FREEPORT, NY 1994
USGS 7.5 MIN. HICKSVILLE QUADRANGLE, HICKSVILLE, NY 1967, PHOTOREVISED 1979
USGS 7.5 MIN. HUNTINGTON QUADRANGLE, HUNTINGTON, NY 1967, PHOTOREVISED 1979

N

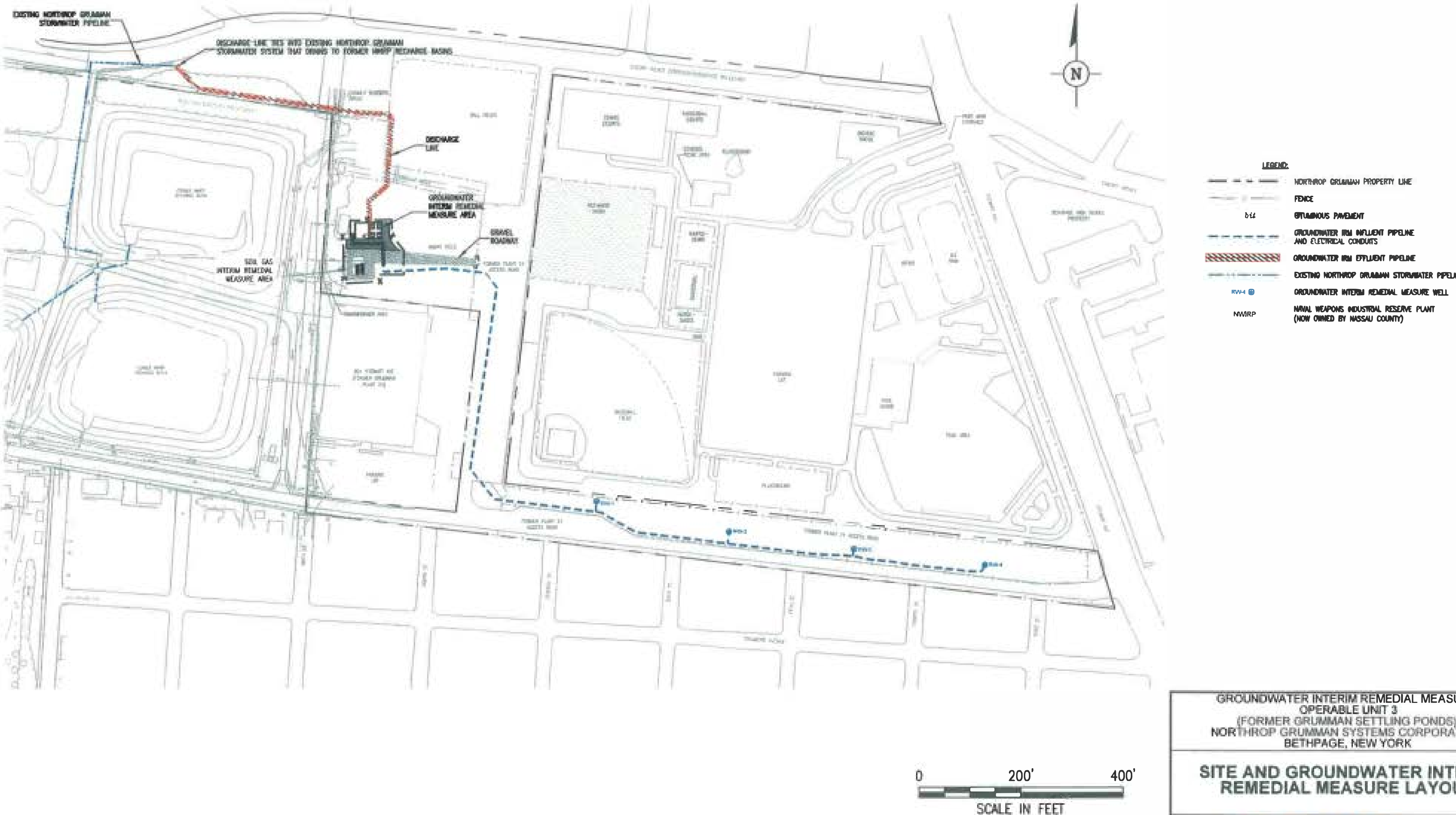
0 2000' 4000'
SCALE IN FEET

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

SITE LOCATION MAP

ARCADIS

FIGURE
1

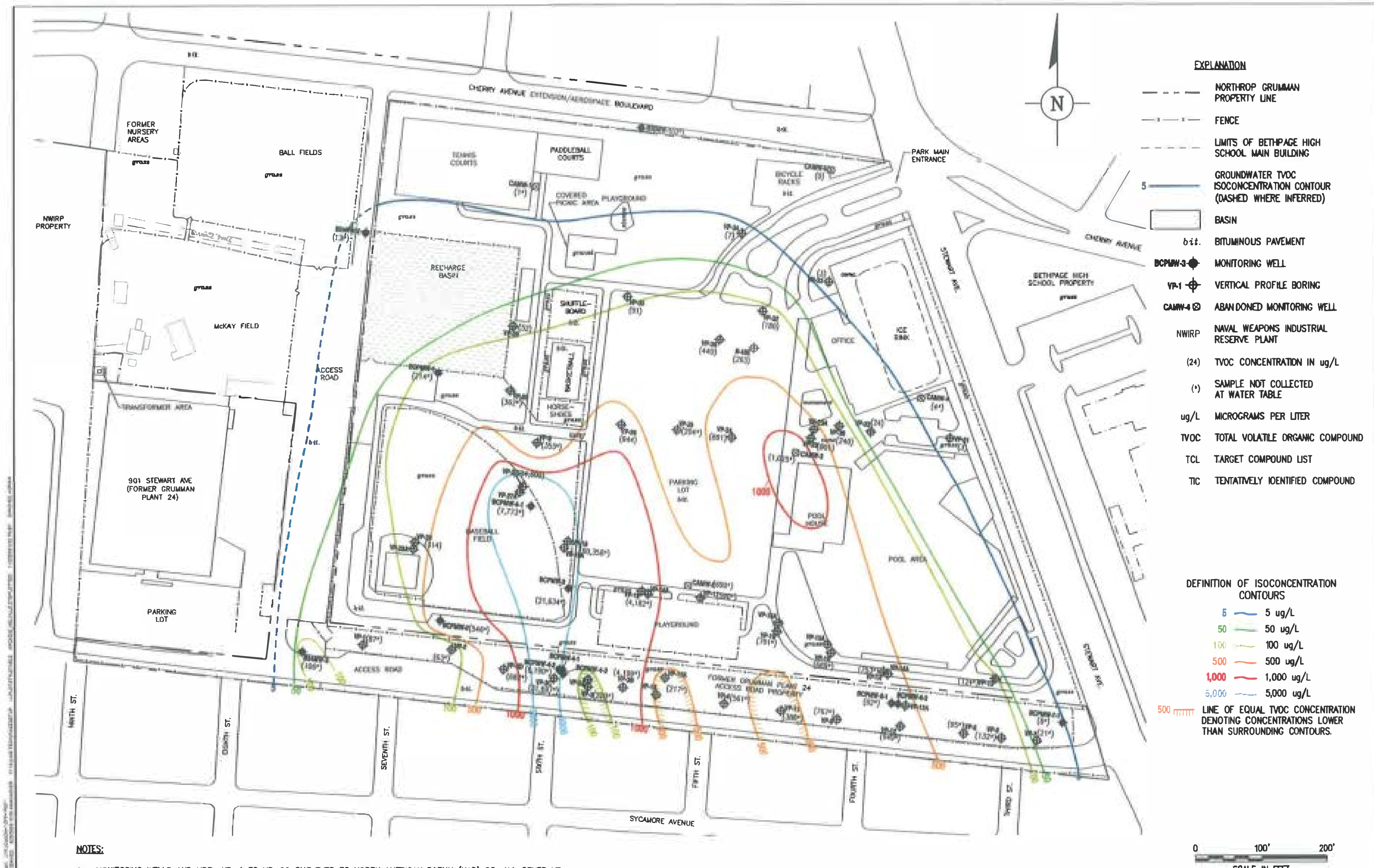


GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

SITE AND GROUNDWATER INTERIM REMEDIAL MEASURE LAYOUT

ARCADIS

FIGURE
2



NOTES:

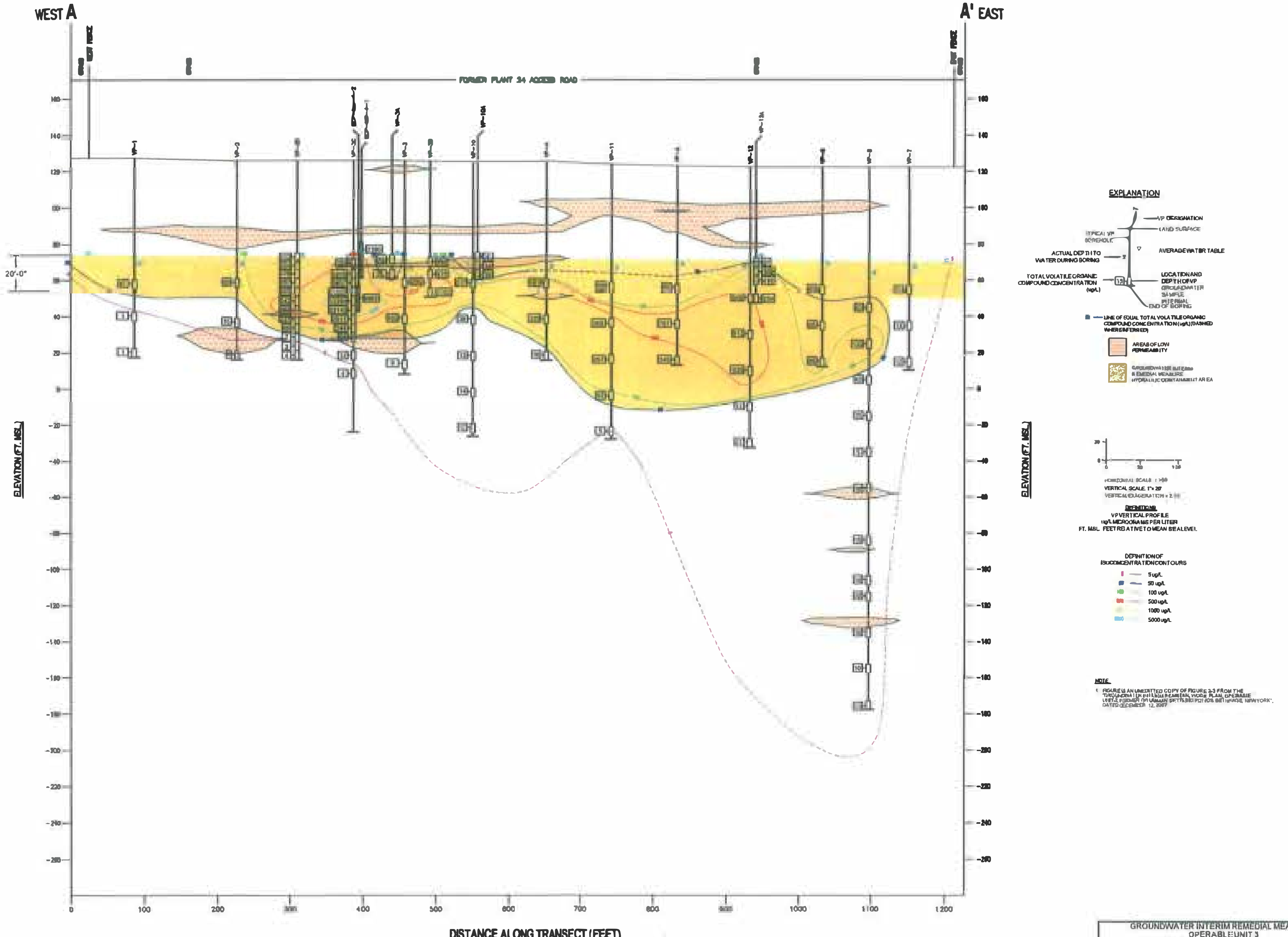
1. MONITORING WELLS AND VPBs VP-1 TO VP-20 SURVEYED TO NORTH AMERICAN DATUM (NAD) 83. ALL OTHER VP LOCATIONS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO TOWN OF OYSTER BAY REDEVELOPMENT IN 2005.
3. MAXIMUM TVOC CONCENTRATION IS SHOWN FOR EACH VP (INCLUDES CO-LOCATED VPs). SAMPLE WAS COLLECTED AT THE WATER TABLE UNLESS OTHERWISE NOTED.
4. MOST RECENT TVOC CONCENTRATION IS SHOWN FOR EACH MONITORING WELL. AT CLUSTERED WELL LOCATIONS, THE HIGHEST TVOC CONCENTRATION IS SHOWN.
5. TVOC CONCENTRATIONS SHOWN ARE THE SUM OF THE TCL VOCs ANALYZED IN GROUNDWATER, BUT THE SUM DOES NOT INCLUDE VOC TICs (WHICH IN SOME CASES INCLUDES CHLORODIFLUOROMETHANE [FREON 22]).
6. FIGURE WAS PRODUCED FROM DRAWING 5-7 OF THE "REMEDIAL INVESTIGATION REPORT (SITE AREA), OPERABLE UNIT 3 – FORMER GRUMMAN SETTLING PONDS, BETHPAGE, NEW YORK, DATED FEBRUARY, 1, 2008.

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

TOTAL VOLATILE ORGANIC COMPOUNDS IN SHALLOW GROUNDWATER

ARCADIS

FIGURE 3

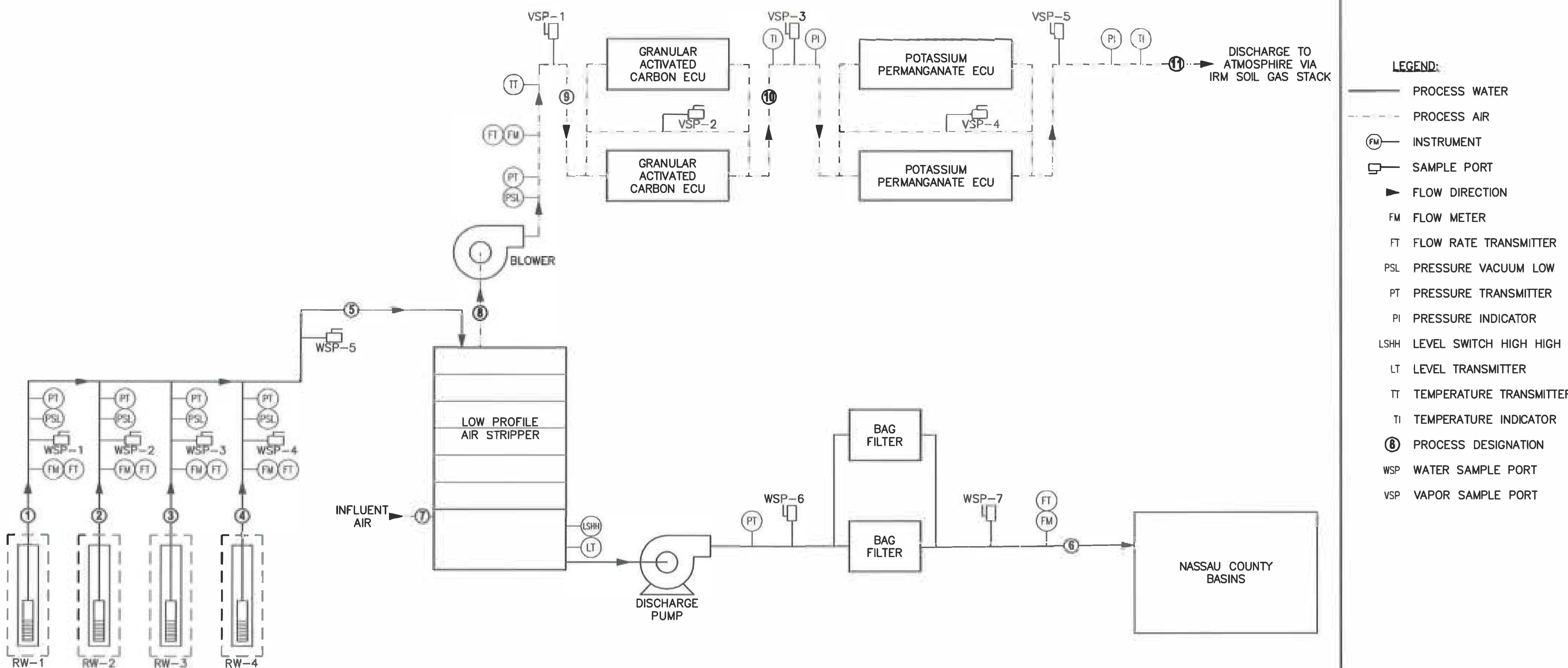


GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

CROSS-SECTION VIEW OF TOTAL VOLATILE ORGANIC COMPOUND (TVOC) IMPACTS AND HYDRAULIC CONTAINMENT AREA

ARCADIS

FIGURE 4



PROCESS	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪
Mass Loading (lbs/day)											
Trichloroethene	0.009	0.041	0.082	0.008	0.140	<0.008	0.000	0.140	0.140	<0.014	<0.014
cis -1,2 Dichloroethene	0.007	1.877	0.431	0.030	2.346	<0.008	0.000	2.346	2.346	<0.235	<0.235
Vinyl Chloride	0.000	0.443	0.001	0.000	0.444	<0.003	0.000	0.444	0.444	0.444	<0.044
Flow Rate (gpm)	40	85	85	40	250	250	—	—	—	—	—
Flow Rate (CFM)	—	—	—	—	—	—	1,300 - 1,600	1.300	1,535	1.557	1,581
Pressure (feet of water)	10	10	10	10	8	15	—	—	—	—	—
Pressure (inches of water)	—	—	—	—	—	—	0	- 28 to - 38	12	6	0
pH	6.4	6.4	6.4	6.4	6.4	6.2	—	—	—	—	—
Temperature	55	55	55	55	55	55	10	55	97	95	95
Relative Humidity	—	—	—	—	—	—	20 - 80	100	<50	<50	<50

GROUNDWATER INTERIM REMEDIAL MEASURE
OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEWYORK

PROCESS SCHEMATIC, PROCESS FLOW DIAGRAM, AND MONITORING LOCATIONS

ARCADIS

FIGURE 5

ARCADIS

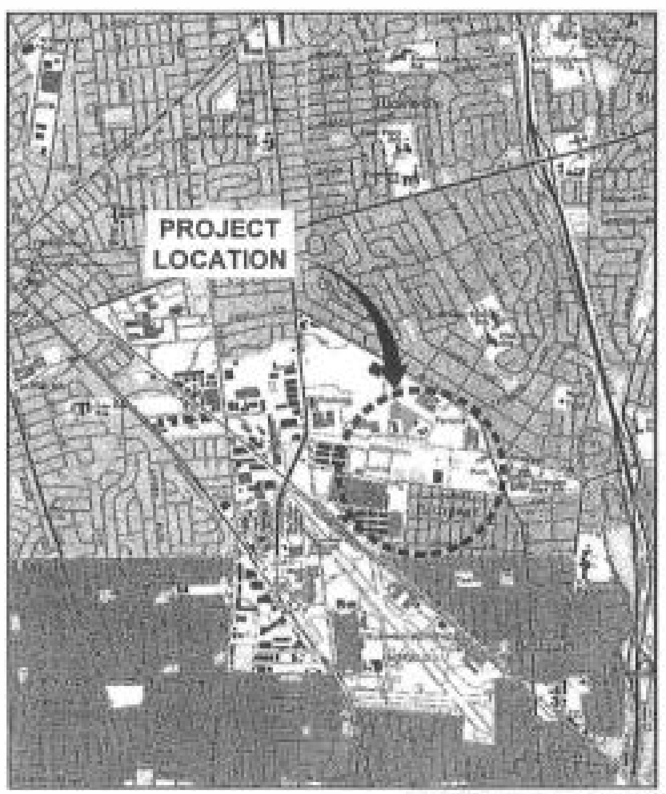
Appendix B

Record Drawings
(Provided Under Separate Cover)

RECORD DRAWINGS

OPERABLE UNIT 3 GROUNDWATER INTERIM REMEDIAL MEASURE

FORMER GRUMMAN SETTLING PONDS



REFERENCE: BASE MAP USGS 7.5 MINUTE QUADRANGLE., AMITYVILLE, FREEPORT, N.Y. 1969, PHOTOREVISED 1979. HUNTINGTON, HICKSVILLE, N.Y., 1967, PHOTOREVISED 1979.

LOCATION MAP

2000' 4000'

GRAPHIC SCALE

NEW YORK

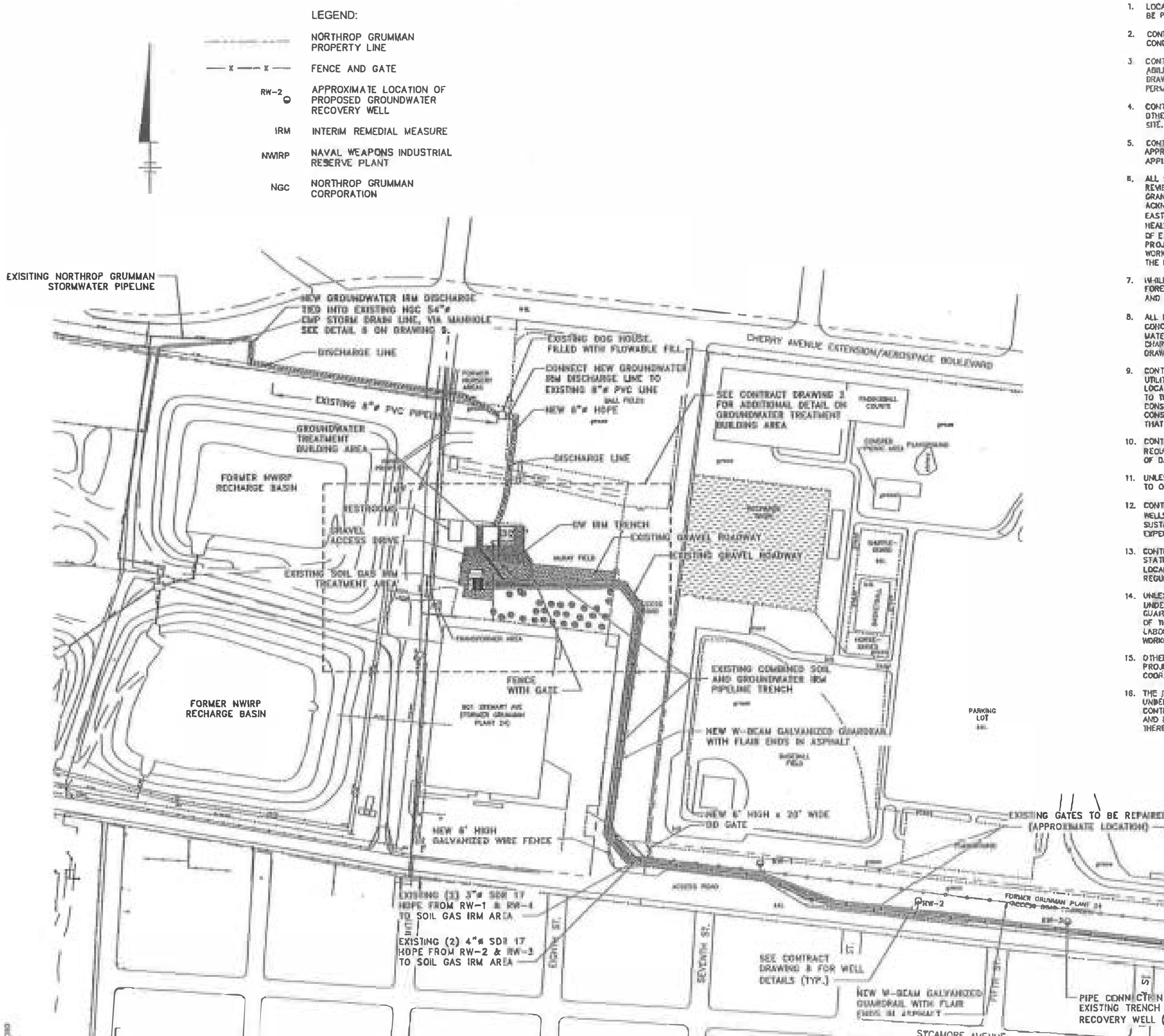
SEPTEMBER 2009

NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

ARCADIS

ARCADIS U.S., INC.

INDEX TO DRAWINGS



NOTES:

1. LOCATION OF WORK: ALL WORK DESCRIBED IN THESE DRAWINGS/SPECIFICATIONS SHALL BE PERFORMED ON BEHALF OF NORTHROP GRUMMAN SYSTEMS CORPORATION, INC.
2. CONTRACTORS SHOULD VISIT THE SITE AND EXAMINE ALL OF THE PHYSICAL CONDITIONS THAT AFFECT THE FINAL BID PRICE.
3. CONTRACTORS SHALL OBTAIN ALL NECESSARY FIELD MEASUREMENTS TO VERIFY THE ABILITY TO EXECUTE THE WORK IN ACCORDANCE WITH THIS SCOPE OF WORK AND DRAWINGS. NO ADDITIONS OR REVISIONS TO THE BID OR CONTRACT PRICE WILL BE PERMITTED BASED ON EXISTING CONDITIONS.
4. CONTRACTORS SHALL PROVIDE ALL LABOR, MATERIAL, AND EQUIPMENT, UNLESS OTHERWISE STATED, NECESSARY TO PERFORM THIS WORK. THE SITE WILL BE A UNION SITE.
5. CONTRACTORS SHALL BE RESPONSIBLE FOR OBTAINING ALL TRADE PERMITS, AND APPROVALS NECESSARY TO PERFORM THIS WORK; INCLUDING AGREEMENTS WITH APPLICABLE, LOCAL AND TRADE UNIONS.
6. ALL SITE WORKERS SHALL HAVE THE APPROPRIATE HEALTH AND SAFETY TRAINING; REVIEW AND SIGN THE PROJECT HEALTH AND SAFETY PLAN UNLESS WAIVER IS GRANTED BY THE PROJECT HEALTH AND SAFETY OFFICE; AND REVIEW AND ACKNOWLEDGE NORTHROP GRUMMAN SYSTEMS CORPORATION INTEGRATED SYSTEMS EASTERN REGION'S (ISER) "ON-SITE CONTRACTOR'S ENVIRONMENTAL, SAFETY AND HEALTH COMPLIANCE MANUAL, BETHPAGE, NEW YORK, DATED JUNE 12, 2008." COPIES OF EACH PERSON'S APPLICABLE STRANDING CERTIFICATES SHALL BE PROVIDED TO THE PROJECT HEALTH AND SAFETY OFFICER PRIOR BEFORE THE EMPLOYEE CAN START WORK AT THE SITE. COPIES OF TRAINING CERTIFICATES SHALL BE KEPT ON FILE WITH THE PROJECT FILE.
7. WHILE CONSTRUCTION ACTIVITIES ARE UNDER WAY AT LEAST ONE CONTRACTOR, FOREMAN, OR CREW SUPERVISOR SHALL BE PRESENT AT THE JOB SITE AT ALL TIMES AND WILL DIRECTLY REPORT TO THE ARCADIS SITE SUPERVISOR.
8. ALL EXCAVATED/DEMOLITION MATERIALS INTO TWO CATEGORIES: CONCRETE/ASPHALT/METAL MATERIAL AND SOIL MATERIAL. CONCRETE/ASPHALT/METAL MATERIAL SHALL BE DISPOSED OF BY CONTRACTOR. SOIL MATERIAL WILL BE CHARACTERIZED AND DISPOSED OF BY IN ACCORDANCE WITH THE SPECIFICATIONS ON DRAWING 12 AND ALL FEDERAL, STATE AND LOCAL REGULATIONS.
9. CONTRACTORS ARE RESPONSIBLE FOR LOCATING AND VERIFYING LOCATION OF ALL UTILITIES WITHIN AREA AFFECTED BY CONSTRUCTION. COPIES OF PRINTS OBTAINED OR LOCATIONS PROVIDED TO CONTRACTOR WITH RESPECT TO UTILITIES SHALL BE SUPPLIED TO THE ENGINEER WITH A RECORD SET OF DRAWINGS AT COMPLETION OF CONSTRUCTION. IF A CONFLICT EXISTS BETWEEN THE UTILITY LOCATION AND THE CONSTRUCTION DRAWINGS, CONTRACTOR IS TO NOTIFY THE ENGINEER IMMEDIATELY SO THAT THE CONFLICT MAY BE RESOLVED.
10. CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE ENGINEER WITH ALL INFORMATION REQUIRED TO COMPLETE A SET OF "RECORD" DRAWINGS BY KEEPING A RECORD SET OF DAILY PROGRESSION OF WORK.
11. UNLESS OTHERWISE NOTED, ALL AREAS DISTURBED BY THIS WORK SHALL BE RESTORED TO ORIGINAL CONDITION.
12. CONTRACTOR TO PROTECT AND PRESERVE ALL EXISTING FEATURES (I.E. MONITORING WELLS, EQUIPMENT, ETC.) WITHIN AREAS AFFECTED BY CONSTRUCTION. DAMAGE SUSTAINED TO AN EXISTING FEATURE WILL BE REPAIRED/REPLACED AT CONTRACTOR'S EXPENSE TO SATISFACTION OF ENGINEER.
13. CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH ALL COUNTY, LOCAL, STATE, AND FEDERAL REGULATIONS, INCLUDING, BUT NOT LIMITED TO, ALL APPLICABLE LOCAL, STATE, AND/OR FEDERAL (OSHA, USEPA, AND DOT, ETC.) RULES AND REGULATIONS.
14. UNLESS OTHERWISE INDICATED HEREIN, ALL MATERIALS AND EQUIPMENT FURNISHED UNDER THIS CONTRACT SHALL BE NEW, FREE FROM DEFECTS, AND SHALL BE GUARANTEED FOR A PERIOD OF AT LEAST ONE YEAR FROM THE DATE OF ACCEPTANCE OF THE WORK. THE CONTRACTOR SHALL FURNISH, AT NO COST TO THE ENGINEER, ALL LABOR AND MATERIALS NECESSARY TO CORRECT PROBLEMS DUE TO FAULTY WORKMANSHIP OR MATERIALS.
15. OTHER CONSTRUCTION ACTIVITIES MAY BE TAKING PLACE CONCURRENTLY WITH THIS PROJECT. THE CONTRACTOR SHALL CONSULT WITH THE VARIOUS PARTIES AND SHALL COORDINATE SCHEDULES.
16. THE INFORMATION SHOWN ON THE DRAWINGS CONCERNING TYPE AND LOCATION OF UNDERGROUND UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. CONTRACTOR IS RESPONSIBLE FOR MAKING HIS OWN DETERMINATIONS AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERETO.
17. TRENCHING WILL BE PERFORMED IN AREAS WHERE VEHICULAR TRAFFIC MAY BE PRESENT. THE CONTRACTOR(S) SHALL NOTIFY THE TOWN OF OYSTER BAY HIGHWAY DEPARTMENT AND ENGINEER OF THE PROPOSED START OF WORK WITHIN THESE TRAFFIC AREAS A MINIMUM OF 48 HOURS PRIOR TO THE START OF THE WORK. FURTHERMORE, THE CONTRACTOR WILL PERFORM THIS WORK IN A MANNER TO ALLOW FOR MINIMAL DISRUPTION TO TRAFFIC. THIS WILL INCLUDE PERFORMING WORK IN ACCORDANCE WITH TOWN OF OYSTER BAY HIGHWAY DEPARTMENT REQUIREMENTS IN SECTIONS AND/OR PROVIDING TRAFFIC PLATES TO ALLOW TRENCH SECTIONS TO BE DRIVEN OVER. TRAFFIC CONTROLS SHALL BE PROVIDED AS REQUIRED BY TOWN OF OYSTER BAY HIGHWAY DEPARTMENT REQUIREMENTS.
18. PIPE ROUTING SHOWN FOR CONSTRUCTION LAYOUT PURPOSES ONLY. ACTUAL ROUTING TO BE FIELD DETERMINED AND IS SUBJECT TO ENGINEER'S APPROVAL.
19. CONTRACTOR SHALL EXTEND ALL PROCESS PIPING AND MAKE ALL NECESSARY CONNECTIONS TO WELL VAULTS.
20. ALL PIPING PRESSURE TESTS SHALL BE MADE BY THE CONTRACTOR IN THE PRESENCE OF THE ENGINEER.
21. CONTRACTOR SHALL PROVIDE ALL PRODUCTS AND PROPERLY CALIBRATED TESTING EQUIPMENT REQUIRED TO PERFORM THE PIPING PRESSURE TESTING WORK.
22. TESTS MAY BE PERFORMED ON SEPARATE SECTIONS OF PIPING TO EXPEDITE CONSTRUCTION. THE CONTRACTOR SHALL NOT PERFORM PRESSURE TESTING AGAINST SYSTEM VALVES.
23. AFTER THE INITIAL PRESSURE TEST ON PIPING IS COMPLETED SUCCESSFULLY, THE CONTRACTOR SHALL BACKFILL THE TRENCHES AS SPECIFIED.
24. EXCAVATIONS SHALL BE KEPT FREE FROM STANDING WATER.
25. CONTRACTOR SHALL NOTIFY THE ENGINEER AT THE COMPLETION OF EXCAVATIONS AND TRENCHING TO ALLOW FOR INSPECTIONS.
26. CONTRACTOR SHALL PROVIDE APPROPRIATE SAFETY BARRICADES AROUND TRENCHING AND EXCAVATION TO PREVENT ACCIDENTS OR UNAUTHORIZED ENTRY.
27. BACKFILL OF TRENCHES IN UNPAVED AREAS WILL BE APPLIED IN 6-INCH THICK COMPACTED LIFTS. BACKFILL OF TRENCHES IN DESIGNATED ROAD CROSSING AREAS SHALL BE APPLIED IN 6-INCH COMPACTED LIFTS SUCH THAT A 95% MODIFIED PROCTOR DENSITY SHALL BE ACHIEVED.
28. CONTRACTOR'S FILL SOURCE MUST BE TESTED BY CONTRACTOR AND APPROVED BY THE ENGINEER PRIOR TO COMMENCING THE WORK AND/OR PLACING THE MATERIAL.
29. EXCAVATIONS WILL BE BACKFILLED AS PROMPTLY AS WORK PERMITS ONCE REQUIRED INSPECTIONS HAVE BEEN COMPLETED.
30. DO NOT PLACE MATERIALS ON SURFACES THAT ARE MUDDY, FROZEN, OR CONTAIN ICE OR FROST.
31. CONTRACTOR SHALL PLACE A STRIP(S) OF UTILITY WARNING TAPE SPACED AT 18 INCHES ON CENTER IN ALL TRENCHED AREAS. THIS TAPE SHALL CONTAIN A WIRE FOR METAL DETECTION OR HAVE AN ALUMINUM CORE. TAPE SHALL BE PLACED AT A DEPTH OF 6 INCHES IN NON-PAVED AREAS AND BELOW THE SUBBASE IN PAVED AREAS.
32. ALL CONCRETE AND PAVEMENT CUTS ARE TO BE SMOOTH EDGE SAW CUTS BY CIRCULAR SAW BLADES.
33. SURVEY NOTE: MAP FEATURES BASED ON SURVEY PREPARED BY NELSON & POPE ENGINEERS AND SURVEYORS, "EXISTING TOPOGRAPHY", DATED 4-19-07.
34. EXISTING FEATURES ON PARK AND OFF-SITE ARE BASED ON AERIAL PHOTOGRAPHY AND ARE APPROXIMATE.
35. ALL PAVED AREAS SHALL BE RESTORED.
36. ALL EXISTING GROUNDWATER EXTRACTION PIPING SHALL BE FLUSHED OUT PRIOR TO CONNECTING TO FINAL CONNECTION.
37. ALL INFLUENT LINES SHALL BE FLUSHED PRIOR TO MAKING FINAL CONNECTIONS AT WELL VAULT AND BUILDING.
38. PIPE CLEAN-OUTS SHALL BE INSTALLED AT WELL VAULTS AND AT PIPE PENETRATIONS INSIDE TREATMENT BUILDING FOR ALL INFLUENT LINES.
39. GROUNDWATER IRM LINES SHALL BE FLUSHED OUT WITH CLEAN WATER PRIOR TO PRESSURE TESTING.
40. ALL INFORMATION PRESENTED ON THESE DRAWINGS IS CONFIDENTIAL.

ZONING NOTES:

SECTION 48 BLOCK G, LOT 92 LIE WITHIN THE TOWN OF OYSTER BAY AND ARE ZONED "GB" GENERAL BUISNESS.

THE FOLLOWING IS A PARTIAL LISTING OF ZONING REQUIREMENTS PRINTED IN THE CODE OF THE TOWN OF OYSTER BAY:

MAXIMUM LOT WIDTH/FRONTAGE:	40 FEET
MAXIMUM BUILDING COVERAGE:	80%
MINIMUM FRONT YARD SETBACK:	10 FEET
MINIMUM REAR YARD SETBACK:	20 FEET
MAXIMUM BUILDING HEIGHT:	35 FEET

DATUM NOTES:

1. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988.
2. COORDINATES ARE BASED ON THE NEW YORK STATE PLANE COORDINATE SYSTEM OF 1983, LONG ISLAND ZONE.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 066827
State: NY
Project Mgr.: CSG
Designed by: CDL
Drawn by: BKG
Checked by: TEM

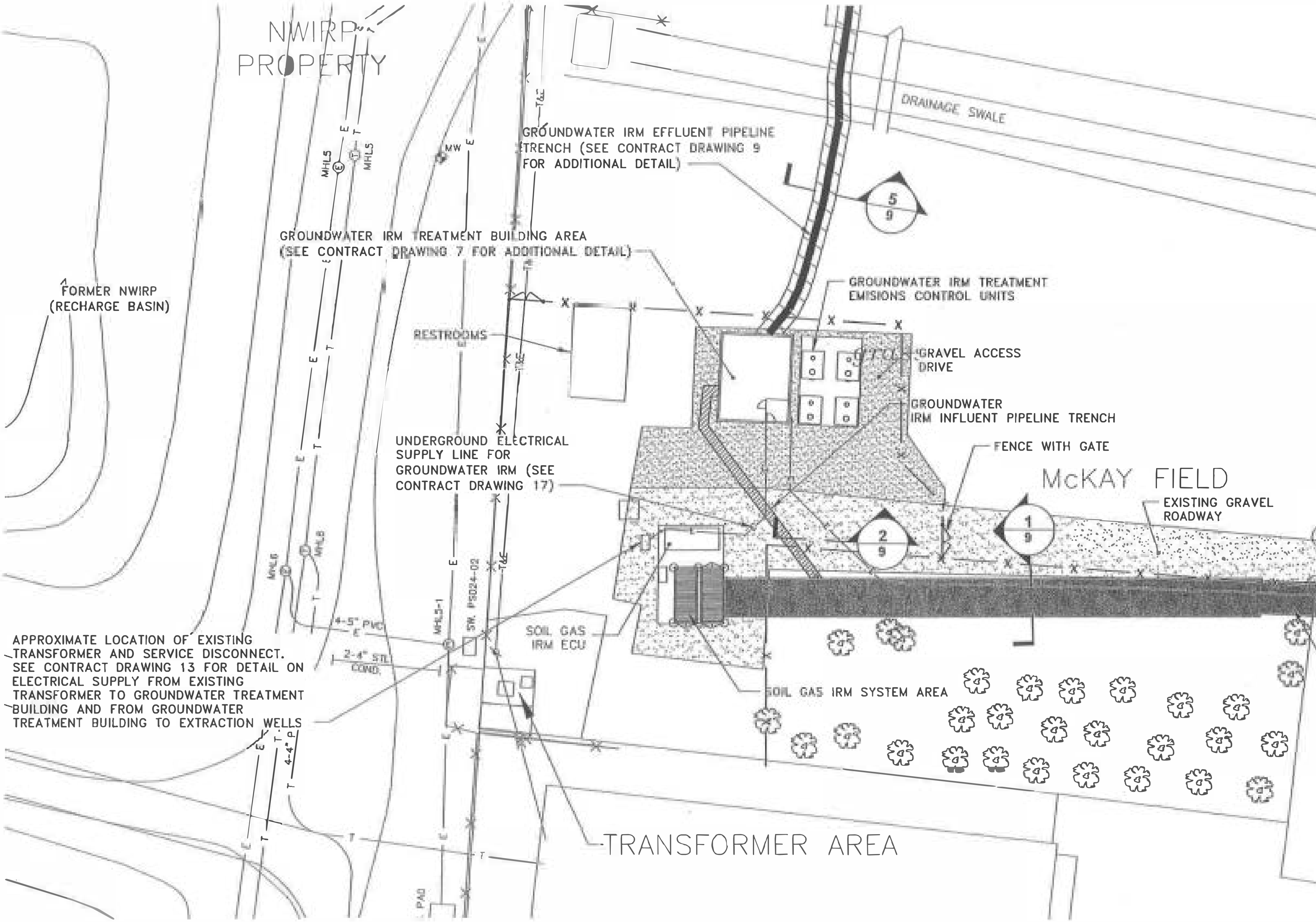
ARCADIS
ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

SITE PLAN

ARCADIS Project No. NY001464.1807.00003
Date: SEPTEMBER 2009
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315.446.9120

1



LEGEND:

— X —	PROPOSED FENCE
—X—	EXISTING FENCE
	EXISTING GRAVEL ROADWAY
	EXISTING SOIL AND GROUNDWATER PIPELINE TRENCH
	PROPOSED GRAVEL ROADWAY
	PROPOSED GROUNDWATER IRM PIPELINE TRENCH
IRM	INTERIM REMEDIAL MEASURE
NWIRP	NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
ECU	EMISSION CONTROL UNIT

NOTES:

1. ALL PROPOSED FENCES SHALL BE 6' HIGH GALVANIZED WIRE (2 x 9 GAUGE WITH 1⅝" TOP AND BOTTOM RAIL).
2. GATES SHALL BE 6'H x 12'W 00 GATES ON 3" TP (SCH 20).

XREFS: 01464X02 01464X01 01464X00 ACCESS RD_NAD83 IMAGES: BCP_Aerial.jpg

20' 0 20' 40'
1"=20'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 060827

State	Date Signed	Project Mgr.
NY		CSG
Designed by	Drawn by	Checked by
CDL	BKD	TEM

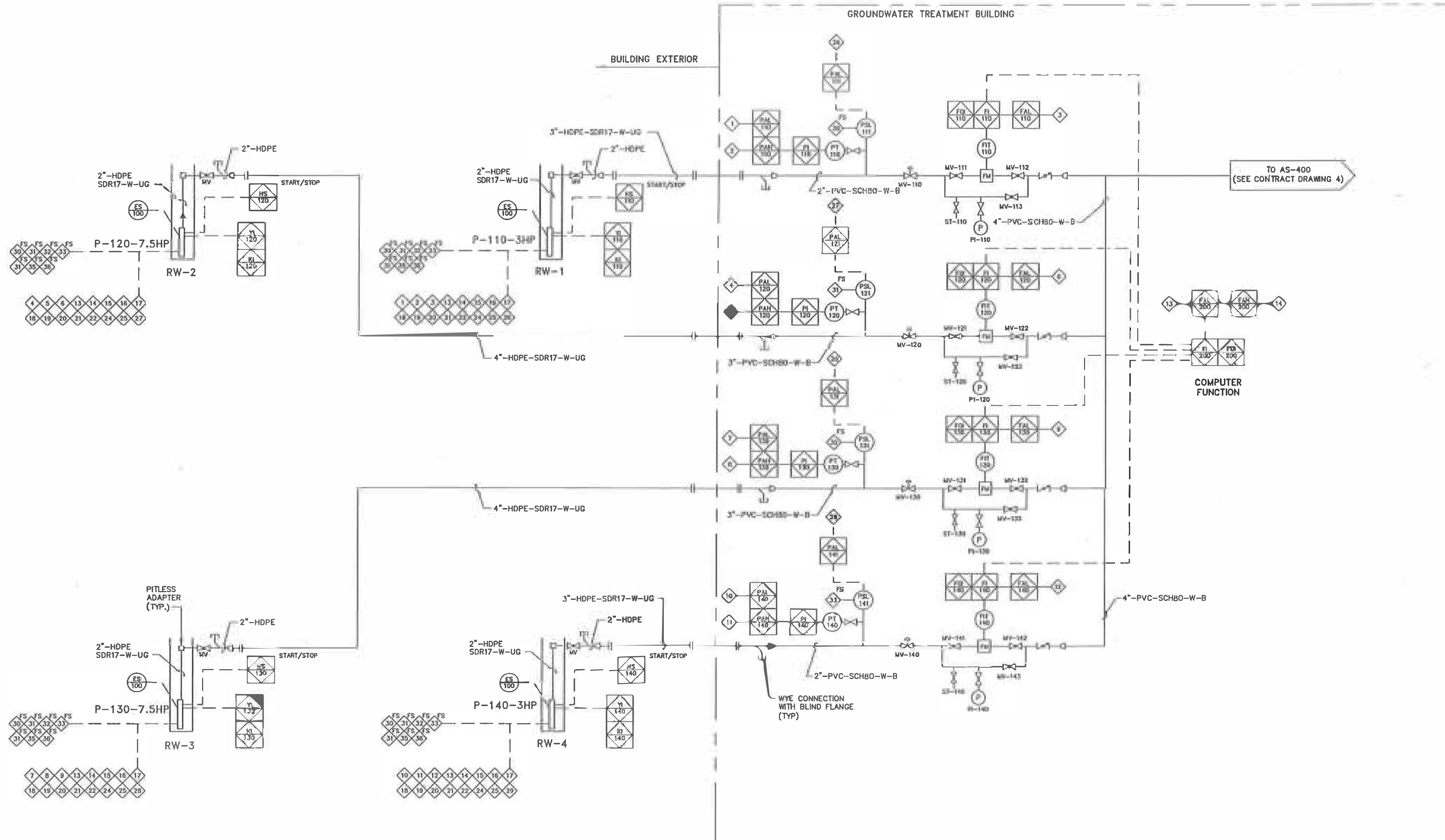
ARCADIS
ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

TREATMENT BUILDING AREA PLAN

ARCADIS Project No. NY001464.1807.00003
Date SEPTEMBER 2009
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315 446.9120

2



NOTE:

LEGEND, ABBREVIATIONS AND INTERLOCKS SHOWN ON CONTRACT DRAWING 6.

