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CONTRACT NO. N62473-07-D-3211
Contract Task Order WE04

DRAFT FINAL WORK PLAN
FOR
THE DESIGN, INSTALLATION and OPERATION OF SOIL VAPOR EXTRACTION SYSTEM
SITE 1, FORMER DRUM MARSHALLING AREA
AT
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NY

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ACRONYMS

APP	Accident Prevention Plan
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIH	Certified Industrial Hygienist
CLEAN	Comprehensive Long Term Environmental Action Navy
CMP	Complete Manifest Package
CPM	Critical Path Method
CSV	Carbon Tetrachloride Number
CTO	Contract Task Order
EHS	Extremely Hazardous Substance
EPCRA	Emergency Planning and Community Right-to-Know Act
GAC	Granular Activated Carbon
HVAC	Heating, Ventilation and Air Conditioning
LEL	Lower Explosion Limit
LEPC	Local Emergency Planning Committee
MS	Matrix spike
MSD	Matrix spike duplicate
NRC	National Response Center
MW	Monitoring Well
NWIRP	Naval Weapons Industrial Reserve Plant
NAVFAC	Naval Facilities Engineering Command
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
PCE	tetrachloroethene
PLCs	Programmable Logic Controllers
PPE	Personal Protective Equipment
PQCM	Program Quality Control Manager
PRGs	Preliminary Remediation Goals
QC	Quality Control
RAB	Restoration Advisory Board
RAC	Remedial Action Contract
SAP	Sampling and Analysis Plan
RCRA	Resource Conservation and Recovery Act
SSHO	Site Safety and Health Officer
SQCM	Site Quality Control Manager
SQCP	Site Quality Control Plan
SVE	Soil Vapor Extraction
SVPM	Soil Vapor Pressure Monitor
SVOCs	Semi-Volatile Organic Compounds
T&D	Transportation and Disposal
TAL	Target Analyte List
TBCs	To Be Considered
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOX	Total Organic Halogens
TSCA	Toxic Substances Control Act

TtEC	Tetra Tech EC, Inc.
VGAC	Vapor Phase Granular Activated Carbon
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Work Plan for design, installation and operation of a soil vapor extraction (SVE) system for the containment of volatile organic compounds (VOC) in soil at Site 1, Former Drum Marshalling Area, located at the Naval Weapons Industrial Reserve Plant (NWIRP) in Bethpage, New York. The Work Plan has been prepared for Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic, Contract Task Order (CTO) No. WE04 under Remedial Action Contract (RAC) No. N62473-07-D-3211.

1.1 Project Description

The following sections present the project description, and include the project objectives and action levels. Figure 1-1 of this Work Plan shows the General Location Map for the site Tetra Tech NUS (TtNUS). Figure 1-2 shows the Site Location Map for the project (TtNUS).

1.1.1 Project Background

The text in this section was taken directly from the Design Analysis Report for Soil Vapor Extraction Containment – Former Drum Marshalling Area (Design Analysis Report), NWIRP Bethpage, prepared for NAVFAC, Mid-Atlantic, by Tetra Tech NUS (TtNUS), in April 2009. Figures and tables referenced in the text below are found in the Design Analysis Report and are not included in this Work Plan.

Remedial Investigations conducted in the early 1990s identified VOC-contaminated soils and shallow groundwater at Site 1 that were contributing to a regional groundwater plume [Halliburton NUS (HNUS) 1993]. To address this contamination, a 1995 Record of Decision (ROD) was prepared that included in-situ treatment of VOCs, excavation and offsite disposal of soils contaminated with polychlorinated biphenyls (PCBs), and placement of a permeable cover to address other residual contaminants including cadmium, chromium, and VOCs. The in-situ treatment consisted of a soil vapor extraction (SVE) system that started operation in 1998. Remedial goals for this system were based on protection of groundwater and minimization of solvent emissions during a planned subsequent soil excavation to address the PCBs. The operation of the in-situ system achieved these goals and was shutdown in 2002 [Foster Wheeler Environmental Corporation (FWEC, 2003)]. Final actions to address cadmium, chromium, and PCB-contaminated soils, including excavation and capping are being evaluated by the Navy. Based on the distribution of other site contaminants, the area to be addressed by excavation and cover is anticipated to be most of Site 1 except for a 50-foot strip to the north and east of Site 1 (Attachment A - Design and Analysis Report). Site photos and the current layout of NWIRP Bethpage are in Attachment A - Design Analysis Report.

Soils at Site 1 consist mainly of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units that in descending order are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay, and the Lloyd Formation. The Upper Glacial Formation, which is about 30 to 45 feet thick, consists chiefly of coarse sands and gravels. The Upper Magothy Formation consists chiefly of coarse sands to a depth of about 100 feet, below which finer sands, silts, and clay predominate. The clay is fairly common but laterally discontinuous; no individual clay horizon of regional extent underlies the NWIRP. The Raritan Clay underlies the Magothy Formation at a depth of about 700 feet beneath the NWIRP and is reportedly 100 to 150 feet thick. The underlying Lloyd Sand Formation is reportedly about 300 feet thick.

For Site 1, a clay unit is present near the groundwater table [50 feet below ground surface (bgs)] at the southeast corner of the site. This clay unit is suspected to be a source of chlorinated solvents that are migrating into the overlying soil gas and the source of offsite VOCs in soil vapor. Although there is no direct evidence of a dense non-liquid phase liquid being present, some material may be present bound to the clays. This clay is being investigated under a separate action as a potential source of solvent contamination. Historically, groundwater levels at Site 1 have been measured to vary between 48 and 65 feet bgs. Log sheets for soil borings installed along the fence line and into the residential neighborhood are presented in Attachment A - Design and Analysis Report.

Chlorinated solvents including trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) have been identified as the VOCs of interest in soil gas at the site. Concentrations greater than 1,000 µg/m3 (micrograms per cubic meter of air) have been directly associated with Site 1 activities and historical environmental data, and based on preliminary screening exceed guidelines established by the New York State Department of Health (NYDOH) for subslab soil vapor concentrations. Of these chemicals, TCE is the primary VOC of concern. Addressing TCE contamination in accordance with DOH guidance should result in the other VOCs associated with the site being addressed as well (NYSDOH, 2006). Positively detected VOCs for onsite and offsite soil gas are presented on Figure 4, Design Analysis Report, (Tetra Tech NUS, Inc. [TtNUS], 2008 and TtNUS, 2009). Anticipated initial concentrations of extracted soil vapors are presented in Table 1-1 and are based on the mean chemical concentrations of the intermediate-depth and deep soil gas samples collected along the eastern fence line.

PCBs, cadmium, and chromium have also been identified in site soils at concentrations requiring remediation. The majority of these chemicals have been detected in the central portion of Site 1. Based on limited data, these chemicals are not expected to be present along the fence line at environmentally significant concentrations (i.e., trigger handling as hazardous waste). Available analytical data for these soils is presented in Attachment A - Design and Analysis Report. This data consists of information collected from the Remedial Investigation of the Site in 1991 to 1993 and soil cores IDW obtained during the January 2008 soil gas testing for disposal purposes (HNUS, 1993 and Attachment A - Design and Analysis Report).

1.1.2 Site Contaminants

Table 1-1 of this Work Plan, presented below, provides a summary of site contaminants as presented in the Design Analysis Report prepared by TtNUS. At this time, no other chemical data from the site has been presented to, nor reviewed by TtEC. TtEC will be collecting and analyzing a limited amount of soil samples to establish worker health and safety protocols during soil handling activities.

1.1.3 Project Objectives

The remedial objective for this project is to use an on-site soil vapor extraction system to prevent further off-site migration of VOC contaminated soil vapor and to the extent practical, capture contaminated soil gas with TCE concentrations greater than 250 ug/m3. A secondary objective is to address soil gas with a TCE concentration greater than 5 ug/m3 (TtNUS, April 2009).

Table 1-1 Summary of Contamination Concentrations

Chemical of Concern	Concentration		Mean Concentration	Media
		Maximum		
Trichloroethene (µg/m³)	-	180,000	41,128	Soil Vapor
Tetrachloroethene (µg/m³)	-	1,200	381	Soil Vapor
1,1,1-Trichloroethene (µg/m³)	-	90,000	20,634	Soil Vapor
PCB Arochlor-1248 (ug/Kg)	-	>500	Na	Waste Soil
TCLP Cadmium[1] (ug/L)	1.2[1]	Na	Na	Waste Soil
TCLP Chromium[1] (ug/L)	11.4[1]	Na	Na	Waste Soil

[1] Data from one waste classification sample.
Na- not available
TCLP-toxicity characteristic leaching procedure

2.0 WORK DESCRIPTION

Specific tasks associated with this project are discussed in greater detail in this section. The system is expected to operate for approximately 2 to 5 years, with TtEC operating the system for at least the first 6 months.

2.1 Task 1 - Design of SVE System

The Design Analysis Report for Soil Vapor Extraction Containment System (TtNUS, April 2009) provides a detailed background on the Site history, remedial objectives, pilot-scale details, and a preliminary remedial system design for this SVE Containment System based on the pilot-scale testing. TtEC will provide necessary details in order to construct and operated the SVE system in accordance with the Design Analysis Report. TtEC will verify the material and equipment specifications for the piping, mechanical and electrical components of the SVE system as presented in the Design Analysis Report.

The SVE Containment System will consist of the following elements:

- Twelve soil vapor extraction (SVE) wells (SVE Wells), (6 intermediate and 6 deep);
- One Moisture separator;
- Two soil vapor extraction blowers (SVE Blowers);
- Interim Vapor-Phase Granular Activated Carbon (VGAC) off gas treatment;
- Associated piping, valving and instrumentation; and
- Twelve soil vapor monitoring wells.

The SVE Wells will be located along the eastern boundary of the Site. Each well will be piped below ground to the Flow Monitor Station, where flow, vacuum and gas quality can be monitored. The Flow Monitor Station will be a small shed located at the southeast corner of the Site. All the soil vapor extraction lines will collect into a single header within the Flow Monitor Station, and a single pipe line will be piped underground to the Treatment Building, existing unoccupied building number 03-35. The process equipment, including the moisture separator, soil vapor extraction blowers, VGAC vessel and associated piping, valving and instrumentation will be in the existing unoccupied building number 03-35 (Treatment Building).

2.2 Task 2 - Mobilization and Site Preparation

Mobilization activities include the preparation of project submittals. This Work Plan and the system design, as previously discussed, are the primary components of this task. Other submittals will include a Accident Prevention Plan (APP) which includes a Site Safety and Health Plan, air permit application (for "review purposes only") and Draft Operation and Maintenance (O&M) Manual. The APP will be submitted concurrently with this Work Plan. The air permit application will be prepared subsequent to approval of the Work Plan to assure that substantive permitting requirements will be met. It has been assumed that an actual air discharge permit is not required because the NWIRP-Bethpage is a federal facility. All submittals will be provided to NAVFAC personnel for review and approval.

Subsequent to approval of the Work Plan by NAVFAC, Mid-Atlantic, TtEC will begin the procurement process and limited field activities. The procurement process includes the identification of materials, equipment, and subcontracts needed to construct the SVE system. Specifications for the procurement packages will be prepared and issued to vendors and contractors. TtEC will award the contracts after reviewing the bids and proposals. Limited field activities will be non-intrusive activities, including site reconnaissance, limited mobilization, equipment delivery, and surveying. These activities will be performed under a site-specific Incident Prevention Plan (prior to approval of the APP) due to the time constraints of the project schedule. All intrusive activities will be performed under the Navy approved APP.

Following the approval of the submittals, a pre-construction meeting will be conducted with TtEC and NAVFAC personnel prior to start of intrusive field activities. The purpose of this meeting is to develop a mutual understanding of the construction activities, review the project schedule, discuss Quality Control (QC) issues, and coordinate site activities with NWIRP-Bethpage personnel.

Craft labor will be used on an as needed basis. All personnel working at Site 1 will meet the requirements of the APP.

Construction equipment and materials will be mobilized in a timely manner. Temporary utilities (i.e., telephone service) and facilities (i.e., sanitary facilities) will be established.

No trailers are intended to be brought onto the site. The existing treatment building will be used as an office and a storage area for small items during the construction and operation of the SVE system.

Based on TtEC's discussions with Navy and site personnel, there are underground utilities on the site, and a utility mark-out will be performed by geophysical survey subsequent to intrusive field activities.

A personnel decontamination area and an equipment decontamination area will be set up on site. The decontamination area will be constructed with a polyethylene liner installed over wood supports, an earthen berm or hay bales. The bottom will be sloped to one end to function as a sump. If necessary, a small sump pump will be provided to pump the collected water into 55-gallon drums. The water will be sampled for waste characterization and disposed of in accordance with the sampling results. Since the majority of this project involves clean construction, decontamination is anticipated only during drilling and sampling activities.

Select TtEC personnel will receive the "code" to enter the site automatic gate. All visitors and subcontractors will need to contact the TtEC Site Superintendent (or designee) to access the site. A TtEC representative will need to accompany any site visitors or subcontractors each time they must access the site through the gate.

2.3 Task 3 - Monitoring, Sampling, Testing, and Analysis

In order to verify the effectiveness of the remedial activities, a sampling and analysis program will be implemented. A detailed sampling and analysis plan is provided in Section 5.

2.3.1 SVE/Monitoring Wells and Monitoring Points

SVE well and Soil Vapor Pressure Monitor (SVPM) installation is described in Section 2.4.1 and 2.4.2 Six SVE well clusters, each consisting of an intermediate and deep well, will be utilized for the extraction of soil vapors during the system operation. The six deep SVE wells may also be used as monitoring wells for collecting groundwater samples. TtEC will not collect groundwater samples as part of the installation and operation of the SVE system. The six intermediate SVE wells will not encounter groundwater and will only be used for soil vapor extraction.

Twelve SVPMs will be used to monitor the system vacuum pressure on soil vapor and to confirm the capture of the contaminated soil vapors in the area east of Site 1.

Table 2-1 presents details on the SVE wells and the SVPMs regarding their installation status and purpose. Sample collection and analysis will be conducted as detailed in Section 5 of this Work Plan.

Table 2-1 SVE Well and SVPM Details

Well ID	Installation Status	Approximate Maximum Depth below ground surface (bgs)	Purpose
SVE-101 I	already installed stick-up completion	35 ft	soil vapor extraction
SVE-101 D	already installed stick-up completion, development	60 ft	soil vapor extraction, groundwater monitoring
SVE-102 I	installation, stick-up completion	35 ft	soil vapor extraction
SVE-102 D	Installation, stick-up completion, development	60 ft [1]	soil vapor extraction, groundwater monitoring
SVE-103 I	installation, stick-up completion	35 ft	soil vapor extraction
SVE-103 D	Installation, stick-up completion, development	60 ft [1]	soil vapor extraction, groundwater monitoring
SVE-104 I	installation, stick-up completion	35 ft	soil vapor extraction
SVE-104 D	Installation, stick-up completion, development	60 ft [1]	soil vapor extraction, groundwater monitoring
SVE-105 I	installation, stick-up completion	35 ft	soil vapor extraction
SVE-105 D	Installation, stick-up completion, development	60 ft [1]	soil vapor extraction, groundwater monitoring
SVE-106 I	installation, stick-up completion	35 ft	soil vapor extraction
SVE-106 D	Installation, stick-up completion, development	60 ft [1]	soil vapor extraction, groundwater monitoring

Table 2-1 SVE Well and SVPM Details			
Well ID	Installation Status	Approximate Maximum Depth below ground surface (bgs)	Purpose
SVPM-2002-S	already installed, sand removal, flushmount completion	10 ft	soil vapor monitoring
SVPM-2002-I	already installed, sand removal, flushmount completion	25 ft	soil vapor monitoring
SVPM-2002-D	already installed, sand removal, flushmount completion	50 ft [2]	soil vapor monitoring
SVPM-2003-S	already installed, sand removal, flushmount completion	10 ft	soil vapor monitoring
SVPM-2003-I	already installed, sand removal, flushmount completion	25 ft	soil vapor monitoring
SVPM-2004-I	installation, flushmount completion	25 ft	soil vapor monitoring
SVPM-2004-D	installation, flushmount completion	50 ft [2]	soil vapor monitoring
SVPM-2007-I	already installed, sand removal, flushmount completion	25 ft	soil vapor monitoring
SVPM-2007-D	already installed, sand removal, flushmount completion	50 ft [2]	soil vapor monitoring
SVPM-11S	complete	25 ft	soil vapor monitoring
SVPM-12	complete	52 ft	soil vapor monitoring
SVPM-12S	complete	27 ft	soil vapor monitoring

1 Deep SVE wells to be installed at least 10 feet in groundwater for use as groundwater monitoring wells.
2 Deep SVPM to be installed above groundwater.
Note: No groundwater samples will be collected by TtEC during the installation and operation of the SVE system.

2.3.2 Well Development

The six deep SVE wells will be developed 24 hours after their installation. The wells will be developed using a disposable polyethylene bailer, centrifugal pump with dedicated polyethylene tubing, or positive displacement foot-valve pump with dedicated polyethylene tubing. The wells will be developed by a licensed driller being supervised by TtEC field personnel.

Well development will proceed by removing volumes of water from the well until the discharged water reaches a concentration of 50 NTUs (according to a turbidity meter) or the turbidity level stabilizes at a concentration greater than 50 NTUs. In addition, pH, temperature, and conductivity measurements will also be obtained during development and recorded in a field logbook.

Development water will be monitored for organic vapors with a photoionization detector (PID). The development water will be containerized in drums and staged on-site for characterization prior to disposal.

2.3.3 Air Monitoring and Testing

Headspace analysis, using a PID, will be performed during drilling activities. Sampling protocols and frequency are discussed in Section 4 of this Work Plan.

Air monitoring for VOCs by PID and dust monitoring (if noticeable dust is present) will be conducted during intrusive field activities (i.e., trenching and drilling) as detailed in the APP.

Extracted vapor sampling will also be conducted to estimate the efficiency of the extraction process during the operation of the system. The vapor sampling protocols will be detailed in the O&M Manual (to be submitted at a later date.)

2.3.4 Wastewater Sampling

All decontamination water generated during the remedial activities will be containerized in 55-gallon drums. Development water generated during well development will be containerized in 55-gallon drums. Condensate generated by the SVE system will be transferred from the 1,000-gallon moisture separator to 55-gallon drums. Samples of the decontamination and well development water and condensate will be collected and analyzed prior to disposal.

2.3.5 Soil Sampling

Soil sampling for lithologic purposes will be conducted during well installation to assist with the horizontal and vertical placement of the wells. In addition, limited soil sampling for VOCs, PCBS, chromium, and cadmium will be conducted during well installation to provide information on soil contaminants in the work area. Sampling protocols and frequency are discussed in Section 5 of this Work Plan.

2.3.6 Laboratory Chemical Analysis

Samples collected during the installation and operation will be analyzed by a laboratory approved by the Navy and the State of New York.

2.4 Task 4 - Physical Treatment – SVE

This task encompasses all portions of vapor handling including extraction wells and associated piping.

2.4.1 Soil Vapor Extraction Well Installation

Twelve (12) SVE wells will be used to collect VOCs contained in the soil and convey them to the treatment system. The twelve SVE wells include six (6) intermediate wells and six (6) deep wells. The six deep wells may also be used as monitoring wells (MWs) for groundwater sample collection.

One cluster of two SVE wells was previously installed and requires a stick-up well completion.

The five (5) intermediate SVE wells will be installed to a stratigraphy controlled depth of approximately 35 feet below ground surface (bgs). The five (5) deep SVE/MWs will be installed to a stratigraphy controlled depth of approximately 60 ft bgs, and at least 10 ft into the groundwater. The wells will be installed by a licensed New York State driller using 4.25- to 6.25-inch hollow stem augers. Drill cuttings will be containerized in drums and staged on-site for proper disposal.

Split-spoon samples will be collected every five feet from the ground surface to the completion depth. A final split spoon will be collected from the proposed screen interval at each well location. This interval represents the approximate vadose zone screen location for the SVE wells. The split-spoon samples will be evaluated in order to identify the possible presence of significant clay lenses, which may impact the effectiveness of the SVE system. The presence of a clay lens could inhibit the capture of vapors from the screened interval. If clay is detected within the screened interval of the SVE well, the screen length or location will be modified accordingly depending on the conditions encountered.

A soil sample will also be collected from 4 soil borings, at a depth of 0 to 4 feet bgs for chemical analysis of VOCs, PCBs, chromium and cadmium in order to establish worker health and safety protocols during soil handling activities (i.e., trenching). A composite sample of the entire 4 foot interval will be collected for PCBs, chromium and cadmium analysis. A distinct grab sample for VOC analysis will be collected from the 6 inch interval that exhibits staining or high levels of VOCs as measured by a PID (if no contamination is obvious, the sample will be collected from the 1 to 1.5 foot interval).

The soil samples will be visually classified according to the USCS. Detailed lithologic (geologic) logs for each well will be recorded in the field logbook and on a standardized Boring Log form. All field observations, including blow counts, PID readings, evidence of contamination, and description of moisture content, will be recorded in the field logbook and on the Boring Log form.

Five (5) 2-inch outer diameter (OD) intermediate SVE wells and five (5) 2-inch OD deep SVE wells will be installed in approximate 4-inch boreholes. The intermediate SVE wells will be installed to approximately 35-feet bgs with a 20 slot Polyvinyl Chloride (PVC) screen interval at 25-35 feet bgs. The deep SVE wells will be installed to approximately 60-feet bgs with a 20 slot PVC screen interval at 40-60 feet bgs. Schedule 40 PVC screens and risers will be installed to approximately 4 ft bgs. Both types of wells will be filter packed with No. 2 sand or equivalent and the sand will be installed from the bottom of the well to one-foot above the well screen. A two-foot thick bentonite seal will be placed above the sand. The remainder of the borehole will be filled with a cement/bentonite grout to approximately 4 ft bgs. A 2" x 2" PVC T-fitting with a removable cap will be installed onto to the well riser at 4 feet bgs. A 2-foot section of schedule 40 2-inch PVC will be glued, parallel to the ground, facing in a southern direction or according to directive provided by TtEC personnel. This 2-foot section of PVC shall be capped but not glued. This connection will be used to connect the wells to the SVE system. From the tee fitting, a schedule 40 2-inch PVC riser will be installed vertically, to approximately 2 ft above grade. The wellheads will be completed using a leak tight threaded well cap and lockable stick-up steel casing. The remaining annulus will be filled from 4 feet bgs to grade with a cement grout.

Each well will also have a sample port to allow collection of soil gas samples, and for measurements of vacuum pressure. This port will be located approximately two feet from valves and fittings that could interfere with velocity measurements.

2.4.2 Soil Vapor Pressure Monitors

SVPMs will be installed to monitor the system vacuum pressure on soil vapor and to confirm the capture of the contaminated soil vapors in the area east of Site 1.

One intermediate and one deep SVPM will be installed (SVPM-2004I and 2004D). The intermediate SVPM will be installed to approximately 25-feet bgs with a 1-inch, 20 slot PVC screen interval at 23-25 feet bgs. The deep SVPM will be installed to approximately 42-feet bgs with a 1-inch, 20 slot PVC screen interval at 40-42 feet bgs. Filter pack for both types of wells will be No. 2 sand or equivalent and will be installed from the bottom of the well to three-foot bgs. A three-foot thick cement grout seal will be placed above the sand to grade. Schedule 40 PVC screens and risers will be utilized. The wellheads will be completed using a flush mount protective steel casing. The new monitors will be installed using either a hollowing stem auger or direct push methodology. Each SVPM will include a sealed cap, valve, and threaded sample port to measure vacuum pressure.

Macro-core (or split spoon samples) will be collected from the proposed screen interval at each SVPM location. This interval represents the approximate vadose zone screen location for the SVPMs. The macro-core samples will be evaluated in order to identify the possible presence of significant clay lenses, which may impact the effectiveness of the SVPM.

SVPM-2002S, I, and D, -2003S and I, and -2007I and D were installed in January 2009 and temporarily abandoned in February 2009 by filling each with No. 2 Sand, then capping and covering the SVPM with soil. The seven existing 1-inch SVPM points are to be located, and the sand removed by appropriate means. A flush mount protective steel casing will then be installed at ground surface. The sand that is removed from the existing SVPMs must be containerized due to the potential contact with contamination. It is not anticipated that the SVPMs encounter groundwater.

2.4.3 Well Development

The SVE wells will be developed in accordance with the procedure described in Section 2.3.1.

2.4.4 SVE Piping

The SVE system will be piped as shown on TtEC's Design Drawings. SVE piping from the SVE wells to the Flow Monitor Station will be underground. All the soil vapor extraction lines will collect into a single header within the Flow Monitor Station, and a single pipe line will be piped underground to the Treatment Building. Piping will be buried below the frost line to the greatest extent possible to prevent freezing and protect from aboveground loads. Below grade piping will be placed in well graded sand. Each transfer line is to have a minimum slope as shown on contract drawings, where practicable.

The single pipe will be piped above ground prior to entering the Treatment Building by a sealed wall penetration. This short section of pipe will be insulated.

All SVE system piping will be PVC, schedule 40, unless otherwise noted on the drawings. All PVC pipe will be male-female socket connections and shall be cemented. Piping from the SVE wells to the Flow Monitor Station is approximately 3,600 linear feet (lf) of schedule 40 PVC pipe and fittings. Piping from the Flow Monitor Station to the Treatment Building is approximately 1,400 lf of schedule 40 PVC pipe and fittings. The actual layout details will be as shown on the drawings.

2.4.5 Mobilization/Setup of Treatment Equipment

This task includes all elements to construct the treatment system.

2.4.6 Equipment Installation

All mechanical equipment to be installed will be new. The equipment for the system will include: 1) 1,000-gallon Moisture Separator with level indicator; 2) two SVE Blowers with ancillary instrumentation and equipment; 3) 5,000 lb. activated carbon unit and stack; 4) power panel, local control panel and motor starters for system control and shutdown scenarios, 5) and miscellaneous instruments, valves and ancillary devices. Installation will be performed by subcontractors, under the supervision of TtEC personnel with support provided by manufacturer's representative(s), as required.

Interconnecting piping, valve and sample ports will be installed per drawings. Electrical wiring, conduits, etc. will be installed by a local electrician familiar with both local and Navy site codes.

2.4.7 Startup

Upon completion of equipment installation and hookup, the system will be started up in accordance with manufacturer's instructions and the TtEC O&M Manual. If appropriate, the O&M Manual will be revised to reflect operating data obtained during the startup.

The following is a preliminary list of measures to be executed prior to system start-up:

- Hydrostatic testing of the piping system
- Motor rotation and alignment
- Electrical circuits check
- Calibration adjustments
- System shutdown scenarios simulations
- "Hot" start-up procedure

Once the prestart-up tests have been completed, "hot" start-up of the extraction system will be conducted in accordance with O&M procedures. Both pressure and gas velocity measurements will be made at each well system port to assure design flows and to balance the system. Off-gas readings will be made before and after the carbon unit to monitor VOC capture and breakthrough.

System start-up and prove-out will consist of the following:

- Air flow rates and pressure checks
- System shutdown scenarios simulations
- Off-gas sampling

The overall system will be monitored during this period to ensure proper operation.

2.5 Task 5 – Operation and Maintenance

The O&M of the remediation system will be performed for a period of at least six months by TtEC personnel.

TtEC personnel will visit the site weekly during system operation. Operating system data such as extraction flow rate, extraction vacuums, and individual well vacuums will be recorded.

System operating data will be entered into a site-specific database to track remediation system effectiveness. This critical step will enable TtEC to optimize remediation system effectiveness. The database will track VOC removals by the system, VOC concentrations in individual wells, and exerted vacuums at individual wells.

TtEC personnel will perform all routine periodic maintenance items, such as lubrication of equipment, belt wear, air filter inspections/replacements, vibration checks, instrument checks, PID readings, condensate draining and scheduling and assisting with carbon change-outs. Both weekly and monthly inspection logs will be completed, as well as, any non-routine incidents such as telemetry system call-ins.

Engineering support is provided to; 1) interpret system data; 2) monitor system performance; 3) recommend system adjustments; 4) recommend pulsing frequency and schedule; and 5) provide monthly reporting to the Navy.

2.6 Task 6 – Disposal

Transportation and disposal (T&D) of waste material will be performed as described in Section 5 of this Work Plan. Five waste streams were identified which will require off-site T&D. These are: 1) Drill cuttings; 2) Spent personal protective equipment (PPE); 3) Condensate from moisture separators; 4) Spent activated carbon; and 5) Decontamination water and well development water from drilling.

It is anticipated that soils excavated during trenching activities will not be contaminated and will be used as backfill in the trenches.

2.7 Task 7 – Demobilization

Upon completion of construction activities, construction equipment and personnel will be demobilized. Upon completion of O&M, all site equipment and utilities will remain for operation of the SVE system.

No equipment other than sampling tools (including drilling tools) will require final decontamination. Final PPE, decontamination pad liners, and other potentially contaminated supplies will be labeled and properly disposed. Clean drums used for the collection of decontamination water will be returned to the supplier for recycling. Gross decontamination of construction equipment will be necessary. Construction equipment will be returned to the respective supplier when it is no longer needed.

2.8 Task 8 – Annual Operating Reports

At the end of each calendar year, an Annual Report shall be developed summarizing the actions taken during that year and the results of operation as well as any conclusions that may be able to be drawn from the results and any recommendations for future O&M optimization. A draft version of the Annual Report shall be submitted for regulatory review and a Final version developed based on incorporation of regulatory comments. Submission of the draft and final versions will be by the contractor and will be in accordance with the distribution list attached to a forwarding letter that will be prepared by the Navy Remedial Project Manager (RPM). A preliminary copy of the draft version is to be forwarded to the Navy RPM for review prior to full distribution.

2.9 Task 9 – Meetings

The Project Manager from TtEC will accompany the Navy to two (2) meetings throughout the SVE system's 6-month operational period to discuss the system's performance. These meetings will either be

technical review meetings with the Bethpage regulatory community or Restoration Advisory Board (RAB) meetings with local community groups. It is anticipated that a presentation will be required at each of these meetings so meeting preparation time will also be included in this task as well as actual meeting attendance time.

3.0 MANAGEMENT APPROACH

This section presents key aspects of TtEC's project organization and management including key personnel and their responsibilities, project management methods and project control methods.

3.1 Organization

Mr. Stavros Patselas is the responsible Project Manager (PM). Table 3-1 describes the other staff resources assigned to this project, along with responsibilities and primary reporting chain of command.

Table 3-1 Personnel Responsibilities and Authorities

Position	Responsibilities	Reports to
Project Manager (PM)	• CTO negotiation assistance • Commit project resources • Obtain staffing • Approval - Work Plan, budgets, schedules	• Program Manager
Remedial Engineer	• Provide technical support • Facilitate technical adjustments • Evaluate technical progress	• PM
Project Superintendent/ Site Safety and Health Officer (SSHO)	• Coordinate daily activities • Communicate with ROICC • Schedule personnel, equipment • Supervise field labor and subcontractors • Implement APP • Ensure site staff have adequate medical training • Issue "Stop-Work"	• PM/Project Environmental and Safety Manager
Field Engineer/ Site QC Manager (SQCM)	• Assist Project Superintendent with system construction • Implement SQCP • O&M oversight	• PM/ Program QC Manager (PQCM)
Project Control Engineer	• Track budgets, schedule	• PM
Field Geologist	• Driller supervision • Log soil cuttings • Sampling and field analysis	• Project Superintendent
Regulatory Specialist	• Waste characterization and waste profile preparation • Prepare manifests and bills of lading • Waste tracking	• PM
Field Technician	• Perform O&M duties	• Field Engineer

Based on the requirements of the CTO, TtEC will either hire locally available field labor or subcontract portions of the project. Portions of the project that may be subcontracted are summarized in Table 3-2.

The subcontractors will be finalized after completion of the procurement process. When possible, Small Business (SB)/Small Disadvantage Business (SDB) subcontractors will be used for these services.

Table 3-2 Subcontract Services

Service	
• Mechanical Installation	• T&D of soil, PPE and well development water
• Electrical Installation	• Carbon Supply and Regeneration
• Well installation	• T&D of VOC condensate
• Equipment Rental	• Surveyor
• Vapor analysis	• Geophysical Utility Locating
• Soil and water analysis	• Field and Construction Supplies

3.1.1 Key Personnel

Project staff include the PM, Remedial Engineer, Project Superintendent/Site Safety and Health Officer (SSHO), Program Quality Control Manager (PQCM), Field Engineer/Site Quality Control Manager (SQCM), Field Geologist, Regulatory Specialist, and field labor.

PM – Mr. Stavros Patselas is the PM for the CTO. He is responsible for the overall direction and management of the project including technical quality, schedule, cost control, reports/submittals, and Navy contact.

Reporting to Mr. Patselas will be the technical staff required to complete the project. This includes the engineers and scientists shown on the organization chart. The Project Superintendent/SSHO and the field staff will report to the PM while assigned to the project. Also reporting to Mr. Patselas will be the support services that control cost and schedule and procure material, equipment, and subcontracts.

Remedial Engineer – Mr. Geoffrey King is the remedial engineer for SVE system project. He will provide technical support, evaluate technical progress, and report to the PM.

Project Superintendent - The Project Superintendent, Mr. Ed Urbanek, is responsible for all construction activities and will coordinate field activities with technical staff. He will interact with NAVFAC and NWIRP construction personnel and will oversee subcontractor activities. The Project Superintendant is cross-trained as a Safety and Health Officer to provide assistance to the SSHO in all Safety and Health matters. He has "stop work" authority for all work and safety-related issues.

Site Safety and Health Officer – The Project SSHO, Mr. Joseph Gray, is responsible for implementation of the APP. As the cross-trained SSHO, he enforces the APP, air monitoring, sampling, training and coordination of medical surveillance for all site personnel. He has "stop work" authority for all safety-related issues. The SSHO will receive project guidance from the PM while maintaining an independent reporting relationship to the contract Certified Industrial Hygienist (CIH). The Project SSHO may designate other cross-trained staff for safety and health duties, such as conducting the Daily Health and Safety Brief.

PQCM – Mr. Jonathan Dziekan is the PQCM. He is responsible for approval and oversight of quality control activities and procedures used on the project. He will provide direction to the SQCM.

Field Engineer/SQCM – Mr. Ben Ketterer is the Field Engineer/SQCM for the CTO. He will monitor activities to ensure conformance with approved work plans, design documents, corporate procedures, and Program policies. He will oversee the operation and maintenance of the system and is responsible for monthly data reports.

As the SQCM, he will inspect the activities of field labor, subcontractors, and vendors and will monitor the performance of off-site laboratories, prepare construction submittals and maintain the submittal register. He has "stop work" authority. In this role, he reports directly to the PQCM.

Field Geologist – Ms. Christine Joblon is the Field Geologist and will oversee well installation. She will be responsible for final location of the wells, log soil cuttings and supervise well development.

3.1.2 Communications

Weekly Meetings - Weekly telephone conferences or site meetings between the PM and NAVFAC personnel will address short-term issues such as site personnel, activities schedule, and other issues relevant to the status and forecast of site activities. When necessary, key team members and/or subcontractors will participate in these meetings. Assignments will be identified and documented in these meetings.

Monthly Progress Meetings - The first weekly meeting after issuance of a monthly progress report will also be used to discuss long range issues. Attending the meeting will be NAVFAC and TtEC personnel. Action plans and assignments will be documented.

Verbal Updates - The occurrence of new developments in the project, particularly those that may result in changes to the contract, will be verbally communicated to the Navy RPM as information is available. This will allow quicker and better field decision-making consistent with project objectives.

Emergency Notification - In the event of a site emergency, the Navy RPM and the Navy's Facility Manager will be notified immediately after notification of any emergency response teams or organizations.

3.1.3 Cost and Schedule Control

The contract procedures will be followed to prepare, monitor and control cost and schedule. On-site support will be provided to maintain the cost reports and schedule during construction.

A target schedule will be created from the original detailed project schedule. Actual project progress will be measured against the target schedule so that variances to the original plan can be easily identified and evaluated. The detailed schedule will be used by the Project Superintendent to plan upcoming manpower and resource requirements on the project. The Project Superintendent will also use the schedule to coordinate material deliveries with construction activities.

Contract changes are those increases or decreases in the project that require an increase or decrease in resources. If changes are identified, a Change Request Form (CRF) will be prepared and submitted for Navy approval.

4.0 SYSTEM DETAILS

This section gives details on the system design and specifications.

4.1 Engineering Design Documents

Draft Site maps and Engineering Drawings are listed below and provided in Appendix A of this Work Plan:

T-1	Title Sheet
C-1	Existing Conditions
C-2	Site Plan (1 of 2)
C-3	Site Plan (2 of 2)
C-4	Miscellaneous Sections and Details
C-5	Well Sections and Details
P-1	Piping and Instrumentation Legend
P-2	Piping and Instrumentation Diagram
P-3	Process Equipment Layout and Details
M-1	Flow Monitoring Station Piping Arrangement
M-2	Treatment Building General Piping Layout
M-3	Heating and Ventilation Layout and Details
E-1	Electrical Legend and General Notes
E-2	Electrical Single Line and Panel Diagrams
E-3	Electrical Power and Instrument Plan
E-4	Lighting Plan
E-5	Fire Alarm Plan

Draft Design Criteria Document and Technical Specifications are provided in Appendix B of this Work Plan.

4.2 Permanent Installations

4.2.1 Treatment Building Description

The remediation system will be housed within an existing unoccupied building number 03-35 Treatment Building. It is assumed that chlorinated solvents are the contaminants of concern at this site. Explosive vapors due to the presence of petroleum products or other contaminants are not expected. Therefore, the Treatment Building will be classified as Non-Hazardous for electrical installation.

4.2.1.1 Heating and Ventilation

The Treatment Building will be equipped with heating and ventilation systems. The heating system will consist of two 5 kilowatt horizontal blower unit heaters with electric elements. The ventilation system will consist of two wall mounted ventilator fans and two wall mounted 3 foot by 3 foot louvers. The heaters will be located on the north side of the building. The ventilator fans will be located on the south side of the building and the louver will be located on the north side. The ventilation system has been designed to provide a minimum of four air exchanges per hour.

4.2.1.2 Treatment Building Lighting

The Treatment Building is currently equipped with interior lighting; however, additional lighting shall be installed to supplement current lighting as shown on the drawings. The proposed additional lighting will include the installation of nine (9) ceiling mounted two-32 watt fluorescent lamps which will be connected to the existing lighting panel and switches. The Treatment Building is currently equipment with exterior lighting, and will not be modified or supplemented.

4.2.1.3 Electrical Service

The Treatment Building is currently equipped with 480 volt (V) service, and stepdown transformer that provides a lighting panel with 240/120V service within the building. The 240/120V panel supplies the building lighting, as well as numerous 120V duplex receptacles. The existing lighting panel will also provide power for the system local control panel, instruments, exit lights above each door, building ventilator fans and 6 (six) 120V, GFCI protected, duplex receptacles. A 480V panel will be installed on the east side of the building that will provide power to the system power panel and motor starters, the 5 kilowatt unit heaters and a 3-pole 480V receptacle to be installed on the west side of the building. The details and locations of electrical equipment and ancillary devices are shown on the drawings.

4.2.1.4 Fire Detection System

Fire detection devices will be installed as shown on drawings. Fire detection devices include heat detectors, smoke detectors, and fire alarm/strobes. The fire detection devices will alarm to an existing autodailer in an adjacent building. A 10 pound, 4A:40B:C fire extinguisher will be located at each entrance of the Remediation Building.

4.3 Remedial Design Approach

The design approach for this project is the preparation of a construction level design providing enough detail to facilitate direct construction of the system in conjunction with the support of the design engineers. This approach includes the development of basic drawings and performance type technical specifications for the treatment processes and support systems.

Remedial Design Assumptions

1. The Design Analysis Report for Soil Vapor Extraction Containment System (TtNUS, April 2009) provides a detailed background on the Site history, remedial objectives, pilot-scale details, and a preliminary remedial system design for this SVE Containment System based on the pilot-scale testing.
2. No new source of contamination will be added to increase the present levels of contamination in the aquifer or in the site soils.
3. The system will operate 24 hours per day, 7 days per week for four years with exception to maintenance and adjustment periods After the startup and prove-out periods, it will operate with minimal operator interface, except for routine maintenance, walk through inspections and plant shutdowns.
4. The process treatment train for this design will generate two effluent streams, an air stream and low volume water stream resulting from entrained water present in the gas stream. The treatment system equipment will be designed to produce an air effluent that will meet criteria in the New York State Air Guide-1, 1991 (6 NYCRR Parts 200 though 257). The condensate will be tested and disposed off-site.

4.3.1 Soil Vapor Extraction System Design

The SVE Containment System will consist of the following elements:

- Twelve SVE Wells intermediate and 6 deep;
- Associated piping, valving and instrumentation; and
- Twelve soil vapor monitoring wells.

The SVE Containment System will nominally operate at 600 cubic feet per minute (CFM), and maximum at 1,000 CFM. Each intermediate depth SVE WELL shall require 4 inches of water column (i.w.), and each deep SVE WELL shall require up to 20 i.w. The SVE Wells will be located along the eastern boundary of the Site. Each well will be piped below ground to the Flow Monitor Station, where flow, vacuum and gas quality can be monitored. The Flow Monitor Station will be a small shed located at the southeast corner of the Site. All the soil vapor extraction lines will collect into a single header within the Flow Monitor Station, and a single pipe line will be piped underground to the Treatment Building, existing unoccupied building number 03-35. The process equipment, including the moisture separator, soil vapor extraction blowers, VGAC vessel and associated piping, valving and instrumentation will be in the existing unoccupied building number 03-35 (Treatment Building).

4.3.2 Vapor Phase Treatment System

The Vapor Phase Treatment System will be located in the Treatment Building and consist of the following elements:

- Moisture separator;
- Two Soil Vapor Extraction Blowers;
- Interim Vapor-Phase Granular Activated Carbon (VGAC) off gas treatment; and
- Associated piping, valving and instrumentation.

All treatment equipment to be installed will be new.

The Moisture Separator will be installed in the Treatment Building and will be 1,000 gallons in capacity, and will include a visual sight glass. The Moisture Separator will remove and collect any drawn water or condensate, prior to entering the blowers. Collected condensate and water will be removed by portable 120V pump into 55-gallon drums on a periodic basis, tested and disposed of off-site.

Two vapor extraction blowers will be installed in the Treatment Building for the SVE Containment System. Each will be capable of operating at 600 CFM and providing enough suction for all wells and system components. The blowers will be piped in parallel. One blower will be in spare position during periods of nominal running conditions. When maximum conditions are required, both blowers will run simultaneously.

A 5,000-pound VGAC vessel will be installed in the Treatment Building to remove VOCs prior to atmospheric discharge of the vapor stream.

Details associated with the vapor phase treatment system are in the drawings. Vendor catalog sheets will be included as project submittals at a later date.

4.3.3 Operation and Controls

The SVE system is intended to run continuously for four years, except for routine maintenance, walk through inspections and plant shutdowns. The SVE system will have a control panel for local operation. The local control panel will comprise of mechanical interlocks and relays and no Programmable Logic Controllers (PLCs) will be used.

SVE rates for each well will be controlled by local manual valves. A portable velocity meter will be used to measure air flow while adjusting the control valves. Extraction wells with higher contaminant concentrations (based on PID readings) will be operated at a higher flow rate. Extraction well flow rates and injection air flow rates will be pulsed periodically (i.e. cycled on/off or adjusted high/low) to prevent stagnant conditions from developing between adjacent extraction/injection wells.

Each blower will have manual start and stop buttons, and reset switches for interlock shutdown scenarios. The treatment system will have the following interlock shutdown scenarios:

- Low Vacuum Switch in piping before the soil vapor extraction blowers;
- High Level Switch for collected condensate in the Moisture Separator;
- Temperature High Switch in the piping after the soil vapor extraction blowers; and
- High Pressure Switch in piping after the soil vapor extraction blowers.

In shutdown scenarios, the local control panel will alarm the existing autodialer in an adjacent building.

The extraction wells may periodically be cycled to promote a more efficient extraction and overall remediation. This technique is typically employed to prevent extraction "dead zones", plugging and short circuiting in the site soils. As the remediation progresses, the use of this application will be further evaluated based on field conditions. The general criteria for its use includes long term flow rate fluctuations, pressure variances, mass loading rates and moisture build-up.

4.4 Treatment System

The Design Analysis Report for Soil Vapor Extraction Containment System (TtNUS, April 2009) provides a detailed background on the Site history, remedial objectives, pilot-scale details, and a preliminary remedial system design for this SVE Containment System based on the pilot-scale testing.

Vapor phase carbon adsorption treatment systems consist of containerized beds of adsorbent typically granular activated carbon (GAC). Large and highly permeable void spaces between relatively large GAC particles or pellets allow the contaminated air to flow through the bed, contacting the particles and allowing adsorption to take place. The treated air leaves the bed with reduced concentrations of adsorbate until the carbon has reached capacity (i.e. has become saturated). Once the carbon has reached capacity, no further adsorption takes place.

Saturated vapor phase carbon can either be disposed of or sent off-site for regeneration. For this application, the carbon system will be regenerated off-site. The entire vapor phase carbon module will be removed from service, placed on a truck and replaced with a new unit. The units will be United States Department of Transportation (USDOT) approved and will be regenerated at an approved facility.

Vapor Phase carbon will be regenerated in accordance with industry standards such as ASTM D3467 - Carbon Tetrachloride Test. The reactivated carbon will have a Carbon Tetrachloride Number (CSV) of 70 (typical).

4.4.1 Material Specifications

The purpose of this section is to identify the material specification for the major ancillary equipment such as piping and wiring. In all cases, the materials specified will conform with the applicable standards and Navy standards as required.

All PVC piping will conform to Type 1, Grade 1 in accordance with ASTM D1784/5, ASTM D2466 and ASTM 12454-B.

All carbon steel piping will conform to ASTM A53. All carbon steel piping to be located outdoors will have a protective coating to guard against corrosion.

Copper pipe for instrumentation or other service will be Type L hard drawn conforming to ASTM B88, ASME B16.18 and ASME B16.22 with grade 95TA welded joints. Stainless steel tubing for instrumentation connection (as necessary) will be Type 316 3/8 inch OD, tube wall thickness of 0.035 inches conforming to ASTM A213.

Ball valves ¼ inch to 4 inch used for the SVE system will be Type 1 Grade A PVC construction with true union connections and socket connections. Seals will be Viton with either Viton or Teflon seats. Valves will be full port design for low pressure loss and have a fine pitched threaded seal retainer for precise seat adjustments. All valve seats will be reversible and self lubricating for bubble tight seal. Valves will be rated for 225 psi.

Butterfly Valves used for the SVE system will be Type 1 Grade A PVC single piece wafer type body. They will be design rated at 150 psi bubble tight shut off. Valve bodies will be molded of PVC with discs molded of Polypropylene. The shaft will be 416 stainless steel and blow-off proof. Liners and o-rings will be Viton.

Electrical conduit will be rigid steel conduit, low carbon, hot dipped galvanized both inside and outside, with threaded joints. All conduit will be Underwater Laboratories (UL) approved. Flexible galvanized conduit will be steel core with continuous copper ground in the convolutions covered with extruded PVC. Connectors will be nylon-insulated screw-in ground core type connectors constructed of malleable iron.

Wire installed in conduit for services 600 volt and below, will be 600 volt, stranded copper, single conductor, heat and moisture resistant thermoplastic insulation 70 (C type THHN/THWN). Cables installed for services 600 volt and below will be 600 volt multi-conductor type 'TC' cable with stranded copper conductors, heat and moisture resistant thermoplastic insulation, 75 C type THNN/TWHN and an overall black PVC jacket. Power cable will have a grounding conductor which is either green insulated or re-identified with green tape. Minimal size for power wire will be No. 12 AWG, except that No. 14 AWG will be used for control. Instrument signal cable will be single pair No. 16, stranded copper, 3000V PVC insulation with overall aluminum mylar shield, UL listed as PLTC and include an overall PVC jacket.

5.0 SAMPLING AND ANALYSIS

A sampling and analysis program is described below to verify the effectiveness of the remedial activities conducted at Site 1. Tables 5-1 and 5-2 summarize the field sampling program and the waste characterization sampling program, respectively. Science Procedure SCI-3, Sample Preservation, Chain of Custody, Packaging & Shipping is contained in the TtEC Corporate Reference Library and the procedure will be followed to prepare samples for shipment to the laboratory. Appendix A presents the Standard Operating Procedures for field monitoring, sampling and decontamination procedures.

5.1 Air Monitoring and Testing

The following sections describe the air monitoring and testing activities which will be conducted during this remedial action. Appendix C presents SOP 31 for Air Monitoring [Real Time] and SOP 15 for Soil Sample Field Screening [Headspace Analysis].

5.1.1 Ambient Air Monitoring

The field team will monitor the ambient air quality as part of the health and safety surveillance program during the remedial activities. The following instruments will be used in accordance with the manufacturer's recommended calibration and maintenance procedures.

- PID (HNu with 10.6eV lamp or equivalent)
- Combustible Gas Indicator (CGI)

During air monitoring, the field team will generate data on the presence or absence of VOCs. If "hot spots" are found at the site, the health and safety protection levels/requirements and the technical approach to the affected tasks will be modified and implemented, depending on the action level. Details on health and safety monitoring to be performed for the various field tasks are defined in the APP.

5.1.2 Headspace Analysis during Drilling

Ten new SVE wells and two SVPMs will be installed as part of the SVE system installation. Details regarding the installation of these wells and monitors are provided in Sections 2.4.1 and 2.4.2. As the borings for these wells are drilled, borehole screening using a PID will be performed on a continuous basis. The readings collected will be used both for health and safety purposes and to identify "hot spots" which may exist on-site. All screening readings, and the approximate depth within each boring at which the reading was collected, will be recorded in the field logbook and on the Boring Log.

In addition, soil headspace measurement with a PID will be performed on split-spoon and macro-core samples collected from each borehole. The entire split-spoon or macro-core will be screened with the PID, then the six-inch interval exhibiting the highest PID readings will be collected for headspace analysis, as well as a limited number for laboratory analysis as discussed in Section 2.4.1. Each sample collected will be transferred directly from the split spoon or macro-core to a pre-cleaned, screw-top, air-tight glass jar using a clean stainless steel spoon. The sample jar will be identified, using permanent waterproof marker, with the location and depth of the sample and project number. After the sample jar has been prepared, the probe tip of the PID will be inserted into the container and a head-space reading will be collected. All field observations, including blow counts, head-space analysis results, evidence of contamination, and description of moisture content, will be recorded in the field logbook and on the Boring Log form.

Table 5-1 Summary of Field Sampling Program

				SAMPLES FOR LABORATORY ANALYSIS AND QA/QC					
MATRIX	**SAMPLE LOCATION**	**HEADSPACE ANALYSIS**	**WATER LEVEL MEASURE-MENTS**	**VOCs**	**CHROMIUM CADMIUM PCBs**	**DUPLICATE SAMPLES**	**TRIP BLANK VOCs only**	**FIELD BLANK**	**MS/ MSD**
Air/Vapor	Borings for SVE wells, soil vapor pressure monitors, and soil sampling	Continuous during drilling activities	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Extracted Soil Vapor at SVE blower Outlet	Weekly for the first quarter, then twice a month during operation	N/A	One sample per month during operation	N/A	N/A	N/A	N/A	N/A
	Carbon Units	Weekly for one month, then twice a month during operation	N/A	One post-carbon sample per month during operation	N/A	N/A	N/A	N/A	N/A
Soil	SVE System Area Soil Borings	Continuous during drilling activities	N/A	4 samples total from 4 soil borings	4 samples total from 4 soil borings	1 per drilling event	N/A	1 per drilling event	1 per drilling event

NOTES:

VOCs indicates Volatile Organic Compounds

Table 5-2 Summary of Waste Characterization Sampling Program

MATRIX	SAMPLE LOCATION	LABORATORY ANALYSIS													
		TCL VOCs	TCLP VOCs	TCL SVOCs	TCLP SVOCs	TCLP Pest/Herb	TAL Metals	TCLP Metals	TOX	PCBs	Paint Filter Test	Specific Gravity	Ignitability	Reactivity	Corrosivity
Purge/ Development/ Decontamination/ Water	55-gallon drums	1		1			1		1	1		1	1	1	1
Condensate	55-gallon drums		1		1			1	1	1			1	1	1
Drill Cutting Soil	55-gallon drums		1		1	1		1	1	1	1	1	1	1	1
Spent Activated Carbon	Carbon Vessel		1		1	1		1		1			1	1	1

NOTES:

TCL indicates Target Compound List

TCLP indicates Toxicity Characteristic Leaching Procedure

VOCs indicates Volatile Organic Compounds

SVOCs indicates Semi-Volatile Organic Compounds

5.1.3 Extracted Vapor Sampling

VOC concentrations in the extracted vapor will be measured with field instruments to estimate the efficiency of the extraction process. These field measurements will be collected weekly for the first quarter, and twice a month for the balance of the project. One extracted vapor sample will be collected from the outlet of the blower on a monthly basis during the system operation. The sample will be submitted to the laboratory for VOC analysis in accordance with TO15 methodology.

Other vapor monitoring requirements, such as real-time measurements of VOCs from the SVE wells or SVPMs, from the system ports, or for pressure monitoring will be detailed in the O&M Manual.

System operation and analytical data will be reviewed periodically and the sampling frequency may decrease based on the concentrations of contaminants in the extracted vapor samples. After one year of operation, if concentrations of contaminants in the extracted vapor are below the permit equivalency concentrations, carbon filtration of the vapor may not be necessary.

5.1.4 Carbon Unit Sampling

VOC concentrations will be measured before and after the carbon unit using field instruments. PID readings will be collected from sampling ports weekly for a minimum of one month. Based on operating data, and projected carbon change-out requirements, additional field measurements may be collected on a twice a month basis. One vapor sample will be collected from the effluent sample port on the carbon unit per month during the system operation. The sample will be submitted to the laboratory for VOC analysis using TO15 methodology.

System operation and analytical data will be reviewed periodically and the sampling frequency may decrease based on the concentrations of contaminants in the extracted vapor samples. After one year of operation, if concentrations of contaminants in the extracted vapor are below the permit equivalency concentrations, carbon filtration of the vapor may not be necessary.

5.2 Sampling Wastewater

The following describes the sampling activities which will be conducted for sampling and disposal of the condensate, decontamination and well development water.

5.2.1 Condensate Sampling

The condensate generated by the SVE system will be placed in 55-gallon USDOT-approved steel drums for on-site storage. A representative sample must be analyzed in order to classify the waste for disposal. After the treatment system's performance has been stabilized, a composite waste classification sample will be prepared by combining grab samples collected from the drums of condensate waste in storage. Per disposal facility requirements, the water sample will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, PCBs, total organic halogens (TOX), ignitability, corrosivity, and reactivity. If the waste generation process does not change substantially, the Treatment, Storage and Disposal Facility (TSDF) will only require one characterization analysis for approval to accept this waste stream. Approximately 500 gallons of condensate may be generated during of the six months of operation.

5.2.2 Decontamination and Well Development Water Sampling

The well development and decontamination water are anticipated to be classified as non-hazardous. Both the development and decontamination water will be containerized in 55-gallon drums for on-site storage and off-site disposal. Depending on the volume of waste water generated, at least one representative sample will be analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, Target Analyte List (TAL) Metals, PCBs, TOX, specific gravity, ignitability, reactivity, and corrosivity.

5.2.3 Activated Carbon Sampling

Prior to off-site disposal, it will be necessary to sample and analyze the spent activated carbon to characterize the carbon. A grab sample will be collected from the carbon vessel and will be analyzed for TCLP VOCs, TCLP SVOCs, TCLP Pesticides/Herbicides, TCLP Metals, PCBs, ignitability, reactivity, and corrosivity. Only one sample will be required to characterize the carbon and fulfill the carbon regeneration facility's pre-acceptance requirements.

5.3 Sampling Soil

5.3.1 Soil Borings

Four soil samples will be collected during the SVE well installation to establish worker health and safety protocols during soil handling operations. A soil sample will be collected from one soil boring in each SVE cluster (four soil samples total), excluding SVE-106. Based on drawings in the Design Analysis Report, SVE-105, SVE-104, SVE-103, and SVE-102 appear to be closest to the area of known PCB contamination. The soil samples will be collected from a depth of 0 to 4 feet bgs for chemical analysis of VOCs, PCBs, chromium and cadmium. A distinct grab sample for VOC analysis will be collected from the 6 inch interval that may exhibit staining and/or high levels of VOCs as measured by a PID (if no contamination is obvious, the sample will be collected from the 1 to 1.5 foot interval). A composite sample of the entire 4 foot interval will be collected for PCB, chromium and cadmium analysis.

A macrocore sample will be collected from the screen interval depth for the two SVPMs for logging and visual observation, no chemical analysis will be required.

Appendix C presents SOP 13 for Subsurface Soil Boring Sampling [by Split Spoon/Macrocore].

5.3.2 Waste Characterization Soil Sampling

Waste characterization soil sampling will be conducted upon completion of the drilling activities. It is anticipated that the drill cuttings we be classified as a non-hazardous waste. One composite soil sample from the soil stored in drums (or rolloffs, if necessary) will be prepared and submitted for analysis. Each composite sample will be analyzed for TCLP SVOCs, TCLP Pesticides/Herbicides, TCLP Metals, PCBs, TOX, ignitability, corrosivity, reactivity, and the paint filter test for free liquids. A distinct grab sample will be collected for TCLP VOC analysis. Samples may be collected and analyzed for additional parameters if required by the disposal facility.

Soil excavated during trenching activities is anticipated to be used as backfill. The four soil samples collected during well drilling will be used to characterize the soil in the trenching area. The wells are to be installed along the proposed trench line and will encounter the same soils.

5.3.3 Waste Classification Analysis – Land Disposal Restrictions

If analyses determine that a waste requiring land disposal is hazardous under the Resource Conservation and Recovery Act (RCRA), then it may be necessary to resample the waste for additional constituents. It may then be necessary to perform a total constituent analysis for the constituents regulated under the RCRA Land Disposal Restrictions for all waste codes which are found to be present in the waste.

5.4 Sample Identification

Each sample will be designated by an alphanumeric code that identifies the site, sample type, and a sequential sample number. The site code will be the initials for the site name, in this case: Naval Weapons Industrial Reserve Plant (NWIRP) – 1 (Site 1). Sample type will be identified by a two-letter code, while each sample number will be identified by the monitoring well number or geotechnical boring number.

Site/Location	Sample Type	Sample Number	Additional Number
BP1	AA	NN(N)(N)	NN

Symbol Definition:

A = Alphabetic
N = Numeric

Sample Type Options:

CD = Condensate
SB = Soil Boring
SV = Soil Vapor
EF = Carbon Air Effluent
IN = Carbon Air Influent
WC = Waste Carbon
WS = Waste Soil/Solids
WW = Waste Water (well development and decontamination water)

Sample Number Options (generally signifies location, sample number or month/day). The additional numbers could signify depth of a sample or sample event round, or year.

For example, a sample collected from the effluent port of the carbon vessel for air vapor analyses in August would be designated BP1-EF-0809. The EF signifies the type as well as the location of the sample. A soil sample collected from SVE well 102 boring at 0 to 4 feet would be identified as BP1-SB-102-04

Field QC samples will be designated as follows:

FB Field blank (followed by the date, DDMMYY)

FR Field duplicate (replicate) (followed by the sample number)

TB Trip Blank (followed by the date, DDMMYY)

A field blank collected on July 25, 2009 would be designated as BP1-FB-072509.

5.5 Laboratory Analysis

Analytical testing will be performed by a Navy and NYSDEC approved laboratory, following either New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol – Contract Library Program (ASP-CLP) and/or SW-846 protocols. Sample collection and analytical protocol information, including sample matrix, analytical parameter, sample container requirements, sample preservation, laboratory analysis, and holding times, is presented in Table 5-3.

5.6 Quality Assurance/Quality Control (QA/QC)

The procedures that will be used to ensure that data are of known quality and will be acceptable for project objectives are described in this section.

All sampling procedure and quality assurance/quality control (QA/QC) requirements will be consistent with those described in the *Navy Installation Restoration Chemical Data Quality Manual*, Naval Facilities Engineering Service Center, September, 1999.

5.6.1 Quality Control Sample Requirements

QA/QC samples are analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA/QC samples to be collected include field duplicates, equipment rinsate blanks, trip blanks, and temperature blanks. The descriptions below include sampling methodologies, sample frequencies, and the purpose of the QA/QC samples.

5.6.1.1 Field Duplicate Samples

Field duplicate (replicates) samples are two samples of the same matrix which are collected, to the extent possible, at the same time, from the same location, using the same techniques, and are analyzed at the same laboratory. Field duplicates will be handled, containerized, preserved, stored, and transported in the same manner. Field duplicates will be collected at a frequency of 5 percent per sample matrix or one per day, whichever is more frequent. The off-site laboratory will analyze samples as "blind" duplicates to provide a measure of sampling variability.

5.6.1.2 Equipment Rinsate Blanks

Equipment rinsates (field blanks) are samples consisting of a reagent (analyte-free) water collected daily during a sampling event from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of equipment rinsates is to determine whether the sampling equipment is causing cross-contamination of samples. Where equipment is decontaminated and reused, equipment rinsates will be collected at a frequency of 1 in 20 samples. Where equipment is disposable and not decontaminated, a single rinsate blank, serving to document that disposable equipment and sample containers are not contributing to sample contamination, will be collected for each analysis.

5.6.1.3 Trip Blanks

Trip blanks will be collected for VOC analyses. They consist of laboratory-grade distilled and/or deionized water and are used to detect contamination that may be introduced during sample handling and transport. These samples are prepared prior to field operations, brought out into the field, and returned to the laboratory unopened. A trip blank will be included with every sample shipment cooler sent to the laboratory for VOC analyses.

Table 5-3 Summary of Analytical Parameters, Test Methods, Containers, Preservation, and Holding Times for Samples

Matrix	Parameter	Proposed Test Method	Container	Preservation	Holding Time
Air/Vapor	VOCs	TO 15	(1) 6-liter SUMA Canister	N/A	N/A
Water (Decontamination Water, Well Development/ Purge Water and Condensate)	TCL VOCs	8260B	(2) 40 ml glass vials w/ Teflon-lined septum; No headspace	Ice to 4°C	7 Days
	TCL SVOCs	8270D	(2) 1-liter amber glass w/ Teflon-lined cap	Ice to 4°C	5 VSTR Days Extract 40 Days to Analyze
	TCLP VOCs	1311/8260B	(2) 40-ml glass vials w/ Teflon-lined septum; No headspace	HCL to pH <2 Ice to 4°C	7 Days to Extract 7 days to Analyze
	TCLP SVOCs	1311/8270D	(1) 1-liter glass w/ Teflon-lined cap	Ice to 4°C	5 Days VSTR to TCLP Extract 7 Days to preparatory Extract 40 Days to Analyze
	TAL Metals (includes Cr and Cd)	6010B	(1) 1-liter polyethylene	Nitric Acid to pH<2; Ice to 4°C	6 Months (Hg - 28 Days)
	TCLP Metals	1311/6010B/ 7471A	(1) 1-liter glass or polyethylene	Nitric Acid to pH<2; Ice to 4°C	180 Days (Hg - 28 Days)
	TOX	9020B	(2) 1-liter amber glass w/ Teflon-lined cap; no headspace	H2SO4 to pH<2; Ice to 4°C	28 Days
	PCBs	8082A	(1) 1-L amber glass w/Teflon-lined cap	Ice to 4°C	5 VTSR Days Extract 40 Days to Analyze
	Specific Gravity	ASTM 213E	(1) 100 ml glass or plastic	N/A	28 Days
	Ignitability	Method 1020A	(1) 1-liter amber glass w/ Teflon-lined cap	N/A	N/A
	Reactivity	SW-846 Chp. 7.3	(1) 1-liter amber glass w/ Teflon-lined cap; no headspace	Ice to 4°C	Analyze Immediately
	Corrosivity	Method 1110	(1) 500-ml polyethylene	N/A	N/A
Soil	PCBs	8082A	(1) 8 oz. glass w/Teflon-lined cap	Ice to 4°C	5 VTSR Days Extract 40 Days to Analyze

Table 5-3 Summary of Analytical Parameters, Test Methods, Containers, Preservation, and Holding Times for Samples

Matrix	Parameter	Proposed Test Method	Container	Preservation	Holding Time
	TCL VOCs	8260B	(2) 40 ml glass vials w/Teflon-lined septum	Ice to 4°C	7 Days
	TCLP VOCs	1311/8260B	(2) 40 ml glass vials w/Teflon-lined septum	Ice to 4°C	7 Days to Extract 7 Days to Analyze
	TCLP SVOCs	1311/8270D	(1) 8 oz. glass w/Teflon-lined cap	Ice to 4°C	5 Days VSTR to TCLP Extract 7 Days to preparatory Extract 40 Days to Analyze
	TCLP Pest/Herb	1311/8081B/ 8151A	(1) 8-oz. glass w/Teflon-lined cap	Ice to 4°C	5 Days VSTR to TCLP Extract 7 Days to preparatory Extract 40 Days to Analyze
	TAL Metals (includes Cr and Cd)	6010B	(1) 1-liter polyethylene	Nitric Acid to pH<2;	6 Months
	TCLP Metals	1311/6010B/7471A	(1) 8-oz. glass w/Teflon-lined cap	Ice to 4°C	180 Days(Hg - 28 Days)
	TOX	9020B	(1) 8-oz. glass w/Teflon-lined cap	Ice to 4°C	28 Days
	Ignitability	1020A	(1) 8-oz. glass w/Teflon-lined cap	N/A	N/A
	Reactivity	SW-846 Chapter 7.3	(1) 8-oz. glass w/Teflon-lined cap	Ice to 4°C	Analyze Immediately
	Corrosivity	1110	(1) 8-oz. glass w/Teflon-lined cap	N/A	N/A
	Paint Filter Test	9095	(1) 100 ml glass w/Teflon-lined cap	N/A	N/A
	Density	ASTM 213E	(1) 6-oz. glass w/Teflon lined cap	N/A	N/A

NOTES:
VOCs indicates Volatile Organic Compounds
TCLP indicates Toxicity Characteristic Leaching Procedure
TAL indicates Target Analyte List
TCL indicates Target Compound List
PCBs indicates polychlorinated biphenyls
Pest/Herb indicates pesticides/herbicides
SVOCs indicates Semi-Volatile Organic Compounds
TOX indicates total organic halogens

5.6.1.4 Temperature Blanks

A temperature blank consisting of potable water will be included in each cooler to document cooler temperature upon receipt at the laboratory.

5.6.2 Sample Shipping and Packaging

Chain-of-Custody (COC) forms, sample labels, custody seals, and other sample documents will be completed as specified in the above-referenced manual. All entries will be made in permanent ink. If errors are made when completing any of these forms, the error will be crossed out with a single line, initialed, and dated by the sampler.

Each sample will be labeled with the following information:

- Site Name
- Field identification or sample station number
- Date and time of sample collection
- Designation as a grab or composite sample
- Sample type (matrix)
- Signature of the sampler
- Sample preservation
- Analyses to be performed

Each environmental sample will be properly identified and sealed in a polyethylene (PE) bag. The bag will be placed in a fiberboard cooler, which has also been lined with a large PE bag. The samples will be packed with sufficient ice (sealed in PE bags) to cool the samples to 4° C. Non-combustible absorbent cushioning material will be added to minimize the possibility of container breakage. The large PE bag in the cooler will be sealed and the container closed. Custody seals and nylon strapping tape will be affixed to the cooler. All samples will be shipped within 24 hours of collection via a common carrier. All sample coolers and samples will be shipped in accordance with New York DOT requirement and regulations.

A COC record will be used to record the custody of samples, and will accompany the samples at all times. The following information will be included on the COC record:

- Project name
- Signature of samplers
- Sampling station number, date and time of collection, grab or composite designation
- Signatures of individuals involved in the transfer (i.e., relinquishing and accepting the samples)
- Sample matrix
- Analyses to be performed
- Sample preservation

5.6.3 Laboratory Data Reporting

As a minimum, laboratory reports presenting data will contain the following:

- Title of project
- Date report was prepared

- Name, address, and telephone number of laboratory
- Sample identification numbers
- Type of sample
- Date on which analysis was performed
- Any special observations, circumstances, or comments which may be relevant for interpretation of the data
- Signature of the laboratory manager
- All analyte concentrations determined for each parameter tested

Each parameter tested shall include: name of parameter, USEPA or New York State approved testing procedure references, detection limits, results of analysis, and the unit of the reported results. Quality control results including surrogate and internal standard recoveries, spike recoveries, and blank data shall be reported for each sample.

5.6.4 Records

5.6.4.1 Sampling and Monitoring Records

An on-site individual will maintain a site logbook that summarizes the daily sampling and monitoring activities. The logbook will be bound with numbered pages. The records will be dated and signed or otherwise authenticated on the day of entry. The logbook will document vital information, such as sample source, sampling methods, sample conditions, and field measurements. Any problems encountered and corrective actions taken will also be documented in the logbook.

5.6.4.2 Laboratory Records

In addition to the data set deliverables, the laboratory will maintain records that contain, at a minimum, the following information:

- Copies of relevant analyst notebook pages
- Copies of relevant instrument logs
- Raw instrument outputs (chromatograms, ion spectra, absorbance value, etc.)
- QC charts
- Documentation of corrective actions
- Chain-of-custody information
- Automated data processing system output and/or calculations
- Calibration data
- Blank, spike, and spike duplicate results

5.7 Equipment Decontamination Procedures

All non-disposable equipment involved in field sampling activities and drilling will be decontaminated prior to sampling, between each sample, and before removal from the site. Appendix C presents SOP 52 for Decontamination of Drilling Equipment and SOP 55 for Decontamination for Non-disposable Chemical Sampling Equipment. The general decontamination procedure for sampling equipment will include:

1. A liquinox detergent and potable water scrub;
2. Potable water rinse;
3. Distilled/deionized water rinse;

4. Rinse with approved solvent;
5. Distilled/deionized water rinse; and
6. Air dry.

Methanol will be used as the decontamination solvent for equipment used to collect organic samples. A solution of 9.9% nitric acid in water will be used as the decontamination solvent for equipment used to collect inorganic samples. Fluids generated by decontamination of non-disposable sampling equipment will be collected in 55-gallon USDOT-approved drums and sampled for characterization purposes. Appropriate disposal will be determined following receipt of the sampling results.

6.0 ENVIRONMENTAL PROTECTION

6.1 Applicable or Relevant and Appropriate Requirements (ARARs)

As a NYSDEC inactive hazardous waste site, actions at the site are conducted consistent with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Remedial actions are required to comply with, and upon completion attain, Applicable or Relevant and Appropriate Requirements (ARARs). A requirement that is relevant and appropriate must be complied with to the same degree as if it were applicable. In addition to ARARs, regulatory agency advisories, criteria, or guidance may be identified as requirements "to be considered" (TBCs).

Remedial actions conducted entirely on site need only comply with the substantive aspects of the ARARs/TBCs and not the administrative aspects such as permitting (specifically exempted under CERCLA Section 121(e)) or administrative reviews. Activities off site must comply with all necessary Federal, state, and local laws; regulations; and ordinances (e.g., transportation of remedial action wastes must comply with local, state, and Federal transportation standards, both substantive and administrative). A list of project-specific ARARs/TBCs is presented in Table 6-1.

Table 6-1 List of Applicable or Relevant and Appropriate Requirements (ARARs) and Requirements to be Considered (TBCs)

Requirement	Citation	Description
Federal		
USDOT Hazardous Materials Transportation Regulations	49 CFR 172	Defines USDOT Hazard Classes, Proper Shipping Names and labeling, marking and shipping paper requirements for transportation of USDOT Hazardous Materials.
	49 CFR 172.700-704	Requirements for USDOT training for hazardous materials employees
	49 CFR 173	Packaging requirements for USDOT regulated hazardous materials
Hazardous Waste Classification	40 CFR 261	Requirements for the identification of hazardous waste
Hazardous Waste Generation	40 CFR 262, 40 CFR 265 Subparts C, D	Requirements for generators of hazardous waste including storage limits, inspections, marking, record keeping and Contingency Plan
Transportation of Hazardous Waste	40 CFR 263	Requirements applicable to the off-site transportation of hazardous waste

Table 6-1 List of Applicable or Relevant and Appropriate Requirements (ARARs) and Requirements to be Considered (TBCs)

Requirement	Citation	Description
Storage of Hazardous Waste	40 CFR 265, Subpart I, CC	Requirements for the use and management of containers at generator location
Employee HW Training	40 CFR 265.16	Specifies training requirements for all generator employees involved in hazardous waste management activities.
RCRA Land Disposal Restrictions	40 CFR 268.7	Establishes Specifies Universal Treatment Standards for RCRA wastes, and Generator notification requirements
CERCLA Release Reporting	40 CFR 302	Reporting requirements for releases of CERCLA Hazardous Substances
EPCRA Release Reporting	40 CFR 372	Reporting Requirements for releases of Extremely Hazardous Substances
Clean Water Act Release Reporting	40 CFR 110 and 117	Reporting Requirements for releases of petroleum and hazardous substances into surface waters
New York		
Air Pollution Control Regulations	Air Guide 1, 6 NYCRR 200, 201,202,212, & 307	Specifies requirements and standards for new source controls for VOCs from point sources
Hazardous Waste Management	6 NYCRR 371 & 373	Specifies standards for identification and classification of hazardous wastes; generator management requirements and requirements for hazardous waste transportation
Hazardous Materials Transportation	17 NYCRR 507	NYSDOT regulations for transportation of NYSDOT hazardous materials
NY State Release Reporting	6 NYCRR 613.8, 6 NYCRR 595, & 6 NYCRR 597.2	Specifies NY State Requirements for petroleum and hazardous materials releases. Provides list of regulated hazardous materials

6.2 Environmental Conditions Report

During site mobilization, TtEC will survey the site with the contracting officer and take photographs of the site and prepare an Environmental Conditions Report documenting existing conditions and environmental features on-site.

6.3 Permitting Activities

As this is a remedial action under CERCLA, permits are not required for activities to be conducted on-site. Rather, we will comply with the substantive requirements of the project ARARs.

6.4 Hazardous and Solid Waste Management

Any hazardous wastes generated during construction or O&M phases will be managed in accordance with Section 5, Waste Management, of this Work Plan.

6.5 Air Pollution Control

The NYSDEC is authorized by the United States Environmental Protection Agency (USEPA) for enforcement of the Clean Air Act within NY State. The operation of the SVE system will result in VOC emissions, which will require the use of activated carbon to control VOC emissions. An air emissions permit application will be prepared and submitted to NYSDEC as a courtesy notification even though it is not required for site activities conducted under CERCLA. Fugitive dust emissions may result from project operations, and will be controlled using the best available technology. This may include keeping surfaces adequately wet to prevent fugitive dust emissions.

6.6 Endangered Species Act

The Endangered Species Act is not applicable to this project. No threatened or endangered species are known or suspected to exist in the area of the remedial action.

6.7 Protection of Trees and Shrub

TtEC will not remove, cut, deface, injure, or destroy any trees or shrubs without the Navy's approval, and will protect existing trees which are to remain. TtEC will not attach ropes or cables or chains to existing trees for anchorage without Navy approval. Trees and other landscape features damaged by equipment operations will be replaced with equivalent undamaged trees and landscape features.

6.8 Spill Prevention

TtEC will take all the necessary precautions to prevent petroleum, hazardous wastes, and other hazardous substances from entering the ground surface, groundwater, or surface waters. All petroleum fuel, and hazardous waste containers and tanks will be equipped with secondary containment in accordance with 40 CFR 112, and 40 CFR 264.

6.9 Excursion and Release Reporting

An Emergency Response Section and a Spill Control Plan are both contained in the APP. Information contained in these sections details how TtEC will address spill control, notification, prevention, and emergency response activities onsite.

6.10 Training and Certification Requirements for Project Personnel

As indicated in the APP, site personnel performing intrusive activities in any exclusion zones must have 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Worker Training. Site supervisory personnel will also have 24-hour on-the-job supervision, 8-hour refresher, 8-hour supervisor, and First Aid/Cardiopulmonary Resuscitation (CPR) with bloodborne pathogens training. Subcontractor personnel will be required to have training appropriate for the activities they will be required to perform.

Personnel performing hazardous waste management and/or hazardous material shipping activities will be trained in accordance with RCRA training requirements under 40 CFR 265.16, and USDOT Hazardous Material Training under 49 CFR 172 Subpart H, respectively.

6.11 Inspections by Regulatory Agencies

Site personnel will contact the TtEC Project Superintendent if contacted by a regulatory agency for a site inspection. The TtEC Project Superintendent will contact the TtEC PM, who will notify the Navy RPM, the TtEC Project Environmental and Safety Manager (PESM) and the TtEC Environmental Safety Quality (ESQ) Director. TtEC personnel will follow the TtEC procedure EHS 1-10 External Regulatory Inspections and Notifications revised April 4, 2000. In the event of an unannounced inspection, the TtEC Project Manager, Program Manager, PESM and ESQ Director will be contacted immediately.

6.12 Inspections by Third Parties

Any outside party requesting access to the site will be referred to the Project Superintendent, who will initiate the appropriate notification of the Project Manager and the Navy RPM. TtEC personnel will not grant site access or answer questions for unauthorized personnel.

6.13 CERCLA Release Reporting

CERCLA requires the immediate reporting of any release of a "reportable quantity" of a hazardous substance onto land, surface or ground water, or air in any 24-hour period. Releases permitted under state or federal permits (i.e. National Pollutant Discharge Elimination System (NPDES)) are not subject to reporting. The materials regulated are hazardous substances and hazardous wastes listed in 40 CFR 302.4. Releases of petroleum products are not regulated under CERCLA (but are regulated under the Clean Water Act (CWA) and NYS Regulations). Immediately upon recognition that a reportable release has occurred, the person(s) in charge of the facility must notify by phone the National Response Center (NRC) and the State Emergency Response Center (SERC) and the Local Emergency Planning Committee (LEPC) established under the Emergency Planning and Community Right -to- Know Act (EPCRA). Ideally, TtEC would immediately report all releases to the Navy Representative who would in turn notify the NRC, the SERC, and the LEPC, but in the absence of the Navy Representative, we would assume reporting responsibilities. A follow up written report must be submitted to the USEPA Region II Office, the SERC, and the LEPC within 30 days of the event.

National Response Center -	(800) 424-8802
State Emergency Response Center -	NYS Department of Environmental Conservation (800) 457-7362 or (518) 457-7362
Nassau County Office of Emergency Management -	(516) 573-0636

In addition, CERCLA contains a provision Section 111(g) that requires the facility operator to provide reasonable notice about a release of a hazardous substance to potentially injured parties by publication in local newspapers serving the affected area. TtEC assumes that the Navy will assume responsibility for all public notices.

6.14 EPCRA Release Reporting

Any person in charge of a facility must provide immediate notification whenever a "reportable quantity" of an Extremely Hazardous Substance (EHS) migrates off-site, this include releases to air, water or land.

There is no reporting requirement if the release does not go off-site and only results in exposure to persons within the boundaries of the facility. Lists of EHS's are published in 40 CFR 372.65. If a material is listed on both the EHS and CERCLA lists then the notification must be made to the LEPC, SERC and the NRC. If the material is listed on the EHS, but not on the CERCLA list then notification must only be made to the LEPC and the SERC. We will report all EHS releases to the Navy representative who will perform the required notification, except in the absence of the Navy Representative, when we will perform the notifications. The telephone numbers are the same as those for CERCLA reporting. Newspaper notification is not required for releases of EHS's.

6.15 Clean Water Act Reporting

Under the CWA, the facility operator must provide immediate notice by phone to the NRC whenever a reportable quantity of oil or hazardous substance is released into a navigable water, or adjoining shoreline. Federally or state permitted releases (i.e. NPDES) are not subject to reporting. A reportable quantity of oil is one that violates applicable water quality standards or causes a discoloration of or film onto the surface of the water. Reportable quantities of CWA regulated hazardous substances are published in 40 CFR 117. Although this facility is not identified as being adjacent to navigable water, a reportable release could occur if oil or hazardous materials are released into tributaries, drainage swales, or storm drains which lead into navigable waters. We will report all suspect release to the Navy Representative; in the absence of the Navy Representative we will provide immediate notification to the NRC.

6.16 NYS Release Reporting

New York State regulates releases of petroleum and hazardous substances that has the potential to pollute the waters or lands of the state. The list of NY State Hazardous Substances is published in 6 NYCRR 597.2.

Any discharge of petroleum or hazardous substances must be reported to the NYSDEC, at (800) 457-7362 or (518) 457-7362, within 2 hours of the discharge or knowledge of the discharge. Releases that are contained within secondary containment systems and do not reach the land or water are not required to be reported within 24 hours, if the release is completely contained and all material releases has been recovered. If a facility operator suspects a probable spill, then notification must be provided within 24 hours of the discovery.

Reporting requirements apply to facility owners and operators, persons in possession of a hazardous substance and any employee or agent of any owner or operator who has knowledge of a spill or release. These regulations are applicable to the site and if a release occurs, TtEC will report any releases to the Navy. If the Navy Representative is not available, TtEC will report any reportable releases to the NYSDEC.

7.0 WASTE MANAGEMENT

7.1 Introduction

The objective of Waste Management is to ensure the safe handling, management, T&D of all waste streams generated during the remedial action. In addition, each of these activities will be conducted in compliance with project ARARs/TBCs for on-site waste management activities and all applicable Federal, NY State, and local requirements for off-site waste T&D.

7.2 Waste Classification

The following is an overview of the classification requirements for wastes generated during the remedial action. Refer to Table 7-1, Summary of Waste Material, for a summary listing of classification and disposition requirements by individual waste stream. Wastes are anticipated to be non-hazardous under RCRA and non-regulated under the Toxic Substance Control Act (TSCA), however, information and protocols pertaining to these waste classifications are included in the following section.

The project Regulatory Specialist will confirm waste classification assumptions by reviewing the analytical data developed for each remedial action waste stream prior to off-site T&D. A waste certification and Waste Profile Sheet will be provided to the Navy for review, approval, and generator signature prior to off-site disposal of each waste stream.

Table 7-1 Summary of Waste Material

Waste Stream	Volume	Classification	Disposition
Drilling soils/slurries	TBD	RCRA Hazardous or Non-hazardous depending on analysis	Off-site disposal RCRA Subtitle D Solid Waste Landfill or permitted soil recycling facility
Purge, Development and Decontamination wastewater	TBD	RCRA Hazardous or Non-hazardous depending upon analysis	Off-site disposal – Subtitle C Waste Water Treatment Facility (WWTF) or permitted WWTF
PPE	TBD	RCRA Non-hazardous	Off-site disposal - RCRA Subtitle D Solid Waste Landfill
SVE condensate water	TBD	RCRA Hazardous or non-hazardous depending upon analysis	Off-site disposal - RCRA Subtitle C WWTF or permitted WWTF
Spent Activated Carbon	TBD	RCRA Hazardous or non-hazardous depending upon analysis	Off-site disposal - RCRA Subtitle C carbon regeneration facility or permitted carbon regeneration facility

7.3 Hazardous Wastes

Pursuant to 40 CFR 262.11 and 6 NYCRR 371, generators are required to classify their wastes prior to disposal. Based on the Design Analysis Report, listed hazardous wastes are not expected to be present on-site. It is anticipated that any drilling soils, SVE condensate water, activated carbon, and well development water generated from system operation would be classified as non-hazardous waste. Unless the soils or groundwater contain PCBs or exceed Federal standards for TCLP analysis, the soils and contaminated groundwater would be classified as non-hazardous waste. SVE condensate or spent activated carbon would not be regulated as environmental media and may be RCRA hazardous if they fail TCLP for metals or organics.

If waste is classified as a hazardous waste based on analytical data, it will be necessary to ship the waste off-site for disposal in less than 90 days due to the RCRA Hazardous Waste Generator 90 day storage limits.

7.4 PCB Wastes

Based upon the site history and former operations conducted, PCBs above 50-ppm are not expected to be present in the Site 1 well installation or trenching area. Soils or groundwater containing less than 50-ppm PCBs will be managed as non-hazardous solid wastes for disposal. If soils or groundwater containing 50 or more ppm of PCBs are identified, they will be segregated for management as a TSCA waste and disposed at a TSCA permitted disposal facility. PCB wastes will be managed and disposed in accordance with requirements under TSCA 40 CFR 761 and NYS Hazardous Waste Regulations under 6NYCRR 370-375 because PCBs are regulated as a NYS Hazardous Waste. Any decontamination water derived from soils containing greater than 50-ppm of PCBs will be disposed as TSCA wastes in accordance with the anti-dilution provisions of TSCA. SVE condensate and well development waste water will be as TSCA wastes only if they are determined to contain greater than or equal to 50-ppm of PCB's in accordance with USEPA Guidance Memorandum "PCB Contamination at Superfund Site - Relationship of TSCA Anti-Dilution Provision to Superfund Response Actions" dated July 31, 1990.

If waste is classified as a TSCA-regulated waste based on analytical data, it will be necessary to ship the waste off-site within 30 days, as per the USEPA and TSCA PCB waste storage limits (unless a storage area with roof/walls & bermed area is utilized).

7.5 Screening/Segregation

Wastes will be screened and segregated to minimize the mixing of contaminated and uncontaminated materials. The goal is to separate waste as accurately as possible into categories that will facilitate cost-effective management of the wastes.

7.6 Containerization

USDOT specification 1A1 (closed top) and 1A2 (open top) steel drums will be used for containerizing the non-bulk waste streams generated for this remedial action.

7.7 Accumulation/Storage

All containers storing hazardous wastes will remain on-site for less than 90 days from its accumulation start date unless specific approval has been received from NYSDEC. Containers holding non-putresible solid wastes will remain on-site for no more than one year from their accumulation start date. TtEC will obtain NWIRP-Bethpage specific storage requirements from the Resident Office in Charge of Construction (ROICC) prior to mobilization and will incorporate these requirements into the project plan.

All on-site hazardous waste storage will comply with generator requirements listed in 40 CFR 262 and 6CNYRR 372. If TSCA regulated PCB wastes are identified, all on-site PCB waste storage will be conducted in accordance with PCB container storage requirements under 40 CFR 761.65. All waste container storage areas for RCRA Hazardous, TSCA or liquid wastes will be equipped with secondary containment.

7.8 Container Inspections

Hazardous waste and PCB waste container inspections will be performed and logged weekly to ensure proper labeling and marking, and to monitor the condition of the containers and the condition of the storage area. The weekly inspection reports will be maintained in the project file and copies will be provided to the Navy.

7.9 Container Labeling and Marking

At the time of generation, all waste containers will be marked in indelible ink, paint or grease pencil with the following information:

- Source and location
- Contents of material in the container and expected hazards
- Accumulation start date for hazardous wastes
- Out of Service Date for PCB wastes
- Date container was sampled
- HAZARDOUS WASTE label if known or suspected to contain hazardous wastes
- PCB label if known or suspected to contain PCB wastes
- NON-HAZARDOUS WASTE label if known or suspected to contain non-hazardous wastes

Upon receipt of analytical results, the waste will be classified by the Regulatory Specialist, in consultation with NAVFAC personnel, in accordance with applicable regulations. Based upon final classification, the Regulatory Specialist will select a proper USDOT Shipping name and description for any USDOT regulated hazardous materials. The Regulatory Specialist will direct the completion of any required USDOT markings and labels and will specify the placarding requirements for the transportation vehicle.

7.10 Permitting/Notification Requirements

Since hazardous and PCB wastes have been generated from previous remedial activities at NWIRP-Bethpage, the Navy has already performed the required RCRA and PCB waste notifications to USEPA and obtained the required Generator USEPA Identification Numbers. No additional notifications are required for on-site waste management activities. No permits are required for site activities.

7.11 Selection and Identification of TSDFs

TSDFs to be used for this project have not yet been selected and will be selected via competitive bid in accordance with Federal Acquisition Regulation (FAR) requirements. A Formal Request for Proposal (RFP) will be prepared after project mobilization. Facilities will be selected in accordance with the requirements of the RFP, the CERCLA Off-site Rule for wastes from CERCLA sites and TtEC Regulatory Compliance Procedures. Each of these facilities is subject to final approval by the Navy. The CERCLA Off-Site approval status of each facility will be verified within 60 days of the anticipated disposal date.

7.12 USEPA Hazardous Waste Generator Identification Numbers

The Navy's USEPA Hazardous Waste Generator Identification Numbers will be obtained and used for all off-site hazardous and PCB waste disposal. Transporter and disposal facility identification numbers would also be obtained and verified prior to off-site shipment of site wastes.

7.13 Complete Manifest Packages

Hazardous Waste Manifests will be used for all off-site Hazardous and PCB waste shipments. The state hazardous waste manifest to be used will be specified by the state in which the TSDF is located. If the TSDF state does not require its own manifest, then a NYS Hazardous Waste Manifest will be used. Bills of Lading or non-hazardous waste manifests will be used for shipment of all non-hazardous wastes. A Complete Manifest Package (CMP) will be submitted to the Navy for each waste stream destined for off-site disposal. The principal components of the CMP will consist of:

- Hazardous Waste Manifests or Bills of Lading
- Waste Profile Sheets
- Land Disposal Restriction Waste Notification Forms, if required

Supporting documentation will include Material Safety Data Sheets (MSDS), waste disposal history, analytical results, waste certifications performed by TtEC, information reviewed in identifying the proper USEPA waste codes and USDOT Proper Shipping Names, and packaging, labeling, and marking requirements.

TtEC will submit a CMP to the Navy for each waste stream for review and approval prior to shipment. After the CMP has been approved and signed, two copies of the approved and signed CMP will be prepared. One copy will be placed in the project file and one copy will be returned to the Navy with the transporter-signed copies of the manifests and Bills of Lading.

7.14 Recordkeeping and Reporting Requirements

TtEC will supply the following documents to the Navy to enable the Navy to comply with the records retention and reporting requirements under RCRA:

- Generator signed manifests
- TSDF signed manifests
- Land Disposal Restriction Waste Notification Forms
- Manifest Discrepancy and Exception Reports
- Waste Profile Sheets
- TSDF Certificates of Disposal/Destruction
- All test results, waste analyses and waste determinations.

These records will be supplied in the CMP with a duplicate submitted in the Project Closeout Report.

Discrepancy Reports will be prepared for the Navy's approval and signature for any manifest discrepancy related to waste type or volume. These reports will be prepared and submitted within 15 days after waste receipt by the TSDF.

Manifest Exception Reports are required if a generator does not receive a TSDF signed manifest within 45 days of the shipment date. If we do not receive a manifest by the 35th day, we will contact the TSDF and verify the shipment status and prepare an Exception Report, which will be submitted to the Navy Representative for approval and signature by the 40th day. We will document all calls to locate the shipment and include the documentation in the Exception Report.

8.0 CRITICAL PATH METHOD (PROJECT SCHEDULE)

We have prepared Critical Path Method (CPM) type construction schedules for the installation of the SVE system. The schedule is provided in Figure 8-1. A normal 8-hour, 5-day work week is assumed. Start-up is scheduled for October 2009.

9.0 QUALITY CONTROL

TtEC RAC Program Organization is specifically designed to control work performed by the TtEC team in accordance with the contract requirements. TtEC will manage this contract though the dedicated Program Management Office (PMO) located in Langhorne, Pennsylvania.

The RAC program is organized into four (4) elements under the Program Management Team:

- Contract Administration
- QC
- Health and Safety
- Project Manager

The PMO also provides support groups, which provide additional assistance to the Project Management Team on an as-needed basis.

The PMO support groups themselves are organized into five (5) elements:

- Procurement
- Planning and Scheduling
- Cost Estimating
- Budgeting and Accounting
- Technical and Regulatory Compliance

Five (5) of the above elements (Contract Administration, Planning and Scheduling, Cost Estimating, Budgeting and Accounting, and Technical and Regulatory Compliance) are non-remediation related and are not addressed in this QC Plan. The major function of the QC Plan is to ensure that all organization elements perform the assigned actions in compliance with the contract.

The QC Plan provides for monitoring, auditing and conducting field inspections to ensure compliance is being maintained. Maintenance on the project records and required reports and logs is also addressed. A program to ensure all submittals are correct and complete before forwarding to the Contracting Officer's Representative is included in this QC Plan.

9.1 Quality Control Group

The QC Group assigned to the Program is technically responsible to the TtEC Corporate Quality Assurance Officer. The Group is headed by the PQCM who receives administrative direction from the Program Manager for the purpose of coordinating QC activities with the CTO operations, testing sequences and schedule, and achieving timely resolution of quality issues.

The QC Group consists of the PQCM and the SQCM.

9.1.1 PQCM

The PQCM is responsible for:

- Approving the QC Plan for the project
- Assuring that all relevant portions of the QC Plan are implemented during the project through audits and surveillance of the project activities
- Issuing report to the PM on any deviation from the approved plans
- Reviewing, modifying or correcting all contract submittals prior to forwarding to the Contracting Officer's Representative
- Authorizing the SQCM to act on his behalf for all Site related QC activities

The PQCM, as stated in Section 3.1.1 is Mr. Jonathan Dziekan.

9.2 SQCM

The SQCM will implement the TtEC QC Program and will have the sole responsibility of ensuring compliance with contract documents. He will have the authority to reject material or workmanship that does not comply. The SQCM, or a designated representative acceptable to the Navy, will be present at the project Site whenever remedial actions are in progress. The major responsibilities of the SQCM as outlined in the Basic Contract include:

- Managing and implementing an effective QC Program
- Notifying the Contracting Officer's Representative at least one (1) week in advance of any field activities and at least 24 hours in advance of any cancellations in work
- Conducting QC meetings at the Site with the Project Superintendent on a bi-weekly basis
- Providing documentation of daily field activities in the Contractor Production Report and the Contractor QC Report
- Identifying, controlling, and assuring resolution of deficiencies, including corrective action implementation
- Maintaining project records as required by the contract

The SQCM, as stated in Section 3.1.1 is Mr. Ben Ketterer.

9.3 Submittals Processing

9.3.1 General

TtEC will use and maintain the Submittal Register to track submittals from issue to approval, and to comply with the Navy requirement for submittals under the Basic Contract. TtEC will forward submittals requiring Navy approval and will submit these items as listed on the Submittal Register.

Each submittal will be complete and in sufficient detail for ready determination with the contract requirements. All items will be checked and approved by the PQCM and will be transmitted via an appropriate transmittal form which will be initiated and dated by the PQCM indicating that the accompanying submittal conforms or does not conform to contract requirements.

9.3.2 Receipt of Submittals

Submittals will be electronically submitted to:

Department of the Navy - NAVFAC
Ms. Christi Davis
Ms. Lora Fly

NWIRP - Bethpage
Mr. Greg Pearman (ROICC)
Mr. Al Taormina (Environmental)

Each submittal will be identified with:

- Contract Number and CTO Number
- Unique sequential transmittal number
- Name and address of the submitting organization
- Date of submittal
- Description of item being submitted
- Approval of submitting organization indicating conformance to requirements

The PQCM will enter each submittal into the Submittal Register, determine if approval is required by the Contracting Officer's Representative, and proceed with review of submitted material.

9.3.3 Review and Processing of Submittals Which Do Not Require Navy Approval

Material submitted for review by the PQCM or designated representative will indicate that it either conforms to established requirements or does not conform to established requirements. The PQCM will advise the submitter of the results of the review. The submittal log will be updated to indicate status. Note that the conforming submittals will be transmitted to Project and Navy personnel as determined by the distribution schedule; non-conforming submittals will be returned to the submitter for correction, resolution of comments, and re-submittal.

9.3.4 Review and Processing of Submittals Which Require Navy Approval

Material submitted for review by the PQCM or designated representative will be signed to indicate that it conforms to requirements. The submittal will then be transmitted in accordance with the project distribution schedule for review and approval. All items sent to the Navy will be done so through a transmittal form, which will indicate each item transmitted, the date reviewed by the PCQM, and its review status. Upon completion of reviewing, the Contracting Officer's Representative will return the submittal form to the SQCM for further action.

The PCQM will advise the submitter of the results of the review in writing and include any comments. The submittal log will be updated to indicate status. Note that non-conforming submittals will be returned to the submitter for correction, resolution of comments, and resubmittal if required.

9.3.5 Revised Submittals

Revised submittals will be logged, reviewed, and processed in a manner identical with the initial submittal and will comply with the Navy requirements under the Basic Contract.

9.4 Quality Control Site Activities

9.4.1 Introduction

This section addresses all aspects of QC Site Activities, including:

- QC inspection activities
- Identification of work features to be inspected
- Control of subcontractors and vendors

9.4.2 Three Phases of Control

The SQCM will perform the three phases of control to ensure that work compiles the Work Plan, APP, and all applicable federal, state, and local rules and regulations. The Three Phases of Control, as defined below, will adequately cover both on-site and off-site activities for each definable feature of work. A definable feature of work is a task that is separate and distinct from other tasks and requires separate control requirements.

9.4.2.1 Preparatory Phase

The SQCM will notify the Contracting Officer's Representative at least two (2) work days in advance of each preparatory phase inspection to allow for their participation in the inspection, if desired. Preparatory phase inspections will be documented on the Preparatory Phase Inspection Checklist and in the Contractor's QC Report. The SQCM will perform the following prior to the commencement of each definable feature of work:

- Review each paragraph of the applicable Work Plan sections
- Verify that appropriate shop drawings and submittals for materials and equipment have been submitted and approved. Verify receipt of approved factory test results, when required
- Review the testing plan and ensure that provisions have been made to provide the required QC testing
- Examine the work area to ensure that the required preliminary work has been completed;
- Examine the required materials, equipment, and sample work to ensure that they are on hand and conform to the approved shop drawings and submitted data
- Review the APP and appropriate activity hazard analysis to ensure that applicable safety requirements are met, and that required MSDS are submitted
- Discuss remedial methods

9.4.2.2 Initial Phase

The SQCM will notify the Contracting Officer's Representative at least two (2) work days in advance of each initial phase notification. When remedial crews are ready to start work on a definable feature of work, the initial phase will be conducted with the SQCM and the Project Superintendent. The initial

segment of the definable feature of work will be observed to ensure that the work complies with contract requirements. The results of the initial phase will be documented on the Initial Inspection Checklist and in the Daily QC Report. The initial phase will be repeated for each new crew to work on-site, or when acceptable levels of specified quality are not being met. The SQCM will perform the following for each definable feature of work:

- Establish the quality of workmanship required
- Resolve conflicts
- Review the APP and the appropriate activity hazard analysis to ensure that applicable safety requirements are met
- Ensure that testing that needs to be performed is completed by an approved laboratory

9.4.2.3 Follow-up Phase

Follow-up phase inspection are similar in content and approach to initial phase inspections, and will be performed as needed during on-going work daily, or more frequently as necessary, until the completion of each definable feature of work. The follow-up phase inspection will be documented in the Daily QC Report. The SQCM will perform the following for each definable feature of work:

- Ensure the work is in compliance with contract requirements
- Maintain the quality of workmanship required
- Ensure that testing is performed by the approved laboratory
- Ensure that rework items are being corrected

9.4.3 Work Features Requiring Inspection or Testing

Prior to implementation of individual phases of work activities, the SQCM and Project Superintendent will meet to identify specific work requirements, including submittal information, scheduling, and QC requirements. This joint review allows close coordination of work and maximizes efficiency of operations. Project roles, potential problems, and procedures for resolving issues will be established up-front at these discussions to allow for clarification of direction and immediate response to any problem that may arise. As a result of this approach, QC activities will be maintained as an integral component of the overall project approach.

9.4.4 Completion Inspection

At the completion of all work or any increment thereof, the ROICC will conduct a completion inspection of the work.

9.4.5 Control of Subcontractors and Vendors

Construction subcontractor's qualification to perform the required work will be evaluated by the SQCM. All subcontractor activities will be subject to QC inspection in accordance with the Basic Contract.

9.5 Documentation

9.5.1 General

All inspection and testing activities performed will be documented by the SQCM.

9.5.2 Daily Quality Control Report

The SQCM or his designee will record his inspection activities in the Daily QC Report. The Daily QC Report will be submitted to the Contracting Officer's Representative daily. Reports for weekends and holidays will be included on the first working day's report following those periods.

9.6 Meetings

9.6.1 Pre-Construction Meeting

Prior to mobilization, the Project Superintendent will conduct a pre-construction meeting in the ROICC office. The ROICC will approve the date and time for the pre-construction meeting.

9.6.2 Public Meeting

Prior to mobilization, the Project Superintendent will conduct a pre-construction meeting in the ROICC office. The ROICC will approve the date and time for the pre-construction meeting.

9.6.3 Daily Safety Meeting

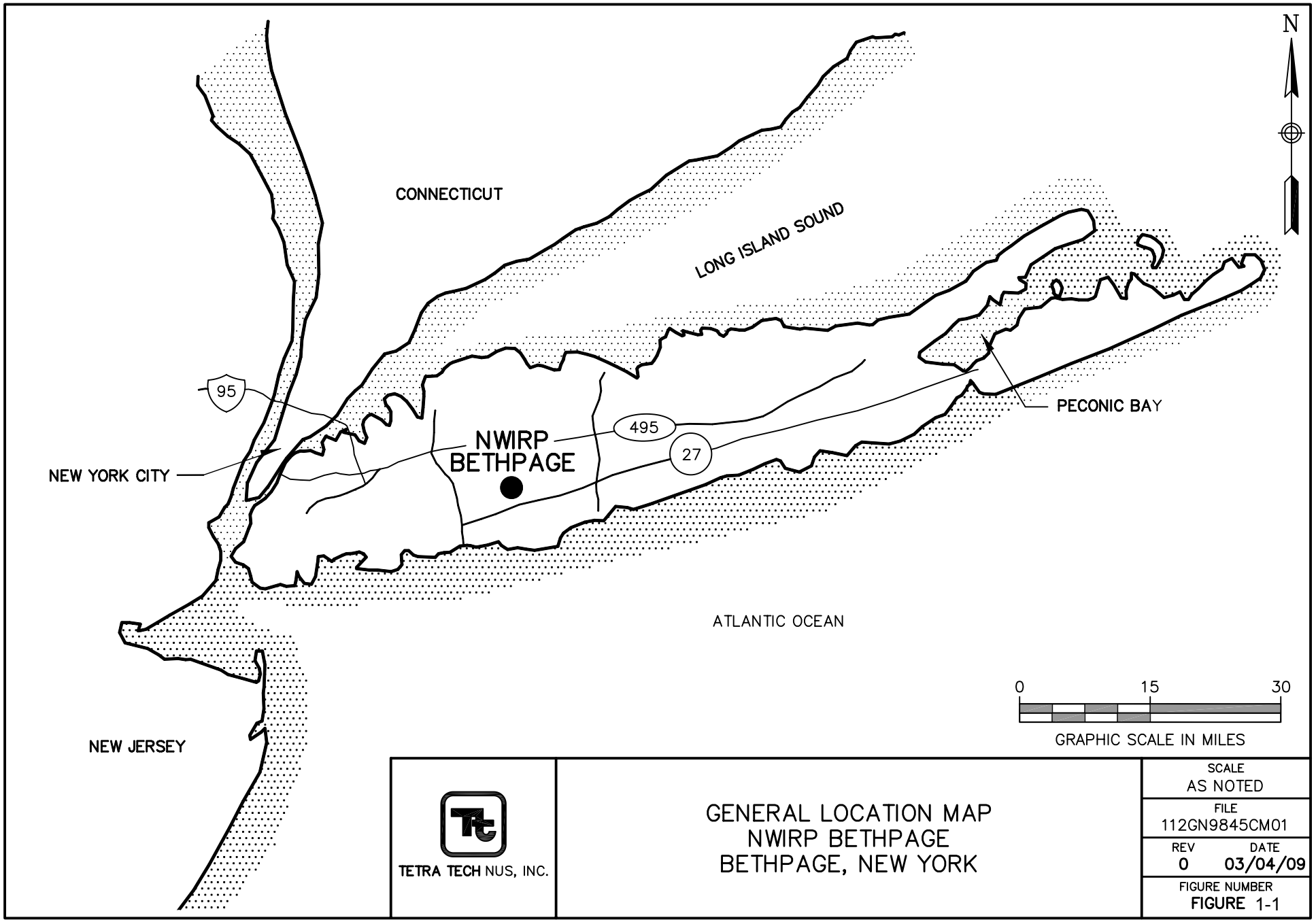
Prior to starting work, a daily safety meeting will be conducted by the SSHO. All of the day's planned activities will be reviewed with particular attention focused on PPE and risk. All personnel are required to attend the meeting.

9.6.4 Photographic Documentation

If permission is obtained from the Public Affairs Office, photographs of the remedial activities will be taken for use in the Project Closeout Report.

FIGURES

112GN9845\3110\112GN9845CM01.DWG 03/04/09 MKB

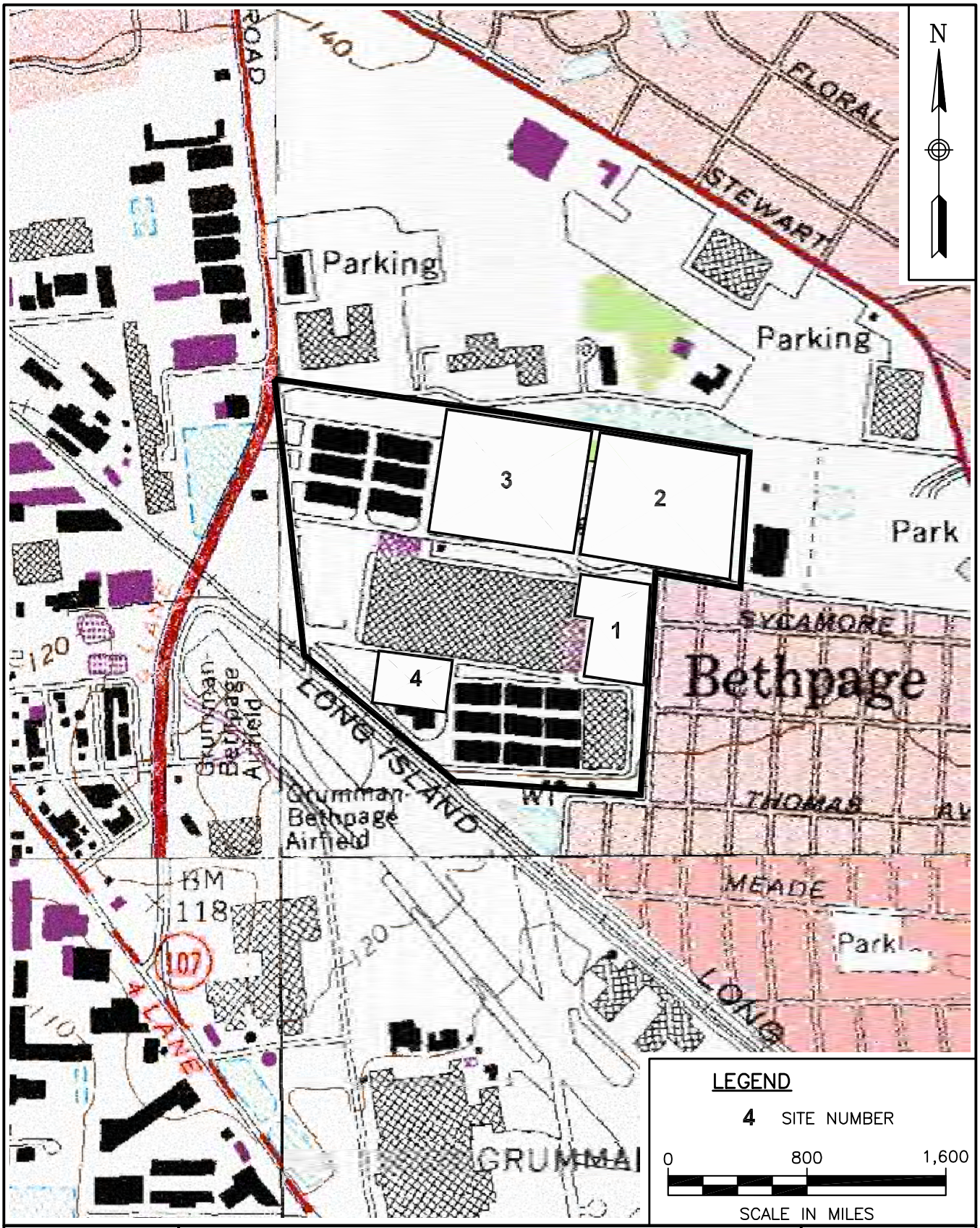


TETRA TECH NUS, INC.

GENERAL LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

SCALE	AS NOTED
FILE	112GN9845CM01
REV	0
DATE	03/04/09
FIGURE NUMBER	FIGURE 1-1

112GN9845\3110\112GN9845CM02.DWG 03/04/09 MKB

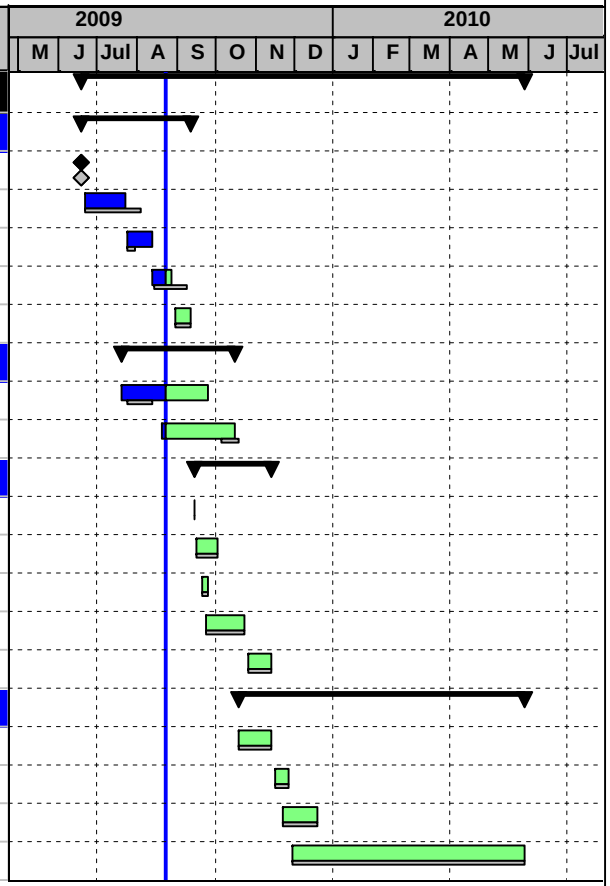


TETRA TECHNUS, INC.

SITE LOCATION MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

SCALE	AS NOTED
FILE	112GN9845CM02
REV	0
DATE	03/04/09
FIGURE NUMBER	FIGURE 1-2

Activity ID	Activity Description	Rem Dur	Activity % Complete	Start	Finish
SVE Containment System		278		19-Jun-09 A	28-May-10
Design and Work Plan		19		19-Jun-09 A	11-Sep-09
A1020	CTO Award	0	100%	19-Jun-09 A	
A1030	Design & Work Plan Draft to Navy	0	100%	22-Jun-09 A	24-Jul-09 A
A1050	Draft Client Review	0	100%	25-Jul-09 A	13-Aug-09 A
A1200	Draft Final Design & Work Plan to Regulators	5	69.92%	14-Aug-09 A	28-Aug-09
A1210	Draft Final Regulator Review	9	0%	31-Aug-09	11-Sep-09
Procurement		54		20-Jul-09 A	16-Oct-09
A1040	Procurements	24	0%	20-Jul-09 A	25-Sep-09
A1150	SVE Treatment Equipment	38	0%	20-Aug-09 A	16-Oct-09
Construction		61		14-Sep-09	13-Nov-09
A1060	Mobilization - Drilling	2	0%	14-Sep-09	15-Sep-09
A1070	Drilling Operations	13	0%	16-Sep-09	02-Oct-09
A1090	Mobilization - Construction	5	0%	21-Sep-09	25-Sep-09
A1100	Exterior Piping & Manifold	22	0%	23-Sep-09	23-Oct-09
A1080	Interior Construction w/ Electrical & Bldg Modifications	14	0%	26-Oct-09	13-Nov-09
Test and Turnover		222		19-Oct-09	28-May-10
A1180	O&M Manual	19	0%	19-Oct-09	13-Nov-09
A1160	System Testing/Start-up/ Prove-out	9	0%	16-Nov-09	27-Nov-09
A1170	Construction Completion Report	19	0%	23-Nov-09	18-Dec-09
A1190	O&M - 6 Months	126	0%	30-Nov-09	28-May-10



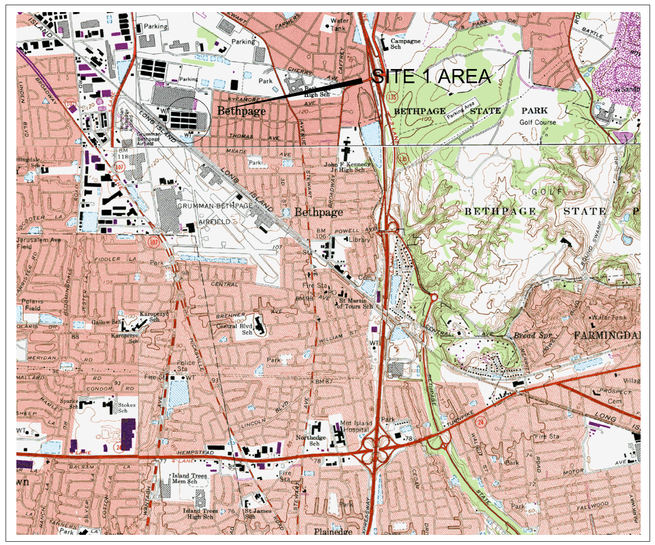
Summary
Actual Work
Remaining Work
Critical Remaining Work
Milestone
Primary Baseline
Baseline...

SVE Containment System
Hunters Point Shipyard

Data Date: 24-Aug-09

TASK filter: All Activities

APPENDIX A
DRAFT ENGINEERING DRAWINGS



NWIRP BETHPAGE VICINITY MAP

0 2,000 4,000

SCALE IN FEET

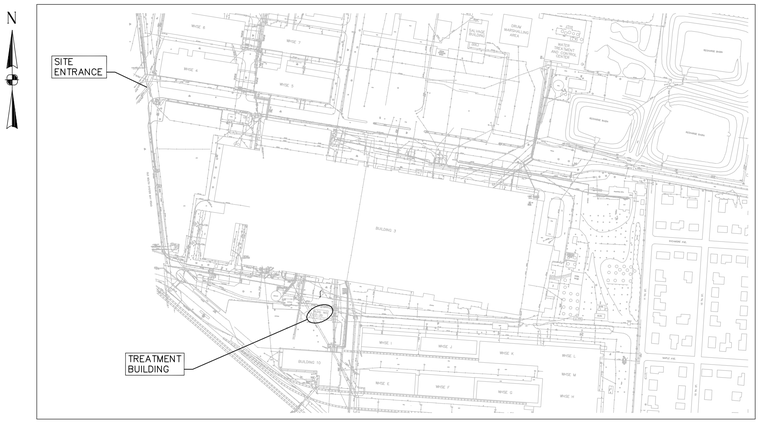
DESIGN-BUILD CONSTRUCTION FOR INTERIM REMEDIAL ACTION

DRAFT FINAL DESIGN

SITE 1 AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

BETHPAGE, NEW YORK

CONTRACT No. N62473-10-D-3211
CONTRACT TASK ORDER No. WE04



WORK AREA

0 300 600

SCALE IN FEET

DRAWING INDEX

DRAFT FINAL DESIGN
NOT FOR CONSTRUCTION

REV	DESCRIPTION	PREP BY	DATE	APPRVD
A	DRAFT DESIGN	BV/TD	7-23-09	SGP
B	DRAFT FINAL DESIGN	DLB	9-2-09	SGP

TETRA TECH ENGINEERING CORPORATION PC

DESN: NH DR: BMV CH: ENC CHK: SP

SUBMITTED BY: (FIRM NUMBER) (TITLE) (DATE)

SOUTHWESTDIV, NAVFAC HQ, NAVFAC PWC OFFICER IN CHARGE

APPROVED DATE

NAVAL FACILITIES ENGINEERING COMMAND
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
TITLE SHEET
APPROVED DATE
EFANE FOR COMMANDER, NAVFAC

SEAL AREA

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO DATE

CODE I.D. NO.

SCALE : AS SHOWN

SPEC. NO.