NOT TO SCALE		
THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING.		USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 080827
State: NY | Date Signed: | Project Mgr.: CSG
Designed by: CDL | Drawn by: KLS | Checked by: TEM

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

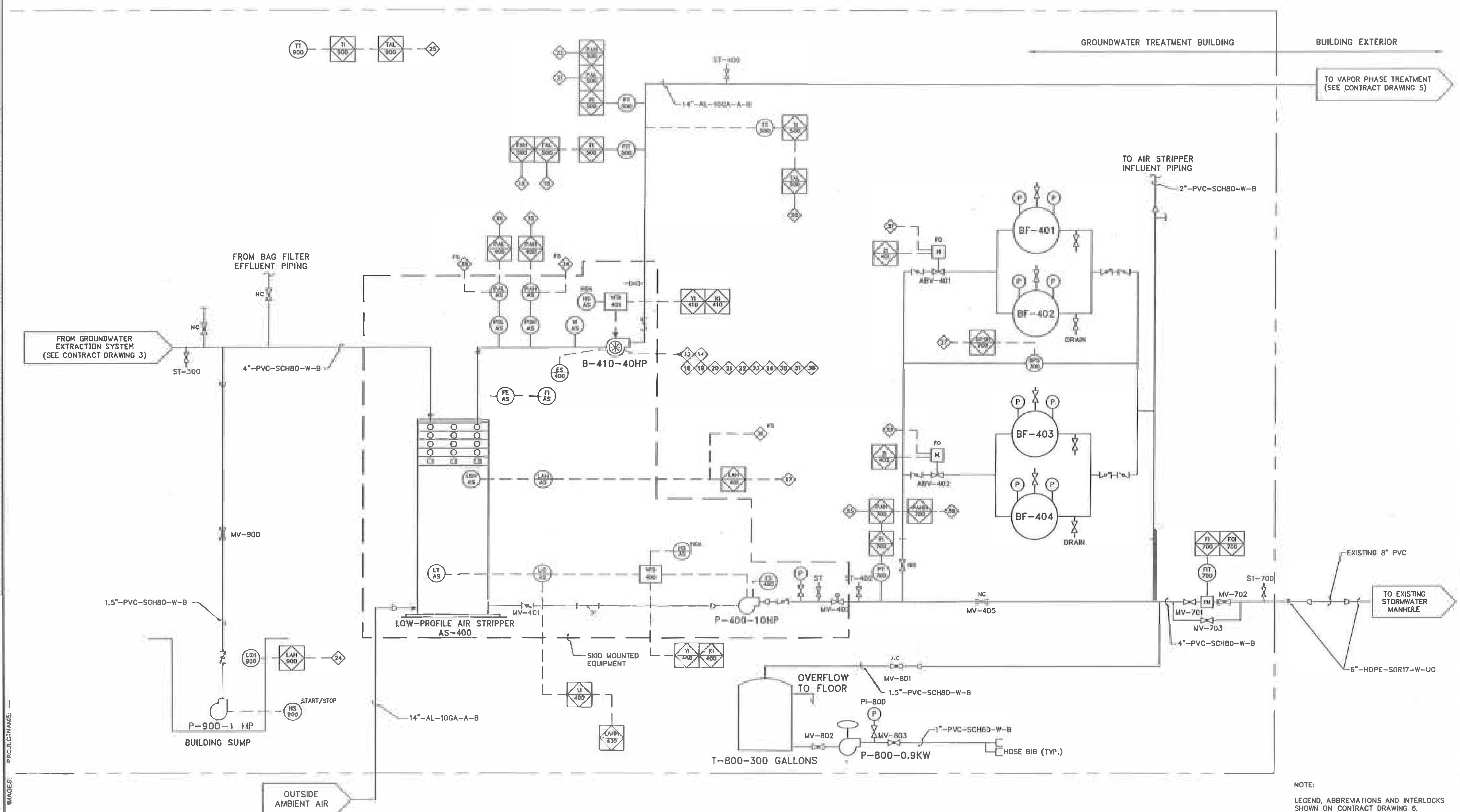
PIPING AND INSTRUMENTATION DIAGRAM #1

MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date SEPTEMBER 2009

ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315.446.9120

3



NOTE:

LEGEND, ABBREVIATIONS AND INTERLOCKS SHOWN ON CONTRACT DRAWING 6.

NOT TO SCALE	Professional Engineer's Name: WILLIAM S. WITTEK; Professional Engineer's No.: 080627; State: NY; Date Signed; Project Mgr.: CSG; Designed by: CDL; Drawn by: KLS; Checked by: TEM	ARCADIS OF NEW YORK, INC.
THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE	No. / Date / Revisions / By / Ckd	

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

ARCADIS

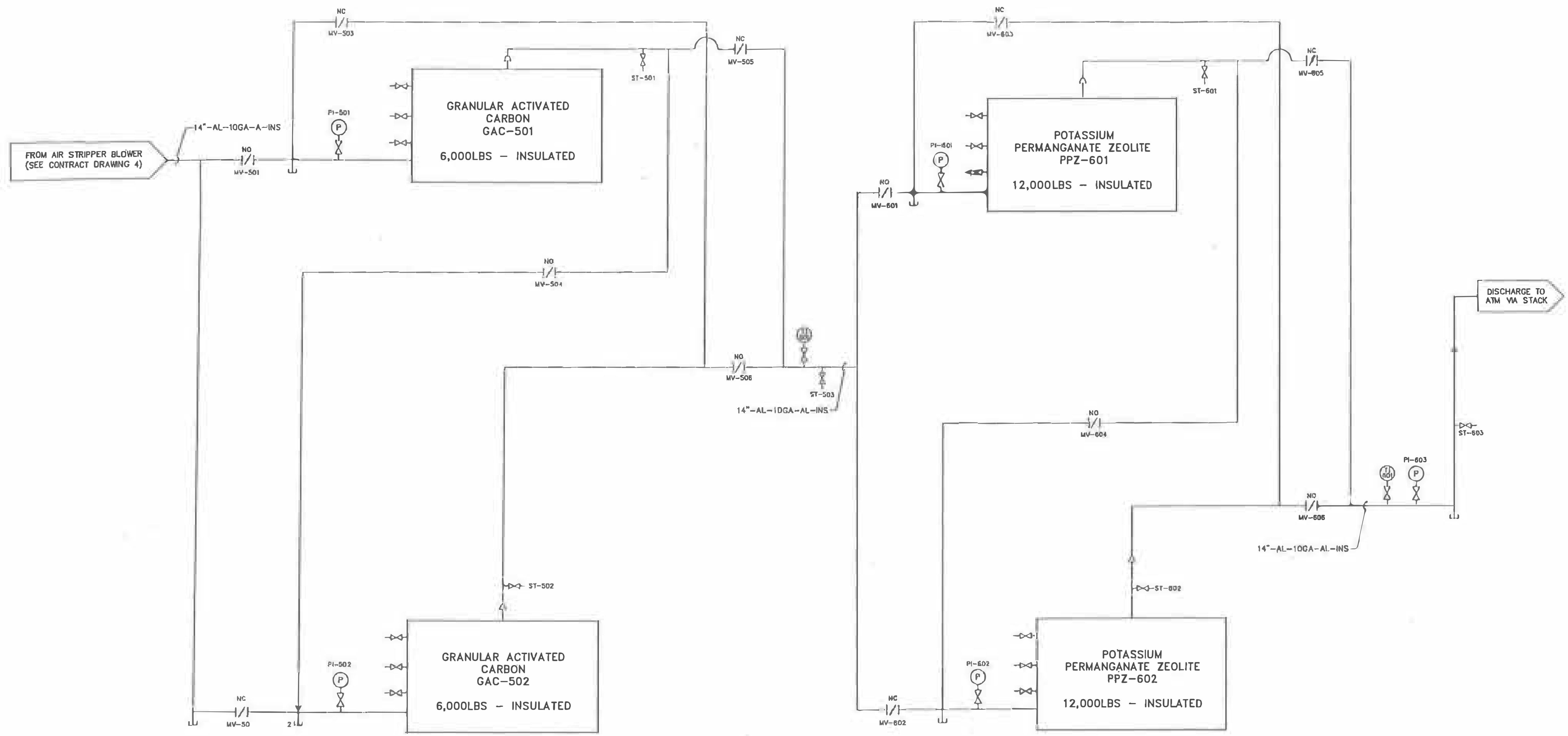
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

PIPING AND INSTRUMENTATION DIAGRAM #2

MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date: SEPTEMBER 2009
ARCADIS, 6723 Towpath Road, P.O. Box 66, Syracuse, NY 13214, Tel: 315.446.9120

4



NOTE:

LEGEND, ABBREVIATIONS AND INTERLOCKS SHOWN ON CONTRACT DRAWING 6.

NOT TO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 050827
State: NY
Designed by: CDL | Drawn by: KLS | Checked by: TEM | Project Mgr.: CSG

ARCADIS
ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

PIPING AND INSTRUMENTATION DIAGRAM #3

MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date SEPTEMBER 2009
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315.446.9120

5

EQUIPMENT LEGEND:

- PRIMARY PROCESS PIPING
- SECONDARY PROCESS PIPING
- EXISTING PROCESS PIPING
- INSTRUMENTATION SIGNAL
- SKID MOUNTED EQUIPMENT
- PLANT AIR
- SAMPLE TAP
- PRESSURE GAUGE
- GLOBE VALVE
- BALL VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- AIR PRESSURE REGULATOR/FILTER
- COUPLER
- REDUCER
- SPOOL PIECE DAMPER
- WYE CONNECTION WITH BLIND FLANGE
- LOCAL, FIELD MOUNT
- LOCAL CONTROL PANEL (AIR STRIPPER)
- MAIN PLC CONTROLLER
- MAIN PLC INTERLOCK
- SECONDARY FAIL-SAFE INTERLOCK
- CENTRIFUGAL PUMP
- BLOWER
- METERING PUMP
- SUBMERSIBLE WELL PUMP
- HOSE BIB
- BOOSTER PUMP

ABBREVIATIONS:

A	AIR	LE	LEVEL ELEMENT
ABV	ACTIVATED BLOCK VALVE	LI	LEVEL INDICATOR
AL	ALUMINUM	LIC	LEVEL INDICATING CONTROLLER
AS	AIR STRIPPER	LSH	LEVEL SWITCH HIGH
BF	BAG FILTER	LSL	LEVEL SWITCH LOW
ø	DIAMETER	LT	LEVEL TRANSMITTER
DPSH	DIFFERENTIAL PRESSURE SWITCH HIGH	MV	MANUAL VALVE
ES	EMERGENCY STOP	NC	NORMALLY CLOSED
FAH	FLOW ALARM HIGH	NO	NORMALLY OPEN
FAL	FLOW ALARM LOW	PAH	PRESSURE ALARM HIGH
FE	FLOW ELEMENT	PAL	PRESSURE ALARM LOW
FI	FLOW INDICATOR	PT	PRESSURE TRANSMITTER
FIT	FLOW INDICATING TRANSMITTER	PI	PRESSURE INDICATOR
FM	FLOW METER	PLC	PROGRAMMABLE LOGIC CONTROLLER
FO	FAIL OPEN	PPZ	POTASSIUM PERMANANATE ZEOLITE
FP	FLOOR PENETRATION	PSL	PRESSURE SWITCH LOW
FOI	TOTALIZED FLOW INDICATOR	PSH	PRESSURE SWITCH HIGH
GAC	VAPOR-PHASE GRANULAR ACTIVATED CARBON	PVC	POLYVINYL CHLORIDE
GA	GAUGE HIGH DENSITY	SCH	SCHEDULE
HDPE	POLYETHYLENE	SDR	STANDARD DIMENSION RATIO
HOA	HAND-OFF-AUTO	TAL	TEMPERATURE ALARM LOW
HP	HORSEPOWER	TI	TEMPERATURE INDICATOR
HS	HAND SWITCH	TT	TEMPERATURE INDICATING TRANSMITTER
INS	INSULATED	TYP	TYPICAL
KI	PUMP RUN TIME INDICATOR	RW	RECOVERY WELL
KW	KILOWATT	UG	UNDERGROUND
LAH	LEVEL ALARM HIGH	VFD	VARIABLE FREQUENCY DRIVE
LAHH	LEVEL ALARM HIGH-HIGH	W	WATER
LAL	LEVEL ALARM LOW	YI	RUN INDICATION
LALL	LEVEL ALARM LOW-LOW	ZI	POSITION INDICATOR

PLC INPUT/OUTPUT SCHEDULE:

ANALOG INPUTS:

1. PT-110
2. PT-12D
3. PT-130
4. PT-140
5. FIT-110
6. FIT-120
7. FIT-130
8. FIT-140
9. LI-400
10. FIT-500
11. PT-500
12. TT-500
13. PT-700
14. FIT-700
15. TT-900

DISCRETE INPUTS:

1. YI-110
2. YI-120
3. YI-130
4. YI-140
5. KI-11D
6. KI-120
7. KI-13D
8. KI-140
9. KI-400
10. KI-410
11. PSL-111
12. PSL-121
13. PSL-131
14. PSL-141
15. PAH-400
16. PAL-400
17. LAH-400
18. YI-400
19. YI-410
20. LSH-900
21. DPSH-700
22. ZI-401
23. ZI-402
24. ES-100
25. ES-400

DISCRETE OUTPUTS:

1. P-110 SHUTDOWN
2. P-120 SHUTDOWN
3. P-130 SHUTDOWN
4. P-140 SHUTDOWN
5. AIR STRIPPER SHUTOOWN
6. P-900 ON/OFF
7. AUTODIALER
8. AUTODIALER
9. AUTODIALER
10. AUTODIALER

PIPE IDENTIFICATION TAGS:

DIAMETER – SERVICE – SCHEDULE – MATERIAL – OTHER

DIAMETER: NOMINAL DIAMETER (INCHES)

SERVICE:
A = AIR
W = WATER

SCHEDULE = US STANDARD UNITS

MATERIAL:
AL = ALUMINUM
HDPE = HIGH DENSITY POLYETHYLENE
PVC = POLYVINYL CHLORIDE

OTHER:
B = BARE
INS = INSULATED
UG = UNDERGROUND

MAIN PLC INTERLOCK SCHEDULE:

1. LOW PRESSURE IN P-110 INFLUENT LINE (PAL-110), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
2. HIGH PRESSURE IN P-110 INFLUENT LINE (PAH-11D), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
3. LOW FLOW IN P-110 INFLUENT LINE (FAL-11D), SHUT DOWN P-110, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
4. LOW PRESSURE IN P-120 INFLUENT LINE (PAL-120), SHUT DOWN P-12D, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
5. HIGH PRESSURE IN P-120 INFLUENT LINE (PAH-120), SHUT DOWN P-120, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
6. LOW FLOW IN P-120 INFLUENT LINE (FAL-120), SHUT DOWN P-120, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
7. LOW PRESSURE IN P-130 INFLUENT LINE (PAL-130). SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
8. HIGH PRESSURE IN P-13D INFLUENT LINE (PAH-130), SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
9. LOW FLOW IN P-130 INFLUENT LINE (FAL-130), SHUT DOWN P-130, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
10. LOW PRESSURE IN P-14D INFLUENT LINE (PAL-140). SHUT DOWN P-140, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
11. HIGH PRESSURE IN P-140 INFLUENT LINE (PAH-140), SHUT DOWN P-14D, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
12. LOW FLOW IN P-140 INFLUENT LINE (FAL-14D), SHUT DOWN P-140, SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
13. LOW FLOW AT COMBINED AIR STRIPPER INFLUENT LINE (FAL-200), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER
14. HIGH FLOW AT COMBINED AIR STRIPPER INFLUENT LINE (FAH-2D0), SHUT DOWN EXTRACTION WELL PUMPS. SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
15. HIGH PRESSURE AT AIR STRIPPER (PAH-400), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
16. LOW PRESSURE AT AIR STRIPPER (PAL-400), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
17. HIGH SUMP LEVEL AT AIR STRIPPER (LAH-400), SHUT DOWN EXTRACTION WELL PUMPS. SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER WILL BE SHUT DOWN LOCALLY BY AIR STRIPPER CONTROL PANEL ON A 5 MINUTE DELAY.
18. LOW AIR FLOW AT AIR STRIPPER BLOWER DISCHARGE LINE (FAL-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
19. HIGH AIR FLOW AT AIR STRIPPER BLOWER DISCHARGE LINE (FAH-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) . SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
20. LOW AIR TEMPERATURE AT AIR STRIPPER BLOWER DISCHARGE (TAL-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) , SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
21. LOW AIR PRESSURE AT AIR STRIPPER BLOWER DISCHARGE LINE (PAL-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
22. HIGH AIR PRESSURE AT AIR STRIPPER BLOWER DISCHARGE LINE (PAH-500), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) , SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
23. HIGH PRESSURE AT AIR STRIPPER PUMP DISCHARGE LINE (PAHH-70D). SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
24. HIGH LEVEL AT BUILDING SUMP (LAH-900), SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY) , SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.
25. LOW AIR TEMPERATURE AT BUILDING (TAH-900), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
26. LOW PRESSURE IN P-110 INFLUENT LINE (PAL-111), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
27. LOW PRESSURE IN P-120 INFLUENT LINE (PAL-121), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
28. LOW PRESSURE IN P-13D INFLUENT LINE (PAL-131), SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
29. LOW PRESSURE IN P-140 INFLUENT LINE (PAL-141). SIGNAL ALARM AT PLC AND ACTIVATE AUTODIALER.
37. HIGH DIFFERENTIAL PRESSURE AT BAG FILTERS (DPSH-700), OPEN SECONDARY VALVE (MBV-402 OR MBV-401) AND CLOSE PRIMARY VALVE (MBV-401 OR MBV-402). PRIMARY AND SECONDARY VALVE DESIGNATION SHALL ALTERNATE AFTER OPERATOR ACKNOWLEDGES THAT PRIMARY BAG FILTERS HAVE BEEN CHANGED.
38. IN THE EVENT THAT ALL WELL PUMPS ARE SHUT DOWN BY PLC, AIR STRIPPER SYSTEM SHALL BE SHUT DOWN.
39. HIGH-HIGH PRESSURE AT AIR STRIPPER PUMP DISCHARGE LINE (PAHH-700). SHUT DOWN EXTRACTION WELL PUMPS, SHUT DOWN AIR STRIPPER SYSTEM (5 MINUTE DELAY), SIGNAL ALARM AT PLC, AND ACTIVATE AUTODIALER. AIR STRIPPER SHUT DOWN DELAY WILL BE CONTROLLED BY AIR STRIPPER LOCAL CONTROL PANEL.

SECONDARY FAIL-SAFE INTERLOCK SCHEDULE:

30. LOW PRESSURE SWITCH (PSL-111) IN P-11D ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
31. LOW PRESSURE SWITCH (PSL-121) IN P-120 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
32. LOW PRESSURE SWITCH (PSL-131) IN P-130 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
33. LOW PRESSURE SWITCH (PSL-141) IN P-140 ACTIVATED (DE-ENERGIZED), SHUT DOWN WELL PUMPS.
34. HIGH PRESSURE SWITCH (PSH-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.
35. LOW PRESSURE SWITCH (PSL-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.
36. HIGH LEVEL SWITCH (LSH-AS) AT AIR STRIPPER ACTIVATED, SHUT DOWN WELL PUMPS.

AIR STRIPPER LOCAL CONTROL PANEL INTERLOCK SCHEDULE:

1. HIGH PRESSURE AT AIR STRIPPER (PSH-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
2. LOW PRESSURE AT AIR STRIPPER (PSL-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
3. HIGH SUMP LEVEL AT AIR STRIPPER (LSH-AS), SIGNAL DRY CONTACT FOR EXTERNAL SHUT DOWN/INDICATION, SIGNAL LOCAL PANEL ALARM LIGHT, AND SHUT DOWN AIR STRIPPER BLOWER (5 MINUTE DELAY).
4. AIR STRIPPER DISCHARGE PUMP SPEED WILL BE CONTROLLED BY VFD BASED ON AIR STRIPPER SUMP LEVEL SET POINT.

NOT TO SCALE

Professional Engineer's Name: WILLIAM S. WITTEK

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

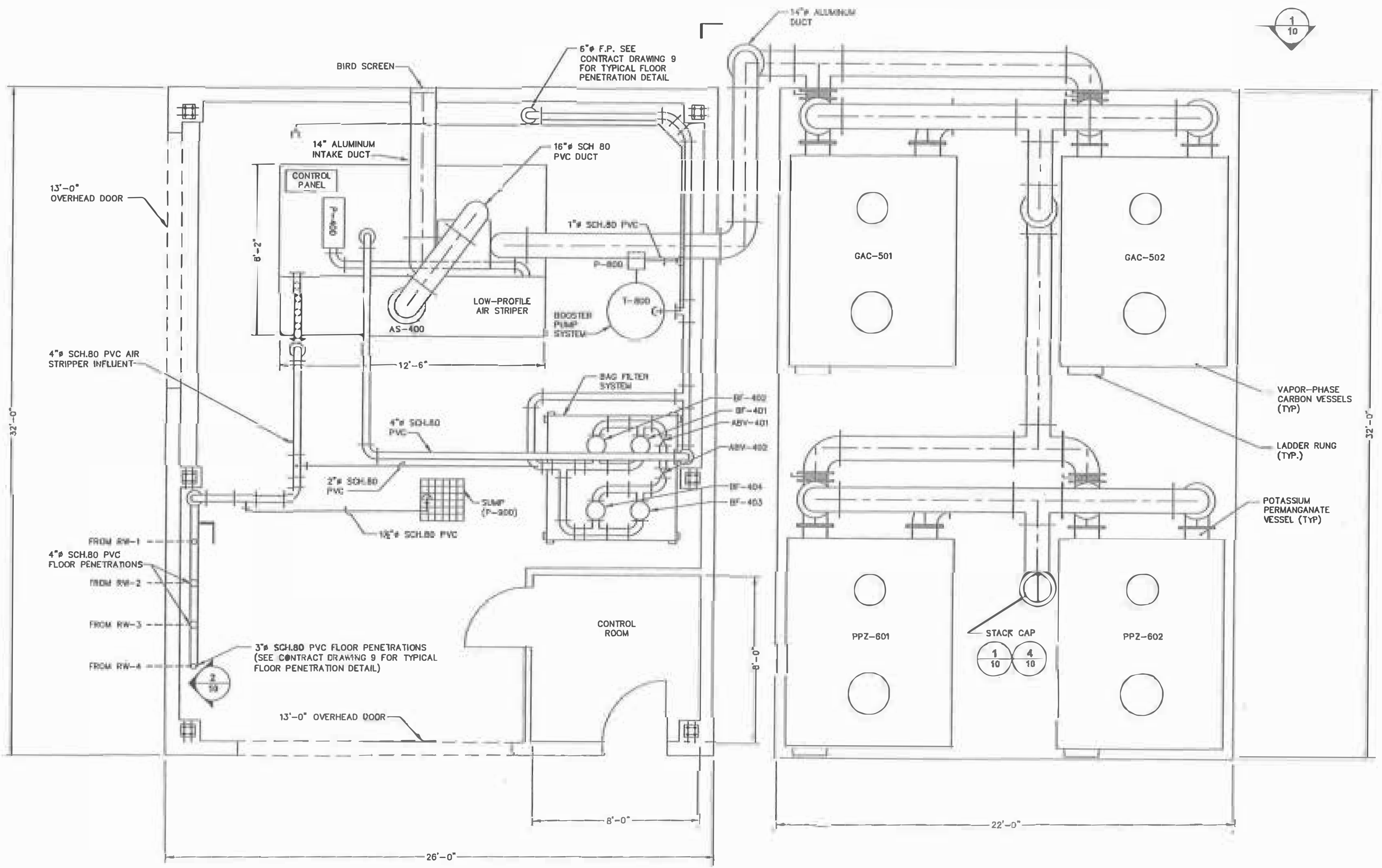
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

LEGEND, ABBREVIATIONS AND INTERLOCKS

MECHANICAL

Date: SEPTEMBER 2009

6



NOTES:

1. REFER TO CONTRACT DRAWINGS 9 AND 10 FOR MISCELLANEOUS SECTIONS AND DETAILS.
2. REFER TO CONTRACT DRAWING 15 FOR EQUIPMENT POWER, LIGHTING, HVAC AND GROUNDING PLAN.
3. REFER TO CONTRACT DRAWING 16 FOR INSTRUMENTATION PLAN.
4. REFER TO CONTRACT DRAWINGS 18 THROUGH 21 FOR FOUNDATION AND BUILDING DETAILS AND SPECIFICATIONS.
5. REFER TO CONTRACT DRAWINGS 3, 4, AND 5 FOR VALVE, SAMPLE TAP, PRESSURE GAUGE, AND TEMPERATURE GAUGE LOCATIONS.
6. REFER TO CONTRACT DRAWING 6 FOR LEGEND AND ABBREVIATIONS.
7. REFER TO CONTRACT DRAWING 11 FOR EQUIPMENT, INSTRUMENT, AND MECHANICAL SPECIFICATIONS.

3/8"=1'-0"

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 080827
State: NY | Date Signed | Project Mgr.: CSG
Designed by: CDL | Drawn by | Checked by: TEH

ARCADIS

ARCADIS OF NEW YORK, INC.

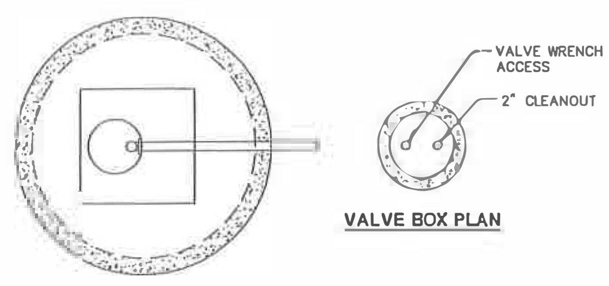
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT LAYOUT

MECHANICAL

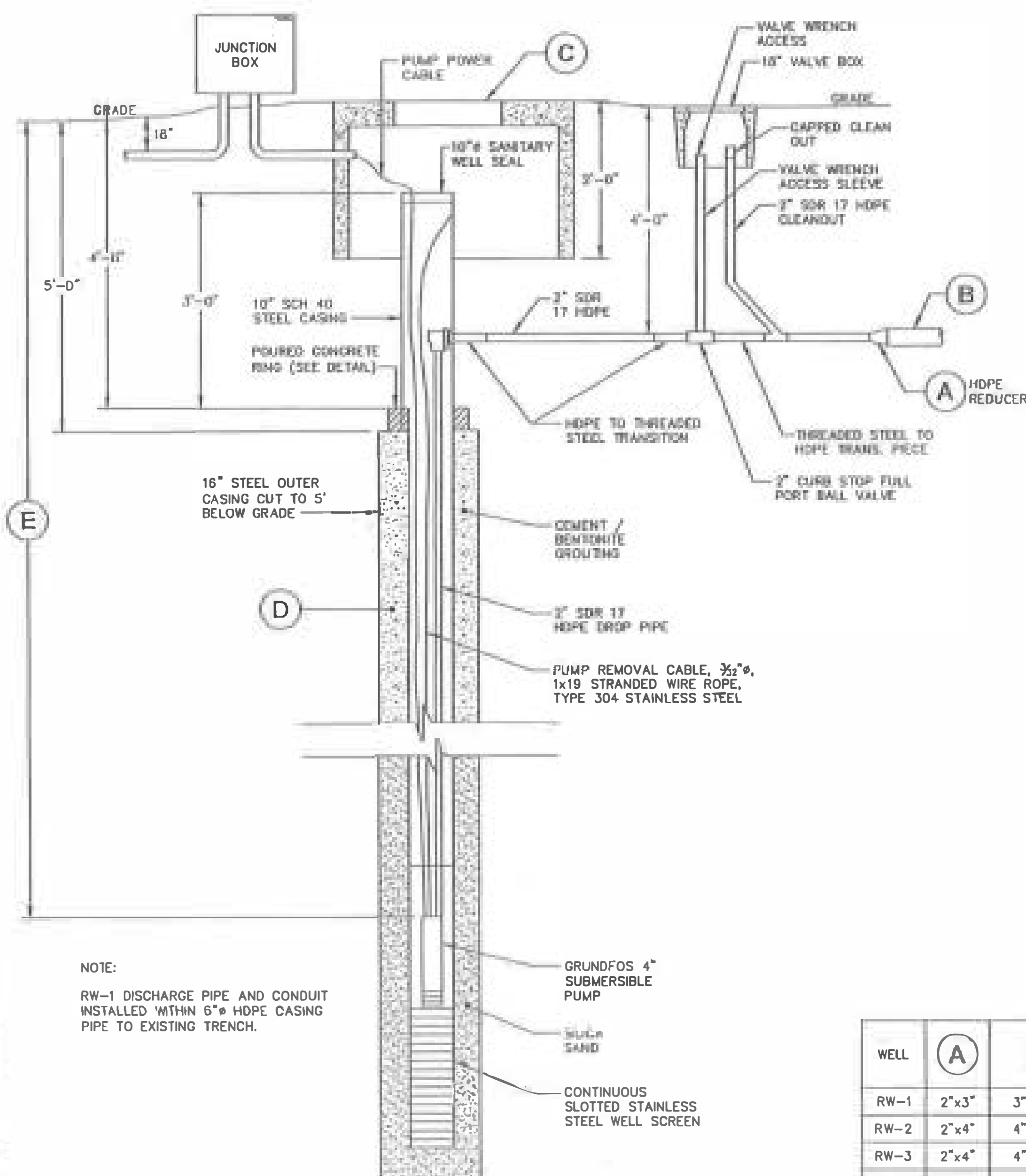
ARCADIS Project No. NY001464.1807.00003
Date: SEPTEMBER 2009
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel. 315.446.9120

7



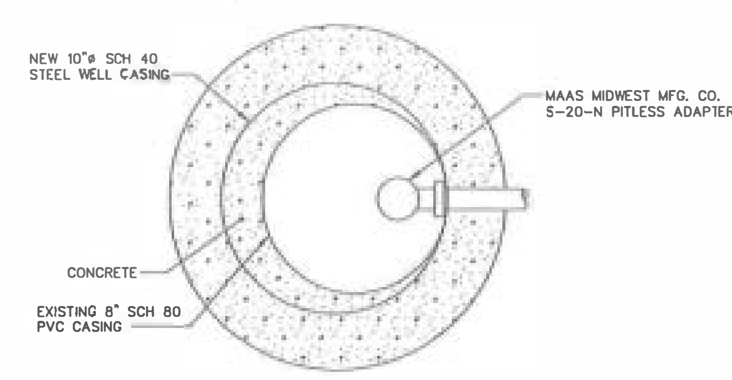
WELL VAULT PLAN

VALVE BOX PLAN

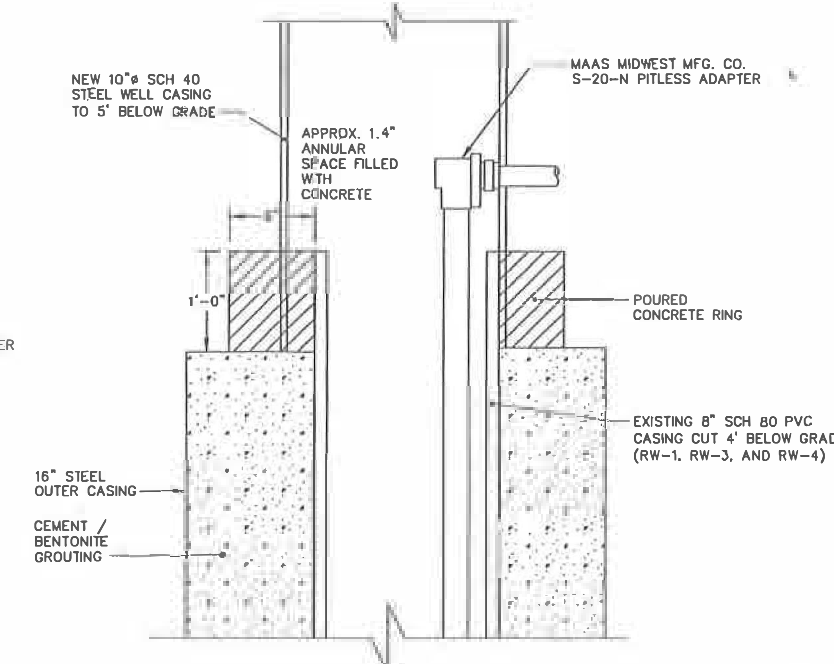


NOTE:

RW-1 DISCHARGE PIPE AND CONDUIT INSTALLED WITHIN 6"ø HDPE CASING PIPE TO EXISTING TRENCH.



CASING OVERLAP PLAN

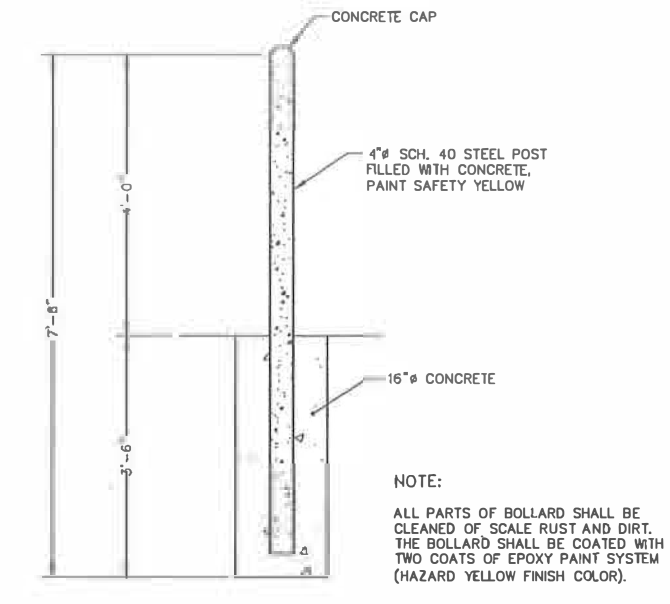


NOTE:

FOR RW-2, EXISTING CASING PIPE IS 6-INCH SCH 40 CARBON STEEL AND THEREFORE WAS NOT ALTERED AS SHOWN ABOVE. PITLESS ADAPTER WAS INSTALLED DIRECTLY ON 6-INCH SCH 40 CARBON STEEL CASING PIPE FOR RW-2.

PITLESS ADAPTER INSTALLATION DETAIL

NOT TO SCALE

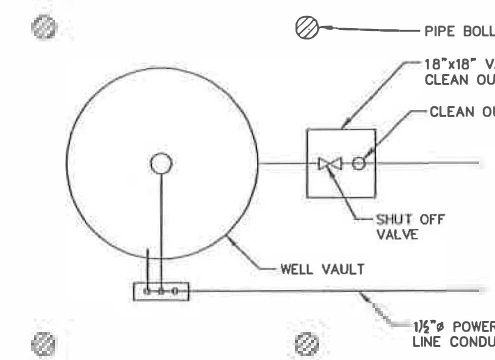


NOTE:

ALL PARTS OF BOLLARD SHALL BE CLEANED OF SCALE RUST AND DIRT. THE BOLLARD SHALL BE COATED WITH TWO COATS OF EPOXY PAINT SYSTEM (HAZARD YELLOW FINISH COLOR).

TYPICAL BOLLARD DETAIL

SCALE: 3/4"=1'-0"



PLAN

NOTE:

PVC CASING PIPE CONDUIT FOR RW-1 JOINS PVC WELL POWER CONDUIT AT ELECTRICAL HAND HOLE.

WELL VAULT WITH BOLLARDS

NOT TO SCALE

WELL	(A)	(B)	(C)	(D)	(E)	GRADE ELEVATION (US ft.)
RW-1	2"x3"	3" SDR 17	H-20	8" SCH 80 PVC	80	126.72
RW-2	2"x4"	4" SDR 17	H-10	6" SCH 40 STEEL	82	126.23
RW-3	2"x4"	4" SDR 17	H-10	8" SCH 80 PVC	80	124.82
RW-4	2"x3"	3" SDR 17	H-10	8" SCH 80 PVC	80	123.36

WELL INSTALLATION PROCEDURE:

1. EXCAVATE TO 5' BELOW GRADE AROUND WELL CASING TO PRODUCE AND 8' WIDE BY 8' LONG BY 5' DEEP EXCAVATION AT RW-1 AND RW-4. EXCAVATE TO 5' BELOW GRADE AROUND WELL CASING TO PRODUCE A 10' WIDE BY 10' LONG BY 5' DEEP EXCAVATION AT RW-3.
2. CUT 3 ⅝" HOLE IN 3' LENGTH OF 10" STEEL CASING.
3. CUT 8" PVC CASING SO TOP OF CASING HEIGHT IS 4' BELOW GRADE.
4. POUR CONCRETE RING AROUND 8" PVC CASING.
5. ATTACH PITLESS ADAPTER TO 10" STEEL CASING.
6. SET 10" STEEL CASING INTO CONCRETE WITH ANNULAR SPACE AS SHOWN ON DRAWING AND WITH 3 ⅝" HOLE FACING DESIRED DISCHARGE DIRECTION.
7. CONNECT EXISTING 3"ø (OR 4"ø) HDPE PIPE TO PITLESS ADAPTER USING 3"ø HDPE PIPE WITH 3"ø MALE NPT END.
8. BACKFILL EXCAVATION TO DEPTH OF 2½' BELOW GRADE (BED HDPE PIPE IN SAND OR PEA GRAVEL PRIOR TO BACKFILL).
9. SET 4'ø CONCRETE MANHOLE WELL ENCLOSURE.
10. INSTALL CONDUIT TO INSIDE OF MANHOLE ENCLOSURE AND ATTACH JUNCTION BOX TO MANHOLE INTERIOR.
11. PULL PUMP POWER WIRING TO MANHOLE VIA NEW CONDUIT.
12. PREPARE PUMP BY ATTACHING THE APPROPRIATE LENGTH OF 2"ø HDPE PIPE (OUT FITTED WITH THE INTERNAL COMPONENT OF THE PITLESS ADAPTER) THE APPROPRIATE LENGTH OF 3/32" ø SUPPORT CABLE AND THE APPROPRIATE LENGTH OF ELECTRICAL POWER CABLES.
13. TEMPORARILY CONNECT POWER TO PUMP AND BUMP PUMP TO CHECK FOR PROPER ROTATION. MARK WIRES TO NOTE PROPER CONNECTIONS. AND THEN DISCONNECT TEMPORARY ELECTRICAL CONNECTION TO THE PUMP.
14. INSTALL THE WELL PUMP TO THE APPROPRIATE DEPTH
15. SECURE 3/32" SUPPORT CABLE TO EYE HOOK INSTALLED IN THE UPPER WELL CASING ABOVE THE PITLESS ADAPTER.
16. THREAD PUMP POWER CABLES THROUGH WELL SEAL AND INSTALL WELL SEAL.
17. MAKE ELECTRICAL CONNECTIONS TO PROVIDE POWER TO PUMP.
18. PLACE COVER ON MANHOLE WELL ENCLOSURE.
19. BACKFILL AND COMPACT AREA AROUND MANHOLE WELL ENCLOSURE.
20. RESTORE ANY DISTURBED SURFACES TO ORIGINAL CONDITION.

SCALE AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 080827
State: NY | Date Signed: | Project Mgr.: CSG
Designed by: CDL | Drawn by: | Checked by: TEM

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

WELL DETAIL

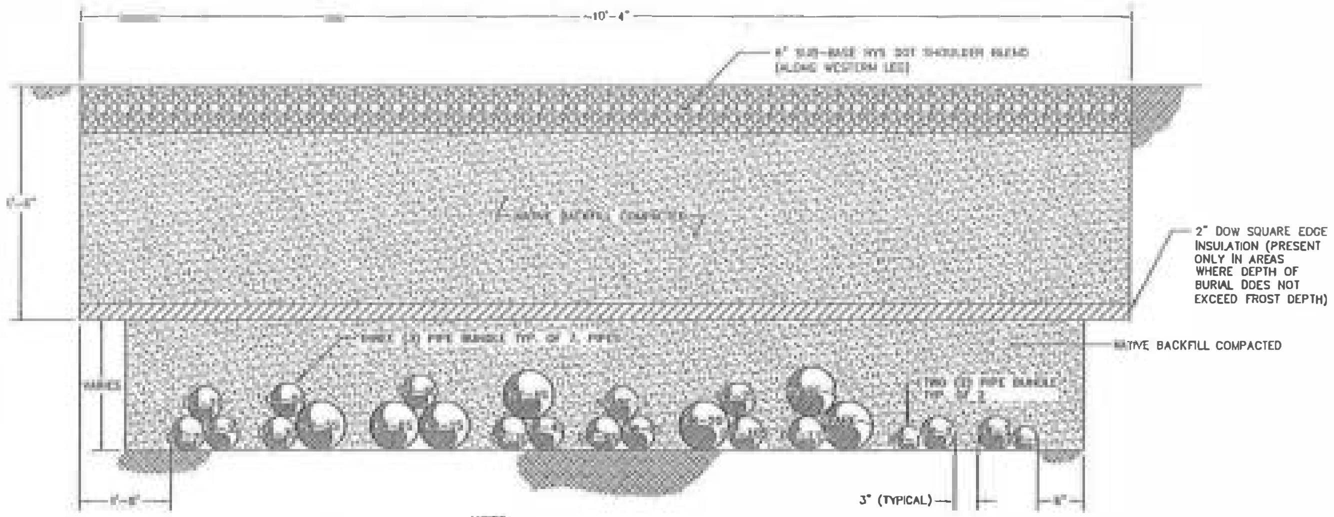
MECHANICAL

ARCADIS Project No. NY001464.1807.00003

Date SEPTEMBER 2009

ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315.446.9120

8

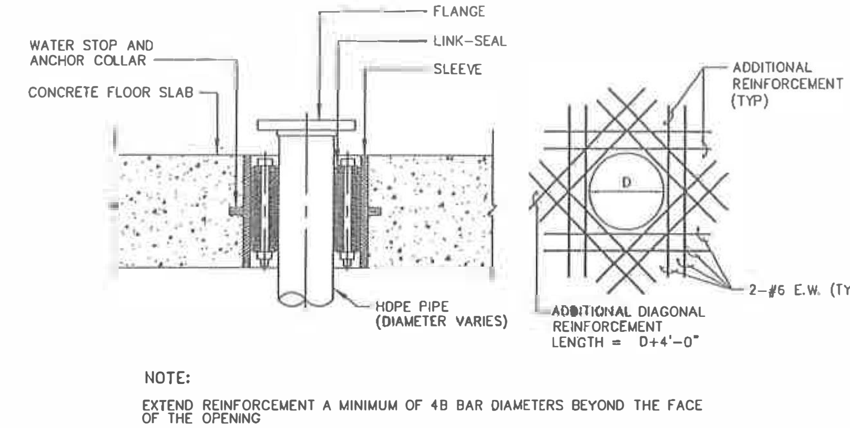


NOTE:

DEPTH OF TRENCH VARIES FROM 2'-6" TO 5'-0".