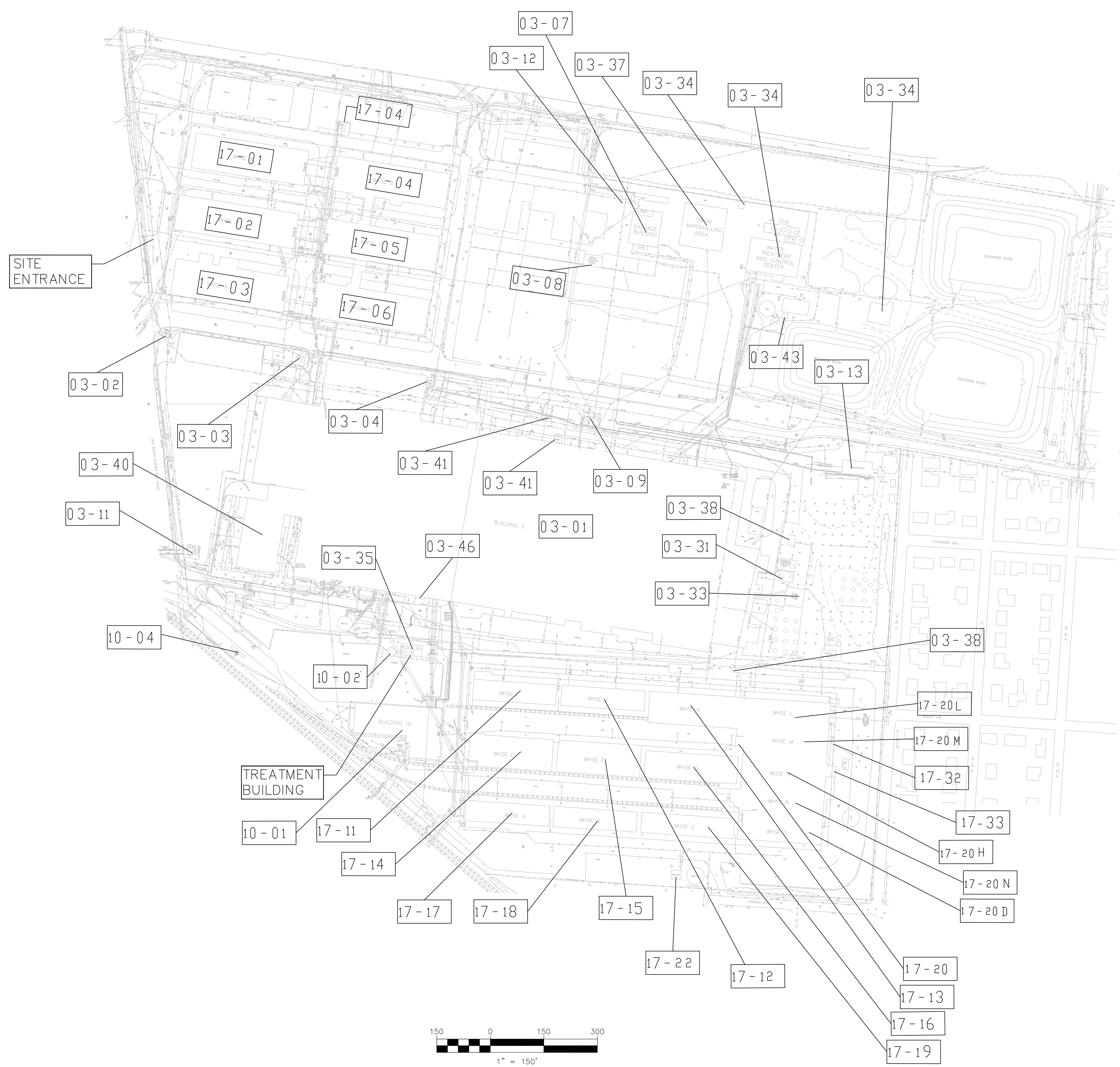
CONSTRN. CONTR. NO. N62473-10-D-3211

NAVFAC DRAWING NO.

SHEET OF

SIZE: D DIS. SH. NO. T-1

P:\Southwest RAC\Bethpage Site 1\CAD - GIS\DRAWINGS\33\70\W04T1-REV B.dwg



REVISION					
REV	DESCRIPTION	APPROVED ENGG	ENVIR	ENERGY	DATE
1	DELETED ABANDONED BLDG NUMBERS	RA			03/18/92
2	ADDED TBG COGEN-COMBINED CYCLE PLT AND AERATION BASIN	RA			06/15/92
3	REMOVED BLDG 04-84 TRAILERS	RA			/06/92
4	REMOVED BLDGS 12-10 & 105-01	RA			/22/92
5	UPDATE SITE PLAN SURVEY	JWG			/25/98
6	UPDATE SITE PLAN SURVEY	JWG			/15/98
7	UPDATE SITE PLAN SURVEY	JWG			/05/98
8	UPDATE SITE PLAN SURVEY	JWG			/19/96
9	UPDATE SITE PLAN SURVEY	JWG			/17/96
10	UPDATE SITE PLAN SURVEY	JWG			/07/96
11	UPDATE SITE PLAN SURVEY	JWG			/14/96
12	UPDATE SITE PLAN SURVEY	JWG			/24/97
13	UPDATE SITE PLAN SURVEY	JNS			/13/98
14	UPDATE SITE PLAN SURVEY	JNS			/30/98

LIST OF UTILITES:

NEW YORK CITY ONE-CALL CENTER
(800) 272-4480

BETHPAGE WATER DISTRICT
25 ADAMS AVE.
BETHPAGE, NY 11714
(516) 931-0093

CABLEVISION
(516) 393-3295

COUNTY OF NASSAU
DEPARTMENT OF PUBLIC WORKS
[SANITARY SEWER]
1550 FRANKLIN AVENUE
MINEOLA, NY 11501-4822
(516) 571-7319, 20

KEYSPAN ENERGY [GAS]
175 EAST OLD COUNTRY ROAD
HICKSVILLE, NY 11801
(800) 272-4480
(631) 567-7800 (LOCATIONS SERVICE)

LONG ISLAND POWER AUTHORITY (LIPA)
[ELECTRIC]
175 EAST OLD COUNTRY ROAD
HICKSVILLE, NY 11801
(800) 272-4480
(631) 567-7800 (LOCATIONS SERVICE)

MCI
(800) 840-0338

TOWN OF OYSTER BAY
DEPARTMENT OF PUBLIC WORKS
[STREETS AND STORM SEWER]
SYOSSET, NY 11791-5699
(516) 677-5935

VERIZON
(718) 471-4206

NAVY FACILTIY MANAGER
AL TAORMINA, ECOR SOLUTIONS
(516) 346-0344

REFERENCE:

NORTHROP GRUMMAN
DRAWING SOURCE NAVY PARCEL 8/6/98

NOTES:

1. THE SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM SHALL BE INSTALLED INSIDE BUILDING NO. 03-35
2. CONFIRMATION OF COMPLETED DIG SAFE NOTIFICATION MUST BE PROVIDED TO TETRA TECH PRIOR TO ANY INTRUSIVE ACTIVITIES.

BLDG NO.	DESCRIPTION	NAVY BLDG NO.
003-01	MANUFACTURING	3
003-02	WELL HOUSE #8	43
003-03	WELL HOUSE #9	42
003-04	WELL HOUSE #10	44
003-07	SALVAGE BLDG	21
003-08	SALVAGE YARD	22
003-09	WELL HOUSE #11	45
003-11	WELL HOUSE #14	46
003-12	WELL HOUSE #15	128
003-13	SANITATION OFFICE	34
003-24	GUARD BOOTH *	
003-31	BOTTLE GAS STORAGE	130
003-33	TRANSPORTATION BLDG	
003-34	INDUSTRIAL WASTE TREATMENT FAC	133
003-35	MAINTENANCE BLDG	
003-37	DRUM STORAGE PAD	
003-38	STORAGE BLDG	
003-40	GAC PROM	
003-41	STORAGE SHED	
003-43	STORAGE BLDG	
003-46	STORAGE BLDG	
003-49	SAND SHED	
003-52	WELLWATER TREATMENT BLDG	
003-50	ALUMINUM SHED	
010-01	LABORATORY	10
010-02	STORAGE BLDG	
010-04	SCALE HOUSE	31
017-01	WAREHOUSE 8	8
017-02	WAREHOUSE 6	6
017-03	WAREHOUSE 4	4
017-04	WAREHOUSE 9 & INTERCONNECT	9
017-05	WAREHOUSE 7 & INTERCONNECT	7
017-06	WAREHOUSE 5 & INTERCONNECT	5
017-09	WELL HOUSE	13
017-11	WAREHOUSE 3I	17
017-12	WAREHOUSE 3J	18
017-13	WAREHOUSE 3K	19
017-14	WAREHOUSE 2E	14
017-15	WAREHOUSE 2F	15
017-16	WAREHOUSE 2G	16
017-17	WAREHOUSE 1A	11
017-18	WAREHOUSE 1B	12
017-19	WAREHOUSE 1C	13
017-20D	WAREHOUSE D	20
017-20H	WAREHOUSE H	20
017-20L	WAREHOUSE L	20
017-20M	WAREHOUSE M	20
017-20N	WAREHOUSE N	20
017-22	PUMP HOUSE	26
017-25	STORAGE SHED	
017-32	BOILER HOUSE	
017-33	BOILER HOUSE	
017-36	WATER LIFT STATION	47
017-37	#306123 DRUM STORAGE SHED	

* = NOT DESIGNATED IN SQUARE FOOTAGE REPORTS

DRAFT FINAL DESIGN
NOT FOR CONSTRUCTION

THIS DRAWING PRODUCED ON AUTOCAD
DO NOT REVISE MANUALLY

TETRA TECH ENGINEERING CORPORATION PC

DSGN: TAH DR: BMV CHK: SP
SUPV: CH ENG:
SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
NORTHDIV DM: HD: HD:
FPE: DIR:
OFFICER IN CHARGE
APPROVED DATE

REV	DESCRIPTION	PREP BY	DATE	APPRVD
A	DRAFT DESIGN	BV/TD	7-23-09	SGP
B	DRAFT FINAL DESIGN	DLB	9-2-09	SGP

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
EXISTING CONDITIONS
APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SAT TO DATE
CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.
SHEET OF
SIZE: D
DIS. SH. NO. C-1

P:\Southwest RAC\Bethpage Site 1\CAD - GIS\DRAWINGS\3370\W04C1-REV B-TEST.dwg

LEGEND:

(symbol)	SOIL VAPOR EXTRACTION WELLS
(symbol)	CONDENSATE CLEAN-OUT PORT
(symbol)	HYDRANT
—x—x—x—	FENCE
———	PROPOSED NEW EXTRACTION PIPE TRENCH
(symbol)	STORM DRAIN MANHOLE

ABBREVIATIONS:

SD	STORM DRAIN
BW	BETHPAGE WATER (POTABLE)
E	ELECTRICAL
G	GAS
GW	WELL WATER (ABANDONED)
SP	SPRINKLER LINE
ST	STEAM
T	TELEPHONE
ACP	ASBESTOS CONCRETE PIPE
BIT	BITUMINOUS (ASPHALT)
CIP	CAST IRON PIPE
CONC	CONCRETE
GALV	GALVANIZED
RCP	REINFORCED CONCRETE PIPE
ABND	ABANDONED

NOTES:

1. REMOVE EXISTING FENCE WEST OF CONCRETE RAMP AT WHSE K ALONG PROPOSED TRENCH.
2. FLOW MONITORING STATION SHALL BE MINIMUM 20' LENGTH CONEX STYLE CONTAINER SET ON GRAVEL BASE. SEE DRAWING NO. C-4, SECTION D, DETAIL 2.
3. PROPOSED TRENCH LOCATION FROM FLOW MONITORING STATION TO BLDG. 03-35 MAY REQUIRE MODIFICATION BASED ON UNDERGROUND UTILITIES IDENTIFIED DURING THE GEOPHYSICAL SURVEY OR UNCOVERED DURING EXCAVATION.
4. HAND DIGGING IS REQUIRED AROUND ALL EXISTING UTILITIES.
5. FOR WELL DETAILS, SEE DRAWING NO. C-5.
6. SEE DETAIL NO. 9 ON DRAWING NO. C-5 FOR CONDENSATE CLEAN-OUT PORT DETAILS.
7. A TOTAL OF TWELVE SVE WELLS SHALL BE USED FOR VAPOR EXTRACTION. SVE-101 IS EXISTING AND OTHERS SHALL BE INSTALLED DURING CONSTRUCTION PHASE. THE SVE WELLS SHALL BE SCREENED AT INTERMEDIATE DEPTHS (25-30 FT) AND DEEP DEPTHS (40-60 FT). SEE DETAIL NOS. 4 AND 5 ON DRAWING NO. C-5 FOR SVE WELL DETAILS.
8. SOIL VAPOR TRANSFER PIPELINE BETWEEN MONITORING STATION AND TREATMENT BUILDING TO HAVE 0.1%(MIN) SLOPE TOWARDS CONDENSATE CLEAN-OUT PORTS.

CONSTRUCTION DRAWING NOTES:

THE CONTRACTOR SHALL NOTE THE CONDITION OF ANY EXISTING FENCE THAT MAY BE IMPACTED BY PROJECT CONSTRUCTION.

LOCAL FIRE DEPARTMENTS AND EMERGENCY MANAGEMENT TEAMS SHALL BE MADE AWARE OF SITE ACTIVITIES.

REPRESENTATIVES FROM NYSDEC/NASSAU COUNTY SHALL BE PERMITTED TO INSPECT THE SITE (INCLUDING RELEVANT RECORDS) AT ANY TIME DEEMED NECESSARY, TO ENSURE THAT ALL ACTIVITIES ARE IN ACCORDANCE WITH THE APPROVED SITE PLANS AND THE TERMS.

ALL CONSTRUCTION ACTIVITY, INCLUDING OPERATION OF MACHINERY, EXCAVATION, FILLING, GRADING, CLEARING OF VEGETATION, DISPOSAL OF WASTE, AND STOCKPILING OF MATERIAL MUST TAKE PLACE WITHIN THE APPROVED WORK AREA.

WHERE CONSTRUCTION ACTIVITIES ARE ADJACENT TO PUBLIC ROADS, THE CONTRACTOR SHALL PARK PERSONNEL AND CONSTRUCTION VEHICLES IN AREAS THAT WILL NOT INTERFERE WITH NORMAL TRAFFIC, WILL NOT CAUSE ANY SAFETY HAZARD, AND WILL NOT INTERFERE WITH EXISTING LAND USES OUTSIDE THE SITE. THE CONTRACTOR SHALL POSITION PERSONNEL AND VEHICLES SO AS NOT TO INTERFERE WITH ACTIVITIES OF THE ADJOINING PROPERTIES.

A STANDARD OF "NO VISIBLE DUST" WILL BE IMPLEMENTED, AND ACTION LEVELS FOR FUGITIVE DUST WILL BE ESTABLISHED AND MONITORED AT THE PERIMETER OF THE SITE AND IN WORK AREAS. FUGITIVE DUST RESULTING FROM CONSTRUCTION ACTIVITIES SHALL BE MINIMIZED BY IMPLEMENTING APPROPRIATE CONTROL MEASURES. THESE MEASURES MAY INCLUDE THE APPLICATION OF MULCH, WATER, STONE, OR APPROVED CHEMICAL AGENTS ON EXPOSED SOILS, STOCKPILED SOILS WHEN DRY AND WINDY CONDITIONS EXIST

ACTION LEVELS FOR VAPOR EMISSIONS WILL BE ESTABLISHED AND MONITORED AT THE PERIMETER OF THE SITE AND IN WORK AREAS. ODORS AND VAPOR EMISSIONS SHALL BE MINIMIZED BY IMPLEMENTING APPROPRIATE CONTROL MEASURES. THESE MEASURES MAY INCLUDE THE APPLICATION FOAM OR APPROVED CHEMICAL AGENTS ON EXPOSED SOILS OR STOCKPILED SOILS. ALL SOIL STOCKPILES MUST BE COVERED WHEN NOT IN USE.

BLASTING IS NOT PERMITTED.

NOISE IMPACTS SHALL BE MINIMIZED AND MITIGATED TO THE EXTENT PRACTICABLE. CONTRACTOR WILL COMPLY WITH STATE AND LOCAL NOISE ORDINANCES, INCLUDING POTENTIAL RESTRICTION OF WORK HOURS AS SET FORTH IN THOSE REGULATIONS. CONTRACTOR SHALL MAINTAIN ALL EQUIPMENT IN GOOD OPERATING CONDITIONS AND ALL MOTORS AND ENGINES WILL BE MUFFLED ACCORDING TO MANUFACTURER'S SPECIFICATIONS. ANY FAULTY NOISE SUPPRESSOR WILL BE REPAIRED OR REPLACED, EQUIPMENT WILL NOT BE LEFT RUNNING UNNECESSARILY, AND EXISTING TALL GROWING VEGETATION WILL BE MAINTAINED, TO THE MAXIMUM EXTENT PRACTICABLE, TO SERVE AS A NOISE BUFFER.

CONTRACTOR TO PROVIDED SUFFICIENT CLEAR WORKING DISTANCE TO EXISTING OVERHEAD LINES AVOIDING ANY POWER LINE HAZARD.

FOR TRENCH EXCAVATIONS IF THERE IS INDICATION THAT THERE IS POSSIBILITY FOR GROUND MOVEMENT ADEQUATE PROTECTION IS TO PROVIDED AS PER OSHA REGULATIONS. AS PER OSHA REGULATIONS LADDER/RAMP MUST BE PROVIDED AT A SPACING OF 25 FT FOR TRENCHES THAT ARE DEEPER THAN 4 FEET. SPOILS AND OTHER EQUIPMENT THAT COULD FALL INTO A TRENCH OR EXCAVATION MUST BE KEPT AT LEAST 2 FEET FROM THE EDGE OF A TRENCH UNLESS SECURED IN SOME OTHER FASHION.

THE DISPOSAL OF TREES, BRUSH, OR OTHER DEBRIS MUST BE COORDINATE WITH TETRA TECH SITE SUPERINTENDENT.

IN THE EVENT THAT ARCHAEOLOGICAL MATERIALS, HUMAN REMAINS, OR EVIDENCE OF HUMAN BURIALS ARE ENCOUNTERED DURING CONSTRUCTION, ALL WORK IN THE VICINITY OF THE FIND SHALL BE IMMEDIATELY HALTED, THE FIND PROTECTED FROM FURTHER DAMAGE, AND THE PROJECT MANAGER ADVISED.

THE CONTRACTOR SHALL LIMIT MOVEMENT OF CREWS, VEHICLES, AND EQUIPMENT ON THE RIGHT-OF-WAY AND APPROVED ACCESS ROADS TO MINIMIZE DAMAGE TO PROPERTY AND DISRUPTION OF NORMAL LAND USE ACTIVITY.

THE CONTRACTOR SHALL MAINTAIN ALL FENCES AND GATES, DURING THE CONSTRUCTION PERIOD. ANY FENCE OR GATE DAMAGED DURING CONSTRUCTION WILL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR.

PRIOR TO ANY EXCAVATION, THE CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES.

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
SITE PLAN (1 OF 2)

SEAL AREA

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SAT TO	DATE
CODE I.D. NO.	
SCALE : AS SHOWN	
SPEC. NO.	
CONSTRN. CONTR. NO. N62473-10-D-3211	
NAVFAC DRAWING NO.	
SHEET	OF
SIZE: D	DIS. SH. NO. C-2

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50 0 50 100

1" = 50'

NOTES:

1. FOR WELL DETAILS SEE DRAWING C-5.
2. A TOTAL OF TWELVE SVE WELLS SHALL BE USED FOR VAPOR EXTRACTION. SVE-101I AND SVE-101D ARE EXISTING AND OTHERS SHALL BE INSTALLED DURING CONSTRUCTION PHASE. THE SVE WELLS SHALL BE SCREENED AT INTERMEDIATE DEPTHS (25-30 FT) AND DEEP DEPTHS (40-60 FT). SEE DETAIL NOS. 4 AND 5 ON DRAWING NO. C-5 FOR SVE WELL DETAILS.
3. A TOTAL OF NINE SOIL VAPOR PRESSURE MONITORS SHALL BE USED TO MEASURE TREATMENT SYSTEM VACUUMS. SVPM-2004I AND SVPM-2004D SHALL BE INSTALLED DURING CONSTRUCTION PHASE. SOIL VAPOR PRESSURE MONITORS SVPM-2002S, I & D, SVPM-2003S & I AND SVPM-2007I & D ARE EXISTING BUT MUST BE REDEVELOPED BY REMOVING FILLED SAND (NO. 2) AND INSTALLATION OF PERMANENT FLUSH MOUNT CASING. SEE DETAIL NOS. 6, 7 AND 8 ON DRAWING NO. C-5 FOR SVPM DETAILS.

LEGEND

- OFFSITE SOIL GAS SAMPLE LOCATION
- ONSITE SOIL GAS SAMPLE LOCATION
- SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- SVE CONTAINMENT WELL LOCATION
- FENCE LINE
- PROPERTY LINE
- PROPOSED SOIL VAPOR PRESSURE MONITORING POINT (SVPM)
- SOIL VAPOR EXTRACTION WELLS

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SUPV: CH ENG:
SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
SOUTHWESTDIV DM: HD: HD: FPE: DIR:
OFFICER IN CHARGE
APPROVED DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
SITE PLAN (2 OF 2)

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

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SIZE: D
DIS. SH. NO. C-3

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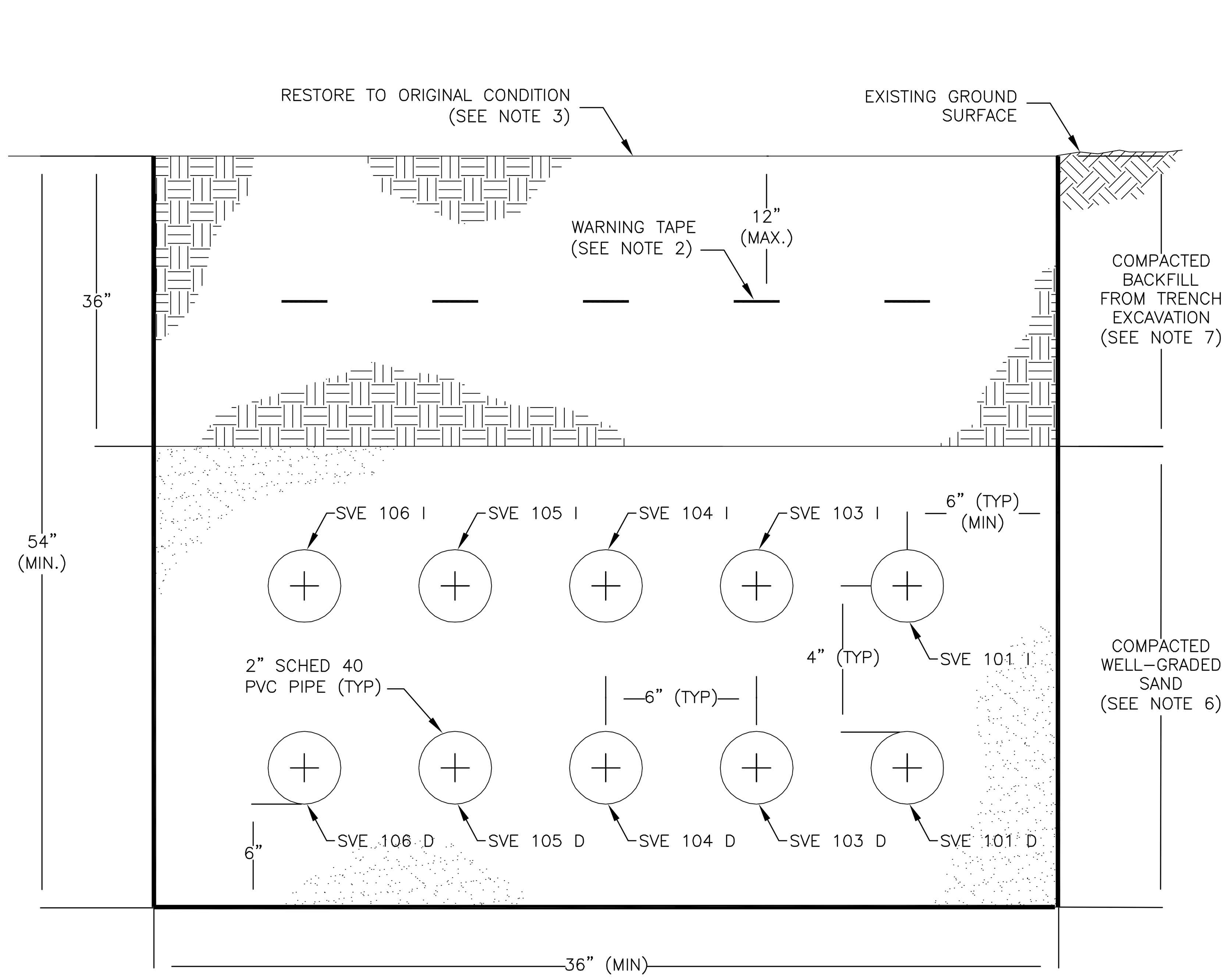
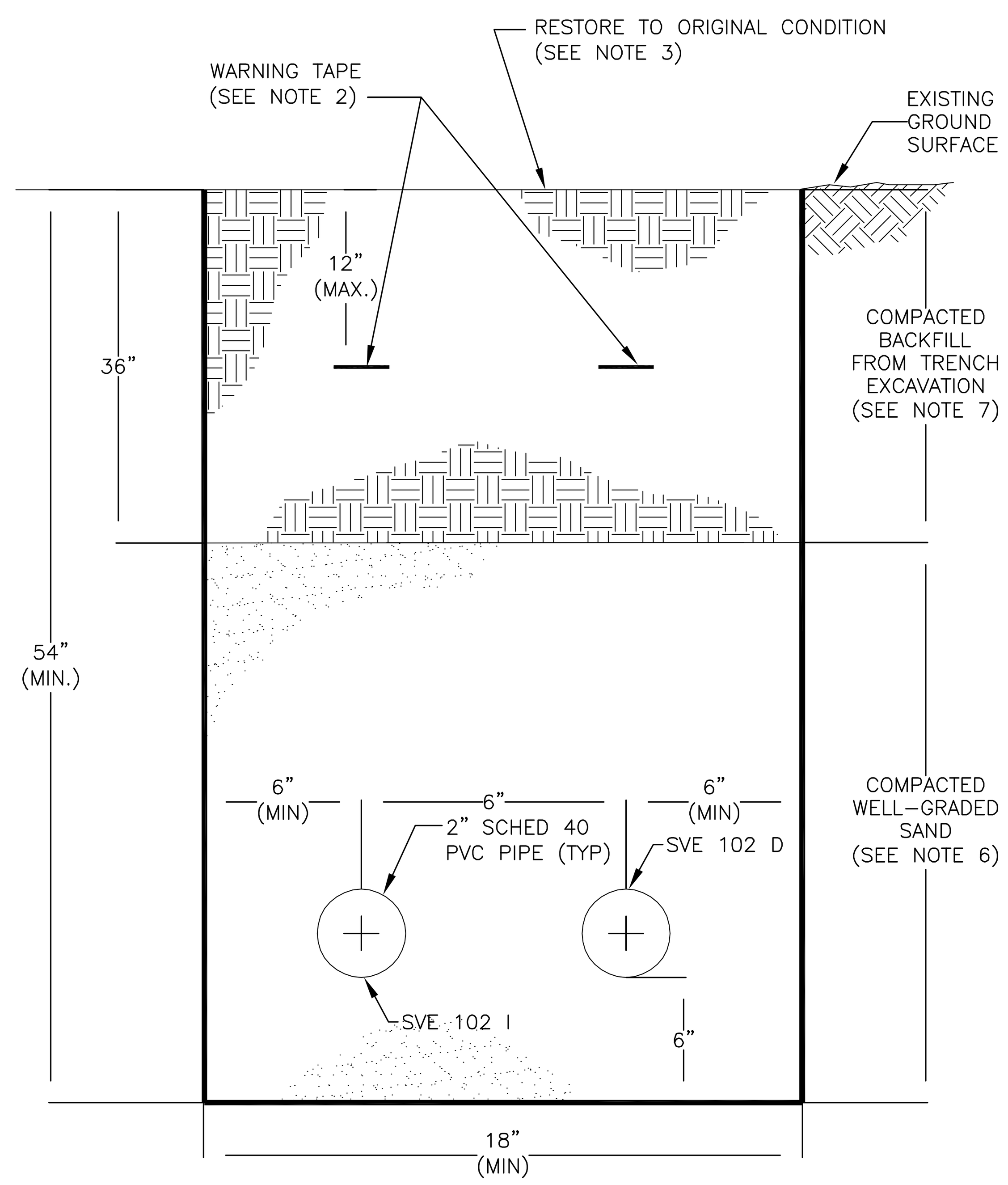


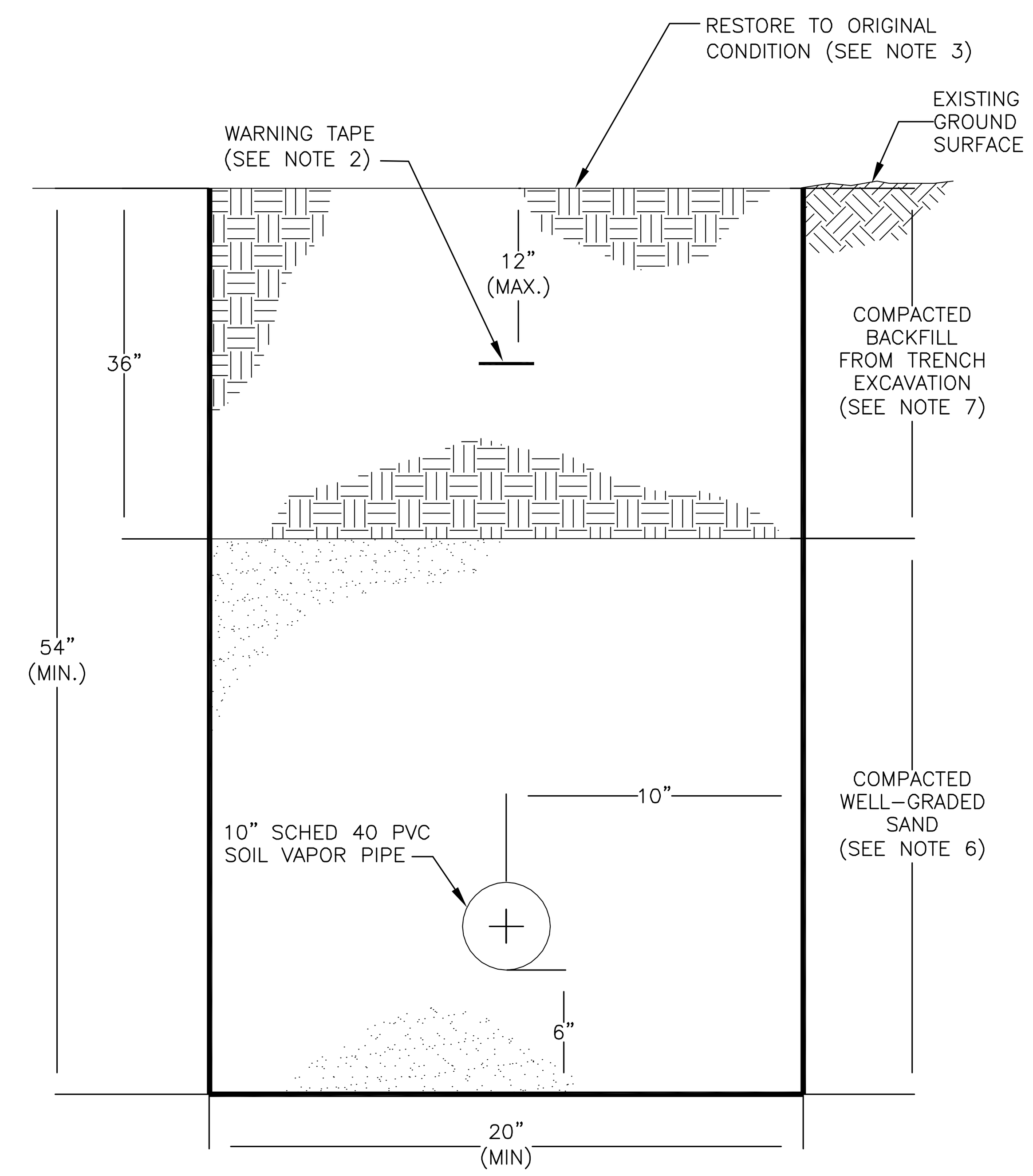
SECTION A (N.T.S.) C-4 EXTRACTION PIPING FROM WELLS SVE 101, 103, 104, 105, 106

SEE NOTE 12



SECTION B (N.T.S.) C-4 EXTRACTION PIPING FROM WELLS SVE 102

SEE NOTE 12



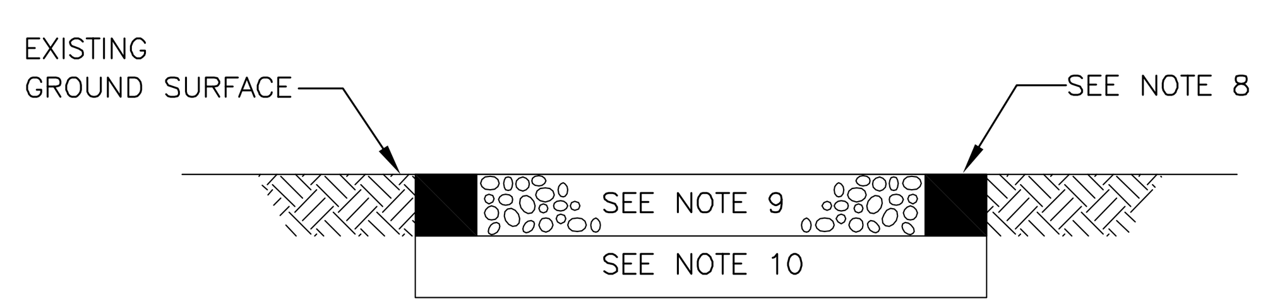
SECTION C (N.T.S.) C-4 SOIL VAPOR PIPE TO TREATMENT BUILDING

SEE NOTE 13

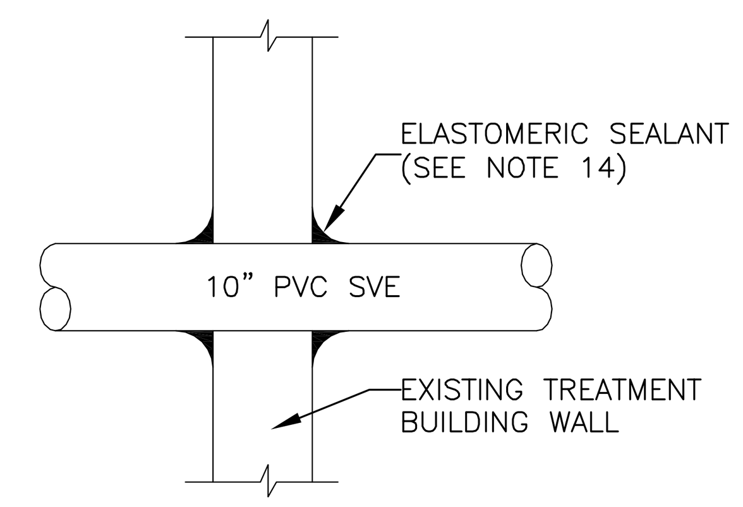
NOTES:

1. FOR MULTIPLE PIPELINES PLACED IN THE SAME TRENCH, SPACE PIPES AT LEAST 6 INCHES APART AS MEASURED FROM CENTERLINE OF PIPE.
2. WARNING TAPE SHALL CONSIST OF A SOLID ALUMINUM CORE, A COATED IMPRINT, AND A REINFORCED PROTECTIVE PLASTIC JACKET BONDED TO THE FOIL CORE. MINIMUM WIDTH SHALL BE 6" AND THE MINIMUM THICKNESS SHALL BE 4.5 MILS.

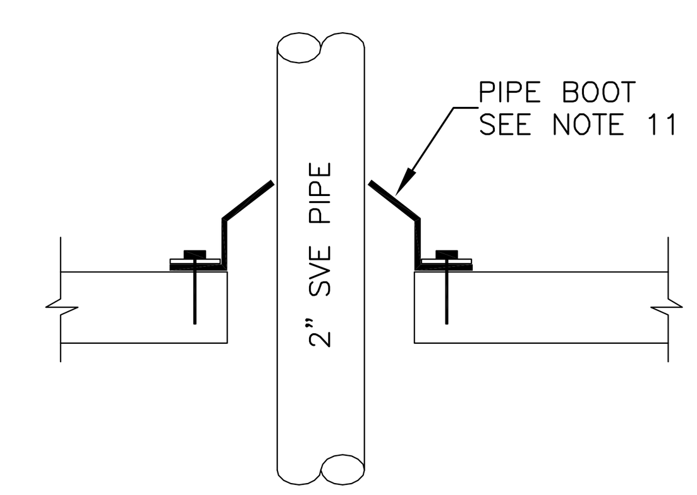
   THE PIPELINE WARNING TAPE SHALL BE YELLOW AND STATE: "CAUTION – BURIED PIPELINE BELOW".
3. CONTRACTOR SHALL PLACE A MINIMUM OF 6 INCHES OF COMPACTED EXISTING SOIL OVER THE PIPE TRENCH EXCEPT WHERE PAVEMENT IS LOCATED. CROWN EXISTING SOIL APPROXIMATELY 1 INCH ABOVE EXISTING GROUND TO ALLOW FOR SETTLEMENT. EXISTING PAVEMENT AND CONCRETE REMOVED DURING CONSTRUCTION SHALL BE REPLACED IN KIND.
4. FOR UTILITY CONTACT INFORMATION, SEE DRAWING C-1.
5. EXCAVATED CONCRETE, ASPHALT, AND ANY OTHER UNSUITABLE MATERIAL FROM THE TRENCH SHALL BE DISPOSED OFF-SITE.
6. THE WELL-GRADED SAND SHALL BE IMPORTED, CLASSIFIED AS SW IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM. A CLEAN FILL CERTIFICATION IS REQUIRED FROM SUPPLIER.
7. THE COMPACTED BACKFILL FROM TRENCH EXCAVATION SHALL BE A SUITABLE MATERIAL WITH A MAXIMUM SIZE NOT TO EXCEED 3 INCHES AND NOT MORE THAN 12% BY WEIGHT GREATER THAN 2 INCHES.
8. PLACE 6"x6" (NOMINAL) PRESSURE TREATED LUMBER AT PERIMETER OF GRAVEL BED.
9. PLACE 6" (NOMINAL) OF CLEAN NY STATE #2 GRAVEL. GRAVEL TO EXTEND 2.0 FT BEYOND BUILDING WALLS IN EACH DIRECTION. RECYCLED CONCRETE IS NOT ACCEPTABLE.
10. EXCAVATE TO A MINIMUM DEPTH OF 1.0 FT BELOW EXISTING GROUND SURFACE. SCARIFY AND RECOMPACT EXCAVATED SOIL IN 6" LOOSE LIFTS TO REQUIRED ELEVATION. COMPACT TO A MINIMUM OF 95% RELATIVE COMPACTION WITH RESPECT TO THE MAXIMUM DRY DENSITY AS DETERMINAL BY ASTM D698.
11. PIPE BOOTS TO BE MECHANICALLY SECURED TO BUILDING FLOOR.
12. MAINTAIN EXTRACTION PIPELINE SLOPE TOWARDS WELL LOCATIONS AT 0.1%(MIN).
13. SOIL VAPOR TRANSFER PIPELINE BETWEEN MONITORING STATION AND TREATMENT BUILDING TO HAVE 0.1%(MIN) SLOPE TOWARDS CONDENSATE CLEAN-OUT PORTS.
14. PIPE ABOVE GROUND, OUTSIDE SHALL BE INSULATED.



SECTION D (N.T.S.) C-4 GRAVEL BASE FOR FLOW MONITORING STATION



DETAIL 1 (N.T.S.) 10" PVC PIPE PENETRATION THRU TREATMENT BUILDING WALL



DETAIL 2 (N.T.S.) 2" PVC PIPE PENETRATION THRU MONITORING BUILDING FLOOR

EROSION AND SEDIMENT CONTROL NOTES:

1. TEMPORARY EROSION CONTROL DEVICES SHALL BE INSTALLED AS SOON AS PRACTICABLE AND APPROPRIATE. EROSION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO ANY EXCAVATION OR FILLING OPERATIONS AND INSTALLATION OF PROPOSED STRUCTURES OR UTILITIES. THEY SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED AND THE AREA IS STABILIZED. ADDITIONALLY, NO SITE PREPARATION WORK SHALL BE UNDERTAKEN UNTIL ALL REQUIRED EROSION CONTROL MEASURES HAVE BEEN INSTALLED.
2. SILTATION PREVENTION MEASURES, SUCH AS SILT FENCING AND HAY BALES, SHALL BE INSTALLED AND MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT, TO PREVENT MOVEMENT OF SILT FROM THE SITE AND INTO ANY CATCH BASIN, WATERCOURSE, STREAM, WATER BODY, OR WETLAND. THEY SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED AND THE AREA IS STABILIZED.
3. ALL DISTURBED AREAS WHERE SOIL WILL BE TEMPORARILY EXPOSED OR STOCKPILED FOR LONGER THAN ONE DAY SHALL BE CONTAINED BY A CONTINUOUS LINE OF STAKED HAY BALES PLACED AROUND THE STOCKPILE. TARPS ARE AUTHORIZED TO SUPPLEMENT THESES APPROVED METHODS. EXCESS SOILS MUST BE SPREAD AT LOCATIONS DESIGNATED BY TETRA TECH SITE SUPERINTENDENT.
4. ALL AREAS OF SOIL DISTURBANCE RESULTING FROM THIS PROJECT SHALL BE STABILIZED IMMEDIATELY. ALL TRENCHES MUST BE BACKFILLED AS SOON AS PRACTICAL. (TRENCHES MUST NOT BE LEFT OPEN FOR LONG DURATIONS. NO STORMWATER IS ALLOWED TO ACCUMULATE OR ENTER INTO THE TRENCHES.
5. WASTE WATERS FROM CONSTRUCTION OPERATIONS SHALL NOT ENTER THE EXISTING STORM SYSTEMS. ANY SUCH WASTE WATERS DISCHARGED INTO STORM SYSTEMS SURFACE WATERS SHALL BE ESSENTIALLY FREE OF SETTLEABLE MATERIAL. SETTLEABLE MATERIAL IS DEFINED AS THAT MATERIAL THAT WILL SETTLE FROM THE WATER BY GRAVITY DURING A 1-HOUR QUIESCENT PERIOD.
6. ALL VEHICLES EXITING THE WORK AREA MUST PASS THROUGH A TIRE WASH/DECONTAMINATION ZONE, WHERE VISIBLE DIRT WILL BE REMOVED FROM THE TIRES AND OTHER PARTS OF THE VEHICLE AS NECESSARY.
7. THE CONTROL MEASURES TO BE USED DURING THE PROJECT ARE SUMMARIZED BELOW:
   a. SILT FENCE: SILT FENCE WILL BE INSTALLED ALONG EARTH DISTURBANCES WHICH HAVE THE POTENTIAL TO ERODE AND CREATE SILTATION..
   b. HAY BALES: HAY BALES WILL BE INSTALLED AROUND SOIL STOCKPILES TO PREVENT SEDIMENTS FROM LEAVING THE STOCKPILE AREA.
   c. MULCHING: MULCHING WILL BE USED AS A TEMPORARY EROSION CONTROL MEASURE IN AREAS OF DISTURBANCES.
   d. DIVERSION BERMS: DIVERSION BERMS INTERCEPT AND DIVERT RUNOFF WATER IN PROPER MANNER, HENCE DIVERTING THE RUNOFF AWAY FROM DISTURBED AREAS/TRENCHES.
8. ALL EROSION AND SEDIMENT CONTROL DEVICES WILL BE IN PLACE AT THE END OF EACH WORKING DAY. THE CONTROL DEVICES WILL BE INSPECTED AND MAINTAINED AS PRESCRIBED BELOW.
   a. ALL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY RUNOFF-PRODUCING RAINFALL, AND NO LESS THAN ONCE EVERY WEEK. ANY NECESSARY REPAIRS WILL BE MADE WITHIN 48 HOURS TO MAINTAIN ALL PRACTICES AS DESIGNED.
   b. SEDIMENT ACCUMULATIONS AT THE SILT FENCE WILL BE REMOVED WHEN THE DEPTH OF THE SEDIMENT AT THE SILT FENCE REACHES 0.5 FT. REPAIRS WILL BE MADE WITHIN 48 HOURS TO THE FENCE TO MAINTAIN IT AS A BARRIER.
   c. THE STABILIZED CONSTRUCTION ENTRANCES/DECONTAMINATION ZONES WILL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT THE TRACKING OF SEDIMENTS ONTO PUBLIC RIGHT-OF-WAY OR ROADS. PERIODICALLY, THE ENTRANCE WILL BE TOP DRESSED WITH ADDITIONAL AGGREGATES TO MAINTAIN THE 6 INCH THICKNESS. ANY SEDIMENT WHICH IS SPILLED, DROPPED OR WASHED ONTO THE PUBLIC RIGHT-OF-WAY SHALL BE REMOVED AT THE END OF EACH WORKING DAY.
   d. ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES WILL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL MAINTENANCE AND REPAIR WILL BE CONDUCTED IN ACCORDANCE WITH THE PRACTICE SELECTED.
9. ALL TEMPORARY EROSION AND SEDIMENT CONTROL PRACTICES WILL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY PRACTICES ARE NO LONGER NEEDED. TRAPPED SEDIMENT WILL BE REMOVED OR STABILIZED ON SITE.

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NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
MISCELLANEOUS SECTIONS AND DETAILS

SEAL AREA

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SAT TO

CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.
SHEET OF
SIZE: D
DIS. SH. NO. C-4

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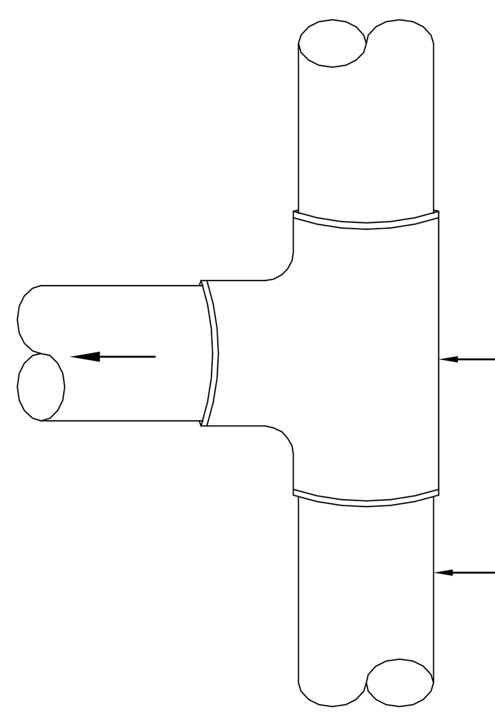
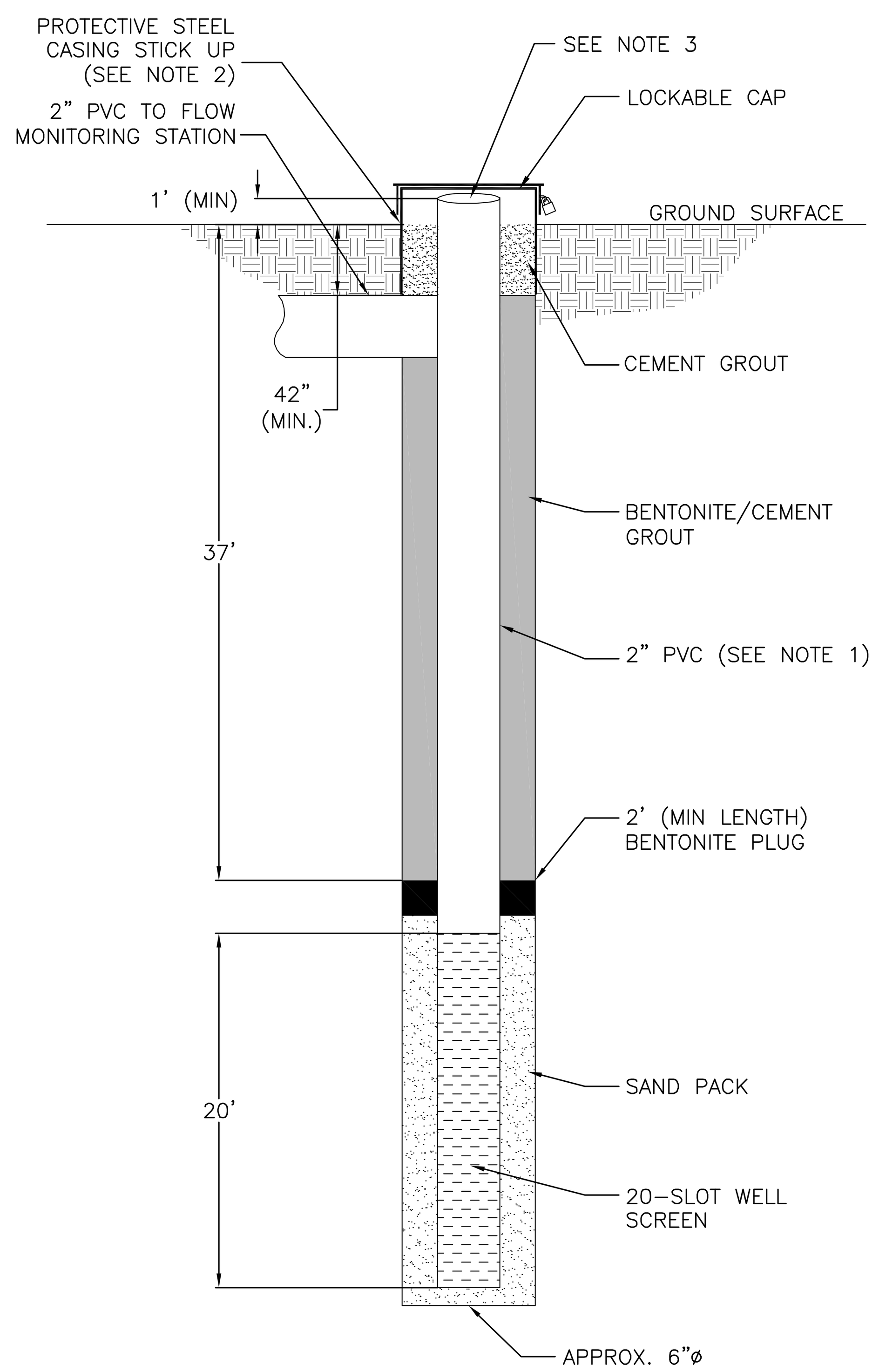
NOTES:

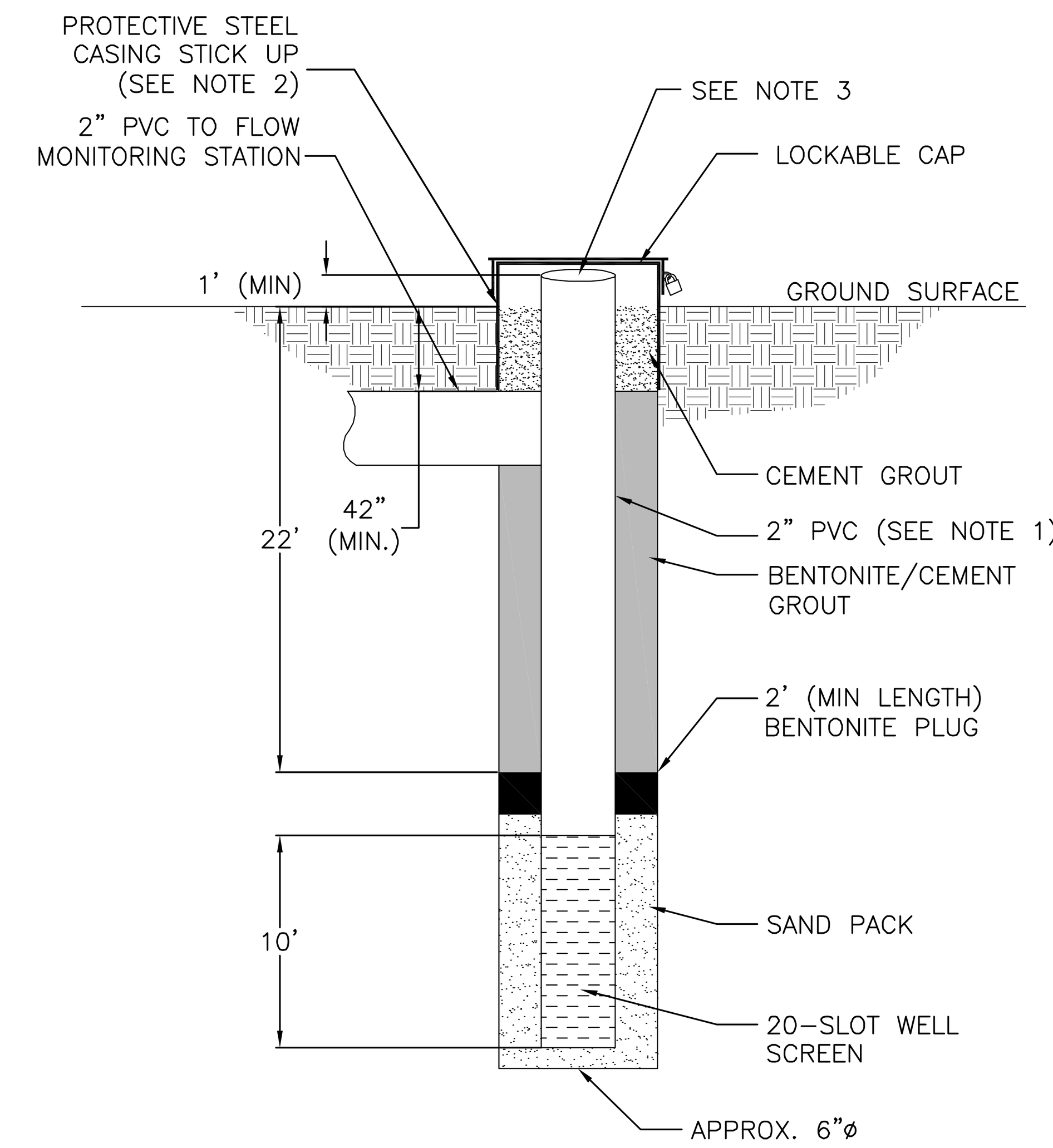
1. RISER PIPE TO BE 2" SCHED 40 PVC. SEE DETAIL 3 FOR CONNECTION TO TRANSFER LINE.
2. PROTECTIVE STEEL CASING TO HAVE LOCKABLE CAP.
3. WELL RISER CAP TO BE LOCKING PLUG STYLE.
4. PRESSURE MONITOR RISER TO BE 1" SCHED 40 PVC.
5. SOIL VAPOR TRANSFER PIPELINE BETWEEN MONITORING STATION AND TREATMENT BUILDING TO HAVE 0.1% SLOPE TOWARDS CONDENSATE CLEAN-OUT PORTS.
6. MINIMUM APRON IS 4" CONCRETE IS 4 KSI WITH 6X6 WWF. PITCH APRON AWAY FROM MANHOLE AT APPROXIMATLEY 2%.



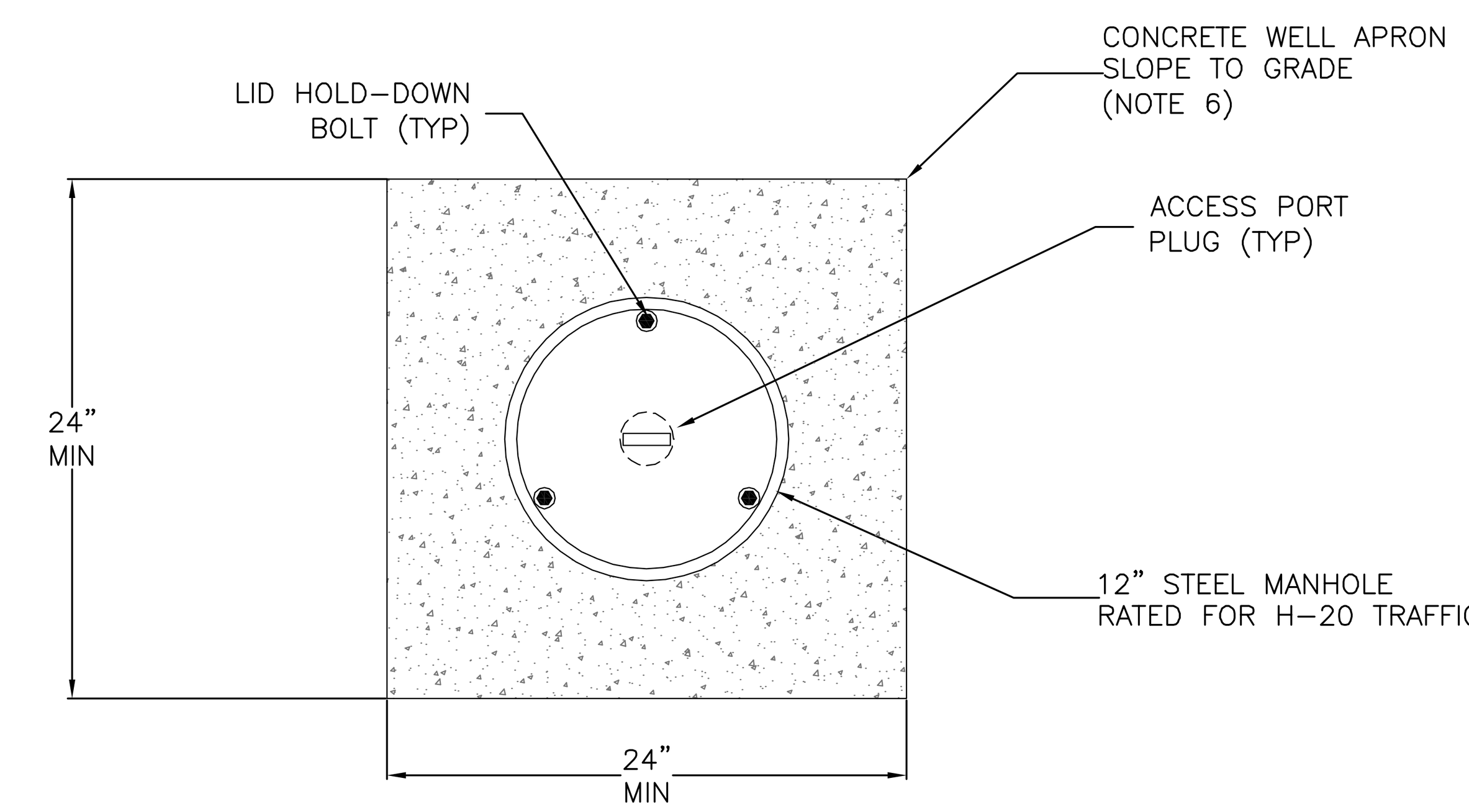
DETAIL 3 TEE CONNECTION
(N.T.S.)



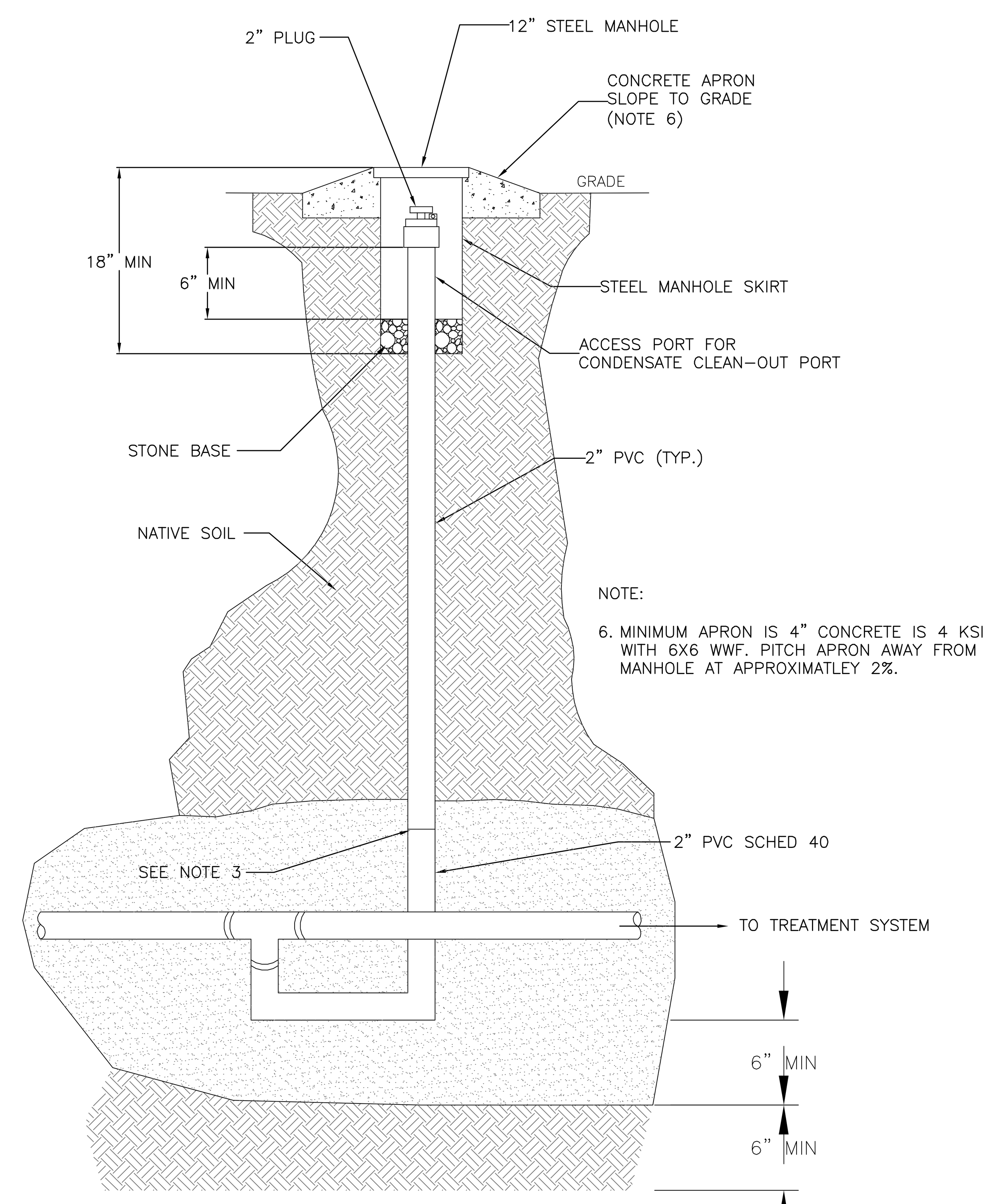
DETAIL 4 DEEP SOIL VAPOR EXTRACTION WELL DETAIL
(N.T.S.)



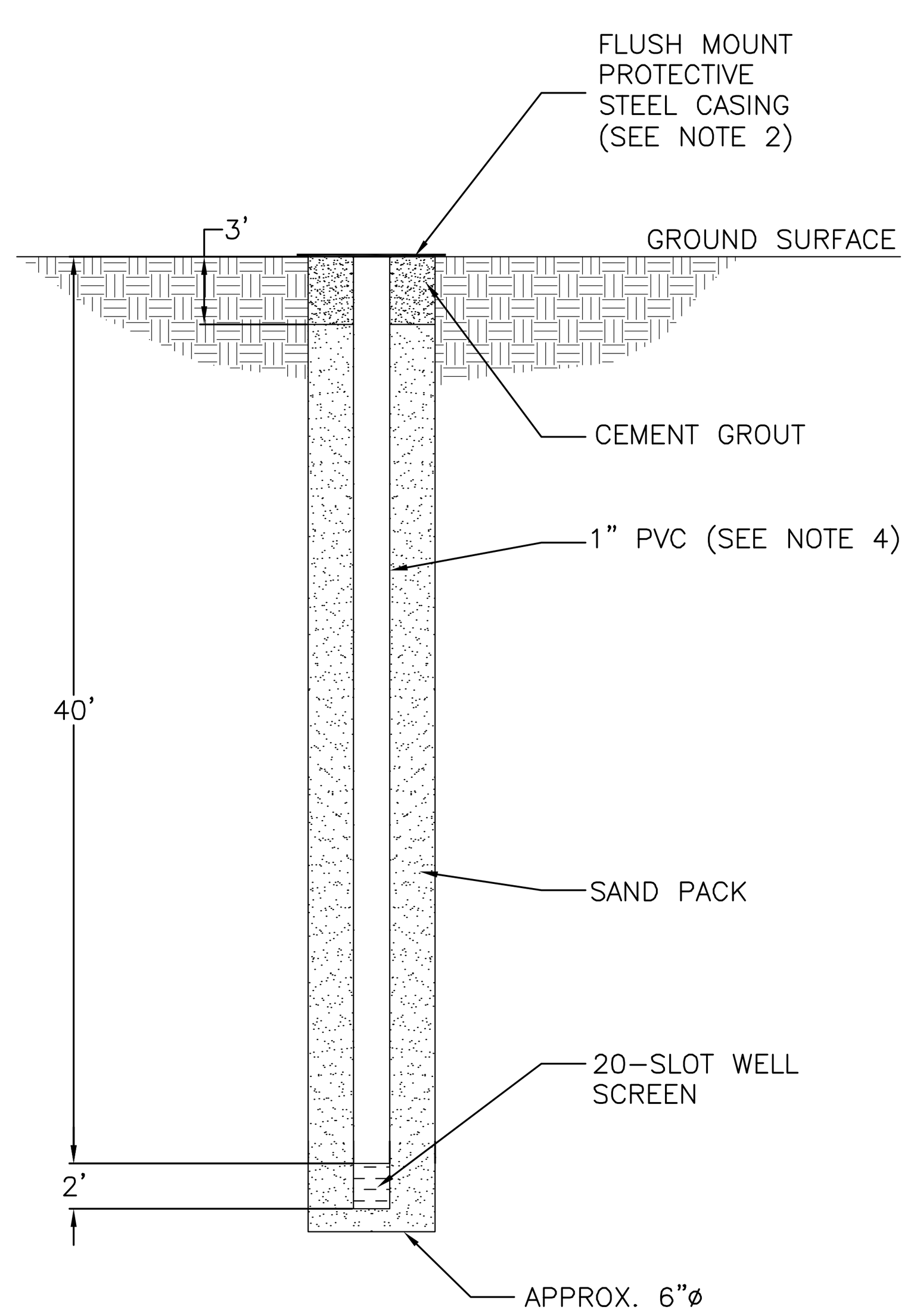
DETAIL 5 INTERMEDIATE DEPTH SOIL VAPOR EXTRACTION WELL DETAIL
(N.T.S.)



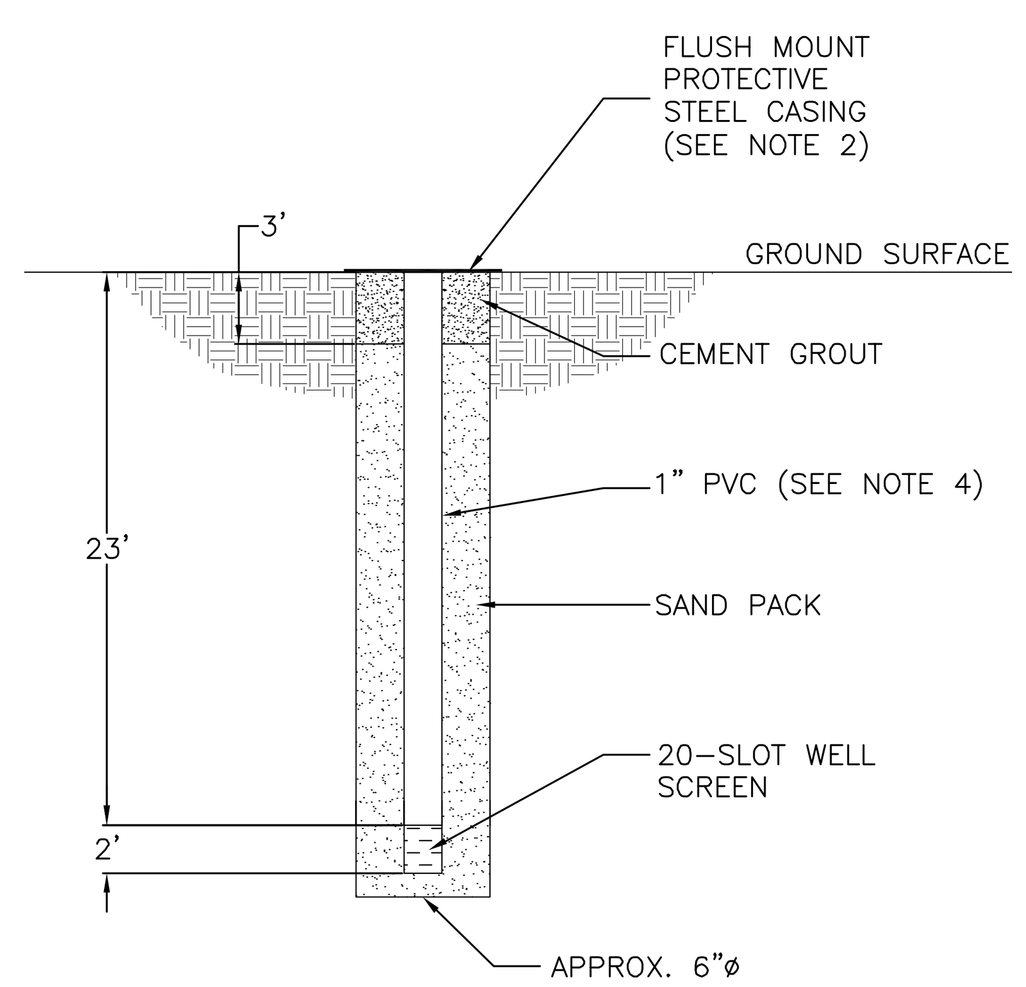
DETAIL 10 CONDENSATE CLEAN-OUT PORT PLAN VIEW (TYP.)
(N.T.S.)



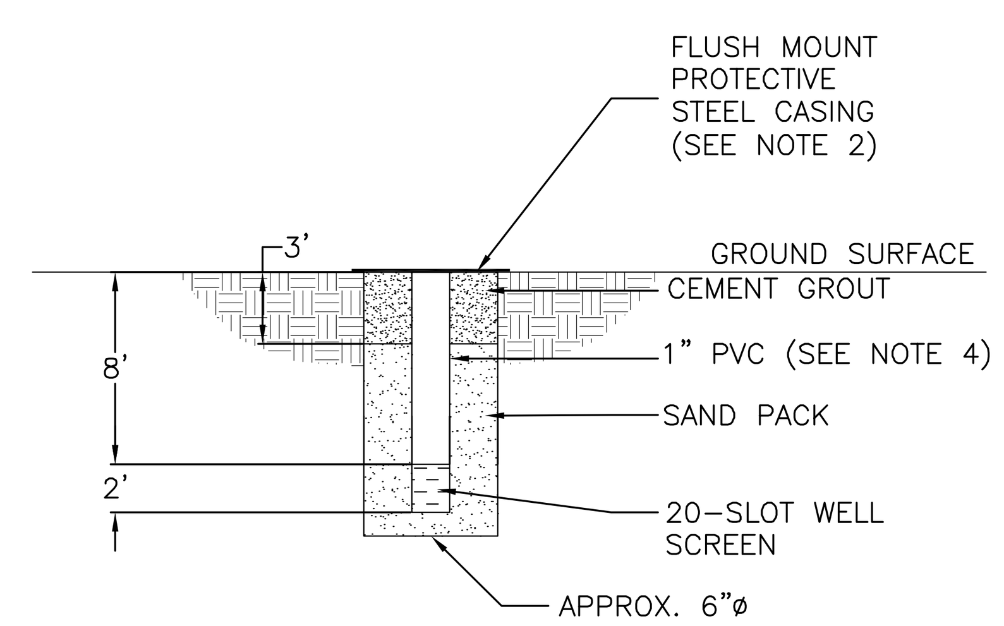
DETAIL 9 CONDENSATE CLEAN-OUT PORT SECTION VIEW (TYP.)
(N.T.S.)



DETAIL 6 DEEP SOIL VAPOR PRESSURE MONITOR
(N.T.S.)



DETAIL 7 INTERMEDIATE DEPTH SOIL VAPOR PRESSURE MONITOR
(N.T.S.)



DETAIL 8 SHALLOW SOIL VAPOR PRESSURE MONITOR
(N.T.S.)

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NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
WELL SECTIONS AND DETAILS

SEAL AREA

JEBBY ABRAHAM VARUGHESE, P.E.
NYPE NO. 087171
EXPIRATION DATE 6/30/2012

SCALE : AS SHOWN
CONSTRN. CONTR. NO. N62473-10-D-3211
SIZE: D
DIS. SH. NO. C-5

VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- BALL VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- KNIFE GATE VALVE
- BP BACKFLOW PREVENTER
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- SP SAMPLE PORT
- FLEXIBLE HOSE
- FLEXIBLE CONNECTOR
- CONSERVATION VENT
- BASKET TYPE STRAINER
- Y-TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BF BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- FLANGE
- UNION
- QUICK DISCONNECT COUPLING
- GAUGE SEAL
- DAMPER
- FLAME ARRESTOR

VALVE OPERATOR SYMBOLS

- S SOLENOID
- M MOTOR, ELECTRIC
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS – FLOW

- ORIFICE PLATE
- PITOT TUBE
- AVERAGING PITOT TUBE
- VENTURI OR FLOW TUBE
- TOTALIZING FLOWMETER
- FLUME
- WEIR
- TURBINE OR PROPELLER TYPE METER
- MAGNETIC FLOW METER
- ROTAMETER

EQUIPMENT SYMBOLS

- SUBMERSIBLE SUMP PUMP
- PUMP
- HAND OPERATED DIAPHRAGM PUMP
- M MIXER
- BLOWER
- FLOW DAMPENER
- VSD VARIABLE SPEED DRIVE
- PARTICULATE FILTER
- AIR FILTER/SILENCER

GENERAL INSTRUMENT AND HMI SYMBOLS

ONE VARIABLE TWO VARIABLES

- LOCALLY MOUNTED
- PANEL MOUNTED
- REAR-OF-PANEL MOUNTED
- I INTERLOCK (FOR LOGIC DESCRIPTION SEE SPEC. 13600)
- P PURGE
- PLC PROGRAMMABLE LOGIC CONTROLLER
- LSL PERSONAL COMPUTER SOFT SWITCH
- PERSONAL COMPUTER HUMAN MACHINE INTERFACE
- PERSONAL COMPUTER
- A ALARM

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- HEAT TRACE
- CONNECTION TO PROCESS, MECHANICAL LINK OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING
- DATA HIGHWAY SIGNAL

INSTRUMENT IDENTIFICATION TABLE

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		AUTO
B	BURNER FLAME				
C	CONDUCTIVITY		CLOSE	CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOWRATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL SWITCH	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY				MIDDLE
N					
O	OPEN		ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST)		
Q	QUANTITY OR EVENT	INTEGRATE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE ACTUATE	

PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
BA	BUTYL ALCOHOL
CF	CHEMICAL FEED
CO2	CARBON DIOXIDE
CR	CONDENSATE RETURN
CWR	CHILLED WATER RETURN
CWS	CHILLED WATER SEND
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
IA	INSTRUMENT AIR
P	PRODUCT
PROP	PROPANE
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
STM	STEAM SUPPLY
TF	TOTAL FLUIDS
V	VAPOR

PIPING MATERIAL ABBREVIATIONS

ABS	ACRYLONITRILE BUTADIENE STYRENE
AL	ALUMINUM
CPVC	CHLORINATED POLYVINYL CHLORIDE
CS	CARBON STEEL
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
FLEX	FLEXIBLE PIPE/DUCT/TUBING
GALV	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
NEO	NEOPRENE HOSE
PE	POLYETHYLENE
PP	POLYPROPYLENE
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE/TUBING
TEF	TEFLON TUBING
VCP	VITRIFIED CLAY PIPE

PROCESS PIPING IDENTIFICATION

PROCESS PIPE

XXX-YY-Z

- PIPE CONTENTS
- PIPING MATERIAL
- PIPE DIAMETER (INCHES)

INSTRUMENT AND HMI IDENTIFICATION

INSTR LOOP

FIT-100A

- SUFFIX
- TAG NUMBER
- SUCCEEDING LETTERS
- FIRST LETTER

FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN
FC	FAIL CLOSED
FL	FAIL LOCKED
FO	FAIL OPEN
HOA	HAND-OFF-AUTOMATIC
I/I	CURRENT-TO-CURRENT
I/P	CURRENT-TO-PNEUMATIC
LCP	LOCAL CONTROL PANEL
LEL	LOWER EXPLOSIVE LIMIT
LR	LOCAL-REMOTE
MI	MOTOR RUN INDICATION
OC	OPEN-CLOSE
OO	ON-OFF (MAINTAINED)
ORP	OXIDATION REDUCTION POTENTIAL
OSC	OPEN-STOP-CLOSE (MOMENTARY)
SI	MOTOR SPEED INDICATION
SS	START-STOP (MOMENTARY)
↑	HIGH SELECT
↓	LOW SELECT
$\sqrt{}$	SQUARE ROOT
Σ	ADD OR TOTALIZE

DRAFT FINAL DESIGN
NOT FOR CONSTRUCTION

TETRA TECH ENGINEERING CORPORATION PC

DSGN: BK DR: BMV CHK: SP
SUPV: CH ENG:
SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
SOUTHWESTDIV DM: HD:
HD:
FPE: DIR:
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DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
PIPING AND INSTRUMENTATION LEGEND
APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

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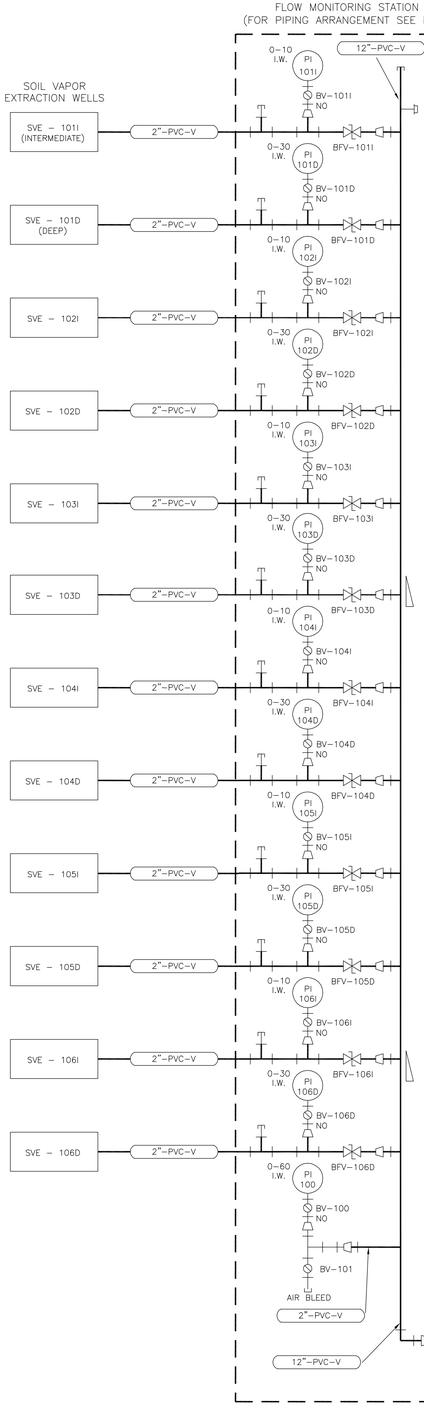
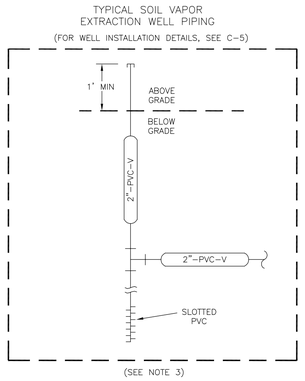
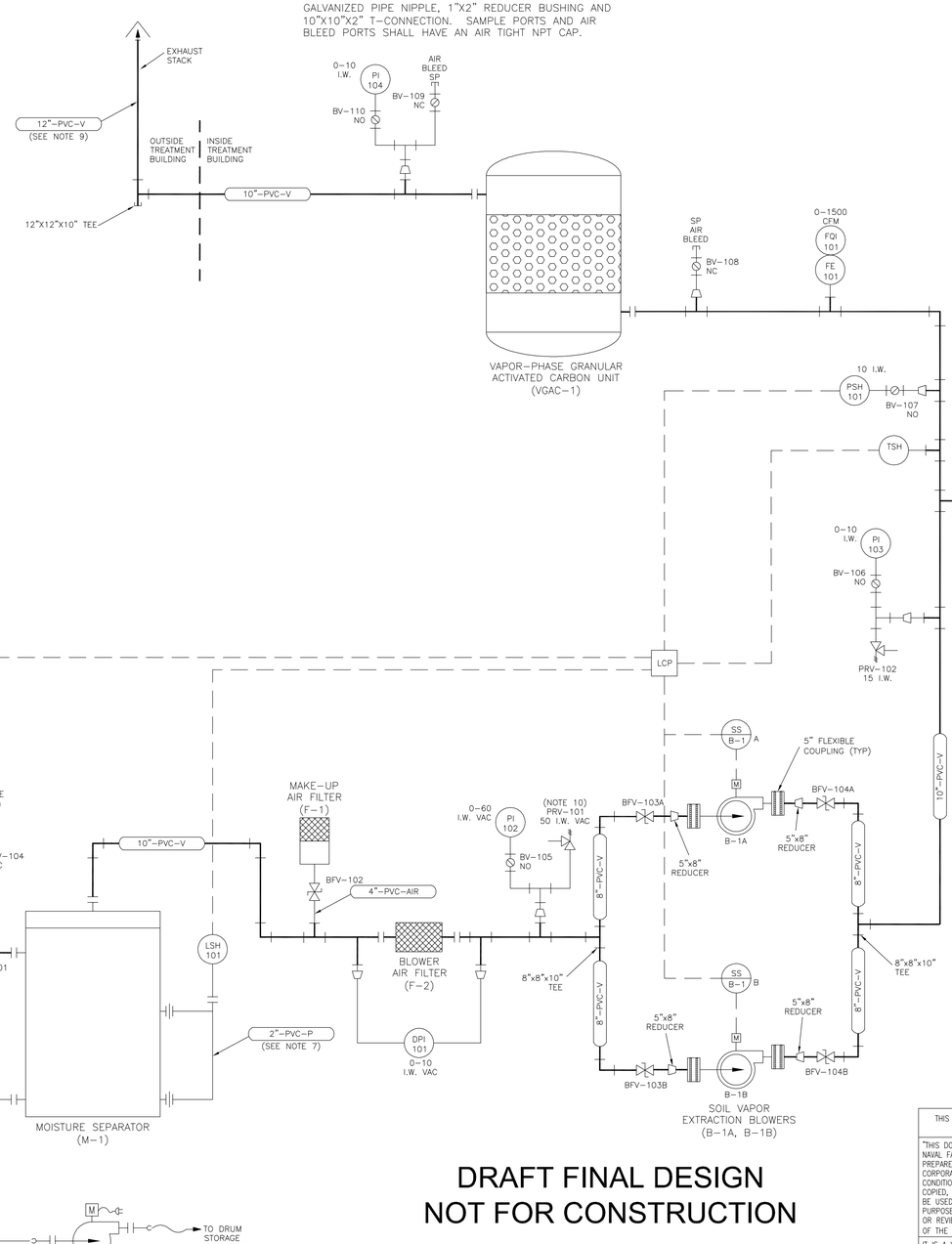




NOTES:

1. THE BASIS OF DESIGN AND REMEDIAL OBJECTIVES FOR THE SVE CONTAINMENT SYSTEM CAN BE FOUND IN DETAIL IN "DESIGN ANALYSIS REPORT FOR SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM" (TTNUS, APRIL 2009)
2. FLOW MONITOR PORTS SHALL BE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF T-CONNECTION. FLOW MONITOR PORTS SHALL HAVE AN AIR TIGHT NPT CAP.
3. ALL WELL HEAD ASSEMBLIES ARE SIMILAR CONSTRUCTION. SEE DRAWING C-5 FOR INSTALLATION DETAILS.
4. ALL UNDERGROUND PIPING SHALL SLOPE TOWARD CONDENSATE CLEANOUT PORTS. CONDENSATE CLEANOUT PORTS SHALL BE LOCATED AS IDENTIFIED ON DRAWING C-2. ADDITIONAL PORTS MAY BE NECESSARY, OR THE PROPOSED MAY REQUIRE RELOCATION AT LOW POINTS IN PIPE ROUTE. CLEANOUT PORTS SHALL HAVE AN AIR TIGHT CAP. SEE DRAWING C-5 FOR INSTALLATION DETAILS.
5. SAMPLE PORT AND AIR BLEED PORTS SHALL BE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 1" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION. SAMPLE PORTS AND AIR BLEED PORTS SHALL HAVE AN AIR TIGHT NPT CAP.
6. PRESSURE INDICATORS SHALL BE 1/2" NPT AND CONNECTED TO THE MAIN PROCESS PIP'ING BY USE OF 1/2" NPT GALVANIZED PIPE NIPPLE, 1/2" NPT BRASS BALL VALVE, 1/2" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND 10"X10"X2" T-CONNECTION.
7. SIGHT TUBE SHALL BE CONSTRUCTED OF 2" DIAMETER CLEAR PVC PIPE.
8. ALL PIPING SHALL BE SCHEDULE 40 PVC, UNLESS OTHERWISE NOTED.
9. EXHAUST STACK SHALL BE CONSTRUCTED OF 12" SCHEDULE 80 PVC AND EXTEND 5' ABOVE ROOF.
10. INSTRUMENTS SHALL HAVE AN ADJUSTABLE RANGE BETWEEN 0-75 I.W.
11. ABOVE GROUND PIPING THAT IS OUTSIDE SHALL BE INSULATED, INCLUDING PIPING WITHIN THE FLOW MONITORING STATION.



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TETRA TECH ENGINEERING CORPORATION PC

DSGN. BK DR. BMV CH. ENG. (TITLE) (DATE)
CHK. SP SUPV. SUBMITTED BY: (FROM MEMBER) SOUTHWESTDW HD: HD: DIR: PIC: OFFICER IN CHARGE APPROVED DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
PIPING AND INSTRUMENTATION DIAGRAM

NAVAL FACILITIES ENGINEERING COMMAND
NAVFAC ENGINEERING COMMAND, MID-ATLANTIC
EFANE FOR COMMANDER, NAVFAC
APPROVED DATE

SEAL AREA

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO DATE

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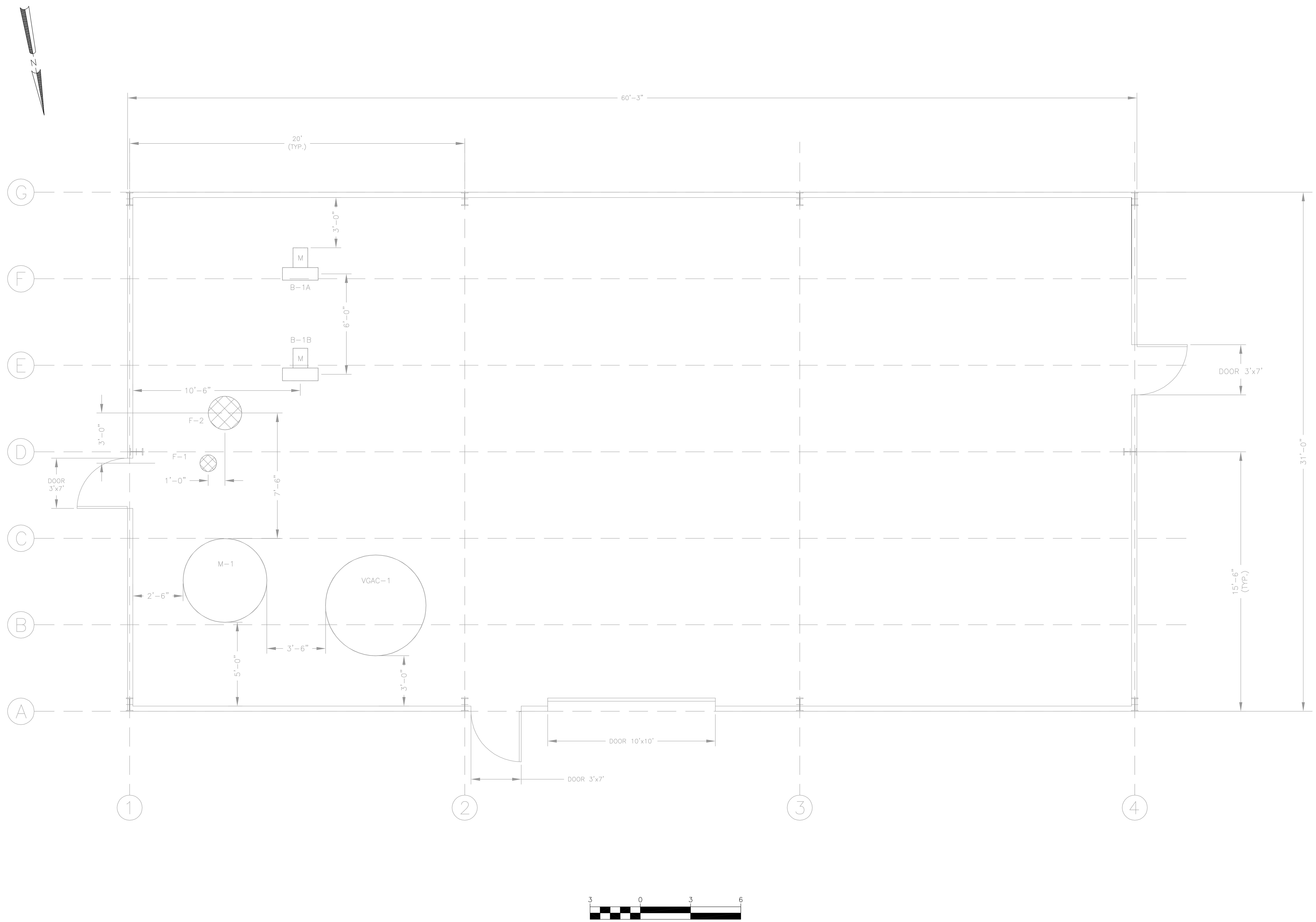
NOTES:

1. ALL MAN DOORS AND OVERHEAD DOORS ARE EXISTING. MAN DOORS ARE APPROXIMATELY 7'X3'. OVERHEAD DOOR IS APPROXIMATELY 10'X10'.



PROCESS EQUIPMENT LIST		
ITEM NUMBER	NUMBER REQUIRED	NAME/DESCRIPTION
M-1	1	MOISTURE SEPARATOR -CONFIGURATION: VERTICAL, CLYINDRICAL -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, PAINT EXTERIOR COATING -CAPACITY: 250 GALLON CONDENSATE COLLECTION -DIMENSIONS: 5 FT DIA X 7 FEET HT, 1,000 GALLON
F-1	1	MAKE-UP AIR FILTER -CONFIGURATION: INTAKE FILTER/SILENCER COMBINATION HOUSING -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 500 CFM AT 20 IW, 4 INCH FLANGED CONNECTION
F-2	1	BLOWER AIR FILTER -CONFIGURATION: INLINE VACUUM SERVICE FILTER -MATERIAL OF CONSTRUCTION: CARBON STEEL, CORROSION RESISTANCE COATING -CAPACITY: 1,200 CFM AT 35 IW, 10 INCH FLANGED CONNECTION
B-1A, B-1B	2	SOIL VAPOR EXTRACTION BLOWER -CONFIGURATION: HORIZONTAL CENTRIFUGAL -RATING: 600 CFM AT 35 IW -MOTOR: 7.5 HP, 460V, 3PH, 60HZ, ODP
VGAC-1	1	VAPOR-PHASE GRANULAR ACTIVATED CARBON -CONFIGURATION: VERTICAL, CYLINDRICAL -MATERIAL OF CONSTRUCTION: CARBON STEEL, EPOXY INTERIOR COATING, PAINT EXTERIOR COATING -RATING: 600 CFM AT 3 IW, 1,200 CFM AT 6 IW -CAPACITY: 5,000 LB CARBON -DIMENSIONS: 6 FT DIA X 8 FT HT

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DEPARTMENT OF THE NAVY — NAVAL FACILITIES ENGINEERING COMMAND

NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT — BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA

SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM

PROCESS EQUIPMENT LAYOUT AND DETAILS

APPROVED — DATE — EFANE FOR COMMANDER, NAVFAC

SEAL AREA

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
EXPIRATION DATE 6/30/2011

SAT TO — DATE

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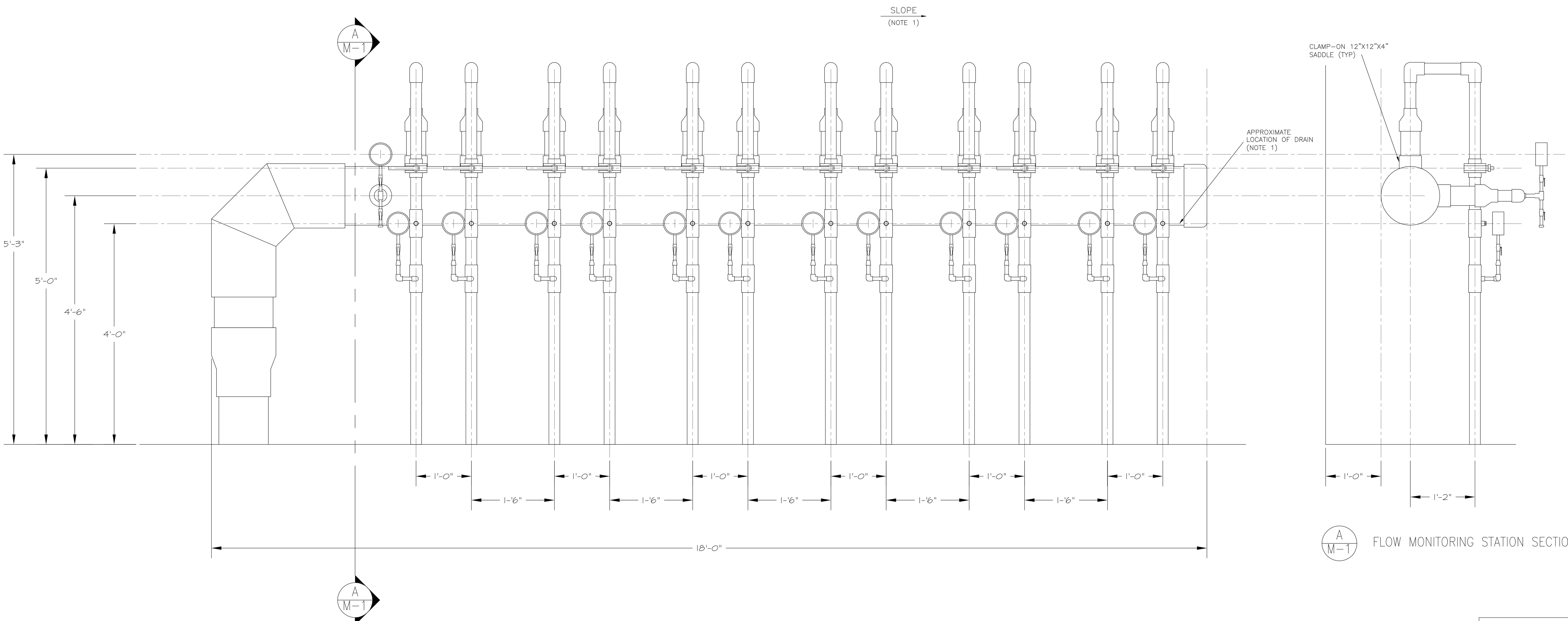
NOTES:

1. 12" PVC HEADER PIPE SHALL BE SLOPED 1" FOR EVERY 10' OF PIPE LENGTH AWAY FROM TURNDOWN. A THREADED 1/2" NPT PLUG SHALL BE INSTALLED ON THE LOW SIDE OF THE HEADER PIPE FOR DRAINING.
2. SAMPLE PORT AND AIR BLEED PORTS SHALL BE 1" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1" NPT GALVANIZED PIPE NIPPLE, 1" NPT BRASS BALL VALVE, 1" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND T-CONNECTION. SAMPLE PORTS AND AIR BLEED PORTS SHALL HAVE AN AIR TIGHT NPT CAP.
3. PRESSURE INDICATORS SHALL BE 1/2" NPT AND CONNECTED TO THE MAIN PROCESS PIPING BY USE OF 1/2" NPT GALVANIZED PIPE NIPPLE, 1/2" NPT BRASS BALL VALVE, 1/2" NPT GALVANIZED PIPE NIPPLE, 1"X2" REDUCER BUSHING AND T-CONNECTION.
4. FOR ADDITIONAL PIPING DETAILS INCLUDING SIZES AND MATERIALS, SEE DRAWING P-2.
5. ALL PIPING WITHIN FLOW MONITORING STATION WILL BE INSULATED.



A / M-1 FLOW MONITORING STATION SECTION

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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
FLOW MONITORING STATION PIPING ARRANGEMENT

SEAL AREA

GEOFFREY P. KING, P.E.
NYPE NO. 080339-1
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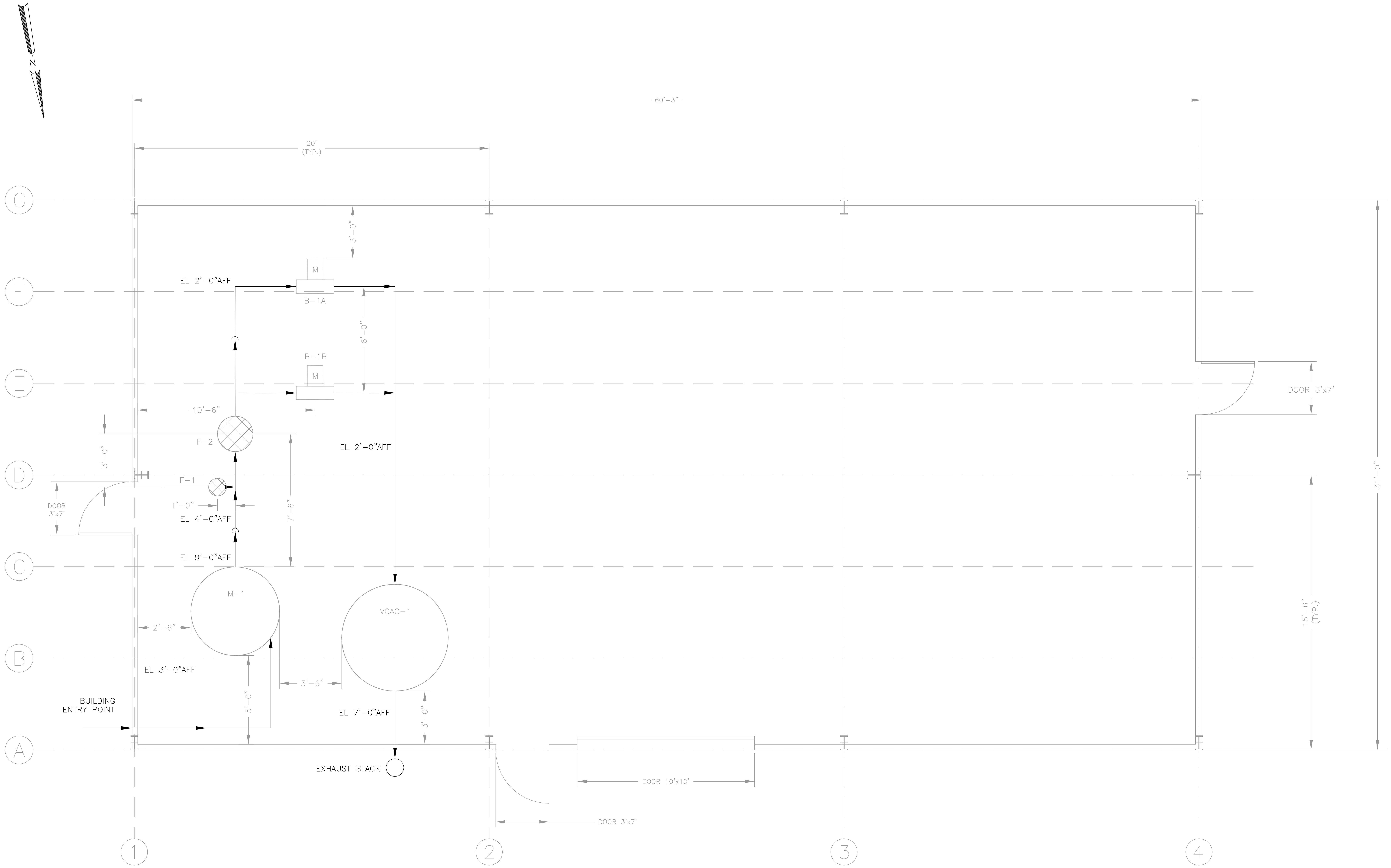

NOTES:

1. ALL PIPING HEIGHTS AND LOCATIONS ARE FOR REFERENCE. EXACT LOCATIONS AND HEIGHT DETERMINED BASED ON EXACT BUILDING AND EQUIPMENT SPECIFICATIONS.
2. BUILDING WALL PENETRATIONS PER DETAIL ON DRAWING C-4.
3. EXHAUST STACK SHALL BE CONSTRUCTED OF 12" SCHEDULE 80 PVC AND EXTEND 5' ABOVE ROOF.

LEGEND:

Symbol	Description
———	VAPOR PROCESS PIPING AND DUCTWORK
○	PIPING TURNS UPWARD IN THE DIRECTION OF FLOW
◡	PIPING TURNS DOWNWARD IN THE DIRECTION OF FLOW

6 0 3 6
1" = 3'

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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
TREATMENT BUILDING GENERAL PIPING LAYOUT

SEAL AREA

GEOFFREY P. KING, P.E.
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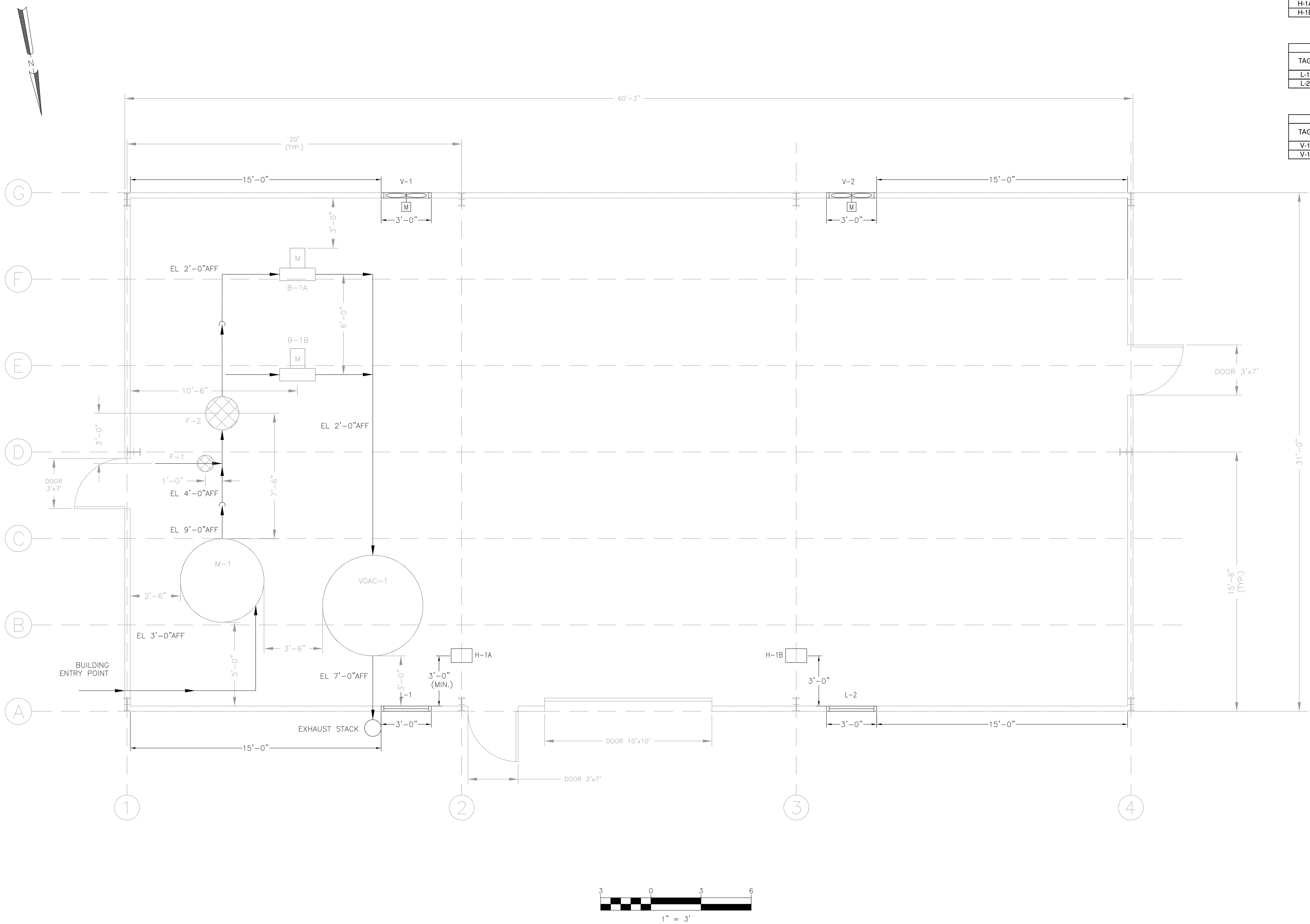

UNIT HEATER SCHEDULE					
TAG	DIMENSIONS	POWER RATING	MOUNTING HEIGHT (AFF)	WEIGHT (LBS)	REMARKS
H-1A	13" X 9" X 16" HT	5 KW	10'	32	HORIZONTAL
H-1B	13" X 9" X 16" HT	5 KW	10'	32	HORIZONTAL

HT - HEIGHT
SEE NOTE 1

LOUVER SCHEDULE			
TAG	DIMENSIONS	MOUNTING HEIGHT (AFF)	REMARKS
L-1	3' X 3' X 4" DP	3'	
L-2	3' X 3' X 4" DP	3'	

DP - DEEP
SEE NOTE 2

VENTILATOR SCHEDULE					
TAG	DIMENSIONS	FLOWRATE	HORSEPOWER	MOUNTING HEIGHT (AFF)	REMARKS
V-1		1,000 CFM	1/4 HP	8'	WALL MOUNT
V-1		1,000 CFM	1/4 HP	8'	WALL MOUNT

SEE NOTE 3

NOTES:

1. UNIT HEATERS H-1A AND H-1B SHALL BE HORIZONTAL BLOWER HEATER TYPE WITH ELECTRIC ELEMENTS, AND BE MOUNTED ON SUITABLE WALL MOUNTING BRACKET. UNIT HEATERS SHALL BE 460V 3PH, AND INCLUDE A LOCAL DISCONNECT SWITCH, AND ADJUSTABLE THERMOSTAT SWITCH.
2. LOUVERS L-1 AND L-2 TO BE FIXED BLADE WITH FRAME AND INSECT/BIRD SCREEN. EACH LOUVER TO INCLUDE ADJUSTABLE BAROMETRIC INTERIOR WALL DAMPERS. LOUVERS TO BE CONSTRUCTED OF 0.08" THICK ALUMINUM.
3. VENTILATORS V-1 AND V-2 SHALL BE WALL MOUNTED, DIRECT DRIVE TYPE FAN. VENTILATORS SHALL BE 120V 1PH, AND INCLUDE A LOCAL DISCONNECT SWITCH, ADJUSTABLE THERMOSTAT, AND HAVE DAMPERS THAT CLOSE WHEN NOT IN OPERATION.

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TETRA TECH ENGINEERING CORPORATION PC

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SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
HEATING AND VENTILATION LAYOUT AND DETAILS

SEAL AREA

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LEGEND FOR SINGLE LINE

- GROUND
- 7A / 18–70 / M — MAGNETIC BREAKER; BREAKER MAX. CONT. AMP; ADJ. INST. TRIP; MAGNETIC TRIP
- 1 — SIZE 1, FULL VOLTAGE NON-REVERSING, COMBINATION MOTOR STARTER WITH MAGNETIC BREAKER
- MEDIUM VOLTAGE FUSED LOAD INTERRUPTER POLE MOUNTED SWITCH MANUALLY OPERATED
- TRANSFORMER OIL FILLED
- TRANSFORMER DRY TYPE
- CONTACT NORMALLY OPEN
- CONTACT NORMALLY CLOSED
- H O A — HAND-OFF-AUTO SELECTOR SWITCH
- S S — START-STOP PUSHBUTTON
- 7A / 18–70 / M — MAGNETIC BREAKER; BREAKER MAX. CONT. AMP; ADJ. INST. TRIP; MAGNETIC TRIP
- ST — SOLID STATE TRIP. WITH LONG TIME INSTANTANEOUS, SHORT TIME AND GROUND FAULT TRIP
- 100 AF / 20 AT / TM — THERMAL MAGNETIC BREAKER; BREAKER FRAME SIZE; BREAKER TRIP; THERMAL MAGNETIC
- POTENTIAL TRANSFORMER
- CURRENT TRANSFORMER
- AS — AMMETER SWITCH
- VS — VOLTMETER SWITCH
- LCP — LOCAL CONTROL PANEL
- FVNR STARTER
- FUSE
- 2 HP — MOTOR
- A — AMMETER
- V — VOLTMETER
- LA — LIGHTNING ARRESTOR AND SURGE CAPACITOR
- 480V, 3Ø, ELECTRICAL HEATER
- M — UTILITY METER
- DISCONNECT SWITCH

LEGEND FOR FIRE ALARM AND SECURITY

- FA — MANUAL FIRE ALARM PULL STATION
- FCP — FIRE ALARM CONTROL PANEL
- HD — HEAT DETECTOR
- SD — SMOKE DETECTOR
- H — FIRE ALARM HORN WITH FLASHER
- DS — DOOR SWITCH
- SCP — SECURITY CONTROL PANEL
- PFE — PORTABLE FIRE EXTINGUISHER

LEGEND FOR INSTRUMENTS

- 110V. AC INSTRUMENT (DIGITAL SW)
- 4–20 mA SIGNAL INSTRUMENT
- 4–20 mA SENSOR
- 4–20 mA SIGNAL INSTRUMENT REQUIRES 110V AC POWER
- M — MOTOR OPERATED VALVE (MOV)
- S — SOLENOID OPERATED VALVE (SOV)
- PLC — PROGRAMABLE LOGIC CONTROLLER CABINET
- PHONE JACK

LEGEND FOR POWER

- CABLE TRAY
- ABOVE GROUND CONDUIT
- UNDERGROUND CONDUIT
- J — JUNCTION BOX
- P — PULL BOX
- UH — UNIT HEATER
- M — MOTOR
- CP — CONTROL PANEL
- POWER OUTLET
- 30A — DISCONNECT SWITCH
- T — TRANSFORMER
- PP — POWER PANEL BOARD 277/480V, 3Ø, 4W

LEGEND FOR LIGHTING

- HIGH PRESSURE SODIUM LIGHTING (HPS) LIGHTING FIXTURE (M.H. 20'–0" AFF)
- PNL NO. 1–2 CKT NO.
- OUTDOOR WALL PACK FIXTURE (HPS) WITH PHOTOELECTRIC CELL (M.H. 10'–0" AFF)
- MS — OUTDOOR WALL PACK FIXTURE WITH PHOTOELECTRIC CELL AND MOTION SENSOR (M.H. 10'–0" AFF)
- X — EXIT LIGHT
- F — CEILING MOUNTED SINGLE TUBE FLUROSENT LIGHT
- F — CEILING MOUNTED DOUBLE TUBE FLUROSCENT LIGHT
- WALL MOUNTED EMERGENCY BATTERY PACK (M.H. 10'–0" AFF)
- RECEPTACLE 480V, 20A, 3 POLE
- PNL NO. 1–2 CKT NO. — DUPLEX RECEPTACLE (M.H. 1'–6" AFF); WP – WEATHER PROOF; GFCI – GROUND FAULT CIRCUIT INTERRUPTER; XP – EXPLOSION PROOF
- LP — LIGHTING PANEL BOARD
- J — JUNCTION BOX
- HOME RUN TO 120V PANEL BOARD 3/4"C–2#12&1#12G
- $ — SINGLE POLE SWITCH (M.H. 4'–0" AFF)
- $3 — THREE WAY SWITCH (M.H. 4'–0" AFF)
- CORD WITH PLUG
- TS — THERMOSTAT
- AIR TERMINAL WITH ADHESIVE BASE
- AIR TERMINAL WITH BOLTED BASE

ELECTRICAL–POWER ABOVE GROUND POWER CABLE AND WIRE NOTES

1. THE SMALLEST WIRE SIZE FOR POWER CIRCUITS 600 VOLTS & BELOW SHALL BE #12 AWG, EXCEPT THAT #14 AWG SHALL BE USED FOR CONTROL.
2. WHERE WIRES IN CONDUIT ARE USED, WIRES FOR POWER & CONTROL LEADS TO MOTORS 600 VOLTS & BELOW SHALL BE INSTALLED IN THE SAME CONDUIT WHEN THE POWER WIRE IS #2 AWG. OR SMALLER. FOR POWER WIRES LARGER THAN #2 AWG POWER & CONTROL WIRES SHALL BE INSTALLED IN SEPARATE CONDUITS.
3. POWER & CONTROL WIRES SHALL BE LABELED WITH A WIRE NUMBER AS SHOWN IN ELEMENTARY & INTERCONNECTION WIRING DIAGRAMS.
4. THE COLOR CODING FOR SINGLE CONDUCTOR WIRES SHALL BE AS FOLLOWS:
   A) POWER PHASE LEADS – 480V SYSTEM SHALL BE IDENTIFIED WITH BROWN/ORANGE/YELLOW MARKING TAPE
   B) ALL CONTROL LEADS INCLUDING THOSE FOR CONTROL STATIONS, INTERLOCKING CIRCUITS, CURRENT TRANSFORMERS ETC., SHALL BE RED.
   C) ALL GROUNDING SHALL BE EITHER BARE OR HAVE A GREEN COVERING.
   D) TWO WIRE 120VAC BRANCH CIRCUITS SHALL BE AS FOLLOWS
   THE GROUNDED CONDUCTOR SHALL BE WHITE
   THE UNGROUNDED CONDUCTOR SHALL BE BLACK
   ALL BRANCH CIRCUIT WIRES SHALL BE IDENTIFIED & LABELED TO MATCH PANEL CIRCUIT DIRECTORIES.
5. WIRES INSTALLED IN CONDUIT:
   A) FOR SERVICES 600 VOLT & BELOW WIRE #14 AWG & LARGER SHALL BE 600 VOLT SINGLE CONDUCTOR, STRANDED COPPER HEAT & MOISTURE RESISTANT THERMOPLASTIC INSULATION 75°C TYPE THHN/THWN.
   B) FOR 15KV SERVICE, CABLE SHALL BE AS SPECIFIED BY UTILITY COMPANY (LONG ISLAND POWER AUTHORITY).
   C) INSTRUMENT SIGNAL CABLE:
   INSTRUMENT SIGNAL CABLE SHALL BE SINGLE TWISTED PAIR #16, STRANDED COPPER, 300V, PVC INSULATION WITH OVERALL ALUMINUM MYLAR SHIELD, UL LISTED AS PLTC AND OVERALL PVC JACKET.

ELECTRICAL–POWER ABOVE GROUND POWER GENERAL NOTES

1. ALL ELECTRICAL INSTALLATIONS SHALL BE COMPLETED IN A WORKMANLIKE MANNER IN CONFORMANCE WITH TTEC ELECTRICAL SPECIFICATIONS FOR THIS CONTRACT, THE NATIONAL ELECTRICAL CODE, ALL LOCAL CODES AND REGULATIONS. (AND ALL APPLICABLE DRAWINGS AND DETAILS).
2. ALL EQUIPMENT AND MATERIALS FURNISHED TO COMPLETE INSTALLATIONS SHALL BE TESTED, LABELLED OR OTHERWISE DETERMINED TO BE SUITABLE FOR THEIR INTENDED USE BY A RECOGNIZED INDEPENDANT TESTING LABORATORY SUCH AS UNDERWRITERS LABORATORIES INC., OR FACTORY MUTUAL ENGINEERING CORP. (U.L. OR F.M.).
3. BEFORE INSTALLING ELECTRICAL RACEWAY SYSTEM, A CAREFUL CHECK SHALL BE MADE TO AVOID INTERFERENCES WITH EQUIPMENT, PIPING & STRUCTURES. THE RACEWAY SYSTEM IS SHOWN DIAGRAMATICALLY AND EXACT ROUTING MUST BE DETERMINED IN FIELD.
4. RACEWAY SYSTEM SHALL BE PROPERLY SUPPORTED. SUPPORTS SHALL NOT BE MORE THAN 10'–0" APART AND WITHIN 3'–0' OF A BOX, FITTINGS OR CABINET. RACEWAY SYSTEM SHALL BE GROUNDED.
5. ALL CONDUITS, COUPLINGS & ELBOWS SHALL BE RIGID STEEL OR INTERMEDIATE METAL CONDUIT WITH A HOT DIPPED GALVANIZED COATING INSIDE & OUTSIDE, THREADS SHALL HAVE A PROTECTIVE ZINC COATING, UNLESS OTHERWISE NOTED.
6. MINIMUM CONDUIT SIZE FOR ABOVE GROUND INSTALLATION SHALL BE 3/4".
7. ALL UNUSED OPENINGS IN FITTINGS, BOXES, ETC., SHALL BE PLUGGED WITH A CONDUIT PLUG. DURING CONSTRUCTION, ALL OPENINGS SHALL BE KEPT CLOSED TO PREVENT MOISTURE & FOREIGN MATERIAL, SUCH AS DIRT & DEBRIS, FROM ENTERING THE CONDUIT SYSTEM.
8. CONNECTIONS IN MOTOR TERMINAL BOXES AND ALL OTHER SPLICES, WHERE NECESSARY, SHALL BE MADE WITH SOLDERLESS CONNECTORS PER MANUFACTURES INSTRUCTIONS.
9. CONDUIT FITTINGS SHALL BE STANDARD THREADED WITH COVERS & GASKETS, TYPE FORM 8 FERALOY OR APPROVED EQUAL, FOR UNCLASSIFIED & CLASS 1, DIV.2 AREAS.
10. IN UNCLASSIFIED NON–PROCESS BUILDINGS, ELECTRIC METALLIC TUBING (EMT) CONDUIT MAY BE USED IN FALSE CEILINGS OR IN CONCEALED AREAS OF GENERAL USE, EXCEPT ALL 480V & ABOVE CIRCUITS MUST BE RUN IN RIGID STEEL. CONDUIT.
11. ALL WIRE & CABLES SHALL BE PULLED INTO THEIR CONDUITS BY APPLICATION OF A SUITABLE COMMERCIAL PULLING COMPOUND, "PLOY–EAS" FOR POLYETHYLENE INSTALLATION. PULLING DISTANCE SHALL NOT EXCEED THE EQUIVALENT OF 300 FEET STRAIGHT RUN, OR A PULL SHALL CONTAIN NOT MORE THAN THE EQUIVALENT OF THREE (3) 90° BENDS.
12. ALL CABLES FURNISHED WITH SHIELDING SHALL BE TERMINATED WITH STRESS CONES & GROUNDED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATION.
13. CONTROL WIRING SHALL BE IDENTIFIED USING SLEEVE TYPE WIRE MARKERS WITH IDENTIFICATION CORRESPONDING TO THAT ON WIRING DIAGRAMS. WIRE MARKERS SHALL BE INSTALLED AT ALL TERMINAL & JUNCTION POINTS. WIRE MARKER SHALL BE RAYCHEM "TMS" HEAT SHRINKABLE SLEEVES.