EXISTING TRENCH DETAIL (1)

NOT TO SCALE

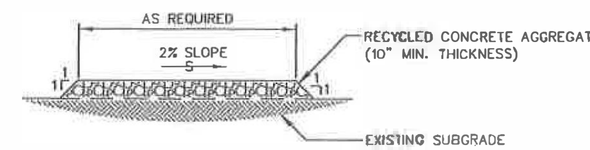


NOTE:

EXTEND REINFORCEMENT A MINIMUM OF 48 BAR DIAMETERS BEYOND THE FACE OF THE OPENING

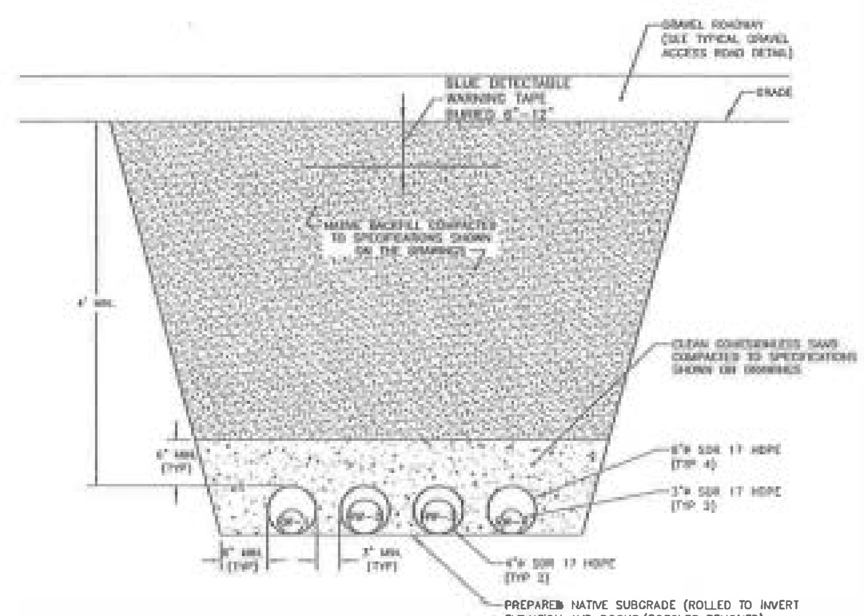
TYPICAL FLOOR SLAB PENETRATION (3)

NOT TO SCALE



TYPICAL GRAVEL ACCESS ROAD DETAIL (4)

NOT TO SCALE

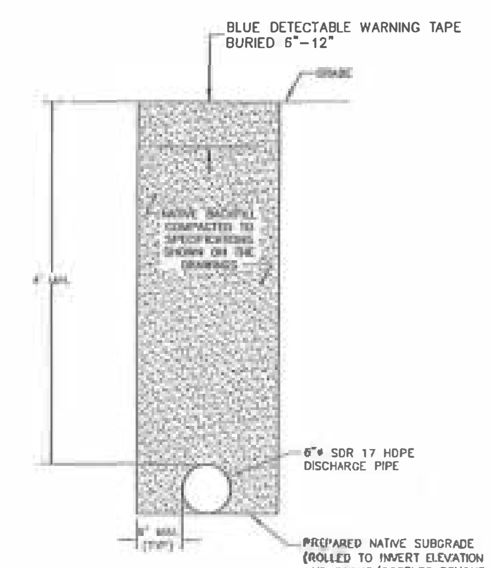


NOTE:

1. GRAVEL ROADWAY TO BE RESTORED TO ORIGINAL CONDITIONS.
2. BACKFILL COMPACTED TO 99% STANDARD PROCTOR DENSITY.

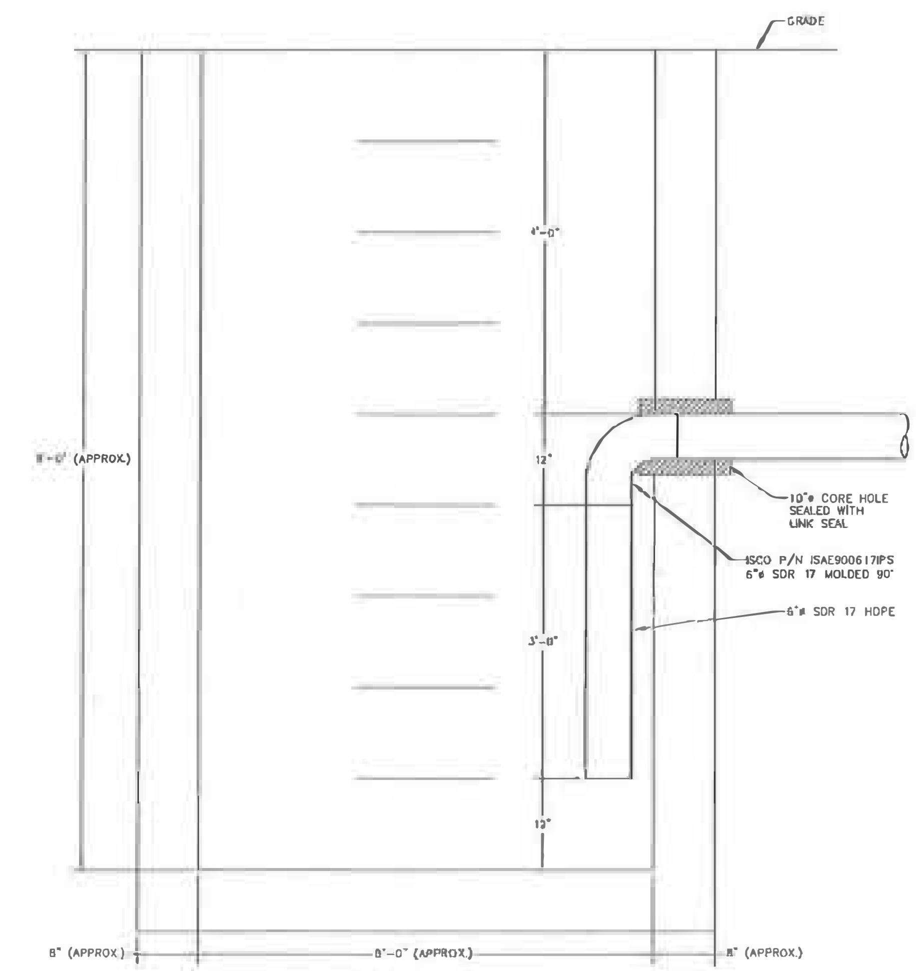
TRENCH DETAIL AT GRAVEL ROADWAY CROSSING (2)

NOT TO SCALE



DISCHARGE PIPE TRENCH DETAIL

NOT TO SCALE



MANHOLE CONNECTION DETAIL (6)

NOT TO SCALE

Professional Engineer's Name	WILLIAM B. WITTEK
Designed by	CDL
Checked by	TEM

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

ARCADIS

ARCADIS OF NEWYORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

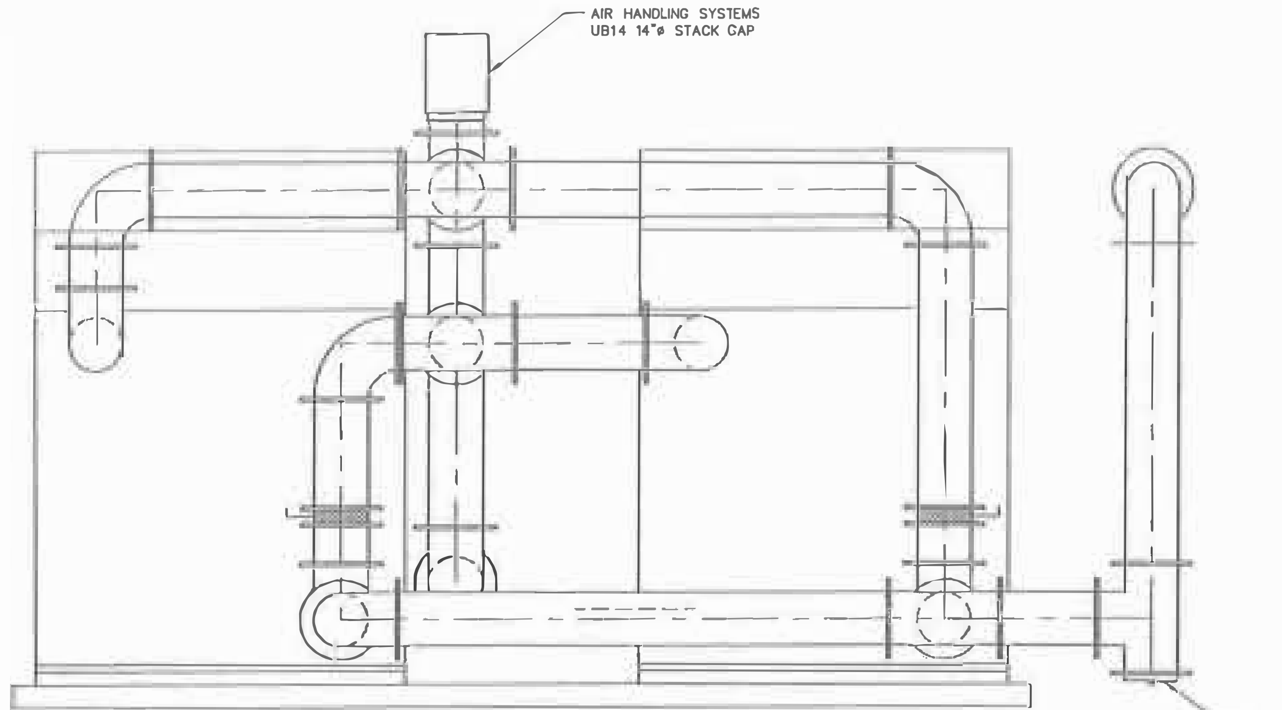
MISCELLANEOUS SECTIONS AND DETAILS

ARCADIS Project No. NY001464.1807.00003

Date SEPTEMBER 2009

ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel: 315.446.9120

9

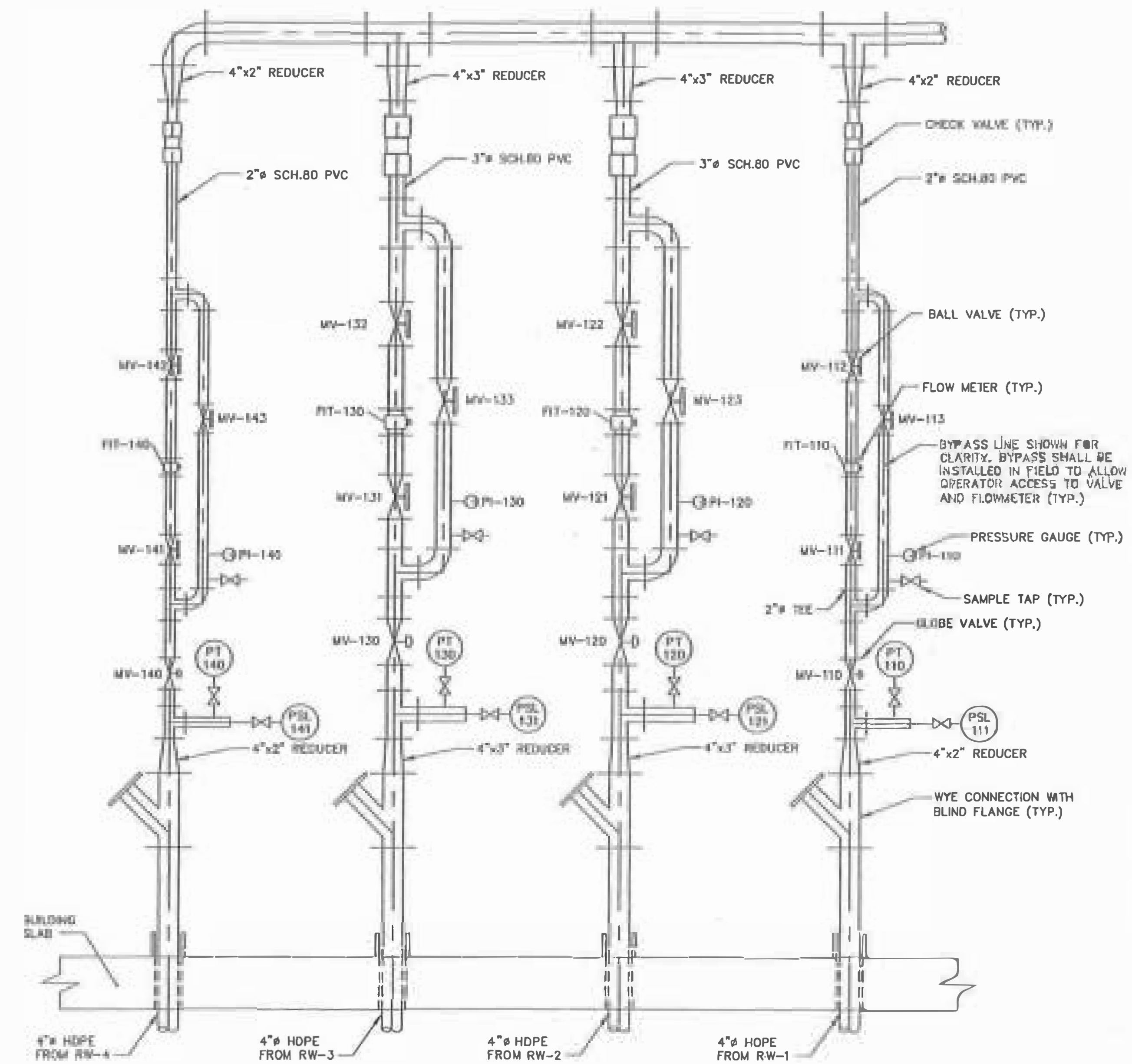


NOTE:

1. ALL DUCTING WILL BE INSULATED WITH TRYMER 2000 FOAM INSULATION NOT SHOWN ON THIS DETAIL FOR CLARITY. SEE CONTRACT DRAWING 11 FOR SPECIFICATIONS.
2. ECU'S SHALL BE INSULATED.

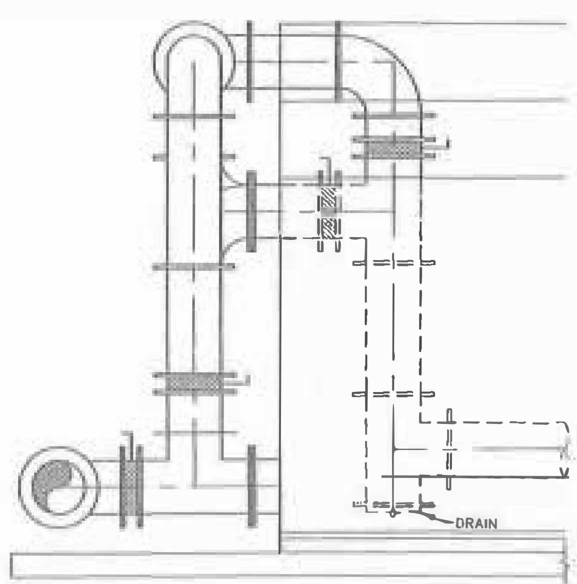
DUCT PROFILE (1)

SCALE: 1/2"=1'-0"



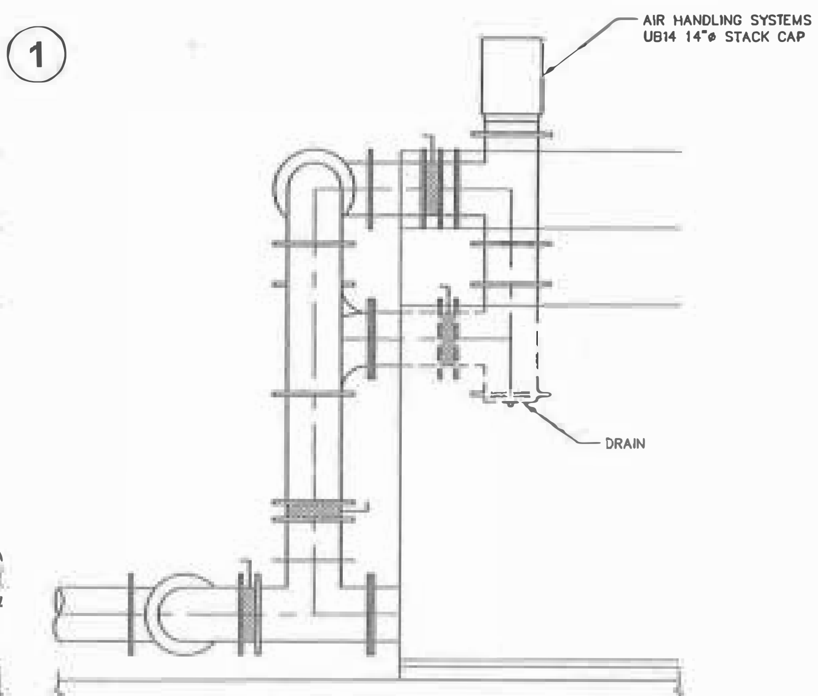
INFLUENT PIPE PROFILE (2)

SCALE: 3/4"=1'-0"



GAC VESSEL VIEW (3)

SCALE: 1/2"=1'-0"



PPZ VESSEL DUCTING AND STACK VIEW (4)

SCALE: 1/2"=1'-0"

SCALE(S) AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 080827
State: NY | Date Signed | Project Mgr.: CBG
Designed by: CDL | Drawn by: BKD | Checked by: TEH

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

MISCELLANEOUS SECTIONS AND DETAILS

MECHANICAL

ARCADIS Project No. NY001464.1807.00003
Date: SEPTEMBER 2009
ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel. 315.446.9120

10

INSTRUMENT SPECIFICATIONS:

1. FLOWMETERS SHALL BE 2-INCH (FIT-110, -140), 3-INCH (FIT-120, -130) or 4-INCH (FIT-700) MAGNETOFLOW BADGER MAGNETIC WAFER-STYLE FLOWMETERS OR EQUAL WITH LINER SUITABLE FOR WATER SERVICE, 316 SS ELECTRODES, GROUNDING RINGS, AND INTEGRAL MOUNT ELECTRONICS WITH LOCAL RATE AND TOTAL DISPLAY.
2. LIQUID PRESSURE TRANSMITTERS (PT-110, -120, -130, -140, -700) SHALL BE FOXBORO MODEL IGP10-T22D1F-MIL1 GAUGE PRESSURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, 10-300 PSI RANGE, STAINLESS STEEL WETTED MATERIAL, 4-20 MA OUTPUT, LOOP POWERED.
3. AIR PRESSURE TRANSMITTER (PT-500) SHALL BE FOXBORO MODEL IGP20-T22B21F-MIL1 GAUGE PRESSURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, 3.5-200 INCHES H2O RANGE, STAINLESS STEEL WETTED MATERIAL, 4-20 MA OUTPUT, LOOP POWERED.
4. TEMPERATURE TRANSMITTERS (TT-500 - TT-900) SHALL BE FOXBORO MODEL RTT15-T1WCQNAF-L1 INSERTION-STYLE TEMPERATURE TRANSMITTER OR EQUAL WITH LOCAL DISPLAY, NEMA RATED ENCLOSURE, 3-INCH RTD WITH NO WELL, 4-20 MA OUTPUT, LOOP POWERED.
5. TI-500, -800 AIR FLOW METER (FIT-500) SHALL BE SIERRA MODEL 620S-L06M1EN4V4DD0 INSERTION-STYLE THERMA MASS METER OR EQUAL FOR AIR FLOW, 18-30 VDC, 3/8-INCH DIAMETER PROBE, 4-20 MA OUTPUT WITH DISPLAY.
6. TEMPERATURE INDICATORS (TI-501, -601) SHALL BE WIKA MODEL 32040D206G4 OR EQUAL 3-INCH INSERTION-STYLE BIMETAL THERMOMETER WITH 4-INCH STEM, LOWER MOUNT, 316 SS WELL WITH U OF 2.5 INCHES, 0-140°F RANGE.
7. LIQUID PRESSURE GAUGES (PI-110, -120, -130, -140, -800) SHALL BE WIKA MODEL 232.34 OR EQUAL 4.5-INCH PROCESS GAUGE WITH LOWER MOUNT, 316 SS CONNECTION, 0-30 PSI RANGE.
8. AIR PRESSURE GAUGES (PI-501, -502, -801, -802, -803) SHALL BE WIKA MODEL 632.34 OR EQUAL 4.5-INCH LOW PRESSURE PROCESS GAUGE WITH LOWER MOUNT, 316 SS CONNECTION, 0-20 INCHES H2O RANGE.
9. LEVEL SWITCH (LSL-300) SHALL BE GEMS MODEL MBLU40T OR EQUAL FLOAT SWITCH, NORMALLY OPEN OUTPUT WITH 40' CABLE.
10. PRESSURE SWITCH (PSL-111, -121, -131, -141) SHALL BE ASHCROFT TYPE 400 B SERIES MODEL B464B15 WITH WATER TIGHT ENCLOSURE AND DUAL SPDT SWITCHES. 15 PSI MAXIMUM RANGE.

CONTROL SYSTEM SPECIFICATIONS

1. CONTROL SYSTEM SHALL BE AN ALLEN-BRADLEY PLC CONTROL SYSTEM WITH THE FOLLOWING FEATURES:

   SLOT RACK
   SLC 5/04 CONTROLLER
   ETHERNET MODULE
   POWER SUPPLY
   ANALOG INPUT MODULES
   ANALOG OUTPUT MODULES
   DC INPUT MODULES
   DC OUTPUT MODULES
   UPS AND POWER-LOSS SENSOR

2. CONTROL SYSTEM USER INTERFACE SHALL BE DELL VOSTRO 400 DESKTOP PC WITH THE FOLLOWING FEATURES:

   P4 2.8GHZ CPU
   RAM 1 GB
   HARD DRIVE 160 GB
   CD ROM
   OPERATING SYSTEM XP PROFESSIONAL
   AC POWER SUPPLY
   INCREASED CONTROL PANEL DEPTH
   ADDITIONAL PROGRAM AND TEST TIME ADDED

3. SYSTEM AUTODIALER SHALL BE A SENSAPHONE WITH TELULAR CELLULAR MODEM CELL MODEM SHALL INCLUDE AN EXTERNAL ANTENNA WITH 15' OF WHIP.
4. REFER TO MANUFACTURER'S DRAWINGS FOR ADDITIONAL DETAILS.

MAJOR EQUIPMENT SPECIFICATIONS

1. WELL PUMPS (P-110, -140) SHALL BE GRUNDFOS MODEL 40S30-9 OR EQUAL SUBMERSIBLE WELL PUMPS WITH 3 HP, 460 V, 3 PHASE MOTORS CAPABLE OF 40 GPM AT 200 FEET TDH.
2. WELL PUMPS (P-120, -130) SHALL BE GRUNDFOS MODEL 75S75-12 OR EQUAL SUBMERSIBLE WELL PUMPS WITH 7.5 HP, 460 V, 3 PHASE MOTORS CAPABLE OF 85 GPM AT 220 FEET TDH.
3. AIR STRIPPER (AS-400) SHALL BE BISCO ENVIRONMENTAL/NEEP SYSTEMS MODEL 31261 SHALLOW TRAY SYSTEM OR EQUAL WITH 6 TRAYS, 316 SS CONSTRUCTION, WITH A MAXIMUM FLOW RATE OF 425 GPM, AND THE FOLLOWING COMPONENTS MOUNTED ON THE EQUIPMENT SKID:

   INDUCED-DRAFT BLOWER (B-400) SHALL BE NEW YORK BLOWER CO. MODEL 2610A WITH A 40 HP, 460V, 3 PHASE MOTOR CAPABLE OF 1800 CFM AT A PRESSURE OF 55" W.C.

   DISCHARGE PUMP (P-400) SHALL BE A GOULDS PUMPS MODEL 5SH2L52C0 WITH A 10 HP, 460 V, 3 PHASE MOTOR CAPABLE OF 250 GPM AT 90 FEET TDH CONTROLLED BY A VARIABLE FREQUENCY DRIVE BASED ON LIQUID LEVEL IN THE STRIPPER SUMP.

   INSTRUMENTATION AS SHOWN ON CONTRACT DRAWING 4.

   LOCAL CONTROL PANEL WITH FAIL SAFE CIRCUITRY DRY CONTACTS OUTPUTS TO MAIN TREATMENT SYSTEM PLC; SEE CONTRACT DRAWING 6 FOR INTERLOCK REQUIREMENTS.

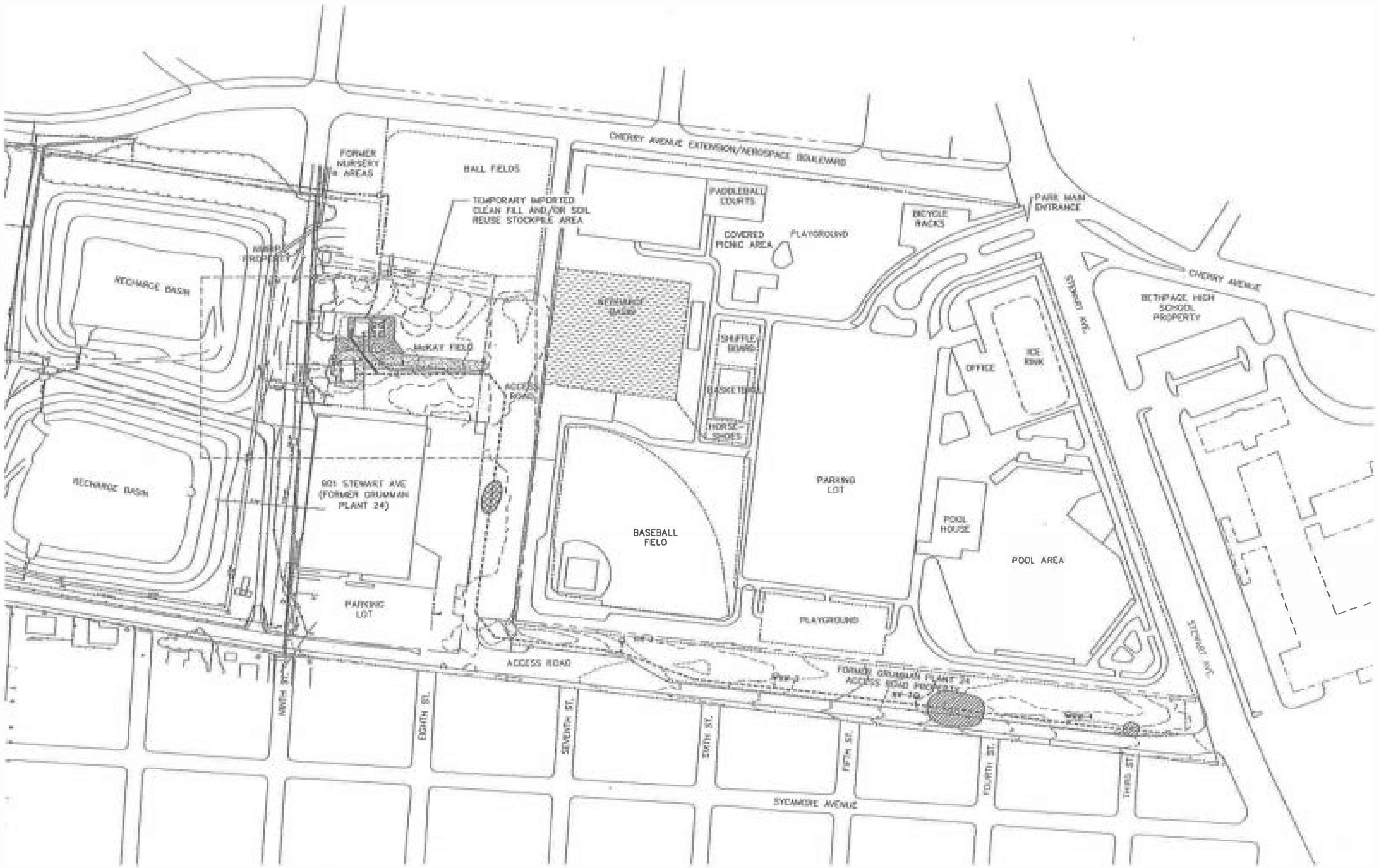
4. BAG FILTER VESSELS (BF-401, -402, -403, -404) SHALL BE FILTER INNOVATION MODEL [illegible]B-112-2P-SW OR EQUAL BAG FILTER HOUSING OF CARBON STEEL CONSTRUCTION RATED AT 150 PSIG.
5. GRANULAR ACTIVATED CARBON VESSELS (C-501, -502) SHALL BE MAPLE LEAF ENVIRONMENTAL EQUIPMENT 10,000 LB. VAPOR-PHASE CARBON ADSORBER OF CARBON STEEL CONSTRUCTION CONTAINING 6,000 LBS. OF GAC PER VESSEL REFER TO MANUFACTURER'S LITERATURE FOR ADDITIONAL DETAILS.
6. POTASSIUM PERMANGANATE VESSELS (PM-601, -602) SHALL BE MAPLE LEAF ENVIRONMENTAL EQUIPMENT 10,000 LB. VAPOR-PHASE ADSORBER OF CARBON STEEL CONSTRUCTION CONTAINING 12,000 LBS. OF POTASSIUM PERMANGANATE PER VESSEL. REFER TO MANUFACTURER'S LITERATURE FOR ADDITIONAL DETAILS.
7. BOOSTER PUMP (P-800) SHALL BE DAVEY MODEL HS12-40HT1 OR EQUAL WITH 304 SS CASING AND SHAFT, EPOXY-COATED STEEL PRESSURE TANK, AND 120 V, SINGLE PHASE, 0.9 KW MOTOR CAPABLE OF 12 GPM AT 40 PSI TDH.
8. EFFLUENT HOLDING TANK (T-800) SHALL BE CHEMTAINER MODEL TA35771A OR EQUAL WITH 300-GALLON CAPACITY AND LINEAR HIGH DENSITY POLYETHYLENE CONSTRUCTION.
9. SUMP PUMP (P-900) SHALL BE HYDROMATIC MODEL OSP50M1 OR EQUAL MANUALLY CONTROLLED SUMP PUMP WITH A ½ HP, 115 V, SINGLE PHASE MOTOR CAPABLE OF 30 GPM AT 20 FEET TDH.
10. PITLESS ADAPTER SHALL BE MAASS MIDWEST-DICKEN MODEL S-20-N, 2", BRASS CONSTRUCTION.

MECHANICAL SPECIFICATIONS

1. ALL ABOVE-GROUND PIPING SHALL BE PVC SCHEDULE 80.
2. ALL PVC PIPE JOINTS SHALL BE SOLVENT WELDED.
3. ALL UNDERGROUND HDPE PIPE SHALL BE HDPE SDR 17, UNLESS OTHERWISE SPECIFIED.
4. ALL HDPE PIPES SHALL BE BUTT-FUSED.
5. ALL PIPE SHALL BE INSTALLED AND PRESSURE TESTED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. ZERO LEAKAGE IS ALLOWED FOR ALL JOINTS.
6. ALL PIPE SHALL BE SUPPORTED AT 7'-0" O.C. (MAX.) AND LOCATED 2'-0" FROM ALL JOINT LOCATIONS. PIPING SHALL BE SUPPORTED PRIMARILY BY THE BUILDING FLOOR SLAB.
7. BALL VALVES SHALL BE PVC TRUE UNION BALL VALVES WITH VITON O-RING SEAL, TEFLON SELF-LUBRICATING SEATS, TIGHT SHUTOFF IN EITHER DIRECTION, FULL PORT DESIGN, SOLVENT WELDED SOCKET ENDS AND OPERATING HANDLE. MANUFACTURER: HAYWARD, NIBCO, PLASTO-MATIC, OR EQUAL.
8. GLOBE VALVES SHALL BE ASAHI MANUAL CONTROL VALVES OF PVC CONSTRUCTION WITH EPDM SEALS, AND SOCKET CONNECTIONS.
9. ACTIVATED BLOCK VALVES (ABV-501, -502) SHALL CONSIST OF ELITE VALVE 4" BALL VALVES AND ELECTRIC ACTIVATORS 115VAC EQUIPPED WITH POSITION INDICATOR.
10. CHECK VALVES SHALL BE SWING CHECK TYPE WITH VITON SEATS. MANUFACTURER: HAYWARD, NIBCO, PLASTO-MATIC, OR EQUAL.
11. SAMPLE TAPS AND DRAIN VALVES SHALL CONSIST OF A ½" DIAMETER PVC PIPE EXTENSION, BALL VALVE AND NIPPLE. SAMPLE TAPS AND DRAIN VALVES SHALL BE LOCATED AT LOCATIONS SHOWN ON THE DRAWINGS AND AT ALL LOW ELEVATIONS IN THE PROCESS PIPING.
12. ALL FLOW METERS SHALL HAVE STRAIGHT PIPE AT A MINIMUM OF 10 PIPE DIAMETERS PRECEDING AND 5 PIPE DIAMETERS FOLLOWING, OR AS SPECIFIED BY THE MANUFACTURER.
13. DAMPERS SHALL BE 14"ø ALUMINUM HEAVY DUTY AIR ISOLATION/CONTROL DAMPER WITH MANUAL ACTUATOR, MODIFIED FOR LOWER LEAK RATES AT HIGHER PRESSURE.
14. WELL VAULT ACCESS COVER SHALL BE HALLIDAY PRODUCTS 24"x24" ACCESS HATCH WITH ¼" ALUMINUM DIAMOND PATTERN PLATE COVER, ¼" ALUMINUM CHANNEL FRAME WITH RECESSED ANCHORS, CONTINUOUS EPDM DEBRIS GASKET.
15. DUCT SHALL BE 14"ø SCH. 10 ALUMINUM DUCT WITH 1.5" THICK TRYMER 2000 FOAM INSULATION WITH WHITE PVC/POLYESTER COVER. DUCT SHALL HAVE ¼" THICK FLANGES, STAINLESS STEEL BOLTING, AND ⅛" NEOPRENE GASKETS. → check
16. ALL DUCT SHALL BE SUPPORTED AT 10'-0" C.C. (MAX.).
17. ECU'S SHALL BE INSULATED WITH 1.5" RIGID STYROFOAM BOARDS FINISHED WITH STUCCO-EMBOSSED ALUMINUM JACKETING. → check

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE	No. / Date / Revisions / By / Ckd	Professional Engineer's Name: WILLIAM S. WITTEK Professional Engineer's No.: 080827 State: NY / Date Signed / Project Mgr.: CSG	ARCADIS ARCADIS OF NEWYORK, INC.	NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS **SPECIFICATIONS** MECHANICAL

ARCADIS Project No.	NY001464.1807.00003
Date	SEPTEMBER 2009
ARCADIS	6723 Towpath Road, P.O. Box 66, Syracuse, NY 13214, Tel: 315.446.9120



LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- ELECTRIC LINE
- GROUNDWATER IRM INFLUENT PIPELINES
- GROUNDWATER IRM EFFLUENT PIPELINE
- NWIRP NAVY BASIN
- RW-2 APPROXIMATE LOCATION OF GROUNDWATER RECOVERY WELL
- IRM INTERIM REMEDIAL MEASURE
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- KNOWN PCB-IMPACTED AREA
- KNOWN VOC-IMPACTED AREA
- USEPA UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

NOTES:

1. PRE-INVESTIGATION BORINGS SHALL TAKE PLACE FOR EVERY 100 LINEAR FEET OF DISCHARGE TRENCH. ONE SOIL SAMPLE SHALL BE TAKEN FOR EACH BORING.
2. ONE SOIL SAMPLE SHALL BE TAKEN AT EVERY LOCATION THAT THE NEW ELECTRICAL TRENCH DEVIATES FROM WITHIN THE LIMITS OF THE EXISTING OU3 SOIL GAS IRM TRENCH. IF THE NEW TRENCH DEVIATES BEYOND THE LIMITS OF THE EXISTING TRENCH FOR AN EXTENDED DISTANCE, ONE SOIL SAMPLE SHALL BE COLLECTED FOR EVERY 100 LINEAR FEET OF UTILITY TRENCH THAT FALLS OUTSIDE THE LIMITS OF THE EXISTING TRENCH.
3. NO SAMPLES WILL BE COLLECTED FROM EXCAVATIONS WITHIN THE LIMITS OF THE EXISTING OU3 SOIL GAS IRM TRENCH.
4. PRE-INVESTIGATION BORINGS SHALL TAKE PLACE IN THE VICINITY OF EACH BUILDING COLUMN FOOTER. ONE SOIL SAMPLE SHALL BE TAKEN FOR EACH BORING.
5. ONE SOIL SAMPLE SHALL BE COLLECTED FOR EVERY 500 CUBIC YARDS EXCAVATED DURING CONSTRUCTION OF THE GROUNDWATER IRM BUILDING AND ECU PAD.
6. ALL SOIL SAMPLES WILL BE ANALYZED FOR VOCS, SVOCS, TOTAL CHROMIUM AND PCBS USING USEPA METHODS 8260, 8270, 6010, AND 8082, RESPECTIVELY.
7. EXCAVATED SOILS THAT CONTAIN ANY CONSTITUENT AT LEVELS ABOVE INDUSTRIAL SOIL CLEANUP STANDARDS (6NYCRR PART 375) BUT ARE NOT CHARACTERISTICALLY HAZARDOUS, MAY NOT BE USED AS BACKFILL AND SHALL BE TRANSPORTED AS NON-HAZARDOUS WASTE FOR OFFSITE DISPOSAL.
8. EXCAVATED SOILS THAT ARE CHARACTERISTICALLY HAZARDOUS FOR ANY CONSTITUENT WILL BE MANAGED IN ACCORDANCE WITH THE HAZARDOUS WASTE GENERATOR REQUIREMENTS CONTAINED IN 6NYCRR PART 372.2. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AND NORTHROP GRUMMAN'S ESH&M DEPARTMENT AT (516) 575-4680 WHEN A HAZARDOUS WASTE IS DISCOVERED OR, WHEN POSSIBLE, PRIOR TO GENERATION TO A HAZARDOUS WASTE. THE CONTRACTOR SHALL PROVIDE A HAZARDOUS WASTE PROFILE TO ESH&M AND FOLLOW ESH&M DIRECTION REGARDING LOCATION OF HAZARDOUS WASTE ACCUMULATION AREAS, INSTALLATION OF SECONDARY CONTAINMENT, CONTAINERS TO BE USED FOR HAZARDOUS WASTE ACCUMULATION, MARKING, LABELING, AND DATING OF HAZARDOUS CONTAINERS, ETC. HAZARDOUS WASTE ACCUMULATION CONTAINERS MUST BE IN GOOD CONDITION, I.E., FREE FROM LEAKS OR MAJOR DENTING.
9. EXCAVATED SOIL WITH A PCB CONCENTRATION GREATER THAN 1 MG/KG MAY NOT BE USED AS BACKFILL WITHIN 2 FEET OF SURROUNDING GRADE.
10. ALL EXCAVATED SOILS DETERMINED TO BE ACCEPTABLE FOR BACKFILL SHALL BE STOCKPILED ONSITE TO BE USED AS BACKFILL DURING THE GROUNDWATER IRM CONSTRUCTION ACTIVITIES OR FOR FUTURE USE.
11. DUST EMISSIONS SHALL BE CONTROLLED BY MISTING WORK AREAS WITH WATER DURING SOIL INTRUSIVE SITE ACTIVITIES.
12. COMMUNITY AIR MONITORING PLAN SHALL BE IMPLEMENTED DURING ALL INTRUSIVE SITE ACTIVITIES.

XREFS: 01464X01 01464X02 01464X00
IMAGES: Temp00000.TIF BCP_Aerial.jpg

100' 0 100' 200'
1"=100'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name: WILLIAM S. WITTEK
Professional Engineer's No.: 080827

State	Date Signed	Project Mgr.
NY		CSG
Designed by	Drawn by	Checked by
CDL	BKO	TEM

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

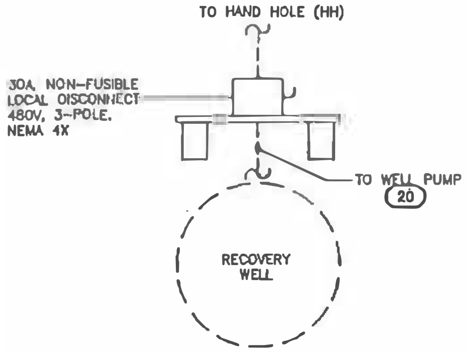
SOIL MANAGEMENT PLAN

ARCADIS Project No.
NY001464.1807.00003

Date
SEPTEMBER 2009

ARCADIS
6723 Towpath Road
P.O. Box 66
Syracuse, NY 13214
Tel 315.446.9120

12



TYPICAL LOCAL DISCONNECT PLAN
NO SCALE

CONDUCTOR SCHEDULE

SYMBOL	WIRE QUANTITY	WIRE SIZE	GROUND	CONDUIT	COMMENTS
20	3	#12	1 #12	3/4"	
30	3	#10	1 #10	1"	SEE CONDUIT SCHEDULE
50	3	#8	1 #8	1"	SEE CONDUIT SCHEDULE
70	3	#4	1 #8	1 1/2"	SEE CONDUIT SCHEDULE
400	(2 SETS) 4	#3/0	1 #1/0	(2) 2 1/2"	PROVIDE TYPE "USE-2" OR "XHHW-2"

REFER TO NOTE 4 BELOW.

CONDUIT SCHEDULE

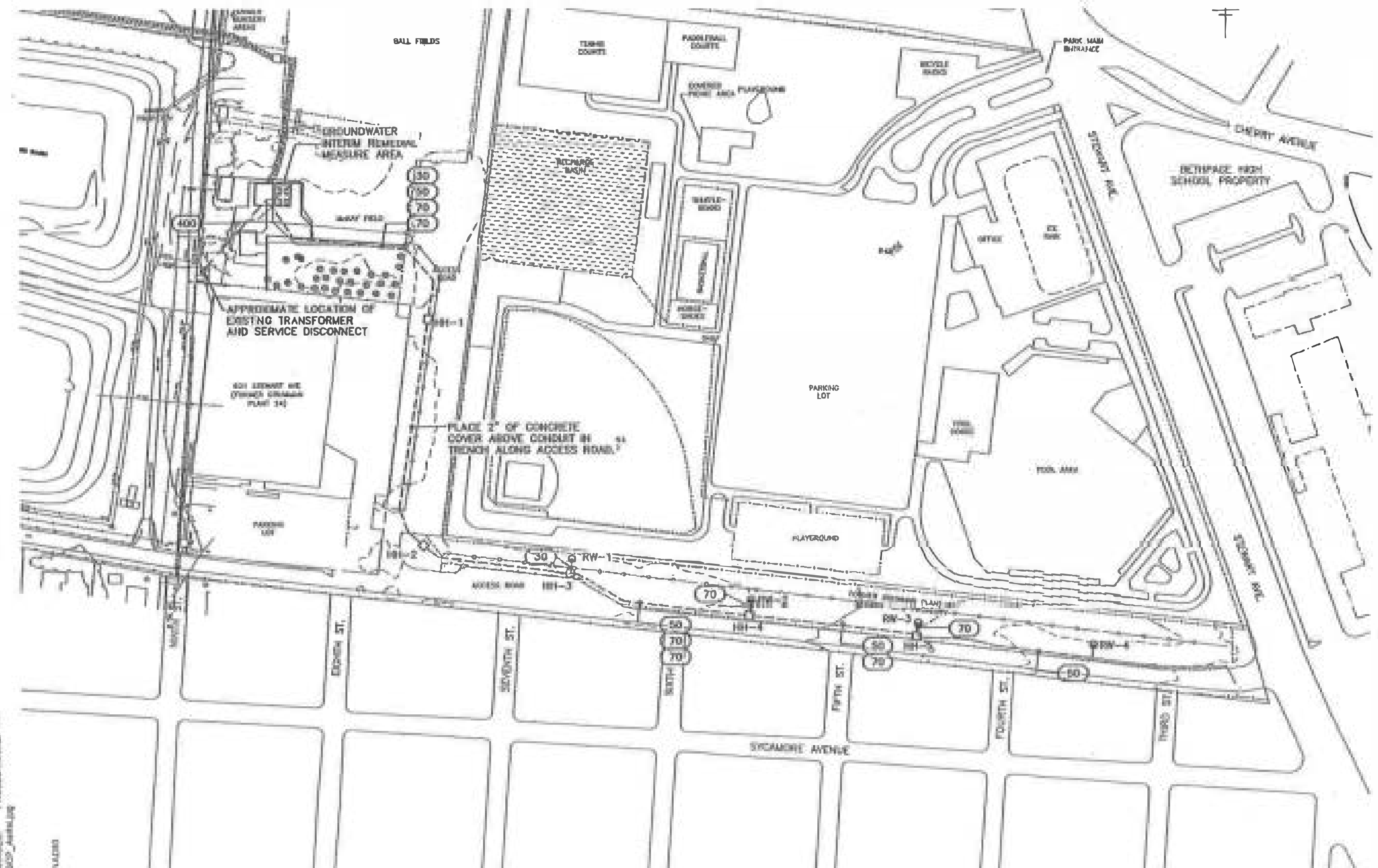
SYMBOL	CONDUIT	COMMENTS
30,50,70,70	2 1/2"	FROM BUILDING TO HH-2
50,70,70	2"	FROM HH-2 TO HH-3
50,70	1 1/2"	FROM HH-3 TO HH-4

LEGEND

- (#) CONDUCTOR SYMBOL - REFER TO SCHEDULE
- HH-# ELECTRIC HANDHOLE
- RW-# RECOVERY WELL
- — — — ELECTRIC CONDUCTOR

NOTES:

1. SEE CONTRACT DRAWING 14 FOR ONE-LINE DIAGRAM.
2. SEE CONTRACT DRAWING 17 FOR ELECTRIC HANDHOLE AND TRENCHING DETAILS.
3. CONDUIT TRENCH TO BE INSTALLED WITHIN LIMITS OF EXISTING OU3 SG PIPE TRENCH WHERE POSSIBLE.
4. INSTALL SPARE 1 1/2" CONDUIT FROM GWIRM BUILDING TO HH-4.



ELECTRICAL SPECIFICATIONS:

GENERAL

1. ALL ELECTRICAL EQUIPMENT SHALL BE U.L. LISTED AND LABELED.
2. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE LATEST REVISION OF NFPA-70 NEC.

RIGID METAL CONDUIT (RGS)

1. GALVANIZED STEEL, HOT-DIPPED ZINC, ANSI STANDARD C80.1 AND C80.4.
2. MANUFACTURER SHALL BE ALLIED TUBE & CONDUIT CORPORATION, TRIANGLE WIRE AND CABLE INC., OR EQUAL.

NONMETALLIC (PVC) CONDUIT

1. NONMETALLIC RIGID CONDUIT AND FITTINGS SHALL BE SCHEDULE 40, POLYVINYL CHLORIDE AND SHALL BE RESISTANT TO CORROSION.
2. CONDUIT AND FITTINGS SHALL BE IN ACCORDANCE WITH NEMA STANDARD TC-2 AND TC-3, LATEST REVISION.
3. MANUFACTURER SHALL BE CARLON ELECTRIC CONDUIT CO., TRIANGLE PWC CO., OR EQUAL.

JUNCTION BOXES

JUNCTION BOXES AND FITTINGS SHALL BE OF GALVANIZED STEEL OR COPPER FREE ALUMINUM.

WIRES AND CABLES

1. GENERAL
   A. ALL CONDUCTORS, UNLESS OTHERWISE NOTED, SHALL BE STRANDED COPPER, CONSTRUCTED OF SOFT DRAWN OR ANNEALED COPPER.
   B. CONDUCTORS INSULATION SHALL BE COLOR CODED, WITH COLOR OF INSULATION ONE COLOR THROUGHOUT THE ENTIRE RUN.
   C. 120/240 VAC, SINGLE PHASE, 3 WIRE
      CONDUCTOR 1 - BLACK
      CONDUCTOR 2 - RED
      NEUTRAL - WHITE
      GROUND - GREEN
2. LOW VOLTAGE CONDUCTORS
   A. ALL CONDUCTORS FOR POWER, LIGHTING AND 120 VAC CONTROL SHALL BE RATED A MINIMUM 600 VAC.
   B. CONDUCTORS SHALL BE CONSTRUCTED OF UNCOATED CLASS C COPPER CONCENTRIC-LAY-STRANDED WIRES.
   C. POWER AND LIGHTING CONDUCTORS SHALL BE TYPE THHN-90C/THWN-2-90C WITH PVC INSULATION AND NYLON JACKET.
3. INSTRUMENTATION CABLES

   TWISTED PAIR OF NO. 16 AWG TINNED COATED CLASS C COPPER CONCENTRIC LAY STRANDED WIRES WITH AN ALUMINUM POLYESTER SHIELD AND COPPER DRAIN. RATED FOR 600V AND COLOR COATED PVC OUTER JACKET.
4. CONNECTORS
   A. PIGTAIL SPLICING #10 AND SMALLER, USE TAPERED SPRING WIRE NUTS. MANUFACTURER SHALL BE IDEAL WING NUT, BUCHANAN B-CAP, T&B PIGGIES, OR EQUAL.
   B. FOR TERMINATION OF #14 CONTROL WIRES TO TERMINALS, USE INSULATED COMPRESSION SPADE TYPE CONNECTORS. MANUFACTURER SHALL BE BURNDY HYDENT, T&B STA-KON, OR EQUAL.
   C. SPLICES AND TERMINALS FOR #8 AND LARGER SHALL BE COPPER COMPRESSION TYPE. MANUFACTURER SHALL BE BURNDY HYDENT OR HYLUG, T&B, STA-CON, OR EQUAL.
   D. FIXTURE CONNECTIONS MANUFACTURER SHALL BE T&B STA-KON SERIES PT-69N, IDEAL CRIMP SLEEVE NO. 410 WITH LONG BARREL, OR EQUAL.

GROUNDING

1. GROUNDING OF ELECTRICAL SYSTEMS AND EQUIPMENT SHALL, AT A MINIMUM, MEET THE REQUIREMENTS OF THE NEC ARTICLE 250 OR SHALL EXCEED ARTICLE 250 AS HEREIN SPECIFIED.
2. ALL CONDUITS SHALL HAVE AN INTERNAL GROUND CONDUCTOR. THIS GROUND CONDUCTOR SHALL BE PROVIDED ALTHOUGH IT MAY NOT BE SHOWN OR SCHEDULED ON THE PLANS.
3. GROUNDING ELECTRODE CONDUCTORS SHALL BE A MINIMUM OF NO. 6 AWG BARE STRANDED COPPER.
4. GROUND RODS SHALL BE 3/4" DIAMETER, 10 FEET LONG, STEEL CORE WITH COPPER MOLTEN WELDED OR ELECTROLYTICALLY BONDED TO EXTERIOR.
5. ALL CONNECTIONS SHALL BE MADE WITH COMPRESSION OR CADWELD CONNECTORS.

ENCLOSURE

1. ENCLOSURES SHALL BE NEMA RATED FOR LOCATION UNLESS OTHERWISE NOTED.
2. WET LOCATIONS OR OUTDOORS, ENCLOSURES SHALL BE NEMA TYPE 4, STAINLESS STEEL.
3. ENCLOSURES SHALL HAVE NAMEPLATE ON THE EXTERIOR IDENTIFYING THE APPLICATION FUNCTION OF THE EQUIPMENT ENCLOSED.

WIRING DEVICES

1. RECEPTACLES MARKED AS GFCI SHALL BE OF THE GROUND FAULT CIRCUIT INTERRUPTER TYPE. MANUFACTURER SHALL BE GE TYPE TGTR 20, OR EQUAL.
2. SWITCHES
   A. LIGHTING SWITCHES SHALL BE RATED 20 AMPERES AT 277 VAC, TOGGLE OPERATED, PLASTIC ENCLOSED, SINGLE POLE, THREE-WAY OR FOUR-WAY AS SHOWN OR REQUIRED. MANUFACTURER SHALL BE P&S SERIES 20ACI SEPCIFICATION GRADE, OR EQUAL.
   B. SWITCHES SHALL HAVE SILVER ALLOY CONTACTS AND PROVISIONS FOR SIDE AND BACK WIRING.
   C. EACH SWITCH SHALL BE SUITED FOR FULL-RATED CAPACITY ON TUNGSTEN FILAMENT AND FLOURSCENT LAMP LOADS.
3. FACEPLATE AND COVERS
   A. FINISHED AREAS SHALL HAVE STAINLESS STEEL TYPE 302 ALLOY COVERS.
   B. WET AND CORROSIVE AREAS SHALL BE WEATHERPROOF COVERS WITH GASKETS.

0 100' 200' 300'
1"=100'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: THOMAS P. ARMSTRONG, JR.

Designed by: TPA | Drawn by: EK | Checked by: TPA

ARCADIS
ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

ELECTRICAL SITE PLAN

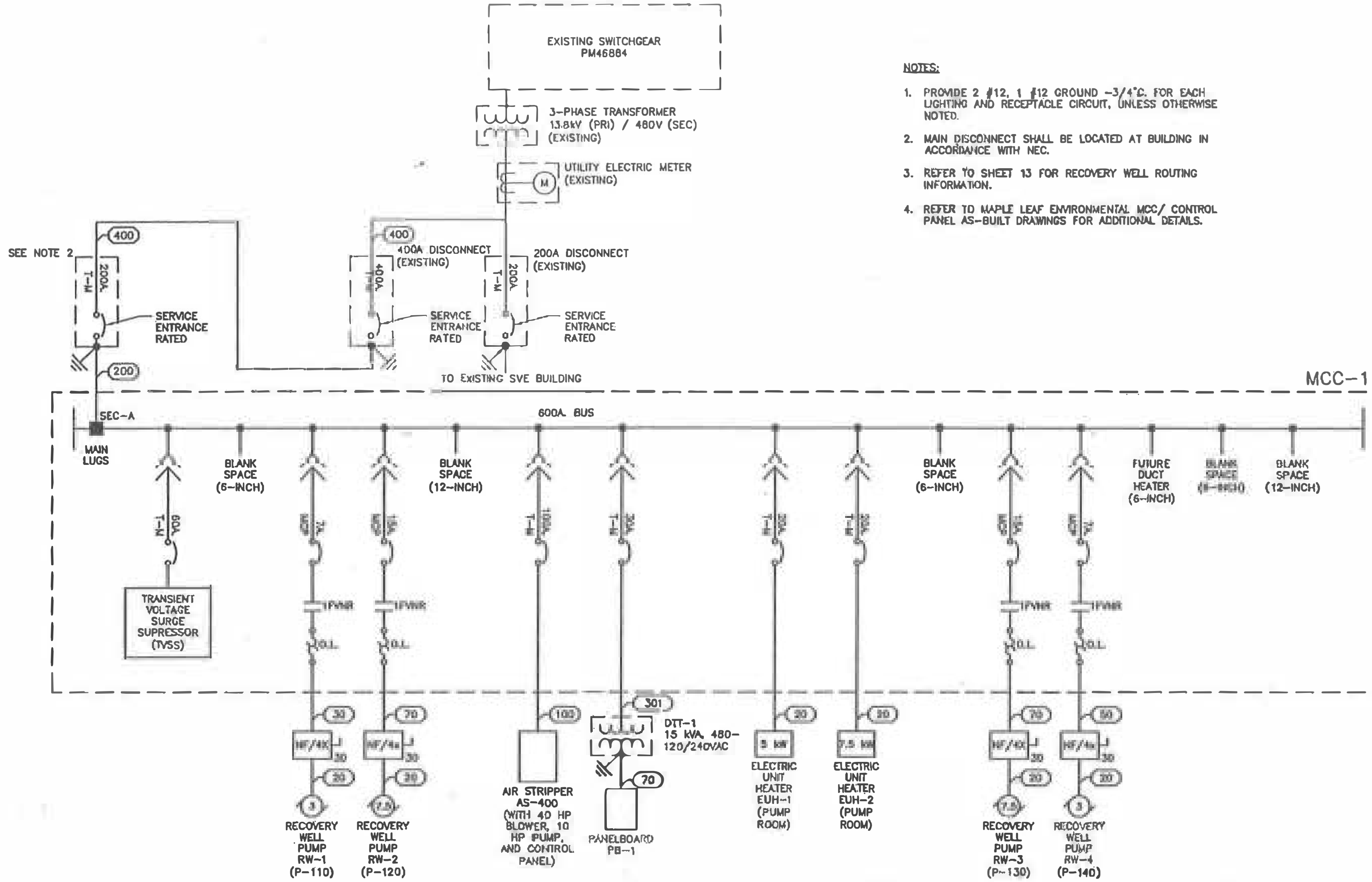
ELECTRICAL

ARCADIS Project No. NY001464.1807.00003

Date AUGUST 2009

ARCADIS
6723 Towpath Road
(P.O. Box 66)
Syracuse, NY 13214
Tel 315.446.9120

13



NOTES:

1. PROVIDE 2 #12, 1 #12 GROUND -3/4"C. FOR EACH LIGHTING AND RECEPTACLE CIRCUIT, UNLESS OTHERWISE NOTED.
2. MAIN DISCONNECT SHALL BE LOCATED AT BUILDING IN ACCORDANCE WITH NEC.
3. REFER TO SHEET 13 FOR RECOVERY WELL ROUTING INFORMATION.
4. REFER TO MAPLE LEAF ENVIRONMENTAL MCC/ CONTROL PANEL AS-BUILT DRAWINGS FOR ADDITIONAL DETAILS.

ABBREVIATIONS

FVNR	FULL VOLTAGE, NON-REVERSING (SIZE 1) STARTER
A.F.F.	ABOVE FINISHED FLOOR
A	AMPERES
DTT	DRY TYPE TRANSFORMER
EF	EXHAUST FAN
EMC	ENCLOSED MOTOR CONTROLLER
EUH	ELECTRIC UNIT HEATER
HP	HORSEPOWER
kVA	KILOVOLT-AMPS
kW	KILOWATT
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR CIRCUIT BREAKER
O.L.	OVERLOAD
PB	PANELBOARD
T-M	THERMAL MAGNETIC CIRCUIT BREAKER
V	VOLTS
VAC	VOLTS AC

LEGEND

- ENCLOSURE LIMITS
- MOTOR STARTER, FVNR-TYPE EQUIPPED WITH THERMAL OVERLOADS (FULL VOLTAGE, NON-REVERSING)
- MOTOR, # DENOTES H.P.
- EARTH GROUND
- TRANSFORMER, POWER
- MOLDED CASE CIRCUIT BREAKER
- ELECTRIC UTILITY METER CABINET
- ENCLOSED SWITCH
  NF = NON-FUSIBLE
  XX = NEMA RATING
  ZZ = AMPACITY RATING
- CONDUCTOR SYMBOL

CONDUCTOR SCHEDULE

SYMBOL	WIRE QUANTITY	WIRE SIZE	GROUND	CONDUIT	COMMENTS
20	3	#12	1 #12	3/4"	
30	3	#10	1 #10	1"	
30L	2	#10	1 #10	3/4"	
50	3	#6	1 #8	1"	
70	3	#4	1 #8	1 1/2"	
100	3	#2	1 #6	1 1/4"	
400	(2 SETS) 4	#3/0	1 #1/0	(2) 2 1/2"	PROVIDE TYPE "USE-2" OR "XHHW-2"

PANEL PB-1 ENCLOSURE: NEMA TYPE 1, CABINET MOUNTING: SURFACE

VOLTS: 120 / 240, PHASE: 1, WIRE: 3W, 10,000 AIC, 60A. C/B, FEED: TOP

LOAD SERVED	LOAD (KVA) A	LOAD (KVA) B	BREAKER AMP	BREAKER POLE	CKT	PH	CKT	BREAKER POLE	BREAKER AMP	LOAD (KVA) A	LOAD (KVA) B	LOAD SERVED
LIGHTS - CONTROL ROOM	0.1		20	1	1	A	2	1	20	0.3		RECEPTACLES - A
LIGHTS - PUMP ROOM		0.5	20	1	3	B	4	1	20		0.4	RECEPTACLES - B
LIGHTS - OUTDOOR	0.1		20	1	5	A	6	1	20	0.4		RECEPTACLES - OUTDOOR
MAIN CONTROL PANEL		1.0	20	1	7	B	8	1	20		0.1	EXIT LIGHTS
SUMP PUMP (P-800)	0.7		20	1	9	A	10	1	20	0.6		6 FLOW METERS (FI)
EUH-3 (CONTROL ROOM)		1.3	20	2	11	B	12	1	20		1.1	BOOSTER PUMP (P-800)
	1.3				13	A	14	1	20	0.4		EF-1 / L1
SFSI-CP		0.2	20	1	15	B	16	1	20		0.4	EF-2 / L2
SPARE			20	1	17	A	18	1	20			SPARE
BLANK				1	19	B	20	1				BLANK
BLANK				1	21	A	22	1				BLANK
BLANK				1	23	B	24	1				BLANK
BLANK				1	25	A	26	1				BLANK
BLANK				1	27	B	28	1				BLANK
BLANK				1	29	A	30	1				BLANK
TOTAL	2.5	3.1								2.0	2.0	

TOTAL CONNECTED KVA:
A: 4.4
B: 5.1
TOTAL: 9.5

NO SCALE

THOMAS P. ARMSTRONG, JR.

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

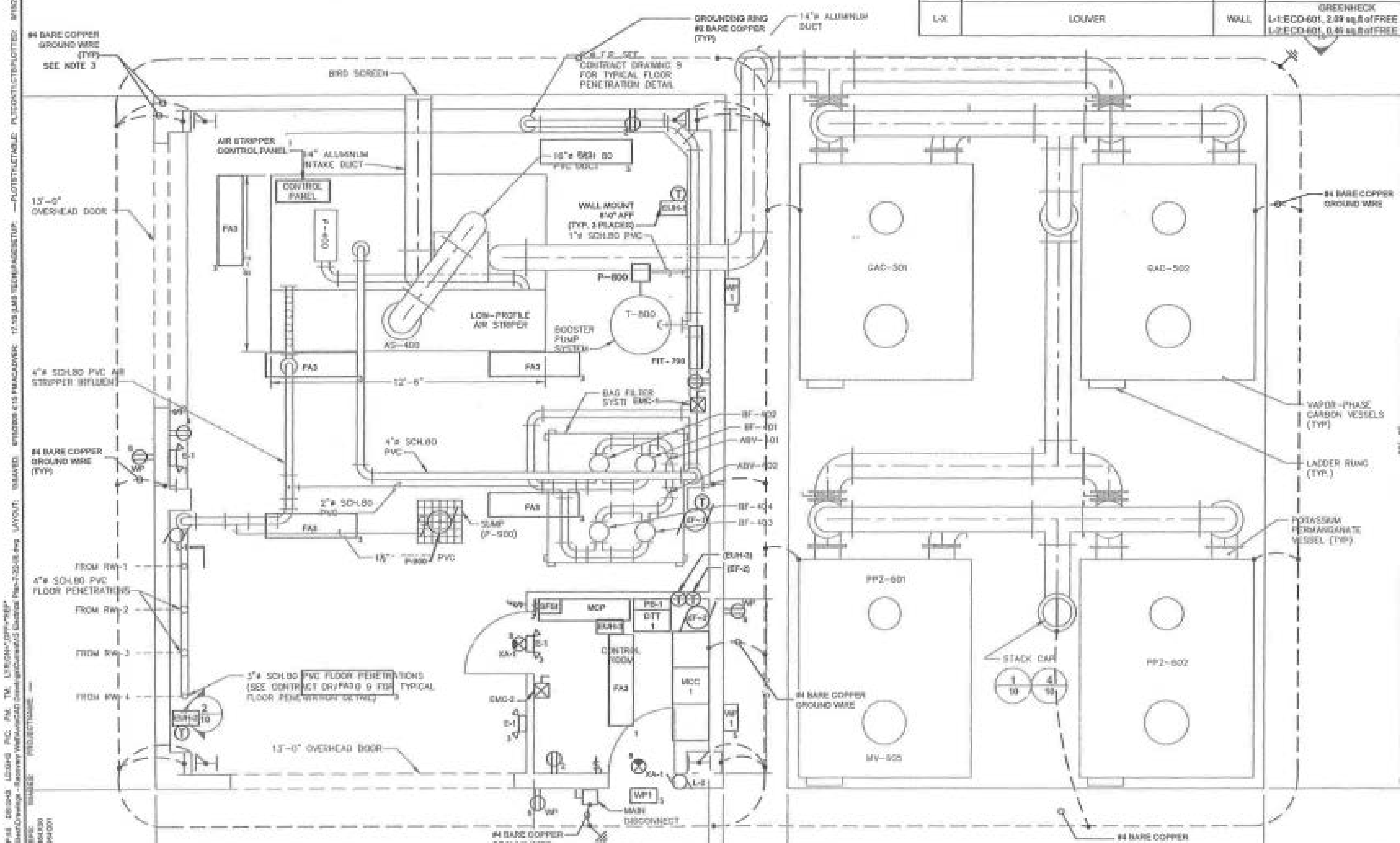
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

ONE-LINE DIAGRAM

ELECTRICAL

AUGUST 2010

HVAC AND LIGHTING SCHEDULE						
SYMBOL	DESCRIPTION	MOUNTING	MANUFACTURER & PART NUMBER	QUANTITY	REMARKS	MISC.
FA3	LIGHTING FIXTURE 3-LAMP FLOURESCENT, OPEN-TYPE	PENDANT	DAY-BRITE CAT#: 1F332PP120	8	120 VAC, 59-INCH T8 LAMPS, PENDANT MOUNT FROM CEILING AT 9'-0" AFF.	
WP1	LIGHTING FIXTURE , WALL PACK, HPS	WALL	DAY-BRITE CAT#: NWP070S12	3	120 VAC. 70 WATT HPS LAMPS, MOUNT 9'-6" ABOVE GRADE.	
XA-1	EXIT SIGN, ILLUMINATED	WALL	DAY-BRITE CAT#: VERW	2	SINGLE-FACE, RED LED LETTERS MOUNT 7'-2" AFF	
EF-X	EXHAUST FAN WALL-MOUNTED	WALL	EF-1: GREENHECK SBE-1H20-4 EF-2: GREENHECK SE1-8-440-D-1	1 1	120 VAC, WITH THERMOSTAT	
E-1	EMERGENCY LIGHTS	WALL	DAY-BRITE CAT#: VU6	3	MOUNT 8'-0" AFF.	
EUH-X	UNIT HEATER, FORCED AIR, RESISTIVE	CEILING	EUH-1:CHROMALOX LUH-05-43-32 EUH-2:CHROMALOX LUH-07-43-32 EUH-3:CHROMALOX LUH-02-32-34	1 1 1	w/REMOTE THERMOSTAT	ALL w/EDS-1
L-X	LOUVER	WALL	GREENHECK L-1:ECO-601, 2.09 sq.ft of FREE AREA L-2:ECO-601, 0.46 sq.ft of FREE AREA	1 1	120 VAC ACTUATOR, EXTERIOR BIRDSCREEN, INTERIOR INSECT SCREEN	



LEGEND

- MOTOR, # DENOTES H.P.
- EARTH GROUND
- DUPLEX RECEPTACLE, 120 VAC
- SINGLE POLE LIGHT SWITCH, 120 VAC
- ENCLOSED SWITCH
  - NF = NON-FUSIBLE
  - XX = NEMA RATING
  - ZZ = AMPACITY RATING
- ENCLOSED MOTOR CONTROLLER
  - XX = NEMA RATING
- FA3 FLOURESCENT LIGHTS
  - # = CIRCUIT NUMBER
- EXIT LIGHTS
- EMERGENCY LIGHTS
- THERMOSTAT
- WP1 WALL PACK LIGHTS
  - # = CIRCUIT NUMBER

NOTES:

1. ALL RECEPTACLES SHALL BE GFCI PROTECTED.
2. ALL OUTDOOR RECEPTACLES SHALL HAVE WEATHERPROOF (WP) COVER.
3. STRUCTURAL COLUMNS SHALL BE BONDED TO GROUNDING SYSTEM IN ACCORDANCE WITH NEC.
4. REFER SHEET 14 FOR CONDUIT AND WIRING REQUIREMENTS.

THOMAS P. ARMSTRONG, JR.

State: NY | Project Mgr.: DSG | Designed by: TPA | Drawn by: GK | Checked by: TPA

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK

OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT LAYOUT - ELECTRICAL

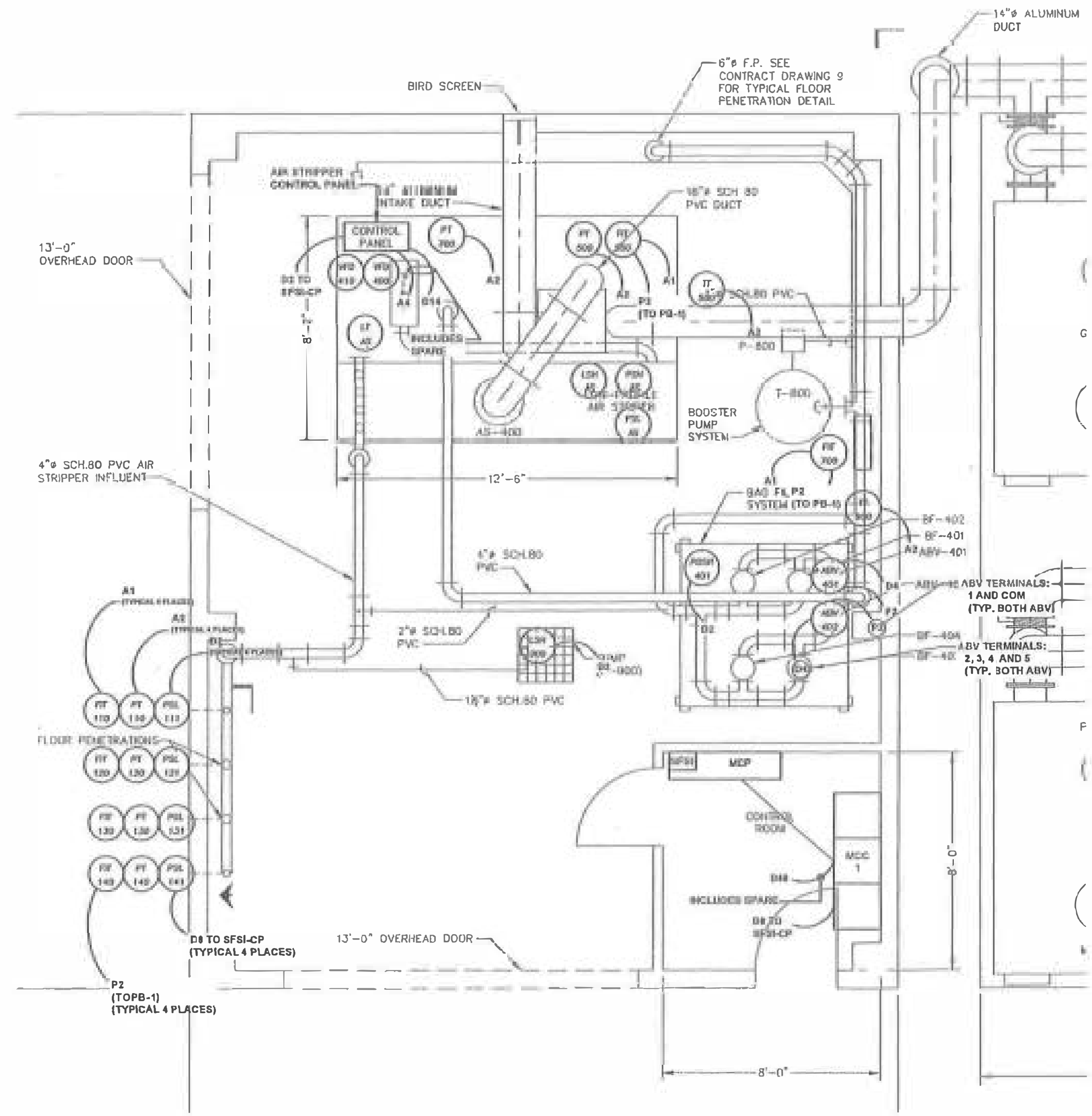
ELECTRICAL

ARCADIS Project No. NY001464.1807.00003

Date AUGUST 2009

ARCADIS
6723 Towpath Road
(P.O. Box 66)
Syracuse, NY 13214
Tel: 315.446.9120

CONDUCTOR WIRE			
SYMBOL	CONTROL WIRE	GROUND	CONDUIT
D2	2#14	1#14	3/4"
D4	4#14	1#14	3/4"
D8	8#14	1#14	3/4"
D14	14#14	1#14	3/4"
D40	40#14	1#14	1 1/4"
A1	(1) PR #18	1#14	3/4"
A2	(2) PR #18	1#14	3/4"
A4	(4) PR #18	1#14	3/4"
P2	2 #12	1#12	3/4"



NOTES

1. ALL CONTROL WIRE HOMERUNS SHALL TERMINATE IN MAIN CONTROL PANEL (MCP), UNLESS OTHERWISE NOTED.
2. REFER TO SHEET 14 FOR POWER CIRCUITING AND CONDUCTOR REQUIREMENTS.
3. SFSI-CP SHALL BE LOCATED WITHIN MCP.
4. DISCRETE HOMERUNS MAY BE COMBINED IN ONE CONDUIT PROVIDED CONDUIT IS NO MORE THAN 40% FULL.
5. ANALOG HOMERUNS MAY BE COMBINED IN ONE CONDUIT PROVIDED CONDUIT IS NO MORE THAN 40% FULL.

DESIGN ASSUMPTIONS

1. AUTODIALER IS INCLUDED IN MAIN CONTROL PANEL (MCP). THEREFORE, HARDWIRING TO AUTODIALER IS NOT SHOWN ON THESE DRAWINGS.
2. PLC ALARM INDICATION LIGHTS ARE INCLUDED WITHIN THE MCP. THEREFORE, HARDWIRING TO INDICATION LIGHTS ARE NOT SHOWN ON THESE DRAWINGS.
3. AIR STRIPPER INSTRUMENTATION WIRING BETWEEN DEVICES AND AIR STRIPPER CONTROL PANEL ARE PROVIDED BY AIR STRIPPER EQUIPMENT MANUFACTURER. THEREFORE, HARDWIRING FOR THESE DEVICES TO AIR STRIPPER CONTROL PANEL IS NOT SHOWN.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: THOMAS P. ARMSTRONG, JR.

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT LAYOUT - INSTRUMENTATION

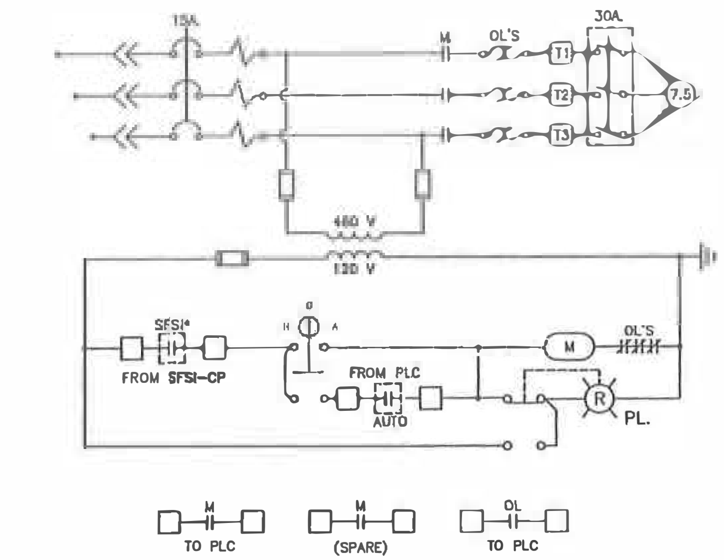
ELECTRICAL

ARCADIS Project No. NY001454.1607.00003

Date AUGUST 2009

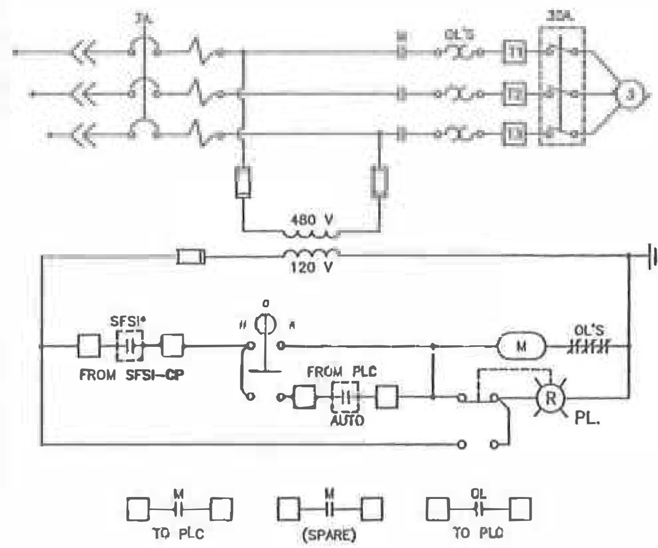
ARCADIS
6723 Towpath Road
(P.O. Box 66)
Syracuse, NY 13214
Tel. 315.446.9120

16



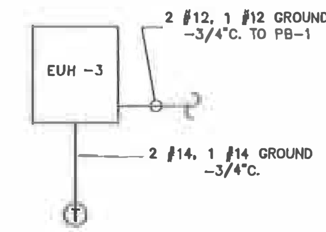
*SFSI = SECONDARY FAIL-SAFE INTERLOCK

SCHEMATIC RECOVERY WELL PUMP
(P-120 AND P-130 ARE SIMILAR)

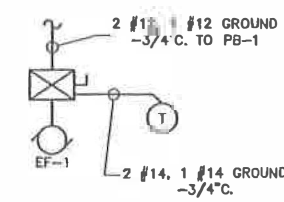


*SFSI = SECONDARY FAIL-SAFE INTERLOCK

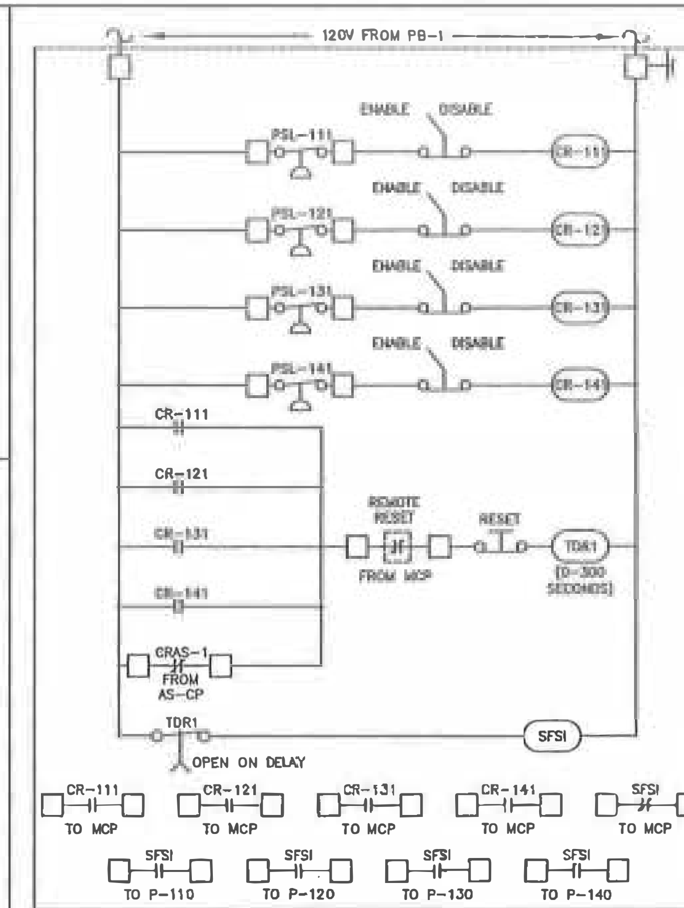
SCHEMATIC RECOVERY WELL PUMP
(P-110 AND P-140 ARE SIMILAR)



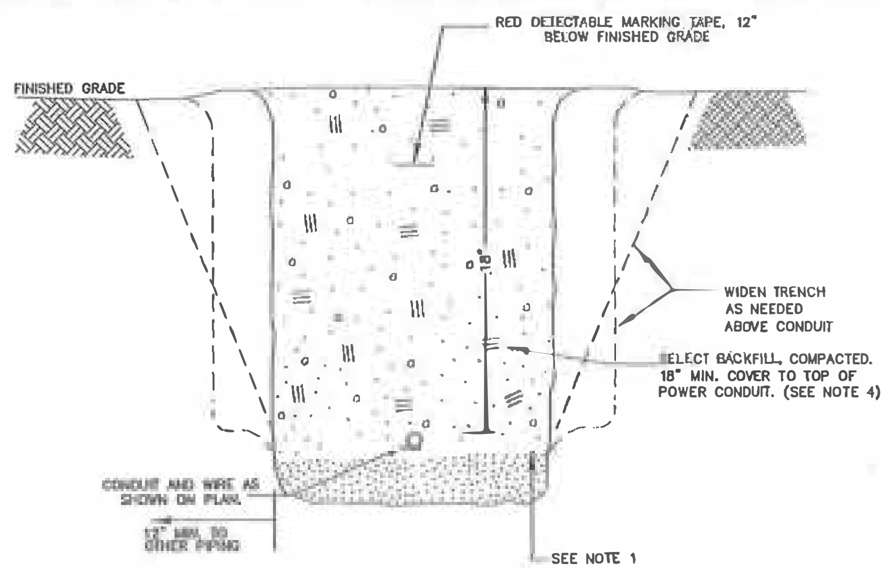
ELECTRIC UNIT HEATER (EUH-3) RISER DIAGRAM



RISER EF-1
(EF-2 IS SIMILAR)



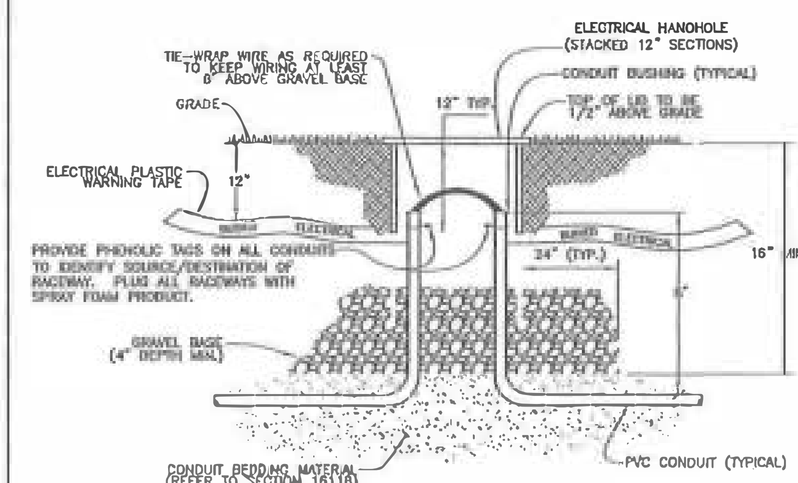
SECONDARY FAIL-SAFE INTERLOCK CONTROL PANEL (SFSI-CP)



NOTES:
1. SPACING SHALL BE 6" MIN. FROM CONDUIT TO TRENCH WALL.
2. WHERE MORE THAN ONE CONDUIT IS INCLUDED IN TRENCH, PROVIDE THE FOLLOWING SPACING:
   - 3" MIN. BETWEEN POWER CONDUITS
   - 3" MIN. BETWEEN CONTROL CONDUITS
   - 6" MIN. BETWEEN POWER AND CONTROL CONDUITS

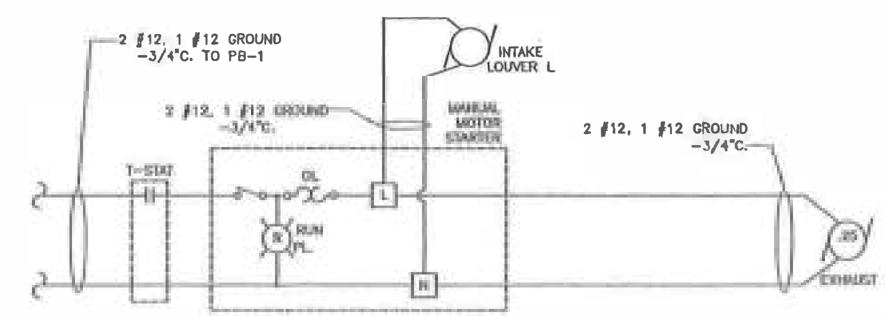
NOTES (cont.):
3. CONDUIT SHALL BE BURIED A MINIMUM OF 24" BELOW ROAD CROSSINGS IN ACCORDANCE WITH NEC 300.5
4. IN AREAS ALONG ACCESS ROAD WHERE 18" COVER IS NOT ACHIEVABLE, PLACE 2" OF CONCRETE COVER AND 12" OF BACKFILL ABOVE CONDUIT.
5. INSTALL SECOND, SPARE CONDUIT FROM TREATMENT BUILDING TO RW-2.

ELECTRIC - TRENCH DETAIL
NO SCALE



NOTE:
PROVIDE FIVE HANDHOLES (HH-1 THROUGH HH-5) EACH 17"x30" AND IDENTIFIED AS "ELECTRIC"

SECTION
ELECTRICAL HANDHOLE DETAIL
NO SCALE



EXHAUST FAN SCHEMATIC
(EF-1 AND EF-2 ARE SIMILAR)

NO SCALE

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
	09/15/09			

Professional Engineer's Name: THOMAS P. ARMSTRONG, JR.
State: NY
Designed by: TPA
Checked by: TPA

ARCADIS
ARCADIS OF NEW YORK, INC.

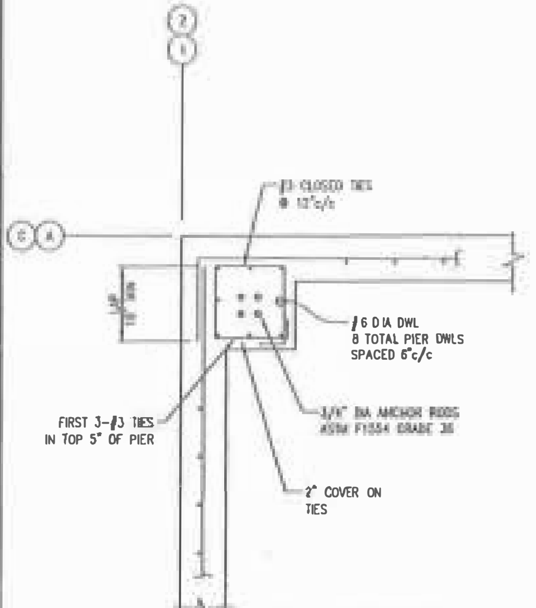
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

EQUIPMENT DETAILS AND SCHEMATICS

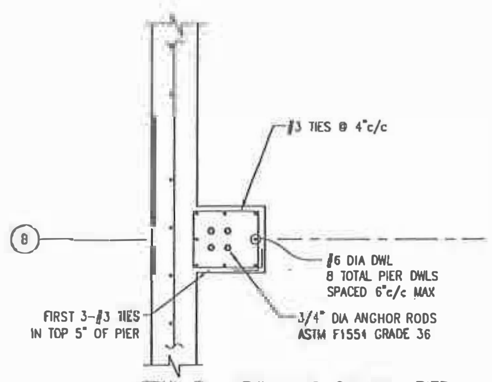
ELECTRICAL

ARCADIS Project No. NY001464.1807.00003
Date AUGUST 2009
ARCADIS
6723 Towpath Road
(P.O. Box 66)
Syracuse, NY 13214
Tel: 315.446.9120

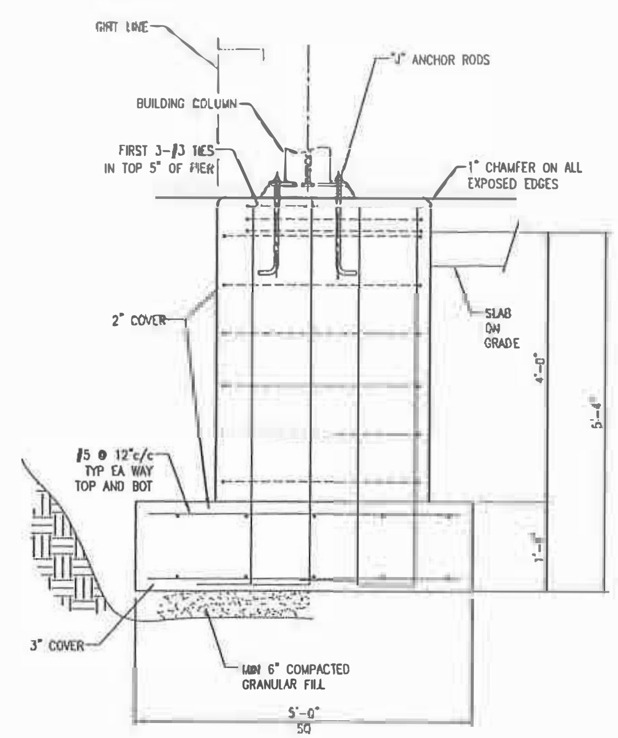
17



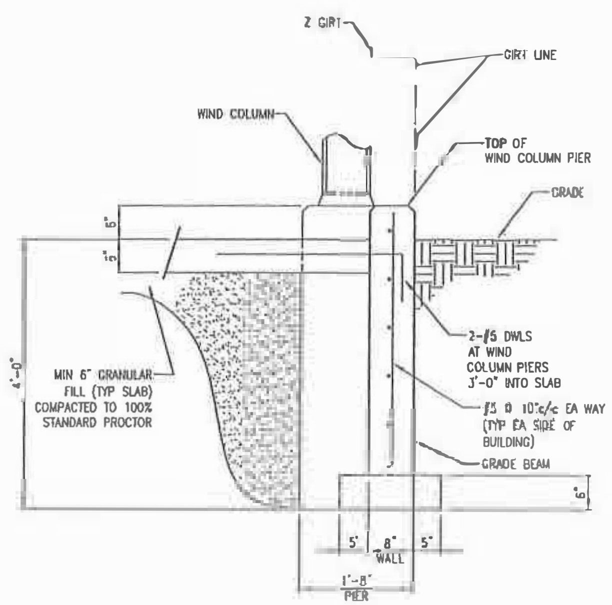
DETAIL A – TYP FOOTER
SCALE: 3/4" = 1'-0"



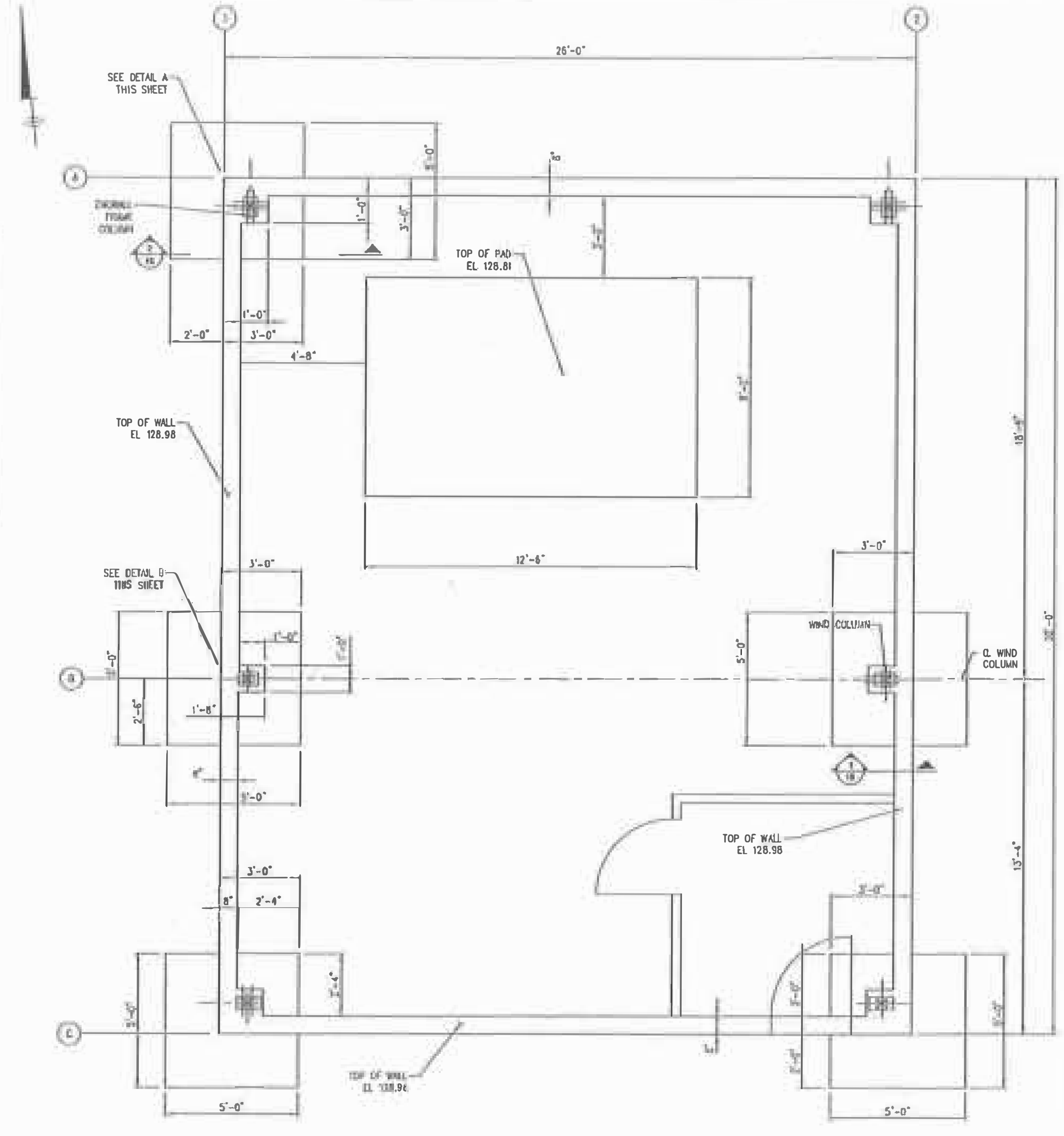
DETAIL B – TYP WIND COLUMN PIER
SCALE: 3/4" = 1'-0"



DETAIL 2/18
SCALE: NO SCALE



DETAIL 1/18
SCALE: 3/4" = 1'-0"



FOUNDATION PLAN
3/8" = 1'-0"

CITY:SYR-NY DIV/GROUP:85 DB:GHS LD:GHS PIC: PM: TM: LYR:ON=*;OFF=*REF*

XREFS: 01464X00-AAH PE, Xref Equipment Layout, 01464X00, xref Foundation, 2009-09-15 AS-BUILT LAYOUT 01464G01

IMAGES: PROJECTNAME:

3/4"=1'-0" 2' 1' 0 1' 2'

3/8"=1'-0" 2' 0 3' 6'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
4	9/29/09	AS-BUILTS – ELEVATIONS UPDATED	AAH	
3	9/15/09	AS-BUILTS	AAH	
2	2/02/09	COLUMN LINE MOVED TO MATCH METALLIC SHOPDRAWING	AAH	
1	1/28/09	SMALLER TIE SPACING AT INTERIOR PIERS.	AAH	

Professional Engineer's Name: AARON A HUNT
Professional Engineer's No.: 083788
State: NY | Date Signed: | Project Mgr.: CSG
Designed by: AAH | Drawn by: AAH | Checked by: TEM/WBW

ARCADIS
ARCADIS OF NEW YORK, INC.

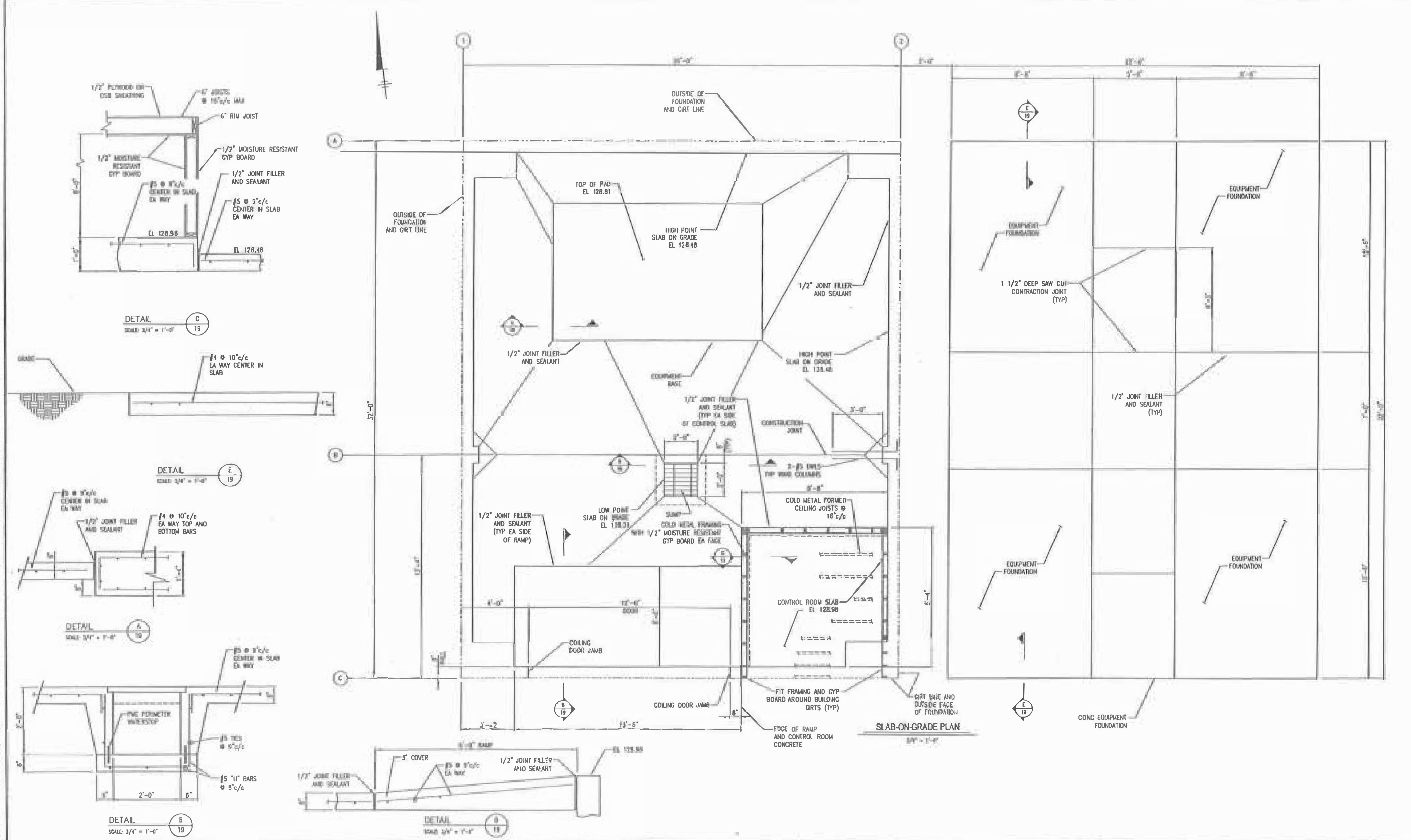
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

FOUNDATION PLAN VIEW AND DETAILS

STRUCTURAL

ARCADIS Project No. NY001464.1607.00003
Date AUGUST 2009

ARCADIS
6723 Towpath Road
Box 66
Syracuse, NY 13214
Tel: 315-446-9120



5	9/29/09	AS-BUILTS - UPDATE ELEVATIONS	AAH	
4	9/15/09	AS-BUILTS	AAH	
3	2/05/09	CONTROL ROOM SLAB INCREASED IN SIZE	AAH	
2	2/03/09	SLAB ISOLATION JOINT MODIFICATIONS	AAH	
1	2/03/09	COLUMN LINE MOVED TO MATCH METALLIC SHOPDRAWING	AAH	
No.	Date	Revisions	By	Ckd

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name: AARON A HUNT
Professional Engineer's No. 083788
Designed by AAH | Drawn by AAH

ARCADIS
ARCADIS OF NEW YORK, INC.