ELECTRICAL–LIGHTING GENERAL NOTES

1. LIGHTING PANELS, LIGHTING FIXTURES, RECEPTACLES AND OTHER ITEMS SHALL BE LOCATED AS SHOWN ON THE DRAWINGS, IF ANY DEVIATION IS REQUIRED, APPROVAL SHALL BE OBTAINED FROM THE ELECTRICAL ENGINEER HAVING JURISDICTION PRIOR TO CHANGE. LOCATION OF LIGHTING FIXTURES SHOWN ON THE DRAWINGS ARE IN GENERAL, APPROXIMATE. EXACT LOCATIONS TO AVOID INTERFACE WITH PIPING AND STRUCTRUES, ETC., ARE TO BE DETERMINED IN THE FIELD, EXCEPT WHERE THE LOCATIONS ARE FIXED BY DIMENSIONS ON DRAWINGS.
2. CONDUIT RUNS AND WIRES ARE NOT SHOWN ON LAYOUT DRAWING. CONTRACTOR TO DETERMINE CONDUIT SIZE, RUNS & WIRE SIZES.
3. CONDUIT SUPPORTS SHALL BE PROVIDED WHERE REQUIRED SUCH AS AT FIXTURE LOCATIONS, RECEPTABLES, ELEVATION CHANGES, FITTING AND BOXES, ALL CONDUIT SUPPORT HARDWARES SHOWN AS GALV. CLAMPS, STRAPS, CLIPS, CHANNEL SHALL BE HOT–DIPPED GALVINIZED STEEL FINISH.
4. CONTRACTOR SHALL INSTALL UNIONS, BUSHINGS, COUPLINGS AND NIPPLES AS REQUIRED FOR PROPER CONDUIT MAKE UP. CONDUIT FITTINGS SHALL BE INSTALLED WITH COVER OPENING IN THE VERTICAL PLANE OR DOWNWARD IN THE HORIZONTAL PLANE.
5. ALL UNUSED OPENINGS IN FIXTURES, BOXES AND FITTINGS SHALL BE PLUGGED & SEALED BY APPROVED METHODS.
6. BEFORE INSTALLING LIGHTING CONDUITS, FIXTURES, ETC., A CAREFUL CHECK SHALL BE MADE TO AVOID INTERFERENCES WITH PIPING, EQUIPMENT, ETC., IF NOT OTHERWISE SPECIFIED CONDUIT RUNS MUST BE KEPT AT LEAST 12" AWAY FROM HOT SURFACES. A MINIMUM CLEARANCE OF 6" SHALL BE KEPT WHERE A CONDUIT CROSSES A HOT PIPE.
7. CONDUIT AND WIRING NOT IDENTIFIED ON DRAWINGS SHALL BE DETERMINED IN FIELD AS FOLLOWS:
   A) MAXIMUM CONDUIT SIZE SHALL BE 1" EXCEPT DROPS TO PANELBOARDS MAY BE 1 1/2"
   B) MINIMUM WIRE SIZE SHALL BE #12 AWG EXCEPT THAT #14 AWG, STRANDED, 600 VOLT TYPE SF–2 FIXTURE WIRE SHALL BE INSTALLED BETWEEN EACH LIGHTING FIXTURE AND THE NEAREST CONDUIT FITTING IN THE RUN. WIRE SIZE MIGHT BE LARGER THAN #12 AWG TO MEET VOLTAGE DROP REQUIREMENTS AND WILL BE SPECIFIED ON DRAWINGS.
8. ALL ABOVE GROUND CONDUIT SHALL BE RIGID STEEL UNLESS OTHERWISE NOTED, ALL ABOVE GROUND LIGHTING CONDUIT SHALL BE 3/4" INCH MINIMUM OR 1" INCH MAXIMUM, WHERE PRACTICAL.
9. ALL LIGHTING FIXTURE ELEVATIONS ARE SHOWN FROM FINISHED GRADE, FINISHED FLOOR OR PLATFORM ELEVATION TO THE BOTTOM OF FIXTURE GLOBE. MINOR VARIATIONS TO SUIT FIELD CONDITIONS ARE ALLOWABLE.

DRAFT FINAL DESIGN
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TETRA TECH ENGINEERING CORPORATION PC

REV	DESCRIPTION	PREP BY	DATE	APPRVD
A	DRAFT DESIGN	DB	7–23–09	SGP
B	DRAFT FINAL DESIGN	DLB	9–2–09	SGP

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, MID–ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
ELECTRICAL LEGEND AND GENERAL NOTES

SEAL AREA

HARISH C. RANA, P.E.
NYPE NO. 071378

SAT TO | DATE

CODE I.D. NO.
SCALE : AS SHOWN
SPEC. NO.
CONSTRN. CONTR. NO. N62473–10–D–3211
NAVFAC DRAWING NO.
SHEET OF
SIZE: D
DIS. SH. NO. E–1

BETHPAGE SITE 1 EXISTING PANEL 120/208V

REV.	SERVICE	CABLE SIZE (AWG)	CKT NO.	BREAKER TRIP AMPS	BREAKER TRIP TYPE	POL	LOAD VA	MAIN BUS	LOAD VA	POL	BREAKER TRIP TYPE	BREAKER TRIP AMPS	CKT NO.	CABLE SIZE (AWG)	SERVICE	REV.
	BLDG LTG FIXTURES (5)	12	1	20	TM	1	1200						2			
	BLDG LTG FIXTURES (4)	12	3	20	TM	1	1200			3	TM	20	4		EXISTING USE	
	EXISTING USE		5	20	TM	1							6			
	EXISTING USE		7	20	TM	1				1	TM	20	8		EXISTING USE	
	EXISTING USE		9	20	TM	1					TM		10			
	EXISTING USE		11	20	TM	1				2	TM		12		EXISTING USE	
	EXISTING USE		13	20	TM	1			800	1	TM	20	14	12	**BLDG RECEPTACLES (3)	
	EXISTING USE		15	20	TM	1			800	1	TM	20	16	12	**BLDG RECEPTACLES (3)	
	EXISTING USE		17	20	TM	1			400	1	TM	20	18	12	*EXIT LTG & EMERGENCY BATTERY PACK	
	CONTROL PANEL	12	19	20	TM	1	400		500	2	TM TM	30	20 22	12	BUILDING EXHAUST FAN V-1	
	FLOW INDICATOR FQI-101	12	21	20	TM	1	50		500	2	TM TM	30	24 26	12	BUILDING EXHAUST FAN V-2	
	SPARE	12	23	20	TM	1	400	150A								

BUS NAMPEPLATE: EXISTING PANEL LP

CABINET TYPE: NEMA-1
MIN. REQ'D IC: 10,000 A RMS SYM, MIN (FOR PANEL AND BREAKERS)

NORMAL SERVICE: 208/120v, 3φ,4WIRE

MAIN BUS: 200A

MAIN: 150A, BREAKER
MOUNTING: WALL

LOCATION: Existing warehouse
DWG: E-3

* LOCK BREAKER IN "ON" POSITION
** PROVIDES GFCI PROTECTION

BETHPAGE SITE 1 NEW 480V PANEL

REV.	SERVICE	CABLE SIZE (AWG)	CKT NO.	BREAKER TRIP AMPS	BREAKER TRIP TYPE	POL	LOAD VA	MAIN BUS	LOAD VA	POL	BREAKER TRIP TYPE	BREAKER TRIP AMPS	CKT NO.	CABLE SIZE (AWG)	SERVICE	REV.
	EXISTING BLDG SUPPLY	3#2/0	1	200	TM	3	–			3	TM	30	2	12	SPARE	
	7 1/2 HP BLOWER B-1A	10	3	30	TM	3	5600			3	TM	30	4		SPARE	
	7 1/2 HP BLOWER B-1B	10	5	30	TM	3	5600		5000	3	TM	30	6	10	5 KW HEATER H-1A	
	CONVENIENCE RECEPTACLE	10	7	20	TM	3	1000		5000	3	TM	30	8	10	5 KW HEATER H-1B	
			9		TM						TM		10			
			11		TM			400A			TM		12			

BUS NAMPEPLATE: PP-1

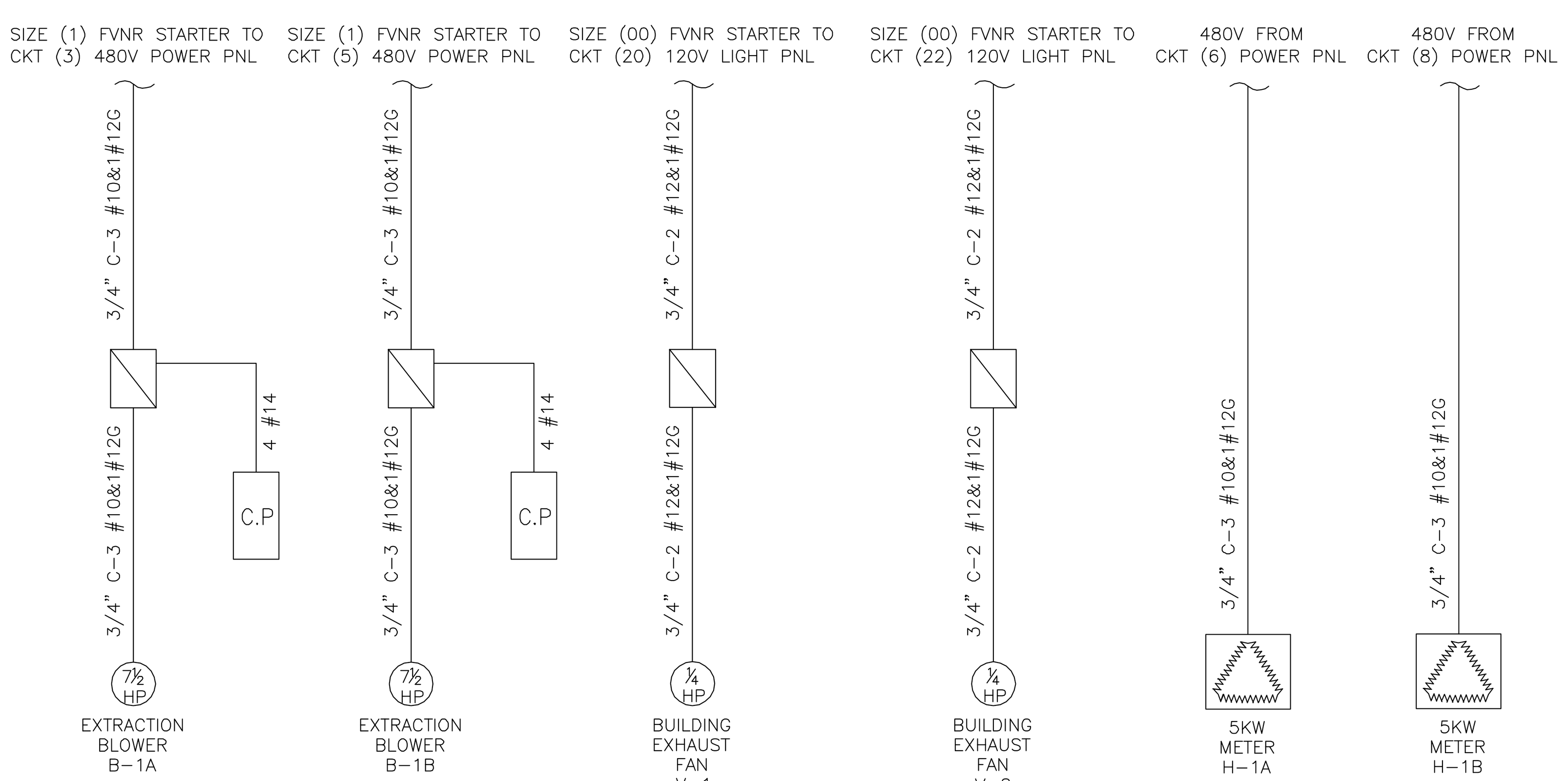
CABINET TYPE: NEMA-12
MIN. REQ'D IC: 22,000 A RMS SYM, MIN (FOR PANEL AND BREAKERS)

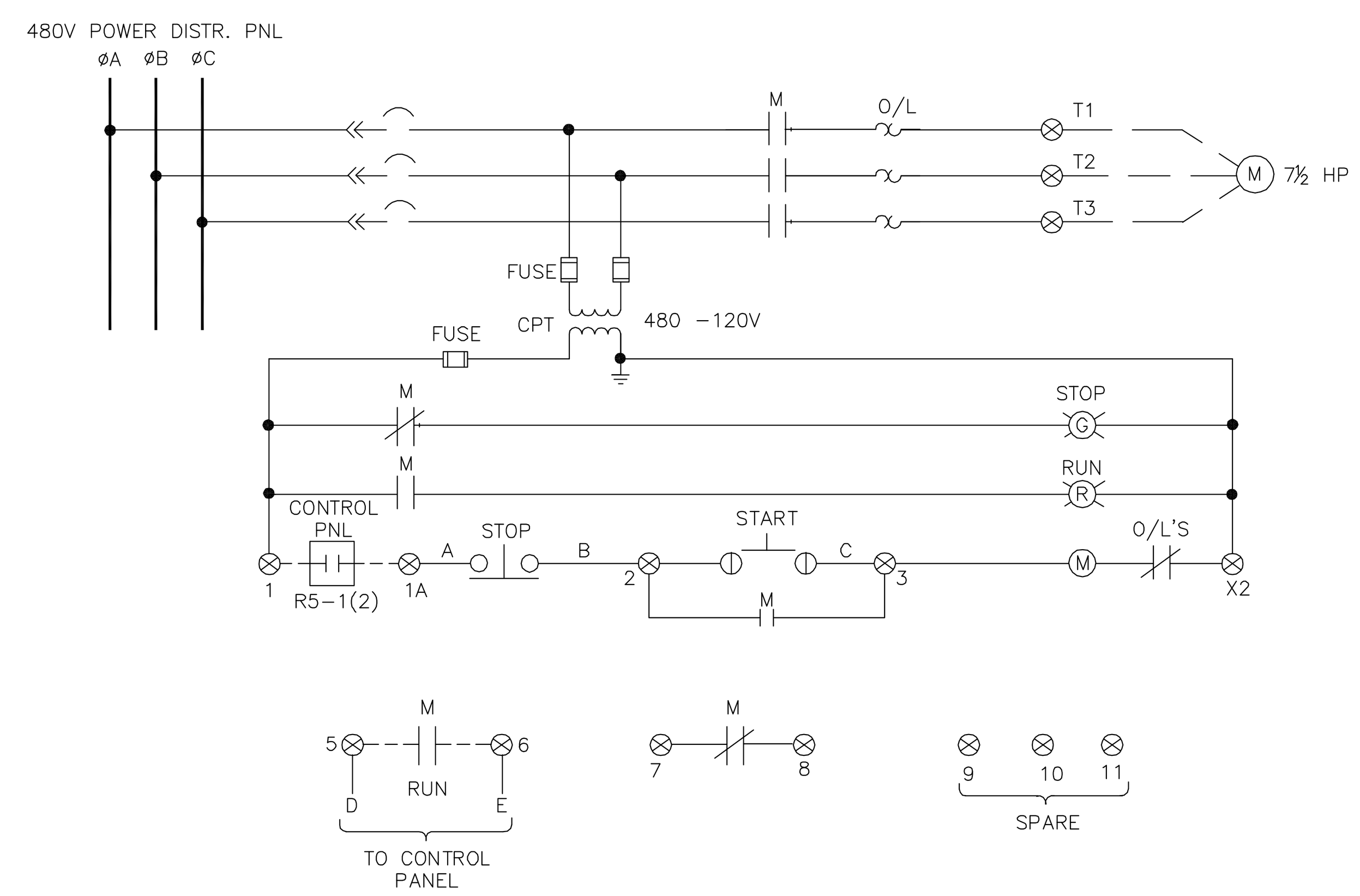
NORMAL SERVICE: 277/480V, 3φ, 4 WIRE, 22 KAIC

MAIN BUS: 400A

MAIN: 400A, BREAKER
MOUNTING: WALL

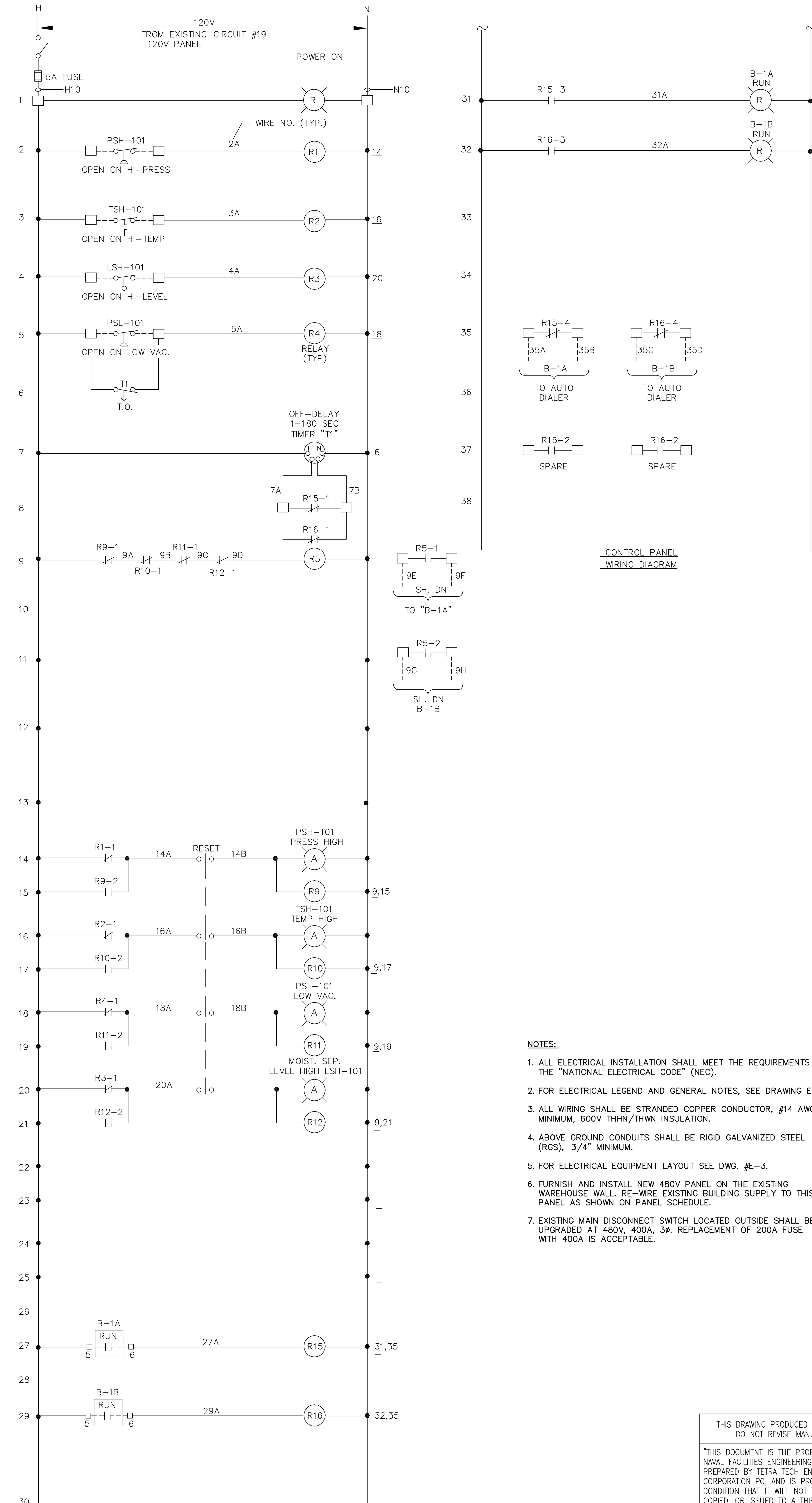
LOCATION: Existing warehouse
DWG: E-3





MOTOR CONTROL DIAGRAM
B-1A & B-1B

⊗ – TERMINAL LOCATED IN STARTER
☐ – TERMINAL LOCATED IN CONTROL PANEL
——— – WIRING BY VENDOR
– – – – – WIRING IN FIELD



CONTROL PANEL WIRING DIAGRAM

NOTES:

1. ALL ELECTRICAL INSTALLATION SHALL MEET THE REQUIREMENTS OF THE "NATIONAL ELECTRICAL CODE" (NEC).
2. FOR ELECTRICAL LEGEND AND GENERAL NOTES, SEE DRAWING E-1.
3. ALL WIRING SHALL BE STRANDED COPPER CONDUCTOR, #14 AWG MINIMUM, 600V THHN/THWN INSULATION.
4. ABOVE GROUND CONDUITS SHALL BE RIGID GALVANIZED STEEL (RGS), 3/4" MINIMUM.
5. FOR ELECTRICAL EQUIPMENT LAYOUT SEE DWG. #E-3.
6. FURNISH AND INSTALL NEW 480V PANEL ON THE EXISTING WAREHOUSE WALL. RE-WIRE EXISTING BUILDING SUPPLY TO THIS PANEL AS SHOWN ON PANEL SCHEDULE.
7. EXISTING MAIN DISCONNECT SWITCH LOCATED OUTSIDE SHALL BE UPGRADED AT 480V, 400A, 3ø. REPLACEMENT OF 200A FUSE WITH 400A IS ACCEPTABLE.

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A	DRAFT DESIGN	DLB	7-23-09	SGP
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TETRA TECH ENGINEERING CORPORATION PC
DSGN: JB DR: BMV CHK: HR
SUPV: CH ENG:
SUBMITTED BY: (FIRM MEMBER) (TITLE) (DATE)
SOUTHWESTDIV DM: HD: HD: FPE: DIR:
OFFICER IN CHARGE
APPROVED DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
ELECTRICAL SINGLE LINE AND PANEL DIAGRAMS

APPROVED DATE EFANE FOR COMMANDER, NAVFAC

SEAL AREA

HARISH C. RANA, P.E.
NYPE NO. 071378
SAT TO DATE
CODE I.D. NO.
SCALE : AS SHOWN
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CONSTRN. CONTR. NO. N62473-10-D-3211
NAVFAC DRAWING NO.
SHEET OF
SIZE: D DIS. SH. NO. E-2

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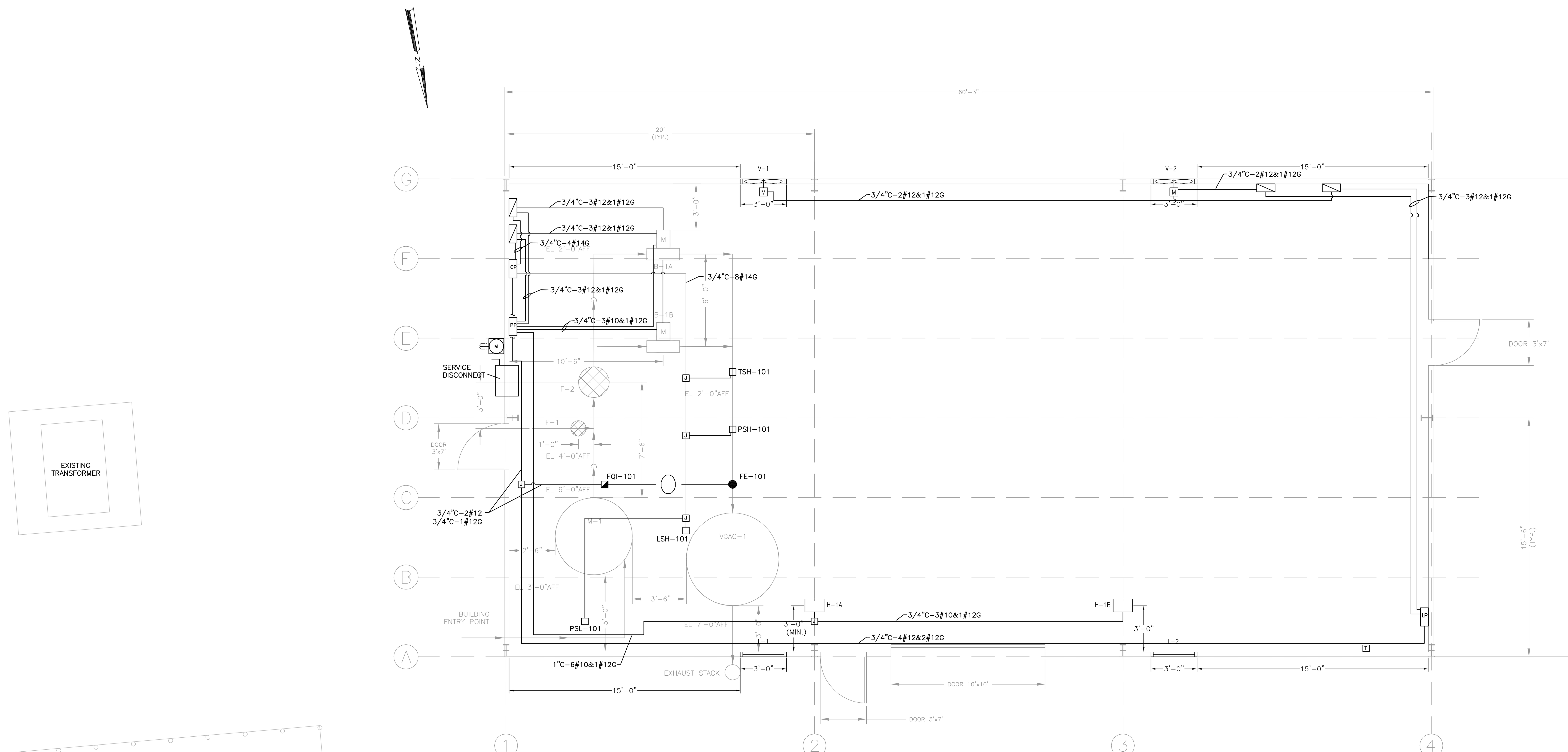

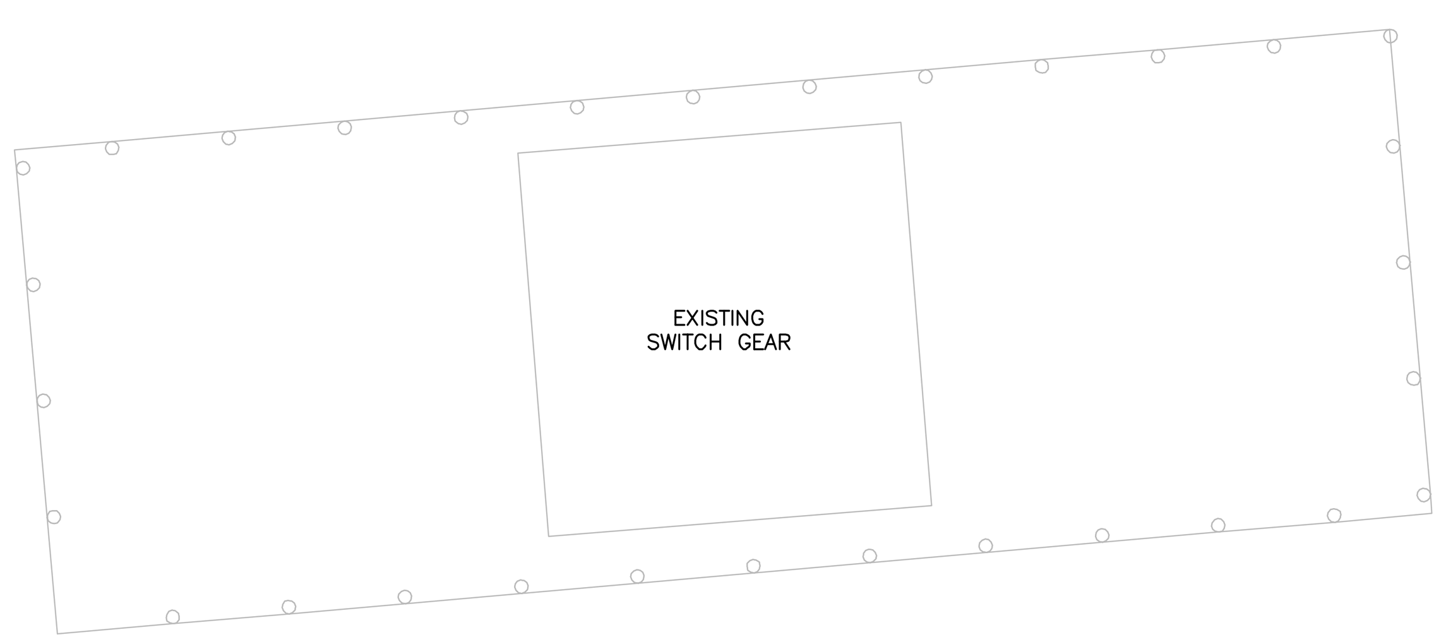

NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. INSTRUMENT LOCATIONS ARE SHOWN DIAGRAMMATICALLY ONLY. EXACT LOCATION TO BE DETERMINED IN THE FIELD.
3. FOR STARTER SIZE AND CIRCUIT CONNECTION NUMBER IN DESIGNATED PANEL SEE DRAWING E-2.
4. EXISTING SERVICE DISCONNECT IS EQUIPPED WITH 200A FUSE. REPLACE SERVICE DISCONNECT SWITCH 200A FUSE WITH 400A FUSE. VERIFY THAT SERVICE DISCONNECT IS RATED 480V, 400A, THREE PHASE, 60HZ.

4 0 4 8

1" = 4'

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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
ELECTRICAL POWER AND INSTRUMENTATION PLAN

SEAL AREA

HARISH C. RANA, P.E.
NYPE NO. 071378

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SIZE: D
DIS. SH. NO. E-3

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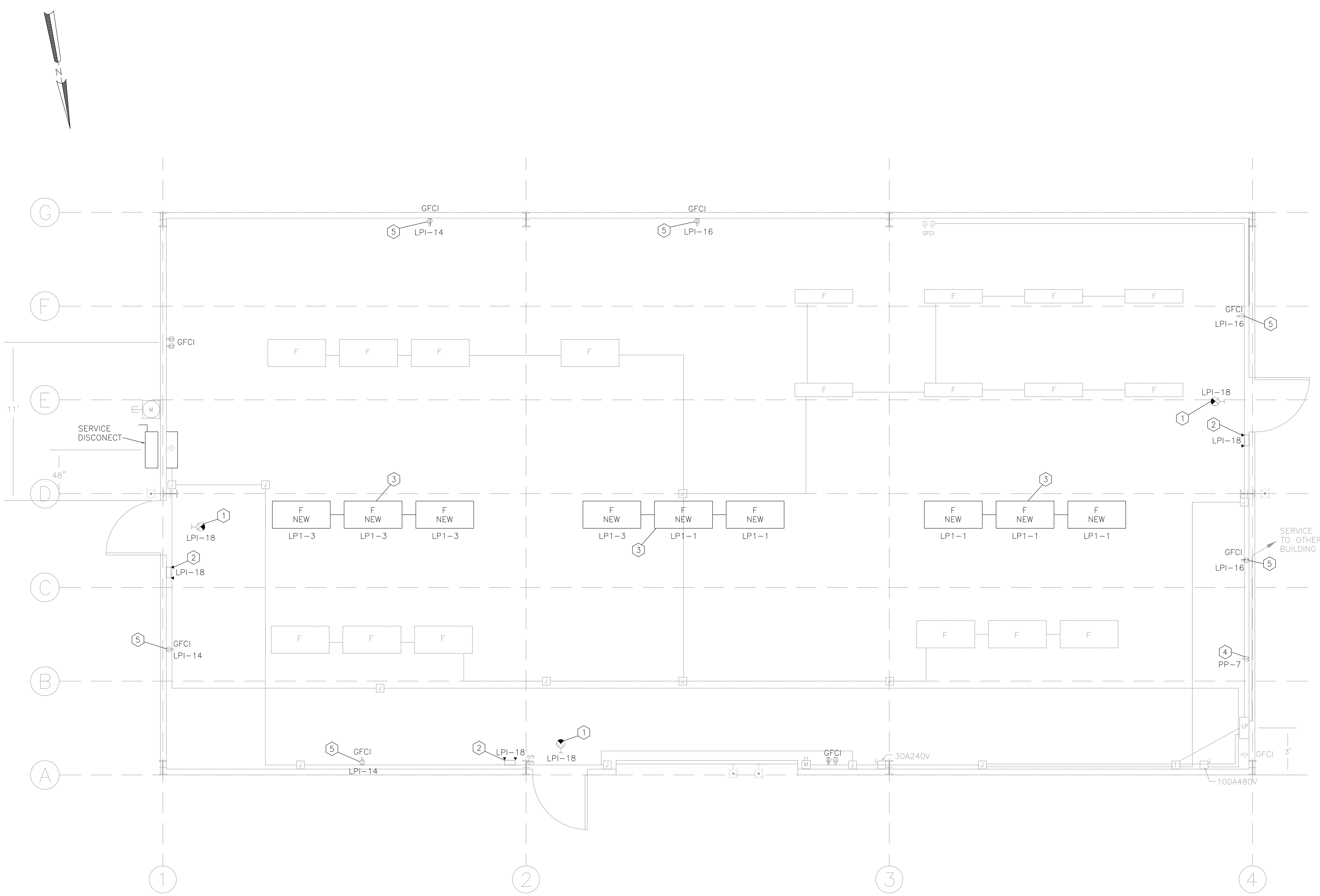

1" = 3'

NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. PRESENT LAMPS WILL BE CONNECTED TO EXISTING LIGHT PANEL CIRCUIT.
3. DUPLEX RECEPTACLES WILL BE CONNECTED TO EXISTING 120/280V PANEL.
4. 3 POLE, 480V RECEPTACLE CONNECT TO NEW POWER DISTRIBUTION PANEL.

BILL OF MATERIALS

1. WALL MOUNTED 120 VAC WITH BATTERY BACKUP EXIT LIGHTING FIXTURE. UNIVERSAL FACE WITH RED LETTER
   RUUD CAT. #EXPBURWH OR APPROVED EQUAL.
2. EMERGENCY BATTERY PACK WITH SEALED MAINTENANCE FREE LEAD CALCIUM BATTERIES FOR 90 MIN. OPERATION AND TWO 9W, 12V TUNGSTEN LAMPS
   RUUD CAT. #EMHC12100 OR APPROVED EQUAL.
3. 4' CEILING MOUNTED, T8 WITH 2-32W FLUORESCENT LAMP WITH ELECTRIC BALLAST
   MCMASTER CARR CAT. #1612K82 OR APPROVED EQUAL.
4. 20A, 480V 3 POLE RECEPTACLE
   MCMASTER CARR CAT. #7162K67 OR APPROVED EQUAL.
5. 120/125V GFCI DUPLEX RECEPTACLE
   MCMASTER CARR CAT. #7160K68 OR APPROVED EQUAL.

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NOT FOR CONSTRUCTION

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TETRA TECH ENGINEERING CORPORATION PC

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
LIGHTING LAYOUT

APPROVED DATE
EFANE FOR COMMANDER, NAVFAC

SEAL AREA

HARISH C. RANA, P.E.
NYPE NO. 071378

SAT TO DATE

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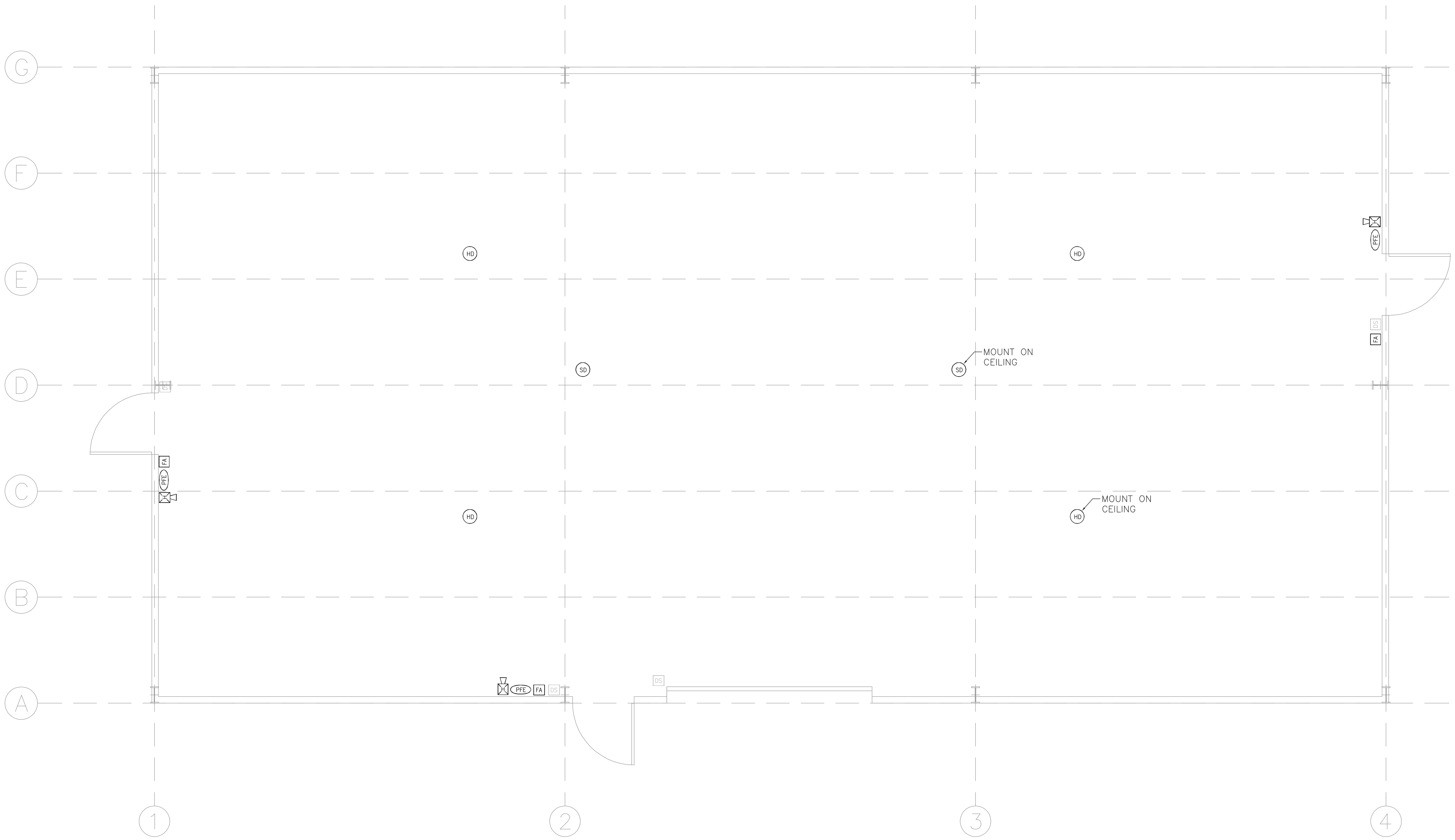

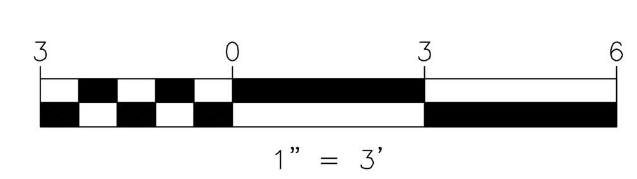

NOTES:

1. FOR ELECTRICAL LEGEND AND GENERAL NOTES SEE DRAWING E-1.
2. FIRE DETECTION/ALARM DEVICES ARE SHOWN AS REFERENCE ONLY. FINAL DESIGN SHALL BE DONE BY FIRE DETECTION/ALARM SUBCONTRACTOR.
3. FIRE DETECTION/ALARM DEVICES SHALL BE CONNECTED TO EXISTING FIRE ALARM PANEL.
4. FIRE EXTINGUISHER TO HAVE 10LB, 4A:40B:C (MINIMUM) RATING. TO BE CONSPICUOUSLY LOCATED, SECURED TO WALL USING HANGER OR BRACKET SUCH THAT TOP OF EXTINGUISHER IS NOT MORE THAN 5' ABOVE FLOOR SURFACE.

DRAFT FINAL DESIGN
NOT FOR CONSTRUCTION

REV	DESCRIPTION	PREP BY	DATE	APPRVD
A	DRAFT DESIGN	DLB	7-23-09	SGP
B	DRAFT FINAL DESIGN	DLB	9-2-09	SGP

TETRA TECH ENGINEERING CORPORATION PC

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
SITE 1, FORMER DRUM MARSHALLING AREA
SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM
FIRE ALARM PLAN

SEAL AREA

HARISH C. RANA, P.E.
NYPE NO. 071378

THIS DRAWING PRODUCED ON AUTOCAD
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APPENDIX B
DRAFT DESIGN CRITERIA DOCUMENT AND TECHNICAL SPECIFICATIONS

DRAFT DESIGN CRITERIA DOCUMENT

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND, ATLANTIC
REMEDIAL ACTION CONTRACT (RAC)
CONTRACT NO. N62473-07-D-3211
CONTRACT TASK ORDER NO. WE04

SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM FACILITY
SITE 1 – FORMER DRUM MARSHALLING AREA
DRAFT DESIGN CRITERIA DOCUMENT SUBMISSION

Issued:

July 22, 2009

Prepared for:

Department of the Navy
Naval Facilities Engineering Command, Mid-Atlantic
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Document Control Number:

Package Status	Date	Prepared By	Approved By	Pages Affected
A	7/22/09	B. Ketterer	S. Patselas	All

SOIL VAPOR EXTRACTION CONTAINMENT SYSTEM FACILITY
SITE 1 – FORMER DRUM MARSHALLING AREA
DRAFT DESIGN CRITERIA DOCUMENT SUBMISSION

NAVAL FACILITIES ENGINEERING COMMAND
MID-ATLANTIC

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Prepared and Submitted by:
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JULY 2009

TABLE OF CONTENTS

1.1 LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ABS	Acrylonitrile Butadiene Styrene
acfm	actual cubic feet per minute
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BTEX	Benzene, Toluene, Ethyl Benzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CMP	Complete Manifest Package
CPM	Critical Path Method
CPR	Cardiopulmonary Resuscitation
CTO	Contract Task Order
DO	Dissolved Oxygen
EFANE	Engineering Field Activity, Northeast
EHS	Environmental Health and Safety
EPCRA	Emergency Planning and Community Right-to-Know Act
ESQ	Environmental, Safety, Quality
FI	Facility Investigation
FI/CMS	Facility Investigation/Corrective Measures Study
FS/CMS	Feasibility Study/Corrective Measures Study
HDPE	High Density Polyethylene
HS	Hand Switch
IR	Installation Restoration
i.w.	inches of water column
K/sf	Kips per square foot
LEPC	Local Emergency Planning Committee
lb/yr	pounds per year
mg/kg	milligrams per kilogram
MSDS	Material Safety Data Sheet
MS	Moisture Switch
ND	Not Detected
NPDES	National Pollutant Discharge Elimination System
NRC	National Response Center
NWIRP	Naval Weapons Industrial Reserve Plant
NYCRR	New York Conservation Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	Operations and Maintenance
ORP	Oxidation Reduction Potential
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PCE	tetrachloroethene

LIST OF ACRONYMS AND ABBREVIATIONS (Cont'd)

PESM	Project Environmental and Safety Manager
PMO	Program Management Office
PPE	Personal Protective Equipment
ppm	parts per million
PQCM	Program Quality Control Manage
PRG	Preliminary Remediation Goal
PS	Project Superintendent
psi	pounds per square inch
PVC	Polyvinyl Chloride
QC	Quality Control
RAC	Remedial Action Contract
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROICC	Resident Officer In Charge of Construction
RQ	Reportable Quantity
SAP	Sampling and Analysis Program
SERC	State Emergency Response Center
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SQCM	Site Quality Control Manager
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
SVPM	Soil Vapor Pressure Monitor
TAL	Target Analyte List
TBC	To Be Considered
TCA	1,1,1-trichloroethane
TCE	trichloroethane
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOX	Total Organic Halogen
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TtEC	Tetra Tech EC, Inc.
TtNUS	Tetra Tech NUS, Inc.
µg/L	micrograms per liter
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VEW	Vapor Extraction Well
VGAC	Vapor-Phase Granular Activated Carbon
VOC	Volatile Organic Compound
VSD	Variable Speed Drive
WC	water column
µg/m^3	micrograms per cubic meter of soil vapor

2.0 INTRODUCTION

Tetra Tech EC, Inc. (TtEC) has prepared this Draft Design Criteria Document for the Soil Vapor Extraction (SVE) Containment System at Installation Restoration Program Site 1 – Former Drum Marshalling Area (the Site), located at the Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York. This document has been prepared for the United States Department of the Navy, Naval Facilities Engineering Command (NavFac), Mid-Atlantic Division (LantDiv). This remedial design project is being performed under Remedial Action Contract (RAC V) contract number N62473-07-D-3211. The *Design Analysis Report for Soil Vapor Extraction Containment System* (TtNUS, April 2009) provides a detailed background on the Site history, remedial objectives, pilot-scale details, and a preliminary remedial system design for this SVE Containment System based on the pilot-scale testing.

1.1 Site History

Remedial Investigations conducted in the early 1990s identified volatile organic compound (VOC)-contaminated soils and shallow groundwater at Site 1 that were contributing to a regional groundwater plume [Halliburton NUS (HNUS) 1993]. To address this contamination, a 1995 Record of Decision (ROD) was prepared that included in-situ treatment of VOCs, excavation and offsite disposal of soils contaminated with polychlorinated biphenyls (PCBs), and placement of a permeable cover to address other residual contaminants including cadmium, chromium, and VOCs.

Soils at Site 1 consist mainly of unconsolidated sediments that overlie crystalline bedrock. The unconsolidated sediments consist of four distinct geologic units that in descending order are the Upper Glacial Formation, the Magothy Formation, the Raritan Clay, and the Lloyd Formation. For the SVE Containment System at Site 1, the subsurface conditions consist of the Upper Glacial Formation, which is about 30 to 45 feet thick, consists chiefly of coarse sands and gravels. A clay unit is present near the groundwater table [50 feet below ground surface (bgs)] at the southeast corner of the site. This clay unit is suspected to be a source of chlorinated solvents that are migrating into the overlying soil gas and the source of offsite VOCs in soil vapor. Log sheets for soil borings installed along the fence line and into the residential neighborhood are presented in the *Design Analysis Report for Soil Vapor Extraction Containment System* (TtNUS, April 2009).

Chlorinated solvents including trichloroethene (TCE), tetrachloroethene (PCE), and 1,1,1-trichloroethane (TCA) have been identified as the VOCs of interest in soil gas at the site. Concentrations greater than 1,000 µg/m3 (micrograms per cubic meter of soil vapor) have been directly associated with Site 1 activities and historical environmental data, and based on preliminary screening, exceed guidelines established by the New York State Department of Health (NYDOH) for subslab soil vapor concentrations. Of these chemicals, TCE is the primary VOC of concern. Addressing TCE contamination in accordance with DOH guidance should address the other VOCs associated with the site (NYSDOH, 2006). Positively detected VOCs for onsite and offsite soil gas are presented on Figure 4 (Tetra Tech NUS, Inc. [TtNUS], 2008 and TtNUS, 2009). Anticipated initial concentrations of extracted soil vapors are presented in Table 1-1 and are based on the mean chemical concentrations of the intermediate-depth and deep soil gas samples collected along the eastern fence line.

PCBs, cadmium, and chromium have also been identified in site soils at concentrations requiring remediation. The majority of these chemicals have been detected in the central portion of Site 1. Based on limited data, these chemicals are not expected to be present along the fence line at environmentally significant concentrations (i.e., trigger handling as hazardous waste). Available analytical data for these soils is presented in Appendix C. This data consists of information collected from the Remedial Investigation of the Site between 1991 and 1994 as well as soil cores obtained during the January 2008 soil gas testing for disposal purposes (HNUS, 1993).

1.2 Remedial Description

The SVE Containment System will consist of the following elements:

- Twelve soil vapor extraction wells (VEWs), 6 intermediate and 6 deep;
- Moisture separator;
- Two Soil vapor extraction blowers;
- Interim Vapor-Phase Granular Activated Carbon (VGAC) off gas treatment;
- Associated piping, valving and instrumentation; and
- Twelve soil vapor monitoring wells.

The VEWs will be located along the eastern boundary of the Site. Each well will be piped below ground to the Flow Monitor Station, where flow, vacuum and gas quality can be monitored. The Flow Monitor Station will be a small shed located at the southeast corner of the Site. All the soil vapor extraction lines will collect into a single header within the Flow Monitor Station, and a single pipe line will be piped underground to the Treatment Building, existing unoccupied building number 03-35. The process equipment, including the moisture separator, soil vapor extraction blowers, VGAC vessel and associated piping, valving and instrumentation will be in the existing unoccupied building number 03-35 (Treatment Building).

2.0 DESIGN REQUIREMENTS

Sections 2.1 through 2.7 discuss the SVE Containment System design. Appendix A is the Drawing List, Appendix B the Technical Specifications, and Appendix C is the Construction Schedule. The draft design drawings are being submitted separately. The basis of design and remedial objectives for the SVE Containment System can be found in detail in the *Design Analysis Report for Soil Vapor Extraction Containment System* (TtNUS, April 2009).

2.1 Design Life

The SVE Containment System and the associated components will be designed for an operational life of approximately 4 years. Any component of the SVE Containment System with a potentially shorter life will be designed to permit its replacement while the system is shutdown with minimal impact to other components. Provisions will be made for the routine maintenance of the components in order to maximize their operational life.

2.2 Environmental Conditions

The following site environmental conditions apply to the structures, systems and components associated with this facility, and represent the conditions normally experienced at the Site during any given year.

Table 1
Environmental Conditions

Condition	Value	Reference
Maximum Ambient Outdoor Temperature	100° F	www.wunderground.com
Minimum Ambient Outdoor Temperature	5° F	www.wunderground.com
Indoor Humidity Range	0 – 100%	ASHRAE
Altitude	530 feet AMSL	www.wunderground.com
Frost Depth	3 feet 6 inches	Environmental Engineer's Handbook

AMSL Above Mean Sea Level
ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
^{o}F Degrees Fahrenheit

2.3 Performance and Functional Requirements

The SVE Containment System will operate 24 hours per day, and 7 days per week for 4 years. After the startup and prove-out periods, it will operate with minimal operator interface, except for routine maintenance, walk through inspections and plant shutdowns. The SVE Containment System will nominally operate at 600 cubic feet per minute (CFM), and maximum at 1,000 CFM. Each intermediate depth VEW shall require 4 inches of water column (i.w.), and each deep VEW shall require up to 20 i.w.

2.4 Mechanical Design Requirements

2.4.1 Piping, Valves and Appurtenances

2.4.1.1 Soil vapor extraction piping will be Polyvinyl Chloride (PVC), schedule 40. All PVC pipe will be male-female socket connections and shall be cemented. Each transfer line is to have a minimum slope as shown on contract drawings, where practicable.

2.4.1.2 An automatic fire suppression system is assumed to not be necessary for this classification of use and occupancy.

2.4.1.3 The SVE Containment System will be designed to meet the following applicable codes and standards:

- ASME B31.3 Process Piping 1999
- UPC Uniform Plumbing Code 1994
- NFPA National Fire Protection Association
- NFPA 10 Portable Fire Extinguishers

2.4.2 Heating and Ventilation System

2.4.2.1 The treatment system building general plant area will be provided with adequate outside air ventilation to maintain a maximum internal ambient indoor air temperature of 106°F based on a maximum outside air temperature of 101°F.

2.4.2.2 The Heating and Ventilation systems will utilize exhaust fans, electric heaters and direct ventilation with outside air to maintain the required indoor specified temperature.

2.4.2.3 Unoccupied areas will be maintained at the minimum temperature required to ensure proper operation of equipment, see Table 1. The treatment building will require the installation of two 5 kilowatt heaters.

2.4.2.4 The treatment building will require the installation of exhaust fans and intake louvers to supply a minimum of 4 air changes per hour.

2.4.3 Codes and Standards

2.4.3.1 The facility will be designed to meet the following applicable codes and standards:

- ASME B31.9 Building Services Piping 1996
- ASHRAE 62 Ventilation for Acceptable Indoor Air Quality
- SMACNA Sheet Metal and Air Conditioning Contractors National Association

2.5 Process/Environmental Design Requirements

The basis of design and remedial objectives for the SVE Containment System can be found in detail in *Analysis Report for Soil Vapor Extraction Containment System* (TtNUS, April 2009) and have been incorparted in this design by reference.

2.5.1 Storage Tanks, Vessels and Appurtenances

2.5.1.1 A moisture separator tank will be installed in the treatment building to remove and collect any drawn water, prior to entering the blowers. It will be 1,000 gallons in capacity, constructed of carbon steel and have corrosion resistant coatings. It will include a visual sight glass, integral vacuum relief valve, and level probe (consisting of high level sensor/switch). The vessel shall be rated for the blower operating vacuum range. Collected condensate and water will be removed by portable pump into 55-gallon drums on a periodic basis, tested and disposed of off-site.

2.5.1.2 A 5,000-pound VGAC vessel will be installed in the treatment building to remove VOCs prior to atmospheric discharge of the vapor stream. It will be designed to operate nominally at 600 CFM with a corresponding pressure drop of 3 i.w., and at a maximum of 1,000 CFM with a corresponding pressure drop of 5 i.w.

2.5.2 Blowers and Appurtenances

2.5.2.1 Two vapor extraction blowers will be installed in the treatment building for the SVE Containment System. Each will be capable of operating at 600 CFM and providing enough suction for all wells and system components, estimated 34 i.w. (*Design Analysis Report,* TtNUS, April 2009).

2.5.2.2 The blowers will be piped in parallel. One blower will be in spare position during periods of nominal running conditions. When maximum conditions are required, both blowers will run simultaneously.

2.5.3 Extraction and Monitoring Wells

2.5.3.1 Twelve VEWs will be installed on the eastern boundary of the Site for the SVE Containment System. They will be installed in six clusters of two wells each, where one well is an intermediate-depth well (i.e., screened depth at 25 to 35 feet bgs) and the other is a deep well (i.e., screened depth at 40 to 60 feet bgs).

2.5.3.2 The VEW riser pipes will be 2 inch PVC Schedule 40, and the screen shall be 0.020 high capacity machine slotted 2 inch PVC.

2.5.3.3 Three soil vapor pressure monitor wells have been installed by TtNUS on the eastern boundary of the Site. In a given location, there may be a shallow (i.e., screened depth at 8 to 10 feet bgs), intermediate (i.e., screened depth at 25 to 35 feet bgs), or deep well (i.e., screened depth at 40 to 50 feet bgs) installed.

2.5.3.4 Nine soil vapor pressure monitor wells will be installed in the residential area east of the Site. In a given location, there may be a shallow (i.e., screened depth at 8 to 10 feet bgs), intermediate (i.e,. screened depth at 25 to 35 feet bgs), or deep well (i.e., screened depth at 40 to 50 feet bgs) installed.

2.5.3.5 Seven of the aforementioned nine soil vapor pressure monitor wells have been installed, and abandoned by filling with No. 2 sand, capped loosely and covered with soil. These soil vapor pressure monitor wells are to be redeveloped by removing sand filling. The remaining two of nine soil vapor pressure monitor wells require new installation.

2.5.3.6 The soil vapor pressure monitor well riser pipes will be 1 inch PVC Schedule 40, and the screen shall be 0.020 high capacity machine slotted 1 inch PVC.

2.6 Civil/Structural Design Requirements

2.6.1 Treatment Building and Appurtenances

2.6.1.1 The maximum soil bearing capacity will not be less than 2.5 kips per square foot (k/sf)

2.6.1.2 The design loads will be as per the latest version of American Society of Civil Engineers (ASCE) 7 and are as follows: wind loading is 110 miles per hour (mph) for 3 seconds; ice loading is for 0.75 inch; seismic loading is maximum ground motion of 35% g for 0.2 seconds and 6% g for 1 second; and snow loading is 30 pounds per square foot (psf).

2.6.1.3 The treatment plant floor (Building 03-35, existing) is concrete. If required, the floor will be sealed to resist erosion due to traffic, water and mild chemical spills. No secondary containment will be provided.

2.6.1.4 The Flow Monitoring Station will be installed on 6” (Nominal) clean gravel over a compacted subgrade.

2.6.1.5 The Flow Monitoring Station Building will be a pre-engineered, prefabricated wooden structure. The building will not be insulated. The building will be verified to meet all appropriate loading requirements including wind, snow, seismic, etc, for the geographic area.

2.6.1.6 An automatic fire suppression system is assumed to not be necessary for this classification of use and occupancy.

2.6.1.7 Appropriate noise containment will be input into the design

2.6.2 Utility, and System Piping

2.6.1.1 Pipe penetration to buildings will be sealed to prevent environmental intrusion.

2.6.1.2 Piping will be buried below the frost line to the greatest extent possible to prevent freezing and protect from aboveground loads. Below grade piping will be placed in well graded sand. Above grade piping will be insulated.

2.6.1.3 The Contractor will work with the local governing body of the sewer, service water, and electrical authority to establish a course of action for each utility.

2.6.2 Codes and Standards

The facility will be designed to meet the following applicable codes and standards:

- ASCE 7 — American Society of Civil Engineers
  Standard Minimum Design Loads for Buildings and Other Structures
- IBC — International Building Code
- SSPC — The Society for Protective Coatings
- Other — Applicable State and Local Codes

2.7 Electrical/I&C Design Requirements

2.7.1 Power Systems and Appurtenances

2.7.1.1 Power for the soil vapor extraction containment system will be provided by the 400A, 480V, 3 phase supply already in service at the containment building.

2.7.1.2 The electrical system will be designed in accordance with NFPA 70, National Electric Code (NEC), 2008.

2.7.1.3 Except as required for connections to equipment, all outdoor conduit raceway and cable runs will be overhead.

2.7.1.4 The current grounding grid will be used for grounding the electrical equipment.

2.7.1.5 Lightning suppression equipment and materials will be evaluated and used as necessary.

2.7.1.6 The treatment plant will contain the following auxiliary systems: fire detection and alarm, and security service. These alarm conditions will have contacts wired into an existing dialer system in adjacent building.