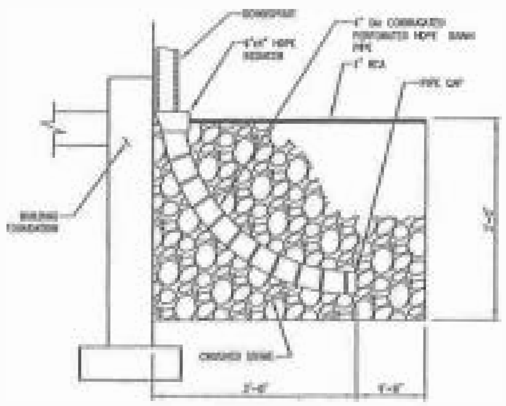
NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

SLAB ON GRADE PLAN VIEW AND DETAILS

STRUCTURAL

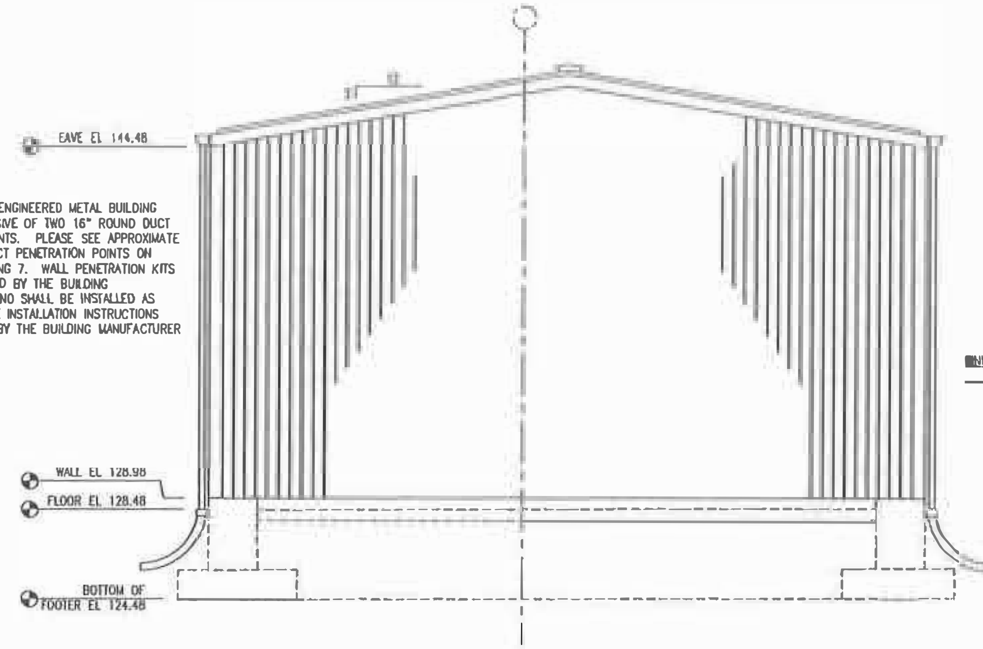
ARCADIS Project No. NY001454.1807.00003
Date AUGUST 2009
ARCADIS 6723 Towpath Road Box 66 Syracuse, NY 13214 Tel: 315-446-9120

19

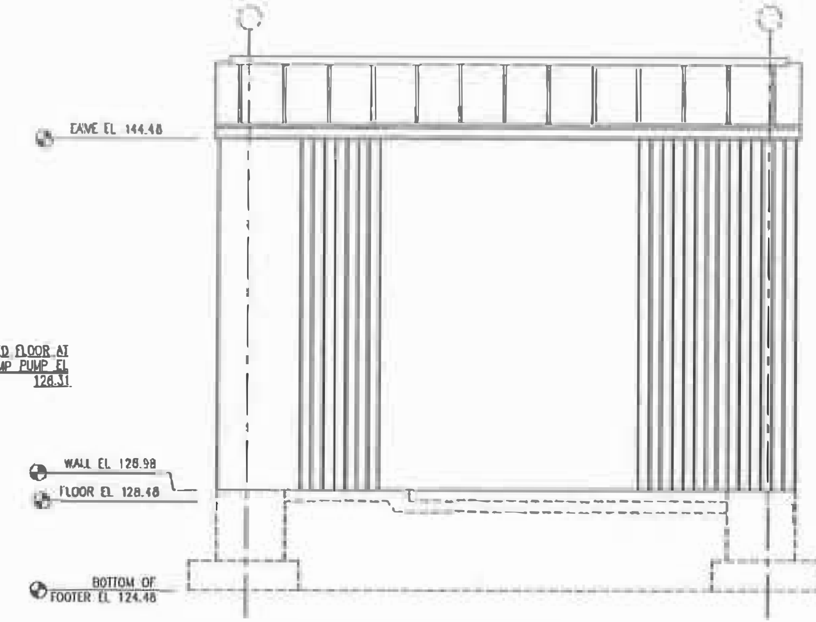


SECTION
TYPICAL DOWNSPOUT
3/4"=1'-0"

NOTE: THE PRE-ENGINEERED METAL BUILDING SHALL BE INCLUSIVE OF TWO 16" ROUND DUCT PENETRATION POINTS. PLEASE SEE APPROXIMATE LOCATION OF DUCT PENETRATION POINTS ON CONTRACT DRAWING 7. WALL PENETRATION KITS WILL BE PROVIDED BY THE BUILDING MANUFACTURER AND SHALL BE INSTALLED AS DIRECTED BY THE INSTALLATION INSTRUCTIONS ALSO PROVIDED BY THE BUILDING MANUFACTURER

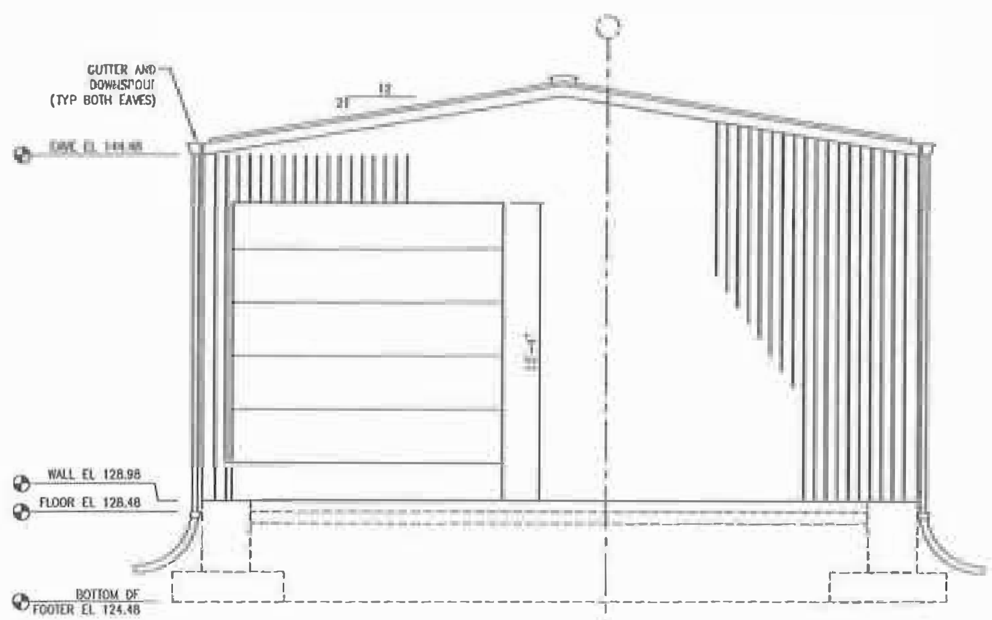


EAST ELEVATION
1/4" = 1'-0"



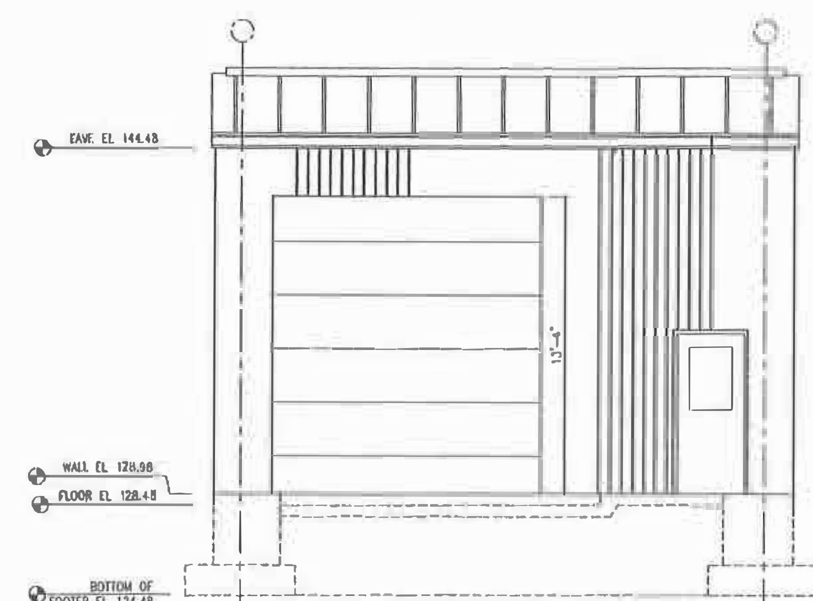
NORTH ELEVATION
1/4" = 1'-0"

DESIGN INFORMATION (NYSBC 2007)	
DESIGN ROOF LIVE LOAD	20 psf
DESIGN ROOF COLLATERAL LOAD (APPLY PURLINS AND FRAMES)	10 psf
NET ALLOWABLE DESIGN SOIL BEARING PRESSURE (PRESUMED BEARING PRESSURE)	1000 psf MIN (VERIFY DURING CONSTRUCTION)
DESIGN SNOW LOAD NYSBC 2007 SECTION 1608 GROUND SNOW LOAD SNOW EXPOSURE FACTOR, Ce SNOW LOAD IMPORTANCE FACTOR, Is THERMAL FACTOR, Ct FLAT ROOF SNOW LOAD, Pf SLOPED ROOF SNOW LOAD, Ps	 20 PSF 0.9 1.1 1.0 13.9 psf 13.9 psf
DESIGN WIND LOAD NYSBC 2007 SECTION 1609 BASIC WIND SPEED 110 MPH WIND LOAD IMPORTANCE FACTOR = 1.15 BUILDING CATEGORY III WIND EXPOSURE B INTERNAL PRESSURE COEFFICENT 0.18 COMPONENTS AND CLADDING LOADS ROOF: ZONE 2 +10.2 PSF, -42 PSF WALLS: ZONE 4 +25 PSF, -27.1 PSF	
DESIGN SEISMIC LOADS NYSBC 2007 SECTION 1613 SEISMIC LOAD IMPORTANCE FACTOR = 1.25 MAPPED SPECTRAL RESPONSE ACCELERATIONS Ss 0.30 S1 0.07 SITE CLASS D SPECTRAL RESPONSE COEFFICIENTS Sds 0.312 Sd1 0.112 SEISMIC DESIGN CATAGORY C BASIC SEISMIC FORCE RESISTING SYSTEM ORDINARY STEEL MOMENT FRAMES DESIGN BASE SHEAR STEEL "BUILDING" BASE SHEAR 5 KIPS SEISMIC RESPONSE COEFFICIENT Cs Cs STEEL 0.111 (MOMENT FRAMES) RESPONSE MODIFICATION FACTOR R STEEL MOMENT FRAME 3.5 ANALYSIS PROCEDURE USED: EQUIVALENT LATERAL FORCE PROCEDURE	



WEST ELEVATION
1/4" = 1'-0"

DATUM NOTES:
1. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988.
2. COORDINATES ARE BASED ON THE NEW YORK STATE PLANE COORDINATE SYSTEM OF 1983, LONG ISLAND ZONE.



SOUTH ELEVATION
1/4" = 1'-0"

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
	10/15/09	AS-BUILT	AAH	
	10/21/09	AS-BUILT	AAH	

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: AARON A HUNT
Professional Engineer's No.: 083766
State: NY | Date Signed: | Project Mgr.: CSG
Designed by: AAH | Drawn by: AAH | Checked by: TEM/WSW

ARCADIS
ARCADIS OF NEW YORK, INC.

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

BUILDING ELEVATIONS

STRUCTURAL

ARCADIS Project No. NY001484.1607.00003
Date AUGUST2009
ARCADIS
6723 Towpath Road
Box 66
Syracuse, NY 13214
Tel 315-446-9120

20

GENERAL

1. QUALITY OF CONSTRUCTION REQUIRED, PERFORMANCE LEVELS OF WORKMANSHIP, MANUFACTURING AND INDUSTRY STANDARDS, STRENGTH AND PHYSICAL REQUIREMENTS OF MATERIALS, CONFORMANCE TO CODES AND REGULATIONS, GUARANTEES AND OTHER PROJECT REQUIREMENTS ARE SPECIFIED IN THE PROJECT MANUAL.
2. IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS OR SPECIFICATIONS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED, OR NOTED SHALL BE PROVIDED.
3. PERFORM ALL WORK IN COORDINATION WITH ALL DRAWINGS AND INFORMATION RELATED TO STRUCTURAL WORK. ANY CHANGES TO THE EQUIPMENT REQUIRING CHANGES TO THE STRUCTURAL SYSTEMS SHALL BE REDESIGNED BY A PROFESSIONAL ENGINEER AT NO COST TO THE OWNER AND SUBMITTED TO THE ENGINEER. SUBMITTAL SHALL BE ACKNOWLEDGED IN WRITING BEFORE BEGINNING CONSTRUCTION.
4. IT IS SOLELY THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO INSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER COMPLETION OF THE PROJECT.
5. FACILITIES HAVE BEEN DESIGNED FOR DESIGN LOADS SHOWN OR SPECIFIED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FACILITIES SUBJECT TO CONSTRUCTION LOADS EXCEEDING THE DESIGN LOADS AND SHALL NOTIFY THE ENGINEER OF ANY SUCH ADDITIONAL LOADS.
6. ALL DIMENSIONS AND ELEVATIONS NOTED THUS (*) ON STRUCTURES SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR IN THE FIELD OR WITH THE EQUIPMENT MANUFACTURER AND SHALL CONFORM TO THOSE SHOWN ON OTHER DRAWINGS.
7. DESIGN LOADS: BASED ON NEW YORK STATE 2007 BUILDING CODE. SEE ELEVATION VIEW FOR LOAD VALUES.

FOUNDATIONS

1. THE CONTRACTOR SHALL BECOME FAMILIAR WITH THE SURVEY AND THE SUBSURFACE INVESTIGATION REPORT BEFORE BEGINNING CONSTRUCTION.
2. NOTIFY THE ENGINEER AS SOON AS POSSIBLE OF ANY UNUSUAL SOIL CONDITIONS OR SOIL CONDITIONS IN VARIANCE WITH TEST BORINGS, SUCH AS UNEXPECTED SPRING OR SEEPAGE WATER, MATERIAL DIFFERING FROM TEST BORINGS, OR SOIL OF QUESTIONABLE BEARING CAPACITY.
3. SET FOUNDATIONS AT ELEVATIONS SHOWN. THE CONTRACTOR SHALL VERIFY WITH THE ENGINEER THAT EACH FOOTING PLACED IS BEARING ON DESIGN MATERIAL.
6. CONCRETE GENERAL NOTES APPLY TO FOUNDATIONS.
7. FOOTINGS SHALL REST ON UNDISTURBED SOIL OR COMPACTED SELECT OR CONCRETE FILL OR ROCK.
8. LEVELS OF BACKFILL AGAINST CONCRETE WALLS SHALL NOT DIFFER BY MORE THAN 2'-0" ON EITHER SIDE OF WALLS UNLESS ADEQUATELY BRACED.
9. PROTECT EXCAVATION FROM FLOODING UNTIL ALL WALLS AND FLOOR FRAMING UP TO AND INCLUDING GRADE LEVEL FLOORS ARE IN PLACE AND BACKFILLING HAS BEGUN. WATER LEVEL SHALL BE MAINTAINED BELOW EXCAVATION AT ALL TIMES.

CAST-IN-PLACE CONCRETE

1. CONCRETE SHALL HAVE THE FOLLOWING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS: 4,000 POUNDS PER SQUARE INCH (PSI) WITH ENTRAINED AIR FOR ALL CONCRETE UNLESS SPECIFICALLY NOTED OTHERWISE IN SPECIFICATIONS OR ON CONTRACT DRAWINGS.
2. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH "THE BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE" ACI 318. TOLERANCES SHALL BE IN ACCORDANCE WITH ACI 347, SECTION 3.3.1, TOLERANCES FOR REINFORCED CONCRETE BUILDINGS.
3. ALL REINFORCING STEEL SHALL BE NEW DOMESTIC DEFORMED BILLET STEEL CONFORMING TO ASTM A-615 GRADE 60.
4. ALL REINFORCING DETAILS SHALL CONFORM TO "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT", ACI 315, UNLESS DETAILED OTHERWISE ON THE STRUCTURAL DRAWINGS
5. CONTRACTOR SHALL REVIEW ALL DRAWINGS FOR SIZE AND LOCATION OF EMBEDDED ITEMS, SLEEVES, SLAB DEPRESSIONS, REQUIRED. THESE ITEMS SHALL BE FURNISHED AND INSTALLED PRIOR TO PLACEMENT OF CONCRETE.
6. WHERE BAR LENGTHS ARE GIVEN ON THE DRAWINGS, THE LENGTH OF ANCHOR HOOK, IF REQUIRED, IS NOT INCLUDED.
7. FOUNDATION WALLS AND SLABS SHALL BE CAST MONOLITHICALLY, EXCEPT FOR REQUIRED CONSTRUCTION JOINTS. CONTRACTOR SHALL SUBMIT ANY AND ALL ALTERNATE AND ADDITIONAL CONSTRUCTION JOINT LOCATIONS AND DETAILS.
8. CONSTRUCTION JOINTS REQUIRED BY THE ENGINEER ARE SHOWN ON THE DRAWINGS. REINFORCEMENT SHALL BE CONTINUOUS ACROSS CONSTRUCTION JOINTS. SUBMIT ALL CONSTRUCTION JOINT LOCATIONS WITH REINFORCING STEEL SHOP DRAWINGS.
9. CLEARANCES FOR REINFORCING STEEL SHALL CONFORM TO THE FOLLOWING:
   TYPICAL REINFORCING BAR CLEARANCE TABLE CONCRETE CAST AGAINST EARTH 3"
   SURFACES EXPOSED TO EARTH OR WEATHER 2"
   SURFACES NOT EXPOSED EARTH OR WEATHER 1-1/2"
10. WELDING OF REINFORCING STEEL IS NOT PERMITTED.
11. CALCIUM CHLORIDE SHALL NOT BE PERMITTED NOR SHALL ANY ADMIXTURE CONTAINING CALCIUM CHLORIDE BE PERMITTED THAT RESULTS IN A TOTAL CONCRETE MIX IN WHICH THE PRESENCE OF CHLORIDE IONS EXCEED 0.15 PERCENT BY WEIGHT OF CEMENT.
12. ALUMINUM PIPE SHALL NOT BE USED WITH CONCRETE PUMPS
13. CONCRETE SHALL BE DISCHARGED AT THE SITE WITHIN 75 MINUTES AFTER WATER HAS BEEN ADDED TO THE CEMENT AND AGGREGATES. ADDITION OF WATER TO THE MIX AT THE PROJECT SITE WILL NOT BE ALLOWED. ALL WATER MUST BE ADDED AT THE BATCH PLANT.
14. REINFORCING BARS REQUIRED FOR PROPER SUPPORT OF PRINCIPAL REINFORCING SHALL BE DETAILED AND SUPPLIED BY THE CONTRACTOR WHETHER OR NOT THEY ARE INDICATED ON THE DRAWINGS.
15. REINFORCING BAR LAP SPLICES, EMBEDMENT, AND HOOK LENGTHS SHALL CONFORM WITH "REINFORCEMENT LAP SPLICE, EMBEDMENT, AND STANDARD HOOKS TABLE".
16. BOND BREAKER MATERIAL SHALL BE 15 POUNDS FELT PAPER, UNLESS NOTED OTHERWISE.
17. JOINT FILLER: ASTM D1752; PRE-MOLDED SPONGE RUBBER FULLY COMPRESSIBLE WITH RECOVERY RATE OF MINIMUM 95 PERCENT; W.R. MEADOWS SPONGE RUBBER, OR AS APPROVED.
18. PROVIDE 1" CHAMFER ON ALL EXPOSED EDGES.

STRUCTURAL STEEL

1. STRUCTURAL STEEL SHALL CONFORM TO THE AISC "SPECIFICATIONS FOR DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS" LATEST EDITION.
2. WELDED CONNECTIONS SHALL CONFORM TO THE LATEST REVISED CODE THE AMERICAN WELDING SOCIETY, AWS D1.
3. BOLTS AND BOLTED CONNECTIONS SHALL CONFORM TO THE REQUIREMENTS OF THE "SPECIFICATIONS FOR STRUCTURAL JOINTS USING ASTM A325 BOLTS" AS APPROVED BY THE COUNCIL ON RIVETED AND BOLTED JOINTS.
4. ANCHOR RODS: ASTM F1554 GRADE 36 KSI, EMBEDMENT, DIAMETER, AND QUANTITY TO BE DETERMINED BASED ON BUILDING MANUFACTURER APPROVED SHOP DRAWINGS.
5. STRUCTURAL STEEL:
   ROLLED STEEL PLATES, SHAPES (EXCEPT WIDE FLANGE SECTIONS), BARS & RODS: ASTM A36
   WIDE FLANGE SECTIONS; ASTM A992
   STEEL PIPE OR STRUCTURAL TUBING; ASTM A53; TYPE E OR S, GRADE B OR A 501.
6. WELDING ELECTRODES SHALL BE E-70XX. FOR WELDING SYMBOLS WITH NO LENGTH DIMENSION GIVEN, THE WELDING SHALL BE CONTINUOUS BETWEEN ABRUPT CHANGES IN DIRECTION. NO INTERMITTENT WELDS SHALL BE PERMITTED, UNLESS OTHERWISE NOTED.

REINFORCEMENT LAP SPLICE, EMBEDMENT LENGTH AND STANDARD HOOKS

BAR SIZE	MIN. LAP LENGTHS FOR BEAMS * CLASS B TOP***	MIN. LAP LENGTHS FOR BEAMS * CLASS B OTHERS	MIN. LAP LENGTHS FOR SLABS AND WALLS ** CLASS B TOP***	MIN. LAP LENGTHS FOR SLABS AND WALLS ** CLASS B OTHERS	MIN. LAP LENGTHS FOR COLUMNS	MIN. EMBEDMENT LENGTHS STRAIGHT BARS* TOP***	MIN. EMBEDMENT LENGTHS STRAIGHT BARS* OTHERS	MIN. EMBEDMENT LENGTHS WITH STANDARD HOOKS	MIN. STD. HOOKS 90° A OR G	MIN. STD. HOOKS 135° A OR G	MIN. STD. HOOKS 135° H
#3	25	19	16	16	12	19	15	5	6	4	2.5
#4	33	25	20	16	15	25	19	7	8	4.5	3
#5	41	31	25	19	19	31	24	9	10	5.5	3.75
#6	49	37	29	23	23	37	29	10	12	8	4.5
#7	71	54	43	33	27	54	42	12	14	9	5.25
#8	81	62	49	37	30	62	48	14	16	10.5	6
#9	91	70	60	46	34	70	54	15	19	–	–
#10	102	79	74	57	39	79	61	17	22	–	–
#11	114	87	89	69	43	87	67	19	24	–	–

REINFORCEMENT LAP SPLICE, EMBEDMENT LENGTH AND STANDARD HOOKS TABLE IS BASED ON A MINIMUM CONCRETE COMPRESSIVE STRENGTH OF 4000 PSI AND 60000 PSI REINFORCEMENT (WITH NO EPOXY COATING).

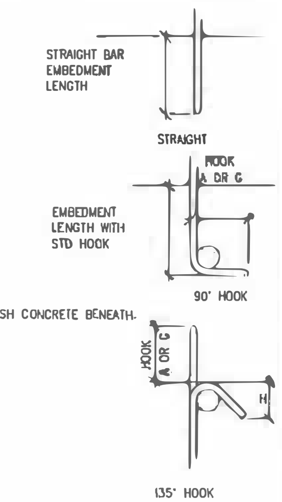
ALL LAPS SPLICES SHALL BE CLASS B SPLICES.

* THE MINIMUM LAP LENGTH FOR BEAMS AND STRAIGHT EMBEDMENTS ARE BASED ON A 3 BAR DIAMETER MINIMUM CENTER TO CENTER BAR SPACING AND A 2 INCH BAR COVER. IF THE SPLICE AND/OR EMBEDMENT DOES NOT CONFORM TO THESE REQUIREMENTS, THEN CONTRACTOR SHALL APPLY APPROPRIATE FACTORS IN COMPLIANCE WITH ACI 318 WITH APPROVAL BY ENGINEER.

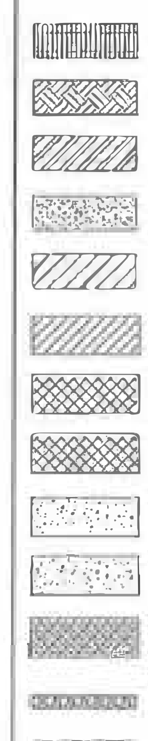
** THE MINIMUM LAP LENGTH FOR SLABS AND WALLS IS BASED ON A 8 INCH BAR SPACING AND A 2 INCH BAR COVER. IF THE LAP CONDITION DOES NOT CONFORM TO THESE REQUIREMENTS, THEN USE BEAM LAP LENGTHS; OR COMPLY WITH LAP REQUIREMENTS OF ACI 318 WITH APPROVAL BY ENGINEER.

*** TOP BARS ARE DEFINED AS ALL WALL, BEAM, OR SLAB HORIZONTAL BARS WITH 12" OR MORE FRESH CONCRETE BENEATH.

WHERE SPLICES ARE INDICATED BETWEEN BARS OF DIFFERENT SIZES, THE SPLICE LENGTH SHALL BE BASED ON THE SMALLER BAR SIZE.



SYMBOLS



ABBREVIATIONS

AB – ANCHOR BOLT
AC – ACRE
ADD'L – ADDITIONAL
ADJ. – ADJUSTABLE
ALT. – ALTERNATE
ALUM. – ALUMINUM
ANCH. – ANCHOR
& – AND
ARCH. – ARCHITECT OR ARCHITECTURAL
ASTM – AMERICAN SOCIETY FOR TESTING MATERIALS
@ – AT
BSMT. – BASEMENT
BITUM. – BITUMINOUS
B/ – BOTTOM OF
B/W – BETWEEN
BOT. – BOTTOM
BOS – BOTTOM OF STEEL
BL – BUILDING LINE
BLDG. – BUILDING
BLK. – BLOCK
BM – BEAM
B PL – BASE PLATE
BRG. – BEARING
BT PL – BENT PLATE
C/C – CENTER TO CENTER
CJ – CONSTRUCTION JOINT
℄ – CENTERLINE
CHKD. – CHECKERED
CLR. – CLEAR
CMU – CONCRETE MASONRY UNIT
COL. – COLUMN
CONC. – CONCRETE
CONST. – CONSTRUCTION
CONT. – CONTINUOUS
CONTL. – CONTROL
CTR. – CENTER
CTSK – COUNTERSUNK
DEPR – DEPRESSION
DET. – DETAIL
DI – DUCTILE IRON
DIA. – DIAMETER
DIM. – DIMENSION
DL – DEAD LOAD
DIST. – DISTANCE
D.S. – DROP SHAFT
DWG. – DRAWING
DWL. – DOWEL
EA. – EACH
EE – EACH END
EF – EACH FACE
EJ – EXPANSION JOINT
EL. – ELEVATION
E. – EAST
EMBD. – EMBEDDED
EW – EACH WAY
EQ. – EQUAL
EXIST. – EXISTING
EXP. – EXPANSION
EXT. – EXTERIOR
FDN. – FOUNDATION
FE – FIRE EXTINGUISER
FIN. – FINISH
FL – FINISH LINE
FLR. – FLOOR
FRP – FIBERGLASS REINFORCED PLASTIC
FF – FAR FACE
FTG. – FOOTING
FT. – FOOT
GA. – GAGE
GALV. – GALVANIZED
GR. – GRADE
GRD – GROUND
GYP BD – GYPSUM BOARD
HORIZ. – HORIZONTAL
HP – HIGH POINT
HHP – HIGH HIGH POINT
HR. – HANDRAIL
HT. – HEIGHT
HS. – HIGH STRENGTH
ID – INSIDE DIAMETER
IF – INSIDE FACE
INT. – INTERIOR
INV. – INVERT
INSUL. – INSULATION
JT. – JOINT
K. – KIP (1000 POUNDS)
LB. – POUNDS
LFT. – LINEAR FEET
LL – LIVE LOAD
LLBB – LONG LEG BACK-TO-BACK
LG. – LONG
LLH – LONG LEG HORIZONTAL
LLV – LONG LEG VERTICAL
LONG. – LONGITUDINAL
LP – LOW POINT
LW – LIGHT WEIGHT
MACH. – MACHINED
MAS. – MASONRY
MAX. – MAXIMUM
MFG. – MANUFACTURER
MID. – MIDDLE
MIN. – MINIMUM
MK. – MARK
MO – MASONRY OPENING
NA – NOT APPLICABLE
N. – NORTH
NF – NEAR FACE
NTS – NOT TO SCALE
OC – ON CENTER
OD – OUTSIDE DIAMETER
OH. – OVERHEAD
OPNG. – OPENING
OPP. – OPPOSITE
PL – PLATE
PC – PRECAST
PSF – POUNDS PER SQUARE FOOT
PPAWS – PREFORMED PLASTIC ADHESIVE WATERSTOP
RAD. – RADIUS
R. – RISER
REINF. – REINFORCING
REQ'D. – REQUIRED
REQ'MTS. – REQUIREMENTS
RM. – ROOM
RO – ROUGH OPENING
S. – SOUTH
SCHED. – SCHEDULE
SECT. – SECTION
SF – SQUARE FEET
SHT. – SHEET
SIM. – SIMILAR
SJ – STEEL JOIST
SLBB – SHORT LEG BACK-TO-BACK
SLV – SHORT LEG VERTICAL
SPA. – SPACES OR SPACING
SPRD. – SPREAD
SS – STAINLESS STEEL
SQ. FT. – SQUARE FEET
STA. – STATION
STD. – STANDARD
STL. – STEEL
STR. – STRUCTURAL
SUP. – SUPPORT
SYM. – SYMMETRICAL
T. – TREAD
T/ – TOP OF
T&B – TOP AND BOTTOM
TEMP. – TEMPORARY
THK. – THICK
TOM – TOP OF MASONRY
TOS – TOP OF STEEL
TYP. – TYPICAL
UON – UNLESS OTHERWISE NOTED
VERT. – VERTICAL
W/ – WITH
W. – WEST
W/O – WITHOUT
WP – WORK POINT
WS. – WATER STOP
WT – WEIGHT

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING. USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

Professional Engineer's Name: AARON A HUNT
Professional Engineer's No.: 083788
State: NY | Date Signed: | Project Mgr.: CSO
Designed by: AAH | Drawn by: AAH | Checked by: TEMWSW

ARCADIS
ARCADIS OF NEW YORK, INC.

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

STRUCTURAL NOTES AND SYMBOLS #1

STRUCTURAL

ARCADIS Project No. NY001464.0007.00003
Date AUGUST 2009
ARCADIS 6723 Towpath Road Box 66 Syracuse, NY 13214 Tel. 315-446-9120

21

PRE-ENGINEERED BUILDING

1.1 DESIGN REQUIREMENTS
- A. APPLICABLE BUILDING CODE: NEW YORK STATE BUILDING CODE 2007.
- B. DESIGN WALL AND ROOF PANEL SYSTEM TO WITHSTAND SPECIFIED LOADS WITH DEFLECTION OF 1/240TH OF SPAN, MAXIMUM.
- C. ANCHOR RODS: FURNISH DESIGN CRITERIA FOR ANCHOR BOLTS FURNISHED BY OTHERS, TO RESIST THE LOADS INDUCED BY THE DESIGN LOADS ON THE STRUCTURE.

1.2 SUBMITTALS
- A. DESIGN DATA: PROVIDE DETAILED DESIGN CRITERIA AND CALCULATIONS.
- B. CERTIFICATION: MANUFACTURER CERTIFICATION THAT THE BUILDING CONFORMS TO THE CONTRACT DOCUMENTS AND MANUFACTURER'S STANDARD DESIGN PROCEDURES.
- C. SHOP DRAWINGS: SHOW BUILDING LAYOUT, PRIMARY AND SECONDARY FRAMING MEMBER SIZES AND LOCATIONS, CROSS-SECTIONS, AND PRODUCT AND CONNECTION DETAILS.
- D. PRODUCT DATA: INFORMATION ON MANUFACTURED PRODUCTS TO BE INCORPORATED INTO THE PROJECT.
- E. COLOR CHARTS: FOR SELECTION OF COLORS.
- F. ANCHOR ROD INSTALLATION DRAWINGS: LAYOUTS WITH BOLT DIAMETERS.
- G. REACTIONS: SUBMIT REACTIONS FOR DESIGN OF FOUNDATION.
- H. SPECIMEN WARRANTY.

1.3 QUALITY ASSURANCE
- A. DESIGN STRUCTURAL COMPONENTS, DEVELOP SHOP DRAWINGS, AND PERFORM SHOP AND SITE WORK UNDER DIRECT SUPERVISION OF A PROFESSIONAL ENGINEER EXPERIENCED IN DESIGN OF THIS WORK AND LICENSED IN THE STATE OF NEW YORK.
- B. DESIGN DATA AND SHOP DRAWINGS SUBMITTED FOR REVIEW SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK.
- C. QUALIFICATIONS:
  1. MANUFACTURER: COMPANY SPECIALIZING IN MANUFACTURING PRODUCTS SPECIFIED IN THIS SECTION WITH MINIMUM 5 YEARS DOCUMENTED EXPERIENCE.
  2. ERECTOR: COMPANY SPECIALIZING IN PERFORMING WORK OF THIS SECTION WITH MINIMUM 5 YEARS DOCUMENTED EXPERIENCE AND APPROVED BY MANUFACTURER.

1.4 WARRANTY
- A. PROVIDE MANUFACTURER'S STANDARD WARRANTY FOR:
  1. PANEL FINISH: 20 YEARS.
  2. WEATHER-TIGHTNESS: 20 YEARS

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. NUCOR BUILDING SYSTEMS
- B. OR AS APPROVED.

2.2 METAL MATERIALS
- A. STRUCTURAL STEEL PLATE, BAR, SHEET, AND STRIP FOR USE IN BOLTED AND WELDED CONSTRUCTIONS: ASTM A572, A570, A529, OR A36, WITH MINIMUM YIELD STRENGTH OF 50,000 PSI.
- B. STRUCTURAL STEEL MATERIAL FOR USE IN ROLL FORMED OR PRESS BROKEN SECONDARY STRUCTURAL MEMBERS: ASTM A570, OR A607 WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
- C. GALVANIZED STEEL SHEET FOR ROLL-FORMED OR PRESS BROKEN ROOF AND WALL COVERINGS, TRIM AND FLASHING: ASTM A653, WITH MINIMUM YIELD STRENGTH OF 50,000 PSI.
- D. HOT-ROLLED STEEL SHAPES: W, M AND S SHAPES, ANGLES, RODS, CHANNELS AND OTHER SHAPES; ASTM A992 OR ASTM A36 AS APPLICABLE; WITH MINIMUM YIELD STRENGTHS REQUIRED FOR THE DESIGN.
- E. STRUCTURAL BOLTS AND NUTS USED WITH PRIMARY FRAMING: HIGH STRENGTH, ASTM A325.
- F. BOLTS AND NUTS USED WITH SECONDARY FRAMING MEMBERS: ASTM A307.

2.3 FRAMING COMPONENTS
- A. PRIMARY FRAMING: RIGID FRAME SOLID WEB FRAMING CONSISTING OF TAPERED OR UNIFORM DEPTH RAFTERS RIGIDLY CONNECTED TO TAPERED OR UNIFORM DEPTH COLUMNS. PROVIDE A CLEAR SPAN THAT SUPPORTS THE LOADS AT BAY SPACINGS INDICATED.
- B. ENDWALL FRAMING: PORTAL FRAME FRAMING.
- C. PURLINS: Z-SHAPED; DEPTH AS REQUIRED; WITH MINIMUM YIELD STRENGTH OF 55,000 PSI; SIMPLE SPAN OR CONTINUOUS SPAN AS REQUIRED FOR DESIGN.
- D. GIRTS: Z- OR C-SHAPED; DEPTH AS REQUIRED, WITH MINIMUM YIELD STRENGTH OF 55,000 PSI; SIMPLE SPAN OR CONTINUOUS SPAN AS REQUIRED FOR DESIGN.
- E. WIND BRACING: PORTAL, TORSIONAL, DIAGONAL BRACING OR DIAPHRAGM IN ACCORDANCE WITH MANUFACTURER'S STANDARD DESIGN PRACTICES; UTILIZING RODS, ANGLES, AND OTHER MEMBERS, WITH MINIMUM YIELD STRENGTHS AS REQUIRED FOR DESIGN.
- F. PRIMARY FRAME FLANGE BRACING: ATTACHED FROM PURLINS OR GIRTS TO THE PRIMARY FRAMING, MINIMUM YIELD STRENGTH AS REQUIRED FOR DESIGN.
- G. BASE ANGLES: 2 INCH BY 3 INCH BY 0.059 INCH STEEL ANGLES, WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
- H. DOOR HEADERS AND JAMBS: Z- OR C-SHAPED; DEPTH AS REQUIRED; WITH MINIMUM YIELD STRENGTH OF 55,000 PSI.
- I. SAG ANGLES AND BRIDGING: STEEL ANGLES WITH MINIMUM YIELD STRENGTH OF 36,000 PSI.
- J. FABRICATION: FABRICATE ACCORDING TO MANUFACTURER'S STANDARD PRACTICE.
  1. FABRICATE STRUCTURAL MEMBERS MADE OF WELDED PLATE SECTIONS BY JOINING THE FLANGES AND WEBS BY CONTINUOUS AUTOMATIC SUBMERGED ARC WELDING PROCESS.
  2. ALL WELDING OPERATORS AND PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH THE AMERICAN WELDING SOCIETY "STRUCTURAL WELDING CODE", AWS D1.1.
  3. FIELD CONNECTIONS: PREPARE MEMBERS FOR BOLTED FIELD CONNECTIONS BY HAVING PUNCHED, DRILLED, OR REAMED HOLES IN THE SHOP.
- K. SHOP COATING: FINISH ALL STRUCTURAL STEEL MEMBERS USING ONE COAT OF MANUFACTURER'S STANDARD SHOP COAT, AFTER CLEANING OF OIL, DIRT, LOOSE SCALE AND FOREIGN MATTER.

2.4 ROOF AND WALL PANEL COMPONENTS
- A. ROOF PANELS: 36 INCH WIDE NET COVERAGE WITH 1-1/4 INCH HIGH MAJOR RIBS AT 12 INCHES ON CENTER WITH MINOR RIBS SPACED BETWEEN THE MAJOR RIBS.
  1. MATERIAL: GALVANIZED STEEL WITH G90 COATING.
  2. THICKNESS: 26 GAGE.
  3. SIDE LAPS: AT LEAST ONE FULL MAJOR RIB, WITH A SUPPORTING MEMBER BEARING EDGE ON THE LOWER PANEL AND AN ANTI-CAPILLARY GROOVE ON THE UPPER PANEL.
  4. LENGTH: CONTINUOUS FROM EAVE TO RIDGE.
  5. ENDLAPS WHERE REQUIRED: 8 INCHES WIDE, LOCATED AT A SUPPORT MEMBER.
  6. FINISH: KYNAR 500 PRE-PAINTED FINISH ON EXTERIOR SURFACE, WASH COAT ON INTERIOR SURFACE. COLOR SELECTED BY OWNER FROM MANUFACTURER'S FULL LINE.
  7. THE ROOF SHALL BE TESTED AND CERTIFIED TO MEET UNDERWRITERS LABORATORIES, INC., UPLIFT RATING: UL 90.
- B. WALL PANELS: 36 INCH WIDE NET COVERAGE WITH 1-1/4 INCH HIGH MAJOR RIBS AT 12 INCHES ON CENTER WITH MINOR RIBS SPACED BETWEEN THE MAJOR RIBS
  1. MATERIAL: GALVANIZED STEEL WITH G90 COATING
  2. THICKNESS: 26 GAGE
  3. SIDE LAPS: TWO FULLY OVERLAPPING MAJOR RIBS SECURED TOGETHER WITH 1/4 INCH DIAMETER COLOR-MATCHED CARBON STEEL FASTENERS.
  4. LENGTH: CONTINUOUS FROM SILL TO EAVE.
  5. ENDLAPS WHERE REQUIRED: 4 INCHES WIDE, LOCATED AT A SUPPORT MEMBER.
  6. CRIMP PANELS AT THE BASE AND NOTCH TO MAKE ROOF PANEL CONFIGURATION AT THE EAVE.
  7. CUT PANELS SQUARE AT EACH END; PROVIDE BASE TRIM AT SILL.
  8. FINISH: KYNAR 500 PRE-PAINTED FINISH ON EXTERIOR SURFACE, WASH COAT ON INTERIOR SURFACE. COLOR SELECTED BY OWNER FROM MANUFACTURER'S FULL LINE.
- C. PANEL FASTENERS:
  1. FOR ROOF PANELS: STAINLESS STEEL-CAPPED CARBON STEEL FASTENERS WITH INTEGRAL SEALING WASHER.
  2. FOR WALL PANELS: COATED CARBON STEEL.
  3. COLOR OF EXPOSED FASTENER HEADS TO MATCH THE WALL PANEL FINISH

PRE-ENGINEERED BUILDING (CONT.)

- A. CONCEALED FASTENERS: SELF-DRILLING TYPE, OF SIZE AS REQUIRED.
  5. PROVIDE FASTENERS IN QUANTITIES AND LOCATION AS REQUIRED BY THE MANUFACTURER.
- B. FLASHING AND TRIM: MATCH MATERIAL AND COLOR OF ADJACENT COMPONENTS. PROVIDE [illegible] EAVES, INCLUDING PEAK AND CORNER [illegible], HIGH AND LOW EAVES, CORNERS, BASES, FRAMED OPENINGS AND AS REQUIRED OR SPECIFIED TO PROVIDE WEATHER-TIGHTNESS AND A FINISHED APPEARANCE.
- C. PLASTIC PANELS: GLASS FIBER-REINFORCED RESIN OR THERMO-FORMED ABS.
  1. [illegible]: MINIMUM 1/8 INCH THICK.
  2. COLOR: MANUFACTURER'S STANDARD COLOR.
- F. SEALANTS, MASTICS AND CLOSURES: MANUFACTURER'S STANDARD TYPE.
  1. PROVIDE AT ROOF PANEL ENDLAPS, SIDELAPS, RAKE, EAVE, TRANSITIONS AND ACCESSORIES AS REQUIRED TO PROVIDE A WEATHER-RESISTANT ROOF SYSTEM; USE TAPE MASTIC OR GUNNABLE SEALANT AT SIDELAPS AND ENDLAPS.
  2. PROVIDE AT WALL PANEL BASES, EAVES, TRANSITIONS AND ACCESSORIES.
  3. CLOSURES: FORMED TO MATCH PANEL PROFILES; CLOSED CELL ELASTIC MATERIAL, MANUFACTURER'S STANDARD COLOR.
  4. TAPE MASTIC: PRE-FORMED BUTYL RUBBER-BASED, NON-HARDENING, NON-CORROSIVE TO METAL; WHITE OR LIGHT GRAY.
  5. GUNNABLE SEALANT: NON-SKINNING SYNTHETIC ELASTOMER BASED MATERIAL; GRAY OR BRONZE.
- G. BLANKET INSULATION: GLASS FIBER WITH FACTORY-LAMINATED FACING MATERIAL.
  1. GLASS FIBER: [illegible] FLEXIBLE, RESILIENT, PRODUCED IN COMPLIANCE WITH THE NAIMA 202 SPECIFICATIONS.
  2. THERMAL RESISTANCE: [illegible] AT 75 DEGREES F MEAN TEMPERATURE.
  3. FLAME SPREAD INDEX: 25 OR LESS, WHEN TESTED IN ACCORDANCE WITH UL 723.
  4. SMOKE DEVELOPED INDEX: 50 OR LESS, WHEN TESTED IN ACCORDANCE WITH UL 723.
  5. UL CLASSIFIED.
  6. FACING: [illegible]
  7. PROVIDE FACING 3 INCHES WIDER ON BOTH EDGES THAN BLANKET.
  8. WIDTH: AS REQUIRED FOR INSTALLATION.
  9. USE BLANKET INSULATION AT ROOF AND WALLS.

2.5 WALL ACCESSORIES
- A. SERVICE DOORS.
- B. SECTIONAL OVERHEAD DOORS.
- C. PROVIDE FRAMED OPENINGS FOR LOUVERS.

2.6 ROOF ACCESSORIES
- A. EAVE GUTTERS: ROLL-FORMED 26 GAGE STEEL SHEET, WITH GUTTER STRAPS, FASTENERS AND JOINT SEALANT, SAME COLOR AS WALL PANELS.
  1. DOWNSPOUTS: 4 BY 5 INCHES IN 10 FOOT LENGTHS WITH DOWNSPOUT ELBOWS AND DOWNSPOUT STRAPS, SAME COLOR AS WALL PANELS.
- B. SNOWGUARDS:
  1. MANUFACTURERS: [illegible], OR AS APPROVED.
  2. FABRICATED FROM CLEAR POLYCARBONATE.
  3. PROVIDE ADHESIVE FOR SECURING SNOWGUARDS TO ROOF PANELS.
  4. CONSULT MANUFACTURER FOR SPACING RECOMMENDATIONS.
- C. PROVIDE FRAMED OPENINGS FOR FANS.

2.7 DOORS
- A. OVERHEAD DOORS TO BE COILING TYPE, STEEL CONSTRUCTION, INSULATED CURTAIN SLATS MIN 20 GA EXTERIOR AND 24 GA BACK COVER. LOCKING MECHANISM REQUIRED. PROVIDE COUNTERBALANCING MECHANISM WITH HELICAL TORSIONAL SPRINGS. PLACE HOOD EXTERIOR OF BUILDING.
- B. INTERIOR MANDOOR - 20 GA., HONEY COMB CORE, WITH 18 GA. FRAME AND LOCKS.
- C. EXTERIOR MANDOOR - 18 GA., INSULATED CORE, STANDARD KEYING, BALL BEARING HINGES, AND 18 GA. FRAME.

(REFER TO METALLIC BUILDING COMPANY DESIGN DRAWINGS FOR ADDITIONAL INFORMATION)

COLD FORMED METAL FRAMING

1.1 MATERIALS
- A. STEEL SHEET: ASTM A653/A 653M, STRUCTURAL STEEL, ZINC COATED, OF GRADE AND COATING AS FOLLOWS;
  1. GRADE: 33 OR 50, CLASS 1 OR 2 AS REQUIRED BY STRUCTURAL CALCULATIONS.
  2. COATING: G60 (Z180).

1.2 FRAMING ACCESSORIES
- A. FABRICATE STEEL-FRAMING ACCESSORIES OF THE SAME MATERIAL AND FINISH USED FOR FRAMING MEMBERS, WITH MINIMUM YIELD STRENGTH OF 33,000 PSI (230 MPA).
- B. PROVIDE ACCESSORIES OF MANUFACTURER'S STANDARD THICKNESS AND CONFIGURATION.

1.3 MISCELLANEOUS MATERIALS
- A. GALVANIZING REPAIR PAINT: SSPC-PAINT 20 OR DOD-P21035, ASTM A780.

1.4 FASTENERS
- A. SCREWS: CORROSION-RESISTANT COATED, SELF-DRILLING, PAN OR HEX WASHER HEAD. PROVIDE SCREW TYPE AND SIZE AS REQUIRED BY STRUCTURAL DESIGN CALCULATIONS FOR THE CONDITION AND THICKNESS OF MATERIALS BEING JOINED.

1.5 FABRICATION
- A. FABRICATE ASSEMBLIES TO SIZE AND CONFIGURATION REQUIRED.
- B. CUT ALL FRAMING COMPONENTS SQUARE FOR ATTACHMENT TO PERPENDICULAR MEMBERS, OR AS REQUIRED FOR AN ANGULAR FIT AGAINST ABUTTING MEMBERS.
- C. FASTEN COMPONENTS WITH SELF-DRILLING SCREWS OR WELDING. FURNISH SCREWS OF SIZES TO BE SUFFICIENT TO INSURE STRENGTH OF CONNECTION. TOUCH UP ALL WELDS WITH ZINC-RICH PRIMER. MECHANICAL FASTENERS, EITHER POWDER ACTUATED OR PNEUMATICALLY DRIVEN, ARE PROHIBITED.
- D. REINFORCE AND BRACE ASSEMBLIES TO WITHSTAND HANDLING STRESSES.
- E. COLD-FORMED METAL FRAMING MAY BE SHOP OR FIELD FABRICATED FOR INSTALLATION, OR IT MAY BE FIELD ASSEMBLED.
- F. INSTALL COLD-FORMED METAL FRAMING ACCORDING TO ASTM C1007, UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
- G. INSTALL COLD-FORMED METAL FRAMING AND ACCESSORIES PLUMB, SQUARE, AND TRUE TO LINE, AND WITH CONNECTIONS SECURELY FASTENED, ACCORDING TO MANUFACTURER'S WRITTEN RECOMMENDATIONS AND REQUIREMENTS IN THIS SECTION.
  1. CUT FRAMING MEMBERS BY SAWING OR SHEARING; DO NOT TORCH CUT.
  2. FASTEN COLD-FORMED METAL FRAMING MEMBERS BY WELDING OR SCREW FASTENING, AS STANDARD WITH FABRICATOR. WIRE TYING OF FRAMING MEMBERS IS NOT PERMITTED.
- H. INSTALL STUDS AT SPACING AS SHOWN ON DRAWINGS AND AS REQUIRED BY STRUCTURAL DESIGN CALCULATIONS, AT EACH SIDE OF OPENINGS AND NOT MORE THAN 2 INCHES FROM ABUTTING WALLS.
  - a. FRAME CORNERS WITH THREE STUDS.
  - b. FRAME WALL OPENINGS WIDER THAN STUD SPACING WITH DOUBLE STUD AT EACH JAMB.
  2. INSTALL SUPPLEMENTARY FRAMING OR BLOCKING TO SUPPORT WORK ATTACHED TO FRAMING.

1.6 TOLERANCES
- A. STUDS: VERTICAL ALIGNMENT (PLUMBNESS), 1/960 (1/8 INCH IN 10 FEET).
- B. WALLS: HORIZONTAL ALIGNMENT (LEVELNESS), 1/960 (1/8 INCH IN 10 FEET).
- C. STUD SPACING: 1/8 INCH FROM DESIGNATED SPACING PROVIDING THAT THE CUMULATIVE ERROR DOES NOT EXCEED REQUIREMENTS OF FINISHING MATERIALS.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:	USE TO VERIFY FIGURE REPRODUCTION SCALE					Professional Engineer's Name: AARON A HUNT
						Professional Engineer's No.: 083769
		09/15/08	AS-BUILTS	AAH		State: NY; Date Signed: ; Project Mgr.: CSG
	No.	Date	Revisions	By	Ckd	Designed by: AAH; Drawn by: AAH; Checked by: TEM/WSW

THIS DRAWING IS THE PROPERTY OF THE ARCADIS ENTITY IDENTIFIED IN THE TITLE BLOCK AND MAY NOT BE REPRODUCED OR ALTERED IN WHOLE OR IN PART WITHOUT THE EXPRESS WRITTEN PERMISSION OF SAME.

ARCADIS

ARCADIS OF NEW YORK, INC.

NORTHROP GRUMMAN CORPORATION • BETHPAGE, NEW YORK
OPERABLE UNIT 3 - FORMER GRUMMAN SETTLING PONDS

STRUCTURAL NOTES AND SYMBOLS #2

STRUCTURAL

ARCADIS Project No. NY001464.1607.00003

Date AUGUST 2009

ARCADIS
6723 Towpath Road
Box 66
Syracuse, NY 13214
Tel: 315-446-9120

22

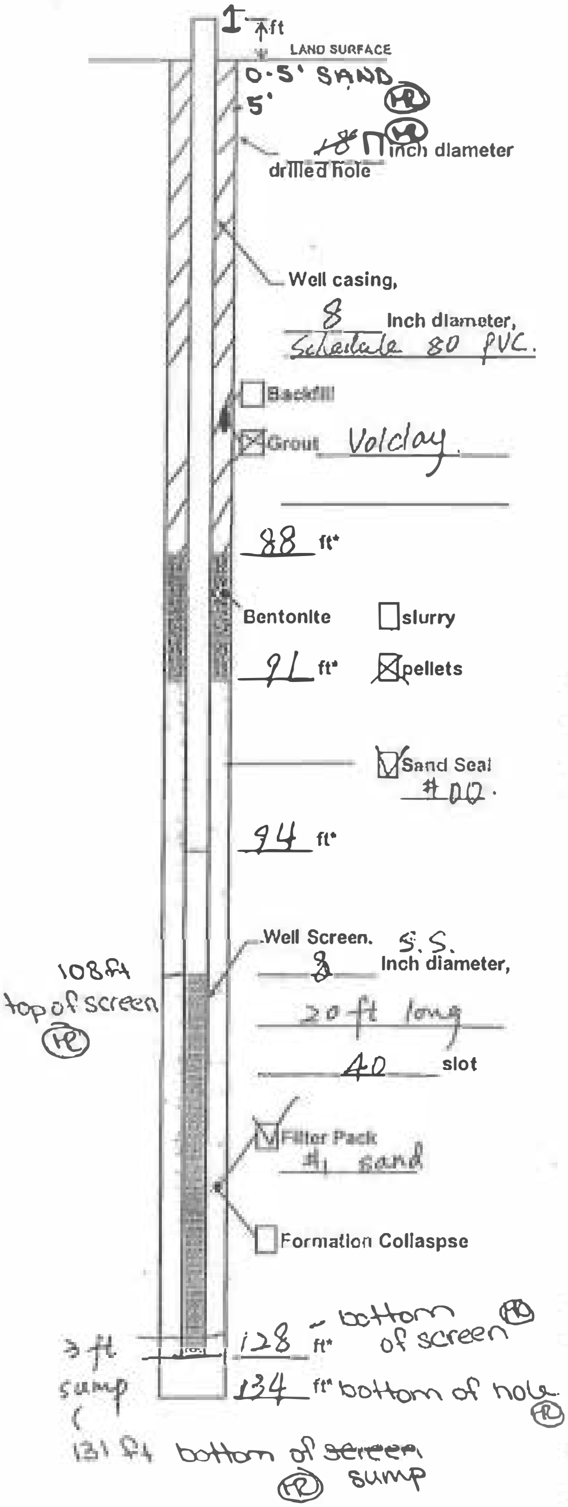
ARCADIS

Appendix C

Remedial Well Boring and Construction Logs

ARCADIS

Well Construction Log
(Unconsolidated)



Project Name and No.	NY001464.1807.00008
Well	RW-01
Town/City	Bethpage
County	Nassau
State	NY
Permit No.	
Land-Surface Elevation and Datum:	______ feet ☐ Surveyed ☐ Estimated
Installation Date(s)	12-11 to 12-12-08.
Drilling Method	Mud-Rotary
Drilling Contractor	Delta
Drilling Fluid	water

Development Technique(s) and Date(s)

surge block with air lift.
pump & surge.

Fluid Loss During Drilling	NA. gallons
Water Removed During Development	~~1690~~ 19,200. gallons
Static Depth to Water	56.20 feet below M.P.**
Pumping Depth to Water	64.56 feet below M.P.**
Pumping Duration	1.6 hours
Yield	200 gpm
Date	01-16-09
Specific Capacity	23.6 gpm/ft
Well Purpose	recovery well for GW IRM.
Remarks	well Chlorinated on 01-14-2009. Total Volume purged ~1690 gal.

* Depth Below Land Surface

**Measuring Point is Top of Well Casing Unless Otherwise Noted.

Prepared by Sunny Xu.

Sample Log

Well/Boring PBRW-01 Project Name and No. Northrop Grumman Syt. Cage. NY1404.1807.8

Site Location Bethpage Comm. Park Aerov Rd. Drilling Started 9/18/08 Drilling Completed 9/18/08

Total Depth Drilled 125 feet Hole Diameter 8.0 Inches Sampling Interval continuous ~~feet~~

Length and Diameter of Sampling Device 2'x2" Type of Sampling Device Split Spoon

Drilling Method HSA Drilling Fluid Used N/A

Drilling Contractor Delta Well Driller Bob Devine II Helper Tom Ewers

Prepared By Jerome Oerthing Hammer Weight 175 lbs Hammer Drop 36 inches

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample Description	PID (ppm)
103	105	1.1	27,30,25 (1.5ft)	0.0-0.25': Sand, medium, subrounded, well sorted	0.0
				trace granule, subrounded, loose, moist,	
				light grey	
				0.25-0.45': Sand; med-fine, subrounded, little	0.0
				silt; little small pebbles; poorly sorted,	
				loose, moist, dark greyish brown	
				0.45-0.6: Silty sand, med-fine, subrounded,	0.0
				well sorted, loose, moist, olive yellow	
				0.6-1.1: Sand; medium, subrounded, well sorted	
				trace silt, loose, moist, light grey-grey	
105	107	0.75'	30,43,37 32	0.0-0.5: Sand, medium, subrounded, well sorted,	0.0
				loose, moist, light grey	
				0.5-0.75': Sand, medium, subrounded, trace	0.0
				silt, well sorted, loose, moist, light	
				yellowish brown	

continued page 2.

Sample Log (Cont.d)

Well/Boring PBRW-01 Project Name and No. NGC OU3 NY1464.1807.8

Prepared By Jerome Oertling

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample Description	PID (ppm)
107	109	0.55	25,7,27, 28,	0.0-0.05 - SAA	0.0
				0.05-0.45 - Sand, fine-medium, subrounded	0.0
				well sorted, little silt at 0.05-0.15.	
				loose, moist, pale yellow.	
				0.45-0.55 - Sand, medium, subrounded-	0.0
				rounded, well sorted, loose, moist,	
				dark grey. Note: <1/8" silt/clay lamination @ 0.05	0.0
109	111	1.5	30,33,33, 40,	Sand, medium, subrounded, well sorted,	
				medium dense, moist, light yellowish brown.	
111	113	2.0	20,6,11, 15	0.0-1.6 Sand, medium, subrounded, some silt, poorly	0.0
				sorted, trace small pebbles (dark brown),	
				loose moist light yellowish brown.	
				1.6-1.65: Silty Sand, medium, subrounded,	0.0
				well sorted, loose moist laminated, dark grey +	
				olive yellow.	
				1.65-2.0 Sand-medium-coarse subrounded	0.0
				well sorted, loose moist light grey 1.65-1.80	
				dark grey 1.80-2.0.	
113	115	1.1		0.0-0.75 - Sand, coarse-medium; subangular,	
				well sorted, loose, moist, light grey to grey	
				continued page 3 —	

Sample Log (Cont.d)

Well/Boring PBRV-01 Project Name and No. NGC OU 3 NY1464.1807.00008

Prepared By Jerome Oe

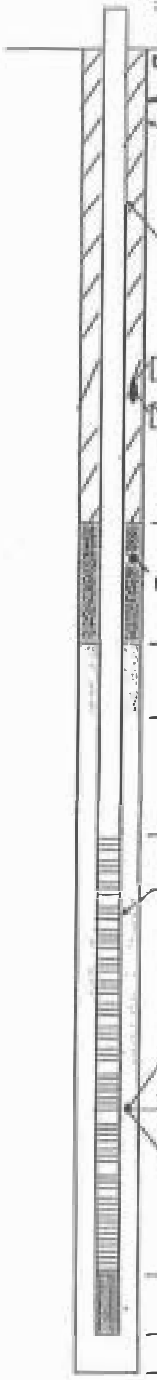
continued from page 2

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)
113	115			0.75-1.1 - Silty Sand, medium, subrounded - trace	0.0
				grey clay, poorly sorted, med dense,	
				moist - olive yellow.	
115	117	2.0	36,41,42 38	0.0-.95 - Sand - coarse - medium, subrounded,	0.0
				well sorted, loose, moist, light grey.	
				.95-1.6 - Sand - med - coarse - alternating	
				laminations of light grey sand (above) and	
				silty sand olive yellow - ~1/2" in length.	
				1.6-1.7 - Silty Sand, medium, subrounded -	0.0
				poorly sorted, dense, moist olive yellow.	
				1.7-1.75 - Silty sand black	
				1.75-2.0 - Sand - med - fine, subrounded,	
				trace silt, med. dense, moist, light	
				yellowish brown	
117	119	2.0		0.0-.95 - Sand, coarse - med, subrounded, well	0.0
				sorted, Loose, moist, light grey	
				.95-1.85 - Sand, medium, subrounded, little silt	0.0
				poorly sorted, medium dense, moist pale yellow	
				1.85-2.0 - Silty Sand, medium, subrounded, poorly	0.0
				sorted, med. dense, moist. olive. yellow.	
				continued p. 4	

ARCADIS

Well Construction Log

(Unconsolidated)



1 (a)
ft
LAND SURFACE
D-3 SAND
5' (B)

9-7/8" inch diameter drilled hole (ID)

Well casing,
6 inch diameter,
Low Carbon Steel

☐ Backfill
☒ Grout 90% Portland 10% Bentonite

53.6 ft*

Bentonite ☐ slurry ☒ pellets

56.7 ft*

☒ Sand Cap #00

65 ft*

44 ft* TOP

Well Screen,
6 inch diameter
SS , .025 slot

☐ Gravel Pack
☒ Sand Pack #0
☐ Formation Collaspse

104 ft* BOTTOM

~~X~~ ft** SUMP: ☐ YES ☒ NO

106 ft*

Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

** Sump if applicable

Project NGC-043 Well RW-02

Town/City Bethpage

County Nassau State NY

Permit No.

Land-Surface Elevation and Datum:

≈125 feet ☐ Surveyed ☒ Estimated

Installation Date(s) 3/17 → 3/19/08

Drilling Method HSA

Drilling Contractor Delta Well

Drilling Fluid None

Development Technique(s) and Date(s)

pump & surge with air

Fluid Loss During Drilling 300 gallons

Water Removed During Development 16,000 gallons

Static Depth to Water 53.8 feet below M.P.

Pumping Depth to Water 94.5 feet below M.P.

Pumping Duration 48 hours

Yield 120 gpm Date 4/8-4/10/08

Specific Capacity 3 gpm/ft

Well Purpose Recovery / monitoring

Remarks ☆ settling occurred overnight ≈ 3 bags of #00 was put into BH (according to M. Lende), when well was tagged w/ #0 depth was 65' but more than likely the #0 had not completely settled out yet.

Prepared by D. Zuck

ARCADIS

(for RW2)

Sample Log

Well/Boring: PB-6W
Project Name and No.: NGC-OU-3 GW IRM / NY001464.1808.00009
Site Location: Bethpage, NY
Drilling Started: 01/23/08 (the "3" is written above a crossed-out "24")
Drilling Completed: 01/24/08
Total Depth Drilled: 90 feet
Hole Diameter: 6 inches
Sampling Interval: 0 - 90 feet
Length and Diameter of Sampling Device: 2ft X 2"
Type of Sampling Device: Stainless Steel Split Spoon
Drilling Method: Hollow Stem Auger
Drilling Fluid Used: Water (~500 gallons)
Drilling Contractor: Delta
Driller: Jason Gaicci (01/23/08), Tom Romano (01/24/08)
Helper: Mike Avazquez
Prepared By: John Corral
Hammer Weight: ~140 lbs
Hammer Drop: 24" inches

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)
0	5	5	Hand Clear	med brown sand with little fine white/gray gravel, qtz, subrounded, moist.	0.0
5	10	0			
10	20	10	Auger Cutting	med. brown sand with little fine white/gray gravel, qtz, subrounded, moist	0.0
20	30	10	Auger Cuttings	med brown sand with little coarse sand to fine gravel qtz, subrounded, moist	0.0
30	40	10	Auger Cuttings	med brown sand with some white/gray coarse sand to fine gravel, qtz, subrounded, moist	0.0
40	50	10	Auger Cuttings	med brown sand with little fine sand and little coarse gravel, qtz, subrounded, dry	0.0
50	60	10	Auger Cuttings	med brown sand with some fine to coarse gray white gravel, qtz, subrounded moist	0.0
60	61	1	5,7,7,10	med light brown sand, with trace fine black/brown gravel, qtz, subrounded moist	0.0

ARCADIS

(for RW2)

Sample Log (Cont.d)

Well/Boring PB-6W

Project Name and No. NGC-OU-3 GW IRM / NY001464.1808.00001

Prepared By John Corral

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample Description	PID (ppm)
61	63	20"	2,2,4,7	med light brown sand, wet	0.0
63	64	10"	2,7,21,30	med light brown sand, wet	0.0
64	66	24"	2,4,20,25	med to course light brown sand, with	0.0
				trace 1/8" to 1/2" thin pieces of rust coloring	
				iron like pieces, wet	
66	68	24"	2,5,11,30	top 12" med to course light brown sand, qtz,	0.0
				subrounded, wet, next 12" med light brown sand	
				with little course sand, qtz, subrounded, wet	
68	70		11,12,11,18	top 12" tan brown fine + medium sand, next	0.0
				6" tan grey fine sand, with some medium sand,	
				next 6" fine sand + silt, greenish gray with	
				some dark gray (bottom 3" redish brown), qtz	
				subrounded, wet	
70	72	24"	5,11,12,20	top 4" med to course light brown sand, next	0.0
				20" fine med sand with some fine sand, light	
				brown with some light orange and dark grey 1" bands,	
				qtz, subrounded wet	
72	74	16"	4,4,7,10	fine to med light brown sand, qtz, subrounded, very wet	0.0
74	76	18"	3,3,12,15	grey fine to med sand, qtz, subrounded, wet	0.0
76	78	4"	7,11,12,R	greyish light brown fine to med sand, qtz, subrounded,	0.1
				very wet	

ARCADIS (for RW2)

Sample Log (Cont.d)

Well/Boring PB-GW

Project Name and No. NGC-OU-3 GW IRM/NY001464.1808.00001

Prepared By John Corral

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)
78	80	20"	4,4,7,17	fine to med light grey sand, qtz subrounded, wet	0.0
80	82	18"	8,15,20,23	med light brown sand, (top 6" greyish white) qtz, subrounded, wet	0.0
82	84	24"	9,11,14,23	med light brown sand, qtz, subrounded, moist	0.0
84	86	10"	4,4,6,11	med to course light brown sand, qtz, subrounded, moist	0.0
86	88	24"	10,5,11,20	med to course brown sand (bottom 12" redish brown more tightly packed, qtz, subrounded, wet	0.0
88	90	20"	4,8,9,15	med to course light brown sand, qtz, subrounded, ~~moist~~ wet	0.0

ARCADIS

Sample Log

Well/Boring: RW-02

Project Name and No.: NGC-043 NY001464.1807.2

Site Location: Bethpage, NY

Drilling ~~Started~~ Re-Started: 2/19/08

Drilling Completed: 2/20/08

Total Depth Drilled: 106 feet

Hole Diameter: ____ inches

Sampling Interval: 2 feet

Length and Diameter of Sampling Device: 2' x 1.75"

Type of Sampling Device: Split Spoon

Drilling Method: HSA

Drilling Fluid Used: None

Drilling Contractor: Delta

Driller: Conrad S.

Helper: Thomas E.

Prepared By: D. Zuck

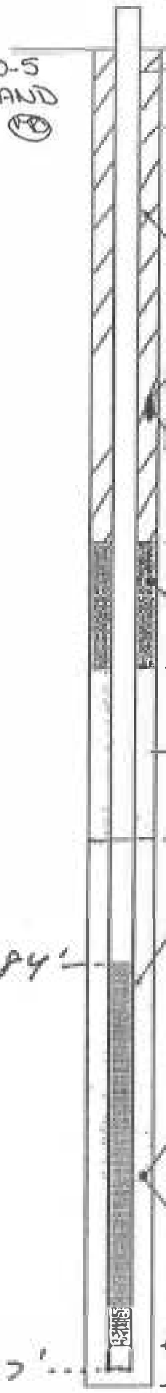
Hammer Weight: 160

Hammer Drop: 3' ~~feet~~ ~~inches~~

Sample Depth (feet below land surface) From	To	Sample Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample Description	PID (ppm)
0'	92'	/	/	Back filled from previous Drilling	0.0
92'	94'	7"	10,11,18,20	Lt Brown, silty SAND, med → (+) fine sub. angular sand, ≈ ~~30%~~ (40%) ~~fines~~ (silts), saturated, v. loose, [SM]	
94'	96'	13"	12,20,19,21	SAA; Except loose ≈ 30% silts	0.0
96'	98'	17"	7,9,10,11	SAA; except only fine sand, trace med. sand, few → trace mica fragments (fine)	0.0
98	100	24" (+)	18,23,19,17	Lt Brown, silty SAND, fine subangular sand, few med subangular sand, some silt, saturated, loose → ~~dense~~ med Dense [SP → SM]	0.0
100	102	24" (+)	19,23,26,30	SAA, trace: 1cm piece of clay @ 8" + 17", few → some angular fine mica fragments.	0.0
102	104	24" (+)	8,12,18,30	SAA, trace: 1cm piece of clay @ 16"	0.0
104	106	16"	6,8,10,14	SAA; Lt → med Brown, No clay	0.0
End of Boring				→	

ARCADIS

Well Construction Log
(Unconsolidated)



1' (temp.) ft
LAND SURFACE

0-5 SAND

5' bls

17' inch diameter drilled hole

Well casing, 8' inch diameter, PVC sch. 80

☐ Backfill

☒ Grout v-clay bentonite grout

68 ft*

Bentonite ☐ slurry

71 ft* ☒ pellets

☒ Sand Seal #00

74 ft*

84'

Well Screen, 8 inch diameter, 55-20' 0.040" slot

☒ Filter Pack #1 gravel

☐ Formation Collaspse

104 ft*

107'

115 ft*

Project Name and No. Northrop Grumman OU3 GWIRM NY001454.180 0006

Well RW-03 Town/City Bethpage, NY

County Nassau State NY

Permit No. ____

Land-Surface Elevation and Datum:

____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 12/3

Drilling Method Reverse Rotary

Drilling Contractor Delta Well & Pump

Drilling Fluid water

Development Technique(s) and Date(s)

Surge Block w/ air lift

Fluid Loss During Drilling NA gallons

Water Removed During Development 33,200 gallons

Static Depth to Water 53.31 feet below M.P.**

Pumping Depth to Water 52.9 feet below M.P.**

Pumping Duration 1 hr. 35 min hours

Yield 210 gpm Date 1/6/09

Specific Capacity 21 gpm/ft

Well Purpose recovery well for GWIRM

Remarks well chlorinated on 1/2/09

Total volume purged 53,600 gal.

* Depth Below Land Surface

**Measuring Point is Top of Well Casing Unless Otherwise Noted.

Prepared by Jerome Oertling

ARCADIS G&M

Sample/Core Log

Boring/Well: PBRW-03 Project/No.: NGC OU3/NY1464.1807.8

Site Location: Bethpage, NY Drilling Started: 9/17/08 Drilling Completed: 9/17/08

Total Depth Drilled: 104 Feet Hole Diameter: 6" ~~3 1/4~~ In Inches Drilling Method: HSA

Length and Diameter of Coring Device: 2' x 2" Type of Coring/Sampling Device: split spoon

Sampling Interval: continuous ~~feet~~ Drilling Fluid Used: none

Drilling Contractor: Delta Well + Pump (Bob Devine II + Tom Ewers

Prepared By: Jerome Oertling

Blows	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes:	Sample/Core Description	PID (ppm)	comments
30,37	82	84	1.8	0.0-0.8	Sand, coarse-v. coarse subrounded.	0.0	1 ft
					some med. sand, well sorted, moist, loose		
					brown		
				0.8-1.2	Sand, coarse-fine, subrounded, little	0.0	
					granules + trace pebble, poorly		
					sorted, moist, dark brown,		
				1.2-1.8	Sand, coarse-medium, subrounded.	0.0	
					well sorted, loose, moist, brown		
27,35, 40,32	84	86	2.0	0.0-1.25	Sand, coarse, subrounded, well sorted,	0.0	
					loose moist light tan.		
				1.25-2.0	Sand, coarse-medium, subrounded, well sorted		
					loose, moist, brown.		
13,17,20, 18	86	88	0.7	0.0-0.3	Sand medium, subrounded, well	0.0	[illegible]
					sorted, loose, moist, light grey.		
				0.3-0.7	Sand, medium, subrounded, well	0.0	
					sorted, loose, moist, laminated (1/8")		
					alternating light grey, brown, and fine		
					grained dark brown layer at 0.4'-0.5',		
					some silt, brown at 0.65-0.7.		

continued page 2.

ARCADIS G&M

Sample/Core Log (Cont.d)

Boring/Well PB RW-03

Page 2

Prepared by J. Oertling

Blows	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes	Sample/Core Description	PID (ppm)
20, 21, 25, 18	88'	90'	1.5	0.0-1.5	Sand, med-coarse, subrounded, well sorted, (trace pebble at 1.0' (subrounded white) trace pebble @ 0.9' (angular, rust red)) med. dense, moist, grey. note: 1/8" lamination, brown at 1.45.'	0.0
3, 11, 17, 18	90	92	1.0	0.0-1.0	Sand, med-coarse, subrounded, well sorted, trace small pebbles (angular rust red) med dense, moist, light tan. trace fines, brown, + lamination at 0.75.	0.0
9, 17, 17, 20	92	94	2.0	0.0-0.4	Sand, Silt + Clay, 1/4 grey clay lenses in matrix of silt, sand, brown. med stiff, moist	0.0
				0.4-2.0	Sand, medium, subrounded, well sorted, trace large pebbles at 1.0-1.1', sub angular, rust red. Grey clay lens (1/8") @ 1.75; trace silt, brown	
	94'	96'	2.0	0.0-0.7	Sand, coarse-medium subrounded, well sorted, loose, moist, light brown. trace granules @ 0.1', subangular, dark red.	0.0
				0.7-2.0	Silty Sand, med-fine, subrounded, poorly sorted, med. dense, moist, brown; silty clay laminations modeled @ 0.9", red + grey. silt lamination (1/8") at ~~1.0~~ 1.5', black	

Continued page 3

ARCADIS G&M

Sample/Core Log (Cont.d)

Boring/Well PBRW-03

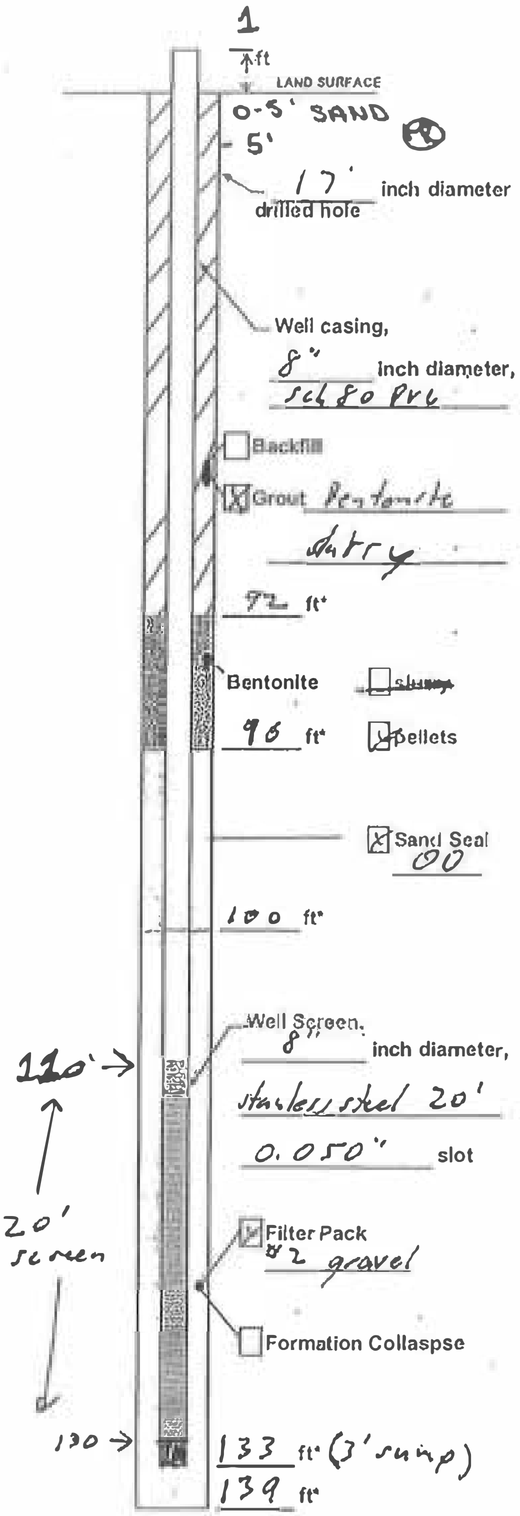
Page 3

Prepared by J. Oertling

	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes:	Sample/Core Description	PID (ppm)
	96	98	2.0	0.0-2.0	Sand, medium-coarse, little silt, subrounded, poorly sorted, dense, moist, brown. lenses of grey clay + black silt 1/8" x 1/2" from 0.0'-1.0' every ~3".	0.0
17,19, 29,34	98	100	1.25	0.0-.65	Sand, med-coarse, subangular, well sorted, loose, moist, light grey	0.0
				.65-1.25	Sand, med, some silt, subrounded, poorly sorted, med. dense, moist, brown. dark grey silty laminations @ 1.0'.	
19, 20, 2, 2, 3	100	102	1.8	0.0-1.3	Sand, med-fine, subrounded, well sorted, little silt, med dense, moist, light brown	0.0
				1.3-1.8	Sand, med-fine, subrounded, well sorted, little silt, med dense, moist, dark grey/brown laminations 1/8" thick.	0.0
11, 17, 21, 19,	102	104	2.0	0.0-1.4	Sand, med-fine, subrounded, well sorted, medium dense, moist, light grey to light tan.	
				1.4-2.0	Sand and silt, subrounded, poorly sorted, medium dense, moist, reddish brown.	
4, 35, 40, 35,	104	106	0.95	0.0-0.95	Sand, coarse-medium, subrounded, little silt, poorly sorted, med. dense, moist, brown-light grey. < 1/8" lamination of grey + red silt @ 0.90.	0.0
					EOB	

ARCADIS

Well Construction Log
(Unconsolidated)



* Depth Below Land Surface

Project Name and No. Northrop Grumman NY001464.1807.00003

Well RW-04 Town/City Bethpage, NY

County Nassau State NY

Permit No. ______

Land-Surface Elevation and Datum:

______ feet [ ] Surveyed [ ] Estimated

Installation Date(s) 11/20 → 11/21/08

Drilling Method reverse rotary (JetA)

Drilling Contractor Delta Well + Pump

Drilling Fluid water

Development Technique(s) and Date(s)

Pump & surge (12/4/08 – 12/11/08)
(air lift)

Fluid Loss During Drilling — gallons

Water Removed During Development ~30,000 gallons

Static Depth to Water 52.21' (TOC) feet below M.P.**

Pumping Depth to Water ~59.55' (TOC) feet below M.P.**

Pumping Duration 1 ½ hours (step test)

Yield 201 gpm Date 12/9/08

Specific Capacity 27.38 gpm/ft

Well Purpose Recovery well (Pumping well) OU-3 GW IRM Bethpage Park

Remarks Development done with surge block & air lift
Well Chlorinated 12/10/08

Total volume purged: 48,000 gallons

**Measuring Point is Top of Well Casing Unless Otherwise Noted.

Prepared by Jerome Oertling / Jen Cherlin

G:\TECHNICL\WOLFERT\Technical Forms\2000\Well Construction (Unconsolidated).XLS - Sheet1

ARCADIS G&M

Sample/Core Log

Boring/Well PB-RW-04 Project/No. NGL OU3 IRM/NY1464.1807.00008

Site Location Bethpage Park Drilling Started 9/15/08 Drilling Completed 9/16/08

Total Depth Drilled 132 Feet Hole Diameter 3 1/4 inches Drilling Method HSA

Length and Diameter of Coring Device 2'x2" Type of Coring/Sampling Device Split Spoon

Sampling Interval continuous Drilling Fluid Used none

Drilling Contractor Delta Well + Pump (Bob Devine II + Tom Ewers)

Prepared By Jerome Oertling

Blows	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes:	Sample/Core Description	PID (ppm)
5	108	110	0.8	0.0-0.8	Sand, medium-coarse, subangular, well sorted, trace granules, subrounded, wet, light grey. Homogeneous. no cementation	0.0
3,20,24	110	112	0.8	0.0-0.4	SAA	0.0
				0.4-0.8	Sand, coarse, angular, well sorted; little musc. mica flakes, flat, angular, moist, light-dark grey lenses. no cementation	0.0
5,11,26	112	114	0.9	0.0-0.9	Sand, medium-coarse, subangular, well sorted, little musc. mica flakes flat, angular, moist, light grey with dark grey lenses. no cementation	0.0
17,20,22	114	116	1.2	0.0-1.2	Sand, medium-coarse, subrounded well sorted; little musc. mica flakes, flat, angular, moist, loose, light grey.	0.0
11,13,14	116	118	1.2	0.0-0.5	SAA - but grey	0.0
				0.5-0.8	Sand, fine-medium, subrounded; well sorted, little musc. mica flakes, flat angular, moist, loose, traces of light brown and black silty sand lenses.	0.0

continued page 2.

ARCADIS G&M

Sample/Core Log (Cont.d)

Boring/Well: PBRW-04

Page: 2

Prepared by: J. Oertling

Blows	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes:	Sample/Core Description	PID (ppm)
	116	118	1.2	0.8-1.2	Sand, medium to coarse, subangular, well sorted, little musc. mica flakes, moist, loose, light brown	0.0
5,23,32,36	118	120	1.0	0.0-0.7	Sand, medium to coarse, subangular, well sorted, little musc. mica flakes, moist, loose, light grey	0.0
				0.7-1.0	Sand, fine-medium, subrounded, laminated with silty sand layers, black + brown 1/8" thick, moist loose, light brown	
1,17,23,22	120	122	0.6	0.0-0.6	Silty Sand, fine, subrounded, alternating laminations of grey clay (<1/8") brown silty sand (1/4"), med. dense, moist, brown	0.0
7,10,20	122	124	0.7	0.0-0.7	Sand med-coarse, fining downwards, subrounded, alternating laminations of pink sand (1/8"), grey clay (1/8") and black silt (<1/8), med dense, moist, grey-brown.	0.0
5,17,24,35	124	126	1.2	0.0-0.5	SAA	0.0
				0.5-1.2	Silty Sand, medium, subrounded, well sorted, trace musc. mica flakes, lenses of pink silt (<1/8"), medium dense, moist, brown.	0.0
0,30,27,25	126	128	1.7	0.0-1.7	Sand, medium-coarse, subangular, well sorted, trace musc. mica flakes, grey clay lenses (1/4") @ 1.0' + 1.2', med dense, moist, light brown.	0.0

continued page 3.

ARCADIS G&M

Sample/Core Log (Cont.d)

Boring/Well PB RW-04 Page 3

Prepared by J. Oertling

Blows	Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Notes:	Sample/Core Description	PID (ppm)
4,2,3,3,3/31	128	130	1.2	0.0-1.2	Sand, med-coarse, sub rounded, well sorted, grey clay lense (1/8") at 0.7', loose, moist, light grey	0.0
17,10,14	130	132	1.7	0.0-1.7	Sand med-coarse, sub rounded, well sorted, trace clay nodules, loose, moist, light brown.	
					EOB	

G:\TECHNICL\FIELD LOGS\Sample Core Log.XLS - Sheet1

ARCADIS

Appendix D

Sampling and Analysis Plan

ARCADIS
Infrastructure, environment, buildings

Imagine the result

Appendix D

Sampling and Analysis Plan

Groundwater Interim Remedial Measure

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York

NYSDEC Site # 1-30-003A

November 2009

Table of Contents

Tables

Figures

Attachments

1. Introduction

This Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Sampling and Analysis Plan (SAP) was prepared by ARCADIS U.S., Inc. (ARCADIS), on behalf of Northrop Grumman Systems Corporation (Northrop Grumman). This SAP summarizes the monitoring programs for the Groundwater IRM, including monitoring locations, frequency, procedures, analytical programs, data evaluations, and reporting. This SAP is provided as Appendix D of the Groundwater IRM OM&M Manual.

The overall objective of this SAP is to develop and implement a program for the collection of appropriate data to monitor and evaluate the effectiveness and efficiency of the Groundwater IRM system towards achieving its objectives. As described in Section 3.1 of the Groundwater IRM OM&M Manual, the remedial action objectives (RAOs) for the Groundwater IRM are as follows:

- Mitigate the off-site migration of dissolved-phase volatile organic compounds (VOCs) through the implementation of a groundwater pump-and-treat system that will extract groundwater along the former Plant 24 Access Road property (i.e., the Groundwater IRM) (Figure 1 of the Groundwater IRM OM&M Manual). Specifically, the Groundwater IRM will address:
    - Groundwater that has TVOC concentrations greater than 5 micrograms per liter (ug/L) in the upper twenty feet of the surficial aquifer across the 1,200-foot wide lateral extent of the Site boundary.
    - Groundwater below the upper 20 feet of the surficial aquifer that has TVOC concentrations above 50 ug/L.
- Comply with applicable NYSDEC Standards, Criteria, and Guidelines (SCGs) for the various Groundwater IRM emissions (i.e. treated water and the air emissions). The discharge criteria for water and air emissions are provided in Tables 1 and 2 of the Groundwater IRM OM&M Manual, respectively.

2. Groundwater IRM Monitoring Programs

The Groundwater IRM Monitoring Program is divided into two primary components, as follows: the Environmental Effectiveness Monitoring Program (Section 3.0 of this SAP) and the Remedial System Performance and Compliance Monitoring Program (Section

4.0 of this SAP). The monitoring program procedures and protocols, as described herein, shall be conducted in accordance with the requirements set forth in the Quality Assurance Project Plan (QAPP) (Attachment D-1 of this SAP), and the site-specific Health and Safety Plan (HASP) (ARCADIS 2005), incorporated herein by reference and provided as Appendix J of the Groundwater IRM OM&M Manual.

3. Environmental Effectiveness Monitoring Program

The Groundwater IRM Environmental Effectiveness Monitoring Program includes two parts, Site Hydraulic Monitoring (i.e., water-level measurement) (Section 3.1) and Groundwater Quality Monitoring (Section 3.2). The objectives of the Groundwater IRM Environmental Effectiveness Monitoring Program are:

- To monitor groundwater flow patterns and determine/verify that operation of the Groundwater IRM has established and maintains an area of hydraulic containment (i.e., capture zone) that is sufficient to achieve RAOs.

- To determine and monitor groundwater quality concentration trends at strategic locations.

Table 1 summarizes the Groundwater IRM Environmental Effectiveness Monitoring Program, and includes the following information:

- The monitoring network, which consists of 35 monitoring locations (i.e., 17 monitoring wells, 4 remedial wells and 14 piezometers). Approximate locations of the wells and piezometers are shown in Figure 1.

- The construction details for the monitoring network.

- The hydraulic monitoring schedule (i.e., the location and frequency of water level measurements).

- The groundwater quality monitoring schedule (i.e., the location, frequency, and analytical parameters of groundwater sampling).

3.1 Site Hydraulic Monitoring

As part of Site Hydraulic Monitoring, water level measurements will be collected quarterly at 35 groundwater locations (Table 1 and Figure 1). In addition, water level measurements will also be collected from the monitoring network during system start-up, as follows:

- Before the system is started up (baseline readings).
- Daily for the first week of operation.
- Weekly for the first two months of operation.

Water level measurement protocols to be used and the data evaluation and reporting requirements are, as follows:

- Water levels will be collected by measuring the depth to water from a surveyed measuring point, identified on each well casing or well head, using an electronic water-level indicator probe that is decontaminated between well locations using methods described in the QAPP (Attachment D-1).
- Water levels will be measured and recorded to the nearest hundredth of a foot (0.01 feet). Water-level measurements and other pertinent information will be recorded as described in the QAPP (Attachment D-1).
- Water level measurements will be converted to groundwater level elevations, added to the project database, and reported, as described in Section 7 of the Groundwater IRM OM&M Manual.
- Groundwater level elevations will be tracked for selected wells/piezometers, plotted on a site plan, and, if possible, contoured to illustrate the configuration of the potentiometric surface and horizontal direction of flow in the surficial aquifer.

Hydraulic monitoring data, along with the groundwater quality data, will be used to assess the effectiveness of the Groundwater IRM. The wells included in the monitoring network and the type and frequency of the data collected may be modified, based on a review of the monitoring reports and with NYSDEC approval.

3.2 Groundwater Quality Monitoring

3.2.1 Monitoring Locations, Frequencies, and Analyses

As shown in Table 1, groundwater samples will be collected at 21 locations (Figure 1) as part of Groundwater Quality Monitoring. Additionally, Table 1 summarizes the locations, frequency, and analyses to be performed on each sample. Specifically, groundwater samples will be collected, submitted to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program- (ELAP-) certified laboratory, and analyzed for the following analyses, per Table 1:

- Volatile Organic Compounds (VOCs) – Samples will be analyzed for the VOCs listed on Table 3 of the QAPP (Attachment D-1 of this SAP) by NYSDEC Analytical Services Protocol (ASP) 2000 Method OLM 4.3.

- Metals – When required, samples will be analyzed for the required metal(s) by USEPA Method 6010 (all metals except for chromium) or 7470 (chromium).

Additional information regarding the project analyses is provided the QAPP (Attachment D-1 of this SAP).

3.2.2 Sampling Methodology

Well evacuation (i.e., purging) and groundwater sample collection protocols will be conducted in accordance with the 1995 United States Environmental Protection Agency (USEPA) Region II Draft Groundwater Sampling Procedure for Low-Flow Pump Purging and Sampling, as discussed below. Information pertinent to the well purging and sampling activities will be recorded, as described in the QAPP (Attachment D-1, Section 4.1.5 – Field Records).

Prior to well purging/sampling, the following site preparation activities will be conducted: access the well, prepare the well site for purging and sampling, and collect initial measurements. To access the well, the protective casing will be unlocked and any surficial dirt will be cleaned from around the wellhead. Site preparation includes placing/securing plastic sheeting around the well. Prior to pump installation for well purging/sampling, the depth to water in the well will be measured to the hundredth of a foot with an electronic water-level indicator and the total depth of the well will be sounded.

Prior to initiation of well purging/sampling activities, a variable speed, 2-inch-diameter, stainless steel Grundfos RediFlo submersible pump will be placed in the well. Prior to installation, dedicated, ½-inch-diameter polyethylene tubing will be connected to the pump, and the pump and tubing will be slowly lowered into the well so as to place the pump intake within the center of the well screen zone.

Well purging will be conducted in accordance with USEPA (1995) Micropurge procedures. During well purging, the purge rate will not exceed 500 milliliters per minute (mL/min). Well purging will continue field parameters have stabilized (as described below). Prior to monitoring field parameters, the calculated volume of water in the pump riser tubing will be purged. During well purging, a flow-through cell will be used to monitor all field parameters. Field parameters (i.e., pH, specific conductance, dissolved oxygen [DO], oxidation-reduction potential [redox], and temperature) will be measured, with calibrated meters, from the flow-through cell approximately every five minutes until stability (i.e., three consecutive readings within 10 percent) is observed. Field meters will be calibrated daily according to the manufacturer's instructions. Following stabilization of field parameters, the flow rate will be decreased to 100 mL/min to allow groundwater sample collection to take place.

Before the collection of each round of groundwater samples, appropriate pre-cleaned sample containers (bottles) will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment D-1, Section 4.2 – Preparation and Preservation of Sample Containers). The sample bottles will be inventoried and inspected to make sure all the required bottles are present, unbroken, and have been adequately prepared by the laboratory (i.e., sample preservation requirements, as applicable). Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each well sampled.

All groundwater samples will be collected from the pump discharge into laboratory-supplied sample bottles. Special care will be taken in filling and capping the VOC vials, so that no headspace or air bubbles are present in the groundwater samples collected for VOC analysis. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

Once sampling is complete, the pump will be gradually be removed from the well and dedicated sampling equipment (i.e., tubing or tubing/screen assembly) will be disconnected from the pump and remain secured inside the well casing. The wells will be locked when sampling is completed.

All samples (including Quality Assurance/Quality Control [QA/QC] samples specified in the QAPP included as Attachment D-1) will be properly labeled and identified, and information on the Water Sampling Log and chain-of-custody form will be completed. The attached QAPP (Attachment D-1 of this SAP) provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Section 4.1 – Field QA/QC), sample labeling (Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude breakage during shipment and placed in a cooler. Sufficient amounts of bagged ice or ice packs will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. When the cooler is ready, it will be sealed with fiber (duct) tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by courier or overnight carrier to the analytical laboratory following sample custody requirements specified in the QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times.

All non-dedicated well evacuation and sampling equipment (e.g., probs, pumps, etc.) will be decontaminated between well locations using methods described in the QAPP (Attachment D-1, Section 4.3 – Decontamination). All water generated during purging and decontamination will be containerized and transported on-site for disposal, as described in Section 6 of this SAP.

3.2.3 Reporting and Evaluation of Monitoring Results

Groundwater quality data will be:

- Tabulated and added to the existing database.
- Used to determine groundwater VOC quality trends at selected groundwater monitoring wells.

ARCADIS

- Compared against NYSDEC SGCs.
- Summarized and reported in the appropriate OM&M Reports. Additional information on the project reporting requirements is provided in Section 7 of the Groundwater IRM OM&M Manual.

Groundwater quality data will be used, along with the hydraulic monitoring data, to assess the effectiveness of the Groundwater IRM and to determine when operation of the Groundwater IRM is no longer required.

The groundwater quality monitoring program described herein may be modified based on a review of the monitoring reports and with NYSDEC approval.

4. Remedial System Performance and Compliance Monitoring Program

The Groundwater IRM remedial system monitoring program includes both compliance and performance monitoring components. The objectives of the Remedial System Performance and Compliance Monitoring Program are:

- To determine compliance with applicable NYSDEC SCGs for the various Groundwater IRM emissions (i.e. treated water and the air emissions).
- To continually assess whether the treatment system is meeting performance objectives (i.e., to design specifications).
- To monitor treatment processes to determine when maintenance activities are needed and to optimize system performance.
- To monitor data trends to identify a potential problem in time to prevent a system failure.

The Remedial System Performance and Compliance Monitoring Program is summarized in Table 2; sampling and monitoring locations listed in Table 2 are shown on Figure 3 of the Groundwater IRM OM&M Manual and in Appendix B - Record Drawings 2 thru 6.

The following information is summarized in Table 2:

- Water and air compliance sampling schedules (i.e., sample collection location, frequency, and parameter).

- Performance monitoring schedules (i.e., the location, frequency, and key process parameter, as measured at various process locations).

In addition to the performance monitoring listed on Table 2, additional performance monitoring may be performed, at the operator's discretion, to further assess status of select system operations.

4.1 Remedial System Monitoring and Data Evaluation

The periodic monitoring of key system operational parameters is required to ensure proper system performance and compliance and by monitoring operational parameter trends, an operator may be able to detect, and subsequently correct, a potential problem before there is system failure.

Key performance, and required compliance, parameters are monitored via one of the following methods:

- Water Quality Samples

- Air Quality Samples

- Locally-Mounted Gauges

- Flow, Pressure, and Temperature Transmitters

4.1.1 Water Quality Samples

Water quality is periodically monitored at seven locations within the Groundwater IRM treatment system by collecting grab samples from permanently installed sample taps and having the samples analyzed for the appropriate parameters by a NYSDOH-certified laboratory, except for pH, which is measured in the field. The sampling schedule is provided in Table 2.

Water samples are collected via the sampling methodology provided in Section 4.2.1 of this SAP.

Water samples are analyzed for VOCs and metals by the same methods that are used for groundwater (see Section 3.2.1 of this SAP).

Results from the performance and compliance water quality samples are used to:

- Determine groundwater quality trends in the remedial wells.
- Determine the effectiveness of the air stripper to remove VOCs from the extracted groundwater.
- Determine when the air stripper may need cleaning.
- Determine the effectiveness of the bag filters to remove iron and other particulate matter from the air stripper effluent.
- Compliance of the system water discharge with applicable AGCs and the project-specific State Pollutant Discharge Elimination System (SPDES) Permit.

4.1.2 Air Quality Samples

Air quality is periodically monitored at four locations within the Groundwater IRM treatment system by collecting grab samples from permanently installed sample taps and having the samples analyzed for VOCs by a NYSDOH-certified laboratory. The sampling schedule is provided in Table 2.

Air samples are collected via the sampling methodology provided in Section 4.2.2 of this SAP.

Air samples are analyzed for the VOCs listed on Table 4 of the QAPP (Attachment D-1) using Modified EPA Method T0-15.