2.7.1.7 Chlorinated solvents are the contaminants of concern at this site. Explosive vapors due to the presence of petroleum products or other contaminants are not expected. Therefore, the process area will be classified as Non-Hazardous for electrical installation.

2.1.1 2.7.2 Instrumentation and Controls

2.7.2.1 All instrumentation and control system components will be of high quality and meet all NEC and IEEE codes and requirements.

2.7.2.4 Several auxiliary systems will be installed in the plant including fire detection, alarm system and security alarm system.

2.7.2.5 All alarm condition scenarios will result in a plant shut down, which will require an on-site visit by trained personnel for appropriate system diagnosis and a manual restart. As a safety precaution, no remote system restarts will be permitted.

3.0 Operations and Maintenance Requirements

All systems, structures and components will be designed and configured to allow ease of operations and routine maintenance under all operating conditions.

4.0 Environmental, Health and Safety Requirements

4.1 All systems, structures and components will avoid the use of lead metal, hazardous waste producing materials or ozone depleting compounds, in accordance with the Site Waste Minimization and Pollution Prevention Plan, which will be developed as part of the design. If any of these materials must be used, justification will be provided and all affected items will be approved by the Contracting Officer prior to installation.

4.2 All Contractor and subcontractor personnel will be made aware of and must follow requirements of the existing site-specific Health and Safety Plan.

4.3 All equipment will be located inside of a locked building to protect it from vandalism and to protect the public from the equipment's operation.

4.4 All piping, fittings, equipment, etc. will be chemically compatible with the contaminants and other process materials that are present.

4.5 During the design process and prior to any intrusive activities, a utility mark-out call will be placed to ensure no active utilities are encountered. All available utility location drawings that can be obtained from the local governing body will be verified against the on-site markings. Additionally, the Contractor or its subcontractor will use a hand-held magnetic utility locator to verify utility locations.

4.6 The Contractor will work with the local governing authority to establish guidelines during the construction phase of the project. Guidelines to be established would include standard work hours, haul routes for equipment and materials, required permit equivalencies, required inspections, etc.

5.0 Regulatory Requirements

5.1 An air discharge permit equivalency application for the treated exhaust stream off-gas will be submitted to the New York State Department of Environmental Conservation (NYSDEC) for review.

Depending upon several criteria established by the NYSDEC, the air discharge permit equivalency may require additional treatment of the off-gas or the location or height of the stack be modified. The air discharge permit equivalency will establish the type and frequency of vapor monitoring and the associated reporting requirements.

6.0 Applicable Codes and Standards

Applicable codes and standards are listed in each individual discipline subsection.

7.0 References

1. Design Analysis Report for Soil Vapor Extraction Containment System (TtNUS, April 2009)

TECHNICAL SPECIFICATIONS

DIVISION 2 – SITE WORK

SECTION 02150

CLEARING AND GRUBBING

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The Subcontractor shall clear and grub only in those areas necessary to complete the work required. Limits for clearing and grubbing shall be marked in the field by the Subcontractor and approved by the Contractor before the work commences.

The Subcontractor's proposed Operations/Laydown Area as designated in the Subcontractor's Construction Work Plan should be such that the felling, trimming or cutting of trees is not necessary.

1.1 REFERENCES

Not used.

PART 2. PRODUCTS

Not used.

PART 3. EXECUTION

3.1 PROTECTION OF UTILITY LINES

The Subcontractor shall notify the Contractor immediately when they encounter or damage a known or an unknown utility line. The Subcontractor shall be responsible for repairs to existing utility lines. The Subcontractor shall provide ample notification, to the utility companies, for utilities, which require removal or relocation, so that interruption of service shall be at a minimum.

3.2 CLEARING AND GRUBBING

A. Clearing and grubbing shall consist of the removal and satisfactory disposal of vegetation designated for removal, including trees, stumps, logs, shrubs, snags, and brush occurring within the trenching and excavation areas (including utility tie-in locations, flow monitoring station area, treatment building areas, and recovery wellhead areas). The surface of the ground within these areas as required for the installation of facilities, utilities, and improvements shall be cleared as necessary of all brush, stumps, roots, grass, and weeds. Clearing operations shall be conducted in a manner that prevents damage to existing structures and installations and those

under construction, and that provides for the safety of employees and others. The Subcontractor shall clear and grub on an as-needed basis as work progresses.

B. The Subcontractor shall remove any rubbish, rubble piles, debris, and all other objectionable obstructions resting on or protruding through the surface of the ground that would otherwise adversely impact the construction activities.

C. The Subcontractor shall not clear and grub any area beyond the Subcontractor's working area. No stumps, tree limbs, or brush shall be buried in any fills or embankments. Damage of any nature shall not be inflicted upon adjoining properties by unwarranted entry on such land.

D. Subcontractor shall chip for mulch all cleared and grubbed materials that is less than 3 inches in diameter.

3.4 DISPOSAL OF CLEARING AND GRUBBING MATERIAL

If deemed necessary by the Contractor, excess excavated soil, and cleared or grubbed material may be disposed of off-site at a location approved by the Contractor.

* * * END OF SECTION * * *

SECTION 02270

EARTHWORK: TRENCH EXCAVATION AND BACKFILLING FOR EXTRACTION SYSTEMS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

This section shall consist of excavating, trenching, and backfilling for underground piping (product transfer lines). The trench depth shall be a minimum of 54 inches. The trench width shall be a minimum of 18 inches and a maximum of 36 inches. The location of the trenches shall be as shown on the Drawings. Suitable excavated material shall be used as partial backfill in the trenches as allowable and directed by the Contractor. After the trench is excavated, SVE pipes shall be installed per the Specifications and Drawings. The trench shall be backfilled with the materials specified herein.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02910	Site Restoration and Revegetation

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 698	(2007) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb f/ft (600 kN-m/m)
ASTM D 1556	(2007) Density and Unit Weight of Soil in Place by Sand-Cone Method
ASTM D 1557	(2007) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. Ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(2008) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(2006 E 2008) Classification of Soils for Engineering Purposes (Unified Soil Classification System)

ASTM D 6938	(2008) In-Place density and Water Content of Soil and Soil-Aggregate by Nuclear Methods(Shallow Depth)

1.2 SUBMITTALS

The Subcontractor shall submit sieve analysis test results for the bedding sand to the Contractor. In addition, the Subcontractor shall submit a letter certifying that the bedding sand is clean and free from any contamination. Five copies of each submittal shall be provided.

PART 2. PRODUCTS

2.1 MATERIALS

A. Bedding Sand

Bedding sand shall consist of a well graded sand material classified as SW in accordance with the Unified Soil Classification System. Bedding Sand is to be imported material, clean and free from any contamination.

B. Warning Tape

Warning tape shall be acid and alkali-resistant polyethylene film, 6 inches wide with a minimum thickness of 0.0035 inches (3.5 mils). Tape shall have a minimum strength of 1,750 psi lengthwise and 1,500 psi crosswise. The tape shall be manufactured with integral wires, foil backing, or other means to enable detection by a metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in Table 02270-1 and shall bear a continuous printed inscription describing the specific utility.

TABLE 02770-1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, and Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

PART 3. EXECUTION

3.1 TRENCH EXCAVATION

Trenches shall be excavated to the dimensions shown on the Drawings. Trench walls shall be made vertical. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content.

A. Bottom Preparation

The bottoms of trenches shall be accurately graded to provide uniform bearing and support for each pipe.

B. Shoring

Subcontractor shall ensure that all excavations are shored or laid back in accordance with applicable codes and standards, especially OSHA CFR 1926.

C. Removal of Unyielding Material

Where overdepth is not indicated and unyielding material is encountered in the bottom of the trench, such material shall be removed below the required grade and replaced with suitable materials. Where unstable material is encountered in the bottom of the trench, such material shall be removed to a depth of 6 to 12 inches, or as directed by the Contractor, and replaced to the proper grade with selected granular material.

D. Drainage and Dewatering

The Subcontractor is responsible for dewatering of the open excavations. Fill shall not be placed in standing water. The Subcontractor shall provide necessary storm water controls to minimize any inflow or infiltration of storm water into open excavations.

E. Material Screening

No releases of hazardous material have been identified in the trench areas; however VOCs, PCBs, Cadmium and chromium have been identified in the soils. Excavated Material are not expected to be hazardous, however shall be screened for contamination (elevated photo-ionization detector readings, odors, staining, or debris). Materials exhibiting contamination shall be stockpiled separately as unsatisfactory and characterized. Payment for the characterization and disposal of hazardous waste shall be made in accordance with the “CHANGES” clause of the General Conditions.

F. Stockpiles of Excavated Material

Stockpiles of satisfactory and unsatisfactory materials shall be placed on-site in approved designated areas and graded as directed by the Contractor. Stockpiles shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and compacted. Excavated satisfactory and unsatisfactory materials shall be kept separate. Stockpiles of satisfactory materials shall be protected from contamination, which may destroy the quality and fitness of the stockpiled material. The Subcontractor shall ensure that all the appropriate measures are in place in accordance with the Contractor’s Soil Erosion and Sedimentation Control Plan.

3.2 BACKFILLING

A. Backfill material shall consist of bedding sand material and suitable excavated trench material. Backfill shall be placed in 6-inch loose layers and compacted by hand operated machine compactors. Each layer shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined in accordance with ASTM D 698 testing

method. The bedding sand material and excavated trench material shall be placed in the trench to depths as shown on the Drawings.

B. Bedding sand material shall be placed and compacted with approved tampers to a depth of at least 6 inches below the pipe and 5 inches above any pipe, conduit, or multiple pipes. The backfill shall be brought up evenly on both sides of the pipe for the full length of the pipe.

C. Each open section of trench shall be backfilled the same day. Open trenches shall be kept to a minimum as determined in conjunction with the Contractor. The Subcontractor is responsible for safely securing the open trenches during work hours and at the end of the day.

D. All surface conditions that are damaged, disturbed or removed during the process of excavation for extraction, discharge and utility systems shall be replaced in kind (refer to Section 02910).

3.3 COMPACTION TESTING

A. Prior to installation of bedding sand material, subgrade shall be compacted to a minimum of 90% compaction per ASTM D 698. If the Subcontractor cannot achieve the required compaction, the Subcontractor is required to remove unsuitable material in order to achieve a minimum of 90% compaction with respect to ASTM D 698.

B. The bedding sand and the excavated trench material shall be compacted to a minimum of 95% relative compaction with respect to the maximum dry density as determined by ASTM D 698 testing method. The field compaction shall be performed on each lift in accordance with ASTM D 6938 at a testing frequency of one test per 100 linear feet of trench. A sand cone test shall be performed in accordance with ASTM D 1556 at a testing frequency of one test per day. The nuclear density gauge shall be calibrated based on the test results obtained from the sand cone test.

C. Testing shall be the responsibility of the Subcontractor and shall be performed at no additional cost to the Contractor. Testing shall be performed by a Contractor approved testing laboratory or may be performed by Subcontractor subject to Contractor approval. Field in-place density shall be determined in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 6938. When ASTM D 6938 is used, the calibration curves shall be checked and adjusted if necessary by the procedure described in ASTM D 6938.

3.4 WARNING TAPE

Warning tapes shall be placed at least 12 inches directly above the pipe or conduit but no more than 12 inches below grade. The installation shall be performed per the manufacturer's recommendations and in accordance with the Drawings.

* * * END OF SECTION * * *

SECTION 02525

EXTRACTION WELL SPECIFICATIONS

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work covered by this Section consists of the installation and development of 5 intermediate depth (I) and 5 deep soil (D) vapor extraction wells, the completion of 1 intermediate depth and 1 deep soil vapor extraction well, as well as the completion and redevelopment of up to 10 soil vapor pressure monitors, and installation of 2 soil vapor pressure monitors.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM C 117	(2004) Materials Finer Than 75 micrometer (No.200) Sieve in Mineral Aggregates by Washing
ASTM C 136	(2006) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	(2007) Portland Cement
ASTM D 1586	(2008) Penetration Test and Split-Barrel Sampling of Soils
ASTM D 1587	(2008) Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
ASTM D 1785	(2006) Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D2113	(2008) Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation
ASTM D 2487	(2006 E-2008) Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(2009) Description and Identification of Soils (Visual-Manual Procedure)

ASTM D 4397	(2009) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
ASTM D 5088	(2002) Decontamination of Field Equipment Used at Nonradioactive Waste Sites
ASTM D 5092	(2004) Standard Practice for Design and Installation of Ground Water Monitoring Wells
ASTM F 480	(Rev B - 2006) Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40 and SCH 80
ASTM F 883	(2004) Padlocks

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2003) Safety -- Safety and Health Requirements

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

EPA 530/F-93/004	(1993; Rev O; Updates I, II, IIA, IIB, and III) Test Methods for Evaluating Solid Waste (Vol IA, IB, IC, and II) (SW-846)
EPA 600/4-79/020	(1983) Methods for Chemical Analysis of Water and Wastes

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards

1.2 DESCRIPTION OF WORK

Provide wells including drilling, casing, well screen, sand packing, grouting, stick-up completion, development, and incidental related work to render in a condition ready for operation.

Install Soil Vapor Extraction Wells
SVE – 101I and D – Complete Installation and Development
SVE – 102I and D
SVE – 103I and D
SVE – 104I and D
SVE – 105I and D
SVE – 106I and D

Install Soil Vapor Pressure Monitors
SVPM – 2002 S, I, D – Installed, Abandoned
SVPM – 2003 S, I – Installed, Abandoned
SVPM – 2004 I, D – Installation Required
SVPM – 2007 I, D – Installed, Abandoned
SVPM – 11 S – Installed, possibly abandoned
SVPM – 12 – Installed, possibly abandoned
SVPM – 12 S – Installed, possibly abandoned

Soil Vapor Pressure Monitors were abandoned in February 2009 by filling with No. 2 sand, capping, and covering with soil. Redevelopment requires the removal of sand filling, and installing a permanent flush mount casing.

1.3 GENERAL REQUIREMENTS

Each system, including equipment, materials, installation, and performance, shall be in accordance with local, State, and Federal regulations except as modified herein. Consider the advisory or recommended provisions to be mandatory, as though the word "shall" has been substituted for the word "should" wherever it appears.

Reference to the "Project Representative" and the "Owner" shall be interpreted to mean the Contractor.

1.4 SUBMITTALS

The following shall be submitted:

SUBMITTAL PROCEDURES:

Shop Drawings

Well construction

Product Data

Well casing

Well screen

Well Riser

Neat cement grout

Bentonite Plug

Caps

Certificates

Well Drilling/Development Material Handling Plan

Health and Safety Plan

Field Sampling and Laboratory Testing Plan

Treatment Facility Permit

Installation Survey Report

Borehole Report

Closeout Submittals

Well Construction Permits
Including Town Permits

Well Development Report

Shipment manifests

Delivery certificates

Treatment and disposal certificates

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in an undamaged condition. Unload and store with minimal handling. Store materials in on-site enclosures or under protective coverings, out of direct sun. Store materials off the ground. Keep insides of pipes and fittings free of dirt and debris. Replace defective or damaged materials with new materials.

1.6 QUALITY ASSURANCE

1.6.1 Required Drawings

Submit well construction drawings showing components and details of well casing, screen, riser, and associated items.

Drawings shall be prepared by a State certified professional geologist or hydrogeologist, or by a State registered professional civil engineer, hereafter referred to as the Contractor's Professional Consultant (CPC). Drawings shall be sealed.

1.6.2 Well Drilling/Development Material Handling Plan

A material handling plan shall be furnished by the Contractor 15 days prior to initiation of the work and include: a schedule to be employed in the well drilling and development stages, a sequence of operations, the method of drilling and development, material hauling, proposed equipment, soil and water testing requirements, and safety precautions and requirements.

Cutting should be screened in accordance with Section 3.3. Soils generated off-site shall be brought on-site, characterized, and disposed of off-site.

1.6.3 Site Safety and Health Plan (SSHP)

Describe safety precautions for each phase of the project as specifically related to handling of soil and water removed during well drilling and development operations. Identify appropriate requirements of 29 CFR 1910 and EM 385-1-1. Identify safety equipment and procedures to be available and used during the project. Furnish the name and qualifications based on education, training, and work experience of the proposed Site Health and Safety Officer (SHSO) and the members of the drill crew. The CPC may perform the responsibilities of the SHSO if properly qualified.

1.6.4 Field Sampling and Laboratory Testing Plan

Describe field sampling methods and quality control procedures.

Sample reports shall show sample identification for location, date, time, sample method, contamination level, name of individual sampler, identification of laboratory, and quality control procedures.

1.6.5 Treatment Facility Permit

Verification that the proposed treatment facility is permitted to accept the Investigation Derived Waste (IDW) materials specified, prior to disposal.

1.6.6 Well Development Report

Provide report, containing the following data: project name and location, well designation, date and time of well installation, depth of well from top of casing to bottom of well, screen length.

1.6.7 Well Construction Permit

Submit a completed permit application and a proposed method of construction to the appropriate state agency prior to construction of the well. Construction of the well will not be allowed until an approved Well Construction Permit has been submitted to the Contracting Officer.

1.6.8 Shipment Manifests

Copies of manifests and other documentation required for shipment of waste materials within 24 hours after removal of waste from the Site. Shipment manifests shall be signed by the Contracting Officer.

1.6.9 Delivery Certificates

Verification that the wastes were actually delivered to the approved treatment facility, within 7 days of shipment.

1.6.10 Treatment and Disposal Certificates

Verification that the wastes were successfully treated and remediated if required.

PART 2 PRODUCTS

2.1 WELL CASING

2.2 WELL SCREEN

Well screens shall be located as indicated. The length of the screen shall be as indicated. Slotted openings shall be distributed uniformly around the circumference of the screen.

2.2.1 PVC Screens

ASTM D 1785, Schedule 40, continuous slot construction.

2.2.2 Riser

PVC - ASTM D 1785, Schedule 40.

2.3 ANNULAR SEALANTS

2.3.1 Bentonite Seal

Provide powdered, granular, pelletized, or chipped calcium montmorillonite in sealed containers from a commercial source, free of impurities. Diameter of pellets shall be less than one fifth the diameter of the borehole annular space to prevent bridging. Bentonite base grout shall be in accordance with ASTM D 5092.

2.3.2 Neat Cement Grout

Provide neat cement grout in accordance with ASTM D 5092. Cement shall be in accordance with ASTM C 150. Quick setting admixtures shall not be allowed. Drilling mud or cuttings shall not be used as a sealing material.

2.4 BOTTOM PLUGS

Provide flush solid plug at the bottom of the well. Plug shall be the same material as the well screen to which it is attached.

2.5 LOCKING WELL CAP

Provide weatherproof, airtight, non-removable locking well cap on the top of the well. Well cap shall accommodate padlock.

Provide a long shackled padlock in accordance with ASTM F 883. Provide two keys for the padlock, and turn them over to the Contracting Officer. Locks at the well site shall be keyed alike.

2.6 WELL HEAD COMPLETIONS

Clearly mark and secure the well to avoid unauthorized access and tampering. Cast the words "EXTRACTION WELL" on the well head covers. Provide a sign reading, "WELL IS FOR MONITORING." Provide stamped metal identification tag as follows:

DO NOT DISTURB
ID #: Date:
Installed By:
Total Depth:
Screened Interval:
TOC Elevation:
Other:
For Information, Call:

2.7 POLYEHTYLENE SHEETING

ASTM D 4397

PART 3 EXECUTION

3.1 GENERAL

Notify the Contracting Officer at least 15 days prior to commencement of work. Location of well shall be as indicated. Drilling, installation, and development of the extraction well shall be supervised, directed, and monitored by the CPC.

3.2 DRILLING

3.2.1 Sampling

Drilling activities shall include environmental monitoring in accordance with the SHSP.

3.2.2 Analysis

The CPC shall review the log data from each borehole and compare the data with the well design requirements. The CPC shall verify the adequacy of the well design, or shall offer a proposed modification to the design based on the geologic data obtained from the borehole. This review and analysis shall be conducted for each borehole. The CPC shall submit the borehole logs, the analysis of the well design, and any proposed design modifications to the Contracting Officer in a Borehole Analysis Report. Any modifications to the well design approved by the Contracting Officer shall be considered a change to the contract documents and shall be negotiated in accordance with the "CHANGES" clause.

3.2.3 Alignment

Verify that the well is plumb.

3.3 SOIL REMOVED FROM THE BOREHOLE

3.3.1 Temporary Containment of Soil Removed from the Borehole

Cuttings removed from the borehole shall be placed in a temporary containment area. Soil shall be stored in 55-gallon DOT approved steel drums (1A1) or stockpiled in trucks or roll off containers suitable for transporting potentially contaminated soils as specified herein. As an option, a temporary containment area may be constructed with 0.25 mm 10 mil reinforced polyethylene sheeting. Place cuttings removed from the borehole on the impervious barrier and cover with 0.15 mm 6 mil reinforced polyethylene sheeting. Provide a straw bale berm around the outer limits of the containment area and cover with polyethylene sheets. Secure edges of sheets with weights to keep the polyethylene sheeting in place. Water runoff shall be diverted from the stockpiled material. Drums will be stored in a temporary containment area on-site.

3.3.2 Testing Requirements for Stockpiled Soils

3.3.2.1 Sampling

A minimum of one composite sample shall be developed and analyzed for each required test [for every 100 cubic yards or fraction thereof] from a composite stockpile of soil removed from all well sites. To develop a composite sample of the size necessary to run the required tests, the Contractor shall take several samples from different areas along the surface and in the center of the stockpile. These samples shall be combined and thoroughly mixed to develop the composite sample. A distinct grab sample will be collected for samples requiring volatile organic compound (VOC) analysis.

3.3.2.2 Testing

A. PCBs, Cadmium, Chromium, and chlorinated solvents [Trichloroethene (TCE), Tetrachlorehene (PCE), 1,1,1-Trichloroethane (TCA)] have been identified as the constituents of concern. A testing procedure is provided in the Project Work Plan

to screen the materials for possible contamination exceeding hazardous waste action levels.

B. The Testing procedure shall contain any additional tests required by the proposed disposal facility.

3.3.2.3 Disposal of Contaminated or Stockpiled Soils

A. Soils failing the testing procedure shall be managed in accordance with applicable State and local regulations.

B. Soils passing shall be managed as Non-Hazardous waste.

3.4 WELL INSTALLATION

Well installation shall be in accordance with ASTM D 5092 and EPA 600-4-89-034, and as indicated on the well construction drawings submitted by the CPC and approved by the Contracting Officer. Borehole shall be stable and shall be verified straight before beginning installation.

3.4.1 Casings and Screens

Well casings, screens, plugs, and caps shall be decontaminated prior to delivery by the manufacturer and shall be certified clean. Materials shall be delivered, stored, and handled in such manner as to ensure that grease, oil, or other contaminants do not contact any portion of the well screen and casing assembly prior to installation. If directed by the Contracting Officer, the well screen and casing assembly shall be cleaned with high pressure water prior to installation. Personnel shall wear clean cotton or surgical gloves while handling the assembly. Centralizers shall be used to ensure that the well screen and casing assembly is installed concentrically in the borehole. When the assembly has been installed at the appropriate elevation, it shall be adequately secured to preclude movement.

3.4.2 Bentonite Seal

Bentonite shall be placed as a slurry through a tremie pipe. Control speed of bentonite placement to prevent bridging or segregation of slurry. Additional water shall be added to the annular space as directed by the CPC to ensure complete hydration of the bentonite. Bentonite shall cure a minimum of 48 hours before the placement of cement grout to ensure complete hydration and expansion of the bentonite.

3.4.3 Neat Cement Grout

Cement grout shall be placed in the annular space above the bentonite seal as indicated on the well construction drawings. Cement grout shall be placed as a slurry through a tremie pipe, and injected under pressure to reduce chance of voids. Grout shall be injected in one continuous operation until full strength grout flows out at the ground surface without evidence of drilling cuttings or fluid. Cement grout shall cure a minimum of 48 hours.

3.4.4 Well Head Completions

Well head completions shall be as indicated and as specified herein. Identify and secure monitoring wells to avoid unauthorized access and tampering.

3.5 TRANSPORTATION OF CONTAMINATED SOIL AND WATER

The Contractor shall be solely responsible for complying with Federal, State, and local requirements for transporting contaminated materials through the applicable jurisdictions and shall bear responsibility and cost for any noncompliance. In addition to those requirements, the Contractor shall do the following:

A. Inspect and document vehicles and containers for proper operation and covering.

B. Inspect vehicles and containers for proper markings, manifest documents, and other requirements for waste shipment.

C. Perform and document decontamination procedures prior to leaving the worksite and again before leaving the disposal site.

3.6 DISPOSAL OF CONTAMINATED SOIL AND WATER

Contaminated materials removed from the Site shall be disposed of in a treatment/disposal facility permitted to accept such materials.

3.7 INSTALLATION SURVEY

Upon completion of well installation and development and acceptance by the Contracting Officer, the Contractor shall determine the vertical and horizontal position of each well by a registered land surveyor licensed in the State of New York. The survey shall document the vertical elevations of the top of the casing pipe and the ground surface elevation adjacent to each well. The survey shall also determine the horizontal location of each well based on the New York State Plane coordinate system. Survey shall be accurate to the nearest .01 foot. This data shall be submitted with a well location map as the Installation Survey Report.

3.8 CLEANUP

Upon completion of the well construction, remove debris and surplus materials from the jobsite.

END OF SECTION

SECTION 02910

SITE RESTORATION AND REVEGETATION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The work covered by this Section consists of scarifying the seed bed, furnishing and placing pulverized agricultural limestone, commercial fertilizer, seed, mulching, and maintaining the seeded areas. The time of seeding may be selected by the Contractor who shall be responsible for securing a satisfactory stand of grass. Seeding shall be performed as soon as possible following the completion and approval of final grading, and the incorporation of soil supplements. If erosion occurs between the time of final grading and time of seeding, the Subcontractor shall replace the soil materials which were eroded away and regrade all eroded areas to reestablish the final grade. The Subcontractor shall also reapply and reincorporate soil supplements in the eroded areas. The Subcontractor may, with the approval of the Contractor, perform temporary seeding operations in order to maintain finished graded areas until optimum time for performing permanent seeding. All surfaces disturbed will be replaced in kind.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 02270	Earthwork: Trench Excavation and Backfilling for Extraction, Discharge, and Utilities Systems

1.2 SUBMITTALS

The Subcontractor shall submit the following to the Contractor:

A. The Subcontractor shall submit a certificate of seed purity and germination analysis under the current Rules for Testing Seeds of the Association of Official Seed Analysts by the State of New York and sample results of topsoil tested for fertilizer and soil nutrients for Contractor review prior to commencement of related Work.

B. The Subcontractor shall submit information on the fiber mulch to be used with a brief description.

PART 2. PRODUCTS

2.1 GENERAL

The Subcontractor shall furnish all of the materials specified. Unless stated otherwise herein, all sampling and testing of these materials shall be at the direction of the Contractor and at the

Subcontractors expense. All materials shall be furnished by suppliers who are approved by the Contractor. The Subcontractor shall replace all damaged grass areas in kind including private property (lawns).

2.2 GRASS SEED

A. Grass seed for the proposed trenches, flow monitoring station area, and treatment building area shall meet the requirements listed in this section and shall consist of the following mixture or approved equivalent:

Seed Type (Specific Name)	Acceptable Varieties	% Purity	% Total Germination	Seeding Rate (lb/acre as pure live seed)
Tall Fescue (Festuca arundinacea)	XY-31	97.25	92	20
Perennial Ryegrass (Lolium perenne)	Pennefine, Manhattan, Citation, or Regal	97.25	88	5

B. Subject to the approval of the Contractor, the Subcontractor may add other grass seeds to the mixture to secure a cover crop, but no additional payment shall be made therefor. No seed shall contain any of the following noxious weed seeds: Canada thistle, field bindweed, Johnson grass, perennial peppergrass, perennial sowhistle, quackgrass, horse nettle, bedstraw, corn cockle, Brassica kaber, Brassica nigra, wild onion or wild garlic.

C. All seed shall conform including the certification of purity and germination analysis to the seed law of New York State.

D. Seed shall be furnished fully tagged and delivered by separate varieties, separately packaged or bagged. All premixed seed shall have an inspection tag, stamped, dated and signed by the Department of Agriculture Inspector, sewn into the inside top of each bag. No seed shall be utilized which has a mix date older than six months. No seed shall be used unless it has been inspected and sampled as described, or sampled by individual species and mixed on the project under the Contractor's supervision.

E. The seed furnished shall not be more than two years old and shall have been tested for germination not more than six months prior to seeding operations. A certificate of test results shall be furnished to the Contractor before approval for use of the seed is given.

F. Seed which has become wet, moldy or otherwise damaged in transit or storage, shall not be accepted.

G. All other grass seed shall be replaced in kind and meet the requirements listed in Parts 2.2.B., 2.2.C., 2.2.D., 2.2.E., and 2.2.F., of this section.

2.3 COMMERCIAL FERTILIZER

Commercial fertilizer shall be uniform in composition, free-flowing material suitable for application with approved standard equipment. The commercial fertilizer shall conform to applicable State of New York fertilizer laws and shall be delivered in bags or other convenient containers, each fully labeled and bearing the name, trademark, and warranty of the producer.

2.4 PULVERIZED AGRICULTURAL LIMESTONE

Pulverized agricultural limestone shall be agricultural ground limestone and shall contain not less than 89% carbonate equivalent ($CaCO_3$ equivalent) and be ground to such fineness that at least 95%, 60% and 50% by weight shall pass standard 20, 60, and 100 mesh sieves, respectively. If moisture content exceeds 5%, the maximum percentage of moisture shall be clearly indicated and the application rates shall be adjusted accordingly to reflect moisture content. Such limestone shall contain a minimum of 3% MgO or a supplemental amount of magnesium (Mg) shall be applied with limestone to achieve a total minimum equivalent application rate of 240 pounds/acre of Mg.

2.5 MULCHING MATERIALS

A. All mulching materials shall be free from mature seed-bearing stalks or roots of prohibited or noxious weeds as defined by the New York Department of Agriculture and Markets, in Article 9 of the Agriculture and Markets Law, Chapter 631.

B. Mulches for seeded areas shall be either hay or straw, or a combination of both.

C. Hay or straw mulching material shall be well cured to less than 20% moisture by weight, and shall contain no stems of tobacco, soybeans, or other coarse or woody material. Asphaltic emulsion may be used if approved by the Contractor.

1. Hay – This shall consist of Timothy hay, mixed clover, or other approved native or forage grasses.

2. Straw - Straw mulching material shall be either wheat or oat straw reasonably free of viable seed.

3. Binder Materials:

a. Asphaltic Emulsion shall consist of refined petroleum asphalt emulsified in alkaline water without the use of clay, starch, or like deleterious substances and not more than 0.75% of saponified acids. It shall be of a fluid consistency suitable for spray application. It shall contain no petroleum solvents or other diluting acids known to be toxic to plant life.

b. Nonasphaltic emulsion consisting of natural vegetable gum blended with gelling and hardening agents.

2.6 WATER

Water shall be fresh and free from injurious amounts of oil, acid, alkali, salts, or other materials harmful to the growth of grass.

2.7 BLACKTOP (ROADWAYS)

All roadway material that is excavated and/or damaged shall be restored in kind.

2.8 CONCRETE

All curb and sidewalk sections that are excavated and/or damaged shall be restored in kind.

PART 3. EXECUTION

3.1 REPLACEMENT IN KIND

Execution for all replacements of products/services will be in kind.

3.2 PREPARATION OF SEED BED

On all surfaces to be seeded, sticks, rocks, weeds, roots, or other objectionable material appearing on the surface which, in the opinion of the Contractor will be detrimental to obtaining a satisfactory stand of vegetation, shall be removed by the Subcontractor. The finished surface of soil shall be maintained in a true and even condition during the sowing of the seed.

3.3 COMMERCIAL FERTILIZER

A. Commercial fertilizer shall be applied at the rates indicated by the test results.

B. No more than 40 pounds of nitrogen, 80 pounds of phosphate and 80 pounds of potash, per acre, shall be placed in the seeder with the seed. Any remaining amount of fertilizer required shall be applied separately. Eighty (80) pounds, per acre, of the nitrogen requirement shall be from a slow-release source such as Ureaform.

3.4 SEEDING

The seeds, fertilizer and any soil amendments shall be combined together prior to application. The application rate shall be in accordance with the project specifications.

3.5 MULCHING

A. After seeding has been completed, mulch shall be uniformly applied over the entire surface at an average rate of 2-1/2 tons (dry weight) per acre and spread to a uniform depth. The mulch shall be in a moist condition at the time of placement or shall be sprinkled immediately after placing. While moist, the material shall be anchored in the soil by an approved method to secure the material firmly in the ground to form a soil-binding mulch and prevent loss or bunching by wind. Mulch material cut into lengths less than 6 inches shall not be acceptable.

B. Approved asphaltic emulsion at the rate of 150 gallons per acre or non-asphaltic emulsion at the manufacturer's recommended rate may be used as an alternative tie down, provided it is applied uniformly over and through the mulch. It shall be non-toxic to plants and seeds. A mechanical blower may be used to apply mulch if it is specifically designed and approved for that purpose.

3.6 MAINTENANCE

A. The Subcontractor shall maintain the completed area in accordance with the requirements of this section, and be responsible for regrading to final contours until all work under the Contract has been completed and has been accepted by the Contractor. The maintenance shall consist of refilling rain-washed gullies, with same or better type of soils that were eroded, reseeding, reapplying soil supplements and mulch, as directed by the Contractor. Regrading is incidental to revegetation.

B. Within the one year remedy guarantee period, the Subcontractor shall repair eroded areas, reapply soil supplements, reseed and mulch in accordance with these Specifications any areas where satisfactory growth has not been obtained, in the opinion of the Contractor.

* * * END OF SECTION * * *

DIVISION 9 – FINISHES

SECTION 09900

PAINTING, GENERAL

PART I. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

General painting shall consist of furnishing and applying coatings of various types to form an effective barrier and/or serve as a form of coding or marking for the various systems, pipes, etc. mentioned here.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

ASME A13.1	(2007) Scheme for the Identification of Piping Systems

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3273	(2000) Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
ASTM D 3274	(2009) Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
ASTM D 4214	(2007) Evaluating the Degree of Chalking of Exterior Paint Films

FEDERAL SPECIFICATIONS (FS)

FS TT-C-535	(Rev B; Am 2) Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
FS TT-C-542	(Rev E) Coating, Polyurethane, Oil-Free, Moisture Curing
FS TT-E-489	(Rev H) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-E-496	(Rev B; Am 3) enamel: Heat-Resisting (400 degrees F), Black
FS TT-F-1098	(Rev D) Filler, Block, Solvent-Thinned, for Porous Surfaces (Concrete Block, Cinder Block, Stucco, Etc.)

FEDERAL STANDARDS (FED-STD)

FED-STD 313	(Rev C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Engineer Activities

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Paint 21	(1982 R-2004) White or Colored Silicone Alkyd Paint
SSPC SP 1	(1982R-2004) Solvent Cleaning
SSPC SP 3	(1982 R-2004) Power Tool Cleaning
SSPC SP 6	(2007) Commercial Blast Cleaning
SSPC SP 7	(2007) Brush-Off Blast Cleaning
SSPC SP 10	(2007) Near-White Blast Cleaning

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

A. The names, quantity represented, and intended use for the proprietary brands of materials proposed to be used for the painting specified.

B. Manufacturer's current printed product description, material safety data sheets (MSDS) and technical data sheets for each coating system. MSDS submittals shall meet the requirements of FED-STD 313. Detailed mixing, thinning and application instructions, minimum and maximum application temperature, and curing and drying times between coats for epoxy, moisture-curing polyurethane, and liquid glaze coatings. Detailed application instructions for textured coatings shall be provided.

C. A statement as to the quantity of paint represented and the intended use.

D. Certificate stating that paints for interior use contain no mercurial mildewcide or insecticide. Certificate stating that paints proposed for use contain not more than 0.06 percent lead. Certificate stating that paints proposed for use meet the volatile organic compound (VOC) regulations of the local Air Pollution Control Districts having jurisdiction over the geographical area in which the project is located.

E. A complete sample of the moisture-curing polyurethane system applied to a panel of the same material as that on which the coating will be applied in the work and for each color specified. The sample panels will be used for quality control in applying the system.

F. A complete painting schedule outlining paint type, color and application requirements with the proper equipment/surfaces/materials to be painted.

1.2 SHIPPING, DELIVERY, AND STORAGE

A. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

B. Paints shall be in sealed containers that legibly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than five gallons. Paints and thinner shall be stored in accordance with the manufacturer's written directions and as a minimum stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors and at temperatures between 40 and 95 degrees F.

PART 2. PRODUCTS

2.1 PAINT

A. The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate, or finish coat. Paint shall conform to the respective specifications listed for use in the painting schedules at the end of this section, except when the required amount of a material of a particular color is 50 gallons or less, an approved first-line proprietary paint material with similar intended usage and color to that specified may be used.

B. Colors shall be as selected by the Contractor from manufacturer's standard colors as provided by the Subcontractor. Manufacturer's standard color is for identification of color only. Tinting of epoxy, and urethane, paints shall be done by the manufacturer. The color of the undercoats shall vary slightly from the color of the next coat.

C. Paints containing lead in excess of 0.06 percent by weight of the total nonvolatile content (calculated as lead metal) shall not be used.

D. Paints containing zinc chromate or strontium chromate pigments shall not be used.

E. Paints shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Materials shall conform to the restrictions of the local air pollution control authority. When the materials specified in the painting schedule do not meet the applicable VOC content limitations, the Subcontractor shall notify the Contractor prior to commencing the work.

2.2 MATERIAL CRITERIA AND APPROVAL

A. Unless otherwise recommended by the paint manufacturer, the ambient temperature shall be between 45 and 95 degrees F when applying coatings other than water-thinned, epoxy, and moisture-curing polyurethane coatings. Water-thinned coatings shall be applied only when ambient temperature is between 50 and 90 degrees F. Epoxy and moisture-curing

polyurethane coatings shall be applied only within the minimum and maximum temperatures recommended by the coating manufacturer. Moisture-curing polyurethane shall not be applied when the relative humidity is below 30 percent.

B. When samples are tested, approval of materials will be based on tests of the samples; otherwise, materials will be approved based on test reports furnished with them. If materials are approved based on test reports furnished, samples will be retained by the Contractor for testing should the materials appear defective during or after application. In addition to any other remedies under the contract the cost of retesting defective materials will be at the Subcontractor's expense.

2.3 EXTERIOR EQUIPMENT SURFACES

A. All exterior equipment surfaces shall be prepared with one coat of DuPont CORLAR 825 high build chromate free primer followed by one coat of DuPont IMRON 326 aliphatic polyurethane enamel (Safety Blue) or Contractor approved equal.

B. Dry mil thickness of the IMRON 326 shall be 2 mils minimum.

PART 3. EXECUTION

3.1 PROTECTION OF AREAS NOT TO BE PAINTED

Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Items removed prior to painting shall be replaced when painting is completed. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Surfaces contaminated by coating materials shall be restored to original condition.

3.2 SURFACE PREPARATION

A. Surfaces to be painted shall be clean and free of foreign matter before application of paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Exposed ferrous metals such as nail heads on or in contact with surfaces to be painted with water-thinned paints, shall be spot-primed with a suitable corrosion-inhibitive primer capable of preventing flash rusting and compatible with the coating specified for the adjacent areas.

B. Masonry surfaces shall be allowed to dry at least 30 days before painting, except concrete slab on grade, which shall be allowed to cure 90 days before painting. Glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Surfaces to receive epoxy coatings shall be acid-etched or mechanically abraded as specified by the coating manufacturer, rinsed with water, allowed to dry, and treated with the manufacturer's recommended conditioner prior to application of the first coat.

C. Ferrous surfaces including those that have been shop-coated, shall be solvent-cleaned. Surfaces that contain loose rust, loose mill scale, and other foreign substances shall be

cleaned mechanically with power tools according to SSPC SP 3 or by sandblasting according to SSPC SP 7. Shop-coated ferrous surfaces shall be protected from corrosion by treating and touching up corroded areas immediately upon detection.

D. Galvanized, aluminum and aluminum-alloy, copper, and other nonferrous metal surfaces shall be solvent-cleaned in accordance with SSPC SP 1.

E. All holes and joints will be filled with putty, spackle, or similar product and then sanded flush to surface before painting.

3.3 MIXING AND THINNING

A. When thinning is approved as necessary to suit surface, temperature, weather conditions, or application methods, paints may be thinned in accordance with the manufacturer's directions. When thinning is allowed, paints shall be thinned immediately prior to application with not more than 1 pint of suitable thinner per gallon. The use of thinner shall not relieve the Subcontractor from obtaining complete hiding, full film thickness, or required gloss. Thinning shall not cause the paint to exceed local limits on VOCs. Paints of different manufacturers shall not be mixed.

B. Two-component systems shall be mixed in accordance with manufacturer's instructions. Any thinning of the first coat to ensure proper penetration and sealing shall be as recommended by the manufacturer for each type of substrate.

3.4 APPLICATION

A. Painting practices shall comply with applicable state and local laws enacted to insure compliance with Federal Clean Air Standards. Unless otherwise specified or recommended by the paint manufacturer, paint may be applied by brush, roller, or spray. At the time of application, paint shall show no signs of deterioration. Uniform suspension of pigments shall be maintained during application. Each coat of paint shall be applied so dry film shall be of uniform thickness and free from runs, drops, ridges, waves, pinholes or other voids, laps, brush marks, and variations in color, texture, and finish. Hiding shall be complete. Rollers for applying paints and enamels shall be of a type designed for the coating to be applied and the surface to be coated. Special attention shall be given to insure that all edges, corners, crevices, welds, and rivets receive a film thickness equal to that of adjacent painted surfaces. Paints, except water-thinned types, shall be applied only to surfaces that are completely free of moisture as determined by sight or touch.

B. Adequate ventilation shall be provided during paint application. Respirators shall be worn by all persons engaged in spray painting. Adjacent inhabited areas shall be protected by approved precautionary measures.

C. Surfaces that have been cleaned, pretreated, and otherwise prepared for painting shall be given a coat of the specified first coat as soon as practical after such pretreatment has been completed, but prior to any deterioration of the prepared surface. Sufficient time shall elapse between successive coats to permit proper drying. This period shall be modified as necessary to suit weather conditions. Oil-based or oleoresinous solvent-type paints shall be considered dry for recoating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and the application of another coat of paint does not cause the

undercoat to lift or lose adhesion. Manufacturer's instructions for application, curing and drying time between coats of two-component systems shall be followed.

D. Masonry surface voids shall be filled; however, surface irregularities need not be completely filled. The filler dry film shall be uniform and free of pinholes. Filler shall not be applied over caulking compound.

E. Solvent-thinned filler, FS TT-F-1098, shall be applied to dry surfaces only and may be applied by brush or roller. Filler shall be allowed to set for three to five minutes or until the filler becomes tacky, and the excess material shall then be removed with a rubber squeegee. Surface voids shall be filled; however, surface irregularities need not be completely filled. Surfaces to which solvent-thinned filler has been applied shall be given the specified topcoat as soon as practical but before the filler material starts to discolor or chalk.

F. Primer for ferrous-metal shall be applied to ferrous surfaces to receive paint other than asphalt varnish prior to deterioration of the prepared surface. The semitransparent film applied to some pipes and tubing at the mill is not to be considered a shop coat, but shall be overcoated with the specified ferrous-metal primer prior to application of finish coats.

3.5 PIPE COLOR CODE MARKING

Pipes in exposed areas and in accessible pipe spaces shall be provided with color band and titles adjacent to all valves, except those provided at plumbing fixtures, at not more than 40-foot spacing on straight pipe runs, adjacent to change in direction, and on both sides where pipes pass through walls or floors. Color code marking shall be of the color listed in Table 09900-1 and the size listed in Table 09900-2. The arrows shall be installed adjacent to each band to indicate the direction of flow in the pipe per ASME A13.1. The legends shall be printed in upper-case letters as listed in Table 09900-1. Marking shall be painted or applied using colored, pressure-sensitive adhesive markers of standard manufacture or snap-around markers. Paint shall be as specified. The colors for banding in Table 09900-1 are given as a guide. Colors used for body of pipes shall comply with NYS plumbing code and ASME A13.1 color requirements.

3.6 MISCELLANEOUS PAINTING

Lettering shall be block type and shall be black (or white for contrast) paint as scheduled for particular substrate. Lettering for equipment shall be 3-inches height. Samples shall be approved by the Contractor before application.

3.7 SURFACES TO BE PAINTED

Surfaces listed in the Painting Schedules on Table 09900-3 (Part 3.10), at the end of this section, except for those listed in Part 3.8, SURFACES NOT TO BE PAINTED, shall be painted as scheduled.

3.8 SURFACES NOT TO BE PAINTED

Surfaces in the following areas are not to be painted: Concrete; aluminum, pipe insulation, stainless steel, copper and plastic components (except bands, arrows and legends for pipe or where codes require full pipe painting); metal building wall and roof panels and liners. In addition, surfaces of hardware, fittings, and other factory-finished items shall not be painted.

3.9 CLEANING

Cloths, cotton waste and other debris that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint and other deposits on adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.10 PAINTING SCHEDULES

The following painting schedules identify the surfaces to be painted and prescribe the paint to be used and the number of coats to be applied.

TABLE 09900-1. COLOR CODES FOR MARKING PIPE

LEGEND /WORDING	MARKER COLORS*	LEGEND /WORDING	MARKER COLORS*
CHEMICALS	Y	LO PRESSURE AIR +	B
COLD WATER	GW	MEDIUM PRESSURE AIR +	B
COLD WATER SUPPLY	GW	HI-PRESSURE AIR	Y
COMPRESSED AIR	B	NON-POTABLE WATER	Y
DISCHARGE	GW	PLANT AIR	Y
DOMESTIC COLD WATER	GW	PLANT WATER	GW
DOMESTIC HOT WATER	Y	PLUMBING VENT	GW
DRAIN	GW	POTABLE WATER	GW
EXHAUST AIR	B	PROCESS WATER	Y
FIRE PROTECTION	R	SANITARY DRAIN	GW
WATER	GW	SANITARY SEWER	GW
HEATING RETURN	Y	SPRINKLER-FIRE	R
HEATING SUPPLY	Y	SPRINKLER-WATER	R
HOT WATER	Y	TREATED WATER	GW
HOT WATER RETURN	Y	VACUUM +	Y
HOT WATER SUPPLY.	Y	UNSAFE WATER	Y
INSTRUMENT AIR	B	VENT	Y
		WASTE	Y
		WASTE WATER	GW
		WELL WATER	GW

* Y = Yellow with Black Letters; GW = Green with White Letters; R = Red with White Letters; B = Blue with White Letters.

\+ For air with varying pressures, use AIR (Yellow). For air pressures above 90 lbs., use HI-PRESSURE AIR (Yellow). For air pressures less than 30 lbs., use LO-PRESSURE AIR (Blue). For air pressure of 30-90 lbs., use MEDIUM-PRESSURE AIR (Blue). For air vacuum pressures, use VACUUM (yellow).

TABLE 09900-2. SIZE OF LEGEND LETTERS

Outside Diameter of Pipe or Covering (Inches)	Length of Color Field (Inches)	Size of Letters (Inches)
3/4 to 1-1/4	8	1/2
1-1/2 to 2	8	3/4
2-1/2 to 6	12	1-1/4
8 to 10	24	2-1/2
over 10	32	3-1/2

TABLE 09900-3. PAINTING SCHEDULE

Surface	First Coat	Second Coat	Third Coat
Ferrous:	FS TT-E-489, Class A	FS TT-E-489, Class A	None
factory-primed mechanical and electrical equipment	---------- or ----------		
	SSPC Paint 21, Type I	SSPC Paint 21, Type I	None

3.11 EXTRA PAINT

The Subcontractor shall turn over to the Contractor at the completion of the project, two gallons of each type of paint and stain used. Paint shall be furnished in sealed and unopened, marked containers.

* * * END OF SECTION * * *

DIVISION 10 – SPECIALTIES

SECTION 10440

INTERIOR SIGNAGE

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

Signs shall be complete with lettering, framing and related components for a complete installation. Signs shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use at least two years at similar facilities.

The Subcontractor shall propose locations and types of interior signage necessary for the treatment building. The proposed sign types and locations must be approved by the Contractor prior to installation. Interior signage shall be provided to meet specified reference requirements and provide a safe and efficient working environment for treatment plant operations.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(Sep 1980; 7th Ed) Designation System for Aluminum Finishes
AA PK-1	(Sep 1987) Registration Record of Aluminum Association Alloy Designations and chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot
AA SAA-46	(Oct 1978; 5th Ed) Standards for Anodized Architectural Aluminum

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A117.1	(1986) Providing Accessibility and Usability for Physically Handicapped People

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 209	(1990) Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(1991) Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

AMERICANS WITH DISABILITIES ACT (ADA)

FEDERAL SPECIFICATIONS (FS)

FS L-P-387	(Ref A; Am 1; Int Am 2) Plastic Sheet, Laminated, Thermosetting (for Designation Plates)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

A. Manufacturer's descriptive data, catalogs cuts and installation instructions for interior signage.

B. Details which shall include location and elevations of each type of sign and shall show dimensions, details and methods of mounting or anchoring, shape and thickness of materials, and details of construction. A schedule showing the location of each sign type shall be included.

C. Samples of each type sign showing typical quality and workmanship. The samples may be installed in the work, provided each sample is identified and location recorded.

D. Two samples of manufacturer's standard color chips for each material requiring color selection.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

PART 2. PRODUCTS

2.1 ALUMINUM ALLOY PRODUCTS

A. Aluminum extrusions shall be at least 1/8-inch thick, and aluminum plate or sheet shall be at least 16 gauge, 0.0508-inch thick. Extrusions shall conform to ASTM B 221; plate and sheet shall conform to ASTM B 209.

B. Where anodic coatings are specified, alloy shall conform to AA KP-1 alloy designation 514.0. Exposed anodized aluminum finishes shall be as shown and shall conform to AA SAA-46.

C. Anodized finish shall conform to AA DAF-46 as follows:

1. Clear (natural) designation AA-M10-C22-A31, Architectural Class II (0.4 mil or thicker).

2. Integral color anodized designation AA-M10-C22-A32, Architectural Class (0.4 mil to 0.7 mil). Color shall be approved by the Contractor.

3. Electrolytically deposited color-anodized designation AA-M10-C22-A34, Architectural Class II (0.4 mil to 0.7 mil). Color shall be approved by the Contractor.

2.2 SHEETING FOR GRAPHICS

A. Vinyl sheeting for graphics shall conform to MS MIL-M-43719, minimum 0.003-inch film thickness. Film shall include a pre-coated pressure sensitive adhesive backing (Class 3).

B. Acrylic sheet for panels and components shall conform to ANSI Z97.1.

2.3 ANCHORS AND FASTENERS

Exposed anchor and fastener materials shall be compatible with metal to which applied and shall have matching color and finish.

2.4 FABRICATION AND MANUFACTURE

A. Holes for bolts and screws shall be drilled or punched. Drilling and punching shall produce clean, true lines and surfaces. Exposed surfaces of work shall have a smooth finish and exposed riveting shall be flush. Fastenings shall be concealed where practicable.

B. Where dissimilar metals are in contact, the surfaces will be protected to prevent galvanic or corrosive action.

2.5 GRAPHICS

A. Signage that provides emergency information, general circulation directions, or identification of rooms and spaces shall be tactile (perceptible to touch) and shall comply with ADA requirements. Characters, symbols, or pictographs on tactile signs shall be recessed or raised 1/32-inch minimum. Tactile letters and numbers shall be sand serif upper case. Tactile characters or symbols shall be at least 5/8-inch high, but no higher than a nominal 2 inches. Characters and symbols shall contrast with their background.

B. Signage graphics for the various sign types shall conform to the following:

1. Cast aluminum letters 1/8-inch thick shall be provided and internally fastened to the message panel.

2. Pressure-sensitive precision-cut vinyl letters shall be provided.

3. Messages shall be applied to panel using silk screen process. No hand cut screens will be accepted. Edges and corners shall be clean.

4. Message shall be acrylic letters 1/8-inch thick and chemically welded to 0.125-inch thick acrylic backup sheet.

2.6 TYPE OF SIGNS

Type of Sign	Size (inches)	Location	Thickness (inches)
Exit	12 x 9	Posted above all exits per Drawing E-5	1/8
Fire Extinguisher	14 x 10	Posted above each fire extinguisher at each door per Drawing E-5	1/8
Caution: Ear Protection Area	14 x 10	Posted outside of building at each door entrance	1/8
Caution: Eye Protection Area	14 x 10	Posted outside of building at each door entrance	1/8
Fire Alarm	14 x 10	Posted above each fire alarm at each door per Drawing E-5	1/8

PART 3. EXECUTION

3.1 INSTALLATION

A. Signs shall be installed at locations approved by the Contractor. All signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs mounted on other surfaces shall not be installed until finishes on such surfaces have been completed.

B. Anchorage not otherwise specified or indicated shall include slotted inserts, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

C. The work shall be protected against damage during construction. Hardware shall be adjusted for proper operation. Glass, frames, and other sign surfaces shall be cleaned.

* * * END OF SECTION * * *

SECTION 10522

FIRE EXTINGUISHERS AND ACCESSORIES

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

A. Shop drawings showing details of extinguishing medium, construction and installation of fire extinguishers and brackets.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces.

PART 2. PRODUCTS

2.1 MATERIALS

A. Fire extinguishers shall be as specified.

B. Units shall be 10 lb capacity carbon dioxide type.

C. Fire extinguisher brackets, supporting bottom and sides of extinguishers, shall be provided for all fire extinguishers.

PART 3. EXECUTION

3.1 INSTALLATION

A. Fire extinguishers and brackets shall be furnished and installed at locations required by the Fire Code of NYS, 2002, and as approved by the Bethpage Fire Marshall.

B. All fire extinguishers shall be inspected and certified within thirty days of start-up.

C. All fire extinguishers failing certification or being denied approval by Bethpage Fire Marshall shall be replaced at no additional cost to the Contractor and then reinspected/recertified as necessary.

* * * END OF SECTION * * *

DIVISION 11 – EQUIPMENT

SECTION 11212

PROCESS BLOWERS

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Contractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The work includes the supply, delivery and training (if necessary) for the installation of two process blowers as shown on the Contract Drawings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 15000	Basic Mechanical Materials and Methods
Section 16051	Electric Motors

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

A. Shop drawings outlining dimensions, connection details, weights and arrangement of function parts. Foundation or pad requirements, including type and location of loading, and size and material of anchor bolts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.

B. Manufacturer's literature including actual blower curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power requirements.

C. A complete set of recommended spare parts based on the equipment literature.

D. Required documentation as described under paragraph 3.3 Testing and Inspections.

E. Warranty as described in paragraph 3.4.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off the ground and shall be protected from weather elements.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. The equipment specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. Any additional equipment which was not specifically mentioned in these sections and/or shown on the Contract Drawings but is necessary for the proper operation of the proposed equipment shall be furnished.

B. The Subcontractor must meet minimum requirement specified in the contract and does not reserve the right to substitute prior to Contractor approval.

2.2 PROCESS BLOWERS

A. The Subcontractor shall provide two Process Blowers. The Process Blowers shall be a horizontal centrifugal blower.

B. Blowers shall have horizontal inlet and horizontal discharge position (90 degrees from inlet), and flanged connections.

C. The blowers shall be rated for efficient operation meeting the performance requirements outlined below in Table 11212-1. The blowers shall be capable of intermittent and continuous operation.

TABLE 11212-1
CENTRIFUGAL PROCESS BLOWERS

Quantity	Two
Location	After Moisture Separator
Service	Soil Vapor Extraction
Fluid	Soil Vapor
Operating Temperature, ^{o}F	50-80
Operating Point CFM @ i.w.	600 CFM @ 35 i.w.
Discharge Position	Horizontal
Suction In	8" Flange
Discharge Out	8" Flange
Volts/Hz/Phase	460/60/3 with standard plug

2.3 BLOWER MOTORS

A. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings. Thrust bearings shall be of sufficient design to handle the design pressure loads and forces. The motors shall be rated and designed to operate on three-phase, 460 volt, 60 Hz, AC power and have an open, drip-proof (ODP) housing.

B. All motors shall have a suitable means for attaching grounding conductor. Contractor's standard grounding means shall be used.

C. All motors shall be supplied with their driven blowers. All motors shall be comparable with the driven blower.

2.4 SYSTEM DESCRIPTION

A. The Subcontractor shall provide all horizontal centrifugal process blowers designed for the intended use that includes start/stop operation and continuous operations.

2.5 PERFORMANCE REQUIREMENTS

A. The performance requirements of the individual centrifugal process blowers are specified in Table 11212-1.

B. All blowers and appurtenances specified under this section shall be products of a single manufacturer regularly engaged in the production of such equipment. The Subcontractor shall have the sole responsibility for the proper functioning of all equipment furnished.

2.6 SPARE PARTS

A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.

B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual (non-standard) tools that are necessary for maintenance and repair of the system.

2.7 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION

A. The process blowers and accessory equipment shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings or as approved by the Contractor.

B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.

3.2 MANUFACTURER'S SERVICE

A. The following shall be performed by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Subcontractor.

1. Supervision – Checking the installation of all components before power is applied.
2. Check Out – Placing the equipment into operation, field calibration, and making necessary adjustments.

3.3 TESTING AND INSPECTION

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or

materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

SECTION 11214

CENTRIFUGAL PROCESS PUMPS

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Contractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The work includes the supply, delivery and training (if necessary) for the installation of one horizontal centrifugal process pumps as shown on the Contract Drawings.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 15000	Basic Mechanical Materials and Methods
Section 16051	Electric Motors

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor:

A. Shop drawings outlining dimensions, connection details, weights and arrangement of function parts. Foundation or pad requirements, including type and location of loading, and size and material of anchor bolts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.

B. Manufacturer's literature including actual pump curves, electric motor data including rated horsepower, full load amps, motor speed, efficiency and power requirements.

C. A complete set of recommended spare parts based on the equipment literature.

D. Required documentation as described under paragraph 3.3 Testing and Inspections.

E. Warranty as described in paragraph 3.4.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off the ground and shall be protected from weather elements.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. The equipment specifications are intended to give a general description of what is required, but do not cover all details which may vary in accordance with the exact requirements of the equipment as offered. Any additional equipment which was not specifically mentioned in these sections and/or shown on the Contract Drawings but is necessary for the proper operation of the proposed equipment shall be furnished.

B. The Subcontractor must meet minimum requirement specified in the contract and does not reserve the right to substitute prior to Contractor approval.

2.2 HORIZONTAL CENTRIFUGAL PROCESS PUMPS

A. The Subcontractor shall provide one Condensate Pump. The Condensate pump shall be a horizontal centrifugal portable transfer pump.

B. Pumps shall have horizontal inlet and discharge position, and 5/8” NPT hose suction and discharge connections.

C. The pump(s) shall be rated for efficient operation meeting the performance requirements outlined below in Table 11214-1. The pumps shall be capable of intermittent and continuous operation.