Results from the performance air quality samples are used to:

- Determine the effectiveness of the emission control units (ECUs) to remove VOCs from the air stripper off-gas.
- Assess when breakthrough occurs in the ECUs and require media replacement.

- Determine compliance with applicable Annual Guidance Concentrations (AGC) and Short-term Guidance Concentration (SGCs) per NYSDEC Division of Air Resources (DAR-) 1 Guidelines for the Control of Toxic Ambient Air Contaminants (NYSDEC 2007).

- Determine when the air stripper off-gas no longer needs treatment and the ECUs can be removed.

4.1.3 Locally-Mounted Gauges

Readings from strategically located mounted gauges and meters are recorded by a system operator at the frequency denoted in Table 2 to instantaneously monitor:

- Pumping rates and water pressures in the four influent pipelines.

- System water discharge rate.

- Water pressures in the air stripper effluent.

- System Air flow rate.

- Air temperature and pressure in the air stripper off-gas treatment system.

To monitor and record system parameters, log sheets have been prepared and are provided in Appendix E of the Groundwater IRM OM&M Manual.

These data are evaluated to determine whether the system is meeting performance objective or if there is any apparent data anomalies.

4.1.4 Flow, Pressure, and Temperature Transmitters

Readings from strategically located transmitters are recorded by Supervisory Control and Data Acquisition (SCADA) system and also by system operator at the frequency denoted in Table 2 to monitor:

- Pumping rates, cumulative flow, and water pressures in the four influent pipelines.

- System water discharge rate and cumulative flow.

- Water pressures in the air stripper effluent.
- System Air flow rate.
- Air temperature and pressure in the air stripper blower effluent.

These data are evaluated to assess the same basic process as the locally-mounted gauges. The redundant nature of the transmitter and gauge data helps determine when of the instruments has failed. The transmitter data is also stored for future reference via a data logger.

4.2 Sampling Methodology

4.2.1 Water Sampling Methodology

Before the collection of each water sample, appropriate pre-cleaned sample containers (bottles) will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment D-1 of this SAP). The sample bottles will be inventoried and inspected to make sure all the required bottles are present, unbroken, and have been adequately prepared by the laboratory (i.e., sample preservation requirements, as applicable). Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves.

All water samples will be collected from the sampling port, into laboratory supplied sample bottles. Special care will be taken in filling and capping the Volatile Organic Analysis (VOA) vials, so that no headspace or air bubbles are present in the water samples collected for VOC analysis. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

All samples (including QA/QC samples specified in the QAPP) will be properly labeled and identified. The QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Attachment D-1, Section 4.1 – Field QA/QC), sample labeling (Attachment D-1, Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Attachment D-1, Section 4. System Startup Plan 4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain- of- custody form for accuracy prior to packaging any sample for shipment. The chain- of- custody form will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The samples may then be wrapped with a cushioning material, as needed, to preclude breakage during shipment and placed in a cooler. Sufficient amounts of bagged ice or ice packs will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. When the cooler is ready, it will be sealed with packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

Samples will be delivered by overnight carrier to the analytical laboratory following sample custody requirements specified in the QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times.

4.2.2 Air Sampling Methodology

Before the collection of each round of vapor samples, appropriate pre-cleaned sample containers will be provided by the laboratory in accordance with procedures and requirements described in the QAPP (Attachment D-1 of this SAP), as applicable. The sample containers provided by the laboratory for vapor sampling will either be one-liter or six-liter Summa canisters. The sample containers will be inventoried and inspected to make sure all the required containers are present and in good condition. Throughout the sample collection and handling process, the sampling technician will wear new disposable surgical gloves for each location sampled.

To collect a vapor sample from the desired sample location, the appropriate container will be filled from the sample port. Heavy walled disposable Teflon tubing will be used to connect the sample container, the sampling vacuum pump (as applicable), and the sample port. If a Summa canister is used, the laboratory will provide the canister under vacuum. The Summa canister will be filled completely until the canister has a vacuum of 5 inches of mercury.

All samples (including quality control checks and quality assurance auditing processes (QA/QC) specified in the QAPP) will be properly labeled and identified, and information on the Field Sampling Log and chain-of-custody form will be completed. The system pressure and temperature at the location and time of sample collection will also be recorded on the Field Sampling Log. The QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols (Attachment D-1, Section 4.1 – Field QA/QC), sample labeling (Attachment D-1, Section 4.2 – Preparation and Preservation of Sample Containers), and sample custody (Attachment D-1, Section 4.4 – Sample Custody). All sample containers will be checked for proper identification/labeling and compared to the chain-of-custody form for accuracy prior to packaging any sample for shipment. The chain-of-custody form will be placed in a sealed plastic bag and accompany sample containers. The samples may then be wrapped with a cushioning material, as needed, to preclude damage during shipment and placed in a package. The vapor samples will remain at ambient temperature throughout transport until arrival at the laboratory. When the package is ready, it will be sealed with packing tape, and custody seals will be placed in such a manner that any opening of the package prior to arrival at the laboratory can be detected.

Samples will be delivered by overnight carrier to the analytical laboratory following sample custody requirements specified in the QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times. During the start-up period, compliance vapor samples will be submitted to the laboratory for 24-hour turnaround of analytical results. All vapor samples will be submitted a NYSDOH-approved laboratory for analysis.

4.3 Data Reporting and System Optimization

Remedial System Performance and Compliance monitoring data will be:

- Used to assess compliance by comparing against project discharge requirements.
- Timely reviewed to assess:
    - Whether system process variables are within acceptable tolerances.
    - Whether the system operation can be optimized.
    - Operational trends, which can provide critical information to help understand how the system is operating. In addition, sometimes the identification of an operational trend may allow an operator to address a potential problem before the problem becomes to serious.

- Summarized and reported in the appropriate OM&M Reports. Additional information on the project reporting requirements is provided in Section 7 of the Groundwater IRM OM&M Manual.

The Remedial System Compliance and Performance monitoring program described herein may be modified based on a review of the monitoring reports and with NYSDEC approval.

5. Quality Assurance Procedures

Quality assurance procedures will be implemented to ensure that analytical results of water and the air samples are of the highest quality. The QAPP (Attachment D-1 of this SAP) provides a summary of the quality assurance procedures and the QA/QC protocols related to field sampling and analysis activities.

6. Field Decontamination Procedures

Proper decontamination of non-dedicated field equipment associated with sampling activities will ensure that the data collected meets the precision, accuracy, representativeness, completeness and comparability (PARCC) requirements, as presented in the QAPP (Attachment D-1 of this SAP).

7. Waste Disposal

All liquid and solid waste generated during sampling activities including, but not limited to, well purge water, decontamination water, gloves, tubing, and other solid debris will be properly segregated and placed in appropriate containers for future disposal.

Water generated from decontamination activities, and purge water from monitoring wells will be containerized for disposal on a daily basis via centrifugal pump to the Nassau County Department of Public Works (NCDPW) Publicly Owned Treatment Works (POTW) via a NCDPW approved intake located on Northrop Grumman property. A copy of the NCDPW approval letter is provided in Attachment D1-2.

8. Record Keeping and Reporting

Records documenting the operation and maintenance of the system will be maintained. Electronic and system inspection and maintenance logs will be retained a minimum of 10 years after data collection and submission of logs.

9. References

ARCADIS G&M, Inc. (ARCADIS) 2006. Remedial Investigation/Feasibility Work Plan, Former Grumman Settling Ponds (Operable Unit 3), Bethpage Community Park, Bethpage, New York. March 8, 2006.

New York State Department of Environmental Conservation, 2005, Order on Consent Index # W1-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Table 1. Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. [1,2]

Well ID	Well Diameter (inches)	Depth to Screen Top (ft bls)	Depth to Screen Bottom (ft bls)	Screen Length (ft)	Well Depth (ft)	Well Materials	MONITORING ACTIVITY: Water Levels [3]	WATER QUALITY [4]: VOC	WATER QUALITY [4]: Cd/Cr/Hg	WATER QUALITY [4]: Fe/Mn
Monitoring Wells										
BCPMW-1	2	50	65	15	65	Sch. 40 PVC	Quarterly	Baseline	Baseline	--
BCPMW-2	2	60	75	15	75	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-3	2	59	74	15	74	Sch. 40 PVC	Quarterly	Baseline	Baseline	Baseline
BCPMW-4-1	4	45	65	20	70	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-4-2	4	68.5	83.5	15	88.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-4-3	4	115	125	10	130	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	Baseline
BCPMW-5-1	4	50	65	15	70	Sch. 80 PVC/ SS	Quarterly	Baseline	Baseline	Baseline
BCPMW-6-1	4	88.5	98.5	10	103.5	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
BCPMW-6-2	4	133	143	10	148	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
BCPMW-7-1	4	90	100	10	105	Sch. 40 PVC	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
B24MW-2	2	54	74	20	74	PVC	Quarterly	Baseline/Annual	Baseline	--
B24MW-3	2	55	70	15	70	PVC	Quarterly	Baseline/Annual	Baseline	--
B30MW-1	2	57	72	15	72	PVC	Quarterly	Baseline/Annual	Baseline	--
MW-200-1	4	85	95	10	100	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-201-1	4	70	80	10	85	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-202-1	4	125	135	10	140	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
MW-203-1	4	103	113	10	118	Sch. 40 PVC/ SS	Quarterly	Baseline/Semiannual [5]	Baseline/Annual	--
Remedial Wells [6]										
RW-01	8	108	128	20	134	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-02	6	84	104	20	104	Steel/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-03	8	84	104	20	107	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--
RW-04	8	110	130	20	133	Sch. 80 PVC/SS	Quarterly	Baseline/Quarterly	Baseline/Quarterly	--

Table 1. Environmental Effectiveness Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. (1,2)

Well ID	Well Diameter (inches)	Depth to Screen Top (ft bls)	Depth to Screen Bottom (ft bls)	Screen Length (ft)	Well Depth (ft)	Well Materials	MONITORING ACTIVITY Water Levels (3)	WATER QUALITY (4) VOC	WATER QUALITY (4) Cd/Cr/Hg	WATER QUALITY (4) Fe/Mn
Piezometers										
PZ-01a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-01b	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-01c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-02a	2	60	65	5	68	Sch. 40 PVC	Quarterly	--	--	--
PZ-02b	1	80	85	5	85	Sch. 40 PVC	Quarterly	--	--	--
PZ-02c	1	130	135	5	138	Sch. 40 PVC	Quarterly	--	--	--
PZ-03	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-04	1	80	85	5	88	Sch. 40 PVC	Quarterly	--	--	--
PZ-05a	2	65	70	5	74	Sch. 40 PVC	Quarterly	--	--	--
PZ-05b	1	110	115	5	117	Sch. 40 PVC	Quarterly	--	--	--
PZ-06a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-06b	1	90	95	5	97	Sch. 40 PVC	Quarterly	--	--	--
PZ-07a	2	65	70	5	72	Sch. 40 PVC	Quarterly	--	--	--
PZ-07b	1	113	118	5	120	Sch. 40 PVC	Quarterly	--	--	--

Notes:

(1) Water samples will be collected and analyzed in accordance with the method and procedures described in this Sampling and Analysis Plan (SAP).

(2) Approximate locations of the wells and piezometers in the OU3 Groundwater IRM Monitoring Program are shown in Figure 1.

(3) Water Levels will be measured in all wells/piezometers during the baseline monitoring event. Water levels will be measured in accordance with the procedures presented in this SAP.

(4) VOC: VOCs, per Table D-3 in the attached Quality Assurance Project Plan (QAPP), using NYSDEC ASP 2000 Method OLM 4.3.
Cd/Cr: Cadmium and Chromium using USEPA Method 6010, except for Chromium, both total and dissolved; Hg: Mercury will only be analyzed for samples collected during the baseline monitoring.
Fe/Mn: Iron and Manganese using USEPA Method 6010, both total and dissolved

(5) Semiannual wells will be monitored annually after Year 1.

(6) Some of the analyses listed here are also covered in the Remedial System Sampling Program (Table 2).

Aronyms:

Sch. 80 PVC: schedule 80 polyvinyl chloride
Sch. 40 PVC: schedule 40 polyvinyl chloride
SS: stainless steel
Steel: low carbon steel
ft: feet
ft msl: feet relative to mean sea level
ft bls: feet below land surface

Table 2. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency			
		Short-Term [3] (first month)	Short-Term [3] (five month period following first month)	Long-Term [4]	SCADA Data Acquisition
Water Samples [5]					
Remedial Well 1 (WSP-1)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 2 (WSP-2)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 3 (WSP-3)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Remedial Well 4 (WSP-4)	VOCs (NYSDEC 2000 OLM 4.3)	Bi-Weekly	Quarterly	Quarterly	NA
	Iron (USEPA 6010)	Bi-Weekly	Annually	Annually	NA
Air Stripper Influent (WSP-5)	VOCs (NYSDEC 2000 OLM 4.3)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
	Iron (USEPA 6010)	1-hr [6]; Days 1, 3, & Weekly	Monthly	Quarterly	NA
Air Stripper Effluent (WSP-6)	Iron (USEPA 6010)	1-hr [6]; As Needed	As Needed	As Needed	NA
Plant Effluent (WSP-7)	**VOCs (NYSDEC 2000 OLM 4.3)**	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	Iron (USEPA 6010)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
	ph (field)	**1-hr [6]; Days 1, 3, & Weekly**	**Monthly**	**Monthly**	NA
Air Samples [7] [8]					
Air Stripper Effluent/ECU-1 Influent (VSP-1)	VOCs (TO-15 Modified)	Monthly	Monthly	Quarterly	NA
ECU-1 Effluent/ECU-2 Influent (VSP-2)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-2 Effluent/ECU-3 Influent (VSP-3)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
ECU-3 Effluent/ECU-4 Influent (VSP-4)	VOCs (TO-15 Modified)	As Needed	As Needed	As Needed	NA
Total Effluent (VSP-5)	**VOCs (TO-15 Modified)**	**Monthly**	**Monthly**	**Quarterly**	NA

Table 2. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems, Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency: Short-Term [3] (first month)	Frequency: Short-Term [3] (five month period following first month)	Frequency: Long-Term [4]	SCADA Data Acquisition
Water Flow Measurements					
Remedial Well RW-1 (FT - 110)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (FT - 120)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (FT - 130)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (FT - 140)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Combined Influent (FR - 200)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
System Effluent (FT-700)	Flow rate (gpm + total gal.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Flow Measurements					
Air Stripper Effluent (FT-500)	Flow rate (SCFM)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Water Pressure Measurements					
Remedial Well RW-1 (PT - 110)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-2 (PT - 120)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-3 (PT - 130)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Remedial Well RW-4 (PT - 140)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Stripper Effluent (PT-700)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Weekly	Weekly	Continuously
Air Temperature & Relatively Humidity Measurements					
Air Stripper Effluent (TT-500)	Temperature	Weekly	Weekly	Weekly	Continuously
ECU Mid-Train (TI-503)	Temperature	Weekly	Weekly	Weekly	NA
Effluent (TI-603)	Temperature	Weekly	Weekly	Weekly	NA

Table 2. Remedial System Monitoring Program, Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems, Corporation, Bethpage, New York. (1)

Sample Location/Instrument [1]	Parameter (Method) [2]	Frequency: Short-Term [3] (first month)	Frequency: Short-Term [3] (five month period following first month)	Frequency: Long-Term [4]	Frequency: SCADA Data Acquisition
Air Pressure Measurements					
Air Stripper Effluent (PT-500)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	Continuously
ECU #1 Influent (PI-501)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #2 Influent (PI-502)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #3 Influent (PI-601)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
ECU #4 Influent (PI-602)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA
System Effluent (PI-603)	Pressure (i.w.g.)	(Daily -1st week) Weekly	Monthly	Quarterly	NA

Notes:

(1) Refer to Appendix E of this Operation, Maintenance and Monitoring Manual for a diagram showing referenced sample locations and measurement points.

(2) Parameters/methods may be modified based on review of short-term and/or long-term testing results. Parameters shown in **Bold** indicate parameters that require NYSDEC notification/approval prior to change in monitoring schedule.

(3) Short-term schedule is tentative. Modification may be required/recommended based on the results of start-up and performance testing. In addition, per the Interim treated effluent (water) discharge criteria, per NYSDEC letter dated March 19, 2009, select samples are being analyzed for Mercury (Hg), this analyte is not expected to be a long-term analyte.

(4) Long-term schedule is tentative. Modification may be required/recommended based on the results of short-term testing or water quality trends.

(5) Water samples will be collected in accordance with the methods described in the Sampling and Analysis Plan, which is included as Appendix A of this Operation, Maintenance and Monitoring Manual. Samples will be analyzed in accordance with the methods and procedures described in the Sampling and Analysis Plan.

(6) Per NYSDEC request, a 1-hr pilot test will be performed during system shake-down. 1-hr pilot test samples will also be analyzed for mercury.

(7) Air samples will be collected and analyzed in accordance with methods described in the Sampling and Analysis Plan, which is included as Appendix A of this Operation, Maintenance and Monitoring Manual.

(8) Additional air samples will be collected to help calculate media usage rates and to help determine media changeout frequencies.

Acronyms:

NA	Not applicable
ECU	Emissions control unit
VOCs	Volatile organic compounds (refer Tables D-3 and D-5 in the Quality Assurance Project Plan (QAPP) (Appendix D) for the analyte lists for aqueous and air samples, respectively).
gal.	Gallons
gpm	Gallons per minute
i.w.g.	Inches water gauge
NYSDEC	New York State Department of Environmental Conservation
EPA	U.S. Environmental Protection Agency
SCADA	Supervisory Control And Data Acquisition

0 100' 200'

SCALE IN FEET

LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- BASIN
- bit. BITUMINOUS PAVEMENT
- BCPMW-1 MONITORING WELL
- MW-200-1 MONITORING WELL
- PZ-2C PIEZOMETER
- RW-2 RECOVERY WELL

NOTES:

1. MONITORING WELLS, BCPMW-1, 2, 3, 4-1, 4-2, 4-3, 5-1, 6-1, 6-2, 7-1, B24MW-2, B24MW-3, B30MW-1 SURVEYED TO NORTH AMERICAN DATUM (NAD) 83. ALL OTHER MONITORING WELLS, RECOVERY WELLS, AND PIEZOMETERS ARE APPROXIMATE BASED ON FIELD MEASUREMENTS.
2. PARK FEATURES SHOWN WERE PRESENT PRIOR TO TOWN OF OYSTER BAY REDEVELOPMENT IN 2005.

OPERABLE UNIT 3
(FORMER GRUMMAN SETTLING PONDS)
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK

GROUNDWATER MONITORING PROGRAM WELL AND PIEZOMETER NETWORK

ARCADIS

FIGURE 1

ARCADIS
Infrastructure, environment, buildings

Imagine the result

Attachment D-1

Quality Assurance Project Plan

Groundwater Interim Remedial Measure

Operable Unit 3 (Former Grumman Settling Ponds)
Bethpage, New York
NYSDEC Site # 1-30-003A

November 2009

1. Introduction

This Operable Unit 3 (OU3) Groundwater Interim Remedial Measure (Groundwater IRM) Quality Assurance Project Plan (QAPP) was prepared by ARCADIS U.S., Inc. (ARCADIS) on behalf of Northrop Grumman Systems Corporation (Northrop Grumman). This QAPP addresses specific quality control (QC) checks and quality assurance (QA) auditing processes. This QAPP is provided as Attachment D-1 of the Sampling and Analysis Plan (SAP); the SAP is provided as Appendix D of the OM&M Manual.

The overall objective of the QAPP is to produce data of the highest quality that can be used to support the OM&M of the Groundwater IRM. This QAPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) guidance, "Guidance for Quality Assurance Project Plans," (USEPA 2002), The New York State Department of Environmental Conservation (NYSDEC) Draft DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC 2002), and considering requirements of the July 4, 2005 Operable Unit 3 Order on Consent (NYSDEC 2005). This QAPP presents project organization and responsibilities, and QA/QC protocols related to field sampling and analysis activities associated with various sampling and monitoring requirements. The procedures in this QAPP will be implemented to ensure that precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) of the data can be documented, as applicable.

2. Project Organization and Responsibilities

The responsibilities of the key project personnel are detailed below.

- The Project Director is responsible for overseeing the implementation of the project tasks. The Project Director will review all documents and other correspondence concerning the activities performed pursuant to the NYSDEC Superfund project (i.e., all activities associated with Operable Unit 3). The Project Director is also responsible for the overall QA including technical adequacy of the project activities and reports and conformance to the scope of work.

- The Project Manager is responsible for the following: overall project coordination; adherence to the project schedules; directing, reviewing, and assessing the adequacy of the performance of the Task Managers assigned to the project; implementing corrective action, if warranted; interacting with the Project Director; reviewing reports; and maintaining full and orderly project documentation.

- Task Manager(s) is responsible for the following: field activity QA/QC; task coordination; adherence to the project schedules; directing, reviewing, and assessing the adequacy of the performance of the technical staff and subcontractors assigned to the project; if warranted; interacting with the Project Manager; preparing reports; and maintaining full and orderly project documentation.

- The project team members include the task managers, field hydrogeologists, sampling team/field technicians, engineers, risk assessors, support staff (e.g., data processors, secretaries, and in-house experts in engineering, etc.) who are qualified to oversee/perform the Work, as appropriate, and will be responsible for work in their respective specialty areas. Project team members will be on-site to supervise all activities specified in this Work Plan.

- The Project QA/QC Officer is responsible for performing systems auditing and for providing independent data quality review of project documents and reports.

- The Site Health and Safety Officer is responsible for implementing the site-specific health and safety directives in the Health and Safety Plan (HASP – Appendix H of the OM&M Manual) and for contingency response.

- The Data Validator is responsible for review of laboratory data for compliance with the QA objectives for the PARCC parameters (i.e., precision, accuracy, reproducibility, comparativeness, and completeness), and notifications to the project manager of any QC deficiencies.

3. Quality Assurance/Quality Control – Field Sampling and Analysis Activities

The overall QA objective for this aspect of the project is to develop and implement procedures for field measurements, sampling, and analytical testing that will provide data of known quality that is consistent with the intended use of the information. Generally, the specific field sampling and analysis activities to be conducted during this project which require QA/QC protocols include: (1) groundwater sampling associated with groundwater quality environmental monitoring; and (2) water and air sampling associated with system performance and compliance monitoring, including system start-up. Standard procedures (as outlined in detail in the SAP) are used so that known and acceptable levels of PARCC parameters are maintained for each data set. More detail on the methodologies associated with these activities is provided in the SAP, including calibration and maintenance of field instruments.

Quality assurance/quality control (QA/QC) protocols will be used to ensure the PARCC parameters of data collected during these field activities meets the objectives of the overall project. Specifically, data will be gathered or developed using procedures appropriate for the intended use of the data. The field measurements and laboratory analyses will be used to support one or more steps in the monitoring described above.

The QA/QC protocols for this aspect of the project will include laboratory analysis and validation procedures, field decontamination procedures, calibration and maintenance of field instruments, tracer gas analysis, and QA/QC sampling procedures. The following sections outline the QA/QC protocols for each of these issues.

3.1 Field QA/QC

To ensure that data collected in the field is consistent, accurate and complete, forms will be utilized for repetitive data collection, such as depth to water in wells, groundwater sampling, etc. These field forms include the Daily Log, Water-Level Measurement Log, Groundwater Sampling Log, Air Monitoring Log, and Equipment Calibration Log, as applicable to a specific field task. Forms are provided in Attachment D1-A of this QAPP.

QA/QC samples will be collected to assure quality control of soil and groundwater samples. Analyses of QA/QC samples will enable data evaluation for accuracy and integrity. A QA/QC sample set includes one or more of the following: field (equipment rinsate) blank, trip blank, blind (field) duplicate, and site-specific matrix spike/matrix spike duplicate (MS/MSD), as applicable. The QA/QC sample set will vary depending on the objective of the collected sample as well as the parameter or group of parameters specified for analysis. A summary of the QA/QC samples is provided in Table D-1 of this QAPP. In general, blanks and duplicate samples will be used to verify the quality of the sampling results. Demonstrated analyte-free water will be supplied by the laboratory for the preparation of equipment and trip blank QA/QC samples; documentation for the analysis of QA/QC blank water will be provided if contamination is detected in the blanks. A brief description of these QA/QC samples follows.

3.1.1 Field (Equipment Rinsate) Blank

A field (equipment rinsate) blank is a water sample that consists of laboratory-supplied analyte-free water that is poured through or over a decontaminated segment of sampling or other non-dedicated down-hole equipment to assess or document the thoroughness of the decontamination process. A rinsate blank will be collected from the decontaminated down-hole equipment by pouring analyte-free water over the equipment and into sample containers before using the equipment in sampling. Field blanks will be collected as specified in Table D-1. These QA/QC samples will only be collected in connection with the collection of aqueous-phase and soil samples and submitted for the appropriate VOC analysis (see Table D-1).

3.1.2 Trip Blank

A trip blank will contain laboratory supplied analyte-free water and will be transported to the site and returned to the laboratory without opening. This will serve as a check for contamination originating from sample transport, shipping, and from site conditions. One trip blank per day per sampling team will be utilized during groundwater sampling. The maximum number of samples per trip blank is 20. These QA/QC samples will only be collected in connection with the collection of aqueous samples (associated with groundwater sampling) for VOC analysis and submitted for the appropriate chemical analysis (see Table D-1).

3.1.3 Blind (Field) Duplicate

The relative difference in analytical results between samples and their blind duplicates will be used to determine if the data reported by the laboratory meet PARCC requirements. The blind duplicate samples will be assigned fictitious identifications; the correct sample identification number will be recorded on the water sampling log. One blind duplicate sample per 20 groundwater samples will be collected during groundwater sampling activities. These QA/QC samples will be collected in connection with the collection of aqueous and soil gas samples (associated with groundwater sampling) and submitted for the appropriate chemical analysis (see Table D-1). These QA/QC samples will also be collected in connection with the collection of and submitted for the appropriate chemical analysis (see Table D-1).

3.1.4 MS/MSD Sample

Site-specific MS and MSD samples will be collected and submitted to the laboratory as separate samples to provide site-specific matrix-interference data. Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed by the appropriate method. The purpose of spiking and analyzing the samples is to evaluate any site-specific matrix interference on the analytical results. One MS/MSD sample set will be collected for every 20 samples collected during groundwater and treatment system sampling activities and only in connection with the collection of aqueous samples for VOC analysis and submitted for the appropriate VOC analysis (see Table D-1).

3.1.5 Field Records

Proper documentation will consist of all field personnel maintaining records of all work accomplished including the items listed below (in addition to the information required on the forms provided in Attachment D1-A):

- Date and time of work events;
- Purpose of work;
- Description of methods;
- Description of samples;
- Number and size of samples;
- Description of sampling point;
- Date and time of collection of sample;
- Measurement or Sample collector's first initial and last name;
- Field observations; and
- Field measurements with portable instruments.

All information pertinent to field sampling activities will be recorded on the logs provided in Attachment D1-A. Duplicates of field notes/forms will be prepared and kept in a secure place away from the Site.

3.2 Preparation and Preservation of Sample Containers

Laboratory pre-cleaned sample containers will be provided by the laboratory. Each sample container will be provided with a label for sample identification purposes. The information on the label will include a sample identification number, time, date and initials of the sample collector. All sample containers will be accompanied by a full chain-of-custody (see Attachment D1-B).

Sample containers will be thoroughly cleaned at the laboratory prior to sampling and, as appropriate; sample preservatives will be added to the bottles, prior to sample bottle shipment to the client. It is laboratory practice to preserve sample containers to minimize potential contaminants in the field and to reduce unnecessary sample handling in the field (see laboratory Quality Assurance Plans in Attachment D1-C for additional information). Table D-2 provides a summary of sample analytical methods, sample containers, holding times and preservation procedures to be used.

3.3 Decontamination

Proper decontamination of all sampling equipment will help ensure that the data collected will meet the PARCC requirements.

3.3.1 Decontamination Zone

The decontamination zone will be at a centralized location, or at a specific sampling location (e.g., monitoring well), depending on the logistics associated with planned field activities. All non-dedicated sampling equipment shall be decontaminated in the designated area(s). Wash waters from equipment requiring decontamination will be properly containerized and disposed of according to procedures outlined in the Waste Disposal section of the SAP.

3.3.2 Decontamination Procedures

Field equipment will be decontaminated between well/sampling locations using the following procedures.

3.3.2.1 Field Decontamination for Non-Dedicated Sampling Equipment

Field decontamination of non-dedicated well evacuation and sampling equipment (i.e., probes and pumps) shall consist of the procedures outlined below. These items will then be stored in such a manner as to preserve their decontaminated condition prior to use at the next sampling location.

Prior to each use, the electronic water-level indicator probe will be decontaminated using the following procedure:

- Surficial wash and manual scrubbing with detergent (e.g., Micro) and potable water solution; and

- De-ionized water rinse.

Prior to each use, the submersible pump will be decontaminated using the following procedure:

- Surficial wash and manual scrubbing with detergent (e.g., Micro) and potable water solution to remove foreign materials;

- Run pump for approximately 5 minutes in detergent (e.g., Micro) and potable water solution;

- Potable water rinse;

- Run pump for approximately 5 minutes in potable water; and

- De-ionized water rinse.

3.3.2.2 Personnel Protective Equipment Decontamination Procedures

The personnel protective equipment (PPE) decontamination procedure shall consist of the minimum decontamination stations outlined in the HASP (Appendix H of the OM&M Manual), as applicable for the planned field activities or in the case that non-disposable PPE is used while conducting the planned field activities.

3.4 Sample Custody

To maintain and document sample possession, chain-of-custody procedures will be followed. A chain-of-custody form contains the signatures of individuals who have possession of the samples after collection in the field; the chain-of-custody form is provided in Attachment D1-B.

A sample is under custody if it is:

1. In one's actual possession; or

2. In one's view, after being in your physical possession; or

3. Was in one's physical possession and then was locked up or sealed to prevent tampering; or

4. It is in a designated secure place restricted to authorized personnel.

Each person involved with the samples will know chain-of-custody procedures. A detailed discussion of the stages of possession (i.e., field collection, transfer, and laboratory custody) is presented below in the following sections.

3.4.1 Environmental Samples Chain-of-Custody

The laboratory begins the chain-of-custody procedure with the preparation of the sample bottles. The field sampler continues the chain-of-custody procedure in the field and is the first to sign the form upon collection of samples. The field sampler is personally responsible for the care and custody of the samples until they are transferred and properly dispatched. Each sample will have sample labels completed (using waterproof ink), have proper preservation, and be packaged to preclude breakage during shipment. Every sample will be assigned a unique identification number that is entered on the chain-of-custody form. Samples can be grouped for shipment using a single form.

3.4.2 Transfer of Custody and Shipments

All samples will be accompanied by a chain-of-custody record. When transferring the possession of samples, the individual(s) relinquishing and receiving will sign, date, and note the time of transfer on the chain-of-custody form. This record documents transfer of custody of samples from the sampler to another person to the analytical laboratory.

Samples will be properly packed for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample cooler. All chemical analytical samples will be delivered to the laboratory within 48 hours of collection or earlier, as needed, to meet analyte holding times.

Whenever samples are split with a facility or government agency, a separate chain-of-custody record will be prepared for those samples and marked to indicate with whom the samples were split.

3.4.3 Sample Custody

The laboratory utilized for chemical analysis will have standard operating procedures for documenting receipt, tracking and compilation of sample data. Sample custody related to sampling procedures and sample transfers are described below.

1. Shipping or Pickup of Cooler.

   (a) Samplers pack cooler and check for any external damage (such as leaking).

   (c) Chain-of-Custody form filled out by field sampling personnel.

   (b) Cooler wrapped with evidence tape.

   (d) Samplers sign packing slip with shipper.

2. Delivery of Cooler to the Analytical Laboratory.

   (a) Samplers pack cooler and check for any external damage (such as leaking).

   (b) Samplers sign the waybill for cooler to the laboratory.

   (c) The laboratory receives cooler and complete chain of custody.

The samples will be stored at the proper temperature prior to analysis. It is the responsibility of the laboratory to properly dispose of samples beyond the holding period.

3.5 Laboratory Analyses

All groundwater samples will be analyzed by a NYSDOH-approved laboratory.

Groundwater and water samples will be analyzed for VOCs using NYSDEC Analytical Services Protocol (ASP) 2000 Method OLM 4.3. The analytical laboratory will also conduct a library search of up to 10 tentatively identified compounds (TICs). Selected samples may be analyzed for Metals using NYSDEC ASP Method ILM 4.0. Analyte VOCs and Metals lists are provided for aqueous samples in Tables D-3 and D-4 along with the respective required method detection limits and/or laboratory reporting limits, respectively.

Air samples will be analyzed for VOCs using Modified USEPA Method TO-15 by a NYSDOH-approved laboratory. Specific compounds to be analyzed for in air samples will include, but not be limited to, the list of compounds summarized in Table D-5, along with the respective required method detection limits and/or laboratory reporting limits.

The internal laboratory Standard Operating Procedures (SOPs) and QA/QC procedures are described in the individual laboratory facility Quality Assurance Plan, an independent plan provided by the analytical laboratory. The Columbia Analytical Services Quality Assurance Manual (QAM) is provided in as Attachment D1-C.

3.6 Laboratory Reporting

The laboratory will provide a NYSDEC Category A deliverable (unless otherwise specified) for the sampling effort within two weeks of receipt of samples. Additional documentation may be required from the laboratory based on the results of the data evaluation.

3.7 Data Validation

Data validation is the process in which analytical data generated by the laboratory are evaluated against a specific set of requirements and specifications, and determinations of data usability and limitations are made. The Data Validator examines the criteria pertaining to analytical data generated in accordance with Contract Laboratory Program (CLP) protocols from four perspectives, as follows:

- Technical requirements.
- Contractual requirements.
- Determination of compliance.
- Determination and action of how to define the usability or qualify the data.

Validation of the data as described below following the QA/QC criteria set forth in the NYSDEC ASP 2001-1; DER-10; and the most recent USEPA CLP National Functional Guidelines for Organic Data Review, (USEPA 2001;2003).

For all groundwater and air data, the review of the data packages will include checking the following:

- Chain-of-custody forms
- Holding times
- Reporting limits
- QA/QC Samples (method blanks, field blanks, and trip blanks)
- Matrix spike and matrix spike duplicates precision and accuracy
- Laboratory control samples and laboratory control sample duplicates precision
- Field and laboratory duplicates precision
- Surrogate spike recoveries
- Dilution factors
- Internal standards
- Check for transcriptions between quantitation reports and Form I's

Final validation of data obtained during the field sampling and analysis activities will be performed by the Data Validator. The laboratory deliverables will be reviewed for accuracy, precision, completeness, and overall quality of data. All laboratory data will be reviewed for adherence to method-specific QA/QC guidelines and to the data validation guidelines that are described above. If specific data quality issues arise based on the data validation and review guidelines described above, the data validation and review process may be expanded, as warranted, in order to address the specific data quality issue. Any additional validation performed will continue to be performed until the specific data quality issue is resolved.

3.8 Data Usability

The Data Validator for the project will review the analytical data for usability including determining if the data are accurate, precise, representative, complete, and comparable. The review of the analytical results will include checking chain-of-custody forms, sample holding times, blank contamination, spike recoveries, surrogate recoveries, internal standard, and precision of duplicate sample analysis, and laboratory control samples (as appropriate). This review will be used to classify the data as valid, usable, or unusable. Valid data will indicate that all QA/QC review criteria have been met and are acceptable (as per details outlined in the preceding section). Data will be characterized as usable when QA/QC parameters are marginally outside acceptable limits (example: sample holding times were slightly exceeded) where the data may be questionable, but still usable within limitation. Unusable data will be data that are observed to have gross errors or analytical interference that would render the data invalid for any purpose.

The data usability summary report (DUSR) will be prepared at the conclusion of validation.

3.9 Performance and System Audits

Performance and system audits will be performed on a periodic basis, as appropriate, to ensure that the work is implemented in accordance with the approved project SOPs and in an overall satisfactory manner. Examples of audits that will be performed during the project activities are as follows:

- The field personnel will supervise and check, on a daily basis during sampling activities, that monitoring well integrity is intact; that field measurements are made accurately; that equipment is thoroughly decontaminated; that samples are collected and handled properly; and that all field work is accurately and neatly documented.

- On a timely basis, the data packages submitted by the laboratory will be checked for the following information: that all requested analyses were performed; that sample holding times were met; that the data were generated through the approved methodology with the appropriate level of QC effort and reporting; and that the analytical results are in conformance with the prescribed acceptance criteria. The quality and limitations of the data will be evaluated based on these factors.

- The project manager will oversee the field personnel and check that the management of the acquired data proceeds in an organized and expeditious manner.

- Audits of the laboratory are performed on a regular basis by regulatory agencies. Audits are discussed in the laboratory Quality Assurance Plan. (Attachment D1-C).

3.10 Preventive Maintenance

ARCADIS has established a program for the maintenance of field equipment to ensure the availability of equipment in good working order when and where it is needed, as indicated, in the following examples:

- An inventory of equipment, including model and serial number, quantity, and condition will be maintained. Each item will be tagged and signed out when in use and, its operating condition and cleanliness will be checked upon return. Routine checks will be made on the status of equipment, and spare parts will be stocked. An equipment manual library will also be maintained.

- The field personnel are responsible for making sure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the field.

The laboratory also follows a well-defined program to prevent the failure of laboratory equipment and instrumentation. This preventive maintenance program is described in the laboratory Quality Assurance Plan. (Attachment D1-C).

4. References

New York State Department of Environmental Conservation, 2005, Order on Consent Index # W1-0018-04-01, Site # 1-30-003A, July 4, 2005.

New York State Department of Environmental Conservation, 2002, Draft DER-10 Technical Guidance for Site Investigation and Remediation.

U.S. Environmental Protection Agency (USEPA). 2004. CLP National Functional Guidelines for Inorganic Data Review, October 2004.

U.S. Environmental Protection Agency (USEPA). 2003. Index to EPA Test Methods. April 2003; revised edition.

U.S. Environmental Protection Agency (USEPA), 2002. EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, EPA/240/R-02/009.

U.S. Environmental Protection Agency (USEPA), 2001. Region II RCRA and CERCLA Data Validation Standard Operating Procedures (SOPs), CLP Organics Data Review and Preliminary Review, SOP HW-6, Revision 12, March 2001. March 2001.

U.S. Environmental Protection Agency (USEPA). 1999. CLP National Functional Guidelines for Organic Data Review, October 1999.

Table D-1. Quality Assurance/Quality Control Sample Summary, Quality Assurance Project Plan (QAPP), Groundwater Interim Remedial Measure, Operable Unit 3, (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.(1)

Matrix	Sampling Event	Sample Location/ Sample Point	Parameters (1)	Frequency (2)	Estimated Sample Quantity per Event	Estimated Field Blanks per Event (3)	Frequency of Trip Blanks per Event (4)	Frequency of Field Duplicates per Event	Frequency of MS/MSD per Event (5)
Aqueous (groundwater)	Groundwater Quality Sampling	Monitoring Wells	VOCs	Semi-Annually/Annually	14	6	6	1	1
			Cd/Cr	Quarterly/Annually	10	5	0	0	0
Aqueous (water)	Remedial System Performance and Compliance Monitoring	Remedial Wells, Treatment Plant influent and effluent	VOCs	Weekly or Monthly	6	0	1	1 per 20	1 per 20
			Cd/Cr/Hg/Fe/Mn	Weekly or Monthly	1	0	0	0	0
			pH	Weekly	1	0	0	0	0
Air	Remedial System Performance and Compliance Monitoring	Treatment System Influent and effluent and intermediate sample locations	VOCs	Quarterly or as Needed	3	0	0	1 per 20	0

Notes and Abbreviations:

(1) Refer to Table D-2 for analytical methods.
(2) Refer to Sample Schedules (Tables 1 and 2 of the Sampling and Analysis Plan) for sample frequency.
(3) One field blank collected per day when non-dedicated (i.e., disposable or reusable) sampling equipment (i.e., pumps and/or bailers) is used.
(4) Trip blanks will be provided by the analytical laboratory and will accompany VOC samples as they are collected and during shipment. Trip blanks collected at a frequency of one per sample shipment.
(5) Matrix spike/matrix spike duplicate (MS/MSD) analysis is performed on a site sample and therefore is not counted as separate samples.

MS/MSD	Matrix spike/matrix spike duplicate
VOCs	Volatile organic compounds
Cd/Cr	Total cadimum/chromium
Cd/Cr/ Hg/Fe/Mn	Total and/or dissolved cadimum/chromium/mercury/iron/manganese (note: mercury is included because it is on the interim SPDES permit equivalancy, it may not be on the final SPDES equivalancy).

Table D-2. Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times, Groundwater Interim Remedial Measure, Operable Unit 3, (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.[1]

Matrix	Monitoring Program	Parameters [1]	Analytical Laboratory Methodology	Sample Containers	Preservation	Holding Time
Aqueous (water/groundwater/perched water)	Remedial System Performance and Compliance Monitoring/Groundwater Quality Monitoring	VOCs	NYSDEC ASP 2000 Method OLM 4.3	Three 40 mL glass VOA with Teflon-lined septa	Cool 4 degrees C, HCl to pH<2	10 days VTSR
		pH	Field	None	None	Field
		TAL Metals, except Chromium	USEPA Method 8010	One 500 mL plastic	HNO_3 to pH <2	180 days
		Total or Dissolved Chrominum	USEPA Method 7470	One 500 mL, plastic	HNO_3 to pH <2	28 days
		TSS	USEPA Method 2540D	One 500 mL, plastic	Cool 4 degrees C	7 days
		TDS	USEPA Method 160.1	One 500 mL, plastic	Cool 4 degrees C	7 days
Air	Remedial System Performance and Compliance Monitoring	VOCs	USEPA Method TO-15 Modified	One 1L SUMMA canister	None	28 days

Notes:
(1) Refer to Tables D-3, D-4, and D-5 for specific analyte lists and minimum detection limits for analyses of aqueous and soil vapor samples.

Acronyms:

USEPA	U.S. Environmental Protection Agency
NYSDEC	New York State Department of Environmental Conservation
ASP	Analytical Services Protocol
TSS	Total Suspended Solids
TDS	Total Dissolved Solids
C	Celsius
L	Liter
HNO_3	Nitric Acid
mL	milliliter
NA	Not applicable
VOCs	Volatile organic compounds
Cd/Cr	Total cadmium/chromium
VTSR	Verified Time of Sample Receipt at lab.

Table D-3. Analyte List for Aqueous Samples (VOCs), Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Method		NYSDEC ASP 2000 OLM 4.3	NYSDEC ASP 2000 OLM 4.3 (2)
Matrix/Sample Type:		Aqueous/Groundwater	Aqueous/Water
Constituent	CAS No.	Contract Required Quantification Limit (ug/L)	Required Method Quantification Limit (ug/L)
1,1,1-Trichloroethane	71-55-6	5	5
1,1,2,2-Tetrachloroethane	79-34-5	5	5
1,1,2-Trichloro-1,2,2-Trifluoroeth (Freon 113)	76-13-1	5	5
1,1,2-Trichloroethane	79-00-5	5	5
1,1-Dichloroethane	75-34-3	5	5
1,1-Dichloroethene	75-35-4	5	5
1,2-Dichloroethane	107-06-2	5	5
1,2-Dichloropropane	78-87-5	5	5
2 - Hexanone (Methyl n-Butyl Ketone)	591-78-6	50	50
2-Butanone (MEK)	78-93-3	50	50
4-Methyl-2-Pentanone (MIBK)	108-10-1	50	50
Acetone	67-64-1	50	50
Benzene	71-43-2	0.7	0.7
Bromodichloromethane	75-27-4	50	50
Bromoform (Tribromomethane)	75-25-2	50	50
Bromomethane (Methyl bromide)	74-83-9	5	5
Carbon Disulfide	75-15-0	50	50
Carbon Tetrachloride	56-23-5	5	5
Chlorobenzene	108-90-7	5	5
Chlorodifluoromethane (Freon 22)	75-45-6	5	5
Chloroethane	75-00-3	5	5
Chloroform	67-66-3	7	7
Chloromethane (Methyl chloride)	74-87-3	5	5
cis-1,2-Dichloroethene	156-59-2	5	5
cis-1,3-Dichloropropene	10061-01-5	5	5
Dibromochloromethane (CDBM)	124-48-1	5	5
Dichlorodifluoromethane (Freon 12)	75-71-8	5	5
Ethylbenzene	100-41-4	5	5
m+p-Xylene	NA	5	5
Methyl tert-Butyl Ether (MTBE)	1634-04-4	5	5
Methylene Chloride (Dichloromethane)	75-09-2	5	5
o-Xylene	95-47-6	5	5
Styrene	100-42-5	5	5
Tetrachloroethene	127-18-4	5	5
Toluene (Methylbenzene)	108-88-3	5	5
trans-1,2-Dichloroethene	156-60-5	5	5
trans-1,3-Dichloropropene	10061-02-6	5	5
Trichloroethene	79-01-6	5	5
Trichlorofluoromethane (Freon 11)	75-69-4	5	5
Vinyl Chloride	75-01-4	2	2

Notes:

(1) Analyte list matches the air analyte list except for Freon 142 and 1,3-Butadiene which cannot be analyzed at this time because laboratory standards are not available. The presence of these compounds in samples will be monitored by reporting Tentatively Identified Compounds (TICs).

(2) The detection limit shown is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL can only be achieved in samples with little or no mass detected.

Acronyms:

ASP Analytical Service Protocol

ug/L micrograms per liter

CAS No. Chemical Abstracts Service list Number.

Table D-4. Analyte List for Aqueous Samples (VOCs), Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.

Matrix/Sample Type:	Aqueous/Groundwater	Aqueous/Groundwater & Water
Constituent (1)	Method	Contract Required Reporting Limits (ug/L)
Aluminum	USEPA 6010	200
~~Antimony~~	USEPA 6010	60
Arsenic	USEPA 6010	10
Barium	USEPA 6010	200
Beryllium	USEPA 6010	5
Cadmium	USEPA 6010	5
Calcium	USEPA 6010	5,000
Chromium	USEPA 7470	10
Cobalt	USEPA 6010	50
Copper	USEPA 6010	25
Iron	USEPA 6010	100
Lead	USEPA 6010	3
Magnesium	USEPA 6010	5,000
Manganese	USEPA 6010	15
Mercury	USEPA 6010	0.20
Nickel	USEPA 6010	40
Potassium	USEPA 6010	5,000
Selenium	USEPA 6010	5
Silver	USEPA 6010	10
Sodium	USEPA 6010	5,000
Thallium	USEPA 6010	10
Vanadium	USEPA 6010	50
Zinc	USEPA 6010	20

Notes:

(1) Samples will only be analyzed for those metals that are specified by the sample schedule (see Tables 1 and 2 of the Sample and Analysis Plan).