D. The pump shall be provided with an easily replaceable suction O-ring, pumpage lubricated and self aligning to maintain maximum pump efficiency without adjustment of impeller clearances.

TABLE 11214-1
CENTRIFUGAL PROCESS PUMPS

Quantity	One
Location	Moisture Separator
Service	Condensate
Fluid	Groundwater
Operating Temperature, ^{o}F	50-80
Viscosity, Centipoise	1.0
Specific Gravity	1.0
Operating Point GPM @ Ft. HD	10 gpm minimum @ 5 ft. TDH
Discharge Position	Horizontal
Suction In	5/8" NPT Hose
Discharge Out	5/8" NPT Hose
Volts/Hz/Phase	120/60/1 with standard plug

2.3 PUMP MOTORS

A. Motor bearings shall be constructed so as to exclude dirt and water and to prevent lubricant from reaching windings. Thrust bearings shall be of sufficient design to handle the design pressure loads and forces. The motors shall be rated and designed to operate on single-phase, 120 volt, 60 Hz, AC power and have a standard 120 volt plug.

B. All motors shall have a suitable means for attaching grounding conductor. Contractor's standard grounding means shall be used.

C. All motors shall be supplied with their driven pumps. All motors shall be comparable with the driven pump.

2.4 SYSTEM DESCRIPTION

A. The Subcontractor shall provide all horizontal centrifugal process pumps designed for the intended use that includes start/stop operation and pumping of contaminated groundwater.

2.5 PERFORMANCE REQUIREMENTS

A. The performance requirements of the individual centrifugal process pumps are specified in Table 11214-1.

B. All pumps and appurtenances specified under this section shall be products of a single manufacturer regularly engaged in the production of such equipment. The Subcontractor shall have the sole responsibility for the proper functioning of all equipment furnished.

2.6 SPARE PARTS

A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.

B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual (non-standard) tools that are necessary for maintenance and repair of the system.

2.7 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION

A. The process pumps and accessory equipment shall be installed in accordance with the manufacturer’s instructions and located as shown on the drawings or as approved by the Contractor.

B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.

3.2 MANUFACTURER’S SERVICE

A. The following shall be performed by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost to the Subcontractor.

1. Supervision – Checking the installation of all components before power is applied.
2. Check Out – Placing the equipment into operation, field calibration, and making necessary adjustments.

3.3 TESTING AND INSPECTION

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 13200

TANKS

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Contractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The work includes the supply, delivery and training (if necessary) for the installation of a moisture separator.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900	Painting, General
Section 15000	Basic Mechanical Materials and Methods

1.2 SUBMITTALS

A. The Subcontractor shall submit five copies of the following to the Contractor:

1. Shop drawings outlining dimensions, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing and final erection of equipment and systems.

2. The Subcontractor shall submit manufacturer's literature, which shall include a complete list of recommended spare parts based on the equipment literature.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground and shall be protected from weather elements.

1.4 SYSTEM DESCRIPTION

A. The Subcontractor shall provide a Moisture Separator vessel. The tank shall be constructed as described below and as per the attached figure in the sizes and locations/heights shown.

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

A. Details of various components are presented below. The general arrangement and design of all working parts shall allow ready access for inspection, replacement, repair and lubrication. Adequate drain, vent and flushing connections shall be provided.

1. The Subcontractor shall provide a 1,000 gallon Moisture Separator vessel. The tank shall be constructed of epoxy coated carbon steel. The tank dimensions shall be 5 feet in diameter and 7 feet in height. Connections shall be provided as per the attached figure in the sizes and locations/heights shown.

B. All tanks shall be painted "Safety Blue" as per Section 09900.

2.2 MOISTURE SEPARATOR (M-1)

A. The Subcontractor shall provide one 1,000-gallon epoxy coated carbon steel tank with air tight cover. The tank dimensions shall be approximately 5 feet in diameter and 7 feet high.

B. The tank shall be provided with the following connections at locations indicated:

Nozzle	Angle (Degrees)	Size (inches)	Description	Elevation Above Tank Bottom
A*	270	10 150# Flange	Inlet	2'6"
B	-	10 150# Flange	Outlet	Top (Center)
C	0	1 FNPT	Sight Tube	4"
D	0	1 FNPT	Sight Tube	1'9"
E	180	5/8" MNPT	Water Drain	2"
M	90	18x18	Manway	32"
-All measurements to center of pipe *Vapor inlet shall enter into the tank tangent to tank wall, and flush to tank wall.				

C. The tank shall be provided with a Phenoline 373 epoxy coating as manufactured by "*Carboline*" or an approved equal.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION

A. The tanks shall be installed in accordance with the manufacturer's instructions and located as shown on the drawings or as approved by the Contractor.

B. All work shall be performed by competent workmen skilled in the field to which they are executing the work.

3.2 MANUFACTURER'S SERVICE

A. The following shall be done by a qualified serviceman of the manufacturer of the equipment and accessories and shall be supplied at no additional cost.

1. Supervision - Checking the installation of all components before power is applied.
2. Check-out - Placing the equipment into operation, field calibration, and adjustments.

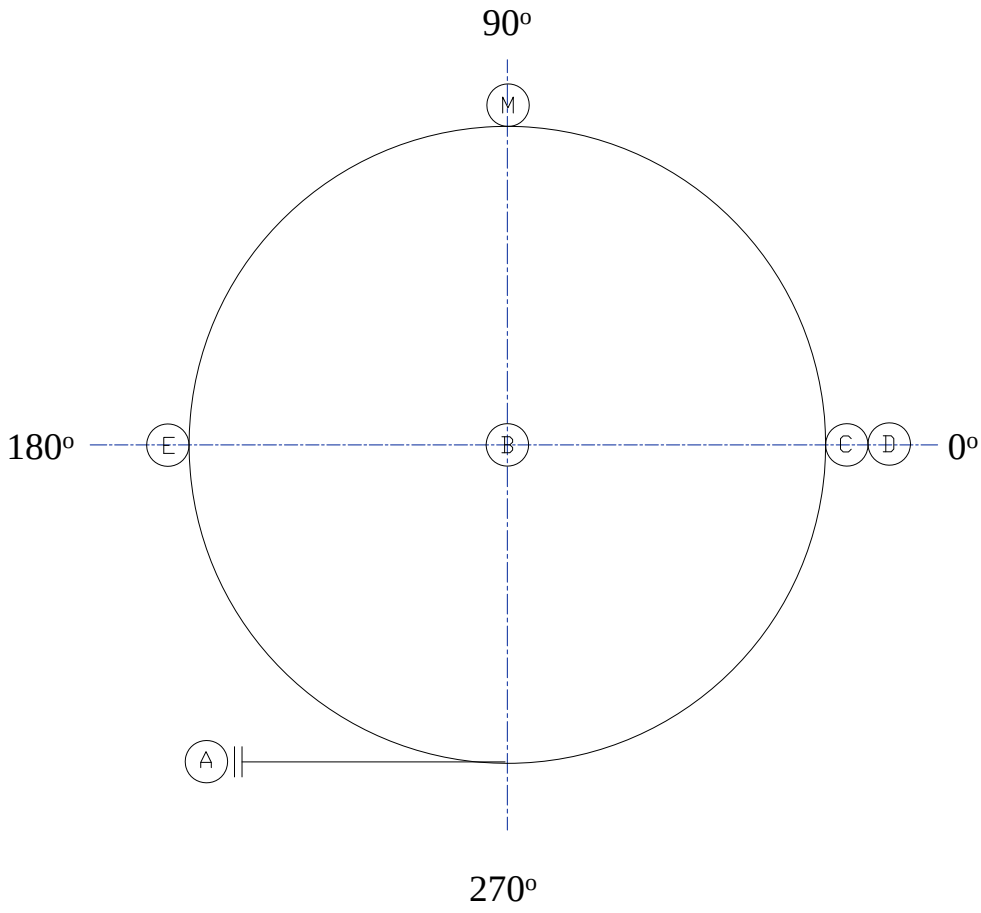
3.3 TESTING AND INSPECTIONS

Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and its intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *



NOZZLE SCHEDULE

Nozzle	Angle (Degrees)	Size (inches)	Description	Elevation Above Tank Bottom
A*	270	10 150# Flange	Inlet	2'6"
B	-	10 150# Flange	Outlet	Top (Center)
C	0	1 FNPT	Sight Tube	4"
D	0	1 FNPT	Sight Tube	11"
E	180	5/8" MNPT	Water Drain	2"
M	90	18x18	Manway	32"

-All measurements to center of pipe

*Vapor inlet shall enter into the tank tangent to tank wall, and flush to tank wall.

TANK DETAILS:

M-1 MOISTURE SEPARATOR

- Tank Volume – 1,000 gallons
- Tank Diameter – 5'0"
- Tank Height – 7'0'
- Configuration: Single wall, above ground, vertical, closed top
- Material of Construction: Epoxy Coated Carbon Steel
- Operating/Design Temp: 60 deg F/100 deg F
- Operating/Design Press: Atmospheric

Tank Plan View

M-1

SECTION 13225

VAPOR-PHASE ACTIVATED CARBON ADSORPTION SYSTEM

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Contractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

This section covers the requirements for the functional design, performance, materials, construction features, testing, quality and handling of the vapor-phase carbon adsorption system.

The work includes the supply, delivery and training (if necessary) for the installation of a vapor phase carbon adsorption system.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 09900	Painting, General
Section 15000	Basic Mechanical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 2652	(1994) Activated Carbon
ASTM D 2854	(1996) Apparent Density of Activated Carbon
ASTM D 2862	(1997) Particle Size Distribution of Granular Activated Carbon
ASTM D 2866	(1994) Total Ash Content of Activated Carbon
ASTM D 2867	(1995) Moisture in Activated Carbon
ASTM D 3802	(1979; R 1994) Ball-Pan Hardness of Activated Carbon
ASTM D 4607	(1994) Determination of Iodine Number of Activated Carbon
ASTM D 5228	(1992) Determination of the Butane Working Capacity of Activated Carbon

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B40.1	(1991) Gauges - Pressure Indicating Dial Type - Elastic Element

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

A. Shop drawings outlining dimension, connection details, weights, arrangement of functional parts, foundation or pad requirements (including type and location of loading), and size and material of anchor bolts. The Subcontractor shall submit detailed drawings and installation instructions for any special requirements for handling, storing, and final erection of equipment and systems.

B. Certified analysis on a sample of the granulated activated carbon (GAC) media to be supplied to demonstrate the media is in accordance with the manufacturer's and Contractor's specifications. Documentation detailing the GAC isotherms and efficiencies for TCE, TCA, etc.

C. Operating instructions outlining the step-by-step procedures required for system startup, operation and shutdown. The manufacturer's name, model number, service manual, parts list, brief description of all equipment and their basic operation features, and operating instructions for each piece of equipment and bulletins, cut sheets and descriptive data are to be included.

1.3 SHIPPING, STORAGE AND HANDLING

Parts shall be preassembled to the largest extent possible, compatible with transportation limitations and equipment protection considerations. Field assembly, if any, shall require merely bolting together of match-marked components. Equipment shall be crated and delivered to protect against damage during shipping. Flange faces shall be protected from damage. All openings shall be covered to prevent entrance of dirt, water and debris. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and until the units and equipment are ready for operation. Finished iron or steel surfaces shall be properly protected to prevent rust and corrosion. All equipment delivered and placed in storage shall be stored with protection from the weather (humidity and temperature), dirt and dust, and other contaminants.

1.4 PERFORMANCE REQUIREMENTS

A. The vapor-phase activated carbon adsorption system shall be a complete once-through forced flow system. The system shall be capable of reducing the levels of the listed organic contaminants. The unit shall be filled with GAC for removal of organic contaminants from soil gas. Equipment shall include, but shall not be limited to, vessels containing activated carbon, supporting equipment and accessories. Terminology is in conformance with ASTM D 2652. The system shall be complete with one carbon vessel, activated carbon, instruments, valves, piping, and other specified appurtenances.

B. This section covers the requirements for the functional design, performance, materials, construction features, testing, quality, and handling of the equipment described herein. It is not the intent of this section to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

C. Each carbon adsorber will be used to treat a maximum of 600 standard cubic foot per minute (scfm) of volatile organic compound (VOC) laden air at a temperature of 50° F and a relative humidity of 70%, containing mixed VOCs.

D. The table below covers the requirements for concentrations. Carbon shall meeting mass loading as described in the table below. The GAC shall be warranted for carbon life as defined by the Subcontractor or Manufacturer of the GAC as based on the concentrations and loading rates below.

SOIL VAPOR CONCENTRATIONS

Chemical of Concern	Concentration Range		Mean Concentration (ug/m3)	Mass Loading (lbs/yr)
	Minimum	Maximum		
Trichloroethene	ND	180,000	41,128	809
Tetrachloroethene	ND	1,200	381	8
1,1,1-Trichloroethene	ND	90,000	20,634	406

1. BPS1-SG1001 to -SH1004 (Depths of 20 and 45 feet), SVPM12, and SVPM12S (TtNUS, 2008 and 2009)

ND- Not Detected
ug/m3- micrograms per cubic meter
lbs/yr- pounds per year

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Standard Products

Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall essentially duplicate items that have been in satisfactory use for at least two years prior to bid opening.

B. Nameplates

Major equipment items such as adsorption vessels, blowers and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment.

2.2 VAPOR-PHASE ACTIVATED CARBON

A. Material shall conform to the following:

1. Minimum iodine number of virgin carbon of 1,000 shall be as determined by ASTM D 4607.
2. Maximum moisture content of 5 percent by weight shall be as determined by ASTM D 2867.
3. Maximum total ash content of 10 percent by weight shall be as determined by ASTM D 2866.
4. Minimum hardness number of 95 necessary for the required life in vapor phase applications shall be as determined by ASTM D 3802.

5. Activated carbon particle size shall be uniform for consistent pressure drop characteristics. Maximum particle size shall be 0.2 inch diameter as determined by ASTM D 2862.
6. The GAC shall be of the type that can be accepted for offsite regeneration of the spent activated carbon by an approved carbon regeneration facility.
7. Minimum apparent density of 0.45 gram/cubic centimeter (g/cc) shall be as determined by ASTM D 2854.
8. Normal operating differential pressure drop shall be 3 inches of water at 600 scfm. Maximum operating differential pressure drop shall be 6 inches of water at 1,200 scfm.
9. US sieve size shall be 4x10.
10. Material shall be free from impurities that affect the serviceability and appearance of the finished product.

2.3 VAPOR PHASE ACTIVATED CARBON ADSORPTION UNITS

A. The Vapor GAC Adsorber vessel shall be 6 feet in diameter and 8 feet tall.

B. The adsorbers shall be constructed of lined carbon steel and contain 5,000 pounds of GAC. The adsorbers shall have 10-inch influent and effluent flanges as well as one 18-inch manway flange for cleaning and inspection. The adsorbers shall meet the following criteria:

1. Material of Construction: Carbon Steel.
2. Maximum Allowable Working Pressure: 3 pounds per square inch gauge (psig).
3. Flow Direction: Up.
4. Outlet Collector: Integral.
5. Inlet Distributor: Integral.
6. The exterior surface of the adsorbers shall be painted "Safety Blue" as per Section 09900, PAINTING, GENERAL.

2.4 NAMEPLATES

Major equipment items shall have the manufacturer's name, address, type or style, model or serial number, catalog number, maximum working/operating temperature and pressure on a plate secured to the equipment. Each piece of equipment shall bear the approval designation and markings required for that designation.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

Equipment shall be installed as indicated with written instructions of the manufacturer. Each vessel shall be anchored as required by the manufacturer.

3.2 PAINTING FOR CORROSION PREVENTION

Equipment which did not receive a factory finish shall be painted, unless specified otherwise. The paint system applied to the outside of the tank shall be in accordance with Section 09900, PAINTING, GENERAL. Surfaces that have not been factory primed shall be primed and top coated with the manufacturer's standard factory finish. Factory painting shall conform to manufacturer's standard factory finish. All defects in the finish prior to or during installation of the equipment shall be repaired by the Contractor as specified in Section 09900-PAINTING, GENERAL. All exposed ferrous surfaces not painted in the factory shall be painted in accordance with Section 09900-PAINTING, GENERAL. Painting of corrosion resistant materials such as copper, brass, bronze, copper-nickel, and stainless steel is not required, unless otherwise specified. All ferrous surfaces shall be coated or painted. Color shall be "Safety Blue" or as otherwise approved.

3.3 FIELD QUALITY CONTROL

A. Equipment Tests

After installation of the carbon adsorption system is complete, operating tests shall be carried out to ensure that the unit installed operates properly. All products shall be carefully inspected for defects in workmanship and material; debris and foreign matter shall be cleaned out of all equipment; all operating mechanisms shall be tested to check their proper functioning; and all nuts and bolts shall be checked for tightness. Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced. Tests shall assure that there is no vibration, or noise from any parts. If deficiencies are revealed during tests, such deficiencies shall be corrected and the tests shall be reconducted at the Subcontractor's expense.

B. Performance Tests

After installation of the activated carbon adsorption system, operating tests shall be carried out to ensure that the system operates properly as specified herein.

C. Noncompliance with Performance Requirements

Removals shall meet or exceed those specified in the performance requirements of this specification. If at any time during the first 12 months of operation the results of the organic analyses of the air emissions are not in compliance with the Request for Determination as provided by the Contractor, except for periods when the carbon is saturated, flow through the unit shall be stopped and the system shall be said to be

inoperable. If at any time the operation of the system does not meet the flow rate requirements, instrumentation or control requirements set forth in this contract, flow through the system shall be stopped. The Subcontractor shall immediately proceed to repair or modify the system for compliance with the contract documents. Repairs or modifications shall be made entirely at the Subcontractor's expense. The Subcontractor shall notify the Contractor one day before the system is to be restarted and retested.

3.4 MANUFACTURER'S SERVICES

A. A manufacturer's trained specialist, experienced in the installation of the Vapor GAC vessel with at least five years of field experience, shall be present at the Site for a maximum of 10 man-days for the following services:

1. Inspection of the installed equipment
2. Supervision of GAC loading
3. Startup assistance
4. Troubleshooting
5. Operator training

3.5 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. The GAC shall be warranted for carbon life as defined by the Subcontractor or Manufacturer of the GAC as based on the concentrations and loading rates in Section 1.4. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

** END OF SECTION **

SECTION 13650

INSTRUMENTATION

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Specifications and Drawings.

See Instrumentation Index, Table 13650-1, for list of instruments.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designations only. In case of contradiction, the most stringent code applies.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI S50.1	Compatibility of Analog Signals for Electronics Industrial Process Instruments.
ANSI C2	National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electrical Code (NEC)

INSTRUMENT SOCIETY OF AMERICA (ISA)

RP 55.1	Hardware testing of Digital Process Computers
RP 12.6	Installation of Intrinsically Safe Instrument System in Classified Location

NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION (NEMA)

ICS 6	Enclosure for Industrial Controls and systems

FEDERAL COMMUNICATION COMMISSION RULES AND REGULATIONS (FCC)

FCC Part 15	Radio Frequency Devices

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor

A. Subcontractor shall submit, in the manner and within the time line as set forth in the Contract Documents, the items listed herein for all the equipment and materials furnished under this section.

B. The Subcontractor's shop drawings shall be direct reading reproducible able to produce clear sharp, and legible prints. Fabrication of the equipment shall not be started until the Subcontractor has received written drawing review approvals from the Contractor in accordance with the submittal register developed for the instrumentation.

C. Submittals to be provided include:

1. Shop drawings outlining overall dimensions, connection details, weights, and arrangement of functional parts. Installation requirements including type and location of loading, and size and material of anchor bolts. Detailed drawings and installation instructions for any special requirements for handling, storing and final erection of instruments and systems.
2. A complete set of recommended spare parts based on the equipment literature.
3. Instrument Calibration sheets.
4. Operation and Maintenance Manual including equipment manuals, maintenance procedures, testing, lubrication requirements, preventive maintenance matrix, list of spare parts, and trouble shooting instructions and warranties.

1.3 PERFORMANCE REQUIREMENTS

A. Instrumentation specified herein shall be designed in accordance with high engineering standards and capable of performing the desired tasks. Each instrument shall be supplied with a stainless steel name tag, which shall include the full tag number of the instrument as shown on the Piping and Instrumentation Diagrams and/or Table 13650-1. Each instrument shall be factory calibrated to the maximum extent possible. Calibration sheets, certifications and instructions shall be provided with each instrument.

B. Instruments shall be rated for general purpose except when located in Class I, Division 2 environments.

PART 2. PRODUCTS

2.1 EQUIPMENT INSTRUMENTATION

A. Local pressure (and vacuum) gages and indicators shall be direct reading gauges, 4-1/2 inch face diameter with a low internal volume spiral/helical bourden tube type with solid front and rear blow. Gauge case shall be PET resin with 316SS tube and socket. Gauges shall conform to ANSI B40.1 (Grade A). Gauges shall be tapped 1/2 inch national pipe thread (NPT) to bottom connection and shall be provided with a 304SS diaphragm type chemical seal tapped 1/2 inch by 1/2 inch. Pressure gauge dial ranges shall be as required for each application. Gauges shall be as manufactured by Ashcroft or Contractor approved equal.

B. Local airflow meter shall be mass flow meter type calibrated for a flow range as shown in Table 13650-1, Instrument Index. Flow element material shall be stainless steel with operating range of 0-250 degree F and up to 200 psig. Unit shall include local flow indication displayed as either mass flow, velocity or volume flow. Flow sensor insertion length shall be as required to operate in a 6 or 12 inch PVC duct line. Connection shall be a compression type fitting 1/2" NPT. Unit shall be manufactured by FCI or Contractor approved equal.

C. Temperature indicators/transmitters shall utilize a solid-state sensor and shall be enclosed within a NEMA 4X housing. The unit shall have an integrally mounted sensor and transmitter capable of a 4-20 mA isolated output adjustable to any 20 degree C span up to 0 to 90 degree C. Accuracy shall be within +/- 1 degree C. Unit shall be manufactured by Ashcroft or Contractor approved equal.

D. Level switches shall be specific gravity compensating switches with continuous buoyancy control switch activation at the water interface for liquids with a specific gravity between 0.6 and 1.5. Unit shall have a 15 amp 115 VAC single pole, double throw (SPDT) switch action with relays. Housing shall be a NEMA 4 cover with corrosion resistance fiberglass and reinforced plastic cover and body. Unit shall be constructed of a 316 stainless steel float shaft and a Fortron (PPS) body, float and busing. All seals shall be Viton. Unit shall be as manufactured by Gems or Contractor approved equal.

E. Temperature switches shall be designed for their intended use and include a NEMA 4 enclosure suitable for outdoor installation. Units shall include heavy-duty hermetically sealed switch narrow deadband and be suitable for temperatures up to 200^{o}F. The set point temperatures shall be fully adjustable over the entire range. Tubes shall be constructed of inconel and include 3/4-inch NPT 316 stainless steel thermowell. Units shall be FM approved and operated on 115 VAC. Units as manufactured by Ashcroft Instruments or Contractor approved equal.

I. Pressure switches shall be designed for their intended use and include a NEMA 4 enclosure suitable for outdoor installation. Unit shall include heavy-duty hermetically sealed switch with narrow band, type C contact, 5A, 120 Volt rated. The set point pressure shall single fully adjustable setpoint over the entire range. Unless otherwise noted switch shall be calibrated to operate on rising pressure. Actuator shall be suitable for temperature up to 200 degree F. Process connection 1/2 inch NPT.

2.2 ACCESSORIES

Each instrument shall be supplied with a stainless steel tag or equivalent material resistant to wear and abrasion permanently affixed to the instrument such that it is clearly visible but does not interfere with the operation or insulation of the unit. The tag shall include the full instrumentation tag number as shown on the Piping and Instrumentation Diagram.

PART 3. EXECUTION

3.1 INSTALLATION

A. Perform installation under supervision of competent instrument technicians. Provide components for complete and operational instrumentation system as specified and indicated. Instrument system installation shall provide adequate clearance for instrument maintenance by maintaining

access space between piping, equipment, etc. Instrument system installation shall not interfere with clearance requirements for mechanical and electrical system maintenance.

B. Provide instrument to be installed in piping with required gaskets, flanges, pipe fittings, thermal compound and manual valves for shutoff, equalization and calibration.

C. Provide sensors in locations to sense the appropriate conditions. Install sensor and transmitter where easily accessible and serviceable without special tools. Install off-line transmitter at grade on 2-inch pipe pedestal (not shown on drawing for purposes of clarity).

3.2 TESTING AND INSPECTIONS

A. Each instrument component shall be given requisite factory tests and calibrations as necessary to determine that the work and materials are free from defects.

B. Acceptance tests, after the equipment is completely installed, may be performed to demonstrate performance requirements, as specified herein at the discretion of the Contractor. The field tests will be governed by provisions of applicable industry and institute standards.

3.3 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction as per the Contract Conditions, which shall be for one year after the on-site receipt of all Subcontractor-provided equipment/materials necessary for the installation of all instrumentation. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Subcontractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the O&M Manual.

* * * END OF SECTION * * *

TETRA TECH EC, INC.
SPECIFICATION 13650 TABLE 1 REVISION A
INSTRUMENT PROCESS DATA AND INDEX

PROJECT NAME: SVE CONTAINTMENT SYSTEM, BETHPAGE SITE 1
PROJECT NUMBER: 106-3570

PREPARED BY: BK DATE: 8/31/2009
CHECKED BY: DATE:
APPROVED BY: DATE:

TAG NO.	EQUIPMENT DESCRIPTION	P&ID DWG NO.	FLUID TYPE/STATE	LINE/ FLANGE SIZE (INCH)	FLOW (CFM)			PRESS. (IW)		TEMP. (DEG F)		RANGE	SET POINT	POWER	MANUFACTURER	MODEL NO.	COMMENTS
					MIN	NOM	MAX	OPER. PRESS.	DESIGN PRESS.	OPER. TEMP.	DESIGN TEMP.						
PI - 101I	Intr. SVE-101I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 101D	Deep SVE-101D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 102I	Intr. SVE-102I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 102D	Deep SVE-102D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 103I	Intr. SVE-103I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 103D	Deep SVE-103D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 104I	Intr. SVE-104I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 104D	Deep SVE-104D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 105I	Intr. SVE-105I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 105D	Deep SVE-105D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 106I	Intr. SVE-106I Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	4	10	50	75	0 - 10 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 106D	Deep SVE-106D Well Pressure Indicator	P-2		1/2 IN NPT	40	50	100	20	30	50	75	0 - 30 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 100	Flow Monitor Station Header Pressure Indicator	P-2		1/2 IN NPT	500	600	1200	25	40	50	75	0 - 60 I.W. VAC			ASHCROFT	TYPE 1188	
PI - 101	Pressure Indicator to M-1 Moisture Separator	P-2		1/2 IN NPT	500	600	1200	30	40	50	75	0 - 60 I.W. VAC			ASHCROFT	TYPE 1188	
PSL - 101	Low Pressure (High Vacuum) Switch	P-2		1/2 IN NPT	500	600	1200	30	40	50	75	0 - 60 I.W. VAC	45 I.W. VAC	YES	ASHCROFT	TYPE 400	ADJUSTABLE RANGE, SHUTDOWN BLOWER
LSH - 101	Moisture Separator Tank M-1 High Level	P-2		1/2 IN NPT				0	0	50	75	0 - 36 IN		YES	GEMS	LS-1800	SHUTDOWN BLOWER
DPI-101	Filter Differential Pressure Indicator	P-2		1/2 IN NPT	500	600	1200	35	40	75	100	0 - 30 I.W. VAC			ASHCROFT	1133	
PI - 102	Pressure Indicator after Blower Air Filter	P-2		1/2 IN NPT	500	600	1200	35	40	75	100	0 - 60 I.W. VAC			ASHCROFT	TYPE 1188	
TI - 101	Temperature Indicator to VGAC - 1	P -2		1/2 IN NPT	500	600	1200	5	10	75	100	0 - 240 DEG F			ASHCROFT	SERIES 600A	
FQIT - 101	Flow Transmitter to VGAC - 1	P-2		1/2 IN NPT	500	600	1200	5	10	75	100	0 - 1500 CFM		YES	FCI	ST-98	
PSH - 101	Pressure High Level to VGAC - 1	P-2		1/2 IN NPT	500	600	1200	5	10	75	100	10 I.W.		YES	ASHCROFT	TYPE 400	SHUTDOWN BLOWER
TSH - 101	Temperature High Level to VGAC - 1	P-2		1/2 IN NPT	500	600	1200	5	10	75	100		140 DEG F	YES	ASHCROFT	TYPE 400	SHUTDOWN BLOWER
PI - 103	Pressure Indicator at Blower Discharge	P-2		1/2 IN NPT	500	600	1200	7	10	75	100	0 - 10 I.W.			ASHCROFT	TYPE 1188	SHUTDOWN BLOWER
PI - 104	Pressure Indicator to Exhaust Stack	P-2		1/2 IN NPT	500	600	1200	2	10	75	100	0 - 10 I.W.			ASHCROFT	TYPE 1188	SHUTDOWN BLOWER

DIVISION 15 – MECHANICAL

SECTION 15000

BASIC MECHANICAL MATERIALS AND METHODS

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Basic mechanical materials includes, but are not limited to, such items as interconnecting process duct work, piping, and pipe fittings, pipe supports, anchor bolts and fasteners, insulation, heating, ventilation, and miscellaneous plumbing.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the Contract Document includes, but is not limited to, the following:

Section 11212	Process Blowers
Section 11214	Centrifugal Process Pumps
Section 13200	Storage Tanks
Section 13225	Vapor-Phase Carbon Adsorption System
Section 13650	Instrumentation
Section 15150	Pipe, Pipe Fittings, Pipe Supports and Valves
Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

THE MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	Pipe Hangers and Supports - Selection and Application.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASME	Boiler and Pressure Vessel Code.
ASME B16.3	Malleable Iron Threaded Fittings.
ASME B16.18	Cast Bronze Solder-Joint Pressure Fittings.
ASME B16.22	Wrought Copper and Bronze Solder-Joint Pressure Fittings.
ASME B16.26	Cast Bronze Fittings for Flared Copper Tubes.
ASME B31.1	Power Piping.
ASME B31.9	Building Services Piping.
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
ASTM B32	Solder Metal.
ASTM B88	Seamless Copper Water Tube.
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing and Fittings.
ASTM D2683	Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pipe.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1-B1	Identification of Pipe Systems.
ANSI B1.20.1-83	Pipe Threads - General Purpose.
ANSI B16.1-89	Cast Iron Pipe Flanges and Flanged Fittings
ANSI B16.5-88	Pipe Flanges and Fittings.
ANSI B16.34-88	Valves-Flanged, Threaded and Welded End
ANSI B36.1DM-85	Stainless Steel Pipe

ANSI B36.19M-85 Stainless Steel Pipe

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC., NATIONAL MECHANICAL CODE/1993

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC. NATIONAL ENERGY CONSERVATION CODE/1993

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

SHEET METAL AND AIR CONDITIONING FIELD OR SUBCONTRACTORS NATIONAL ASSOCIATES (SMACNA)

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of each of the following to the Contractor:

A. Manufacturer's detailed technical data for all materials, fabrication and installation, including catalog cuts of all piping, fittings, valves, ductwork, supports and insulation.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed.

The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground and shall be protected from weather elements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Materials of construction for all piping and piping support systems and accessories are as presented on the Drawings. This includes, but is not limited to, vapor pipes, and general purpose pipes. Basis of selection has been made on the materials compatibility with the intended service. Attention has been paid to corrosion resistance, chemical compatibility and the mechanical requirements of the particular service. Materials other than those selected must be reviewed and approved by the Contractor.

B. Miscellaneous gaskets required for flange connections shall be constructed of Viton or approved equal.

C. Equipment supply Subcontractor shall appropriately size and provide vibration isolation dampers for all equipment. These shall be shipped with or before the equipment and shall be installed on-site by others. The corresponding anchor bolt requirements for the vibration isolation dampers shall be provided to the Subcontractor to ensure proper installation into the concrete floor.

PART 3 EXECUTION

3.1 CONSTRUCTION METHODS

A. General

1. The equipment and materials shall be fabricated and/or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations.
2. All work shall be performed by competent, trained, workmen, skilled in the field to which they are executing the work.
3. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections. All pipes and fittings shall be installed true to alignment, rigidly supported and fitted accurately.

4. Flange covers should not be removed until flanges are ready to be bolted into position or sealing faces may become damaged or distorted. If covers are removed for inspection purposes, they should be replaced immediately.
5. All outdoor piping between the building and the wells and discharge points shall be installed below the frost line as shown on the Contract Drawings to prevent freezing and cracking of the pipes.

B. Workmanship

1. The installation shall be completed as to present a neat and orderly appearance.
2. The inside of pipes and fittings shall be kept free from dirt and debris.
3. Exposed pipe and duct shall show no tool marks.
4. After cutting, pipes shall be reamed out to full bore.
5. Pipes shall be cut accurately and installed without springing or forcing.
6. All work shall be coordinated so that any necessary excavations may be closed promptly. The Subcontractor shall not cover work until it has been inspected and accepted in writing via daily reports.

C. Piping Layout and Installation

1. Run parallel with or at right angles to walls except as otherwise noted. Use fittings for changes in direction.
2. Install so as to provide for proper alignment, slope and expansion.
3. Run exposed piping and duct as close as possible to walls and ceiling.
4. All piping shall be pitched to drain in order to prevent accumulation.
5. Size and location of piping should be as indicated on the Drawings.

D. Installation of Fittings

1. Install flanges adjacent to all equipment.
2. Do not install joints or fittings over any motor, switchbox or other electrical equipment.
3. Provide swing joints at mains and connections to risers, and provide swing joints, expansion loops, and fittings as required for flexible piping system.
4. Where changes in pipe sizes occur, use only reducing fittings; box unions and reducing bushings are not acceptable.

E. Installation of Hangers and Supports

1. The design, engineering, and installation of all hangers and supports shall be in accordance to standards contained in ANSI B31.1 Code for Pressure/Power Piping and all other applicable codes and regulations. Rigidly support all piping and ducts from structures by Code approved hangers, inserts or supports with adequate provisions for expansion and contraction. Support shall be provided at changes in direction and elsewhere at a spacing of no greater than 10 feet.
2. Where piping is installed on structural steel supports, provide blocking of pipe rolls to arrest lateral pipe movement.
3. Support all vertical piping, at intervals as required by Code approved pipe collars, clamps, brackets or wall rests, and at all points necessary to ensure rigid construction.
4. All hangers and supports shall be installed so that they cannot become disengaged by movements of the supported pipe.
5. Support piping from steel frame construction by beam clamps and supplementary steel angles.
6. Supports for piping adjacent to pumps shall be provided and installed that are tested to withstand pump vibrations.
7. Supports and hangers shall be installed in such a way to minimize unnecessary stress on valves, meters and any other pieces of equipment.

F. Joints

1. Ferrous Pipe Screwed Joints
   a) Right hand threads, pipe standard, clean-cut, full depth, and tapered (ANSI Standard B2.1).
   b) Joints made tight without use of lead or paint.
   c) Use no lubricant.
   d) Make up joints with "Teflon" tape or an approved equal. Tape shall be applied to the threads of the pipe and not in the fittings.
2. Copper Pipe Joints
   a) Make pipe and fitting mechanically clean, bright and fluxed.
   b) Apply flux and solder as recommended by manufacturer of solder-type fittings.
3. Polyvinyl Chloride (PVC) Pipe Joints
   a) Clean dirt and moisture from pipe and fittings for solvent welding.
   b) Apply solvent cement of proper grade as recommended by PVC pipe manufacturer.
5. Installation of Joints
   a) Flanged joints shall be made with bolts, bolt studs with a nut on each end of studs if the flange is tapped. The number and size of bolts shall conform to the ANSI standards as the flanges. Bolts and nuts shall be Grade 5 conforming to the

ASTM Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307-74. Bolts and studs shall be of the same quality as machine bolts.

b) For flanged joints, gaskets shall be full-face flat ring gaskets of approved composition suitable for the required service. Gaskets 12 inches in diameter and smaller shall be 1/16 inch thick; those larger than 12 inches in diameter shall be 3/32 inch thick.

6. Stainless Steel Tubing Joints

a) Joints for stainless steel tubing with non-threaded ends shall be made using Swagelok type fitting connectors or approved equal.

b) Install fitting connection as recommended by manufacturer.

c) Threaded joints shall have right hand threads, pipe standard, clean cut and full depth. Joints shall be made up with "Teflon" tape, joint cement such as "*Permatex*" or approved equal, and applied to male threads only.

d) Joints between ferrous and copper pipe shall be made using dielectric fittings or gaskets of proper insulating material.

G. Installation of Sleeves and Escutcheons

1. Provide sleeves cut flush with surface for each pipe passing through walls, floors, partitions or ceilings.
2. Install sleeves one pipe size larger than pipe encased, but allow for insulation.
3. Install sleeves one inch above finished floor in areas where water is present.
4. Caulk and seal between sleeves and pipes, caulk floor sleeves with graphite packing and plastic waterproofing compound.
5. Provide escutcheon plate in finished areas around pipes passing through walls, floors, and partitions.

H. Cutting and Patching

1. The Subcontractor shall install all hangers, supports, and pipe sleeves in floors, walls, partitions, ceilings, and roof slabs as construction progresses to permit their work to be built into place and to eliminate unnecessary cutting of construction work.

2. All cutting of concrete, or other material for the passage of piping and ductwork through floors, walls, partitions, and ceiling shall be done by the Subcontractor, where necessary, to install his work. The Subcontractor will close all such openings around piping, ductwork, and conduits with material equivalent to that removed. All exposed surfaces shall be left in suitable condition for refinishing without further work.

3. No structural member shall be altered or cut without special permission.

3.2 TESTING, ADJUSTING, AND BALANCING

A. Test, adjust, and balance mechanical air and liquid distribution systems and their associated equipment.

B. Testing, adjusting, and balancing work for heating, ventilating and air conditioning ductwork shall follow recommended procedures for examination, preparation, and performance of testing, adjusting, and balancing, as outlined in the NEBB standard.

C. Recorded data shall represent actually measured observed conditions.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical boxes and panels, and restoring thermostats to specified settings.

E. For testing of treatment process piping to be used in vapor service, see Specification Section 15150, PIPE, PIPE FITTINGS, PIPE SUPPORTS AND VALVES.

F. Execution articles above shall supplement the referenced standard.

3.3 EXAMINATION

A. Examine installed work and conditions under which testing is to be done to ensure that work has been completed, cleaned, and is operable.

B. Report any defects or deficiencies noted during examination. Any defects or deficiencies shall be repaired or replaced.

C. Promptly report abnormal conditions in mechanical systems or conditions, which prevent system balance.

3.4 OPERATION AND MAINTENANCE

A. All spare parts and supplies are to be boxed and shipped in separate containers from other equipment and shall be prominently marked.
B. A separate set of special tools shall be provided in a durable case, which shall contain any non- standard size and not normally available wrenches, screw or nut drivers, etc., which are necessary for performing maintenance.

3.6 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

SECTION 15150

PIPE, PIPE FITTINGS, PIPE SUPPORTS AND VALVES

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

The work shall include the supply of all materials, fabrication drawings, erection design, installation, testing and delivery of services as specified in this section and/or on the drawings for completion and proper operation of all system piping and valving as included in the Contract Documents.

The work includes supply, erection, complete installation and testing of the piping, fittings, valves and related accessories.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 15000 Basic Mechanical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

THE MANUFACTURER'S STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)

MSS SP-58	Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	Pipe Hangers and Supports - Selection and Application

1.2 SUBMITTALS

A. The Subcontractor shall submit the following to the Contractor:

1. Shop drawings showing outline and overall dimensions, connection details, weights, anchorage details, arrangement of functional parts, and parts lists if applicable, for all equipment and materials furnished.

2. Literature and drawings describing the equipment in sufficient detail, including parts list and materials of construction.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, Supplier shall carefully pack and brace all components either within shipping containers or on carrier.

B. All equipment shall be sealed to prevent entry of water, dirt or other foreign material. Seals used on nozzles shall not affect, but shall protect the weld preparation or flange faces of the nozzles. Solid steel plugs shall be used to close all threaded connections. All equipment, especially all small, loose pieces, including bolting, tools, gaskets, etc. shall be adequately crated or boxed for protection during shipment.

C. Where required to protect against condensation and humidity, a desiccant shall be provided and its presence with the need of periodic removal and dry-out shall be so marked.

D. Equipment which is hydrostatically tested by Manufacturer, shall be completely drained and thoroughly dried prior to shipment to prevent damage from corrosion or freezing and drain plugs replaced.

E. Boxes or other shipping units shall be clearly marked to indicate any special instructions, e.g., “Fragile”, “Desiccant Inside”, “This Side Up,” etc. Large and heavy shipping units shall have suitable skids for moving or provisions for lifting with slings. If location of slings is critical, these locations shall be marked accordingly.

F. Flanged connections shall be protected by a ½-inch or thicker plywood disc, or suitable alternate, bolted to the face of the flange.

G. Threaded or socket weld connections shall be protected with screwed or snap-in (snap-on) type, securely held, plastic protectors. Cast iron plugs are not acceptable for protection unless part of the permanent assembly.

H. Butt weld connections shall be protected by wooden disks that cover the entire weld end area, and are secured by metal straps and fasteners.

I. All electrical and electronic equipment or accessories installed prior to shipment shall be wrapped and sealed in plastic for rain and weather protection during shipment and storage prior to installation.

1.4 DESIGN CRITERIA - PIPE SUPPORTS

A. Design criteria for the fabrication of the pipe hangers and supports shall conform to the following criteria.

1. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment concentration.

2. Pipe hangers shall be capable of supporting the pipe in all conditions of operations. They shall allow free expansion and contraction of the piping and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.

3. Hangers shall be designed and installed so that they cannot become disengaged by movement of the supported pipe.

4. The hangers and supports shall meet with the following requirements:

a) Standard and fabricated hangers and supports shall be furnished complete with necessary inserts, bolts, nuts, rods, washers and other accessories.

b) Run piping in groups and parallel to building walls where practicable. Provide minimum clearance of 1-in between pipe and other work.

c) Install hangers or supports at all locations where piping changes direction.

d) All hangers and supports shall be capable of adjustment after placement of piping.

e) Each type of hanger or support shall be the product of one manufacturer. Types of hangers or support shall be kept to a minimum.

f) All suspended or supported pipe shall have a hanger or support adjacent to each hub.

g) Vertical piping shall be supported at each floor and between floors by stays or braces designed to prevent rattling and vibration.

h) Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping.

i) Prevent contact between dissimilar metal by use of copper plated, rubber or vinyl coated, or stainless steel hangers or supports.

j) Thin walled stainless steel piping shall be isolated from carbon steel by use of plastic coated hangers or supports.

k) Hangers and supports shall provide for expansion throughout the full operating temperature range.

l) Provide lateral support, anchors and guides for all pipelines in which expansion joints are installed. Anchors and guides shall be in accordance with the recommendations of the manufacturer of the expansion joints.

m) Minimum size single hanger rods shall be in accordance with the schedule below unless otherwise shown or specified. Double rods used for pipe 8-inch and greater may be 1/4-inch less in diameter than indicated.

Pipe Size (inches)	Rod Diameter (inches)
Less than 2	3/8
2-1/2 through 3	1/2
4 through 6	3/4
8 through 12	7/8
14 through 20	1
Larger than 20	1-1/4

n) The Contractor shall verify all spans meet state and local codes and adjust them as necessary prior to fabrication and installation. The Contractor shall be responsible for obtaining the proper span.

PART 2 PRODUCTS

2.1 MATERIALS - PIPE AND PIPE FITTINGS

A. Filler rings shall be used where necessary and shall conform to the 125-pound ANSI standard. Conventional practices shall be incorporated to ensure correct assembly of the adjoining piping.

B. Stainless steel piping shall be schedule 40 304 SS conforming to ASTM A-778 or A-312 without circumferential welds. Pipe shall be cold worked - annealed and passivated, hydrostatically tested and milled certified. All stainless steel pipe fittings shall conform to ASTM A-774 or A403CR. All pipes, fittings and fabrications will be properly marked with type, gauge and heat number.

C. Stainless steel tubing for instrumentation connection as shown on the drawings, shall be Type 316 3/8 inch OD, tube wall thickness of 0.035 inch conforming to ASTM

A213. All tubing and fittings shall be in accordance with ANSI 31.1 Code for Power Piping.

D. Soldered fittings shall conform to ANSI B16.18 and compression fittings shall be flared, conforming to ANSI B16.26, or flareless such as "*Parker-Hannifin*", "*Swagelok*", or approved equal.

E. All PVC process piping shall conform to ASTM D1785, ASTM D2466 and ASTM 12454-B. All PVC piping shall be Schedule 40 unless otherwise noted. Dimensions and tolerances of sockets shall conform to ASTM D2466 and ASTM D2467 where applicable. Maximum height of pipe stop on all fittings except for reducer bushings shall be not greater than the wall thickness of the corresponding size and schedule of the pipe, nor less than the wall thickness of SDR 11 pipe.

G. Copper pipe and fittings shall be Type L hard drawn conforming to ASTM B88, ASME B16.18 and ASME B16.22 with grade 95TA welded joints.

2.2 MATERIALS - VALVES

A. Ball valves designated as PVC shall be schedule 40 construction with socket end connections. Seals to be Viton with Teflon seats. Valves to be full port design for low pressure loss and have a fine pitched threaded seal retainer for precise seat adjustments. Valve seats to be reversible and self-lubricating for bubble tight seal.

B. Ball valves designated as brass shall have female NPT end connections. Seals to be Viton with Teflon seats. Valves to be full port design for low pressure loss and have a fine pitched threaded seal retainer for precise seat adjustments. Valve seats to be reversible and self-lubricating for bubble tight seal.

C. Pressure relief valves shall be bronze or carbon steel construction and Viton seals with 1/2" threaded connections and non-sticking design utilizing a Teflon shaft passing through three vented U-cup seals. They shall be an angle type design. The valves shall have no external metal fasteners and have one corrosion resistant coated internal spring to cover the valves entire set pressure range. All pressure relief valves to be hand adjustable, without tools to relieve pressures between 2 and 50 iw.

D. Butterfly valves shall be rubber seated and conform to requirements specified in AWWA C504, latest revision, and ANSI B16.1. They shall be short body style of cast iron construction with eccentric disk. Valves shall be designed to allow seat refurbishment in the line, and packing replacement without removing the manual actuator. Flanged ends shall be drilled in accordance with ANSI B16.1. Valve position shall have an infinite span over the entire range of actuation.

2.3 PIPE SUPPORTS

A. Any reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired and is not to be considered proprietary. In all cases, any comparable source or device is acceptable upon approval by the Contractor.

B. Equipment described under this section shall be furnished by manufacturers who are experienced, reputable and qualified in the manufacture of pipe supports. The manufacturer shall be fully responsible for the proper operation and performance of the system as a whole.

C. Except where otherwise specified shop painting and coatings shall conform to manufacturers best standard finish.

D. Any Subcontractor that requires any part of the building for support shall coordinate with the actions Contractor.

E. Unistrut pipe supports, unless noted, shall be punch-press made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meets the physical requirements of ASTM A570 GR 33. The pickling of the steel produces a smooth surface free from scale. Unistrut channels shall be accurately and carefully cold formed to size from low-carbon strip steel. Spot-welded combination members shall be welded 3" (maximum) on center.

F. Unistrut fittings, unless otherwise noted, shall be made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meet the physical requirements of ASTM A570 GR 33. The pickling of the steel produces a smooth surface free from scale. Fittings, unless otherwise noted, shall be made from hot-rolled, pickled and oiled steel plates, strip or coil, and conform to ASTM specifications A575, A576, A635, or A36. The fitting steel shall also meet the physical requirements of ASTM A570 GR 3. The pickling of the steel produces a smooth surface free from scale.

G. Unistrut channel nuts shall be manufactured from mild steel bars, and after machining operations are completed, they are case hardened, assuring positive biting action into the in-turned edge of the Unistrut channel. The standard channel nut shall conform to ASTM A576 GR 1015. Screws shall conform to SAE J429 GR 2 (also meet and exceeds ASTM A307). All beam and column load data pertains to carbon steel and stainless steel unistrut channels. Load tables and charts shall be constructed to be in accordance with the specification for the design of cold-formed steel structural members 19 August 1986 Edition with 11 December 1989 Addendum published by the American Iron and Steel Institute.

PART 3 EXECUTION

3.1 ERECTION/INSTALLATION

A. The equipment shall be installed and/or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations.

B. All work shall be performed by competent, trained, workmen, skilled in the field to which they are executing work.

C. All equipment shall be properly and securely installed such that undue stresses are not exerted on equipment and connections. All pipes and fittings shall be installed true to alignment, rigidly supported and fitted accurately.

D. Flange covers should not be removed until flanges are ready to be bolted into position or sealing faces may become damaged or distorted. If covers are removed for inspection purposes, they should be replaced immediately.

E. Wall pipe castings of proper size shall be installed for all pipes passing through masonry walls or floors, unless otherwise shown on the drawings, and concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Subcontractor shall check all drawings and figures, which have a direct bearing on the pipe location and be responsible for the proper location of these pipes during the construction of structures.

F. Flanged joints shall be made up tight, and measures taken to prevent undue strain upon adjacent pieces such as pumps, valves and other piping. Before the pieces are assembled, the Subcontractor shall remove rust preventive coatings from machined surfaces, thoroughly clean pipe ends and gaskets and carefully smooth all burrs and other defects. The flanged bolt holes on each end of flanged pipe and fittings shall accurately straddle the same horizontal and vertical centerlines, unless special drilling is required.

G. Bolts should be tightened using proper bolt torque ratings as recommended by the manufacturer. Threads must be clean and well lubricated and washers should be used to ensure correct torque. Bolts should be tightened alternatively and evenly.

H. Mechanical joint pipes and fittings shall be joined in accordance with Section 9b of the AWWA Standard C600, latest edition, and also in accordance with the "Notes on Method of Installation" included at the end of ANSI Specification A21.11, 1972.

I. PVC pipe shall be joined by a solvent welding method conforming to ASTM D-2564. The solvent shall be designed for its intended use as recommended by the manufacturer. The PVC pipe may be adapted to fittings or other systems by means of a flange assembly made to class 150 ANSI B16.5 dimensional standards.

J. Welding techniques for stainless steel pipe should be TIG and conform to ASME/ANSI B31.3. Inert gas can be argon or argon/helium mixture, electrodes should be 1 to 2% thoriated tungsten and cups should be ceramic. MIG technique should not be used for fabricating piping systems. Copper contacts on wire feed can melt and drop into the weld which produces an unsatisfactory and unsafe situation. Pipe and fittings should be

beveled for butt welding. Never overlap material and weld gas pockets and inclusions should be kept to a minimum.

K. Copper pipe and fittings shall have sweated joints in accordance with ASTM B321 grade 95TA.

L. Machinery used to place equipment/materials on the GWTP floor shall not cause stress on the floor above the allowable maximum.

3.2 TESTING AND INSPECTIONS

A. Each system component will be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the contract documents.

B. Acceptance tests, after the equipment is completely installed, may be performed to demonstrate performance requirements as specified herein. The field tests will be governed by provisions of applicable industry and institute standards.

C. Pipe Vacuum Testing

1. Check and plug all relevant open ends, adequately block all bends, tees, and other fittings, and do whatever else is necessary so that pipelines will safely withstand the pressures developed under the tests and so that no damage or injury will occur to the pipeline, people, or property.

2. All tests shall be conducted at the pressure specified in this section.

3. Every length of pipe installed under this contract shall be tested, unless otherwise specified or approved by the Contractor.

4. All regulators, gages, traps, and other apparatus or equipment, which may be damaged by test pressures shall be isolated or removed before tests are made.

5. All leakage in pipelines and appurtenances shall be located and eliminated. Repairs shall be to the satisfaction of the Contractor, and all work found to possess leaks may be ordered to be re-excavated, removed, and replaced, with no additional compensation. In all cases, repair or replacement shall be with the prior concurrence and to the satisfaction of the Contractor. The testing procedure(s) shall then be repeated.

6. Should any test disclose leakage, or pressure drop greater than that specified, the Subcontractor shall at his own expense locate and repair the defective joints until the specified allowance is met.

7. The vacuum leakage test pressure shall be 20 inches of water of vacuum for a duration of 2 hours.

8. All pipes shall be tested before they are concealed, furred-in, or burried. Restrain and brace all piping adequately prior to testing. Leave all restraining devices in place after testing.

9. These tests shall be considered satisfactorily passed only when there is no evidence of leakage and no other defects are disclosed.

D. The Subcontractor shall ensure pipe and pipe fittings, solvents and joints are compatible with the operating chemicals and surrounding environment.

* * * END OF SECTION * * *

SECTION 15500

HEATING AND VENTILATION

PART 1 GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

It is not the intent of this section and associated drawings to specify all details of design, fabrication and construction. It shall be the responsibility of the Subcontractor to provide equipment that has been designed, fabricated and equipped in accordance with stated standards and high standards of engineering and workmanship that is suitable for the specified service.

This section covers the requirements for the functional design, performance, materials, construction features, quality and handling of the equipment described herein.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 15000	Basic Mechanical Materials and Methods
Section 16051	Electric Motors

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

BUILDING CODE OF NEW YORK STATE; OFFICIAL COMPILATION OF CODES, RULES AND REGULATIONS

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC., NATIONAL MECHANICAL CODE/1993

BUILDING OFFICIALS AND CODES ADMINISTRATORS INTERNATIONAL, INC. NATIONAL ENERGY CONSERVATION CODE/1993

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATES (SMACNA)

AIR CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

The Subontractor shall submit five copies of each of the following to the Contractor:

A. Ventilation and Exhaust System: Illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information to illustrate the requirements and operation of the equipment and the system.

B. Spare parts data for each different item of material and equipment specified, after approval of detail drawings and no later than two months prior to the date of beneficial occupancy. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

C. Heating, Ventilation and Exhaust System: Shop drawings for fans, unit heaters, dampers, controls, and associated appurtenances. Drawings shall include: an electrical connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device; pressure drops; layout drawings showing the installation method, gauge reinforcement, reinforcement spacing rigidity classification, and seal classification; descriptive data of equipment with curves and installation details; and schedule of damper sizes with leakage and flow characteristic charts.

D. Operation and Maintenance (O&M) Manuals

Ventilation and Exhaust System: Maintenance manuals listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

1.4 SYSTEM DESCRIPTION

A. This section serves to provide a general description of the requirements for the Heating and Ventilation systems. The Subcontractor is to design and install heating and ventilation for the Treatment Building.

1. Ventilation: Sufficient air changes to remove air contaminants, particulates, etc. and provide an air quality within the treatment building meeting the latest requirements of the applicable governing authority. Ventilation is provided by exhaust fans for the Treatment Building.
2. Air contaminants may consist of motor vehicle emissions and any fugitive emissions from treatment system equipment.
3. Heating will be provided by individual electric unit heaters for the process area heating requirements. The electric unit heaters will be activated by thermostat control.

1.5 DESIGN CRITERIA

A. Indoor design temperatures shall be as indicated in Table 15500-1.

Table 15500-1
Indoor Design Temperature

Type of Area	**Design Temperature (^{o}F)**		**Outdoor Air Ventilation Criteria**
	Summer	**Winter**	
Treatment Building	N/A	50	Thermostatic

1.6 ENVIRONMENTAL CONDITIONS

The design temperatures for the project will be as shown in Table 15500-2:

Table 15500-2
Design Temperatures

Winter	Summer
5	100

PART 2 PRODUCTS

2.1 EQUIPMENT - GENERAL

Electrical motor-driven equipment specified shall be provided complete with motor, motor starter, and controls. Unless otherwise specified, electric equipment, including wiring and motor efficiencies, shall be in accordance with Division 16. Electrical characteristics and enclosure type shall be as shown, and unless otherwise indicated, all motors of 1 horsepower (Hp) and above with open, drip proof, or totally enclosed fan cooled enclosures, shall be high (premium) efficiency type. Motor starters shall be provided complete with thermal overload protection and other appurtenances necessary. Each motor shall be in accordance with NEMA MG 1 and shall be of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices, but not shown, shall be provided.

2.2 GENERAL HEATING AND VENTILATION EQUIPMENT REQUIREMENTS

A. Power Wall Ventilator Fans: Fans shall have the following specifications:

1. The Treatment Building will require two Power Wall Ventilator Fans. The locations of each Ventilator Fan is shown on contract drawing M-3.
2. Each Ventilator Fan shall be rated for 1,000 CFM at ¼ inches of static pressure.
3. Ventilator Fans shall be wall mount, direct drive fan. Ventilator Fans shall include dampers that close when not in operation, and a cage/exhaust fan guard around blades to protected against debris and accidental contact.
4. Ventilator Fans shall be 120 Volts, Single-phase, and include a local disconnect switch, and adjustable thermostat. Ventilator Fans shall be capable of manual or automatic control.

B. Louvers and Dampers: Building louvers shall have the following specifications:

1. The Treatment building will require two wall Louvers. Louvers to be fixed blade with frame and include insect/bird screen. Each louver shall include adjustable barometric interior wall dampers.
2. Each Louver shall have exterior dimensions of 36”x36” and shall mount flush to both interior and exterior wall (wall thickness requires confirmation).
3. Louvers for installation in exterior walls shall have blades fabricated from anodized aluminum or galvanized steel or aluminum structural shapes. Sheet metal thickness and fabrication shall conform to SMACNA-06. Blades shall be accurately fitted and secured to frames. Edges of louver blades shall be folded or beaded for rigidity and baffled to exclude driving rain. Louvers shall be provided with stainless steel bird and insect screens. Louvers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

4. Dampers: Dampers for installation in exterior walls shall have blades fabricated from anodized aluminum or galvanized steel or aluminum structural shapes. Dampers shall actuate under changes in barometric conditions or during induced draft operations of the ventilation system. Dampers shall have adjustable weights to modify their operation as necessary. Sheet metal thickness and fabrication shall conform to SMACNA-06. Blades shall be accurately fitted and secured to frames. Dampers shall bear AMCA Certified Ratings Seal for air performance and water penetration ratings as described in AMCA 500.

B. Treatment Building Heaters: The Treatment Building Heaters shall have the following specifications:

1. The Treatment Building will require two Unit Heaters. Unit heaters shall have a built-in thermostat and motor starter and be a Horizontal Delivery Blower, Electric Element Heater type as specified on Contract Drawings.
2. Each Unit Heaters shall be rated for 5 kilowatt of heating power. Unit Heaters shall be 460V three-phase, and include local disconnect switch, and adjustable thermostat switch.
3. Unit Heaters shall be mounted on suitable wall mounting bracket at a minimum of 3 feet away from wall or nearest structure, or manufacturer's recommendation.

2.3 SPARE PARTS

A. A spare parts list shall be provided for each different item of material and equipment specified, including all parts recommended by the manufacturer to be replaced after one year of service.

B. A set of manufacturer recommended spare parts and supplies for one year of service is to be included as part of the equipment provided under this section. Also to be provided are any unusual tools that are necessary for maintenance and repair of the system.