Acronyms:

USEPA	U.S. Environmental Protection Agency
RQLs	Required Quantitation Limits
ug/L	micrograms per liter

Table D-5. Analyte List for Air Samples (VOCs), Groundwater Interim Remedial Measure, Operable Unit 3 (Former Grumman Settling Ponds), Northrop Grumman Systems Corporation, Bethpage, New York.[1]

Method		Modified EPA Method T0-15 [2,3]
Matrix/Sample Type:		Air
Analyte	CAS No.	Contract Required Quantification Limit (ppbV)
Acetone	67-64-1	2.1
Benzene	71-43-2	0.5
Bromodichloromethane	75-27-4	0.5
Bromoform (Tribromomethane)	75-25-2	0.5
Bromomethane (Methyl bromide)	74-83-9	0.5
1,3-Butadiene	106-99-0	0.5
2-Butanone (MEK)	78-93-3	0.5
Methyl tert-Butyl Ether (MTBE)	1634-04-4	0.5
Carbon disulfide	75-15-0	0.5
Carbon tetrachloride	56-23-5	0.5
Chlorobenzene	108-90-7	0.5
Chloroethane	75-00-3	0.5
Chloroform	67-66-3	0.5
Chloromethane (Methyl chloride)	74-87-3	0.5
Dichlordifluoromenthane (Freon 12)	75-71-8	0.5
Dibromochloromethane (CDBM)	124-48-1	0.5
1,1-Dichloroethane	75-34-3	0.5
1,2-Dichloroethane	107-06-2	0.5
1,1-Dichloroethene	75-35-4	0.5
trans-1,2-Dichloroethene	156-60-5	0.5
cis-1,2-Dichloroethene	156-59-2	0.5
1,2-Dichloropropane	78-87-5	0.5
cis-1,3-Dichloropropene	10061-01-5	0.5
trans-1,3-Dichloropropene	10061-02-6	0.5
Ethylbenzene	100-41-4	0.5
2-Hexanone (Methyl n-Butyl Ketone)	591-78-6	0.5
Methylene chloride (Dichloromethane)	75-09-2	0.5
4-Methyl-2-pentanone (MIBK)	108-10-1	0.5
Styrene	100-42-5	0.5
1,1,2,2-Tetrachloroethane	79-34-5	0.5
Tetrachloroethene	127-18-4	0.5
Toluene (Methylbenzene)	108-88-3	0.5
1,1,1-Trichloroethane	71-55-6	0.5
1,1,2-Trichloroethane	79-00-5	0.5
Trichloroethene	79-01-6	0.5
Trichlorofluoromethane (Freon 11)	75-69-4	0.5
1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113	76-13-1	0.5
Vinyl chloride	75-01-4	0.5
o-Xylene	95-47-6	0.5
m&p-Xylenes	NA	0.5
Chlorodifluoromethane (Freon 22)	75-45-6	0.5
Ethane, 1-chloro-1,1-difluoro (Freon 142)	75-68-3	0.5

Notes:

(1) Analyte list matches the groundwater/water analyte list except for Freon 142 and 1,3-Butadiene, which are not on the groundwater/water analyte list because aqueous standards for these compounds are not available.

(2) The detection limit shown is the minimum detection limit (MDL) for the analyte by the approved method. However, the MDL can only be achieved in samples with little or no mass detected in the sample.

(3) MDL is presented in parts per billion by volume (ppbV) but lab will provide results in ug/m3.

Acronyms:

ASP Analytical Service Protocol
ug/L micrograms per liter
CAS No. Chemical Abstracts Service list Number.

ARCADIS

Appendix F

Maintenance and Monitoring Forms

MAINTENANCE LOG

Operable Unit 3 Groundwater Interim Remedial Measure

Former Grumman Settling Ponds

Bethpage, New York

Page: ___________

Date	Initials	Equipment ID	Description of Activities

OU3 GW IRM PARAMETER LOG - DAILY, NORTHROP GRUMMAN, BETHPAGE, NEW YORK

DATE: ____________ WEATHER: ______________________ °F INITIALS: ____________

PARAMETER	RANGE	Units	Time: ______ FIELD	HMI	Time: ______ FIELD	HMI	Time: ______ FIELD	HMI
Water Flow								
Remedial Well RW-1 (PT - 110)	50 - 65	(psi)						
Remedial Well RW-1 (PI - 110)	1 - 4	(psi)						
Remedial Well RW-1 (FIT - 110)	25 - 35	(gpm)						
Remedial Well RW-1 (FIT - 110)	--	(Gallons/ k Gallons)						
Remedial Well RW-2 (PT - 120)	60 - 75	(psi)						
Remedial Well RW-2 (PI - 120)	2 - 5	(psi)						
Remedial Well RW-2 (FIT - 120)	70 - 80	(gpm)						
Remedial Well RW-2 (FIT - 120)	--	(Gallons/ k Gallons)						
Remedial Well RW-3 (PT - 130)	60 - 75	(psi)						
Remedial Well RW-3 (PI - 130)	2 - 5	(psi)						
Remedial Well RW-3 (FIT - 130)	70 - 80	(gpm)						
Remedial Well RW-3 (FIT - 130)	--	(Gallons/ k Gallons)						
Remedial Well RW-4 (PT - 140)	50 - 65	(psi)						
Remedial Well RW-4 (PI - 140)	1 - 4	(psi)						
Remedial Well RW-4 (FIT - 140)	25 - 35	(gpm)						
Remedial Well RW-4 (FIT - 140)	--	(Gallons/ k Gallons)						
Combined Influent (FI - 200)	190 - 220	(gpm)						
Combined Influent (FQI - 200)	--	(Gallons/ k Gallons)						
Air Stripper Sump Level	14-18	(in)						
Pump Operation (P-410)	30-60	(Hz)						
Air Stripper Effluent (PT-700)	(3-26)	(psi)						
Bag Filter Influent (A)	Bag Filters 1 or 2 On-Line	(psi)						
Bag Filter Effluent (A)		(psi)						
Bag Filter Influent (B)		(psi)						
Bag Filter Effluent (B)		(psi)						
Bag Filter Change ?	Yes or No							

OU3 GW IRM PARAMETER LOG - DAILY, NORTHROP GRUMMAN, BETHPAGE, NEW YORK

ATE: ______ WEATHER: ______ °F ______ INITIALS: ______

PARAMETER	RANGE	Units	Time: FIELD	HMI	Time: FIELD	HMI	Time: FIELD	HMI
Water Flow (Continued)								
System Effluent (FQI-700)	205 - 215	(gpm)						
System Effluent (FQI-700)	--	(Gallons/ k Gallons)						
Air Flow								
Blower Vacuum (Local PI-400)	28-32	(iwc)						
Pitot Tube Differential Pressure	0.3-0.5	(iwc)						
Air Stripper Effluent (FIT-500)	1,800 - 2,200	(scfm)						
Air Temperature								
Air Stripper Effluent (TT-500)	80 - 95	(°F)						
ECU Mid-Train (TI-601)	75 - 90	(°F)						
Total Effluent (TI-601)	70 - 85	(°F)						
Air Pressure								
Air Stripper Effluent (PT-500)	7 - 15	(iwc)						
GAC-501 Influent (PI-501)	6 - 12	(iwc)						
GAC-502 Influent (PI-502)	3 - 9	(iwc)						
PPM-601 Influent (PI-601)	2 - 6	(iwc)						
PPM-602 Influent (PI-602)	1 - 3	(iwc)						
System Effluent (PI-603)	0 - 2	(iwc)						
Facility								
Building Temperature (TT-900)	45-100	(°F)						
Building Sump Level (P-900)	0.0-2.0 ft	(in/ft)						
Building Sump Emptied (Y/N)	--	--						
OPERATIONS & MAINTENANCE								
Runtime Hours		*Actual time taken:*						
Discharge Pump (P-400)	--	(Hours)						
Blower (P-410)	--	(Hours)						
RW-1 (P-110)	--	(Hours)						
RW-2 (P-120)	--	(Hours)						
RW-3 (P-130)	--	(Hours)						
RW-4 (P-140)	--	(Hours)						

ARCADIS

Appendix G

Standard Operating Procedures

Northrop Grumman Corporation SOP OU3 GW-01 – System Start Up

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-01
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	

Description

This SOP provides instructions on starting the NGC OU3 GW IRM System.

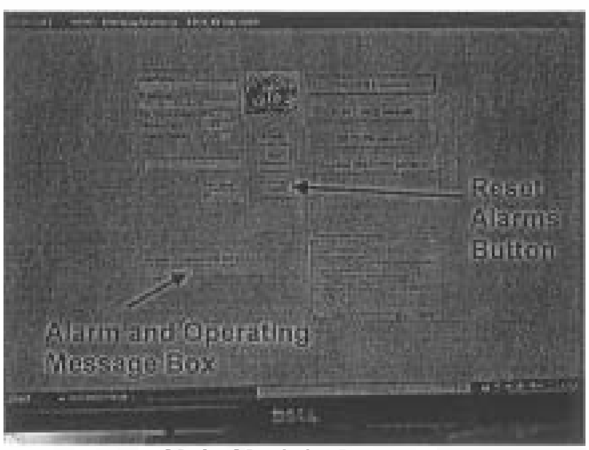
Abbreviations

NGC	Northrop Grumman Corporation
GW	Groundwater
IRM	Interim Remedial Measure
SOP	Standard Operating Procedure

System Start Up

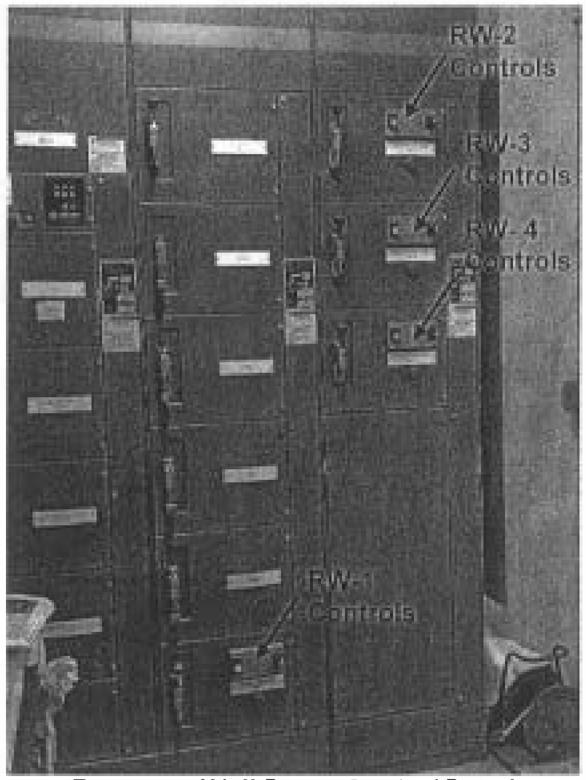
1. Open the MLEE Control System program by double clicking the icon on the site computer desktop.

2. Check the "Main Module" screen in the MLEE Control System Program to ensure that there are no alarms engaged. If an alarm is engaged, it will be shown in the "Alarm and Operating Message" box. Prior to starting the system, clear all alarms by pressing the "Reset Alarms" button on the "Main Module" screen.



Main Module Screen

3. Turn on the four recovery well pumps (RW-1, RW-2, RW-3 and RW-4) by turning the respective "HAND-OFF-AUTO" switches to the "AUTO" positions. Once put in the "AUTO" position, the indicator light should turn orange.



Recovery Well Pump Control Panel

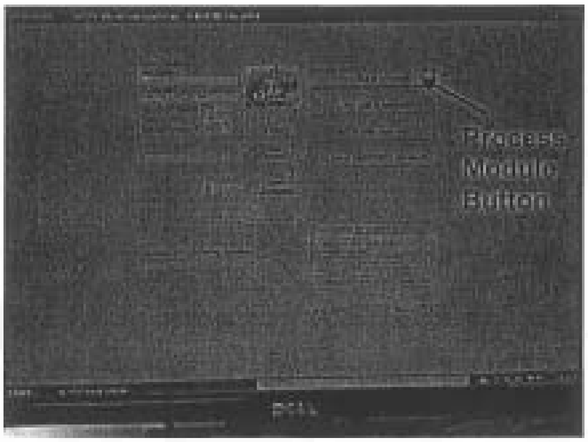
Recovery Well "HAND-OFF-AUTO" Control

4. Ensure that the four recovery well pumps are in the "AUTO" position in the

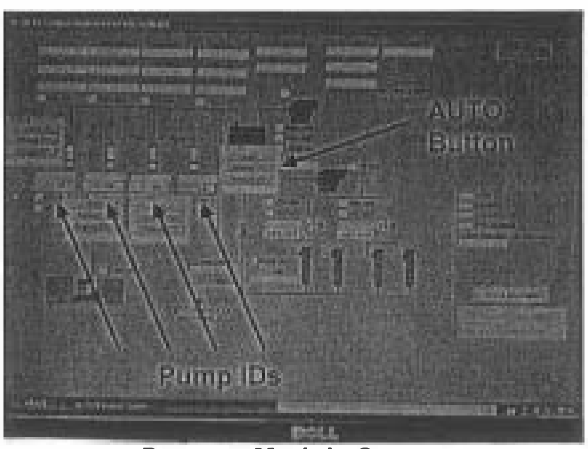
Northrop Grumman Corporation SOP OU3 GW-01 – System Start Up

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-01
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	

MLEE Control System program. To do this, click on the "Process Module" button on the "Main Module" screen. The positions of the recovery well pumps should be indicated on this screen. If the pumps are not in the "AUTO" position, click on the pump ID and hit the "AUTO" button.

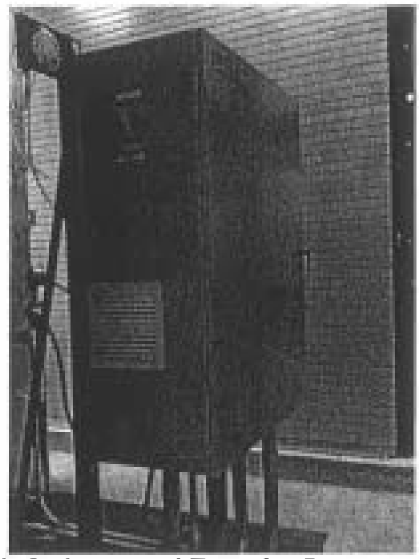


Main Module Screen

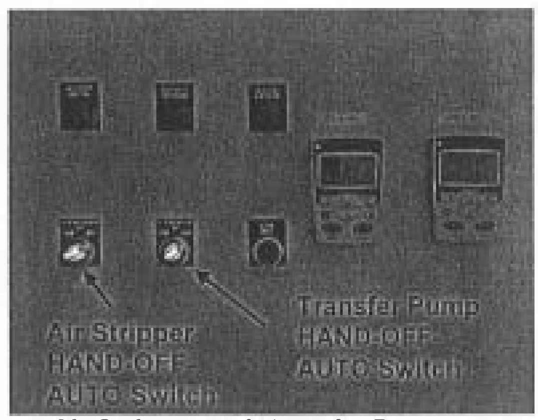


Process Module Screen

5. Turn on the air stripper (AS-400) by turning the "HAND-OFF-AUTO" switch to the "AUTO" position. The panel that contains the air stripper and transfer pump controls is located in the back of the building near the air stripper transfer pump. Open the panel to access the controls.



Air Stripper and Transfer Pump Control Panel

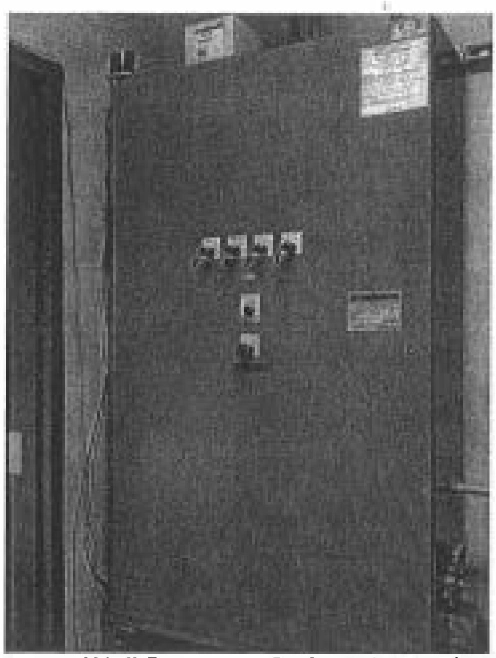


Air Stripper and Transfer Pump Controls

6. Turn off the air stripper transfer pump (P-400) by turning the "HAND-OFF-AUTO" switch to the "OFF" position.

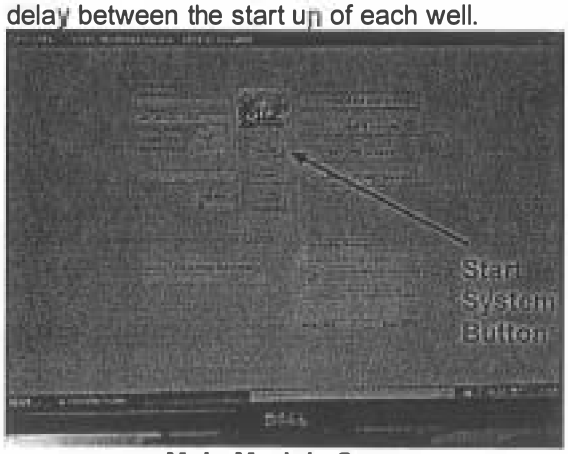
7. Turn on the four recovery well pressure switches (PSL-111, PSL-121, PSL-131 and PSL-141) by placing the respective "ENABLE-DISABLE" switches in the "ENABLE" positions. Note that there is a fifteen minute time delay on the recovery well pressure switches. If the recovery wells are not started and fully

operational within 15 minutes of placing the pressure switch controls in the "ENABLE" positions, the system will shut down.



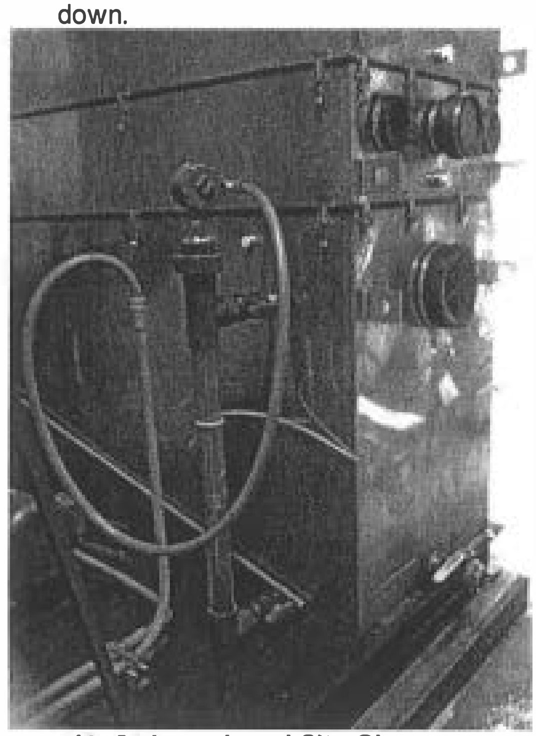
Recovery Well Pressure Switch Control Panel

8. Press the "Start System" button on the MLEE Control System program on the "Main Module" screen. This will activate the system. Note that there is a 2 minute time delay on the recovery well pumps once the system is started. After the 2 minute time period has elapsed, each well will turn on one at a time. There is a 10 second time delay between the start up of each well.



Main Module Screen

9. Monitor the level in the air stripper through the site glass. When the water level in the air stripper reaches the first indicator mark, turn on the air stripper transfer pump by placing the "HAND-OFF-AUTO" switch in the "AUTO" position. Note that if the water level in the air stripper is higher or lower than the lowest indicator mark, there is a possibility that the transfer pump will overwork and pump out all of the water in the air stripper. This will hinder plant operation and the system will shut down.



Air Stripper Level Site Glass

10. Monitor the system, both through the MLEE Control System program and by physically checking the field mounted meters and gauges. Check all values to ensure that they are within their normal operating ranges (see Attachment OU3 GW-01-1 for a list of normal operating ranges).

Northrop Grumman Corporation SOP OU3 GW-01 – System Start Up

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-01
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	

11. If any values are not within their normal operating ranges, contact the Project Manager.

Safety Considerations

- This system removes contaminated groundwater and, once treated, discharges treated water to a surface retention basin and treated vapor to the atmosphere. Therefore, it is EXTREMELY IMPORTANT that the operator be prepared to shut down the treatment system at any time there is question that the water or vapor are not receiving FULL TREATMENT.

- Follow all associated procedures as outlined in the Health and Safety Plan.

Associated SOPs

- None

Contact Phone List

- **Project Manager:**

  Carlo San Giovanni: O: 631.391.5259

  C: 516.903.6591

- **Site Health and Safety Officer:**

  Scott DeCesare C: 516.459.8848

- **Plant Engineer:**

  Patricia Riche O: 631.391.5285

  C: 516.790.6150

Attachment OU3 GW-01-1 Normal Operating Parameters

Location	Location ID	Normal Operating Range	Units
Water Flow Rates			
Remedial Well RW-1	(FIT-110)	25 - 35	(gpm)
Remedial Well RW-2	(FIT-120)	70 - 80	(gpm)
Remedial Well RW-3	(FIT-130)	70 - 80	(gpm)
Remedial Well RW-4	(FIT-140)	25 - 35	(gpm)
Combined Influent	(FI-200)	190 - 220	(gpm)
Air Stripper Effluent	(PT-700)	200-230	(gpm)
System Effluent	(FIT-700)	205 - 215	(gpm)
Water Pressures			
Remedial Well RW-1 (PT - 110)	(PT-110)	50 - 65	(psi)
Remedial Well RW-1 (PI - 110)	(PI-110)	1 - 4	(psi)
Remedial Well RW-2 (PT - 120)	(PT-120)	60 - 75	(psi)
Remedial Well RW-2 (PI - 120)	(PI-120)	2 - 5	(psi)
Remedial Well RW-3 (PT - 130)	(PT-130)	60 - 75	(psi)
Remedial Well RW-3 (PI - 130)	(PI-130)	2 - 5	(psi)
Remedial Well RW-4 (PT - 140)	(PT-140)	50 - 65	(psi)
Remedial Well RW-4 (PI - 140)	(PT-140)	1 - 4	(psi)
Air Flow Rates			
Air Velocity	(Local DP Gauge)	TBD	(iwc)/(cfm)
Air Stripper Effluent	(FIT-500)	1,800 - 2,200	(SCFM)
Air Pressures			
Blower Vacuum	(Local PI-400)	28-32	(iwc)
Air Stripper Effluent	(PT-500)	7 - 15	(iwc)
GAC-501 Influent	(PI-501)	6 - 12	(iwc)
GAC-502 Influent	(PI-502)	3 - 9	(iwc)
PPM-601Influent	(PI-601)	2 - 6	(iwc)
PPM-602 Influent	(PI-602)	1 - 3	(iwc)
System Effluent	(PI-603)	0 - 2	(iwc)
Air Temperatures			
Air Stripper Effluent	(TT-500)	80 - 95	(°F)
ECU Mid-Train	(TI-601)	75 - 90	(°F)
Total Effluent	(TI-601)	70 - 85	(°F)
Building Temperature	(TT-900)	45-100	(°F)
Pump Operation			
Pump Operation	(P-410)	30-60	(Hz)

Northrop Grumman Corporation SOP OU3 GW-02 – System Shut Down

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-02
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	

Description

This SOP provides instructions on shutting down the NGC OU3 GW IRM System.

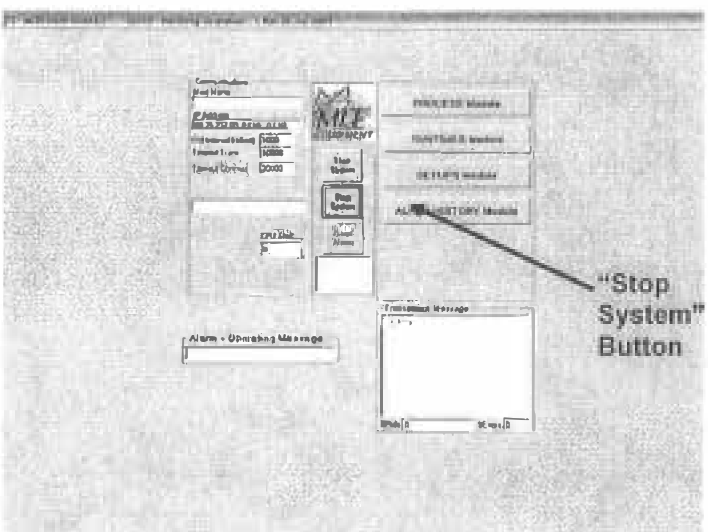
Abbreviations

NGC	Northrop Grumman Corporation
GW	Groundwater
IRM	Interim Remedial Measure
SOP	Standard Operating Procedure
H-O-A	Hand-Off-Auto

System Shut Down

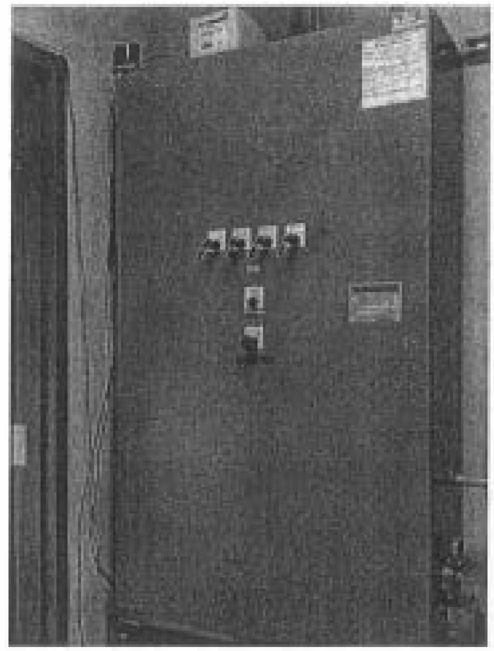
1. Open the MLEE Control System program by double clicking the icon on the site computer desktop.

2. Click the "Stop System" button on the "Main Module" screen in the MLEE Control System Program. This will shut down the system. Note that the blower will run for 8 minutes following the system shutdown.



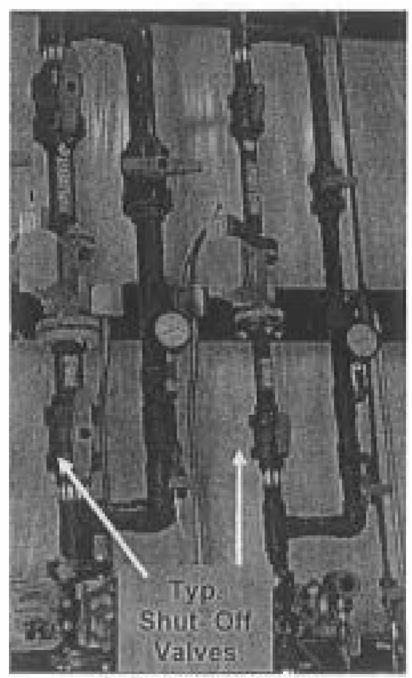
"Main Module" Screen

3. Turn off the recovery well pressure switches by turning the "ENABLE / DISABLE" switches to the "DISABLE" position.



Motor Control Panel

4. Physically **close each well's ball valve on the manifold &** check the field mounted gauges & meters to ensure that the system is offline.

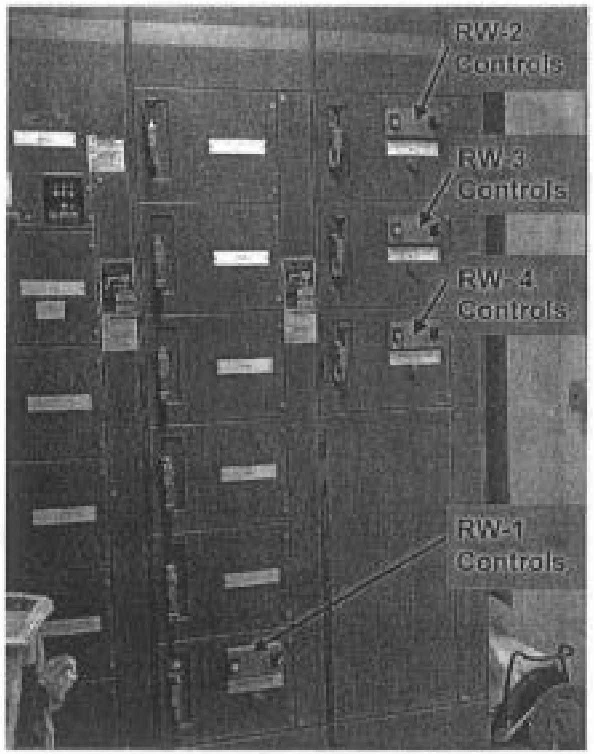


Influent Manifold

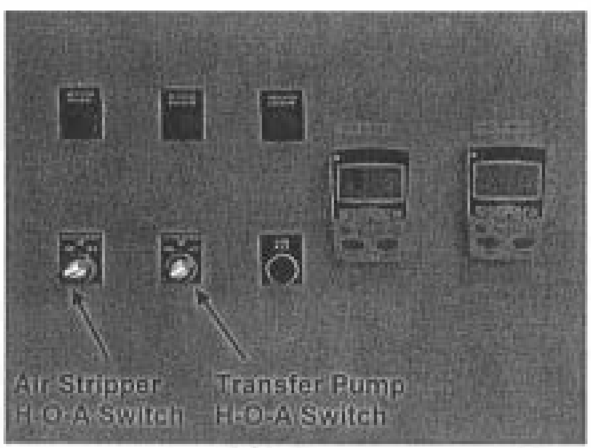
SOP Author:	ARCADIS-US
SOP #:	OU3 GW-02
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	

Northrop Grumman Corporation SOP OU3 GW-02 – System Shut Down

5. Once the blower has shut down, turn off the power to the four recovery well pumps (RW-1, RW-2, RW-3 and RW-4), the air stripper and AS sump transfer pump by turning their respective "HAND-OFF-AUTO" switches to the "OFF" positions.



Motor Control Panel



Local Air Stripper & Transfer Pump Control Panel

Safety Considerations

- This system removes contaminated groundwater and, once treated, discharges treated water to a surface retention basin and treated vapor to the atmosphere. Therefore, it is **EXTREMELY IMPORTANT** that the operator be prepared to shut down the treatment system at any time there is question that the water or vapor are not receiving **FULL TREATMENT**.
- Follow all associated procedures as outlined in the Health and Safety Plan.

Associated SOPs

- None

Contact Phone List

- **Project Engineer:**

William Wittek	O: 631.391.5270
	C: 516.315.6226

- **Plant Engineer &**
- **Site Health and Safety Officer:**

Patricia A. Riché	O: 631.391.5285
	C: 516.790.6150

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-03
Revision #:	1
Date Implemented:	
Approval:	
By:	CE – 8/26/09
Checked By:	PR – 9/09

Northrop Grumman Corporation
SOP OU3 GW-03
Bag Filter Replacement

Description

This SOP provides instructions on replacing the system bag filters once spent.

Abbreviations

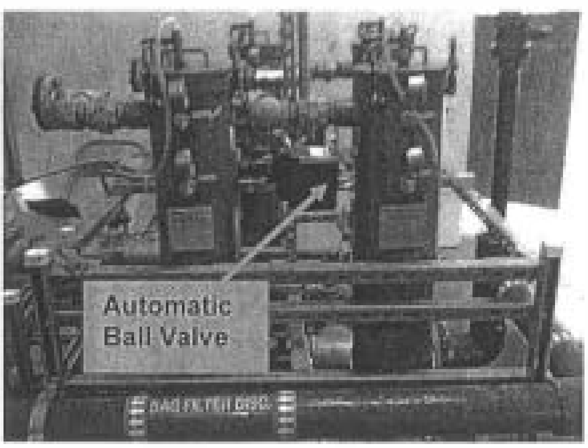
NGC	Northrop Grumman Corporation
GW	Groundwater
SOP	Standard Operating Procedure

Required Equipment

- Crescent Wrench
- Nitrile Gloves
- 2 Polyester Felt Bag Filters (Type 2, 7" x 32"; PE25P2SH-or current model)

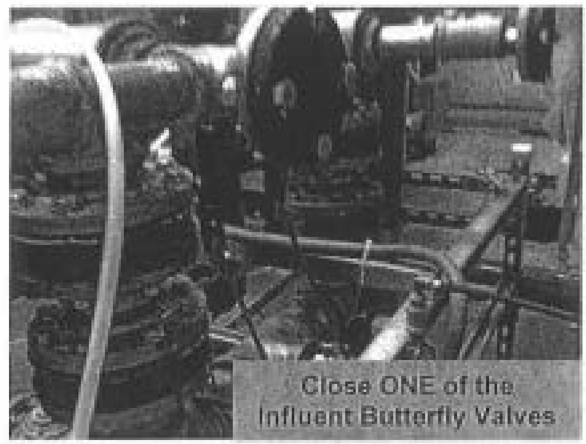
Bag Filter Replacement

1. Ensure the automatic ball valve on the influent line to the filter units being replaced is in the closed position.



2. Check the level in the booster tank to ensure enough water is available for the bag filter replacement. If more water is required (i.e. if the tank is less than 1/2 full), fill the tank in accordance with SOP OU3 GW-04.

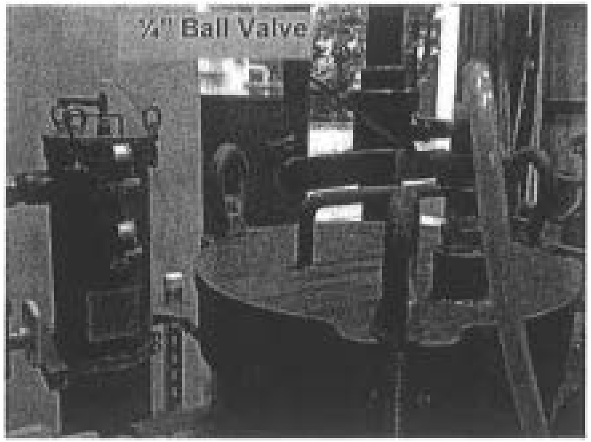
3. Close the influent and effluent butterfly valves to the two bag filter housings containing the bag filters that are being replaced. Ensure the handle seals properly into the notch on the valve plate. When changing the bag filters, either BF-401a and BF-401b will be replaced simultaneously, or BF-402a and BF-402b will be replaced simultaneously.



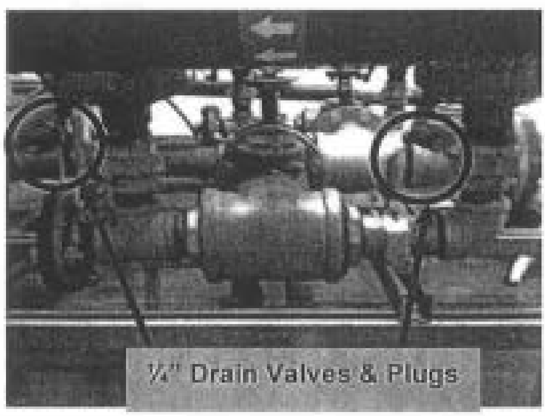
4. Open the ¼" ball valves on top of both of the units containing the spent bag filters.

Northrop Grumman Corporation
SOP OU3 GW-03
Bag Filter Replacement

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-03
Revision #:	1
Date Implemented:	
Approval:	
By:	CE – 8/26/09
Checked By:	PR – 9/09



5. Using a wrench, remove the ¼" plugs from each of the ball valve drains located underneath each bag filter unit housing and set aside.



6. Loosen the lock-downs on the top of each bag filter housing lid using the back end of an open-end wrench. Once all the lock-downs have been loosened pull the two removable ones out of their respective holding notch and let hang down to the side of the filter bag housing. Holding the handle on the lid of the housing flip open the filter unit cover back toward the remaining Lock-down location.

7. Remove filter lid O-Ring and the filter bag hold down unit and set aside.

8. Open the drain valves located under respective units to drain standing water in the filter housings. Allow both units to drain to the floor sump. TO AVOID A SYSTEM SHUT-DOWN, monitor the water level in the floor sump and empty as necessary (See SOP OU3 GW-XX).

9. Close the ¼: drain valves located under the filter bag housings. Replace the plugs add new Teflon tape or similar thread dressing to minimize rusting.

10. Holding the intergral filter bag handle, remove the filter spent filters one at a time. As the water from these bags contains iron oxide be careful to keep spent bags away from clothes or skin to minimize staining. Transfer the spent filters to the appropriate drying rack. Once dry, the bags will be moved to one of the 55-gallon drums (located on the skid adjacent to the influent Well manifold inside the building) for future disposal. Ensure that the waste drum is properly labeled.

11. Obtain a filter bag and remove the inside label, dispose of properly. Unfold the filter bag and fully extend the length of the filter bag, crease a fold lengthwise while holding the top ring of the bag.

Northrop Grumman Corporation
SOP OU3 GW-03
Bag Filter Replacement

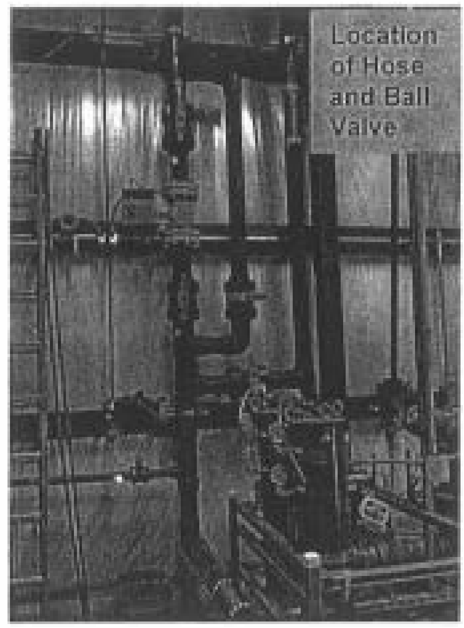
SOP Author:	ARCADIS-US
SOP #:	OU3 GW-03
Revision #:	1
Date Implemented:	
Approval:	
By:	CE – 8/26/09
Checked By:	PR – 9/09

Feed the bottom end of the bag into the filter strainer basket. Use your hand to adjust the bag and its ring to ensure bag is seated properly and reaches the end of the basket. Repeat installation instructions for 2nd filter bag housing.

12. Reinstall the filter bag hold-down rings and ensure that the O-rings for the lid are clean and seated properly. Ensure there is a tight seal at the O-ring. Use a thin layer of an appropriate non-toxic O-Ring dressing when lubricant is no longer observed on the O-Ring.

13. Due to the floor slope, close the lid to the filter housing that is closest to the floor sump. Align the lid while hand tightening the lock-downs. There will be some resistance due to the filter bag hold down ring, if the lid slips –realign and continue tightening. Be careful not to pinch the O-Ring, if it is in the way, open lid and realign the O-Ring & start over. Once the lid is hand tightened and you are sure the O-Ring is aligned properly, you may use the open-end wrench to tighten the lock-downs.

14. Take the hose located adjacent to the bag filter skid in the corner of the building and run the hose to the open bag filter housing. Run the hose in a fashion that minimizes the risk of slips, trips and falls for personnel on the site. Place the hose in the bag filter unit and gently close the lid over the hose to hold it in place. Open the ball valve associated with the hose located near the hose connection.



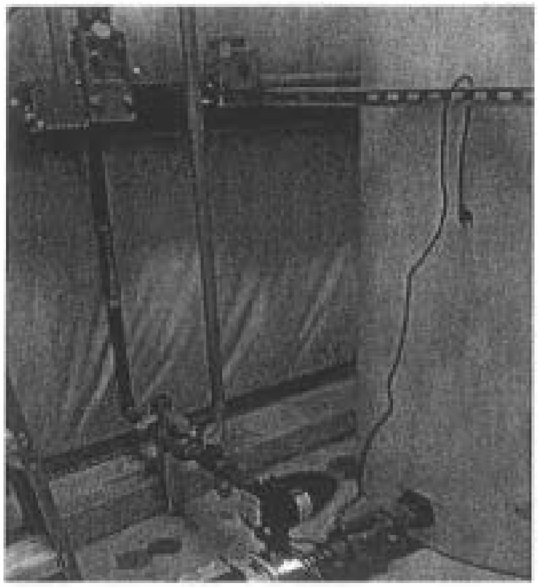
15. Ensuring hands are dry and fingers are clear of the prongs, engage the the holding tank transfer pump by plugging it into a GFCI and then into the Outlet. Fill the open filter to the rim of the housing (note that water will flow to the closed bag filter and fill up that unit as well). Once the units are full, turn off the valve near the hose connection, remove the hose from the bag filter housing.

16. To ensure good housekeeping and to minimize any staining use the local hose and a broom to clean the floor of any drained material that may remain. TO AVOID PLANT SHUT DOWN monitor the level in the floor sump and empty as necessary (SOP XXXX) Close the ball valve associated with the hose when finished.

17. Ensure your hands are dry & unplug the transfer pump. Return to the ball valve associated with the hose and open it to release any remaining pressure. Neatly wrap up the hose and return it to its original location.

Northrop Grumman Corporation
SOP OU3 GW-03
Bag Filter Replacement

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-03
Revision #:	1
Date Implemented:	
Approval:	
By:	CE – 8/26/09
Checked By:	PR – 9/09



18. Close the lid of the second bag filter unit and secure the lid described in Steps 12 & 13 above.

19. Close the ¼" vent valves at the top of both units.

20. Open the bag filter housing effluent valve, and then the bag filter influent valve.

21. Monitor the system for a minimum of 5 minutes and check system parameters, both on the MLEE Control Program and on the field mounted gauges and meters, to ensure that they are within their normal operating ranges (refer to Attachment OU3 GW-01-1 for typical operating parameters).

Safety Considerations

- This system removes contaminated groundwater and, once treated, discharges treated water to a surface retention basin and treated vapor to the atmosphere. Therefore, it is **EXTREMELY IMPORTANT** that the operator be prepared to shut down the treatment system at any time there is question that the water or vapor are not receiving **FULL TREATMENT**.
- Follow all associated procedures as outlined in the Health and Safety Plan.

Associated SOPs

- Attachment OU3 GW-01-1
- OU3 GW-04 – Using the Water Storage Tank
- OU3 GW-XX – Emptying the Building Floor Sump

Contact Phone List

- **Project Engineer:**

William Wittek — O: 631.391.5270, C: 516.315.6226

- **Plant Engineer &**
- **Site Health and Safety Officer:**

Patricia A. Riché — O: 631.391.5285, C: 516.790.6150

Northrop Grumman Corporation
SOP OU3 GW-04 –
Using the Water Storage Tank

SOP Author:	ARCADIS-US
SOP #:	OU3 GW-04
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	PR - 9/09

Description

This SOP provides instructions on using the system water storage tank.

Abbreviations

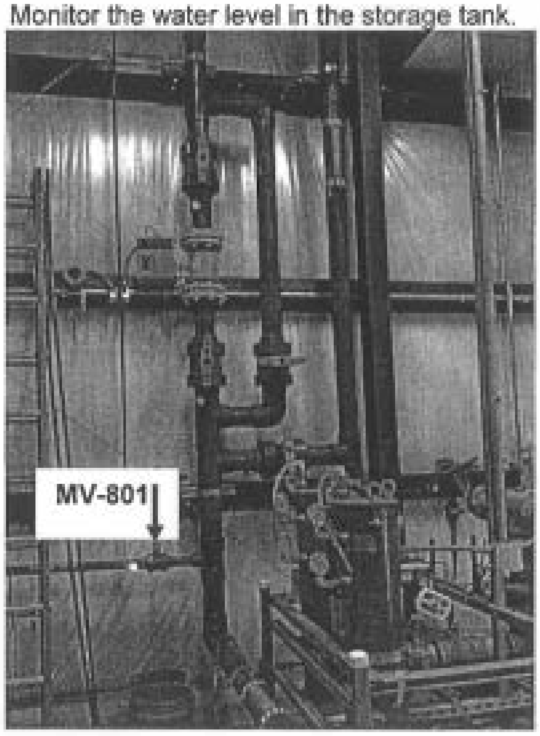
NGC	Northrop Grumman Corporation
GW	Groundwater
SOP	Standard Operating Procedure
GFCI	Ground Fault Circuit Interrupter

Filling the Water Storage Tank

1. With the system online, partially open MV-801 located next to the water storage tank to allow water to flow to the tank.

DO NOT STEP AWAY!!

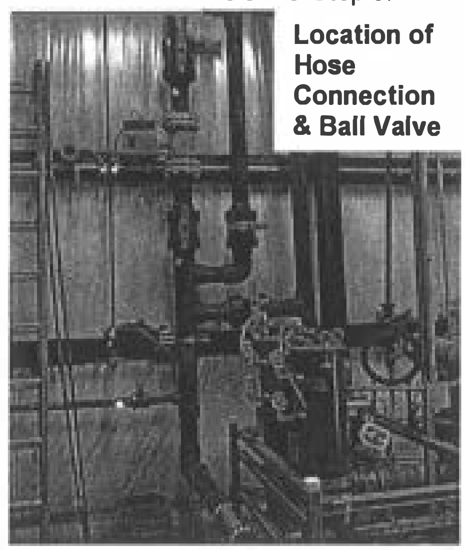
Monitor the water level in the storage tank.



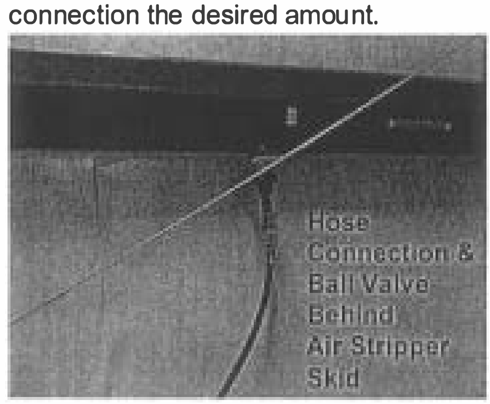
2. Once the water level in the storage tank reaches the desired level, close MV-801.

Using the Water supplied by the Water Storage Tank

3. Prior to using the hose located adjacent to the bag filter units, secure the hose or ensure the end connection is closed, as the transfer pump will produce & maintain 60 psi of pressure. Open the ball valve at the hose connection the desired amount. GO TO Step 5.



4. Prior to using the hose along the wall behind the air stripper skid, secure the hose & ensure the end connection is closed, as the transfer pump will produce & maintain 60 psi of pressure. Open the ball valve at the hose connection the desired amount.

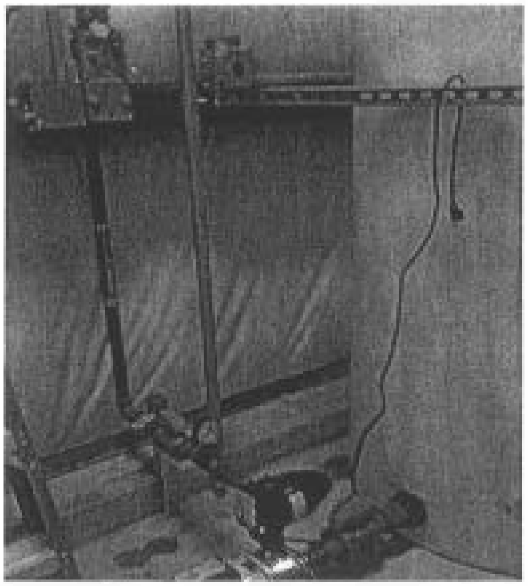


SOP Author:	ARCADIS-US
SOP #:	OU3 GW-04
Revision #:	0
Date Implemented:	
Approval:	
By:	CE - 7/31/09
Checked By:	PR - 9/09

Northrop Grumman Corporation
SOP OU3 GW-04 –
Using the Water Storage Tank

5. Turn on the water storage tank transfer pump by plugging it in:

WARNING—SHOCK HAZARD!!
ALWAYS USE A GFCI PIGTAIL
At this LOCATION!!



6. Once you are finished using the water close the local hose ball valve.

7. Ensure your hands are dry and carefully unplug the holding tank transfer pump.

8. Return to the appropriate hose location. Open the supply ball valve & end connection to release any pressure in the supply line.

Safety Considerations

- This system removes contaminated groundwater and, once treated, discharges treated water to a surface retention basin and treated vapor to the atmosphere. Therefore, it is **EXTREMELY IMPORTANT** that the operator be prepared to shut down the treatment system at any time there is question that the water or vapor are not receiving **FULL TREATMENT.**

- Follow all associated procedures as outlined in the Health and Safety Plan.

Associated SOPs

- None

Contact Phone List

- **Project Engineer:**

  William Wittek — O: 631.391.5270 — C: 516.315.6226

- **Plant Engineer &**
- **Site Health and Safety Officer:**

  Patricia A. Riché — O: 631.391.5285 — C: 516.790.6150