PART 3 EXECUTION

3.1 GENERAL

A. Installation: Material and equipment shall be installed and prepared for service as indicated on the Contract Drawings and as recommended by the manufacturer(s).

B. Control equipment shall be installed under the supervision of the manufacturer's representative, in accordance with manufacturer's written instructions. Unless otherwise indicated, all operators, controllers, sensors, indicators and like devices, when installed on, or which penetrate thermally insulated surfaces, shall be provided with stand-off mounting brackets, bases, nipples, adapters, or extended tubes to provide clearance between the surface and the device *not* less than the thickness of the insulation. Stand-off mounting items shall be integral with the devices or standard accessories of the control manufacturer, unless otherwise approved. Clamp-on devices or instruments where direct

contact with a surface is required, is exempt from use of above mounting items. Transformers shall be provided for electric or electronic controls when required. Sensing elements and pressure taps shall be mounted in controlled medium flow streams to sense representative conditions. A local or remote readout thermometer shall be provided adjacent to each control device temperature sensor. Wall thermostats and guarded thermostats shall be mounted on separate bases. Space thermostat shall be mounted 60 inches above finished flow, unless otherwise indicated. Where necessary to protect equipment mounted control devices, vibration isolation mountings shall be provided.

C. Building Surface Penetrations: Sleeves and prepared openings for louvers and ventilators shall be provided during the construction of the surface to be penetrated. Framed openings, including fire resistive penetrations, shall be provided as specified or indicated, and in accordance with approved shop drawings. Approximately 1-inch clearance shall be provided between penetrating and penetrated surfaces, except where fire resistance criteria governs. Clearance space for non-fire-rated penetrations shall be filled and sealed. Penetrations shall be weather-tight and vapor-tight. Apply sealant to oil-free surfaces, to not less than 2-inch depth.

D. Field Painting: Damaged finished surfaces shall be touched-up or repainted to match the original finish. Painting required for surfaces not otherwise specified and finish painting of items primed at the factory shall be as specified in Section 09900, PAINTING, GENERAL.

3.2 SEQUENCE OF CONTROL

A. Wall ventilators fans shall be capable of manual or automatic control. In the manual mode, the ventilators/fans shall run continuously. In the automatic control mode, the ventilators/fans shall turn on when the space temperature sensed by a space thermostat is above a set point.

3.3 TESTING AND INSPECTION

All heating and ventilation equipment shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the specification and intended use.

3.4 WARRANTY

The Subcontractor shall warrant the equipment and materials of construction, which shall be for one year after the end of the construction phase. The Subcontractor shall warrant the equipment and/or materials of construction for more than one year when such equipment and/or materials respective warranties extend longer than one year. The Contractor shall approve of the installations by others. The Subcontractor's warranty to the Contractor shall not be diminished by installations of work by others. All extended warranties shall be included in the Operations and Maintenance (O&M) manual.

* * * END OF SECTION * * *

DIVISION 16 - ELECTRICAL

SECTION 16000

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

Under no circumstances shall any work begin without first obtaining permission from the appropriate agency. Existing utility lines that might interfere during construction shall be relocated.

All materials, products and equipment provided shall be UL listed.

The scope of work generally includes supply, erection, complete installation and testing of the following:

A. 277/480V power distribution panel, installation and wiring, and connection to the existing incoming power.

B. Power distribution to all electrical equipment.

C. Conduits and wiring for power, lighting and instruments.

D. Lighting (see Specification Section 16470).

E. Grounding.

F. Control panel cabinet, installation and wiring.

G. Instrumentation

1. Subcontractor shall provide all power and control /signal wiring to instruments and control devices.
2. Installation of all off-line electrical instruments.
3. Shielded wire and cable shall be run separate from power or 110V control wiring, and shall be run in rigid steel conduit and/or cable trays, as shown on the drawings.

H. Fire Detection and Alarm System - See Specification Section 16721.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 13650 Instrumentation

Section 16051 Electric Motors

Section 16470 Lighting

Section 16721 Fire Detection and Alarm System

Section 16726 Security Alarm System

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies. For any specific use not covered in this section, or if a conflict arises in a specific situation, the latest revision of the NEC (National Electric Code) shall be the governing body.

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

NATIONAL ELECTRICAL SAFETY CODE (NESC)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NATIONAL ELECTRICAL MANUFACTURING ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES, INC. (UL) STANDARD

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor.

A. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment.

1. Conduit
2. Wires and cables
3. Panel boards
4. Lighting fixtures
5. Receptacles
6. Circuit breakers
7. Disconnect Switches
8. Grounding materials

C. Prior to submittal, all shop drawings and manufacturer’s literature shall be checked for accuracy and conformance to specifications and drawings.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground and shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

D. All equipment, requiring placement within the Treatment Equipment Building prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Subcontractor.

E. Machinery used to place equipment within the Treatment Equipment Building shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 EQUIPMENT

A. Distribution Panel Board

1. The Distribution Panel board shall be dead-front type.
2. Panel board interior shall be complete with buses, dead-front shield, circuit breakers, wire connectors, etc. Interior shall be so designed that circuit breakers can be replaced without disturbing adjacent breakers and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling or tapping.

   Branch circuit shall be arranged using double row construction. Branch circuits shall be numbered by manufacturer.
3. Bus bars for the mains, neutrals and grounds shall be copper. A ground bar and full size neutral bars shall be included. Bussing shall be braced throughout to conform to industry standard practice governing short stresses in panel board.

   Neutral and equipment ground bus shall have suitable lug for each circuit breaker and single pole space provided.
4. Boxes shall be galvanized, code gauge steel without knockouts. Boxes shall be of sufficient size to provide a minimum gutter space of 4 inches on all sides.

   Hinged door covering all circuit breaker handles shall be included in panel trim. Door shall have semi-flush type cylinder lock and catch, except that door over 48 inches in height shall have a vault handle and 3 point latch. Two keys shall be supplied for each lock. All locks shall be keyed alike; directory frame and card having transparent cover shall be furnished on each door.

5. Panel board shall be furnished with circuit breakers having frame sizes and trip settings as shown on the drawings.

   Circuit breakers shall be thermal-magnetic, molded case, bolt-in type with interrupting capacities of not less then 10,000 amperes RMS, symmetrical at rated voltage for 120/240 and 120/208 volt panel board. Interrupting capacities of not less then 22,000 amperes RMS, symmetrical at rated voltage for 480 volt panel board.

   Circuit breakers used as switches in high intensity discharge (HID) lighting circuit shall be listed and shall be marked as HID.

6. Panel board and Circuit Breaker shall be UL listed.

2.2 MATERIALS

A. Conduit

1. Rigid steel conduit or Intermediate metal conduit shall be used for all above ground applications unless otherwise noted.

   Rigid steel conduits shall be heavy-gauge steel, hot-dipped galvanized per ASTM A123 inside and outside over entire length including threads. Conduit shall be manufactured in accordance with UL standard UI-6 and ANSI spec C80.1 and be UL listed.

   Intermediate metallic conduit shall be hot-dipped galvanized steel. Intermediate weight, rigid - type electrical conduit, shall be UL listed and meet the requirements of ANSI spec C80.1.

   Fittings: Cast metals, screwed fittings; inch and larger shall be mogul type.

2. Polyvinyl Chloride (PVC) Conduit for underground application.

   Conduit shall be rigid PVC, schedule 80, meeting the requirements of UL 651 and NEMA TC-2.

   Fittings: Coupling type.

   Joints: Connections shall be made by solvent welding.

3. Liquid-Tight flexible metallic conduit for final connection to motors and instruments.

   Flexible galvanized steel core with continuous copper ground in the convolutions covered with extruded PVC. Conduit shall be UL listed.

   Connectors: Nylon-insulated screw-in ground-core type connectors constructed of malleable iron, Thomas & Betts liquid-tight fittings or Subcontractor approved equal.

B. Wires and Cables

Wire and cable shall meet all standards and specifications applicable, and shall be in conformance with the latest edition of the NEC. Insulated wire and cable shall have size, type of insulation, voltage, and manufacturer's name permanently marked on outer covering at regular intervals not exceeding four feet. Wire and cable shall be delivered in complete coils and reels with identifying tags, stating size, type of insulation, and other pertinent information.

1. Low Voltage Power Cable

   Wires installed in conduit for services 600 volt and below, shall be 600 volt, stranded copper, single conductor, heat and moisture resistant thermoplastic insulation, 75ºC type THHN/THWN.

   Minimum size for power wire shall be #12 AWG, except that #14 AWG shall be used for control.

2. Instrument Signal Cable

   Instrument signal cable for 4-20 mA signal shall be single pair #16 AWG, stranded copper, 300V PVC insulation with overall aluminum Mylar shield, UL listed as PLTC and overall PVC jacket.

3. Extraction Well Switch Control Wire.

   Wire types shall be as specified in paragraphs 1 and 2 above.

C. Outlet Boxes

1. All outlet boxes for concealed wiring shall be sheet metal, galvanized, or cadmium plated at least one and one-half inch deep, single or gauged, of a size to accommodate devices and number of conductors noted. Boxes shall be equipped with plaster ring or cover as necessary. All outlet boxes shall meet the requirements.
2. Boxes for exposed wiring shall be malleable iron, cadmium finish, or cast aluminum alloy and shall not be less than four inches square by one and one-half inch deep unless otherwise noted.. Boxes shall have gasketed cover.
3. Fixture outlet boxes shall be minimum four inches octagonal and, where required as outlet and junction boxes, they shall be four and eleven-sixteenths inches by two and one-eighth inches deep.
4. Outlet boxes for concealed telephone and signaling systems shall be of the four-inch square type with plaster cover and bushed-opening cover plate.
5. Outlet boxes for hazardous areas shall be explosion-proof with appropriate fittings, seal-off, etc.
6. Boxes for floor outlets shall be of the cast-metal threaded-conduit-entrance; waterproof type with means for adjusting cover plate to finished floor level. Boxes shall be approximately four inches in diameter and three and one-half inches deep with an approved gasket or seal between adjusting ring and box.

D. Pull and Junction Boxes

1. Junction boxes and pull boxes inside the groundwater treatment plant (GWTP) shall be furnished and installed as shown on the drawings and as required by the NEC, or where necessary to facilitate pulling in wires and cables without damage.
2. Boxes shall be formed from sheet steel, with corners folded in and securely welded, with three-quarters inch inward flange on all four edges, with box drilled for mounting and with flanged drilled for attachment of cover. Box shall be galvanized after fabrication. Cover shall be made of one piece galvanized steel and provided with gasket and round head brass machine screws for fastening to box. Box and cover shall be made of code gage steel, or heavier as specified. Boxes shall be a minimum of four and one-half inches deep, and sized as required to meet NEC standards, or larger as specified, utilizing manufacturer's standard size or next larger to meet dimensional requirements.
3. Pull and junction boxes inside the GWTP shall be furnished with knockouts. All unused knockouts shall be plugged.
4. If pull or junction box is exposed, the box shall be painted to match the finish of the building surfaces adjacent to the box, unless indicated otherwise by the Contractor.
5. Pull or junction boxes installed below ground shall be watertight, similar to Crouse Hind Cat. No. WJBF or Subcontractor approved equal. Pull or junction boxes outside the GWTP shall be furnished without knockouts for field drilling. All unused knockouts shall be plugged.
6. Pull or junction boxes installed in hazardous areas shall be explosion-proof with appropriate fittings, seal-off, etc.

E. Cabinets

1. Cabinets used for cable supports for service entrance, feeders, and other cables or electrical components shall be of steel and shall be furnished and installed where indicated on the drawings. Boxes shall have removable screw covers fastened by corrosion-resistant machine screws and shall be of a size large enough to accommodate the feeder conduits indicated and also provide ample space to install cable supports.

F. Switches and Receptacles

1. The wiring devices specified shall be UL approved.
2. Wall switches shall be specification-grade, flush-tumbler type with operating mechanism totally enclosed in urea or nylon composition case rated at 20 A at 125 V unless otherwise noted.

   Where more than one flush wall switch is indicated in the same location, the switches shall be mounted in gangs under a common plate.
3. Receptacles: shall be specification-grade, flush or surface mounted, duplex, rated at 20 A, 125 V unless otherwise noted.

   Plates shall be constructed of metal with a gloss finish and shall be of matching wall color. Special markings on the plates shall be provided as indicated on the drawings. When devices are installed in exposed outlet boxes, the plates or covers shall be of a type designed for the boxes.

Receptacle in wet (process) area shall be GFI type.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

A. Codes

1. All materials and workmanship shall comply with NEC and all other applicable codes, specifications, local ordinances, industry standards, utility company, and fire insurance carrier's requirements.
2. Noncompliance: Should any work be performed that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards, fire insurance carrier's requirements, and utility company regulations, the Subcontractor will not bear the cost arising in correcting any such deficiency. Such work will be corrected at no extra cost.

B. Grounding

1. Ground neutral leg of service and all non-current carrying metallic parts of electrical equipment to ground grid, made of eight-feet by three-quarter-inch copper-weld ground rods and 2/0 bare copper ground cable. Provide ground grid around the building and ground building steel columns.
2. Metallic parts to be grounded shall include cable tray, transformer, cabinets, panel boards, outlet boxes, fixtures, and any other equipment required by the latest edition of the NEC article 250.
3. Run separate green insulated ground conductor in conduit with power conductors to each motor for grounding.

C. Concrete Pads

Concrete pads, supports, piers, bases, foundations, and encasement required for the electrical equipment and conduit shall be provided and installed. The concrete pads for electrical equipment shall be six inches larger all around than the base of the equipment unless specifically indicated otherwise.

D. Conduit

1. Conduit sizes shall be as indicated on the Contract Drawings or minimum in accordance with the NEC, including provision for given equipment-grounding conductor.
2. Conduit systems shall be installed in accordance with the latest edition of the NEC and shall be installed in a neat workmanlike manner.
3. The entire conduit system shall be installed to provide a continuous bond throughout the system to provide a grounding system.
4. Install conduit concealed in walls, ceilings, and floors where possible.
5. Install conduit in unfinished areas exposed; run square with ceilings and walls.
6. All conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight. Bends or offsets shall be made with an approved bender or hickey, or hub-type conduit fittings. Number of bends per run shall conform to the NEC limitations.

7. Concealed conduits shall be run in a direct line with long sweep bends and offsets. Exposed conduits shall be parallel to and at right angles to building lines, using conduit fittings for all turns and offsets.

E. Wires and Cables

1. No wire and cable shall be pulled until the conduit system is complete from pull point to pull point.
2. Pull boxes are required in conduit runs over 100 feet or when more than three 90 degree bends are used or as indicated on the drawings.
3. Care shall be exercised while installing wire in conduits so as not to damage the conductor insulation. Wire pulling lubricant may be used in pulling on or moved conductors and shall be used if wire is pulled by mechanical means.
4. Use no wire smaller than No. 12 AWG for power and lighting circuits and no smaller than No. 14 AWG for control wiring.
5. Splices only in junction or outlet boxes.
6. Neatly train and lace wiring inside boxes, equipment, control panel and panel boards.
7. The bending radius of any wire or cable shall not be less than the minimum recommended by the manufacturer. Maximum pulling tension and side-wall pressure of any wire or cable shall not exceed manufacturer's recommended values.
8. Pull all conductors into raceway at same time.
9. Conductor shall be color coded in accordance with NEC. Identify each conductor with numbers at both ends as shown in drawings. Use Brady or approved equal wire marker.
10. Inspect wire and cable for physical damage and proper connection.
11. Perform test for continuity and correctness of wiring and identification of all conductors of lighting and receptacle branch circuits, power and contact circuits and motor leads.
12. All 600V insulated cables for power and motor leads shall be given an "Insulation Resistance Test" using a 1,000 V insulation tester.

F. Wire and Cable Termination and Splices.

1. Joints on branch circuits shall occur only where circuits divide and shall consist of one through circuit to which shall be spliced the branch from the circuit. In no case shall joints in branch circuits be left for the fixture hanger to make. No splices shall be made in conductor except at outlet boxes, junction boxes, or splice boxes.
2. Conductors No. 8 and larger terminated and spliced with Burndy, Thomas and Betts or an approved equal mechanical compression connectors. After the conductors have been made mechanically and electrically secure, the entire joint or splice shall be covered with Scotch No. 33 tape or an approved equal to make the insulation of the joint or splice equal to the insulation of the conductors. The connector shall be UL approved. The tape shall be seven-mil vinyl, self-adhesive tape.
3. Conductors No. 10 and smaller terminated and spliced with Buchanan "B-Cap" or 3M-Scotchlok self-insulated, screw-on connectors; Bakelite wire nuts are not acceptable.

4. Connect conductors to panel boards and apparatus by means of approved lugs or connectors as by Gorilla Grip, Thomas and Betts, or an approved equal.

H. Instruments

1. All off-line instruments shall be supported using floor mounted 2-inch pipe with flange, or equivalent as approved.
2. Final connection to all instruments shall be made using UL listed flexible conduit.

I. Boxes

1. Install boxes appropriately as indicated.
2. Set boxes true and flush and rigidly secure in position.
3. Use painted or galvanized iron hangers to support ceiling outlets.
4. Set boxes so that front edges of box are flush with finished wall or ceiling line or not more than one-quarter-inch back of it except where conduit is exposed.

J. Accessories

All accessories as noted or required to install and make workable all electrical and related items contained under this section of the specification shall be furnished and installed.

3.2 TESTING AND INSPECTIONS

A. Each system component shall be given requisite factory tests as necessary to determine that the work and materials are free from defects and to establish that the design and construction meet the requirements of the contract documents.

B. Make the following minimum tests and checks prior to energizing electrical equipment:

1. Mechanical inspection, testing and setting of circuit breakers, disconnect switches, motor starters, control equipment, etc. for proper operation.
2. Test grounding system for resistance to ground.
3. Test 600 volt power wires and cables by meg-ohm resistance testing.
4. Check wire and cable terminations for tightness.
5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
6. Check the ampere rating of thermal overloads for motors and submit a typed record to the Contractor of same, motor service factor, horsepower, full load current and starting code letter. If inconsistencies are found, new thermal elements shall be supplied and installed.
7. Check rotation of motors prior to energizing. Disconnect driven equipment if damage could occur due to wrong rotation. If it rotates in the wrong direction, correct it.
8. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by schematic and wiring diagrams.

9. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1-2-3 rotation on a phase sequenced motor when connected to “A”, “B” and “C” phases.

C. Testing shall be scheduled and coordinated with the Subcontractor at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.

D. The local authority having jurisdiction must be notified in order that local inspection may be carried out at the proper stage

E. All local permits shall be obtained and paid by the Subcontractor.

** END OF SECTION **

SECTION 16051

ELECTRIC MOTORS

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

The plans and specifications of this project are performance-based documents and hence motor sizes are not exact to certain portions of the process. Regardless of size or use, all electric motors must conform to the minimum requirements of this section unless the Supplier can demonstrate non-applicability due to specific environmental or torque requirements.

Motors furnished under other sections of these specifications shall be in conformance with the requirements listed in this section unless otherwise noted.

All materials. Products and equipment shall be UL listed.

Motors specified herein are three-phase, squirrel cage induction type for 1/2 horsepower and above; single phase for less then 1/2 horsepower; or direct current (DC) motors.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES, INC. (UL)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1.2 SUBMITTALS

The Subcontractor shall submit five copies of the following to the Contractor.

A. Motor data for approval shall include complete nameplate data and test characteristics in accordance with NEMA Standard MG1-12.54 "Report of Test Form for Routine Tests on Induction Motors" and, in addition, the following for motors typical of the units furnished:

1. Efficiency at 1/2, 3/4 and full load
2. Power factor at 1/2, 3/4 and full load
3. Motor outline, dimensions and weight
4. Descriptive bulletins, including full description of insulation system
5. Bearing design data
6. Special features (i.e., space heaters, temperature detectors, etc.)
7. For variable speed motor provide speed range.

1.3 SHIPPING, HANDLING AND DELIVERY

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

D. All equipment requiring placement within the Groundwater Treatment Plant (GWTP) building prior to the building shell construction shall be appropriately scheduled by the Subcontractor.

E. Machinery used to place equipment on the GWTP building shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 RATING

A. Motors shall be suitable for across the line starting at full voltage and 80% rated voltage. They shall also satisfy the speed-torque requirements of the driven equipment over their entire starting and operating range.

B. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.

C. All motors shall be continuous time rated suitable for operation in a 40 degrees C ambient environment unless noted otherwise.

D. Specific motor data such as horsepower (Hp), revolutions per minute (RPM), enclosure type, etc., is specified under the detailed specification for the mechanical equipment with which the motor is supplied.

2.2 NAMEPLATES

The motor manufacturer's nameplates shall be engraved or embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins. Nameplates shall indicate clearly all of the items of information enumerated in NEMA Standard MGI-10.38 or MGI-20.60, as applicable.

2.3 CONDENSATION HEATERS

A. Condensation heaters, where specified under the detailed specification for the mechanical equipment with motor, shall conform to the following:

1. Heaters shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 V, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought out to a separate conduit box.

2.4 SINGLE PHASE MOTORS

A. Unless otherwise specified, motors smaller than 1/2 horsepower shall be single phase, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.

B. Motors shall be rated for operation at 115 volts, single phase, 60 Hz.

C. Locked rotor current shall be greater than specified in NEMA Standard MGI-12.32, Design "N".

D. Motors shall be totally enclosed in conformance with NEMA Standard MGI-10.35. Small fan motors may be open type if suitably protected from moisture, dripping water, and lint accumulation.

E. Motors shall be provided with sealed ball bearings lubricated for 10 years normal use.

F. Motor shall be explosion proof in Class I, electrical area classification.

2.5 THREE PHASE MOTORS-FRAMES

A. Unless otherwise specified, motors 1/2 horsepower and larger shall be 3-phase, squirrel cage induction type.

B. All motors 3/4 HP and larger shall be a NEMA frame 143T or larger. 1/2 horsepower motors, and 3/4 horsepower motors rated 1800 and 3600 rpm, shall be a 56 frame. Motors shall be designed and connected for operation on a 460 volt, 3 phase, 60 hertz altering current system. Dual voltage (230/460) rated motors are acceptable.

C. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor kilovolt-amperes/ horsepower (KVA/Hp) shall not exceed Code Letter G as described in NEMA Standard MG1-10.37 for motors 20 HP and larger.

D. Anti-friction motor bearings shall be designed to be regreasable and initially shall be filled with grease suitable to ambient temperature of 40 degrees C. Bearings shall be AFBMA Types BC or

RN, heavy duty, or shall otherwise be shown to be suitable for the intended application in terms of B-10 rating life, Class M3 or better.

E. All grease lubricated bearings, except those specified to be factory sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type as manufactured by the Alemite Division of the Stewart-Warner Corporation or Contractor approved equal.

F. Insulation systems shall be Class F, operated at Class B temperature rise and shall be manufacturer's premium grade, resistant to attack by moisture, acids, alkalis, and mechanical or thermal shock.

G. Motors for outdoor service shall have vacuum/pressure impregnate epoxy insulation for moisture resistance.

H. Motors shall have a steel or cast iron frame and cast iron or stamped steel conduit box, as specified below. Conduit box shall be split from top to bottom and shall be capable of being rotated to four positions. Synthetic rubber-like gaskets shall be provided between the frame and the conduit box and between the conduit box and its cover. Motor leads shall be sealed with a non-wicking, non-hygroscopic insulating material. A frame-mounted pad with drilled and tapped hole, not less than 1/4-in diameter, shall be provided inside the conduit box for motor frame grounding. Motors specified throughout this Specification shall conform to one of the following standard enclosure designs:

1. Open drip-proof: Manufacturer's standard design with steel or cast iron frame, cast iron end brackets, stamped steel conduit box and 1.15 service factor at 40 degrees C.
2. Totally enclosed fan cooled (TEFC): TEFC motors shall have a steel or cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and upgraded insulation by additional dips and bakes to increase moisture resistance.
3. Totally enclosed non-ventilated (TENV): TENV motors shall include the same rating and accessories as specified for TEFC motors.
4. Explosion proof motor shall have a cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 40 degrees C, tapped drain holes (corrosion resistant plugs for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger) and be UL listed for Class 1, Division 1, Group D hazardous areas.
5. Severe duty: Motors shall be of the corrosion resistant type conforming to motors designed by the manufacturer as "Corro-Duty", "Mill and Chemical", "Custom Severe Duty", or similar quality designation. Severe duty motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box and 1.15 service factor at 40 degrees C and tapped drain holes (corrosion resistant plug for frames 286T and smaller and automatic breather/drain devices for frames 324T and larger).

I. Three phase motors rated 1 hp and larger shall be of the high efficiency type. Minimum efficiencies for motors shall be 85%.

J. Variable speed drive motors shall have Inverter Grade Insulation and shall comply with NEMA MG-1, Part 31 ' Specification for Inverter Duty Application'.

K. Submersible motor shall be of water-lubricated design and meet NEMA standard for submerged condition. Motor shall have 1.15 minimum service factor. Motor leads and power cable from pump to the extraction well junction box, shall be furnished by the well pump manufacturer. Power cable shall be flat-jacketed cable with Tefzel insulation (santoprene) type or Contractor approved equal.

L. Fans shall be of non-sparking, corrosion resistant material.

2.6 QUALITY ASSURANCE

Routine tests shall be performed on representative motors, and shall include the information described in NEMA MG1-12.54 “Report of Test Form for Routine Tests on Induction Motor”. Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

PART 3. EXECUTION

Not used.

** END OF SECTION **

SECTION 16470

LIGHTING

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

All materials, products, and equipment provided shall be UL listed.

The work includes supply, erection, complete installation and testing of the following:

A. Interior Building Lights

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000 Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

NATIONAL FIRE PROECTION ASSOICATION (NFPA)

NFPA-70 National Electrical Code

UNDERWRITERS LABORATORIES (UL)

1.2 SUBMITTALS

Subcontractor shall submit five copies to of shop drawings to the Contractor showing outline and overall dimensions, connection details, weights, anchorage details, and parts lists if applicable, for all equipment and materials furnished under this section. Shop drawings shall include overall dimensions and details of the location of all connections, supports and accessories and a bill of material.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the Subcontractor shall carefully pack and brace all material within shipping containers and on the carrier.

B. The Subcontractor shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The

Subcontractor shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The Subcontractor shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground; shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

PART 2. PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The lighting equipment includes interior lighting, emergency lighting and exit lights for the building. Interior process area lighting shall be controlled by the existing lighting switches as shown on drawing. The lights shall operate on 120 VAC electrical service.

B. Fluorescent lighting fixture shall be used for process area lighting.

C. The layout of lighting fixtures shall give a calculated average intensity as follows:

Enclosed process area	80 foot-candles

2.2 EQUIPMENT

A. Fluorescent lighting fixture shall be premium specification grade troffer with full static door.

B. Exit lighting fixture shall include a solid state charging circuit, batteries, relays, and both normal alternating current (AC) and direct current (DC) emergency lamps all packaged in a single steel, aluminum or plastic housing and shall be suitable for surface, ceiling or end mounting and contain a prismatic down-lens. Face shall be white stencil with red letter and universal snap-out directional arrows.

C. Emergency lighting unit shall include solid-state charging circuit, batteries, relays and two 25-watt, sealed-beam lamp-heads, all neatly packaged in a single unit suitable for wall mounting. Battery shall be sealed, maintenance free, rechargeable type with capacity to supply 100 Watt for 1 1/2 hours at rated voltage. A test switch shall be provided to simulate a power failure condition. Provide lamps to indicate AC on and recharging.

D. Subcontractor shall provide brackets, supports, anchors, frames fast starters and ballast required for a complete, operable system.

E. Subcontractor shall provide all rapid start, cool white fluorescent lamps for fluorescent fixture.

F. All lighting materials shall conform to the requirements of the NBFU and shall have appropriate Underwriters' Laboratories (UL) acceptance.

G. Each basic fluorescent fixture shall be equipped with the necessary number and type of ballast to operate only the lamps with the particular basic unit. Single lamp fixtures shall contain single lamp ballast; two lamp fixtures shall contain one two-lamp ballast.

H. Ballast protectors shall be of the thermally actuated automatic-reset built-in type.

2.3 REQUIREMENTS

A. All materials and equipment shall be suitably grounded and conform with NEC Standards.

B. Light fixtures and accessories shall be painted, galvanized, white metal, or treated to ensure a service life of ten years.

C. Subcontractor shall provide materials and accessories, whether or not specifically described of best grade of commercial manufacturer.

PART 3. EXECUTION

3.1 ERECTION/INSTALLATION

A. Lighting fixtures shall be installed and or erected in accordance with the requirements of the Contract Documents and the manufacturer's instructions and recommendations. Building lighting fixtures shall be arranged as shown on the Contract Drawings.

B. All work shall be performed by competent, trained workmen, skilled in the field to which they are executing the work.

C. All work shall conform to the NEC Standards.

D. The furnishing and installation of the lighting fixtures or lighting equipment must be executed in a manner that will insure completion coincident with the completion of the construction of the project unless otherwise required by the Contract Document.

E Lighting fixture installation shall be level, plumb and square; and fastened rigidly in place.

F. Wiring between fluorescent lamp holder and associated operating and starting equipment shall be of sizes not smaller than the leads furnished with the approved types of ballast and shall have equal or better insulating and heat resisting characteristics. All other wiring within fluorescent lighting fixtures or from the fixture to the splice with the building wiring shall conform to the requirements of the latest issue of the NEC, and shall not be less than No. 12 gauge. Wiring shall be protected with tape or tubing at all points where abrasion is liable to occur. Wiring shall be concealed within fixture construction, except where the fixture design or mounting dictates otherwise.

G. Suspended fixtures shall be provided with swivel hangers in order to ensure a plumb installation. Pendant rods or chains 4 feet or longer excluding fixture shall be braced to limit swinging. Bracing shall be 3 directional and 120 degrees apart. Single unit suspended fluorescent fixtures shall have twin stem hangers. Multiple unit or continuous row fluorescent units shall have a tubing or stem for wiring at one point, and a tubing or rod suspension provided for each length of chassis including one at each end.

H. Ceiling fixtures shall be coordinated with and suitable for installation in, or on from the suspended ceiling provided by other. Installation and support of fixture shall be in accordance with NEC and manufacturer’s recommendations.

I. Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed in the fixtures just prior to the completion of the project.

3.2 TESTING AND INSPECTIONS

A. After installation, the Subcontractor shall check each unit to determine that there are no broken lenses or burned-out bulbs. Broken lenses and bad bulbs shall be replaced by the Subcontractor at no additional expense to the Contractor.

B. Subcontractor shall operate each lighting fixture from a switch or breaker, to determine if the fixture is working and identify the circuit breaker in the lighting panel feeding the fixture.

C. For emergency lighting unit, the test switch on each unit shall be depressed to simulate a power failure. The Subcontractor shall observe that each lamp head is illuminated, and mark the circuit directory at lighting panel supplying these circuits “Do Not Turn Off”, and install clips on circuit breaker operating handles to ensure breakers are maintained in “ON” position.

D. The Subcontractor shall operate the test switch of exit lights units with self contained emergency supply to determine if emergency lamps will operate in the event of failure of normal power to the assembly.

* * * * END OF SECTION * * * *

SECTION 16721

FIRE DETECTION AND ALARM SYSTEM

PART 1. GENERAL

The Contractor is the Navy's representative or agent during the construction phase of this project. All indications of Contractor in this specification refers to the Navy's representative or agent.

The Subcontractor shall provide all materials, labor, and equipment to perform the work specified in this section in accordance with the Technical Specifications and Contract Drawings.

All electrical installation inside the process area (Blower Room) shall meet NEC Class I, Division 2, Group D area classification requirements.

Provide a complete fire detection and alarm system including microprocessor based control panel and all associated devices.

All materials, products, and equipment provided shall be UL listed.

1.1 REFERENCES

Related work and/or equipment that is specified in other sections of the contract document includes, but is not limited to, the following:

Section 16000	Basic Electrical Materials and Methods

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. In case of contradiction, the most stringent code applies.

FACTORY MUTUAL (FM)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	National Electrical Code
NFPA 72	Installation, Maintenance and Use of Protective Signaling Systems
NFPA 90A	Installation of Air Conditioning and Ventilating Systems

UNDERWRITERS LABORATORIES (UL)

UL-04	Fire Protection Equipment Directory UL 6
UL 38	Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
UL 228	Door Closers-Holders, with or without Integral Smoke Detectors
UL 268	Smoke Detectors for Fire Protective Signaling Systems

UL 464 Audible Signal Appliances

UL 521 Heat Detectors for Fire Protective Signaling Systems

UL 864 Control Units for Fire-Protective Signaling Systems

1.2 SUBMITTALS

A. The Subcontractor shall submit five copies of the following to the Contractor:

1. Spare Parts

Spare parts data for each different item of material and equipment specified, not later than 2 months prior to the date of beneficial occupancy. Data shall include a complete list of parts and supplies with the current unit prices and source of supply and a list of the parts recommended by the manufacturer to be replaced after one year of service.

2. Qualifications

Qualifications, with verification or license number, of the registered Fire Protection Engineer or a Registered Professional Engineer who has at least 4 years of current experience in the design of the fire protection and detection systems.

3. Drawings

Fire Alarm Reporting System

Detail drawings, signed by the Fire Protection Engineer, consisting of a complete list of equipment and material, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Detail drawings shall also contain complete wiring and schematic diagrams for the equipment furnished, equipment layout, and any other details required to demonstrate that the system has been coordinated and will properly function as a unit.

Detailed point-to-point wiring diagram signed by the Fire Protection Engineer, showing all points of connection. Diagram shall include connections between system devices, appliances, control panels, supervised devices, and all equipment that is activated or controlled by the panel.

4. Instructions

Fire Alarm Reporting System

Six copies of operating instructions outlining step-by-step procedures required for system startup, operation, and shutdown. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features. Six copies of maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The instructions shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed. Instructions shall be approved prior to training.

Test Procedures

Detailed test procedures, signed by the Fire Protection Engineer, for the fire detection and alarm system 60 days prior to performing system tests.

Testing

Test reports in booklet form showing all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. Each test report shall document all readings, test results and indicate the final position of controls.

5. Certificates

Equipment

Certified copies of current approvals or listings issued by UL, Factory Mutual (FM) or other nationally recognized testing laboratory, showing compliance with specified NFPA standards.

Installer

Evidence that the installer of the system is listed in UL-04 under Protection Signaling Services-Local, Auxiliary Remote Station Proprietary (UUJS).

The system shall be approved by the City Fire Marshall.

1.3 SHIPPING, DELIVERY, AND STORAGE

A. In order to prevent damage during shipment, the supplier shall carefully pack and brace all material either within shipping containers or on the carrier.

B. The supplier shall provide delivery of material undamaged in original containers or packaging, with identifying labels intact and legible, to the project/work site as directed. The supplier shall provide additional protection during shipping as necessary to prevent scraping, marring, or damaging materials or surrounding surfaces. The supplier shall handle materials by methods to prevent bending or overstressing during fabrication and delivery.

C. Components shall be stored off of the ground and shall be protected from weather elements; and be in compliance with all manufacturer storage requirements to avoid warranty issues.

D. All equipment, requiring placement within the Groundwater Treatment Plant prior to the building shell construction, shall be appropriately scheduled by the Subcontractor and coordinated with the Contractor.

E. Machinery used to place equipment within the Ground Water Treatment Plant shall not cause stress on the floor above the allowable maximum.

PART 2. PRODUCTS

2.1 STANDARD PRODUCTS

A. Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products and shall be items that have been in satisfactory use for at least two years. Equipment shall be supported by a service organization that can provide service within 24 hours.

1. Nameplates

Major components of equipment shall have the manufacturer’s name, address, type or style, voltage and current rating, and catalog number on a non-corrosive and non heat-sensitive plate, which is securely attached to the equipment.

2. Keys and Locks

   Locks shall be keyed alike.

3. Tags

   Tags with stamped identification number shall be furnished for keys and locks.

4. Compliance

   The fire detection and internal alarm system and the central reporting system shall be configured in accordance with NFPA 72 and the New York State Building Code. The equipment furnished shall be compatible and be UL listed or FM approved or listed by a nationally recognized testing laboratory in accordance with the applicable NFPA standards.

5. Manufacturer's Services

   Services of a manufacturer's representative who is experienced in the installation, adjustment, testing, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

2.2 SYSTEM DESIGN

A. Operation

The fire alarm and detection system shall be a complete, supervised fire alarm system providing 100 percent coverage. The system shall be activated into the alarm mode by actuation of any alarm initiating device. The system shall remain in the alarm mode until the initiating device is reset and the fire alarm control panel is reset and restored to normal. Alarm initiating devices shall be connected to initiating device circuits (IDC), Style D, or to signal line circuits (SLC), in accordance with NFPA 72. Alarm indicating appliances shall be connected to indicating appliance circuits (IAC), in accordance with NFPA 72. A two-loop conduit system shall be provided so that if any one conduit and all conductors contained in that conduit are severed all IDC, IAC, or SLC on that circuit shall remain functional. All textual, audible, and visual appliances and systems shall comply with NFPA 72.

Addressable system shall be microcomputer (microprocessor or micro controller) based with a minimum word size of eight bits.

1. Sufficient memory shall be provided to perform as specified for an addressable system.

2. Individual identify of initiating and notification appliances shall be provided for the following conditions:

   a) alarm

   b) trouble

   c) open

   d) short

   e) appliances missing/failed

   f) remote detector - sensitivity adjustment from the panel for smoke detectors

3. All initiating and notification appliances shall have the capability of individually being disabled or enabled from the panel.

B. Operational Features

The system shall have the following operating features:

1. Electrical supervision of alarm IDC, SLC and IAC as required. Smoke detectors shall have combined alarm initiating and power circuits.

2. Electrical supervision of the primary power alternating current (AC) supply, battery voltage, placement of alarm zone module (card, PC board) within the control panel, and transmitter tripping circuit integrity.

3. Trouble buzzer and trouble lamp (light emitting diode or neon light) to activate upon a single break, open, or ground fault condition, which prevents the required normal operation of the system. The trouble signal shall also operate upon loss of primary power AC supply, low battery voltage, removal of alarm zone module (card, PC board), and disconnection of the circuit used for transmitting alarm signals off-premises. A trouble alarm silence switch shall be provided which will silence the trouble buzzer, but will not extinguish the trouble indicator lamp. After the system returns to normal operating conditions, the trouble buzzer shall again sound until the silencing switch returns to normal position, unless automatic trouble reset is provided.

4. Transmitter disconnect switch to allow testing and maintenance of the system without activating the transmitter but shall provide a trouble signal when disconnected and a restoration signal when reconnected.

5. Evacuation alarm silencing switch or switches which, when activated, will silence alarm devices, but will not affect the zone indicating lamp nor the operation of the transmitter. This switch shall be over-ridden upon activation of a subsequent alarm from an unalarmed zone and the alarm devices will be activated.

6. Electrical supervision of circuits used for supervisory signal services. Supervision shall detect any open, short, or ground.

7. Zones for alarm shall be determined by Subcontractor/designer and shown on a fire alarm riser diagram.

C. Alarm Functions

An alarm condition on a circuit shall automatically initiate the following functions:

1. Transmission of signals over the station fire reporting system.
2. Visual indications of the alarmed zones on the fire alarm control panel annunciator.
3. Continuous sounding of alarm notification appliances throughout the building.
4. Deactivation of the all heating ventilation and air conditioning (HVAC) units in the alarmed zone throughout the building.

D. Primary Power

Operating power sourced from 208/120 VAC system shall be provided as required by paragraph 3.1 A1 Power Supply for the System. Transfer from normal to emergency power or restoration from emergency to normal power shall be fully automatic and not cause transmission of a false

alarm. Loss of AC power shall not prevent transmission of a signal via the fire reporting system upon operation of any initiating circuit.

E. Battery Backup Power

Battery backup power shall be through use of rechargeable, sealed-type storage batteries and battery charger.

F. Detection Device Type By Area

1. Heat Detectors: All areas shall be protected by heat detectors.
2. Smoke Detectors: All areas shall be protected by smoke detectors

2.3 CONTROL PANEL

A. Control panel to be used is already installed and in service in the adjacent building to the SVE containment building.

B. Visual annunciators shall be provided for each active and spare zone. One spare zone shall be provided. Each lamp shall provide specific identification of the zone by means of a permanently attached rigid plastic, phenolic or metal sign with either raised or engraved letters. Zone identification shall consist of a word description of the zone.

C. Cabinets shall be provided with ample gutter space to allow proper clearance between the cabinet and live parts of the panel equipment.

1. Remote System Trouble Audible/Visual Appliance

Audible appliance shall have a minimum sound level output rating of 85 dBA at 10 feet and operate in conjunction with the panel's integral trouble signal. The audible device shall be silenced by the system trouble silence switch. A rigid plastic, phenolic or metal identification sign, which reads "Fire Alarm System Trouble", shall be provided at the audible appliance. The visual appliance located with the audible appliance shall not be extinguished until the trouble has been cleared.

D. Circuit Connections

E. Circuit conductors entering or leaving the panel shall be connected to screw-type terminals with each terminal marked for identification.

2.4 STORAGE BATTERIES

Storage batteries shall be provided and shall be the sealed, lead-calcium type requiring no additional water. The batteries shall have ample capacity, with primary power disconnected, to operate the fire alarm system for a period of 60 hours. Following this period of operation via batteries, the batteries shall have ample capacity to operate all components of the system, including all alarm signaling devices in the total alarm mode for a minimum period of 15 minutes. Batteries shall be sized to deliver 50 percent more ampere/hours based on a 60 hour discharged rate than required for the calculated capacities.

2.5 BATTERY CHARGER

Battery charger shall be completely automatic, with high/low charging rate, capable of restoring the batteries from full discharge to full charge within 12 hours. A separate ammeter shall be provided for indicating rate of charge. A separate voltmeter shall be provided to indicate the state of the battery charge. A pilot light indicating when batteries are manually placed on a high rate of charge shall be provided as part of the unit assembly if a high rate switch is provided. Charger shall be located in the control panel or battery cabinet.

2.6 MANUAL FIRE ALARM STATIONS

Manual fire alarm stations shall conform to the applicable requirements of UL 38. Manual stations shall be connected into alarm-initiating circuits. Stations shall be installed on mounted outlet boxes. Stations shall be double action type. Stations shall be finished in red, with raised letter operating instructions of contrasting color. Stations requiring the breaking of glass or plastic panels for operation are not acceptable. Stations employing glass rods are not acceptable. The use of a key or wrench shall be required to reset the station. Gravity or mercury switches are not acceptable. Switches and contacts shall be rated for the voltage and current upon which they operate. Stations shall have a separate screw terminal for each conductor. Surface mounted boxes shall be painted the same color as the fire alarm manual stations.

2.7 FIRE DETECTING DEVICES

A. Fire detecting devices shall comply with the applicable requirements of NFPA 72, NFPA 90A, UL 268, and UL 521. Detector base shall have screw terminals for making connections. No solder connections will be allowed. Detectors shall be connected into alarm initiating circuits. Detectors located in concealed locations (above ceiling, etc.) shall have a remote visible indicator lamp. Installed devices shall conform to the classification of the area. Addressable fire detecting devices except flame detectors shall be dynamically supervised and uniquely identified in the control panel.

1. Heat Detectors

   Heat detectors shall be designed for detection of fire by fixed temperature or combination fixed temperature and rate-of-rise principle. Heat detectors shall be rated for a minimum of 50 foot spacing (smooth-ceiling rated) in accordance with UL 521. Detectors located in areas subject to moisture, exterior atmospheric conditions or hazardous locations as defined by NFPA 70, shall be types approved for such locations.

2. Combination Fixed-Temperature and Rate-of-Rise Detectors

   Detectors shall be designed for surface or semi-flush outlet box mounting and supported independently of wiring connections. Contacts shall be self-resetting after response to rate-of-rise principle. Under fixed temperature actuation, the detector shall have a permanent external indication, which is readily visible. Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes shall operate on fixed temperature principle only.

3. Fixed Temperature Detectors

   Detectors shall be designed for surface or semi-flush outlet box mounting and supported independently of wiring connections. Detectors are designed to detect high heat.

B. Smoke Detectors

Smoke detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be ionization or photoelectric type. Detectors shall contain a visible indicator lamp that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making all wiring connections. Detectors that are in concealed (above false ceilings, etc.) locations shall have a remote visible indicator lamp.

1. Photoelectric Detectors

   Detectors shall operate on a light scattering concept using a Light Emitting Diode (LED) light source. Failure of the LED shall not cause an alarm condition. Detectors shall be factory set for sensitivity and shall require no field adjustments of any kind.

2.8 NOTIFICATION APPLIANCES

A. Audible appliances shall be heavy duty and conform to the applicable requirements of UL 464. Devices shall be connected into alarm indicating circuits. All devices shall have a separate screw terminal for each conductor.

1. Alarm Horns

   Horns shall be surface mounted, with the matching mounting back box grill and vibrating type suitable for use in an electrically supervised circuit. Horns shall produce a minimum sound rating of at least 85 dBA at 10 feet. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grills.

2. Visual Notification Appliances

   Visual notification appliances shall have high intensity optic lens and flash tubes. Strobes shall flash at approximately 1 flash per second and a minimum of 1 candela (8,000 peak candle power).

3. Combination Audible/Visual Notification Appliances

   Combination audible/visual notification appliances shall provide the same requirements as individual units except they shall mount as a unit in standard back boxes. All units shall be factory assembled. Any other audible indicating appliance employed in the fire alarm systems shall be approved by the authority having jurisdiction.

4. Master Box

   Master box shall have a weatherproof enclosure, and shall be suitable for surface mounting.

2.9 FIRE DETECTION AND ALARM SYSTEM PERIPHERAL EQUIPMENT

A. Conduit

Conduit in the process area shall be rigid galvanized steel (RGS) conduit or intermediate metallic conduit, (IMC). Electrical metallic tube (EMT) can be used in dry office and/or control room.

B. Wiring

Wiring for 120V AC power shall be No. 12 AWG minimum. Wiring for low voltage DC circuits shall be No. 14 AWG minimum. Power wiring (over 28 volts) and control writing shall be isolated. All wiring shall conform to NFPA 70. System field wiring shall be solid copper and

installed in metallic conduit or EMT, except rigid plastic conduit may be used under slab-on-grade. All conductors shall be color-coded. Conductors used for the same functions shall be similarly color-coded. Wiring code color shall remain uniform throughout the circuit. Pigtail or T-tap connections to alarm initiating, supervisory circuits, and alarm indicating circuits are prohibited. T-tapping using screw terminal blocks is allowed for addressable systems.

C. Special Tools and Spare Parts

Special tools necessary for the maintenance of the equipment shall be furnished. Two spare fuses of each type and size required and five spare lamps and LEDs of each type shall be furnished. Two percent of the total number of each different type of detector, but no less than two each, shall be furnished. Fuses and lamps shall be mounted in the fire alarm panel.

All equipment installed in the process and/or utility areas shall be suitable for damp location, NEMA 1 enclosure is not acceptable.

PART 3. EXECUTION

3.1 INSTALLATION

A. All work shall be installed in accordance with the manufacturer's diagrams and recommendations, unless otherwise specified. Smoke detectors shall not be installed until the building has been thoroughly cleaned.

1. Power Supply for the System

A single dedicated branch-circuit connection for supplying power to the building fire alarm system shall be provided. Breaker shall be marked 'FIRE ALARM CIRCUIT CONTROL" with a rigid plastic nameplate.

2. Wiring

Wiring for systems shall be installed in 3/4-inch minimum diameter conduit. Wiring for the fire alarm system shall not be installed in conduits, junction boxes, or outlet boxes with conductors of lighting and power systems. No more than one conductor shall be installed under any screw terminal. All circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked in accordance with the wiring diagram. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors is prohibited in the system. Wiring within any control equipment shall be readily accessible without removing any component parts. The fire alarm equipment manufacturer's representative shall be present for the connection of wiring to the control panel.

3. Control Panel

The fire alarm devices will be connected to the existing control panel already in service in the adjacent building to the SVE containment building.

4. Detectors

Detectors shall be installed in accordance with NFPA 72. Detectors shall be at least 12 inches from any part of any lighting fixture. Detectors shall be located at least 3 feet from diffusers of air handling systems. Each detector shall be provided with appropriate mounting hardware as required by its mounting location. Detectors which mount in free space shall be mounted directly to the end of the stubbed down rigid conduit drop. Conduit drops shall be

firmly secured to minimize detector sway. Where length of conduit drop from ceiling or wall surface exceeds 3 feet, sway bracing shall be provided.

5. Notification Appliances

Notification appliances shall be mounted a minimum of 8 feet above the finished floor unless limited by ceiling height or otherwise indicated.

3.2 OVERVOLTAGE AND SURGE PROTECTION

All equipment connected to AC circuits shall be protected from surges per IEEE C62.41 and NFPA 70. All cables and conductors, which serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.3 TESTING

A. The Subcontractor shall notify the Contractor 30 days before the preliminary and acceptance tests are to be conducted. The tests shall be performed in accordance with the approved test procedures in the presence of the Contractor. The control panel manufacturer's representative shall be present to supervise all tests. The Subcontractor shall furnish all instruments and personnel required for the tests.

1. Preliminary Tests

Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed initiating and notification appliance. Tests shall include the meggering of all system conductors to determine that the system is free from grounded, shorted, or open circuits. The megger test shall be conducted prior to the installation of fire alarm equipment. If deficiencies are found, corrections shall be made and the system shall be retested to assure that it is functional by the Subcontractor and at no additional expense to the Contractor.

2. Acceptance Test

Testing shall be in accordance with NFPA 72. The recommended tests in NFPA 72 shall be considered mandatory and shall verify that all previous deficiencies have been corrected. The test shall include the following:

a) Test of each function of the control panel.

b) Test of each circuit in both trouble and normal modes.

c) Tests of alarm initiating devices in both normal and trouble conditions.

d) Tests of each control circuit and device.

e) Tests of each alarm notification appliance.

f) Tests of the battery charger and batteries.

g) Complete operational tests under emergency power supply.

h) Visual inspection of all wiring connections.

i) Opening the circuit at each alarm initiating device and notification appliance to test the wiring supervisory feature.

j) Ground fault

k) Short circuit faults

l) Stray voltage

m) Loop Resistance

* * * * END OF SECTION * * * *

APPENDIX C
STANDARD OPERATING PROCEDURES

LIST OF CONTENTS

Subsurface Soil Boring Sampling [Split-Spoon/Macrocore] (SOP 13)

1. Drill a borehole to the desired sampling depth. Drive a split-spoon/macrocore sampler into the undisturbed soil to be sampled.

2. Drive a decontaminated carbon steel 3-inch outer diameter split-spoon sampler with blows from 300 pound hammer falling 30 inches until either approximately 2 feet has been penetrated or 100 blows within a 6-inch interval have been applied (modified from ASTM Method D-1586-84).

3. Record the number of blows required for each 6 inches of penetration or fraction thereof. The first 6 inches is considered to be a seating drive. The sum of the number of blows required for the second and third 6 inches of penetration is termed the penetration resistance. If the sampler is driven less than 2 feet, the penetration resistance is that for the last 1 foot of penetration. (If less than 1 foot is penetrated, the logs shall state the number of blows and the fraction of 1 foot penetrated.) No blow counts will be collected for the macrocore sampling method.

4. Bring the sampler to the surface and remove both ends and one half of the split-spoon so that the recovered soil rests in the remaining half of the barrel. Place the split-spoon on clean polyethylene sheeting. The macrocore will be cut lengthwise to access the soil. Describe thoroughly the approximate recovery (length), the USCS and Burmister classifications, composition, color, moisture, etc. of the recovered soil.

5. Collect the TCL VOC sample immediately upon opening the sample tube, using an EnCore® Sampler. In addition, obtain samples for field screening ([Procedure 15, Soil Sample Field Screening) directly after opening the split-spoon sampler.

6. Collect the TCL VOC sample from the undisturbed soil beneath (3 to 4 inches bgs) using an EnCore® Sampler (Steps 4 through 14).

7. Prior to collecting sample, hold coring body of EnCore® Sampler, and push plunger rod down until small o-ring rests against tabs. This will assure that the plunger moves freely.

   Depress locking level on EnCore® T-handle. Place coring body - plunger end first - into open end of T-handle, aligning the two (2) slots on the coring body with the two (2) locking pins in the T-handle. Twist coring body <u>clockwise</u> to lock pins in slots. Double check that sampler is locked in place prior to use.

8. To collect soil sample, turn T-handle such that "T" is up and coring body is down. This positions plunger bottom flush with the bottom of the coring body; double check that plunger bottom is in position.

9. Using T-handle, push EnCore® Sampler into soil until coring body is completely full. When full, the small o-ring will be centered in the T-handle viewing hole.

10. Remove sampler from soil. Wipe any excess soil from the exterior of the coring body.

11. Cap coring body which it is still on T-handle. Push cap over flat area of ridge. Push and twist cap to lock in place - cap <u>must be</u> seated over coring body ridges to seal sampler.

Subsurface Soil Boring Sampling [Split-Spoon/Macrocore] (SOP 13) (con't)

12. Remove capped EnCore® Sampler by depressing the locking lever on the T-handle while twisting and pulling sampler from T-handle.

13. Lock plunger by rotating extended plunger rod fully counter-clockwise until wings rest firmly against tabs.

14. Attach a completed label (provided with the EnCore® Sampler in the bag) to the cap on the coring body container. Place sampler in zipper bag provided, and seal bag.

15. Place initialed custody seal(s) over the top of the closed EnCore® bag, in such a manner that the bag cannot be opened (even partially); two or more custody seals may be needed. **Do not place custody seals directly on the EnCore® Sampler!**

16. Attach a completed sample tag to the bag, using tape or other method, provided that the sample tag is securely fastened to the bag and will not become dislodged in transit.

17. Collect an additional aliquot of soil from each sample location for VOC analysis in a separate jar, for percent moisture determination by the laboratory (if VOC samples are shipped to a separate laboratory from the SVOC and/or pesticide/PCB samples).

18. Homogenize remaining soil in a stainless steel bowl, using a decontaminated stainless steel spatula or spoon. Fill sample containers for other parameters as needed. In addition, obtain samples for field screening (Procedure 15, Soil Sample Field Screening).

19. Complete sample logs, labels, custody seals, and chain of custody forms. Record sample information in the field notebook.

20. Place the analytical samples in coolers for shipment and chill to 4□C.

Soil Sample Field Screening [Headspace Analysis] (SOP 15)

Soil samples will be field screened using PID headspace analysis in accordance with the following procedure:

1. Collect representative soil samples from each sample interval, and place in two clean, unpreserved wide mouth glass jars. The jars will be filled approximately two-thirds with soil, leaving one-third empty.

2. The mouth of the jars will be covered with aluminum foil (shiny side out). The foil shall cover the mouth of each jar tightly and be secured with a rubber band to prevent the escape of VOCs.

3. After a minimum period of 5 minutes, the foil of one of the jars will be pierced using the probe of the PID, and the instrument inserted into the jar to sample the headspace.

4. Field screening readings and ambient background readings will be recorded in the field log book and on the boring log sheets at the appropriate interval.

Monitoring Well Development (SOP 27)

Each monitoring well installed at the Site as part of the field investigation will be developed in accordance with the following procedure:

1. Wait at least 48 hours for the grout to cure subsequent to monitoring well completion before beginning well development. Each new well will be developed by pumping and surging. The surge blocks will be cylinders that have a diameter slightly smaller than the borehole of the well. Rubber flaps of a slightly larger diameter will be attached to the surge blocks and will come into contact with the sides of the borehole The surge blocks will be raised and lowered across the length of the screen to remove fine particles and deposits which may be clogging the screen. During the surging procedure the well will be pumped using a centrifugal pump to remove suspended particles and induce flow into the well to prevent clogging of the sand pack.

2. Continue development until there is less than a 10 percent variance between successive measurements of pH, temperature, turbidity, and conductivity and/or turbidity is less than 5 NTUs. Development will be continued for a minimum of two hours, but for no longer than eight hours without client permission.

Development water will be containerized in drums for proper disposal.

Air Monitoring [Real Time] (SOP 31)

Real-time air monitoring will be conducted during all intrusive site program activities to ensure the safety of all field personnel. Air monitoring will be conducted by a trained SSHO utilizing a PID or FID, as outlined in the Site-Specific Health and Safety Plan. The procedure for conducting air monitoring is described below.

1. Wear appropriate health and safety equipment as outlined in the Site-Specific Health and Safety Plan.

2. Ensure that the selected air monitoring equipment has been fully charged in accordance with the Site-Specific Health and Safety Plan, and the manufacturer's instructions.

3. At the start of each day's activities, and as appropriate during the day, calibrate all air-monitoring instruments in accordance with the Site-Specific Health and Safety Plan, and the manufacturer's instructions.

4. During drilling activities, air monitoring readings should be measured at the borehole and in the breathing zone of field personnel at regular intervals, as described in the Site-Specific Health and Safety Plan. In addition, air monitoring readings will be collected from each split-spoon sampler as they are opened. Readings will be measured during all other intrusive activities (e.g., opening monitoring wells). Readings should be recorded in field logbooks and on log sheets as described in the Site-Specific Health and Safety Plan.

5. Should readings exceed action levels, appropriate action will be taken, as described in the Site Safety and Health Plan.

Decontamination [Drilling Equipment] (SOP 52)

All drilling equipment involved in field sampling activities will be decontaminated prior to and subsequent to sampling. Equipment leaving the Site will also be decontaminated.

All drilling equipment will be steam cleaned prior to use. Pressurized steam will be used to remove all visible excess material from augers, rods, drill bits, the back of the drilling rig, and other parts of the rig which contact augers, rods, and split-spoons.

Steam cleaning will be conducted on a decontamination pad, which will be constructed on-site for the field investigation.

Any decontamination fluids that result from steam cleaning operations will be stored in U.S. Department of Transportation (USDOT)-approved 55-gallon drums until disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the Site Safety and Health Plan.

Decontamination [Non-disposable Chemical Sampling Equipment] (SOP 55)

Decontamination of non-disposable sampling equipment used to collect samples for chemical analyses (i.e., scoops, trowels, bowls, split-spoons, etc.) will be conducted as described below:

1. Alconox detergent and potable water scrub

2. Potable water rinse.

3. 10 percent nitric acid rinse (ultra pure grade) when sampling for inorganics. Carbon steel split spoons will be rinsed with a 1 percent acid solution to prevent stripping of metals.

4. Deionized water rinse.

3. Methanol rinse followed by a hexane rinse (solvents are pesticide grade or better) for equipment involved in the sampling of organics.

4. Deionized water rinse (volume at least five times amount of solvent used in rinse step above).

5. Air dry.

6. Wrap or cover exposed ends of equipment with aluminum foil for transport and handling.

Decontamination of sampling equipment will be kept to a minimum in the field and wherever possible, dedicated disposable sampling equipment will be used. Decontamination fluids will be stored in U.S. Department of Transportation (USDOT)-approved 55-gallon drums or in an on-site storage tank (liquids only) until disposal. Personnel directly involved in equipment decontamination will wear appropriate protective clothing, as stated in the Site Safety and Health Plan.